Part No. 99995-201

KAWASAKI
Shop Manual

GA1-A	B1L-A
GA2-A	F5
G3SS-A	F6
G3TR-A	F7
G4TR	F8
G5	F81M
G31M-A	

KAWASAK HEAVY INDUSTRIES, LTD.
MOTORCYCLE DIVISION

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Foreword

This Shop Manual covers maintenance and repair of the motorcycles listed on the cover, through the 1972 models.

Before beginning to service a motorcycle, careful reading of the applicable section is recommended to eliminate mistakes and unnecessary work.

Note that in the tables throughout the manual, values for the G5 are the same as those for the G3TR-A or G Series, whichever is listed, except as indicated on the first two pages of the G5 specifications (page i-iii, i-iv).

1. SPECIFICATIONS

1. Side Views
2. Specifications
3. Performance Curves

2. Specifications

Item \ Series				90cc			100cc
				GA1-A	GA2-A	G3SS-A	G3TR-A
Dimension	Overall Length			71.3 in (1,810mm)	71.3 in (1,810mm)	72.1 in (1,830mm)	72.1 in (1,830mm)
	Overall Width			29.1 in (740mm)	29.1 in (740mm)	33.1 in (840mm)	33.1 in (840mm)
	Overall Height			40.1 in (1,020mm)	40.1 in (1,020mm)	40.7 in (1,035mm)	40.7 in (1,035mm)
	Wheelbase			45.2 in (1,150mm)	45.2 in (1,150mm)	45.2 in (1,150mm)	45.2 in (1,150mm)
	Road Clearance			5.9 in (150mm)	5.9 in(150mm)	6.7 in (170mm)	6.5 in (160mm)
	Dry Weight			174 lb (79kg)	174 lb (79kg)	183 lb (83kg)	182 lb (83kg)
Performance	Maximum Speed			62 mph (100kph)	68 mph (110kph)	70 mph (113kph)	66 ph (107kph)
	Fuel Consumption	25 mph(40kph)		176mi/gal(75km/ℓ)	176mi/gal(75km/ℓ)	176mi/gal(75km/ℓ)	165mi/gal(70km/ℓ)
	Climbing Ability			29°	27°	27°	33°
	Braking Distance			21.3ft/22mph (6.5m/35kph)	21.3ft/22mph (6.5m/35kph)	21.3ft/22mph (6.5m/35kph)	21.3ft/22mph (6.6m/35kph)
	Minimum Turning Radius			70.9 in (1.8m)	70.9 in (1.8m)	70.9 in (1.8m)	70.9 in (1.8m)
	S. S. 1/8 Mile			11.6 sec	11.3 sec	11.5 sec	11.3 sec
	S. S. 1/4 Mile			———	———	———	———
Engine	Type			2 stroke·1 cylinder rotary disc valve	2 stroke·1 cylinder rotary disc valve	2 stroke·1 cylinder rotary disc valve	2 stroke·1 cylinder rotary disc valve
	Bore x Stroke			1.85X2.04in (47X51.8mm)	1.85X2.04in (47X51.8mm)	1.85X2.04in (47X51.8mm)	1.95X2.04in (49.5X51.8mm)
	Displacement			5.43 cu in(89cc)	5.43 cu in(89cc)	5.43 cu in(89cc)	6.04 cu in(99cc)
	Compression Ratio			7.0:1	7.0:1	7.0:1	7.0:1
	Maximum Horsepower(HP/r.p.m.)			———	———	———	———
	Maximum Torque (kg-m / ft-lb /r.p.m.)			———	———	———	———
	Valve Timing	Inlet	Open BTC Close ATC	120° 55°	120° 55°	120° 55°	120° 55°
		Scavenging	Open BBC Close ABC	57°30′ 57°30′	57°30′ 57°30′	57°30′ 57°30′	57°30′ 57°30′
		Exhaust	Open BBC Close ABC	84°30′ 84°30′	84°30′ 84°30′	84°30′ 84°30′	84°30′ 84°30′
	Carburetor Type (Mikuni)			VM19SC	VM19SC	VM19SC	VM19SC
	Fuel Tank Capacity			1.73 U.S.gal(6.5ℓ)	2.26 U.S.gal(8.6ℓ)	2.26 U.S.gal(8.6ℓ)	2.26 U.S.gal(8.6ℓ)
	Lubrication System			Super Lube Oil Injection	Super Lube Oil Injection	Super Lube Oil Injection	Super Lube Oil Injection
	Engine Oil			2-stroke engine oil	2-stroke engine oil	2-stroke engine oil	2-stroke engine oil
	Oil Tank Capacity			1.3 U.S.qt(1.2ℓ)	1.3 U.S.qt(1.2ℓ)	1.3 U.S.qt(1.2ℓ)	1.3 U.S.qt(1.2ℓ)
	Starting System			Primary Kick	Primary Kick	Primary Kick	Primary Kick
	Ignition System			Flywheel Magneto	Flywheel Magneto	Flywheel Magneto	Flywheel Magneto
	Ignition Type			Convention	Convention	Convention	Convention
	Ignition Timing Before TDC			B.T.D.C.20°	B.T.D.C.20°	B.T.D.C.20°	B.T.D.C.20°
	Spark Plug NGK			B-7HS	B-7HS	B-8HC	B-8HC

Item \ Series			100cc		125cc	
			G4TR	G31M-A	B1L-A	F6
Dimension	Overall Length		76.7 in (1,948mm)	76.5 in(1,940mm)	77.4 in (1,965mm)	78.5 in (2,000mm)
	Overall Width		33.0 in (840mm)	33.0 in (840mm)	31.1 in (790mm)	33.5 in (850mm)
	Overall Height		41.8 in (1,062mm)	43.5 in (1,100mm)	40.4 in (1,025mm)	42.5 in (1,075mm)
	Wheelbase		50.0 in (1,270mm)	51.0 in (1,295mm)	49.2 in (1,250mm)	51.5 in (1,315mm)
	Road Clearance		10.0 in (250mm)	10.0 in (260mm)	5.3 in (135mm)	9.5 in (245mm)
	Dry Weight		185 lb (84kg)	178 lb (81km)	257 lb (117kg)	231 lb (105kg)
Performance	Maximum Speed		66 mph (107kph)	———	68 mph (110kph)	72 mph (115 kph)
	Fuel Consumption		153 mi/gal(65km/ℓ)	———	153 mi/gal(65km/ℓ)	137 mi/gal(60km/ℓ)
	25mph(40kph) Climbing Ability		29° (high range) 40° (low range)	———	30° 16.4 ft/22mph (5.0m/35kph)	34° 19.5 ft/22mph (6.0m/35kph)
	Braking Distance		21.3ft/22mph (6.5m/35kph)	———		
	Minimum Turning Radius		79.0 in (2.0m)	79.0 in (2.0m)	74.8 in (1.9m)	79.0 in (2.0m)
	S. S. 1/8 Mile		11.5 sec	———	19.0 sec	———
	S. S. 1/4 Mile		———	———	11.5 sec	17.8 sec
Engine	Type		2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve
	Bore x Stroke		1.95X2.04 in (49.5X5.18mm)	1.95X2.04 in (49.5X51.8mm)	2.17X2.07 in (55X52.5mm)	2.05X2.32 in (52X58.8mm)
	Displacement		6.04 cu in (99cc)	6.04 cu in (99cc)	7.56 cu in(124cc)	7.65 cu in (124cc)
	Compression Ratio		7.0:1	7.8:1	6.4:1	7.2:1
	Maximum Horsepower (HP/r.p.m.)			17.5/11,000	12/6,500	17.5/7,500
	Maximum Torque (kg-m / ft-lb /rpm)			1.13 / 8.20 /10,500	1.35 / 9.74 /5,000	1.74 / 12.6 /7,000
	Valve Timing — Inlet	Open BTC Close ATC	120° 50°	140° 70°	110° 45°	115° 55°
	Valve Timing — Scaven-ging	Open BBC Close ABC	57°30′ 57°30′	62° 62°	57°30′ 57°30′	57°30′ 57°30′
	Valve Timing — Exhaust	Open BBC Close ABC	84°30′ 84°30′	93° 93°	79°30′ 79°30′	87° 87°
	Carburetor Type (Mikuni)		VM19SC	VM24SC	VM22SC	VM24SC
	Fuel Tank Capacity		2.5 U.S.gal(9.5ℓ)	1.70 U.S.gal(6.5ℓ)	2.24 U.S.gal(8.5ℓ)	2.4 U.S.gal(9.0ℓ)
	Lubrication System		Super Lube Oil Injection	Gasoline-Oil Mixing	Super Lube Oil Injection	Super Lube Oil Injection
	Engine Oil		2-stroke engine oil	Racing engine oil	2-stroke engine oil	2-stroke engine oil
	Oil Tank Capacity		1.3 U.S.qt(1.2ℓ)	———	1.9 U.S.qt(1.8ℓ)	1.6 U.S.qt(1.5ℓ)
	Starting System		Primary Kick	Primary Kick	Electric & Kick	Primary Kick
	Ignition System		Flywheel Magneto	Magneto	Battery	Flywheel Magneto
	Ignition Type		Convention	Convention	Convention	Convention
	Ignition Timing Before TDC		B.T.D.C.20°	B.T.D.C.23°	B.T.D.C.20°	B.T.D.C.23°
	Spark Plug NGK		B-7HZ (for slow speed) B-8H (for hard use)	B-9HN	B-6HS	B-8HC

G5 Supplement

Maintenance and measurement values for the G5 are the same as those for the G3TR-A (or "G Series" where the G3TR-A is not listed separately), except for the drive chain and sprockets which are the same as those on the G4TR.

Specifications which may differ from those of other models are listed on these two pages, and a separate G5 wiring diagram is included in the rear of the manual on page W-3A.

Table 3-25, 3-26 Carburetor

Type	Main Jet *	Needle Jet	Jet Needle	Pilot Jet	Cut-Away	Air Screw	Float Level	
							Actual Level	Measurement "A"
VM19SC	102.5	E-4	511-4	17.5	2.5	1½ turns out	28 ± 1 mm (1.10 ± 0.4 in)	24 ± 1 mm (.94 ± .04 in)

*Reverse type

Table 4-1 Tires

Tire Size		Air Pressure	
Front	Rear	Front	Rear
2.75-18	3.00-18	23 psi (1.6 kg/cm²)	28 psi (2.0 kg/cm²)

Table 4-11 Fork Spring Free Length

Standard	Service Limit
13.13" (339 mm)	12.95" (329 mm)

Table 4-12 Front Fork Oil (each fork)

Type of Oil	Standard Quantity	Level from top of tube
SAE 10 motor oil	5.4 oz. (160 cc)	14 3/16" (360 mm)

G5 Specifications

Dimensions	
Overall length	76.5 in. (1,940 mm)
Overall width	33.5 in. (845 mm)
Overall height	41.5 in. (1,050 mm)
Wheelbase	49 in. (1,245 mm)
Road clearance	9.5 in. (238 mm)
Dry weight	191 lbs. (87 kg.)
Performance	
Maximum speed	66 mph (107 kph)
Acceleration	
SS 1/8 mi. (0-200 M)	11.5 seconds
Climbing abilitiy	33°
Fuel consumption	160 mi/gal @ 25 mph (70 km/ltr @ 40 kph)
Minimum turning radius	77 in. (1.95 M)
Braking distance	21 ft. @ 22 mph (6.5 M @ 35 kph)
Engine	
Type	2-stroke, single cylinder, rotary disc valve
Displacement	6.04 cu.in. (99 cc)
Bore x stroke	1.95 x 2.04 in. (49.5 x 51.8 mm)
Compression ratio	7.0:1
Lubrication	Superlube oil, 2-stroke engine oil
Starting	Primary kick
Ignition system	Magneto
Ignition timing	20° BTDC
Spark plug	NGK B-8HC

Transmission		
Type		5-speed, constant mesh, return shift
Clutch		Wet, multi-disc
Primary reduction ratio		3.52
Gear ratios:	1st	2.92
	2nd	1.77
	3rd	1.30
	4th	1.09
	5th	0.96
Final reduction ratio		2.80 (42/15)
Overall drive ratio		9.46
Transmission oil		3/4 qt. (.7ℓ) of SAE 10W30 motor oil
Frame		
Type		Tubular, double cradle
Suspension:	Front	Telescopic fork
	Rear	Swing arm
Tires:	Front	2.75-18 4PR
	Rear	3.00-18 4PR
Castor		62°
Trail		3.8 in. (97 mm)
Brakes		
Type		Internal expansion
Drum size:	Front	4.33 x 1.18 in. (110 x 30 mm)
	Rear	4.33 x 1.18 in. (110 x 30 mm)
Electrical Equipment		
Battery		6V, 4AH
Head lamp		6V, 25/25W
Tail/brake lamp		6V, 3/21cp (5.3/17W)

Item \ Series			175cc	250cc		350cc
			F7	F8	F81M	F5
Dimension	Overall Length		80.5 in (2,040mm)	82.0 in (2,090mm)	83.0 in(2,110mm)	82.0 in (2,090mm)
	Overall Width		33.5 in (850mm)	32.0 in (820mm)	35.0 in (900mm)	32.0 in (820mm)
	Overall Height		43.0 in (1,090mm)	43.5 in (1,100mm)	43.0 in (1,095mm)	46.0 in (1,160mm)
	Wheelbase		52.0 in (1,320mm)	55.0 in (1,400mm)	9.0 in (230mm)	55.0 in (1,400mm)
	Road Clearance		10.0 in (250mm)	8.0 in (210mm)	55.0 in (1,400mm)	9.0 in (230mm)
	Dry Weight		233 lb (106kg)	270 lb (123kg)	238 lb (108kg)	265 lb (120kg)
Performance	Maximum Speed		80mph(128kph)	85mph(136kph)	———	84mph(135kph)
	Fuel Consumption 25mph(40kph)		114mi/gal(50km/ℓ)	95mi/gal(40km/ℓ)	———	90mi/gal(38km/ℓ)
	Climbing Ability		36°	36°	———	40°
	Braking Distance		33.0ft/31mph (10.0m/50kph)	49.0ft/31mph (15.0m/50kph)	———	39.0ft/31mph (12.0m/50kph)
	Mimimum Turnign Radius		75.0 in(1.9m)	86.0 in(2.18)	87.0 in(2.2m)	88.0 in(2.23m)
	S.S. 1/8 Mile		———	———	———	9.0 sec
	S.S. 1/4 Mile		16.0	15.9	———	14.8 sec
Engine	Type		2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve	2 stroke 1 cylinder rotary disc valve
	Bore x Stroke		2.42X2.32 in (61.5X58.8mm)	2.68X2.68in (68X68mm)	2.68X2.68in (68X68mm)	3.17X2.68in (80.5X68mm)
	Displacement		10.67 cu in(174cc)	15.1 cu in (246.8cc)	15.1 cu in (246.8cc)	21.1 cu in (346 cc)
	Compression Ratio		7.1 : 1	6.8:1	7.5:1	6.8:1
	Maximum Horsepower (HP/r.p.m.)		21.5/7,500	24.5/6,800	27/6,750	33/6,500
	Maximum Torque kg-m /r.p.m.		2.12 /7,000	2.64 /6,000	3.12 /5,750	3.90 /5,500
	Maximum Torque ft-lb /r.p.m.		15.4	19.10	22.50	28.00
	Valve Timing Inlet	Open BTC	115°	110°	130°	110°
		Close ATC	55°	50°	65°	50°
	Valve Timing Scavenging	Open BBC	55°30′	59°	59°	57°
		Close ABC	55°30′	59°	59°	57°
	Valve Timing Exhaust	Open BBC	82°	83°	87°40′	82°
		Close ABC	82°	83°	87°40′	82°
	Carburetor Type (Mikuni)		VM26SC	VM30SC	VM30SC	VM32SC
	Fuel Tank Capacity		2.4 U.S.gal (9.0ℓ)	2.9 U.S.gal (11.0ℓ)	3.3 U.S.gal(12.5ℓ)	3.3 U.S.gal (12.5ℓ)
	Lubrication System		Super Lube Oil Injection	Injectolube Pressurized Injection	Gasoline-Oil Mixing	Injectolube Pressurized Injection
	Engine Oil		2-stroke engine oil	2-stroke engine oil	Racing engine oil	2-stroke engine oil
	Oil Tank Capacity		1.6 U.S.qt(1.5ℓ)	1.7 U.S.qt(1.6ℓ)	———	1.7 U.S.qt(1.6ℓ)
	Starting System		Primary Kick	Primary Kick	Primary Kick	Primary Kick
	Ignition System		Flywheel Magneto	Flywheel Magneto	Magneto	Flywheel Magneto
	Ignition Type		C.D.I.	Convention	Convention	C.D.I.
	Ignition Timing Before TDC		B.T.D.C.23° (4,000r.p.m.)	B.T.D.C.20°	B.T.D.C.19°	B.T.D.C.23° (4,000r.p.m.)
	Spark Plug NGK		(Champion) L-20V	B-8HC	B-9HC	B-10II-15

Item \ Series			90cc			100cc
			GA1-A	GA2-A	G3SS-A	G3TR-A
Transmission	Type		4-speed Constant mesh rotary change	5-speed Constant mesh return change	5-speed Constant mesh return change	5-speed Constant mesh return change
	Gear Ratio	Low 2nd 3rd 4th 5th	2.92 1.71 1.24 1.00 ——	2.92 1.77 1.30 1.09 0.96	2.92 1.77 1.30 1.09 0.96	2.92 1.77 1.30 1.09 0.96
	Primary Reduction Ratio Final Reduction Ratio Overall Drive Ratio		3.52(74/21) 2.79(39/14) 9.82	3.52(74/21) 2.57(36/14) 8.68	3.52(74/21) 2.64(37/14) 8.92	3.52(74/21) 3.00(42/14) 10.14
	Transmission Oil Transmission Oil Capacity		SAE10W30orSAE#30 0.74 U.S.qt(0.7ℓ)	SAE10W30orSAE#30 0.74 U.S.qt(0.7ℓ)	SAE10W30orSAE#30 0.74 U.S.qt(0.7ℓ)	SAE10W30orSAE#30 0.74 U.S.qt(0.7ℓ)
Clutch	Type		Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate
Electrical Equipment	Dynamo or Magneto	Made By Type	Kokusan FE101	Kokusan FE101	Kokusan FE109	Kokusan FE109
	Regulator	Made By Type	——	——	——	——
	Ignition Coil	Made By Type	Kokusan ST94	Kokusan ST94	Kokusan ST98	Kokusan ST98
	Battery	Made by, Type Capacity	Furukawa 6N4-2A-3 6V 4AH	Furukawa6N4-2A-3 6V 4AH	Furukawa 6N4-2A-3 6V 4AH	Furukawa 6N4-2A-5 6V 4AH
	Head Lamp Type Head Lamp Bulb Brake/Tail Lamp Bulb Speedometer Lamp Bulb Neutral Indicator Lamp Bulb Tachometer Indicator Lamp Bulb Top Indicator Lamp Bulb Charge Indicator Lamp Bulb High Beam Indicator Bulb Turn Signal Lamp Bulb		Semi Sealed 6V 25/25W 6V 17/5.3W 6V 1.5W 6V 1.5W —— —— —— —— —— 6V 8W	Semi Sealed 6V 25/25W 6V 17/5.3W 6V 1.5W 6V 1.5W —— —— —— —— —— 6V 8W	Sealed Beam 6V 25/25W 6V 17/5.3W 6V 1.5W 6V 1.5W —— —— —— —— *6V 1.5W *6V 8W	Sealed Beam 6V 25/25W 6V 17/5.3W 6V 1.5W 6V 1.5W —— —— —— —— *6V 1.5W *6V 8W
Frame	Type		Tubular Double Crade	Tubular Double Crade	Tubular Double Crade	Tubular Double Crade
	Steering angle Caster Trail		45° 64° 3.1 in (80mm)	45° 64° 3.1 in (80mm)	45° 64° 3.5 in (85mm)	45° 64° 3.5 in (85mm)
	Tire Size	Front Rear	2.50-18 4PR 2.50-18 4PR	2.75-18 4PR 2.75-18 4PR	2.50-18 4PR 2.50-18 4PR	2.75-18 4PR (Trial) 2.75-18 4PR (Trial)
	Suspension	Front Rear	Telescopic Fork Swing Arm	Telescopic Fork Swing Arm	Telescopic Fork Swing Arm	Telescopic Fork Swing Arm
	Damper stroke	Front Rear	3.5 in (90mm) 2.6 in (65mm)	3.5 in (90mm) 2.6 in (65mm)	3.5 in (90mm) 2.6 in (65mm)	3.5 in (90mm) 2.6 in (65mm)
	Front Fork Oil Capacity each fork		0.135 U.S.qt(130cc)	0.135 U.S.qt(130cc)	0.135 U.S.qt(130cc)	0.135 U.S.qt(130cc)
	Mixing Ratio	Mobil Oil Spindle Oil	8 : 2	8 : 2	8 : 2	8 : 2
Brake	Inside diameter x width	Front	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)
		Rear	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)	4.33x1.18 in (110x30mm)

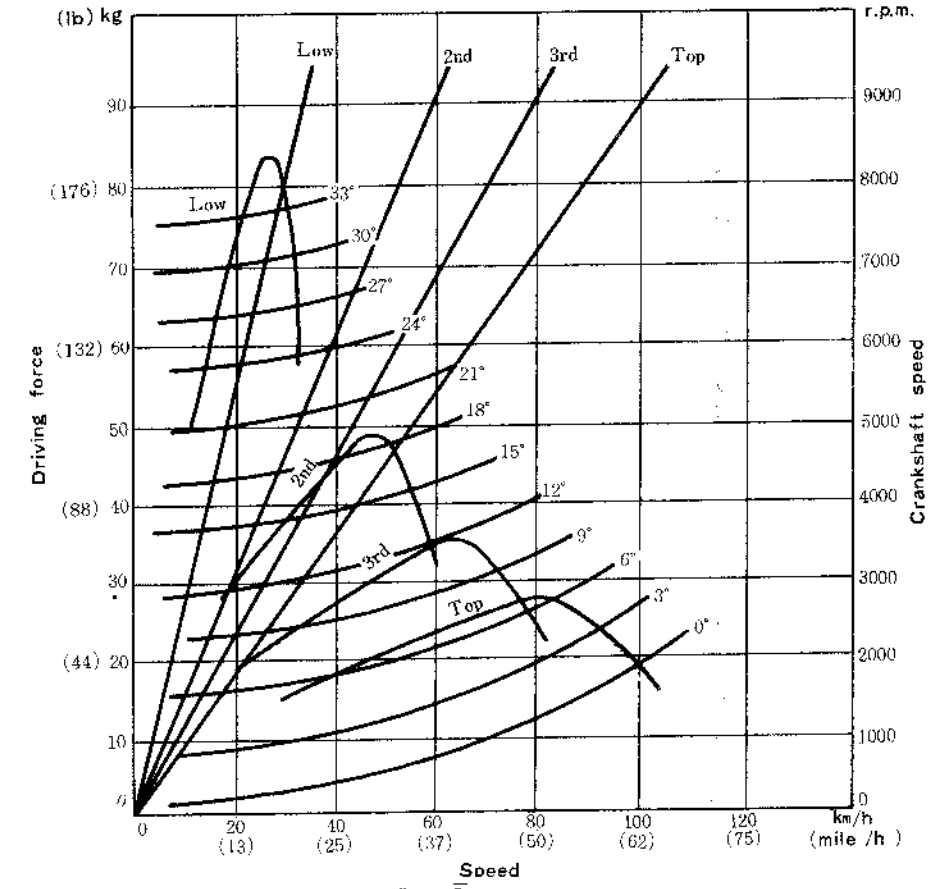
REMARK G4TR High-Low Ratio in Quick Change (1:1.70)
*Mark is special specification for restricted market

Item \ Series			100cc		125cc	
			G4TR	G31M-A	B1L-A	F6
Transmission	Type		5-speed Constant mesh return change	5-speed Constant mesh return change	4-speed Constant mesh return change	5-speed Constant mesh
	Gear Ratio	Low	2.92	2.36	2.67	2.67
		2nd	1.77	1.61	1.62	1.75
		3rd	1.30	1.30	1.20	1.20
		4th	1.09	1.09	0.90	0.91
		5th	0.96	0.96	———	0.72
	Primary Reduction Ratio		3.52(74/21)	3.52(74/21)	3.24(68/21)	3.13(75/24)
	Final Reduction Ratio		2.80(42/15)	3.57(50/14)	2.80(42/15)	3.93(55/14)
	Overall Drive Ratio		9.46	12.1	8.16	8.84
	Transmission Oil		ATForSAE#30	ATF	SAE10W30orSAE#30	ATForSAE10W30
	Transmission Oil Capacity		0.74U.S.qt(0.7ℓ)	0.63U.S.qt(0.6ℓ)	0.95U.S.qt(0.9ℓ)	0.74U.S.qt(0.7ℓ)
Clutch	Type		Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate
Electrical Equipment	Dynamo or Magneto	Made By	Kokusan	Kokusan	Mitsubishi	Mitsubishi
		Type	FE 109	NJ 101	CE-T1R	F-6079BL
	Regulator	Made By	———	———	Mitsubishi	———
		Type			RC-T	
	Ignition Coil	Made By	Kokusan	Kokusan	Diamond	Mitsubishi
		Type	ST 98	ST 98	TU-25	HD-D
	Battery	Made By Type	Furukawa 6N2-2A-5	———	Yuasa 12N12-3B	Furukawa 6N4-2A-5
		Capacity	6V 2AH		12V 12AH	6V 4AH
	Head Lamp Type		Sealed Beam	———	Semi Sealed	Sealed Beam
	Head Lamp Bulb		6V 25/25W	———	*Sealed Beam 12V 35/35W	6V 25/25W
	Brake/Tail Lamp Bulb		6V 17/5.3W	———	12V 20/5W	6V 17/5.3W
	Speedometer Lamp Bulb		6V 3W	———	12V 3W	6V 3W
	Neutral Indicator Lamp Bulb		6V 3W	———	12V 1.5W	6V 3W
	Tachometer Indicator Lamp Bulb		———	———	———	———
	Top Indicator Lamp Bulb		———	———	12V 1.5W	———
	Charge Indicator Bulb		———	———	12V 1.5W	———
	High Beam Indicator Bulb		*6V 1.5W	———	———	6V 1.5W
	Turn Signal Lamp Bulb		*6V 8W		12V 8W	*6V 8W
Frame	Type		Tubular Double Crade	Tubular Double Crade	Pressed Steed Back-bone	Tubular Double Crade
	Steering angle		45°	45°	43°	48°
	Caster		61°	60°30′	63°	62°
	Trail		4.3 in(110mm)	4.33 in(110mm)	3.6 in(91mm)	4.9 in(98mm)
	Tire Size	Front	3.00-18 4PR(Knobby)	3.25-18 4PR	3.00-16 4PR	3.00-18 4PR(Knobby)
		Rear	3.00-18 4PR(Knobby)	3.25-18 4PR	3.00-16 4PR	3.25-18 4PR(Knobby)
	Suspension	Front	Telescopic Fork	Telescopic adjustable Hatta fork	Telescopic Fork	Telescopic Fork with 3-way adiustable length
		Rear	Swing Arm with 5-way positioning	Swing Arm with 5-way positioning	Swing Arm	Swing Arm with 5-way positioning
	Damperstroke	Front	4.5 in(115mm)	6.3 in(160mm)	4.3 in(110mm)	5.7 in(145mm)
		Rear	3.5 in(90mm)	3.5 in(90mm)	3.2 in(80mm)	3.5 in(90mm)
	Front Fork Oil Capacity each fork		0.18 U.S.qt(170cc)	0.12U.S.qt(115cc)	0.185U.S.qt(175cc)	0.16U.S.qt(152cc)
	Mixing Ratio	Mobil Oil Spindle Oil	6 : 4	6 : 4	8 : 2	6 : 4
Brake	Inside diameter x width	Front	4.33x1.18 in (110x30mm)	5.12x1.18 in (130x30mm)	5.91x1.10 in (150x28mm)	5.12x1.10 in (130x28mm)
		Rear	4.33x1.18 in (110x30mm)	5.12x1.18 in (130x30mm)	5.91x1.10 in (150x28mm)	5.12x1.10 in (130x28mm)

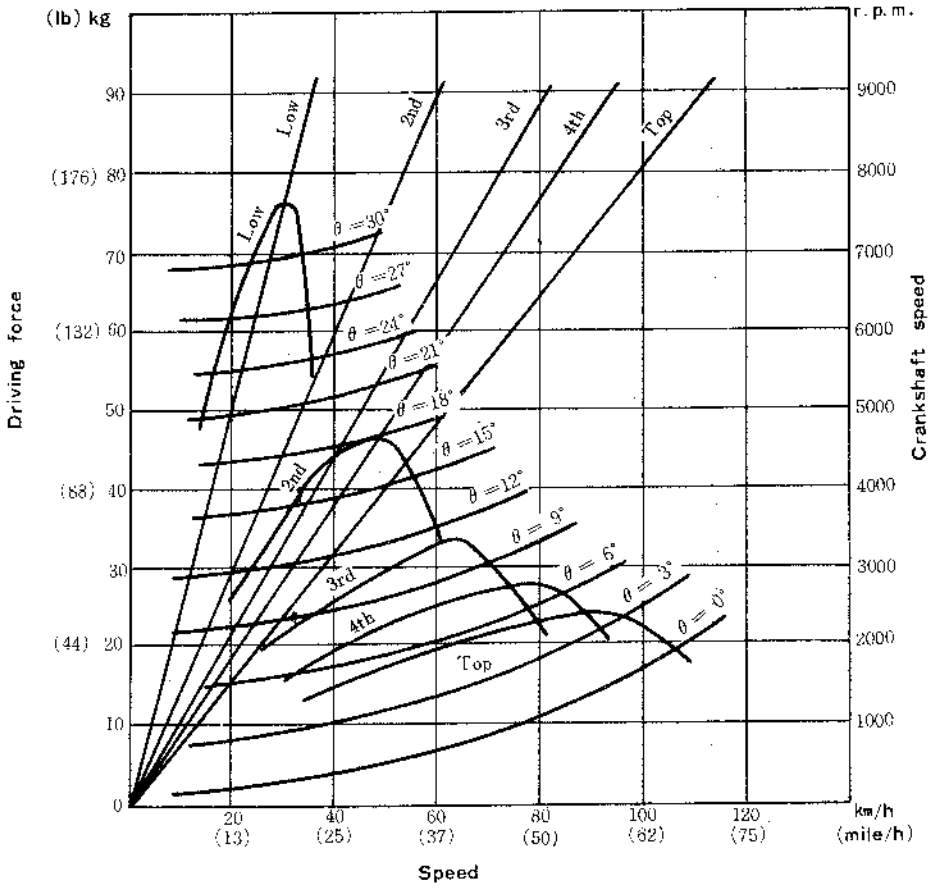
Item \ Series			175cc	250cc		350cc
			F7	F8	F81M	F5
Transmission	Type		5-speed Constant mesh return change	5-speed Constant mesh return change	5-speed Constant mesh return change	5-speed Constant mesh return change
	Gear Ratio	Low 2nd 3rd 4th 5th	2.67 1.75 1.20 0.91 0.72	2.45 1.71 1.17 0.90 0.71	2.45 1.60 1.26 1.09 0.95	2.45 1.71 1.17 0.90 0.71
	Primary Reduction Ratio Final Reduction Ratio Overall Drive Ratio		3.13(75/24) 3.57(50/14) 8.04	3.04(73/24) 3.21(45/14) 9.28	3.04(73/24) 3.21(45/14) 9.29	3.04(73/24) 2.93(41/14) 6.32
	Transmission Oil Transmission Oil Capacity		ATForSAE10W30 0.74U.S.qt(0.7ℓ)	ATForSAE10W30 1.27U.S.qt(1.2ℓ)	ATForSAE10W30 1.06U.S.qt(1.0ℓ)	ATForSAE10W30 1.27U.S.qt(1.2ℓ)
Clutch	Type		Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate	Heavy duty multiple disc, Wet plate
Electrical Equipment	Dynamo or Magneto	Made By Type	Kokusan HM-01	Kokusan FP6309	Kokusan X016	Kokusan HM-01
	Regulator	Made By Type	———	———	———	Kokusan ZR910(SVR)
	Ignition Coil	Made By Type	Kokusan SU101	Kokusan IG3125	Kokusan IG3125	Kokusan SU101
	Battery	Made By Type Capacity	Furukawa 6N4-2A-5 6V 4AH	Furukawa 6N2-2A-5 6V 2AH	———	Furukawa 6N2-2A-5 6V 2AH
	Head Lamp Type Head Lamp Bulb Brake/Tail Lamp Bulb Speedometer Lamp Bulb Neutral Indicator Lamp Bulb Tachometer Indicator Lamp Bulb Top Indicator Lamp Bulb Charge Indicator Lamp Bulb High Beam Indicator Bulb Turn Signal lamp Bulb		Sealed Beam 6V 35/35W 6V 17/5.3W 6V 3W 6V 3W 6V 3W ——— ——— 6V 1.5W *6V 8W	Sealed Beam 6V 35/35W 6V 17/5.3W 6V 3W 6V 3W 6V 3W ——— ——— 6V 1.5W *6V 8W	——— ——— ——— ——— ——— ——— ——— ——— ——— ———	Sealed Beam 6V 35/35W 6V 17/5.3W 6V 3W 6V 3w 6V 3W ——— ——— 6V 1.5w *6V 8W
Frame	Type		Tubular Double Crade	Tubular Double Crade	Tubular Double Crade	Tubular Double Crade
	Steering angle Caster Trail		48° 61° 4.37in(111mm)	45° 62° 4.50 in (118mm)	45° 61.5° 4.8 in(122mm)	45° 60° 5.12 in (130mm)
	Tire Size	Front Rear	3.00-19 4PR(Knobby) 3.50-18 4PR(Knobby)	3.25-19 4PR(Knobby) 4.00-18 4PR (Knobby)	3.00-21 4PR(knobby) 4.00-18 4PR(Knobby)	3.00-21 4PR(knobby) 4.00-18 4PR(Knobby)
	Suspension	Front Rear	Telescopic adjustable Hatta Fork Swing Arm with 5-way positioning	Telescopic adjustable Hatta Fork Swing Arm with 5-way positioning	Telescppic adjustable Hatta Fork Swing Arm with 5-way positioning	Telescopic adjustable Hatta Fork Swing Arm with 5-way positioning
	Stroke	Front Rear	6.3 in (160mm) 3.5 in (90mm)	6.9 in (175mm) 3.9 in (100mm)	6.9 in (175mm) 3.9 in (100mm)	6.9 in (175mm) 3.9 in (100mm)
	Front Fork Oil Capacity(each fork)		0.12 U.S.qt(115cc)	0.185 U.S.qt(175cc)	0.185 U.S.qt(175cc)	0.185 U.S.qt(175cc)
	Mixing Ratio	Mobil Oil Spindle Oil	6 : 4	6 : 4	6 : 4	6 : 4
Brake	Inside diameter x width	Front	5.12x1.10 in (130x28mm)	5.90x1.10 in (150x28mm)	5.90x1.10 in (150x28mm)	5.90x1.10 in (150x28mm)
		Rear	5.12x1.10 in (130x28mm)	5.90x1.10 in (150x28mm)	5.90x1.10 in (150x28mm)	5.90x1.10 in (150x28mm)

3. Performance Curves

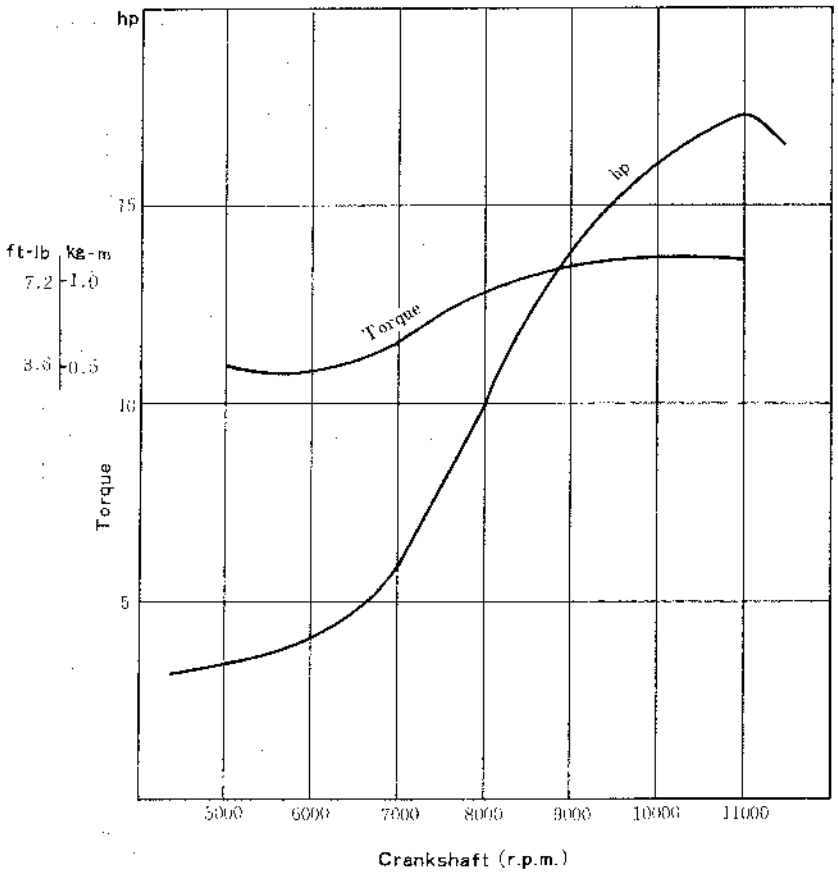
GAI-A Running Performance



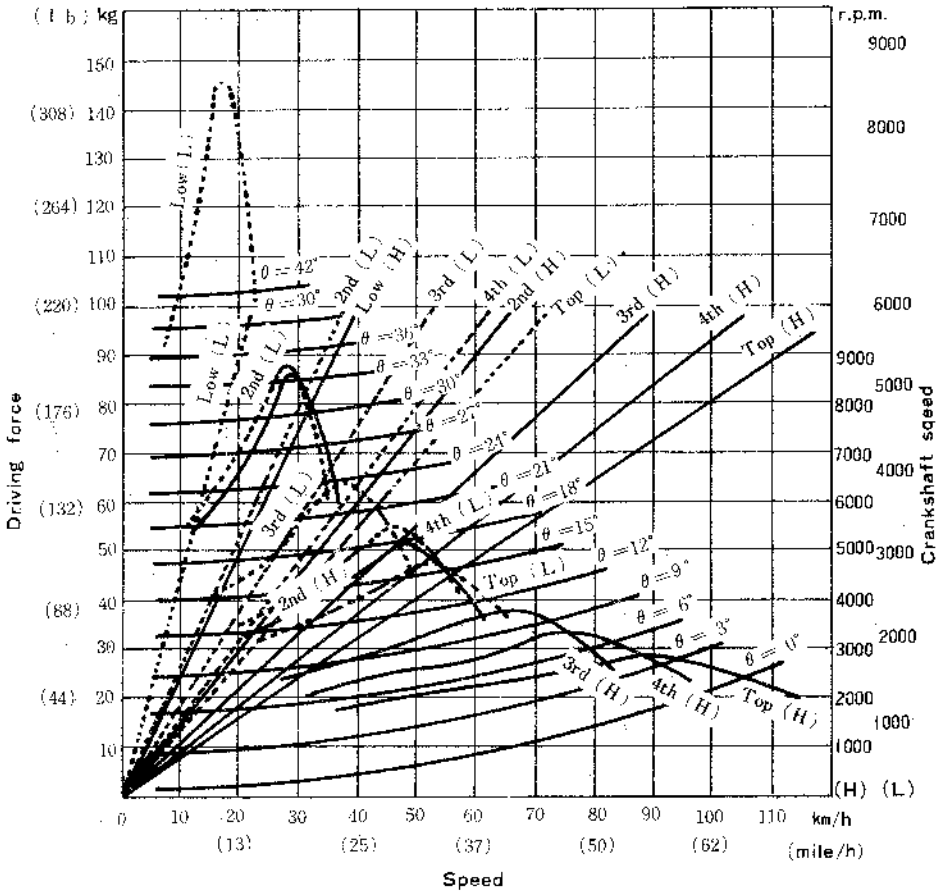
GA2-A Running Performance



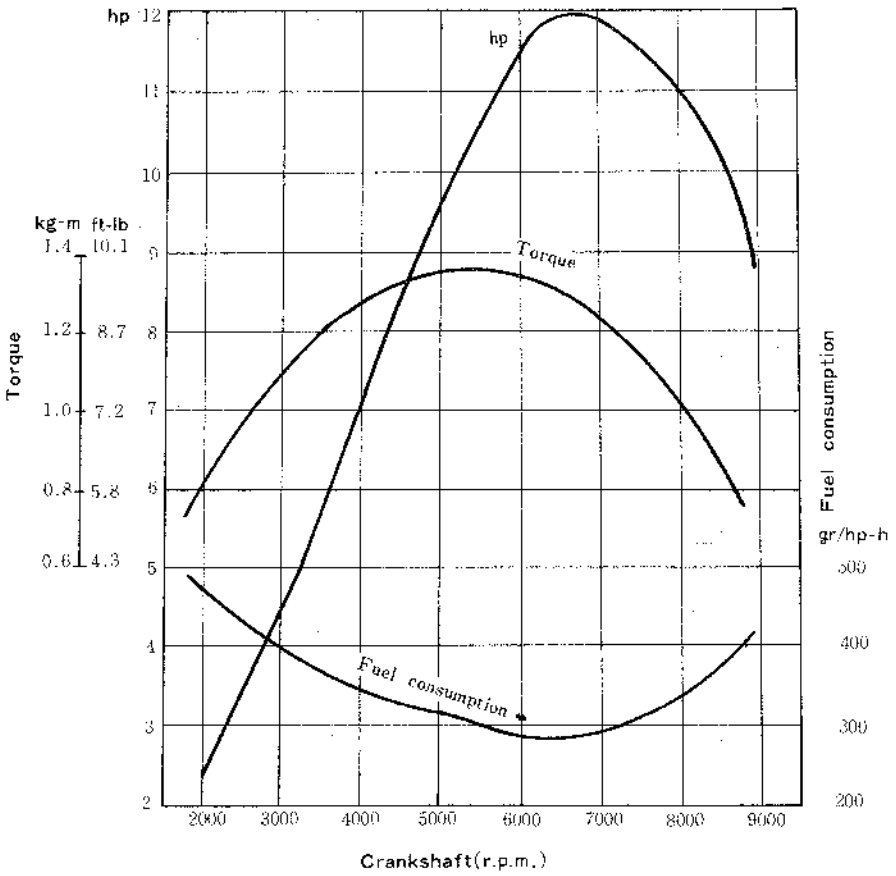
G31M-A Engine Performance



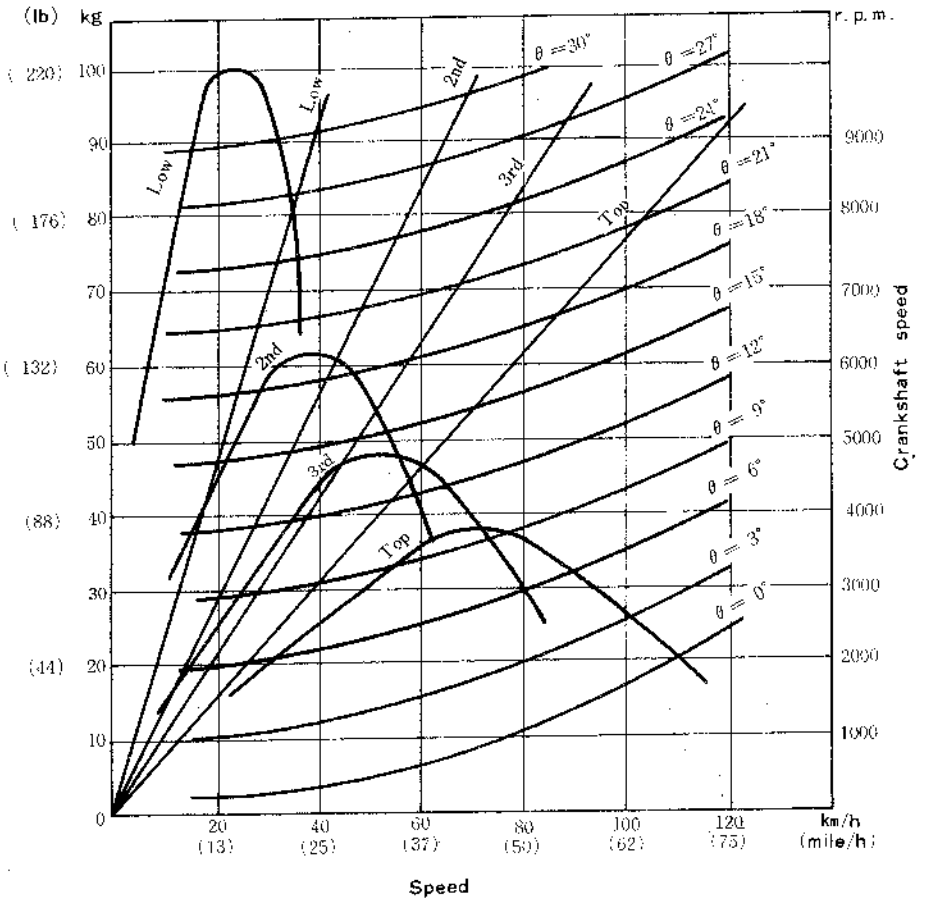
G4TR Running Performance



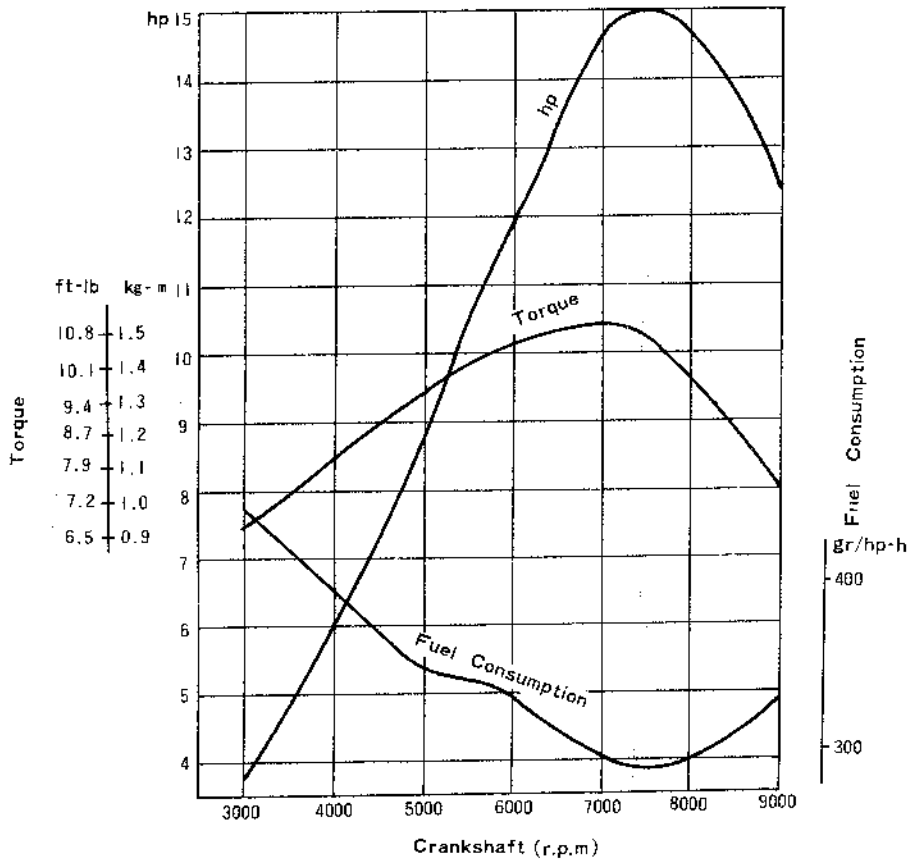
BIL-A Engine Performance



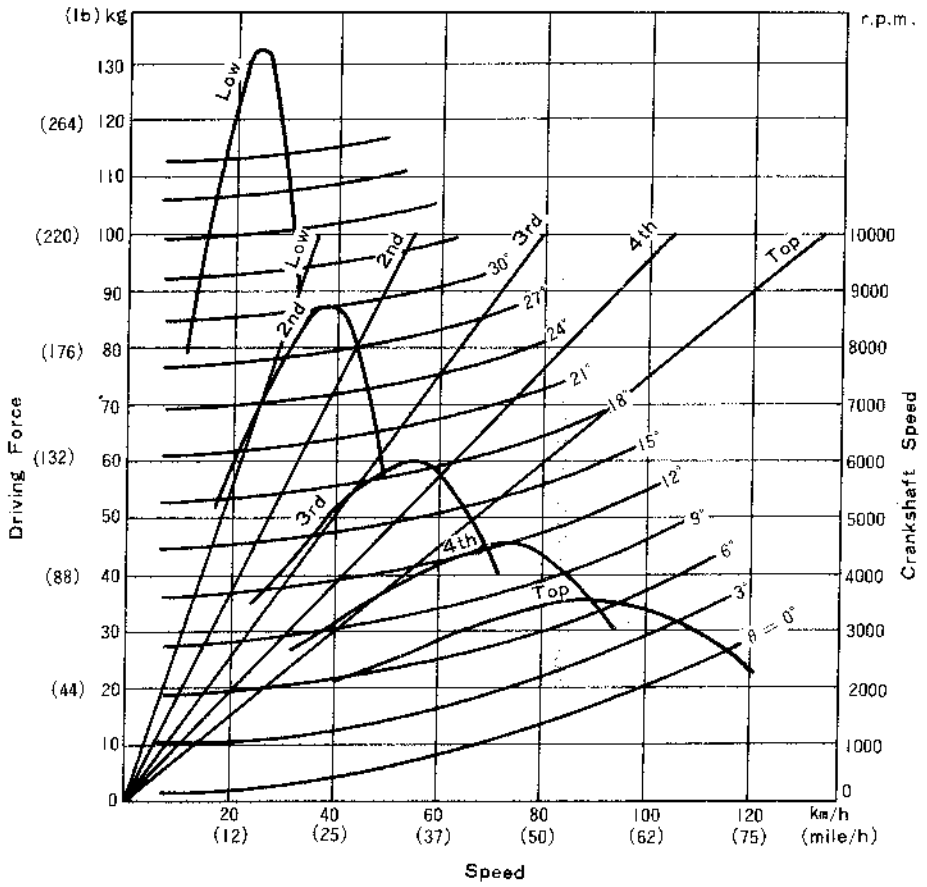
BIL-A Running Performance



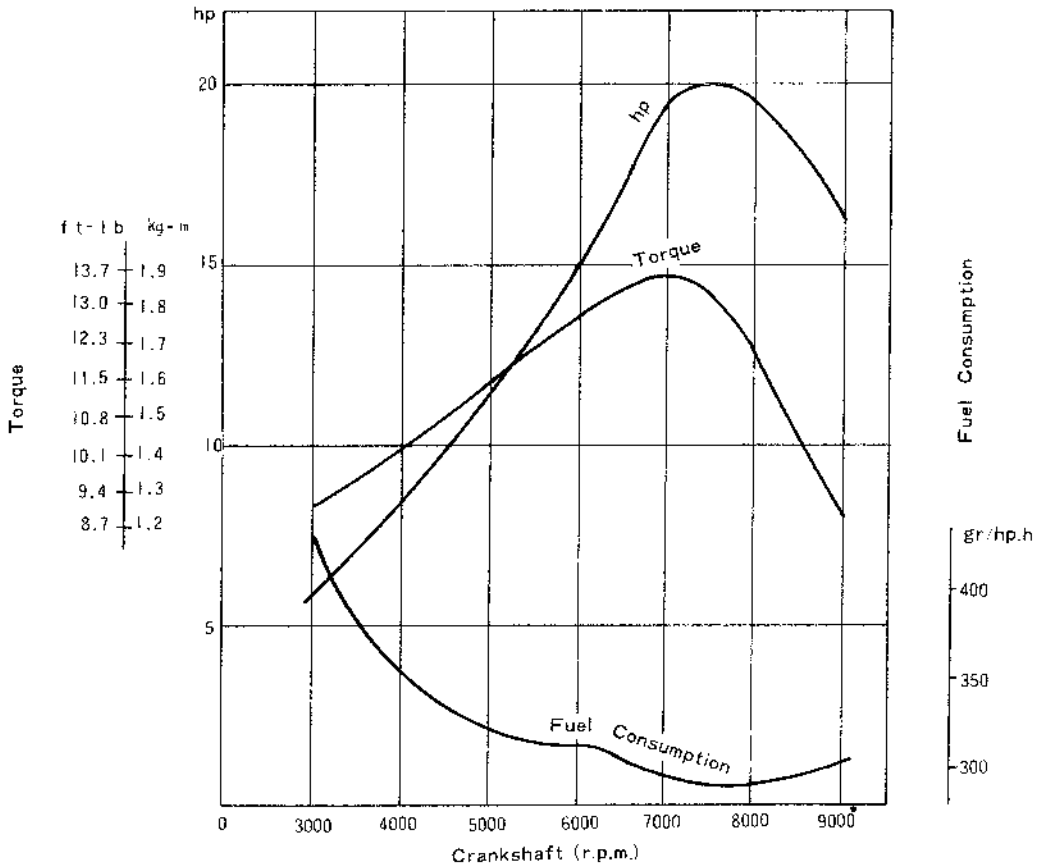
F6 Engine Performance



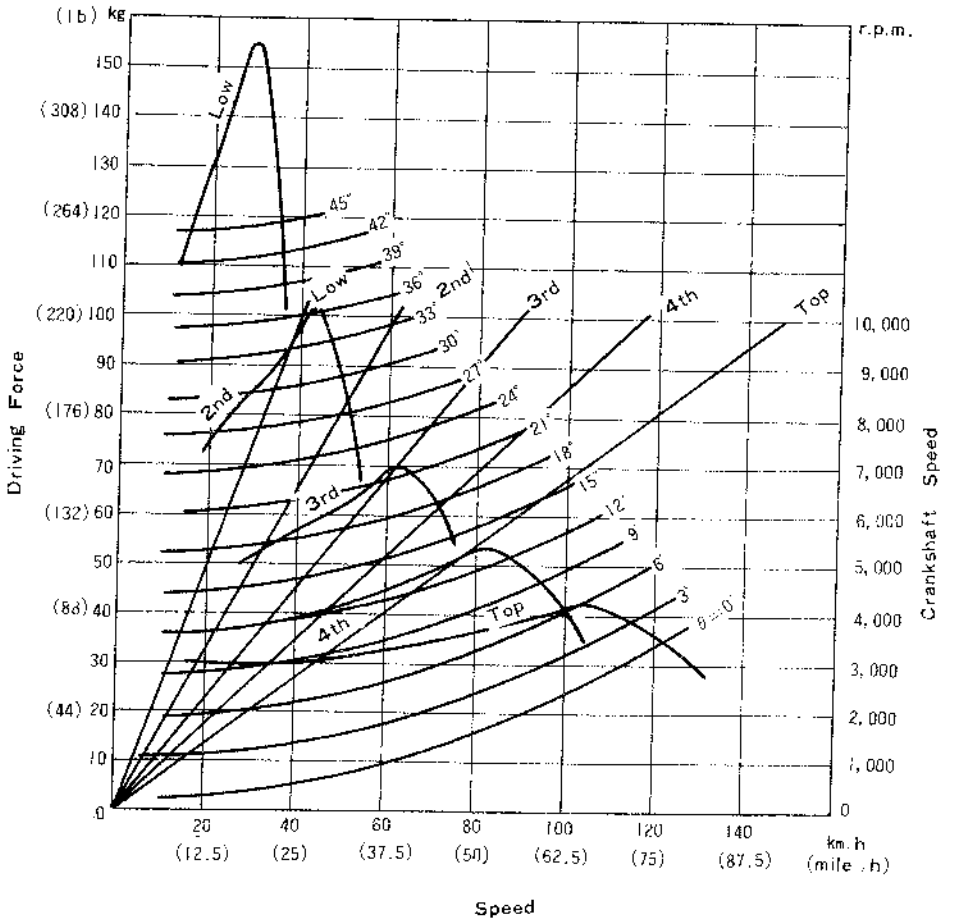
F6 Running Performance



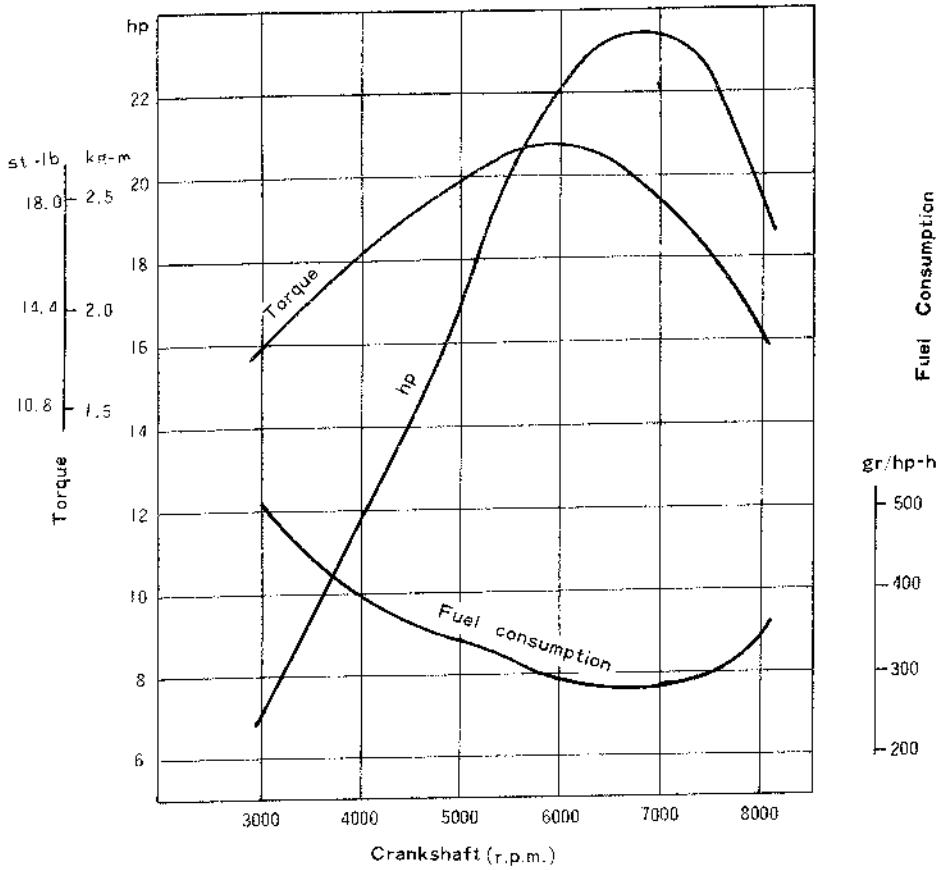
F7 Engine Performance



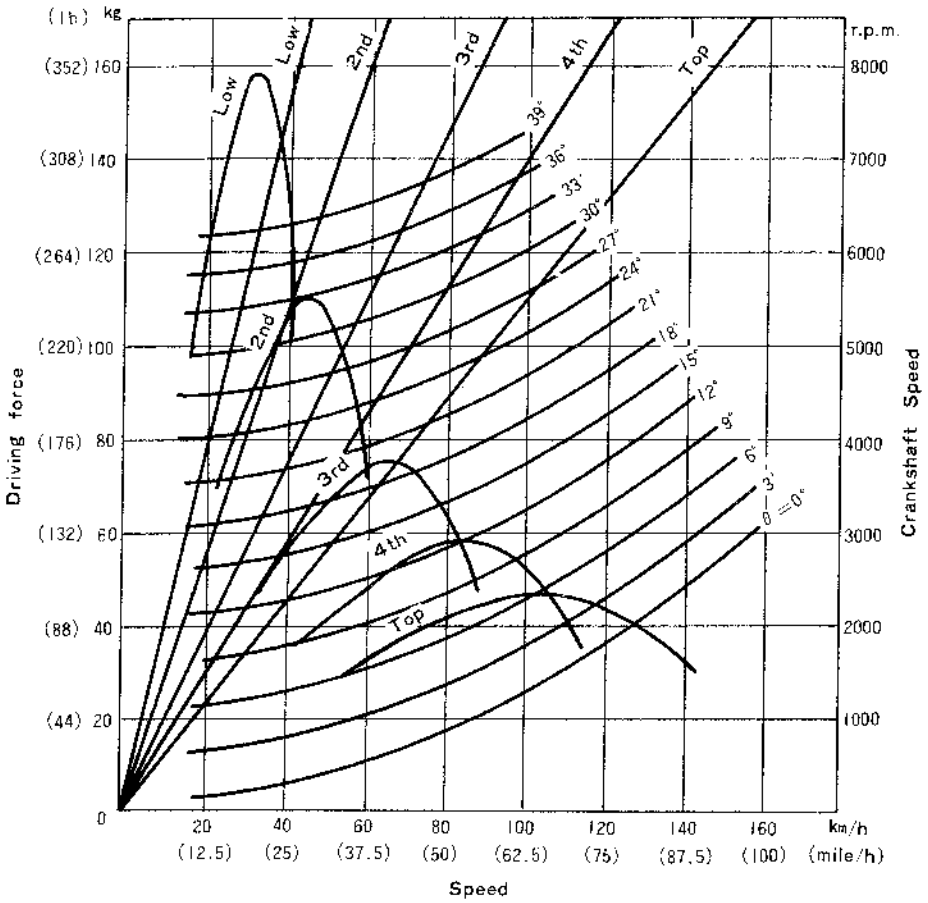
F7 Running Performance



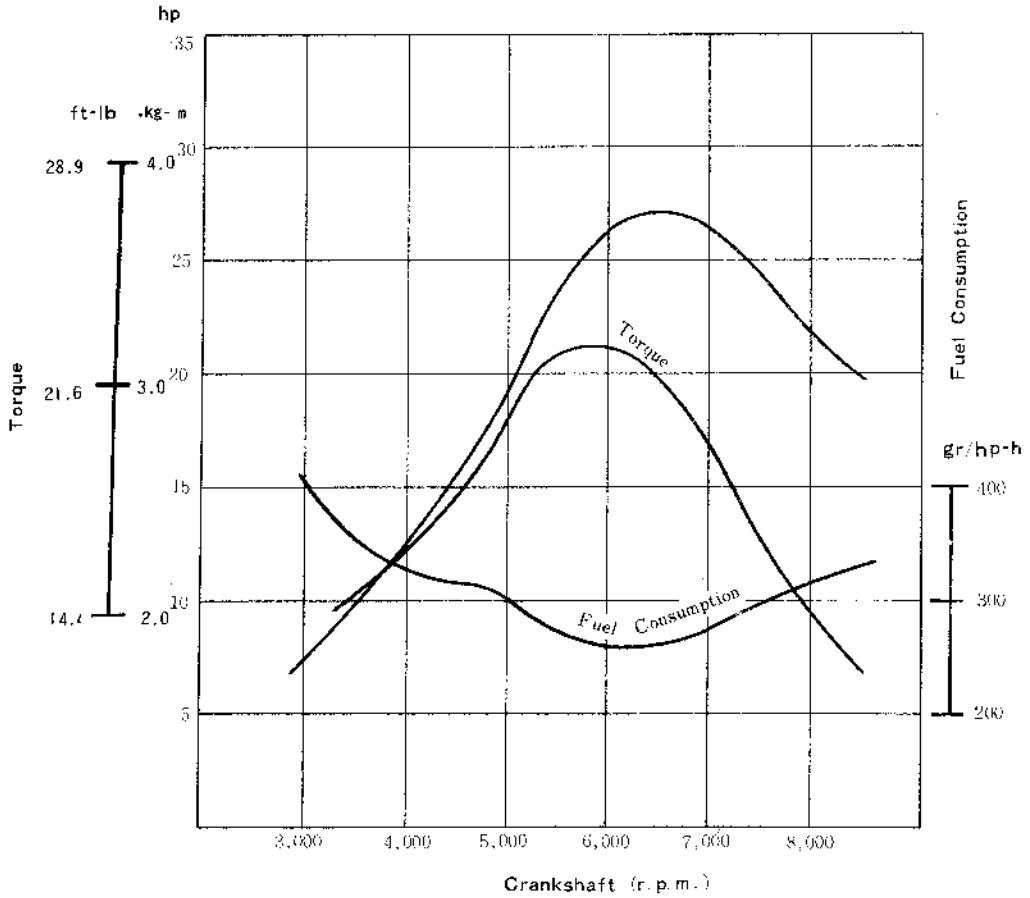
F8 Engine Performamce



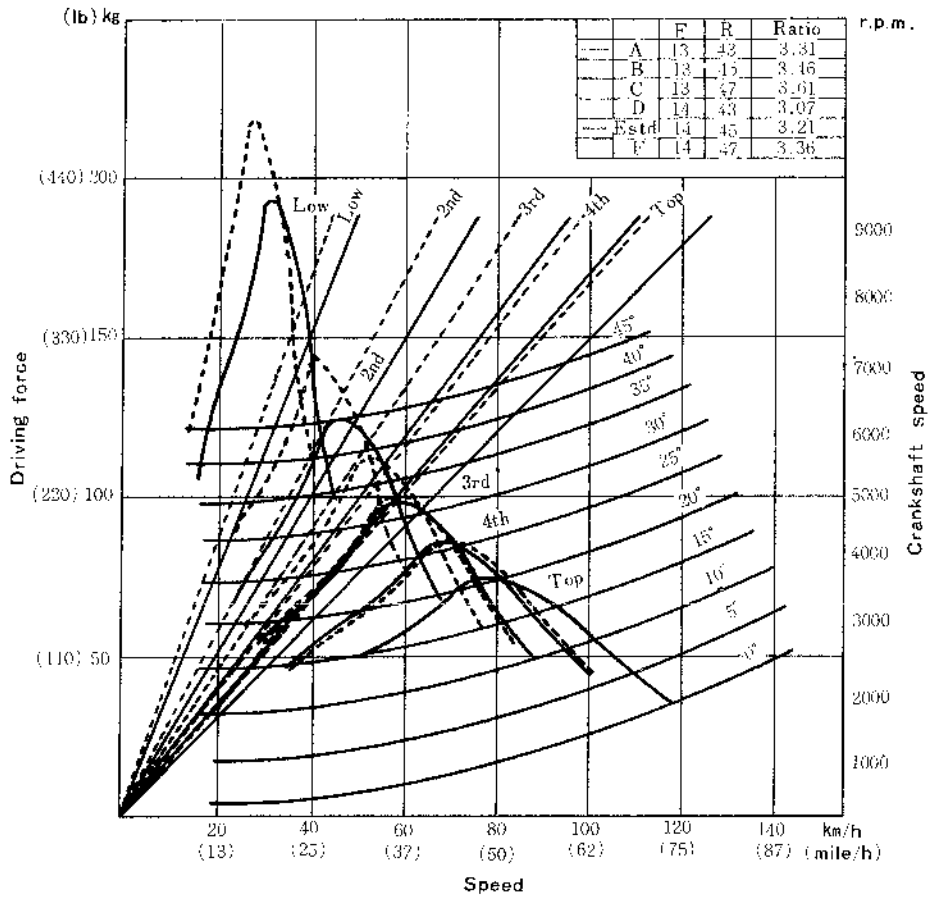
F8 Running Performance



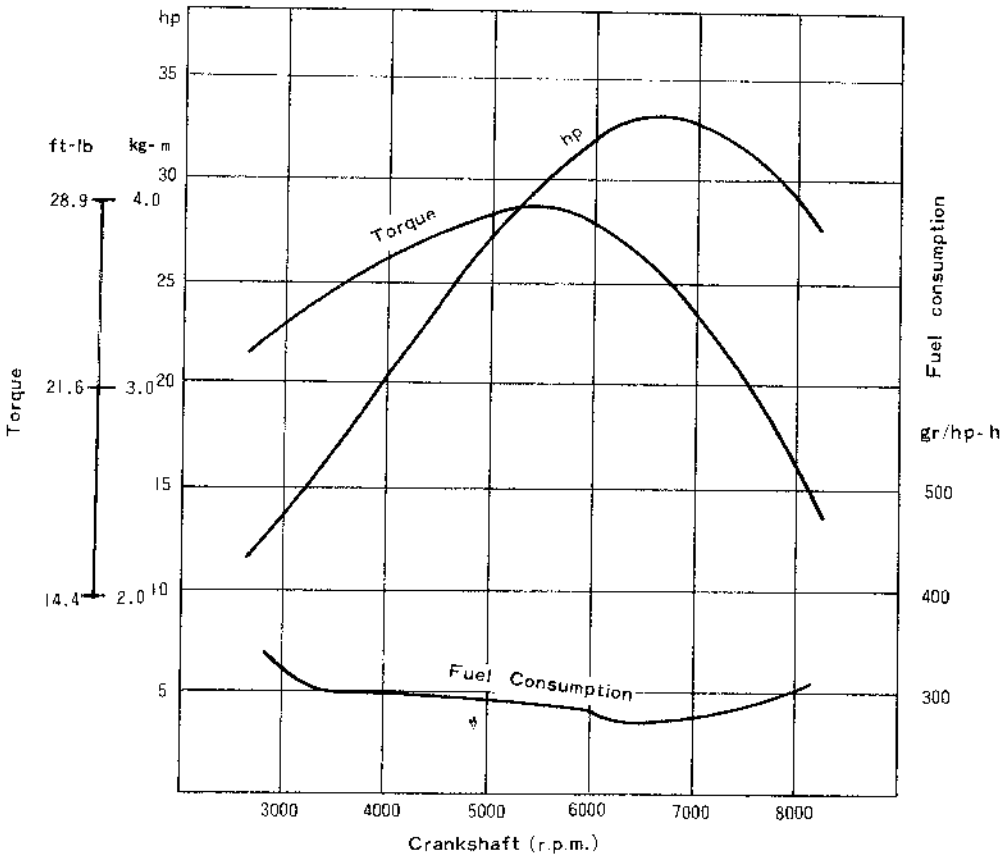
F8IM Engine Performance



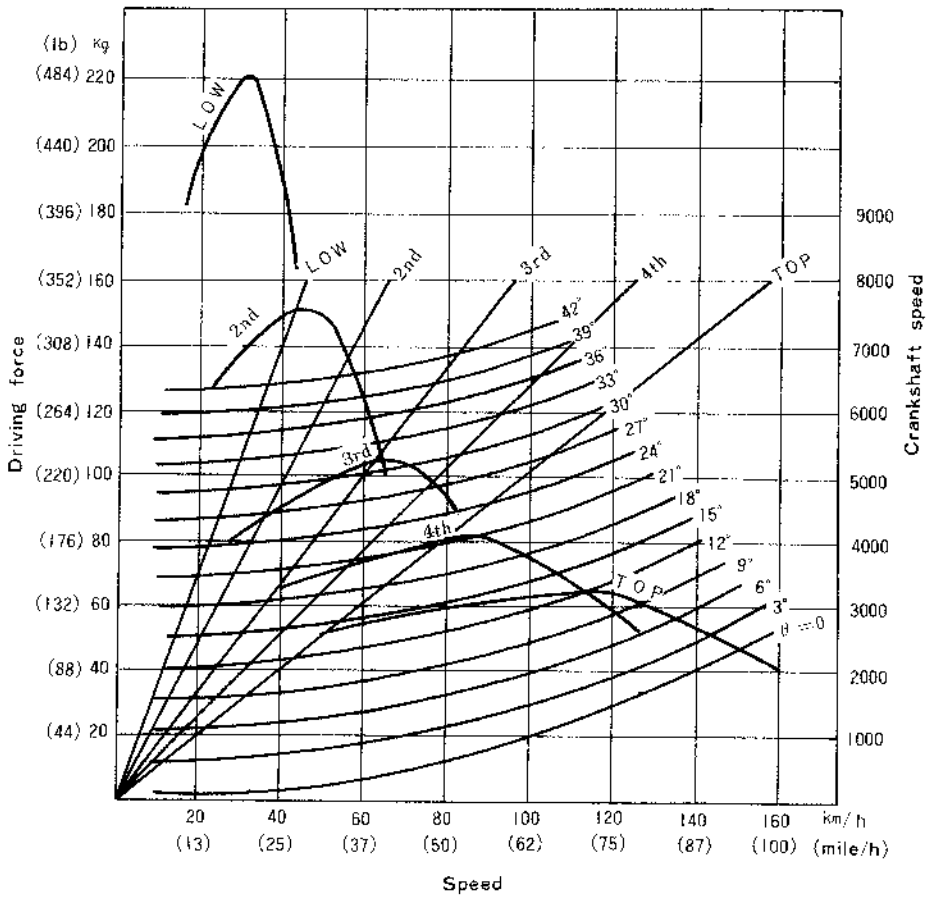
F8IM Running Performance



F5 Engine Performance



F5 Running Performance



II. DISMANTLING, INSTALLATION, AND ADJUSTMENT OF ENGINE

1. Components of the engine

2. Minor disassembly of the engine

3. Removing the engine

4. Installing the engine

5. Adjustments

1. Components of the engine

The engine can be roughly divided into the following components:

[GA2-A]

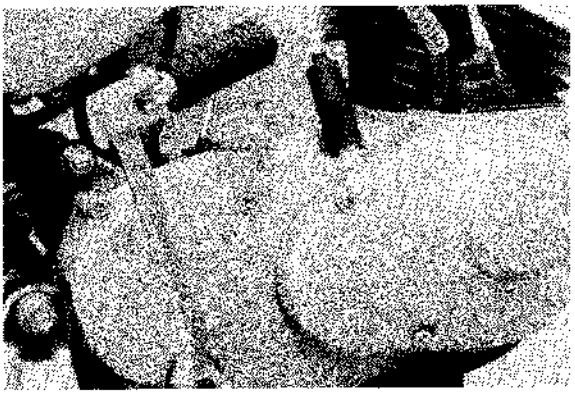


Fig. 2-1

1) Air cleaner
2) Cylinder , Cylinder head
3) Piston , Piston pin
4) Piston rings
5) R.H. engine cover
6) Carburetor
7) Oil pump
8) Clutch release
9) Primary gear
10) Clutch
11) Rotary disc valve
12) L.H. engine cover
13) Gear change mechanism
14) Flywheel magneto
15) Engine sprocket
16) Crankcase
17) Crankshaft
18) Transmission gears
19) Kickstarter

[F5]

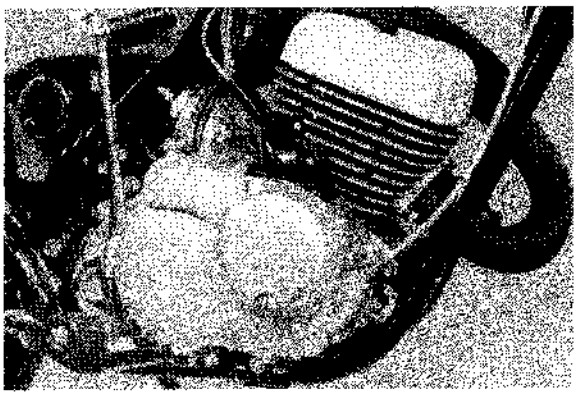


Fig. 2-2

1) Air cleaner
2) Cylinder , Cylinder head
3) Piston , Piston pin
4) Piston rings
5) R.H. engine cover
6) Carburetor
7) Oil pump
8) Primary gear
9) Clutch
10) Rotary disc valve
11) L.H. engine cover
12) Clutch release
13) Gear change mechanism
14) Flywheel magneto
15) Engine sprocket
16) Crankcase
17) Crankshaft
18) Transmission gears
19) Kickstarter

Note; When completely disassembling the engine, follow the order listed above.

2. Minor disassembly of the engine

The engine can be disassembled to an extent without removing it from the frame. Inspect and repair it according to the following procedure.

[GA2-A] [F5]

1) Air cleaner

Fitting bolt
↓
Air cleaner cover
↓
Air cleaner screen
Air cleaner baffle plate
Air cleaner element

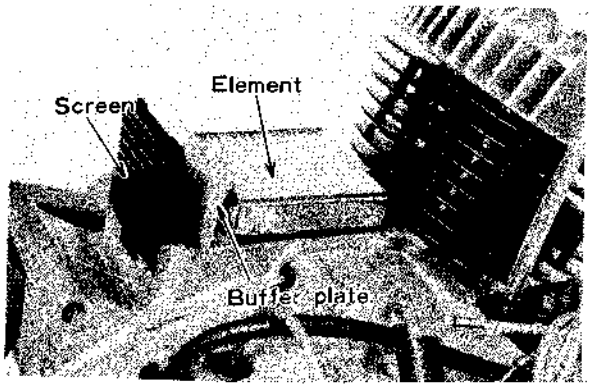


Fig. 2-3

a Wing nut
↓
Air cleaner cap
Air cleaner element
Air cleaner wirenet

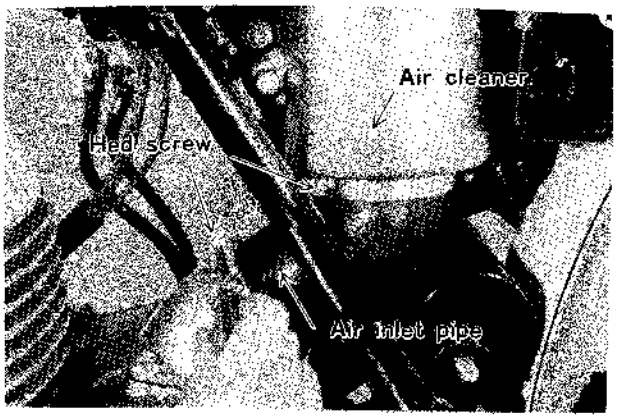


Fig. 2-4

Air cleaner clamps
↓
Connector
↓
Hex-head bolt
↓
Air cleaner body

2) Top end

Cylinder head → Cylinder → Piston ring
→ Piston pin → Piston
→ Small end needle bearing

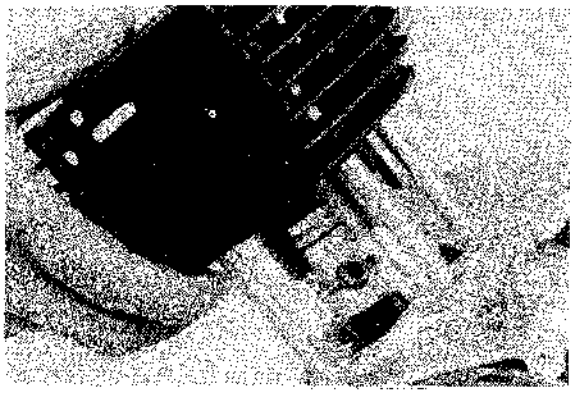


Fig. 2-5

3) Left end

Change pedal
↓
Left cover
↙ ↘
Transmission switch body
Flywheel magneto
Drive chain
↓
Engine sprocket

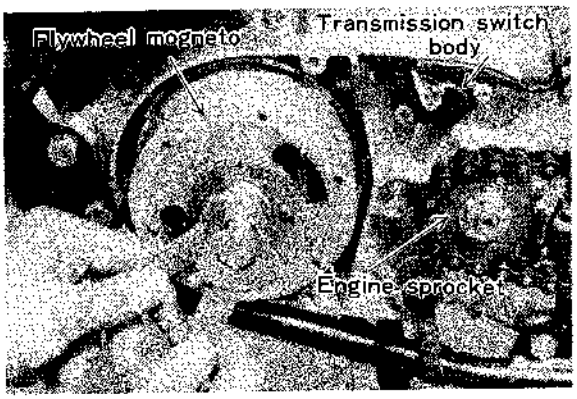


Fig. 2-6

Change pedal
↓
Chain case cover → Clutch release
↓
L.H. engine cover
↙ ↘
Transmission switch body
Flywheel magneto
Drive chain
↓
Engine sprocket

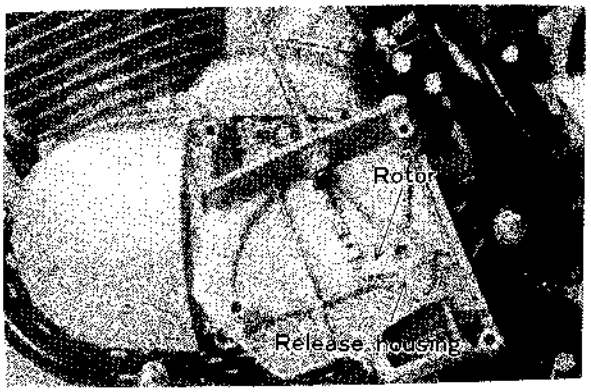


fig. 2-7

4) Right end

a Carburetor cover → Carburetor
↘ Clutch release mechanism

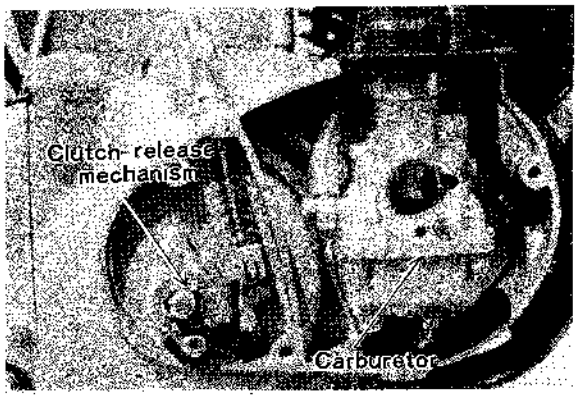


Fig. 2-8

a Carburetor cover
↓
Carburetor
Oil pump

b Oil pump cover → Oil pump



Fig. 2-9

a Kick pedal
↓
Carburetor cover
↓
Oil pump cover
↓
R.H. engine cover
↓
Oil pump gear
Kick gear spring
Primary gear → Rotary valve cover →
Disc valve
Clutch, Transmission external mechanism

b Kick pedal
↓
Carburetor cover
↓
R.H. engine cover
↓
Clutch
Oil pump gear → Primary gear →
Rotary valve → Disc valve
Gear change mechanism
Kick gear
Idle gear

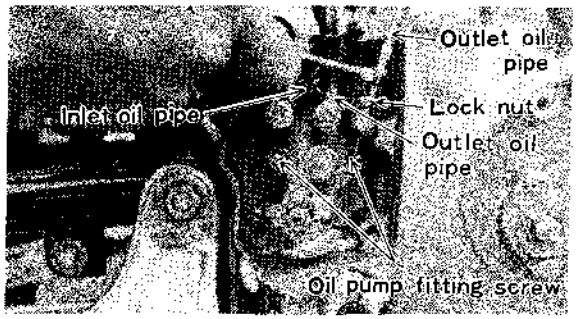


Fig. 2-10

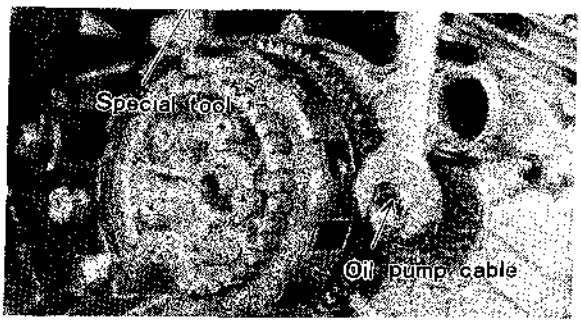


Fig. 2-11

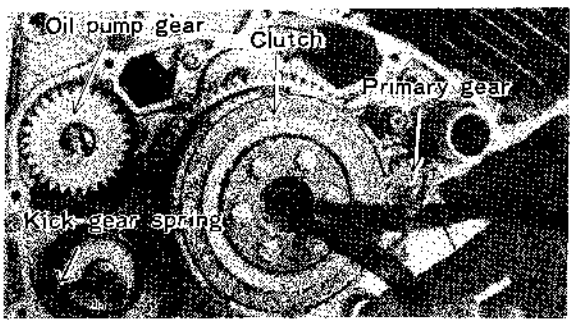


Fig. 2-12

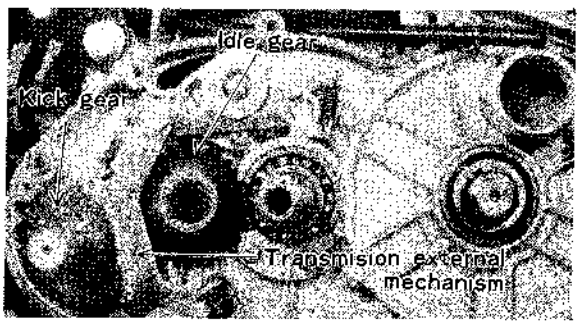


Fig. 2-13

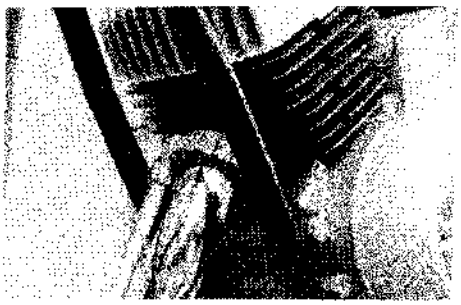
3. Removing the engine

Before removing the engine from frame, remove the exhaust pipes and muffler, air cleaner, carburetors, drive chain, change pedal, cables (clutch, oil pump and tachometer), wirings of the Flywheel magneto and high tension cords. According to the following procedure, they can be removed quickly and efficiently.

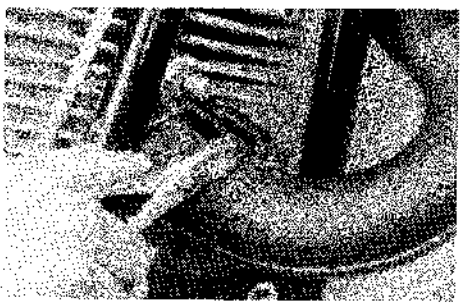
1) Removing the exhaust pipes and muffler

Remove fitting bolts or connector springs on the exhaust pipe and the muffler, take off the exhaust pipe with the muffler.

[GA2-A]


Fig. 2-14

[F5]


Fig. 2-15

2) Removing the air cleaner

Refer to II–2.

Note: The air cleaner on the GA Series does not need to be removed.

3) Removing the carburetor

a Remove the carburetor cover, carburetor cap.

b Turn the fuel cock to off and remove the fuel pipe.

c Loosen the fitting clip to remove the carburetor.

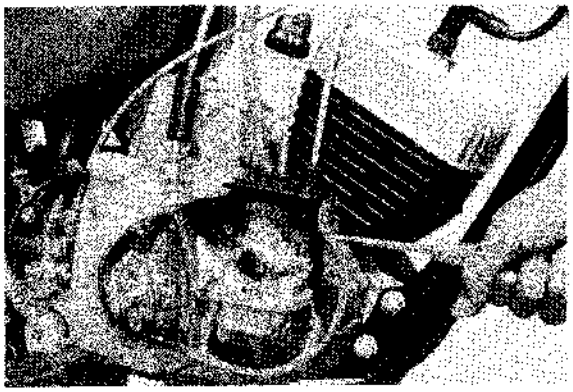


Fig. 2-16

a Remove the carburetor cap, carburetor cover.

b Turn the fuel cock to off and remove the fuel pipe.

c Remove the carburetor.

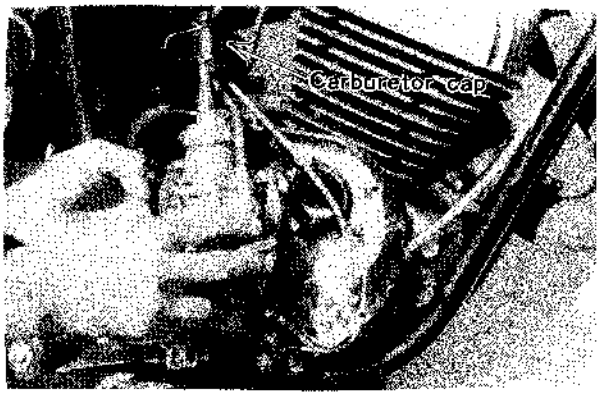


Fig. 2-17

4) Removing the oil pump and tachometer cable

a Remove the oil pump cover.

b Remove the oil pump inner wire from control lever.

c Remove the banjo bolt from the oil pump, take off the inlet oil pipe.

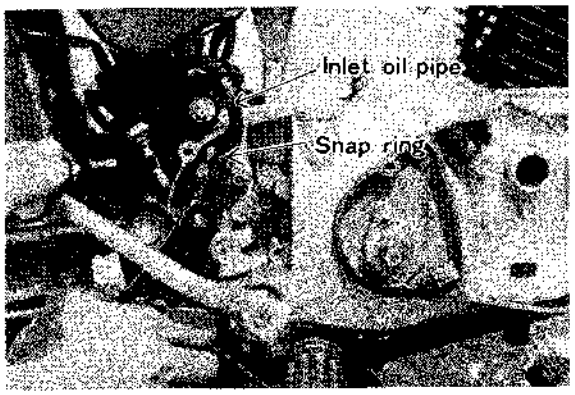


Fig. 2-18

a Remove the carburetor cover.

b Remove the oil pump cable from the oil pump control lever.

c Remove the banjo bolt from the oil pump, tank off the inlet oil pipe.

d Remove the fitting screw, pull out the tachometer cable.



Fig. 2-19

Note; When inlet pipe has been removed, it is necessary to plug the pipe to prevent the oil from flowing out of the oil tank.

5) Removing the clutch cable

After giving sufficient slack in the outer cable, remove the inner cable from the clutch release lever, and remove the clutch cable.

a Remove the change pedal

b Remove the front chain case cover with clutch release.

6) Removing the drive chain

a Remove change pedal and then left cover.

b Remove the master link, take off the drive chain.

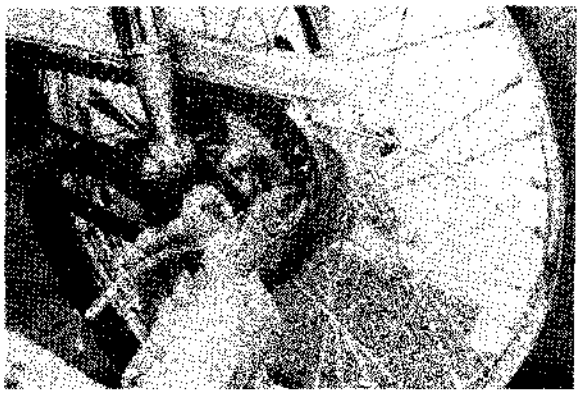


Fig. 2-20

7) Remove flywheel magneto wiring

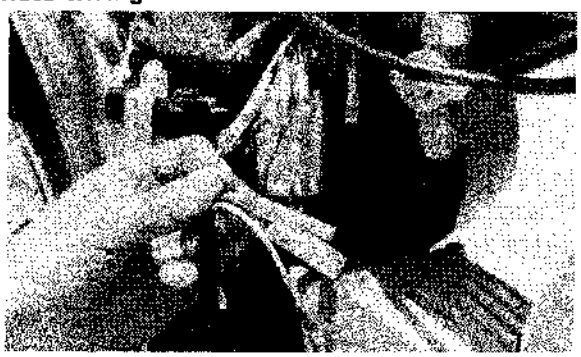


Fig. 2-21

8) Remove the spark plug cap.

9) Remove the engine mounting bolts and take off the engine from the frame.

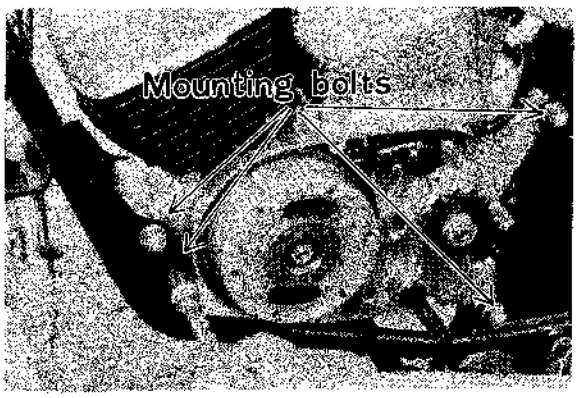


Fig. 2-22

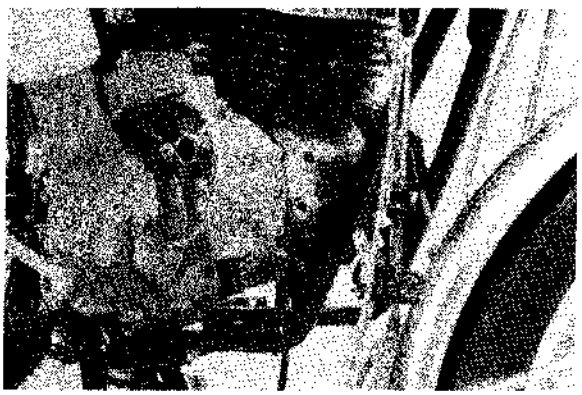


Fig. 2-23

4. Installing the engine

The Engine can be installed in the frame by reversing the removal sequence (Refer to section 3).

Note: The following checks will be made before attempting a test run.

1 Engine oil level (using the recommended oil).
2 Transmission oil level.
3 Clutch adjustment
4 Adjustment of oil pump and throttle cable.
5 Drive chain adjustment.
6 Tightness of the engine mounting bolts.

5. Adjustments

1) Adjusting the idling speed

Before adjusting the idling speed, completely warm up the engine to normal operating temperature. At the same time, adjust the air screw on the carburetor as specified. The starter cable, attached to the starter plunger, must be adjusted so there is 1/8" play in the starter lever.

Note: The ignition timing must be adjusted before making this adjustment.

The idling speed can be adjusted by turning the throttle stop screw on the carburetor top.

The standard idling speed should be adjusted as specified in the following table, so that the battery will be charged.

(Table 2–1)

Models	Air Screw (AS)	Idling Speed
GA1A GA2A G3SSA	1 ½	1,300∿ 1,500
G3TRA G4TR	1 ¾	1,300∿ 1,500
G31M	1 ½	——
B1LA	1 ½	900∿ 1,100
F6	1 ¾	1,300∿ 1,500
F7	1 ½	1,000∿ 1,300
F8	1 ¾	1,000∿ 1,300
F81M	1 ¼	——
F5	1 ¼	1,000∿ 1,300

After adjusting the idling speed, set the play of the control cable to give proper adjustment to the control grip.

The control cable can be adjusted with adjusting nut "A" by loosening lock nut "a".

Be sure to tighten the lock nut after adjusting.

Note: Do not touch the play of the throttle cable without adjusting the oil pump.

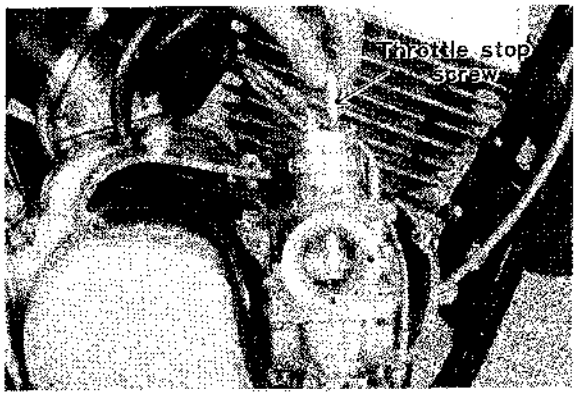


Fig. 2-24

2) Adjusting starter cable

Starter cable play must be adjusted in the same way as the throttle grip by turning the adjuster "A". Be sure to tighten the lock nut after adjusting.

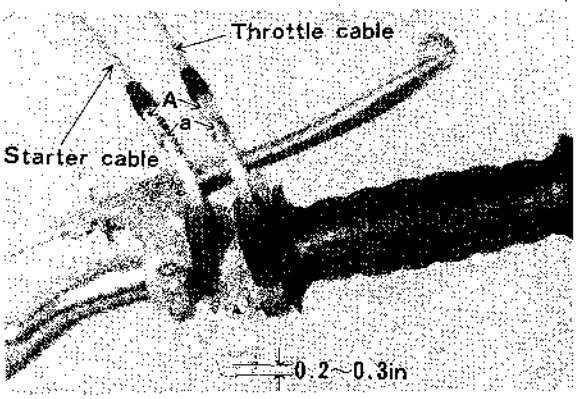


Fig. 2-25

3) Adjusting oil pump

Oil pump must be operated simultaneously with the throttle valve.

The control cable, which consisits of a carburetor throttle cable and oil pump cable, is used to control both at the same time. The oil pump lever is usually set so that the minimum opening corresponds to the zero opening of the throttle valve. Therefore, it is necessary to adjust the throttle cable to eliminate play between the carburetor and the junction on the control cable before starting adjustment of the oil pump.

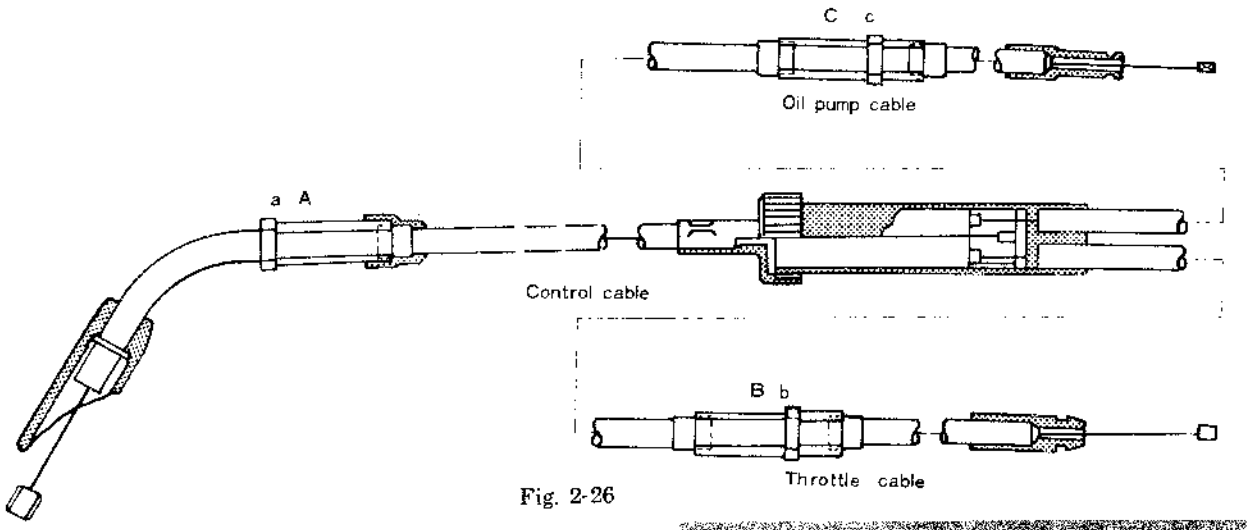


Fig. 2-26

a. Eliminate the throttle cable play as shown in fig 2-33.

The play can be taken up by turning the adjuster "B".

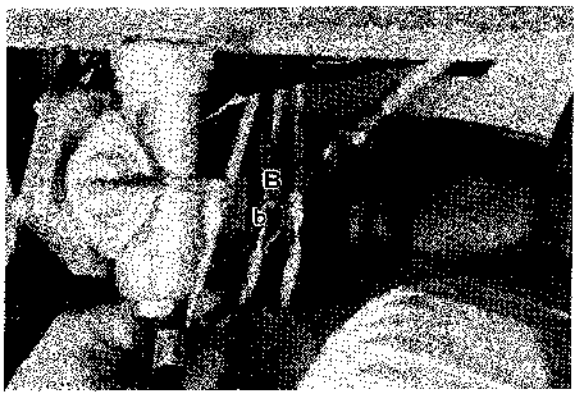


Fig. 2-27

Note: The play of the throttle cable can also be adjusted with the adjuster on the top of the carburetor.

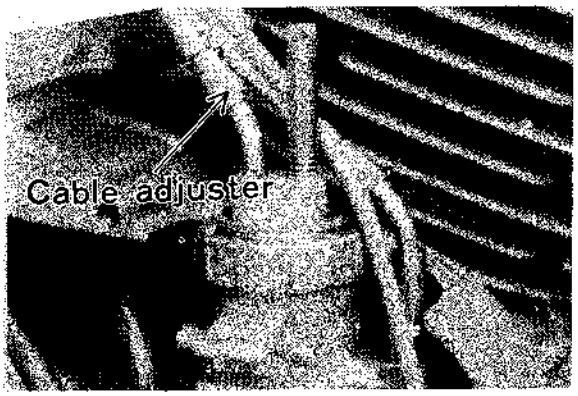


Fig. 2-28

b. The idle position of the oil pump lever can be obtained by aligning the mark on the lever stopper with the mark on the control lever.

Adjust the oil pump cable by turning the adjuster "C" until both marks align.

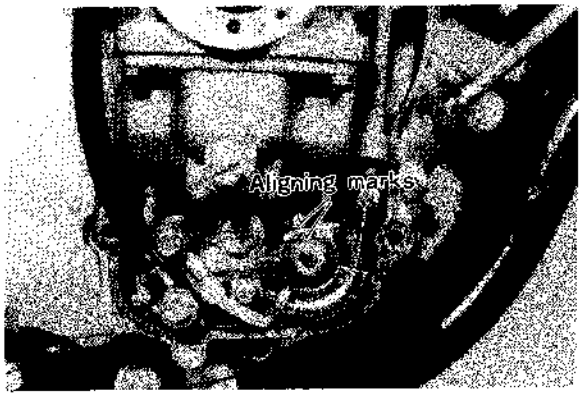


fig. 2-29

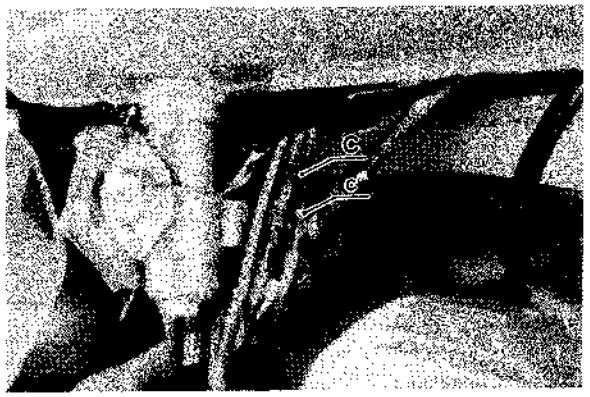


fig. 2-30

Note: When adjusting the oil pump lever minimum opening, play must first be allowed in the cable, to find the place where both the marks align.
Play can be obtained by turning adjuster "C" as in the above.

c. Do not forget to tighten lock nut "c" after making this adjustment.

4) Adjusting clutch

a. Release thread type (G and F series)

The clutch can be disengaged by moving the slotted screw (adjusting screw) in the release rotor.

To obtain an effective stroke for disengaging, the release rotor must be adjusted at the specified angle.

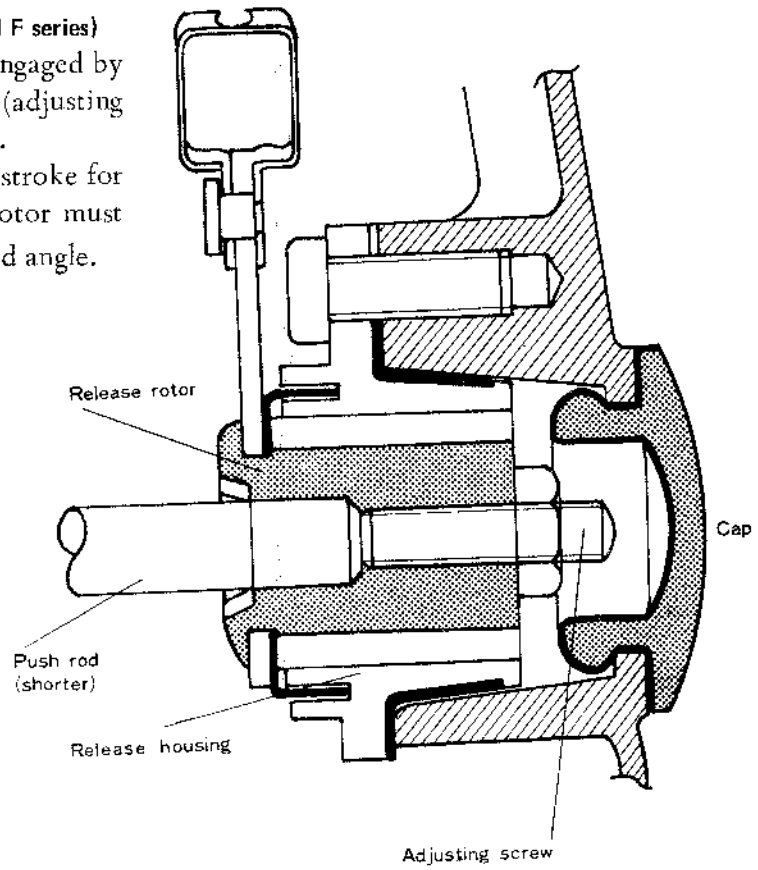


Fig. 2-31

Therefore, the release lever on the rotor must be placed within this limit so the correct angle can be obtained when releasing the clutch.

(1) To make the release rotor assembly, loosen lock nut "a" and back off the slotted screw "A" 3 turns.

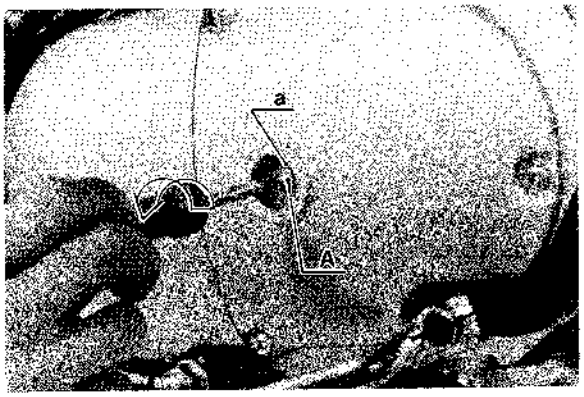


Fig. 2-32

(2) Loosen lock nut "b" and turn the clutch cable adjuster "B" to set the angle of the release lever to 90 degrees as illustrated in fig. 2-39.

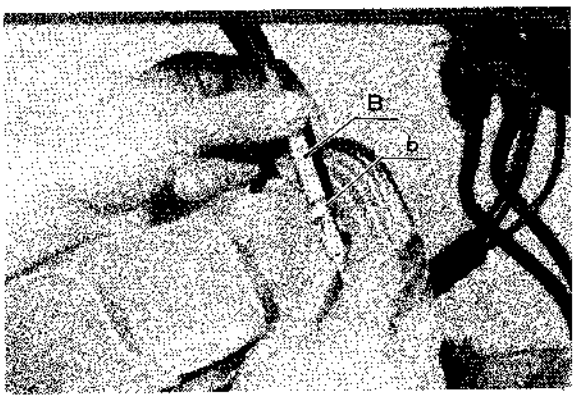


Fig. 2-33

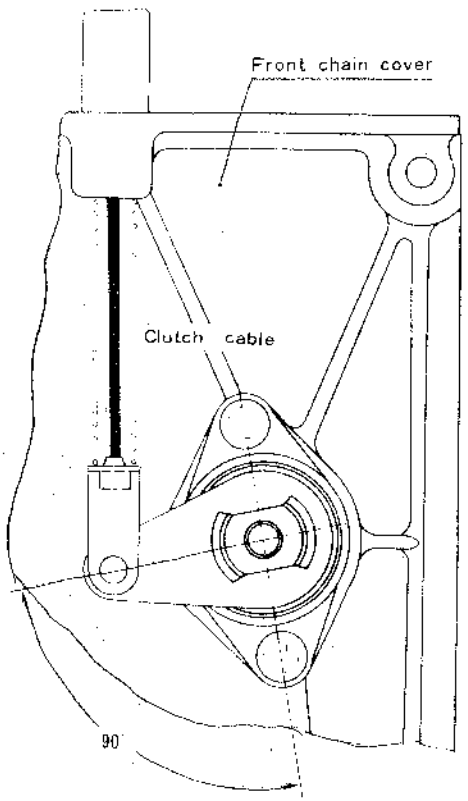


Fig. 2-34

(3) Turn in adjusting screw "A" until it bottoms out, which indicates where the clutch is about to disengage, and lock it with "a". Be sure not to turn it in any further.

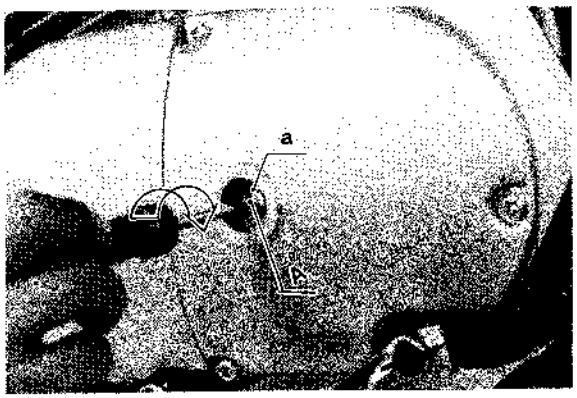


Fig. 2-35

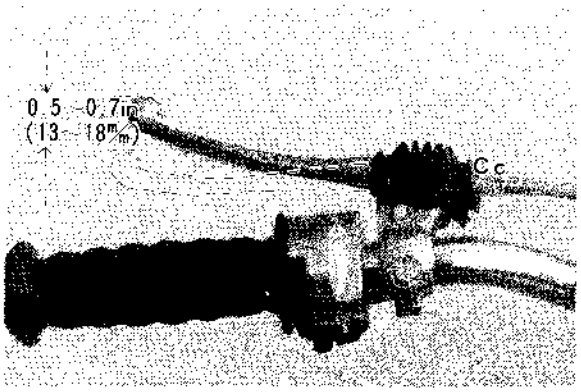


Fig. 2-36

(4) Finally, adjust the clutch lever play with adjuster "C" as illustrated here. Be sure to fix the adjuster with lock nut "c".

Note: 1. F5, F8 and F81M clutch adjusting screw "A" can also be adjusted merely by removing the rubber cap on the front chain cover and inserting a screw driver through the hole.
Model F6 and F7 are also adjustable when the contact-breaker cover is removed.
2. In the case of the G series models, the clutch can be adjusted by removing the carburetor cover.

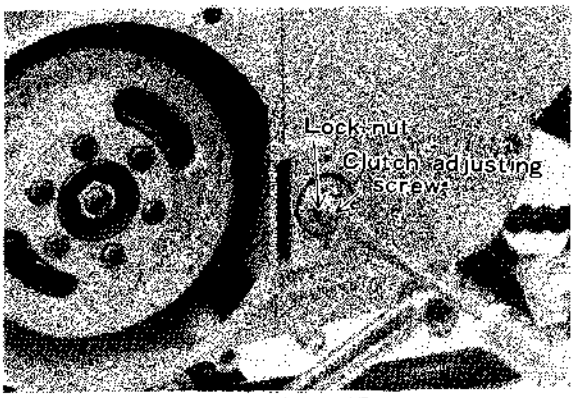


Fig. 2-37

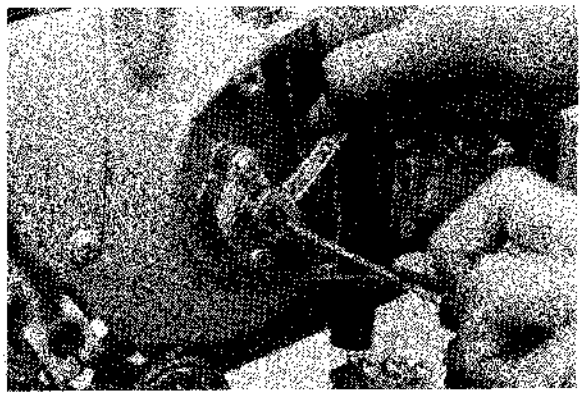


Fig. 2-38

b. Release plate type (B1L-A)

(1) Loosen both, lock nut "C" and "D" and make release lever free by turning in both clutch lever adjuster "A" and clutch cable adjuster "B" completely and pulling inner cable inside right cover.

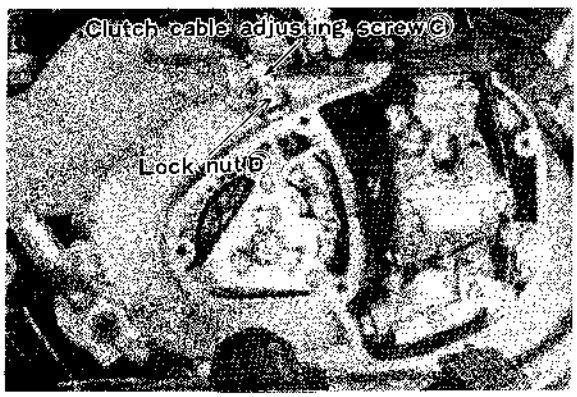


Fig. 2-39

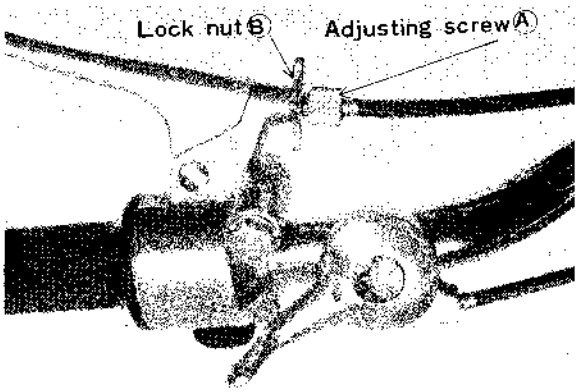


Fig. 40

(2) The clutch is adjusted by the clutch adjusting screw "E" after loosening lock nut "F". There is a screw position where the turning torque increases suddenly when turning in clutch adjusting screw "E". This is where the clutch begins to disengage. Screw it back about 1/4 to 1/2 turn from that position and tighten lock nut "F" securely.



Fig. 2-41

(3) Finally, adjust clutch lever play by clutch cable adjuster "A" and "B", the standard clutch lever play is shown in Fig. 2-36, and fasten tightly with lock nut "e" and "C".

III. MAINTENACE OF ENGINE COMPONENTS

1. Air Cleaner
2. Cylinder and Cylinder Head
3. Piston Rings
4. Piston and Piston Pin
5. Left Cover
6. Removal of Flywheel Magneto
7. Engine Sprocket
8. Right Cover
9. Primary Gear
10. Clutch Release
11. Clutch
12. Rotary Valve Cover and Rotary Valve
13. Transmission External Mechanism
    (Gear Change Mechanism)
14. Crankcase
15. CrankShaft
16. Transmission Gears
17. Kickstarter
18. Lubricating System
19. Carburetor
20. Drain Pump

1. Air cleaner

If particles in the air, such as dust or sand, are drawn into a cylinder, they remain between the piston and the cylinder wearing and scratching the cylinder wall. Therefore, an air cleaner is needed to filter and clean the dusty air taken into the carburetor. The air cleaner also functions to eliminate noise during air intake.

1) Construction

a. Dry Type Element G Series

As illustrated in Fig. 3–1, the triple filtration system consists of three stages: (1) the incoming air is deflected by the dust absorbing buffer plate (felt-lined) facing the inlet, (2) the subsequent collision of air with the dust absorbing upper surface of the air cleaner cover (felt-lined), and (3) the dry-type element performs the final stage of filtration. With this ideal arrangement, dust trapping is very efficient and the dry type element is less likely to become clogged with dust.

b. Wet Type Element B1L-A, F Series

The air cleaner, as shown in Fig. 3–2, is of a three stage filtering construction comprising a semispherical, felt-lined element facing the inlet, a felt-lined element on the inner wall of the air cleaner body case and a wet-type filter element.

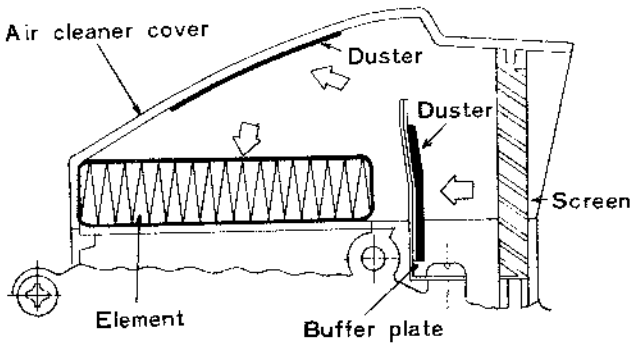


Fig. 3-1

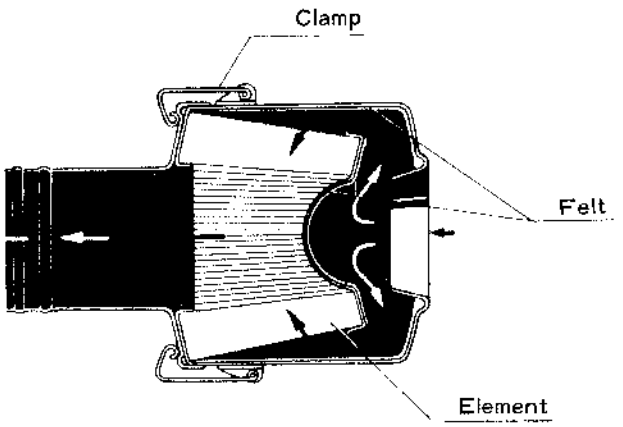


Fig. 3-2

The air cleaner of the off-road motorcycle F series is mounted just under the seat, where dust does not accumulate.

The air passage and the carburetor chamber are of perfect water-proof type to prevent water or mud from entering.

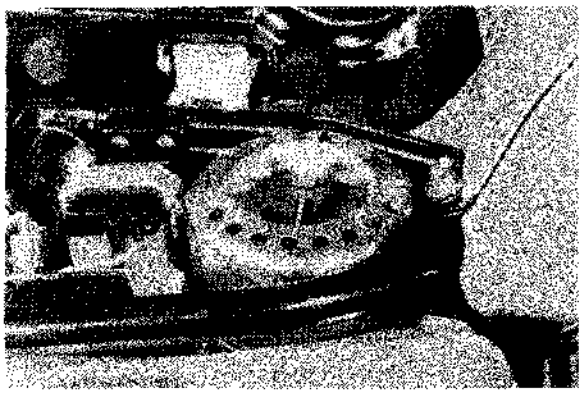


Fig. 3-3

2) Removal

a. Dry Type Element G Series

(1) Remove the four air cleaner cover fitting bolts.

(2) Take out the screen and the element.

(3) Remove the buffer plate fitting screws to remove the buffer plate.



Fig. 3-4

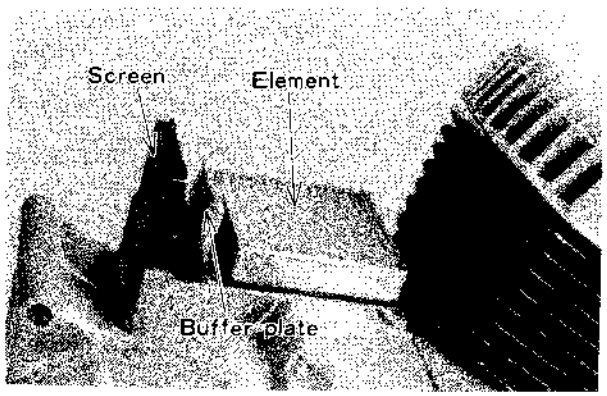


Fig. 3-5

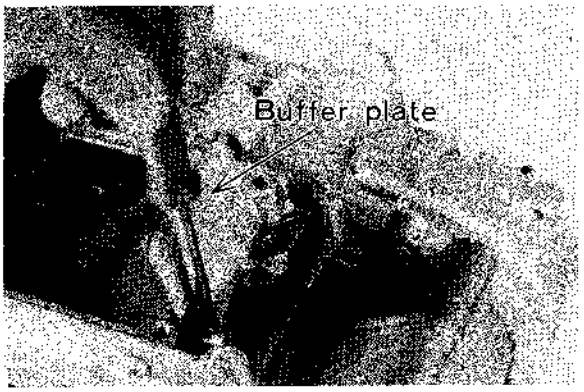


Fig. 3-6

b. Wet Type Element B1L-A

(1) Loosen air cleaner cap fitting screw with phillips screw driver, and remove from air inlet.

(2) Lift up air cleaner body clips by hand to separate body, element and cap.

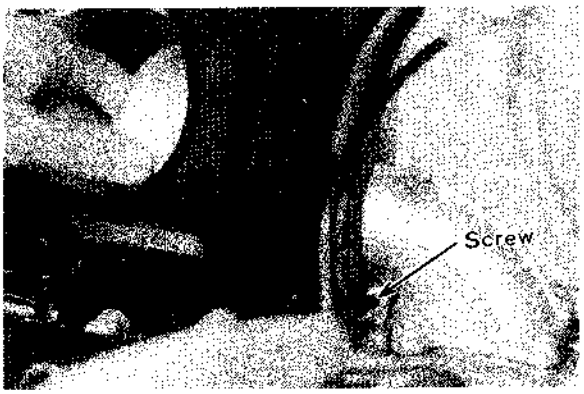


Fig. 3-7

c. Air cleaner for the off-road motorcycle (F Series)

The air cleaner of the off-road motorcycle which runs in dusty places must be cleaned frequently. To disassemble the air cleaner element without removing the air cleaner body, open the seat, remove the air cleaner fitting bolts and wing nuts and take off the air cleaner cap.

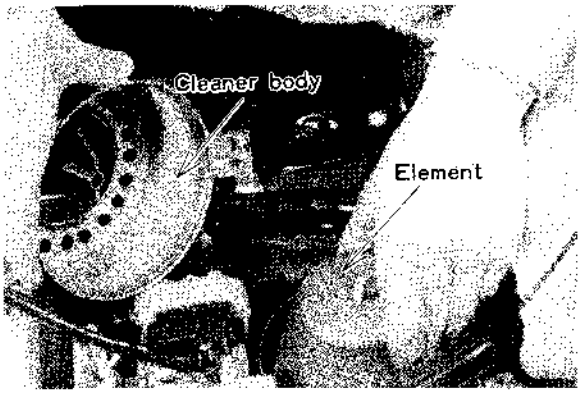


Fig. 3-8



Fig. 3-9

3) Inspection

a. Clean the element and the duster felt of the air cleaner periodically (every 1300 ∿ 2000 mi). If the element is clogged with dust, the filtering efficiency, amount of air intake and engine performance decrease, increasing the fuel consumption.

(1) The element can be cleaned by blowing or tapping dust off. Replace if extremely loaded with dust.
(2) Wash the duster felts of the buffer plate and cleaner cover and foam rubber element in gasoline or oil mixture, then apply a small amount of oil (SAE 30 to 40).

b. Check that the felts on the buffer plate and cleaner cover are not peeled off. If peeled, replace by using a high quality bonding agent.

c. Examine the element for damage. Replace if filter paper is torn.

4) Installation

Install the air cleaner by reversing the removal sequence.

Note: Be careful not to mistake the front side for the back side when installing the screen. The fins should point upward toward the cylinder.

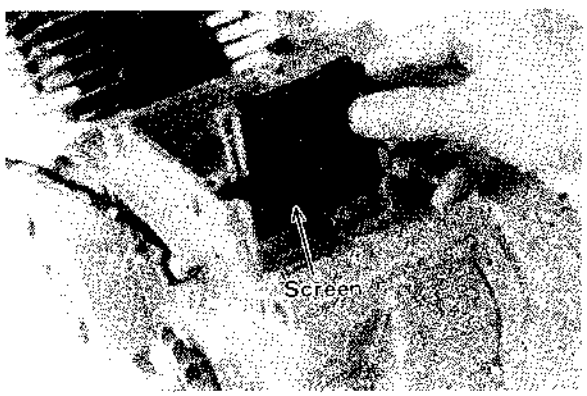


Fig. 3-10

2. Cylinder, Cylinder Head

1) Performance and Construction

a. Cylinder Head

The cylinder head is the part which is heated to the highest temperature because it forms the combustion chamber. To increase the cooling efficiency, the cylinder head is made of high thermo-conductivity aluminum alloy and is provided with cooling fins on its outer surface.

In the case of the F series models, a hole is tapped on the opposite side of the spark plug hole to insert a decompressor which is generally used to allow the compressed gas in the cylinder out. Releasing this gas when starting the engine makes it easy to kick start; therefore, a decompressor can be used to start the engine more easily.

Normally, it is not necessary to have the decompressor, and the hole must be plugged with a bolt identical to the spark plug in thread, pitch, diameter, and reach.

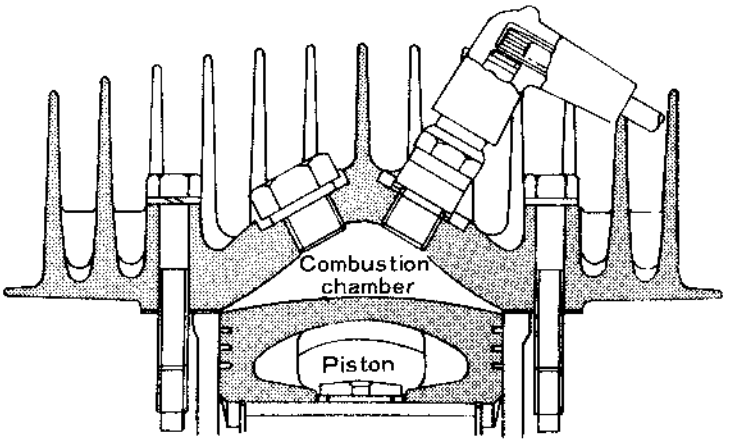


Fig. 3-11

b. Cylinder

The cylinders of GA, B1L and F6 are made of cast iron, and those of F5 and F8 are made of a light aluminum alloy having a high cooling effect, with an sleeve made of special cast iron.

The cylinder has two ports, one for scavenging and another for exhaust. These ports are opened and closed by the reciprocating motion of the piston. The timing of their opening and closing (port timing) greatly influences the thermal efficiency of the engine, that is, the engine performance depends on the effective timing of scavenging and exhaust.

The port timing for each model is shown in the following table.

The intake process of the rotary valve type is carried out by the rotary disc which opens and closes the intake port on the side of the crankcase. Therefore, a cylinder of this type does not have the intake port.

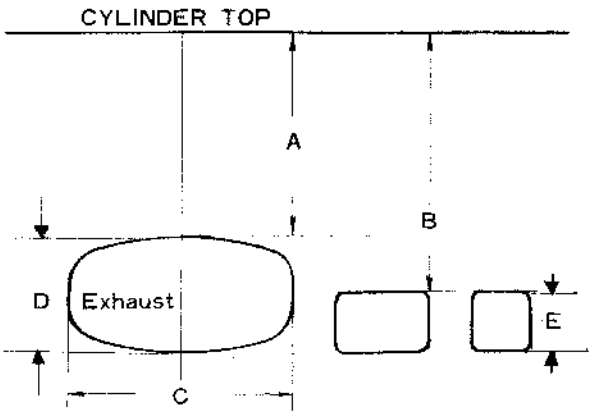


Fig. 3-12

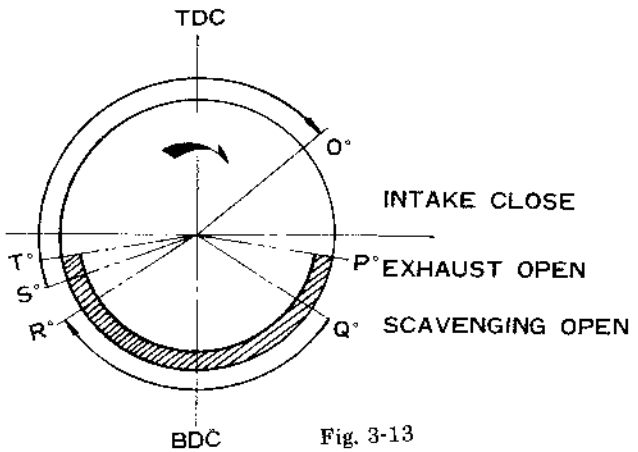


Fig. 3-13

Model	A in(mm)	B in(mm)	C in(mm)	D in(mm)	E in(mm)
GA1-A G3SS-A GA2-A	1.248(31.7)	1.661(42.2)	1.260(32.0)	0.886(22.5)	0.472(12.0)
G3TR-A	1.292(32.8)	1.705(43.3)	1.260(32.0)	0.886(22.5)	0.472(12.0)
G4TR	1.315(33.4)	1.728(43.9)	1.260(32.0)	0.886(22.5)	0.472(12.0)
G31M-A	1.126(28.6)	1.626(41.3)	1.339(34.0)	1.055(26.8)	0.516(13.1)
B1L-A	1.366(34.7)	1.693(43.0)	1.496(38.0)	0.886(22.0)	0.472 0.571(12.0)
F6	1.382(35.1)	1. 98(48.2)	1.378(35.0)	1.028(26.1)	0.5 0(12.7)
F7	1.496(38.0)	1.945(49.4)	1.614(41.0)	0.921(23.4)	0.512(13.0)
F8	1.693(43.0)	2.177(55.3)	1.752(44.5)	1.087(27.6)	0.571(14.5)
F81M	1.598(40.6)	2.177(55.3)	1.752(44.5)	1.181(30.0)	0.571(14.5)
F5	1.732(44.0)	2.224(56.5)	2.008(51.0)	1.063(27.0)	0.563(14.3)

(Table 3-2)

	Intake open	Intake close	Exhaust open	Exhaust close	Scavenging open	Scavenging close
GA1-A GA2-A G3SS-A G3TR-A	120°	55°	84°30′	84°30′	57°30′	57°30′
G4TR	120°	50°	84°30′	84°30′	57°30′	57°30′
G31M-A	140°	70°	93°	93°	62°	62°
B1L-A	110°	45°	79°30′	79°30′	57°30′	57°30′
F6	115°	55°	87°	87°	57°30′	57°30′
F7	115°	55°	82°	82°	55°30′	55°30′
F8	110°	50°	83°	83°	59°	59°
F81M	130°	65°	87°40′	87°40′	59°	59°
F5	110°	50°	82°	82°	57°	57°

2) Removal

a. Remove the cylinder mounting nuts and remove the cylinder head and gasket.

b. Draw the cylinder from the stud bolts, holding it in both hands.

Note: If it does not move, tap around the exhaust port with a plastic hammer while raising the cylinder.

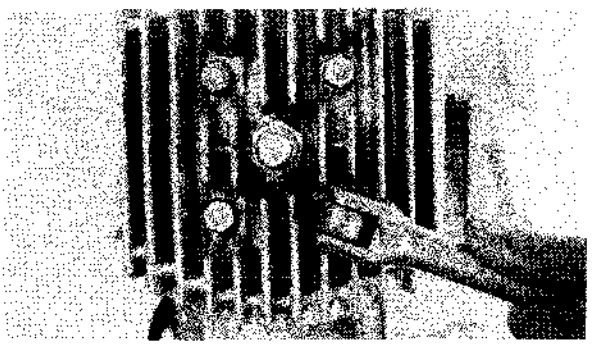


Fig. 3-14

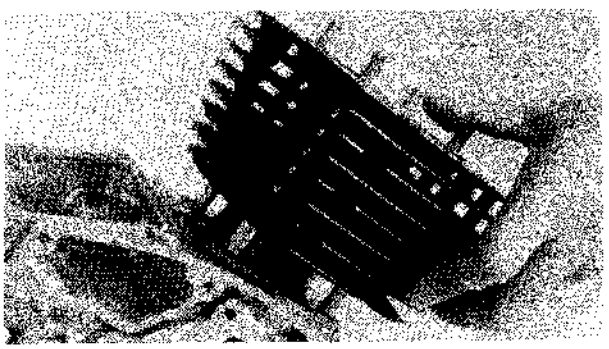


Fig. 3-15

3) Inspection

a. Inspection of cylinder head (for carbon)

Large amounts of carbon accumulated inside the combustion chamber will result in preignition, overheating, or excessive fuel consumption. Since these results seriously affect engine performance, it is necessary to carefully inspect the cylinder head and remove any carbon.

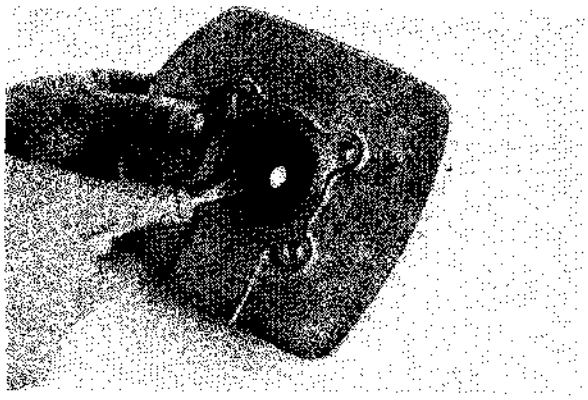


Fig. 3-16

Caution: When removing carbon, take care not to damage the gasket surface of the head.

b. Inspection of cylinder:

(1) Removal of carbon from cylinder:
Carbon is apt to form particularly around the exhaust port of the cylinder. Inspect it and if carbon is present, carefully remove it with a screw driver, or the like.

(2) Inspection of inner surfaces of cylinder:
Examine the inside of the cylinder for any damage. Correct if damaged with about No.400, emery cloth. If extremely damaged, replace the cylinder or perform boring and horing operations.



Fig. 3-17

(3) Boring and Honing Operation

Abrasion and burning of the cylinder, piston and piston rings cause a lowering of engine power and acceleration ability, an increase in fuel and lubricating oil consumption and unbalanced rotation.

After checking the piston and piston rings, inspect the cylinder.

(i) Measurement of Compression Ratio at Combution Chamber

Check that the fitting torque of the cylinder head bolt is normal (approx. 2.5 kg-m or 18 ft. lbs.)

After warming up the engine for a few minutes, remove the spark plug and insert a compression gauge into the spark plug hole. Then, read the pressure on the gauge while kicking over the engine.

Table 3-3

Model	G Series	G31M-A	B1L-A	F6	F7	F8	F81M	F5
Compression Ratio	7.0	7.8	6.4	7.2	7.1	6.8	7.5	6.8
Standard Pressure kg/cm² /r.p.m.	8.5/1000	9.4/1000	7.0/800	8.0/500	8.0/500	12/2800	13/2800	13/2800

(ii) Measurement of cylinder:

Use a micrometer or cylinder gauge for measuring the cylinder bore. As illustrated in Fig. 3-18 measure at four upper and lower points in two directions, front to back and right to left, eight spots in all. If maximum wear exceeds 0.006 in (0.15 mm) or if the difference in the inside diameter between any two points is over 0.002 in (0.05 mm), bore, hone and/or replace the cylinder.

(iii) When boring and honing, remember the following points.

1. Oversize pistons are available in two sizes: 0.02 in and 0.04 in (0.50 mm and 1.00 mm.)

2. The difference in bore between points after honing must be within 0.0004 in (0.01 mm).

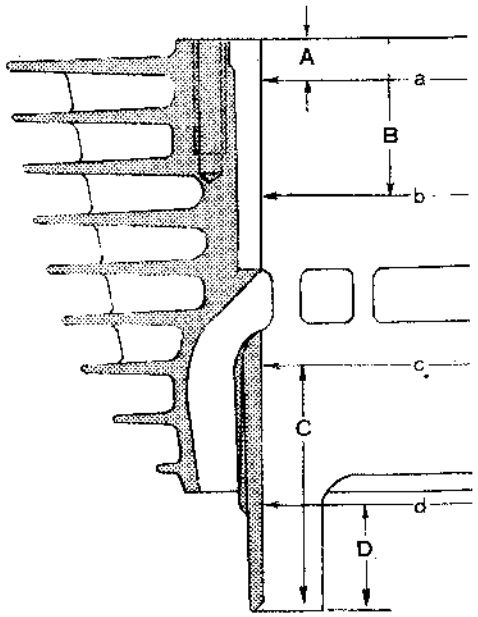


Fig. 3-18

Table 3-4

Models	Standard Dimension	A	B	C	D
GA1-A GA2-A G3SS-A	1.850 in (47.0 mm)	0.4 in (10 mm)	1.0 in (25 mm)	2.0 in (50 mm)	1.0 in (25 mm)
G3TR-A	1.949 in (49.5 mm)	0.4 in (10 mm)	1.0 in (25 mm)	2.0 in (50 mm)	1.0 in (25 mm)
G4TR	1.949 in (49.5 mm)	0.4 in (10 mm)	1.0 in (25 mm)	2.0 in (50 mm)	1.0 in (25 mm)
G31M-A	1.949 in (49.5 mm)	0.4 in (10 mm)	1.0 in (25 mm)	2.0 in (50 mm)	1.0 in (25 mm)
B1L-A	2.165 in (55.0 mm)	0.4 in (10 mm)	1.2 in (30 mm)	2.0 in (50 mm)	1.0 in (25 mm)
F6	2.047 in (52.0 mm)	0.4 in (10 mm)	1.2 in (30 mm)	2.4 in (60 mm)	1.0 in (25 mm)
F7	2.421 in (61.5 mm)	0.4 in (10 mm)	1.2 in (30 mm)	2.4 in (60 mm)	1.0 in (25 mm)
F8	2.677 in (68.0 mm)	0.4 in (10 mm)	1.4 in (35 mm)	3.8 in (70 mm)	1.0 in (25 mm)
F81M	2.677 in (68.0 mm)	0.4 in (10 mm)	1.4 in (35 mm)	2.8 in (70 mm)	1.0 in (25 mm)
F5	3.169 in (80.5 mm)	0.4 in (10 mm)	1.6 in (40 mm)	2.8 in (70 mm)	1.0 in (25 mm)

(iv) After boring and honing are made, piston clearance should be measured. The standard piston clearance is specified in the following table.

(4) Piston clearance

The clearance measurement is obtained by figuring the difference between the inner diameter of the cylinder and the diameter of the skirt of the oversize piston at a position 5 mm from the bottom. (Fig. 3-19)

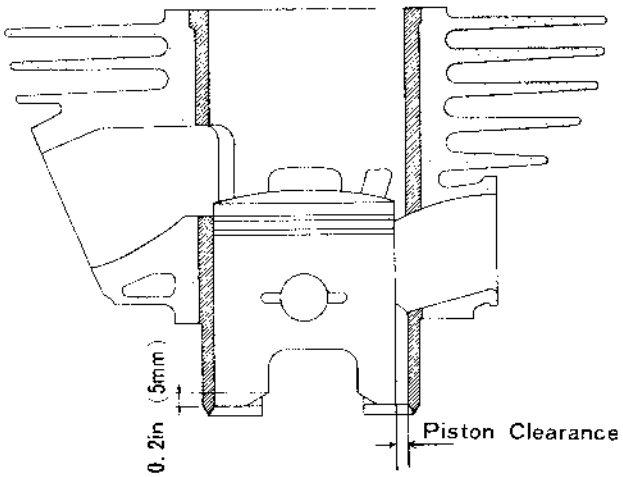


Fig. 3-19

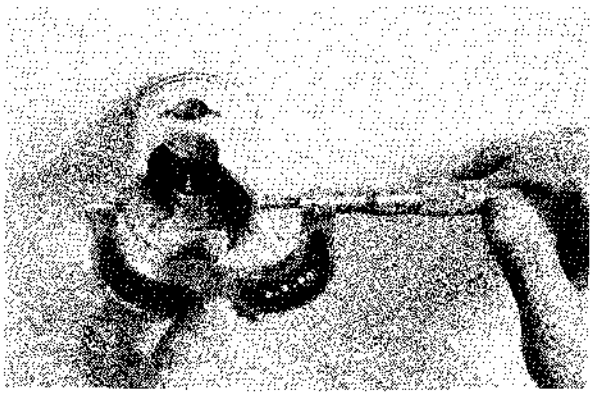


Fig. 3-20

Table 3-5 (Corrected Oct. 18, 1971)

MODEL	DISP.	PISTON CLEARANCE	
G3SS-A	90cc	0.0018 in	(0.046 mm)
G3TR-A	100cc	0.0022 in	(0.056 mm)
G4TR	100cc	0.0014 in	(0.036 mm)
G31M-A	100cc	0.0026-0.0034 in	(0.066 ∼ 0.086 mm)
F6	125cc	0.0027 in	(0.068 mm)
F7	175cc	0.0025 in	(0.064 mm)
F8	250cc	0.0022-0.0024 in	(0.055-0.060 mm)
F81M	250cc	0.0030 in	(0.077 mm)
F5	350cc	0.0039 in	(0.100 mm)
F5 KIT	350cc	0.0039-0.0043 in	(0.100-0.110 mm)

(5) Replacement of Cylinder.
When cylinder is replaced, replace both the piston and the piston rings at the same time.

4) Installation

Reverse the removal procedures.

Note:

(1) When inserting the piston into the cylinder, fit the piston rings to the knock pins in the piston ring grooves. Insert the piston by pressing the ring by hand to prevent it from scratching the side of the cylinder. Any excessive force applied will break the ring or damage the inner surface of the cylinder.

(2) Refer to VI-3 for cylinder head tightening torque value.
Be sure to cross tighten the head bolts to torque the head down evenly.

3. Piston Ring

The piston contains two different piston rings. The top ring is chrome plated and has more gloss than the second ring.
As its principal function, the top ring prevents any compression leakage during the operation of the pistion. This is why it is called the "compression ring".
The second ring is another compression ring similar in nature to the top ring, but its surface is parkerized for smoother sliding contact with the cylinder. The rings also function to increase the cooling effect on the piston to prevent burning.

New piston rings for the G4TR are treated with a synthetic coating to prevent scuffing during break in.

Compared with ordinary two-cycle engines, the F5 cylinder is a little bit difficult to cool because of its single-cylinder construction of 350 cc. To solve this problem, three piston rings are used in the F5 cylinder.

The expander rings are used in the second and third rings on F5 piston, and only the second ring on F6, F7 and F8 piston.

1) Removal of piston rings

a. Separate the meeting ends of the piston ring with both thumbs, while raising the opposite side of the ring with forefingers. The piston ring can be removed easily.

b. **Expander Rings**

Press the meeting ends of the expander ring with a narrow-bladed screwdriver. The ring can be removed easily.

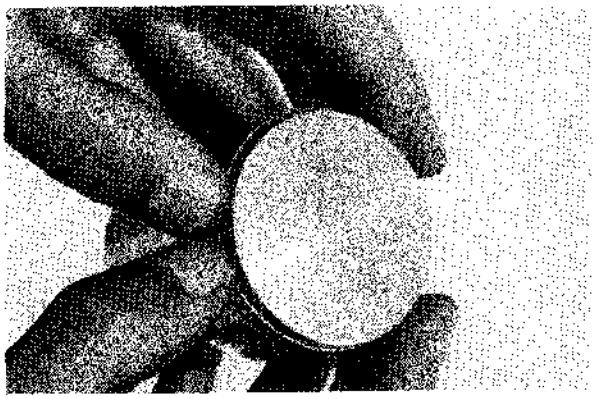


Fig. 3-21

2) Inspection

a. Piston ring gap

Measure the piston ring end gap as an indication of actual wear. Insert the piston ring horizontally 5 mm into the lower part of the cylinder. Then measure the ring end gap using a thickness gauge. Replace the rings if this end gap exceeds .028 in (0.7 mm) respectively. The standard end gap is shown in the table on the following page.

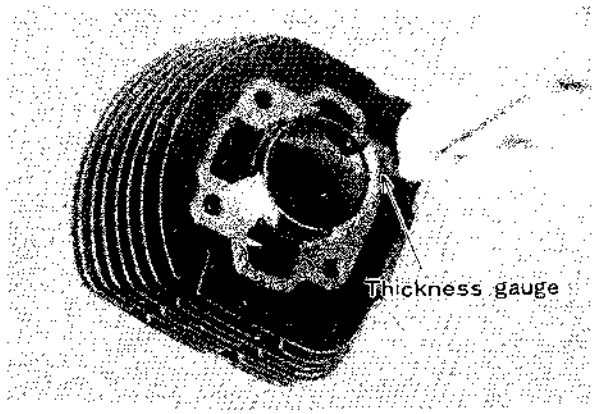


Fig. 3-22

Model	Piston Ring Gap	
G Series B1LA F6	0.0059 ∿ 0.0137 in	0.15 ∿ 0.35 mm
F7 F8 F81M	0.0078 ∿ 0.0157 in	0.2 ∿ 0.4 mm
F5	0.0098 ∿ 0.0177 in	0.25 ∿ 0.45 mm

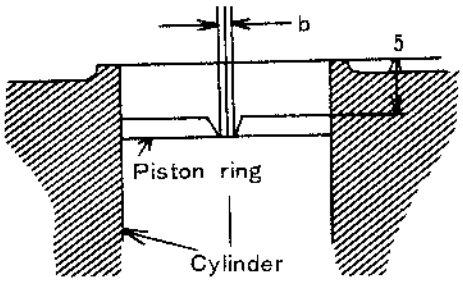


Fig. 3-23

b. Tension

Inadequate ring tension causes gas leakage and decrease of the compression ratio. Check the tension of the rings by measuring the free gaps of the rings.

Table 3-6 Free Gap [in (mm)]

Model	GA1-A GA2-A G3SS-A	G4TR G3TR-A	G31M-A	B1L-A	F6	F7	F8	F81M	F5
Top	0.177 in 4.5 mm	0.177 in 4.5 mm	0.217 in 5.5 mm	0.256 in 6.5 mm	0.276 in 7.0 mm	0.315 in 8.0 mm	0.335 in 8.5 mm	0.335 in 8.5 mm	0.315 in 8.0 mm
2nd	0.177 in 4.5 mm	0.236 in 6.0 mm	0.217 in 5.5 mm	0.276 in 7.0 mm	0.315 in 8.0 mm	0.276 in 7.0 mm	0.295 in 7.5 mm	0.335 in 8.5 mm	0.315 in 8.0 mm

c. Ring and Ring Groove

The clearance between the piston ring and the ring groove is usually 0.05 ∿ 0.13 mm. Improper clearance causes burning of the piston and the ring or gas leakage. Check the vertical clearance by measuring at a few points on the circumference of the piston with a thickness gauge. If the ring or the ring groove is abnormal in shape, replace it.

3) Installation

Place the second ring in position first and then the top ring, over the head of the piston.

Note: Be sure to turn the side of the ring having number and letters toward the top of the piston.

4. Piston and Piston Pin

During operation the piston tends to become so hot that it expands toward the piston head and the piston pin. To allow for this thermal expansion, the outside diameter of the piston is tapered so that it is larger on the lower end, and in addition, its external circumference is shaped like an ellipse.

The piston is made of high alusil, which has a particularly small coefficient of thermal expansion and high thermal and wear resistance. The two ring grooves are each equipped with a locating pin to prevent rotation of the ring.

The arrow mark on the piston top indicates the exhaust port side.

The piston pin is a full floating type and both ends are fixed to the piston by circlips. The piston pin is offset to the inlet side about 0.5 mm from the axis of the piston. The strongest point of the explosion pressure is around the top dead center; thus, by changing the position of lateral pressure of the piston, it is possible to avoid side pressure, and reduce piston slap noise.

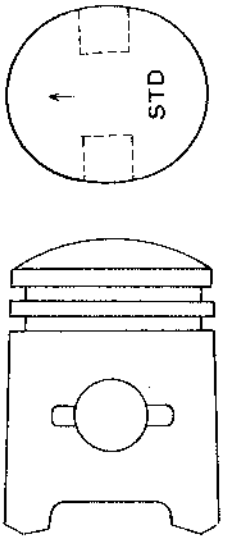


Fig. 3-24

1) Removal

a. Take off the circlip being careful not to drop the piston pin or circlip into the crankcase.

b. Remove the piston by extracting the piston pin with the tool provided.

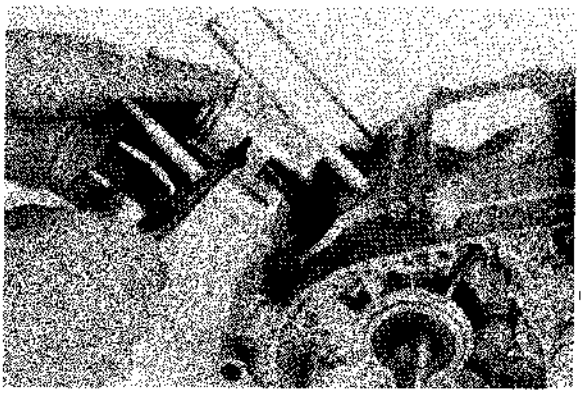


Fig. 3-25

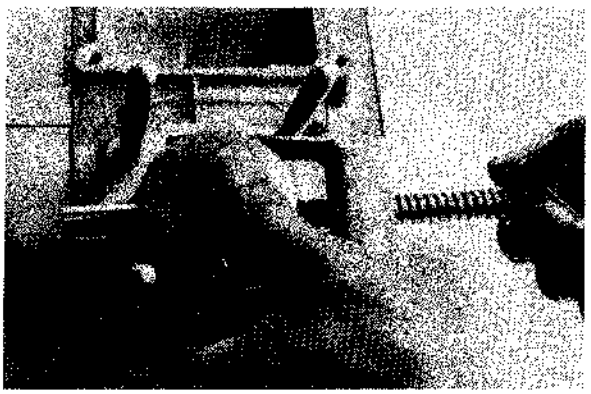


Fig. 2-26

2) Inspection and Correction

a. Inspection and correction of damage.

When you discover any damage from burning or other causes polish the piston with fine emery paper (about # 400) depending on the extent of damage, until the damage is removal. In case of extreme damage, replace piston.

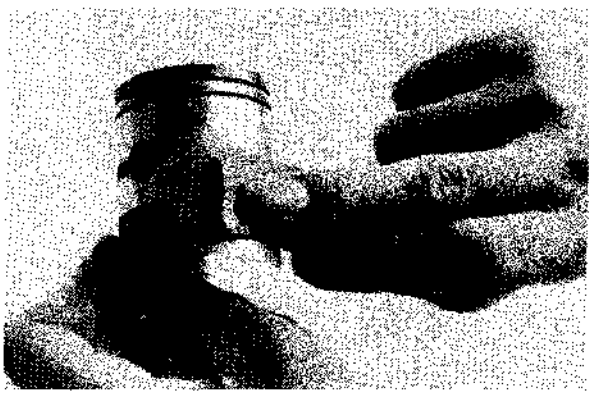


Fig. 3-27

b. Removal of carbon.

(1) Examine the extent of carbon accumulation on the piston head, and remove carbon with a scraper.

(2) Carbon, if accumulated in the groove on the piston ring, may cause adhesion of ring. After checking the accumulation, remove carbon from the ring groove. with a broken ring.

Note: Be careful not to damage the surface of the piston during the carbon removing operation.

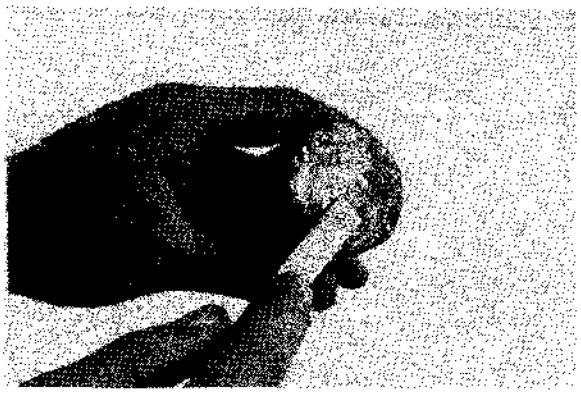


Fig. 3-28

c. Piston clearance

Refer to III-2-2 for measurement of piston clearance.

Standard measurement is as follows:

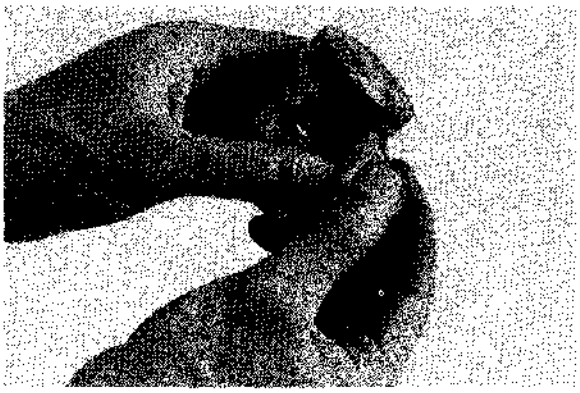


Fig. 3-29

Table 3-7 Piston Specification [in (mm)]

Model	GA1-A GA2-A G3SS-A	G3TR-A G4TR	G31M-A	B1L-A	F6	F7	F8	F81M	F5
Skirt diameter	1.8496 in 46.981 mm	1.9481 49.481	1.9467 49.446	2.1655 55.004	2.0457 51.962	2.4193 61.451	2.6758 67.965	2.6755 67.958	3.1665 80.430
Groove width	0.059 1.5	0.059 1.5	0.039 1.0	0.079 2.0	0.059 1.5	0.059 1.5	0.059 1.5	0.059 1.5	0.059 1.5
Groove depth	0.093 2.35	0.093 2.35	0.090 2.28	0.096 2.44	0.091 2.32	0.104 2.63	0.114 2.89	0.114 2.89	0.133 3.37

Note: 1 The diameter must be measured at right angles to the piston pin.
2 The skirt diameter must be measured 5 mm from the bottom of the piston.

d. Inspection of piston pin.

Check the piston pin for any wear and/or damage.
Replace it if any abnormal condition is found.
When piston pins are replaced, replace the needle roller bearing at the same time.

3) Installation

Reverse the removal procedure.

Note: 1. Take care not to drop the circlip into the crankcase during assembly.
2. Check that the arrow mark points forward to exhaust port side.

5. Left Cover

The left cover, located at the left side of the crankcase, protects the magneto, engine sprocket, bearings, etc. from dust or sand.
The left cover for the G series models or the B1L is one-bodied, but the covers for F series models consist of the engine cover and the front chain case cover which is provided with the clutch release.

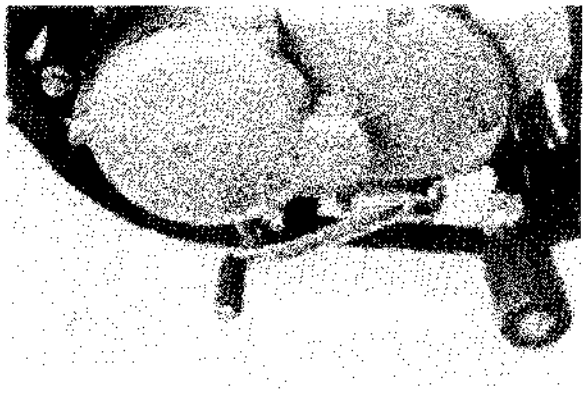


Fig. 3-31

1) Removal

a. Loosen the change pedal fitting bolts and remove the change pedal.

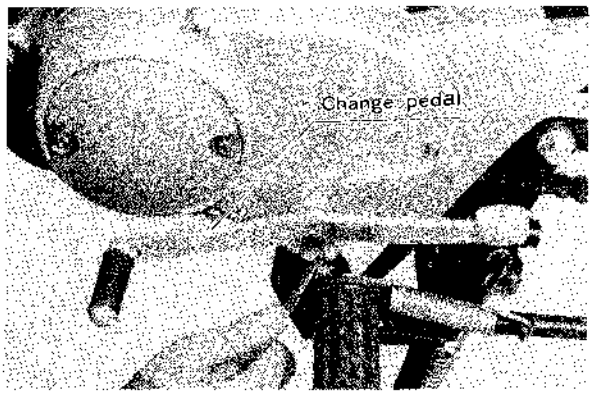


Fig. 3-32

b. Loosen the left cover fitting bolts and remove the left cover.

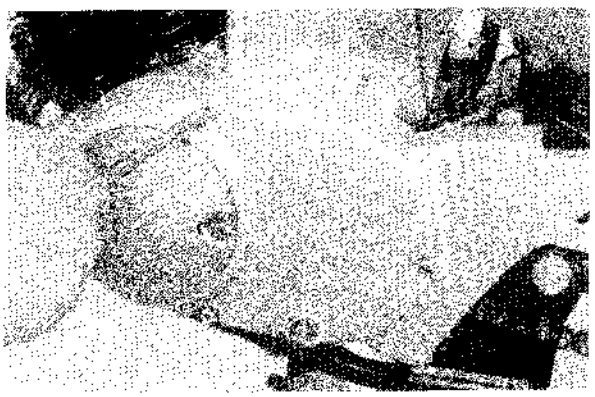


Fig. 3-33

Note: In the case of the F series, remove in this order; contact breaker cover, chain case cover, and then left engine cover.

2) Inspection

Check if the oil seal on the shift axle is damaged.

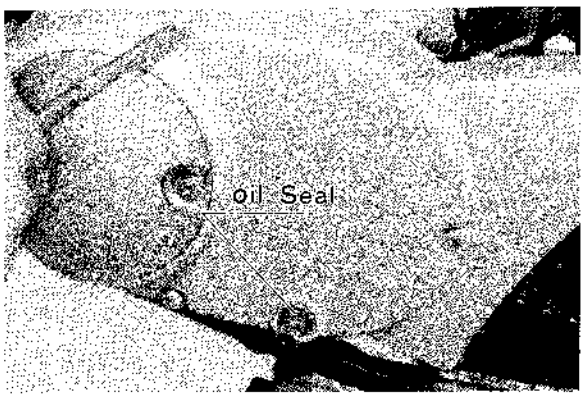


Fig. 3-34

3) Assembly

When mounting the clutch release of the F series model on the front chain case, give it a large operating angle.

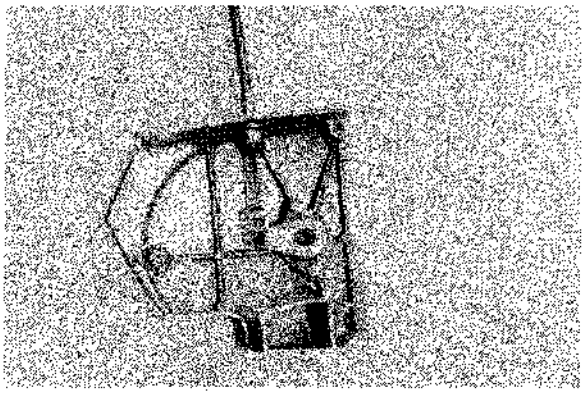


Fig. 3-35

6. Flywheel Magneto

1) Removal

G Series, B1L-A, F6

a. Remove the flywheel mounting bolt and pull off the flywheel using the special puller tool.

b. Remove the wiring of the neutral lamp from the transmission switch body and then the magneto base.

c. Finally, remove the woodruff key.

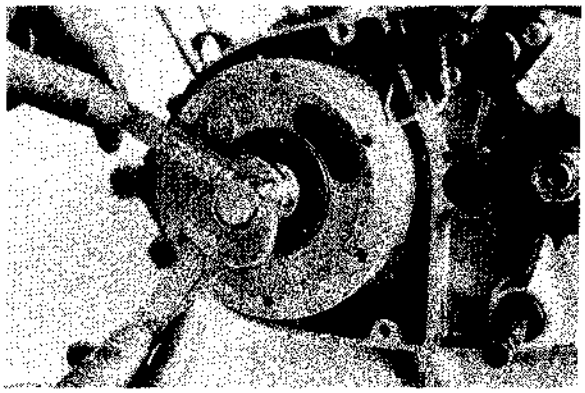


Fig. 3-36

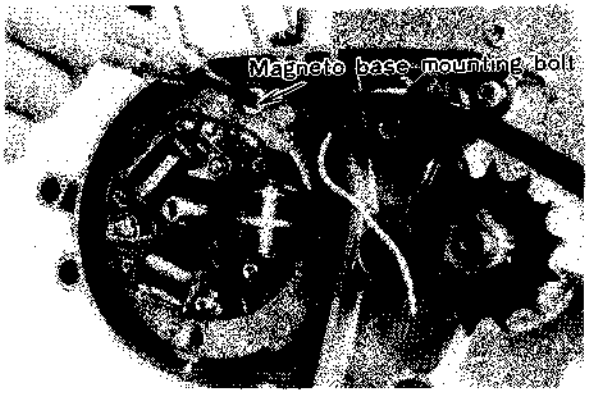


Fig. 3-37

F7, F8, F5

When removing the magneto of the F7, F8 or F5, insert a screw driver through a hole on the flywheel into a hole on the magneto base to hold it tight and loosen the nut while holding the flywheel.

After taking off the nut, remove the flywheel by using a special tool, as shown in Fig. 3-38 and 3-39.

The special tool is also available for the F8.

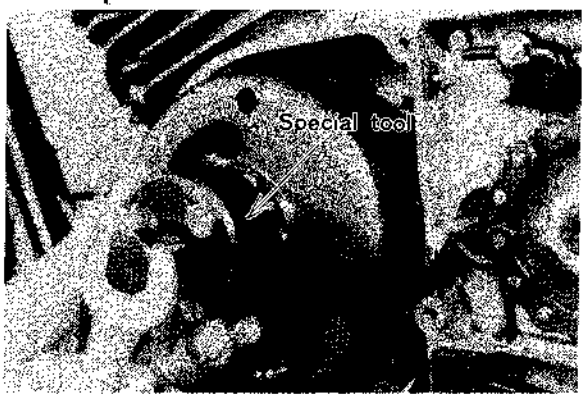


Fig. 3-38

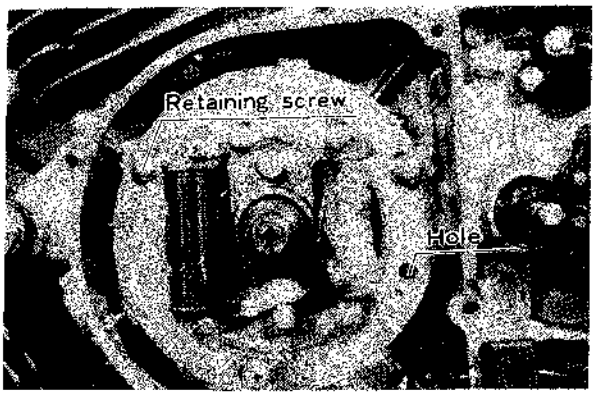


Fig. 3-39

2) Installation

When installing the magneto base on the crankcase, align mark "A" on the magneto base to mark "B" on the crankcase. If the marks are not aligned, ignition timing can not be correctly adjusted, resulting in poor engine performance such as pre-ignition or overheating.



Fig. 3-40

Tighten the flywheel with the prescribed tightening torque to mount it. Loose tightening causes welding between the flywheel and the crankshaft.

Note: Refer to paragraph V, Electrical Equipment for adjusting ignition timing.

Table 3-8

Models	Clamping Torque
G Series B1L-A F6 F81M	36 ft-lb (5 kg-m)
F7 F8 F5	72 ft-lb (10 kg-m)

7. Engine Sprocket

1) Removal

a. Straighten the sprocket lock washer with a chisel.

b. Loosen the mounting nut and remove the sprocket.

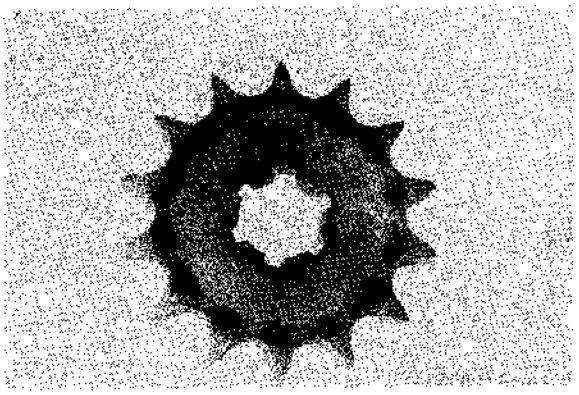


Fig. 3-41



Fig. 3-42

2) Inspection

Check the tooth surface of the sprocket for wear. Excessive wear will cause improper engagement of the chain, abnormal noise and will shorten the chain life. Replace the sprocket if excessively worn.

3) Installation

Reverse the removal procedure.

Note: Install the sprocket, by turning the fixing hole to the front side. Insert the lock washer tang into the sprocket hole and bend up one edge after tightening the sprocket nut/bolt.

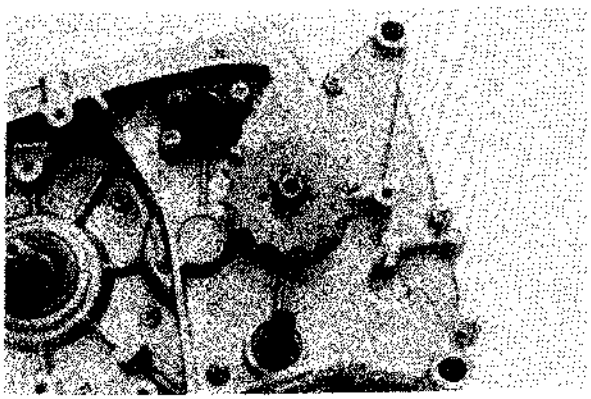


Fig. 3-43

8. Right Cover

Combined with the crankcase, the right cover forms the clutch casing. Outside the right cover, the carburetor cover and the oil pump cover are mounted and, inside them, the carburetor and clutch release (GA, B1L) and the oil pump are respectively installed. Under the carburetor chamber, the oil drain plug is mounted to drain the gas and/or oil which overflows from the carburetor or oil pump. Model F5 is equipped with a drain pump to drain oil forcibly by virtue of the negative pressure produced in the crankcase chamber. The carburetor chamber of F5 is water proof.

1) Removal

G Series, B1L-A

a. Loosen the kick pedal fitting bolt and remove the pedal.
b. Remove the carburetor cover, and take off the carburetor and the clutch wire.
c. Remove the oil pump cover, and take off the oil pump cable and the oil inlet pipes. Insert a screw into the pipe to prevent the oil from flowing out.
d. Remove the case cover by unscrewing the right cover fitting screws.
The right cover can be removed without dismounting the clutch release, the oil pump and the oil pipe. (outlet).

Note: The F series models are basically the same except that the clutch release is located on the front chain case cover.

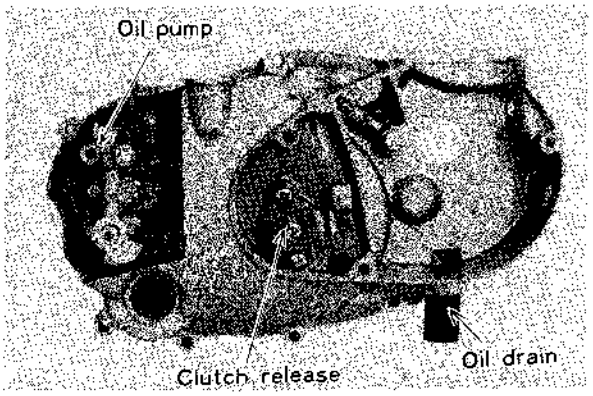


Fig. 3-44

2) Inspection

a. Check that the oil drain under the carburetor is not clogged.
b. Check kick crank oil seal for damage or leakage.
c. Inspect the right cover gasket. Replace if damaged.

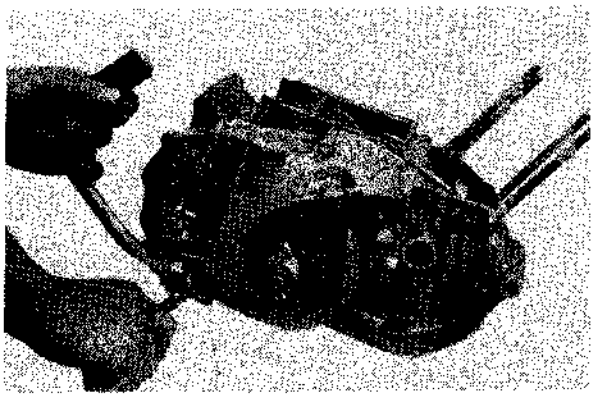


Fig. 3-45

3) Installation

a. Before installing the right cover, make sure the following parts are correctly positioned.

(1) O-ring of valve cover
(2) O-ring of check valve
(3) Clutch holder assembly
(4) Oil pump gear

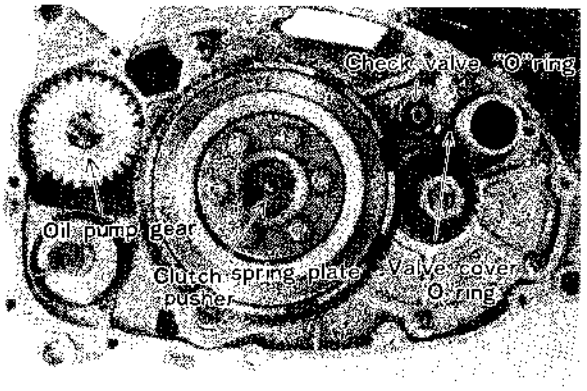


Fig. 3-46

Note: Meshing the oil pump pinion with the oil pump gear can be done readily by moving the crankshaft with the flywheel.

9. Primary Gear

The primary gear is located at the right hand end of the crankshaft.
The primary gear and the clutch housing perform the first reduction. For the reduction ratio and the number of teeth, see the section III-10.
The helical gear is used on the G series and the B1L and the spur gear is used on the F series models.

1) Disassembly

G Series, F6, F7, F81M

a Straighten the primary gear lock washer with a chisel.

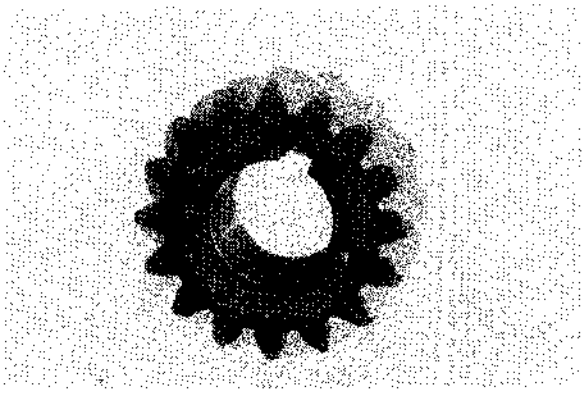


Fig. 3-47

b Remove the primary gear nut, while preventing rotation of the crankshaft with special clutch holding tool.

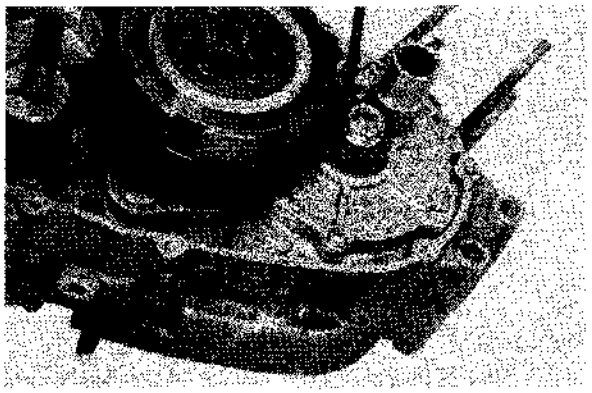


Fig. 3-48

c Remove the primary gear and key.

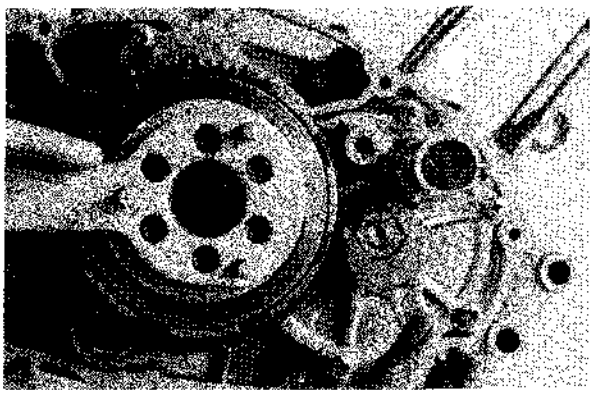


Fig. 3-49

B1L-A, F8, F5

a Straighten the lock washer on the oil pump pinion with a chisel or a screw driver.
b Loosen and remove the screw on the oil pump pinion while locking the crank with the special tool.
c Remove the lock washer, primary pinion from the crankshaft.
d Finally, take off the key.

2) Inspection

Check the tooth surface for wear or damage. Since a damaged tooth surface may cuase nosie, it is necessary to rectify it with a oil stone or by similar means. Replace if seriously damaged.

3) Assembly

Reverse the disassembly procedure.

Note: Fix the primary pinion fitting nut and the oil pump pinion with the specified torque (5 kg-m, 36 ft-lbs.) and tightly lock them with the lock washer.

In the case of F5 and F8, as shown in the figure, punch the lock washer into the small hole on the pinion gear after fixing the oil pump pinion tightly with the lock washer, the tongue of which should be facing out.

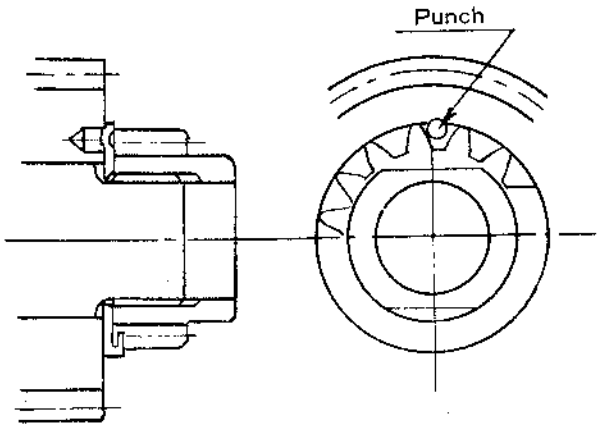


Fig. 3-50

10. Clutch Release

1) Construction

G, F Series

The release housing and release rotor of the F series models made of a synthetic resin are installed on the front chain case cover, and two push rods, a short and a long one are inserted in to the drive shaft.

Parts breakdown is shown in fig. 3-51.

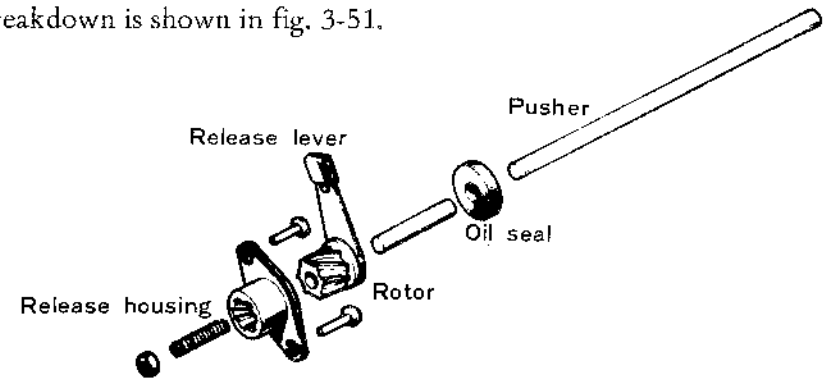


Fig. 3-51

The release mechanism of the G series, differing from that of the F series, operates at the right side of the engine. Mounted on the right cover, the release rotor operates the clutch by moving in the shaft direction turning in the helical part of the release housing, (Both G and F series). Instead of the pushers A and B of the F series, a steel pin is set at the center of the release rotor of the G series.

By holding the clutch lever, the release rotor is operated in rotation with the clutch cable and the release lever; thus, the clutch adjusting screw, the push rods A and B and spring plate pusher operate the spring plate.

B1L-A

Fig. 3-52 shows a sectional view of the clutch release.

Three steel balls are installed between the clutch release lever and clutch cam plate resting in depressions. Adjusting screw and roller pin are installed in the center of clutch lever assembly.

By grasping the clutch lever, the release assembly is turned, the thrust balls are rotated and jumped out of the depressions onto the flat part. This forces the cam plate and the clutch release lever (the roller pin moving with it) apart.

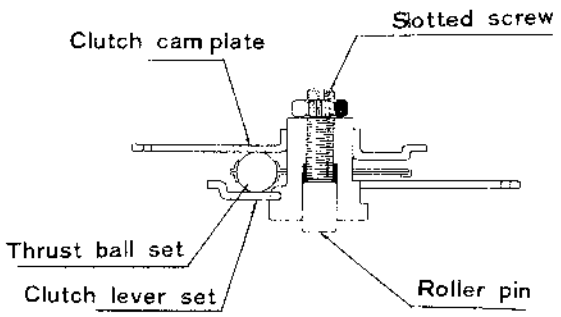


Fig. 3-52

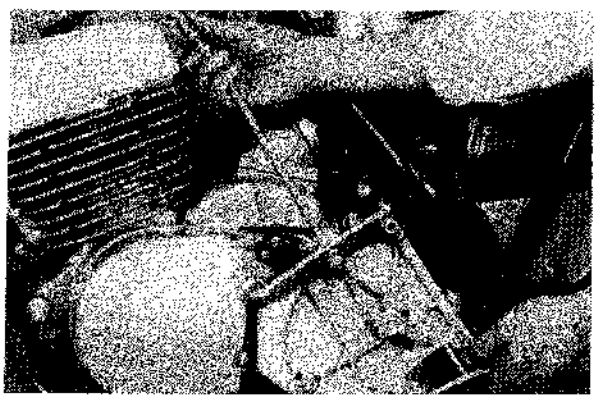


Fig. 3-53

2) Removal

F Series

a To remove the clutch release, take off the front chain cover and remove the clutch cable from the release lever.

It is necessary to remove the contact-breaker cover in the cases of Models F6 and F7.

b The release housing can be removed by unscrewing the two retaining screws.

Note: Be sure to pull the short push rod through the oil seal.

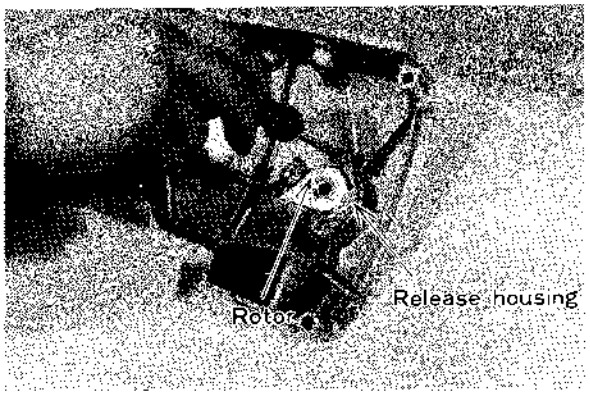


Fig. 3-54

B1L-A

Remove screws and the return spring ring and take off the assembly.

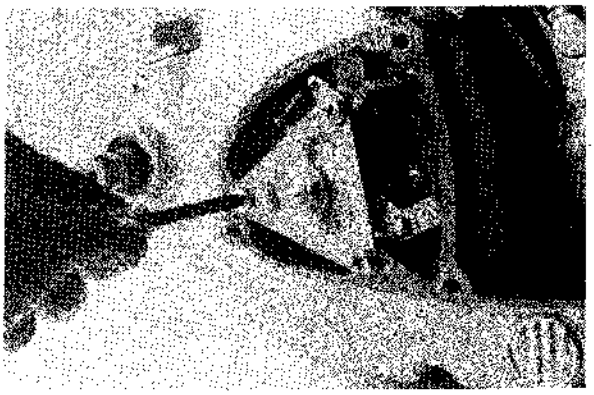


Fig. 3-55

3) Inspection

Install the release rotor and release housing and check for play by moving the release rotor. Replace the release, if it has large cracks or scratches, as these cause bad clutching action.

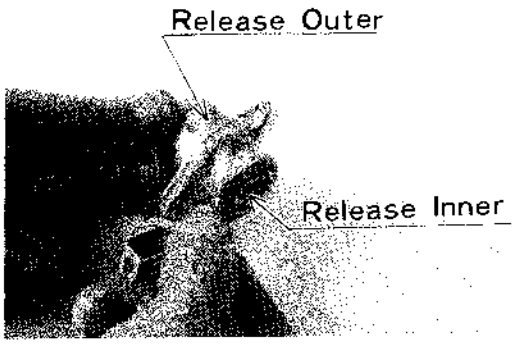


Fig. 3-56

4) Installation

F Series

Carefully mount the release rotor on the release housing with respect to angle of the release lever and install the release housing to the front chain case cover. Tighten the two screws evenly. If the screws are tightened unevenly, the release housing will be warped.

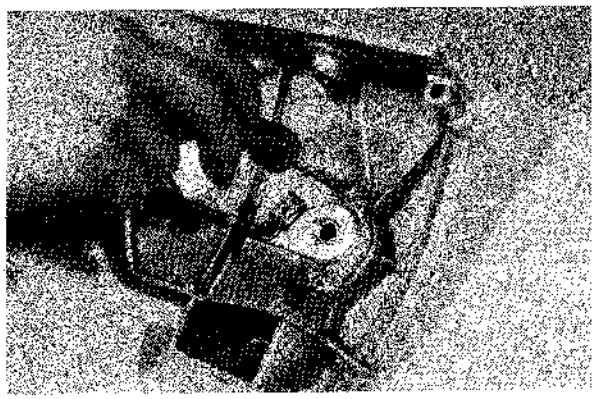


Fig. 3-57

11. Clutch

The clutch is between the crankshaft and the transmission gears. It functions to disengage the transmission of power when starting or shifting gears.
The clutching performance is directly related to the friction between the friction discs and the steel plates. To transmit larger power, the clutch must be a wet-type multiple clutch composed of friction discs and the steel plates. The steel rings are used to raise the disengaging effect in the case of the off-road models.

Table 3-9

Models	G Series	B1L-A	F6	F7	F8, F81M	F5
Friction Plate	4	4	4	5	6	7
Steel Plate	3	3	4	5	7	6
Steel Ring	0	0	0	5	6	7

The clutch housing consists of a reduction gear and a housing which are rivetted together through the damper rubbers. As for the reduction gear, a spur gear is used for F series, and a helical gear for the G series. The primary reduction ratio and the number of the gear teeth are shown in Table 3- .

Table 3-10

Models	G Series	B1L-A	F6, F7	F8, F81M, F5
Primary Gear Teeth	21	21	24	24
Clutch Body Gear Teeth	74	68	75	73
Reduction Ratio	3.52	3.24	3.125	3.04

1) Construction

G series, B1L-A

Fig. 3-58 shows the clutch parts breakdown of the G Series.
The clutch, attached to the drive shaft of the transmission gear, is a wet-type multiple disc type composed of four friction discs of molded cork and four clutch plates.

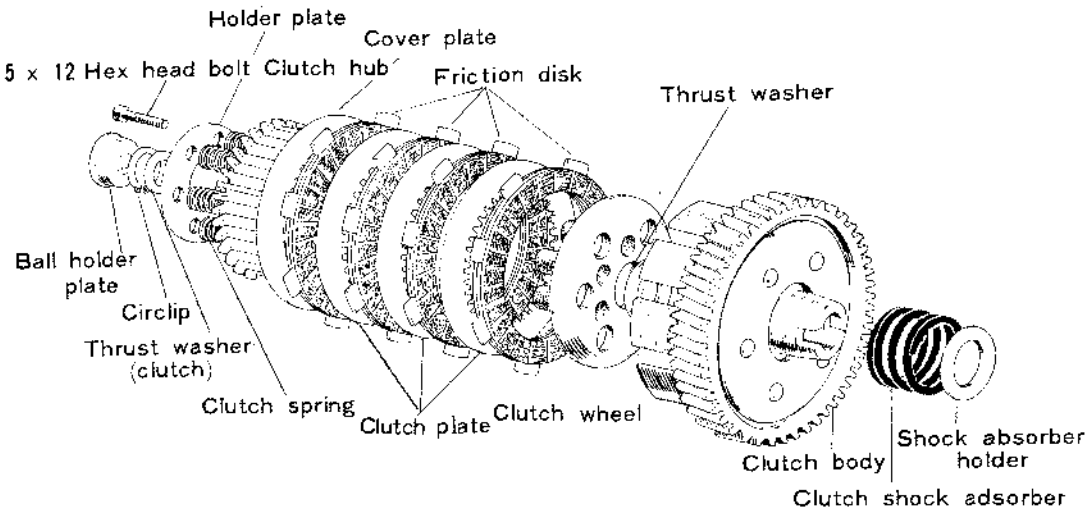


Fig. 3-58

Fig. 3-58 shows a shock absorber (spring) which controls the axial movement due to the axial play of the clutch which is floating on the drive shaft.
For assembling the clutch, the washers and the circlip are used on the clutch hub as a pawl.
In the case of model B1L-A the clutch hub is fixed on the transmission drive shaft with a nut.

a. When engaged.

The clutch housing is driven by the engine power which is transmitted from the crankshaft by meshing the primary pinion with the clutch housing gear. The friction plates, which are fitted to the eight cut-away portions around the clutch housing, move with the clutch housing resulting in moving the steel plates pressed against them by the clutch spring tension. These clutch steel plates are fitted to the grooves around the clutch hub so that they can drive the clutch hub which moves with the drive shaft

b. When disengaged.

When operating the clutch lever on the handlebar, the roller pin inside the clutch release assembly pushes the holder plate on the clutch through the ball holder assembly, compressing of the clutch springs. Accordingly, the clutch wheel moves free from the clutch spring tension resulting in releasing the friction plates from the clutch plates, and the clutch housing is disengaged from the clutch hub and the drive shaft. Or, in other words, the clutch mechanism is desengaged.

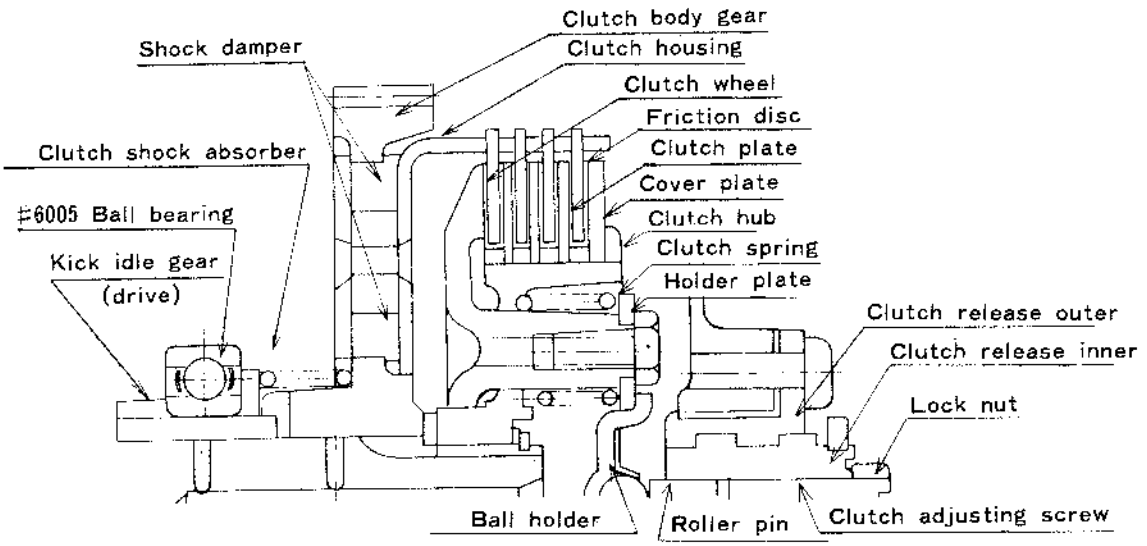


Fig. 3-59

F Series

The parts breakdown of the F5 clutch assembly is shown in Fig. 3-60, indicating there are 7 friction plates and 8 steel plates inserted around the clutch hub.

Arrangement of the discs is the same as that of other models, but the clutch hub is the reverse type, and the clutch wheel called spring plate is located on the opposite side as compared with other models.

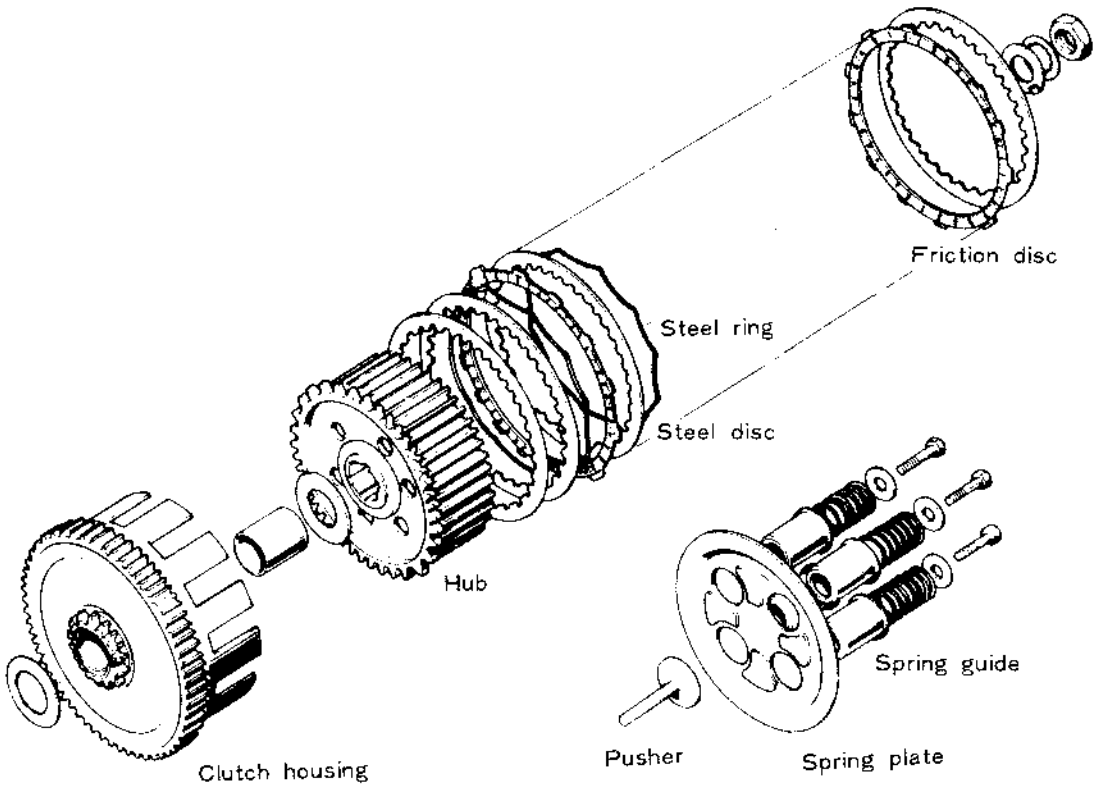


Fig. 3-60

When the clutch lever is pulled in, the release rotor is turned in and the two push rods are forced to the right pressing the spring plate of the clutch. When the spring plate is pressed out, the clutch discs (between the spring plate and the inner boss of the clutch hub) are released from the pressure of the 5 clutch springs which are, at this time, compressed inside the spring guides.

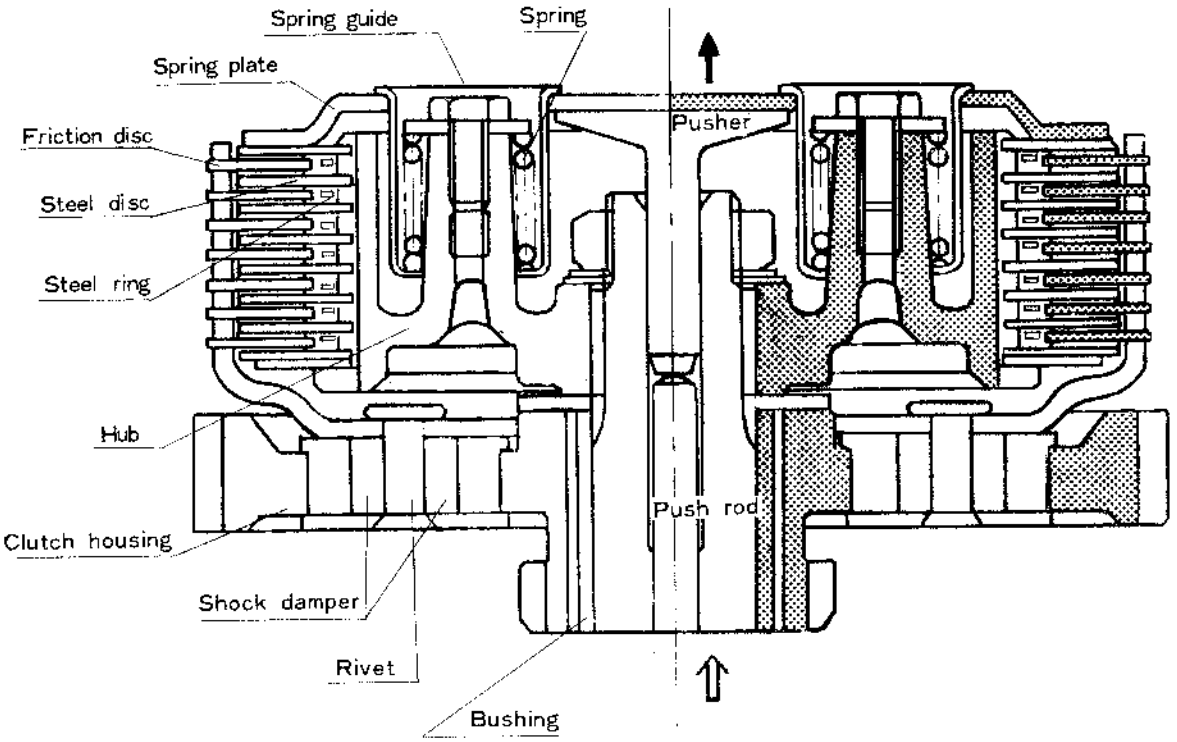


Fig. 3-61

2) Removal

G Series B1L-A

a. Remove the clutch retaining ring and pull the clutch assembly from the drive shaft.

Note: A retaining nut is used on the B1L instead of a ring.

b. Remove the shock absorber and the washer.

Note: A shock absorber is used only on the G Series.

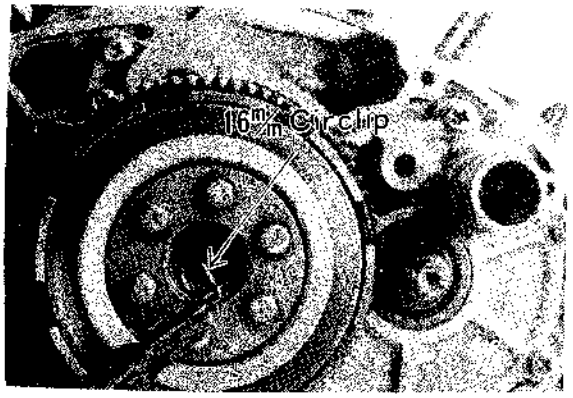


Fig. 3-62

c. Extract the six 5 x 12 mm hexagonal bolts and remove the holder plate, spring, clutch hub, cover plate, friction discs, and clutch plates, one after another.

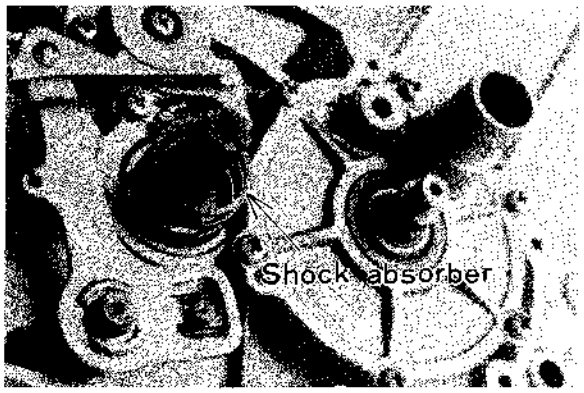


Fig. 3-63

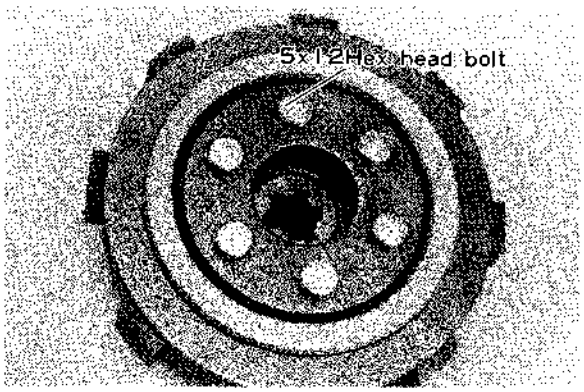


Fig. 3-64

F Series

a. Remove the clutch springs and the spring guides by unscrewing the retaining bolts.

b. The pressure plate, friction plates and steel plates including the steel rings can be removed by hand.

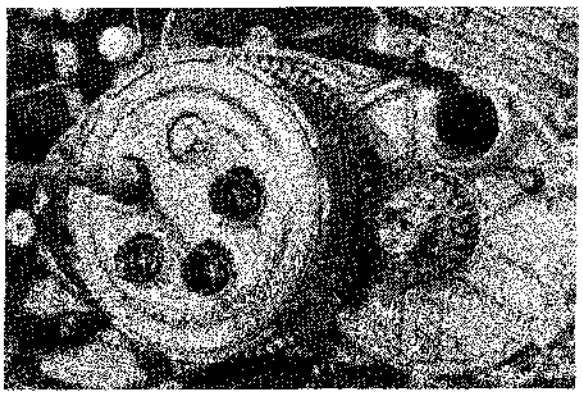


Fig. 3-65

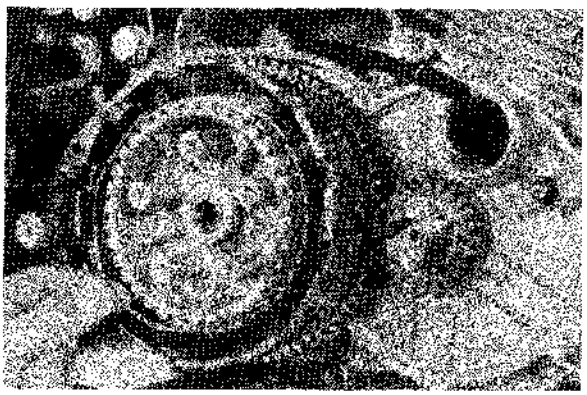


Fig. 3-66

c. Take out the pressure plate pusher.

d. Hold the clutch housing with the special tool while loosening the hub nut.

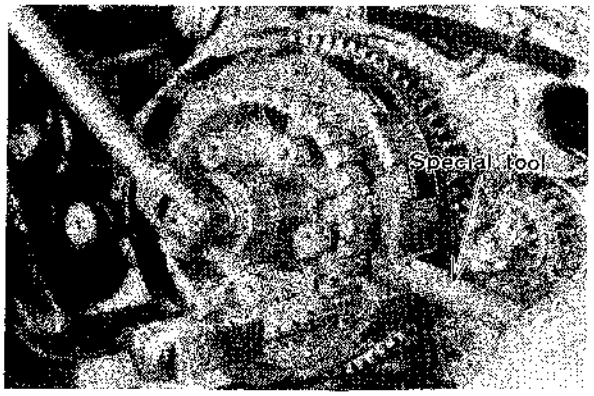


Fig. 3-67

e. Remove the clutch housing and the hub together. Be sure not to lose the thrust washer between the hub and the housing.

f. Slide the clutch bushing and the thrust washer off the drive shaft.

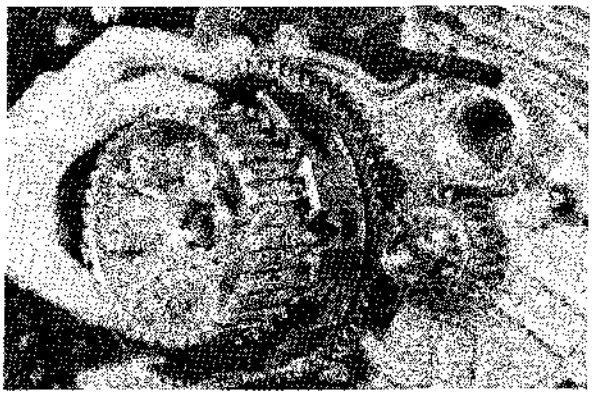


Fig. 3-68

3) Inspection

a. Replace the clutch spring, if its free length is shorter than limit A when released.

Table 3-11

Models	G Series	B1L-A	F6, F7	F8	F81M, F5
Free length	0.85 in (21.6 mm)	1.08 in (27.5 mm)	1.36 in (34.5 mm)	1.32 in (33.6 mm)	1.42 in (36.0 mm)
Repair limit	Over 0.08 in (2.0 mm)	Over 0.1 in (2.5 mm)	Over 0.14 in (3.5 mm)	Over 0.14 in (3.5 mm)	Over 0.14 in (3.5 mm)

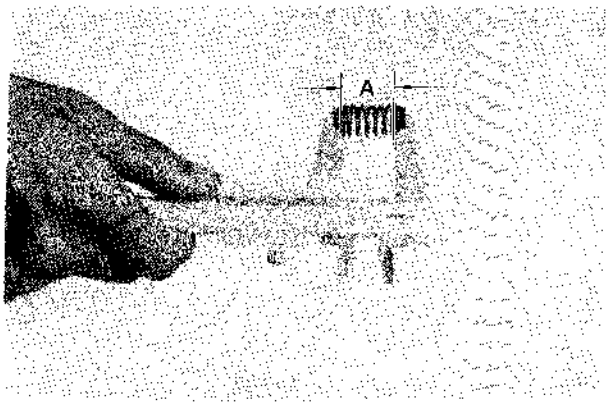


Fig. 3-69

b. Measure the friction disc as shown in Fig. 3-70 and replace if less than the standard by more than 0.3 mm, or if worn out on one side. Replace if the cork on the face of the friction disc damaged by burning or if the groove is worn out. Refer to the table for standard size.

Table 3-12

Models	G Series	B1L-A, F6	F7	F8, F81M, F5
Standard	0.13 in (3.2 mm)	0.16 in (4.0 mm)	0.12 in (3.0 mm)	0.11 in (2.8 mm)
Repair limit	0.01 in (0.3 mm)	0.015 in (0.4 mm)	0.01 in (0.3 mm)	0.01 in (0.3 mm)

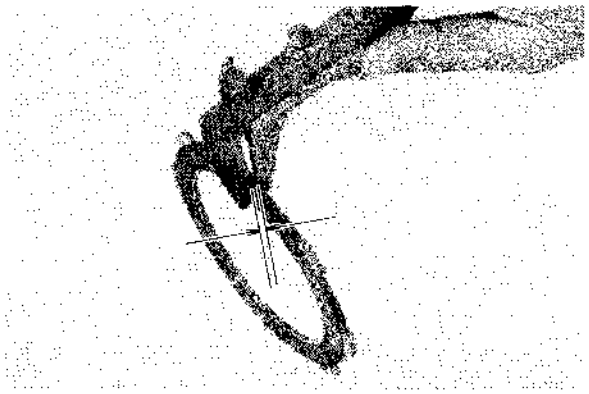


Fig. 3-70

c. Measure the gap between the clutch friction disc teeth and the slots in clutch housing with a thickness gauge. To prevent noisy operation, the gap must be 0.0016 ∿ 0.012 in (0.04 ∿ 0.30 mm). If the gap is too large, replace the clutch friction plates.

d. Check clutch body gear teeth for nicks or damage which may cause gear noise. Polish all nicks, burrs or scratches with an oil stone.

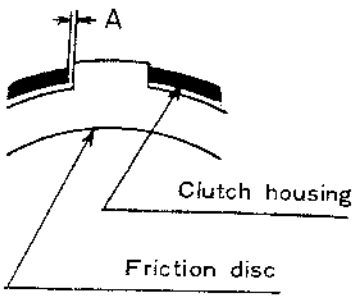


Fig. 3-71

e. Needle bearing

Check for play between bushing and needle bearing assembled into clutch housing, as shown in Fig. 3-72.

If this play is excessive, it causes gear noise, and the bushing should be replaced.

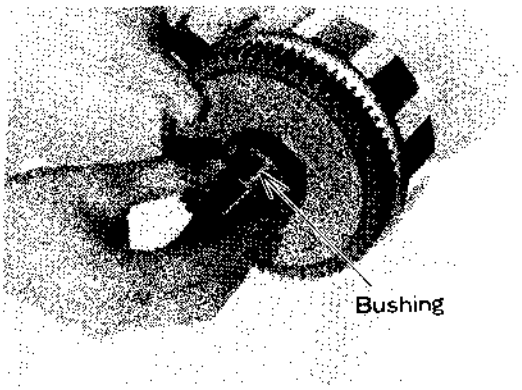


Fig. 3-72

4) Assembly and Installation

Reverse the disassembly and removal procedures.

Note: A total of three thrust washers related to the clutch operation are employed. Make sure the washers are combined correctly to assure proper clutch operation.

12. Rotary Valve and Rotary Valve Cover

1) Rotary Valve System

The rotary valve system consists of a crankshaft, crankcase, rotary disc and rotary disc cover as illustrated in Fig. 3-73. The disc valve is inserted and positioned with a pin on the crankshaft and has a cutaway portion on the circumference. The crankcase has also a port for intake in the right side wall. When the cutaway on the disc meets the port on the crankcase as the crankshaft turns, the fuel-air mixture is drawn in from the carburetor through the rotary disc cover, rotary disc and into the crankcase by virtue of the negative pressure due to piston movement. In the case of the piston valve system, the intake is carried out by only the piston movement, that is, the intake timing is always dictated by the piston. The intake port of the ordinary piston valve system is located on the cylinder wall with two other ports, scavenging and exhaust. Therefore the timing is exactly symmetrical to the bottom dead center. In the case of the rotary valve system, the intake port is separated from the cylinder and piston movement and timed by the crankshaft rotation so that the optimum timing can be obtained for higher intake efficiency resulting in the best possible performance of the engine and eliminating blow back and pre-ignition.

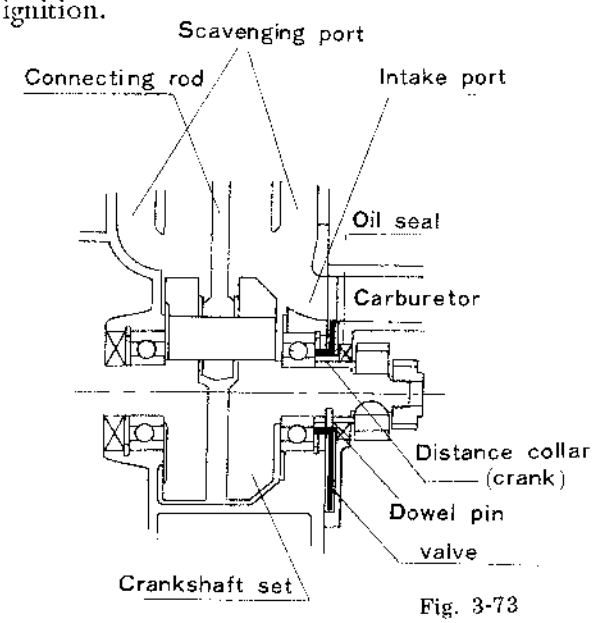


Fig. 3-73

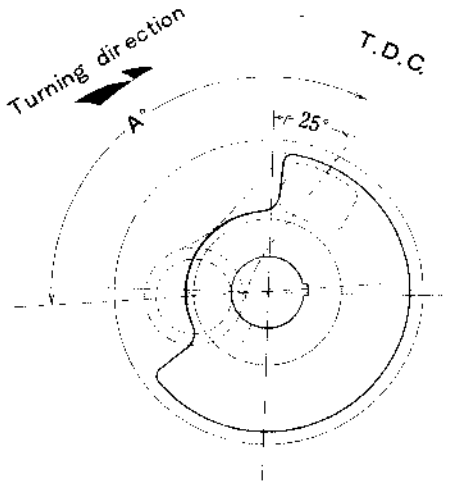


Fig. 3-74

Table 3-13

Valve timing

Models	Inlet Open A° (BTDC)	Inlet Open B° (ATDC)
GA1-A GA2-A G3SS-A G3TR-A	120°	55°
G4TR	120°	50°
G31M-A	140°	70°
B1L-A	110°	45°
F6, F7	115°	55°
F8, F5	110°	50°
F81M	130°	65°

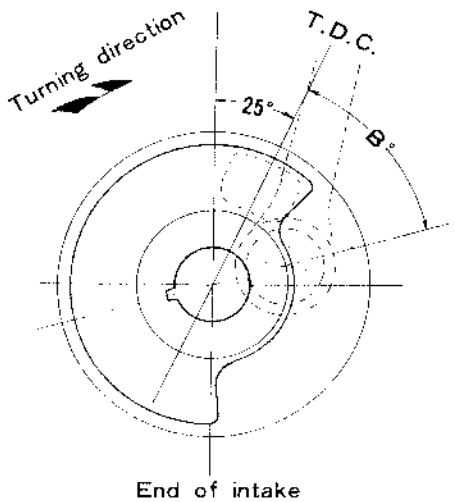


Fig. 3-75

The rotary valve, 0.12 in (3 mm) in thickness, is made of thermosetting phenol resin. The boss of the valve to which the crankshaft is connected has a cast-in steel core, with roller pins used to fix the valve on the crankshaft.
The valve is allowed to move by itself in the axial direction a distance of 0.012 in (0.3 mm), because when the crankcase is compressed with the down-stroke of the piston, the valve is pressed onto the inner surface of the valve cover, thereby interrupting gas passage from the carburetor and keeping air tightness.

The rotary disc valve of the F5 or the F8 is made of steel and rivetted to the valve boss. On the F6 or F7, the rotary disc valve and the valve boss are connected by splines.

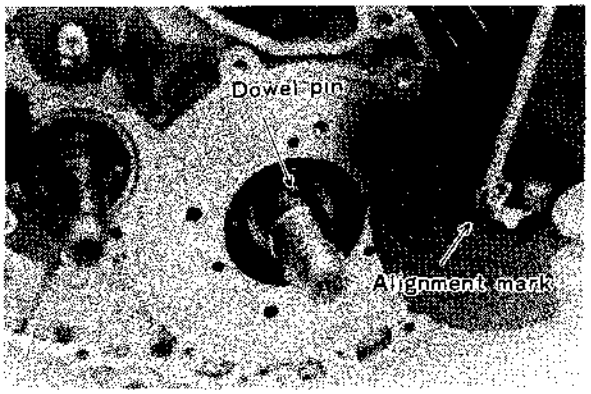


Fig. 3-76

2) Removal

a. Unscrew the retaining screws and remove the valve cover.
b. Pull out the rotary valve.
c. Remove the distance collar and the O-ring from the crankshaft.
d. Finally draw out the roller pin.

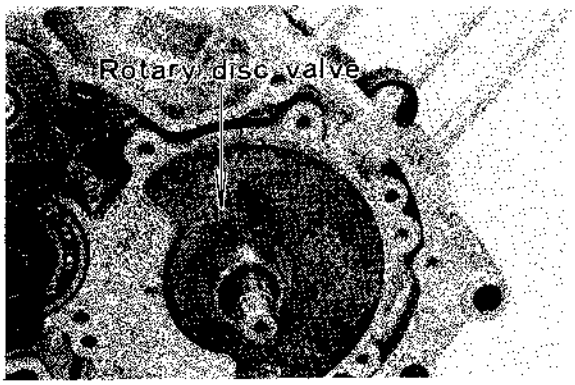


Fig. 3-77

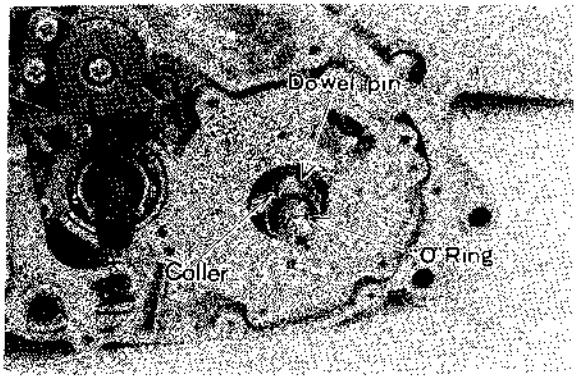


Fig. 3-78

3) Inspection

a. Valve cover

The oil seal, 120 mm O ring, and oil injection nozzle are installed on the valve cover.

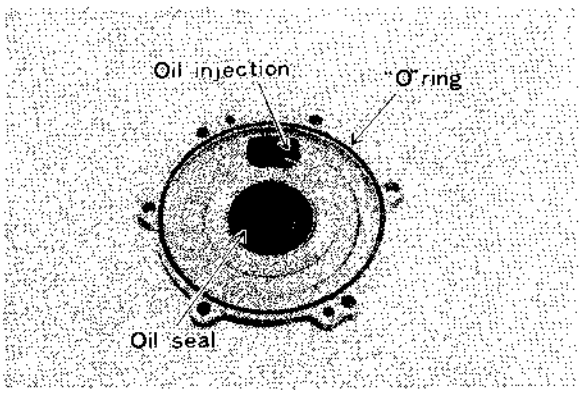


Fig. 3-79

(1) Oil Seal
Check for scratches, damage or deformation of the lip and replace the seal if necessary.

(2) O rings
Check for scratches, damage or deformation of the O rings and replace any bad ones.

(3) Abrasion of the surface of the valve or the depth of the valve cover. Replace the valve cover if the depth of the cover is over the service limit, or if it is much scratched or damaged.

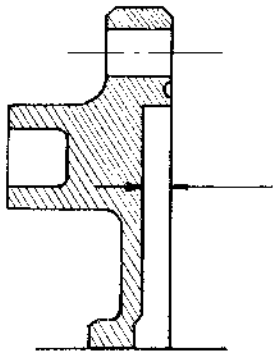


Fig. 3-80

Table 3-14

Models	Standard	Repair limit
G Series	0.13 in (3.4 mm)	Over 0.16 in (4.0 mm)
G31M-A	0.14 in (3.5 mm)	Over 0.16 in (4.0 mm)
B1L-A	0.16 in (4.0 mm)	Over 0.177 in (4.5 mm)
F6, F7	0.14 in (3.45 mm)	Over 0.16 in (4.0 mm)
F8, F81M, F5	0.03 in (0.7 mm)	Over 0.01 in (0.2 mm)

b. Disc valve

(1) Measure the thickness of the resin disc. Replace the disc valve, if it is worn over the service limit, or if there are scratches or damage on its surface.

Table 3-15

Models	Standard	Repair limit
G Series G31M-A	0.12 in (3.1 mm)	0.11 in (2.8 mm) or less
B1L-A	0.16 in (4.0 mm)	0.14 in (3.6 mm) or less
F6, F7	0.12 in (3.1 mm)	0.11 in (2.8 mm) or less
F8, F81M, F5	0.02 in (0.4 mm)	0.01 in (0.36mm) or less

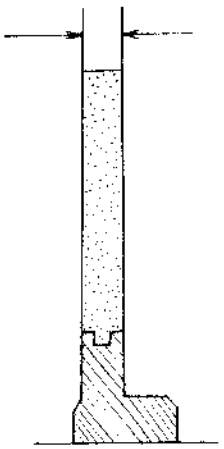


Fig. 3-81

(2) Check for cracks or tears before installing.

4) Installation

Reverse the removal procedure.

Note:

(1) Installation should be preceded by the application of two-cycle engine oil on both sides of the valve.

(2) Insert the smaller "O" ring inside the distance collar and the larger "O" ring into the groove on the valve collar.

(3) Follow the steps given in Fig. 3- to tighten the valve cover fitting screws.

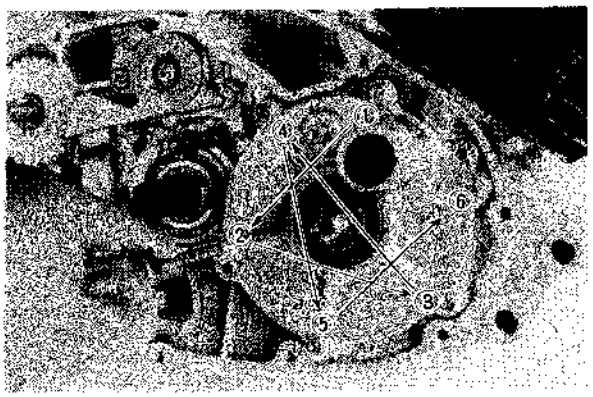


Fig. 3-82

(4) When the F6 and F7 disc valves are installed on the crankshaft, the mark on the disc valve should be aligned with the knock pin on the crankshaft.

13. Transmission External Mechanism (Gear Change mechanism)

To change gears, the change drum in the transmission assembly must be rotated. The external transmission mechanism consists of accessory parts for change drum rotation.
Fig. 3-83 illustrates the components of the transmission external mechanism.

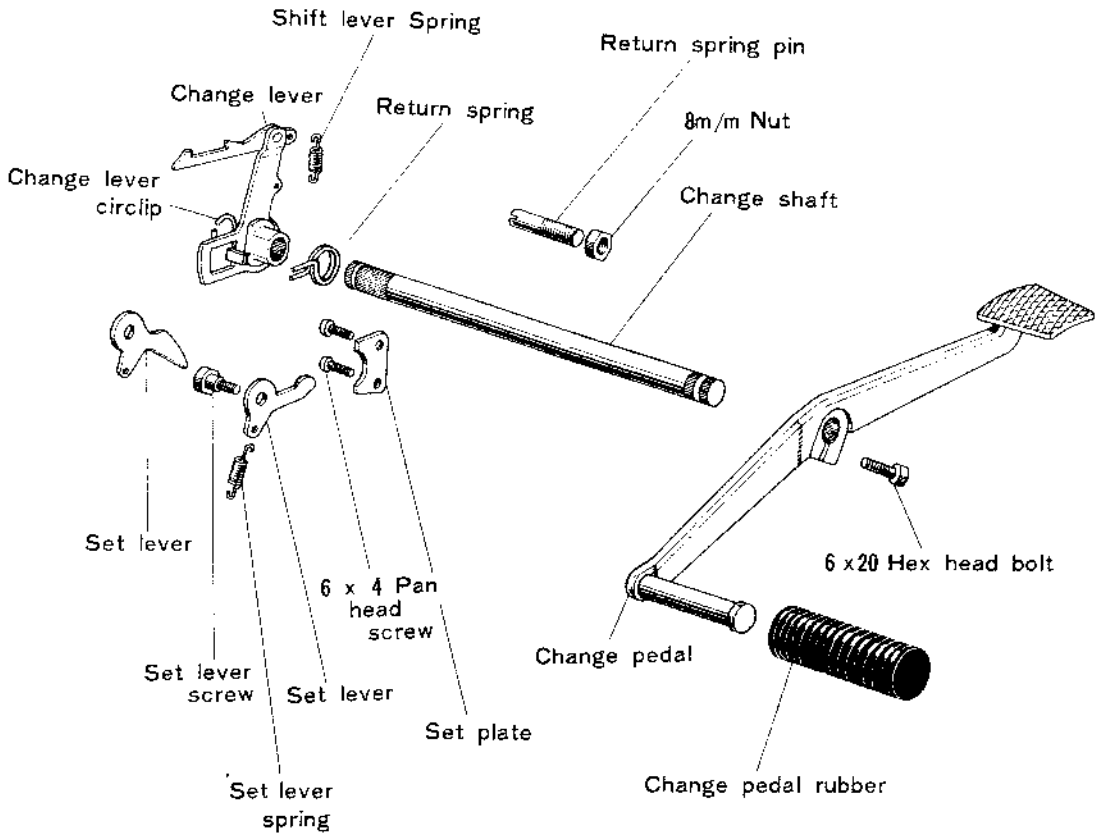


Fig. 3-83

1) Operation

When stepping down or lifting up the shift pedal, the shift shaft turns, actuating the shift lever which is meshed with the change drum pins. Therefore, as the pedal is moved the change drum is rotated, which moves the shift forks inside the transmission gears.

The shift pedal is returned to its original position by the return spring attached to the boss of the shift lever.

The set lever is also meshed with the change drum pins to follow the movement of the drum and keep it in place after each step of rotation of the drum.

The return spring pin is flanked by the return spring and operates as a fulcrum of the return spring to return to shift lever.

The pin must be located as illustrated here, centered in the shift lever window through which the return spring can be seen.

The F series model return spring pin is eccentric, that is, there is difference between the center of the threaded portion and the center of the pin body so that its position in the window can be adjusted by turning it.

2) Removal

a. Disengage and remove the shift lever set from the change drum.

b. Remove the set lever with the shaft.

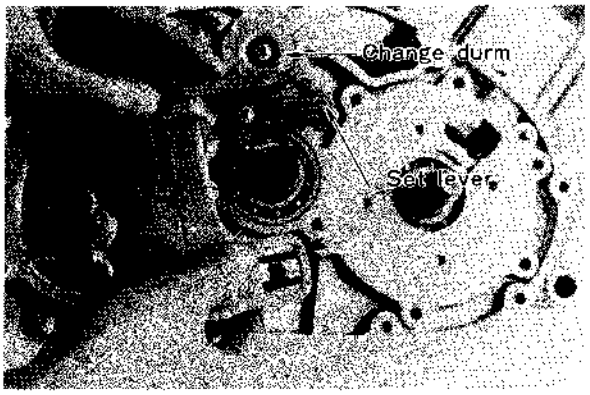


Fig. 3-84

3) Inspection

a. To inspect the return spring, check the spring tension. It is necessary to replace return spring if lacking in tension or cracked.

b. Inspect the set lever spring for lacking of tension or breaks.

c. Inspect the set pin of return spring for looseness. If the set pin is loose, the transmission will miss shift during running. Check tightness of the lock nut.

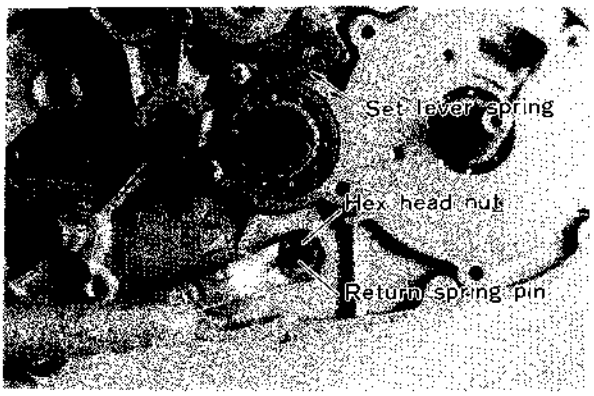


Fig. 3-85

4) Installation

Reverse the removing procedure.

Note:

(1) Be sure to install each spring correctly.

(2) In the case of the F series, do not forget to adjust the position of the shift lever by turning the return spring set pin.

14. Crankcase

The crankcase is die-cast aluminum alloy. The right and left cases are put together with liquid gasket (Kawasaki bond), secured with two dowel pins, and tightened with screws. The crankcase consists of the crank chamber and the transmission chamber. On the down stroke of the piston, the crank chamber raises the pressure of the mixed gas from the carburetor to increase the scavenging effect. The transmission chamber, connected with the clutch chamber, both chambers containing a specified amount of oil, lubricates and cools the transmission gears, change drum, kick gear, clutch housing gear, etc. In the rear of the transmission chamber, a breather hole is located to release the internal pressure build-up when the temperature rises.

The crankcase is the most important part, holding the crankshaft, output shaft, drive shaft, etc. Ball bearings, needle bearings, bushings, oil seals, as shown in the following table, are positioned as indicated.

Left crankcase

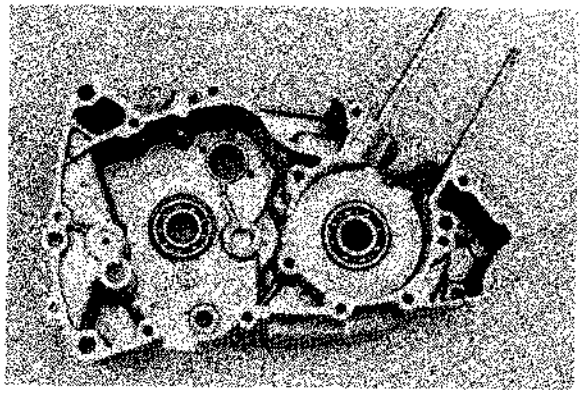


Fig. 3-86

Right crankcase

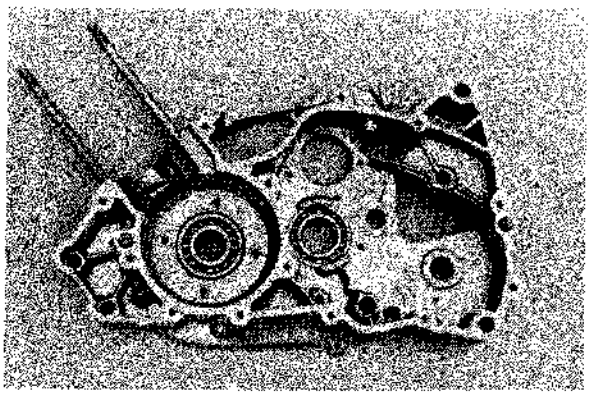


Fig. 3-87

Table 3-16

Left crankcase

Models	Crank Shaft		Output Shaft		Drive Shaft		Shift Shaft
	Ball bearing	Oil Seal	Ball bearing	Oil Seal	Needle bearing	Oil Seal	Oil Seal
G Series	#6204	TB20407	#6004	SC25376	Bushing	--	SB12205
G4TR	#6204	TB20407	#6005	SC32435.5	Bushing	—	SB12205
B1L-A	#6305	TB25407	#6204	SC25476	Bushing	—	VB12185
F6, F7	#6205	TB25407	#6204N	SC30426	7E-HKS162412-1	TB7246	SB12205
F8, F81M, F5	#6305	TB25407	#6205	TB30407	7E-HMK2015	TCY 8 27 55 65	SB12205

Table 3-17

Right crankcase

Models	Crank Shaft		Output Shaft	Drive Shaft
	Ball bearing	Oil Seal (Valve cover)	Needle bearing	Ball bearing
G Series	#6204	TB25407	Bushing	#6005
B1L-A	#6305	TB32457	#6203	#6204
F6, F7	#6305	TB32457	7E-HKS162412-1	#6204N
F8, F81M, F5	SC0626	TB35488	7E-HMK2015	#6205

1) Disassembly

a. Remove the transmission switch body and the set plate.

Note: In the case of the F5 and F8, remove the circlip attached to the shift rods (the top and the fourth).

b. Remove the crankcase screws from the left crankcase.

c. Tap the crankcases alternately with a plastic hammer and separate the crankcase leaving all the shafts remaining inside the right crankcase.

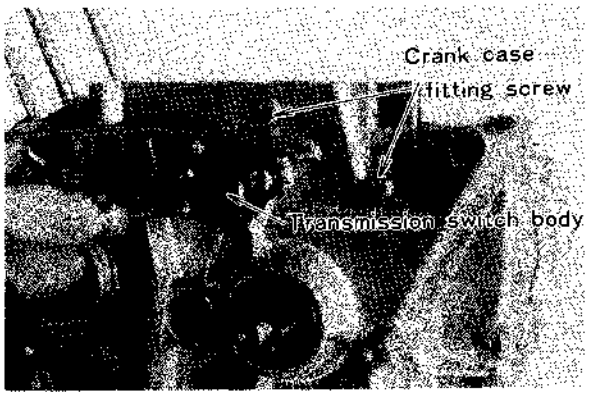
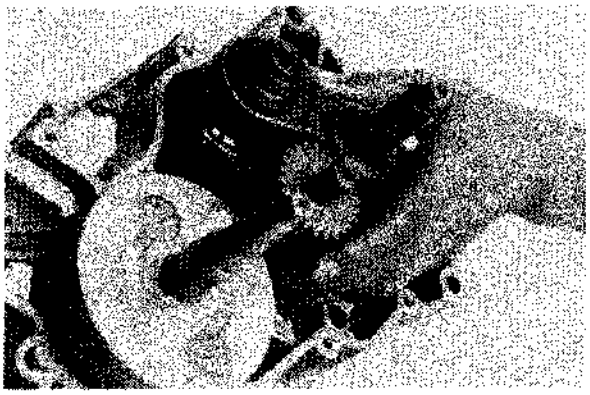


Fig. 3-88

d. By separating the crankcase, (fig.3-89), crankshaft, transmission gear, change drum and kick gear can be removed.


Fig. 3-89

(1) Removal of transmission gear.
While tapping the end of the drive shaft lightly with a plastic hammer, remove the change drum, output shaft, and drive shaft all together from the right crankcase.


Fig. 3-90

(2) Removal of kick gear.

GA Series, B1L-A

After taking off the kick spring and the holder from the kick shaft on the right hand side of the right crankcase, the kick gear can be removed together with the kick shaft.

F Series

Remove the snap ring, the kick spring and the holder at the left end of the kick shaft. Pull out the kick shaft and kick gear from the right side of the right crankcase.
In case the kick gear alone is to be removed, it is not necessary to separate the crankcase.

(3) Removal of crankshaft.
While tapping the right end of the crankshaft with a plastic hammer, remove the crankshaft from the right crankcase.

Note: Before removing the crankshaft, be sure to remove the dowel pin from the right hand side of the crankshaft.

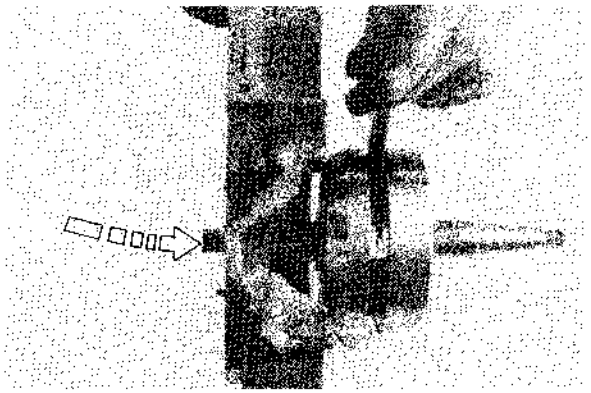


Fig. 3-91

e. Remove the bearing holder, and pull out the oil seal and the main bearing with tools.

2) Inspection

a. Oil supply hole

Check each oil supply hole. If any holes are clogged, blow them out with air.

b. Breather hole

Check the breather hole. If the breather hole is clogged with dest and dirt etc., it is impossible to let out the internal pressure, and the pressure build-up will cause oil leakage.

c. Main bearings

Bearings used on both ends of the crankshaft are generally called "main bearings".

(1) Check inner and outer race for rust.

(2) Too big a radial clearance of a bearing produces engine noise and vibration. So measure the clearance, and if it is over 0.002 in (0.05 mm), replace the bearing.

(3) Pitting of the rolling surface of the race tend to damage the balls and produce engine noise. So inspection must be carried out carefully. Pitting, if bad, can be felt by turning by hand. Replace any bad bearings.

d. Drive shaft and output shaft bearings

The inspection procedure is the same as for the main bearings. Careful checking for pitting is necessary becasue the rolling surface of the race is, in many cases, scored by foreign objects contained in the transmission oil.

e. Bushings

Bushings support one end of the drive shaft and that of the output shaft. An oil groove on the bearing surface of the shaft allows oil to flow in, assuring sufficient lurbication. Examine, the extent of wear, especially uneven wear.

f. Cranksahft oil seals

The crankshaft oil seals maintain crankcase pressure.
If the oil seals are damaged, primary compression leakage will occur, resulting in poor engine performance. So it is important to check the area of each oil seal for oil leakage and the lip of the seal for damages. Replace any damaged or leaking seal.

g. Output shaft and shift shaft oil seals.

Check if there is any oil leakage from the seal areas of the output shaft or the shift shaft, or if the lips of any oil seals are damaged. Replace any damaged or leaking seal.

3) Installation

After making sure there is no pitting on the rolling surface of the outer race of the bearing, insert bearings using a press and a block.

a. Ball bearing

Press in using block metal till flush with crank side surface of crankcase.

b. Oil seal

Press in from magneto side. Turn marked side toward magneto. Press in until seal stops.

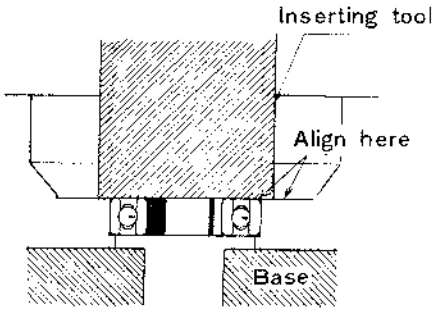


Fig. 3-92

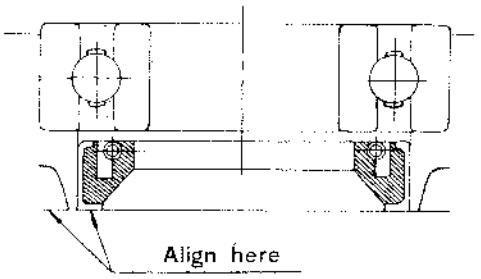


Fig. 3-93

Note: The oil seal should be replaced, whether it is new or old, when the bearing is replaced.

c. Needle beraing (if used)

After applying oil to the needle bearing, press it in completely until it stops.

d. Drive shaft bushing

After oiling, press in from change pedal side. Turn marked surface toward pedal.

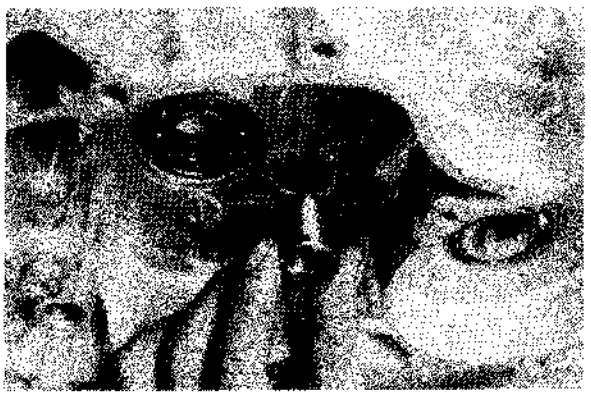


Fig. 3-94

e. Crankcase assembly

In principle, reverse the removal procedure.

(1) First insert the crankshaft into the right crankcase.
(2) Insert the kick shaft.
(3) Insert the transmission gears.
(4) Apply liquid gasket (Kawasaki bond) on the case fitting surface of the left crankcase, and then assemble the left crankcase in position. Do not forget to install the ball and the shim at the tip of the drive shaft, in the case of the G series model.
(5) Install the left crankcase on the dowel pins of the right crankcase while tapping around the entire left crankcase with a plastic hammer. Take care not to damage the lip of the oil seals of the crankshaft and the output shaft.

4) Adjustment

After tightening the fitting screws, be sure:

a. That the crankshaft and the transmission gear rotate smoothly.
b. That gear change is secure and smooth.
c. That the rotation of the kick gear and the operation of the kick ratchet are correct.

15. Crankshaft

The crankshaft assembly consists of the right and the left crankshaft, crank pin, big end needle bearing, side washers and connecting rod. The crankshaft, which is always operated under severe conditions, requires high accuracy in dimension. It is very necessary, therefore, to locate and correct a defective point as early as possible to prevent trouble later.
In this chapter probable troubles and their remedies are described. Observe the following procedures, when inspecting, disassembling, assembling and adjusting.

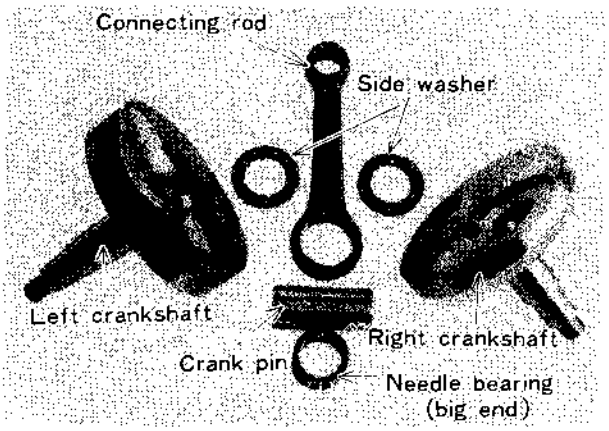


Fig. 3 95

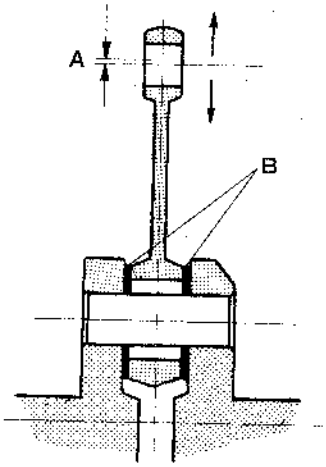


Fig. 3-96

1) Inspection

a. Big end radial clearance

As shown in fig 3-96, measure the play with a dial indicator. If it is exceeds the repair limit replace the crank pin, needle bearing and, if necessary, the connecting rod.

Table 3-18

Models	G Series	G4TR	B1L-A	F6, F7	F8, F81M, F5
Big end radial	0.001 in (0.027 mm)	0.0006 in (0.017 mm)	0.0007 in (0.020 mm)	0.0009 in (0.024 mm)	0.0019 in (0.050 mm)
Repair limit	0.0023 in (0.060 mm)	0.0019 in (0.050 mm)	0.0021 in (0.055 mm)	0.0023 in (0.060 mm)	0.0035 in (0.090 mm)

b. Big end side clearance

Measure the side clearance with a thickness gauge. If it is excceds the repair limit replace worn side washers with new ones.

Table 3-19

Models	G Series	G4TR	B1L-A	F6, F7	F8, F81M,F5
Big end side clearance	0.016 in (0.40 mm)	0.011 in (0.28 mm)	0.011 in (0.28 mm)	0.015 in (0.38 mm)	0.017 in (0.43 mm)
Repair limit	0.024 in (0.60 mm)	0.018 in (0.45 mm)	0.018 in (0.45 mm)	0.024 in (0.60 mm)	0.024 in (0.60 mm)

c. Seizure in big end

If right and/or left crank web is damaged, replace entire crankshaft assembly. Otherwise, disassemble the crankshaft and replace crank pin, needle bearing, side washers and connecting rod.

d. Crankshaft assembly warp

Install the crankshaft assembly at bench center and rotate slowly. Measure right and left side crankshaft warp at the bearing journals using a dial indicator. If the indicator reading is exceeds the repair limit, disassemble the crankshaft and replace the crank pin. When it exceeds standard limit but is not exseeds the repair limit, correct it following the procedures described 3)-C.

Table 3-20

Models	Standard dimension	Repair limit
All Model	0.0012in (0.03mm)	0.004in (0.10mm)

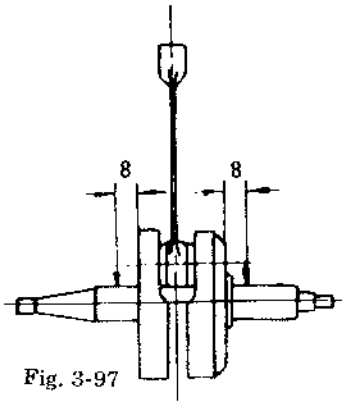


Fig. 3-97

2) Disassembly

Press the crank pin out being careful not to damage the inner surface of the crank pin hole.

3) Assembly

a. Big end radial clearance

Insure that the radial clearance is within the standard limit after assembling only crank pin, needle bearing and connecting rod. Crank pin can not be reused once it has been completely assembled with the crankshaft.

b. Big end side clearance

First assemble the crank pin with either right or left crankshaft, side washers, needle bearing, connecting rod, then press the other crankshaft on them measuring side clearance between them with a thickness gauge.

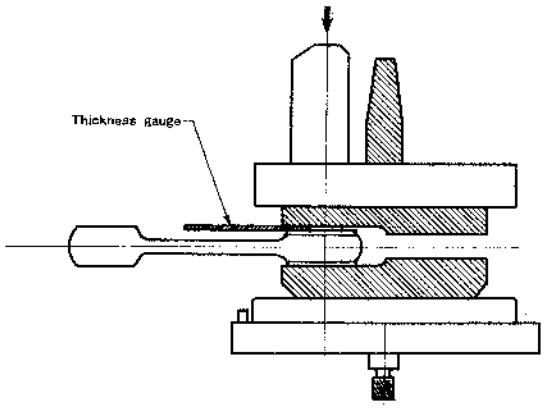


Fig. 3-98

c. Crankshaft Warp

Inspect the assembled crankshaft following the procedures described in 1) -- d and if the indicator reading exceeds the standard limit correct it as follows.
When hammering crankshaft directly, use a soft hammer made of copper or lead.

(1) Distorted crankshaft

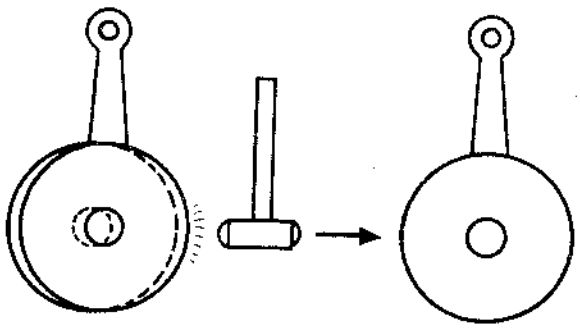


Fig. 3-99

(2) Deflected crankshaft

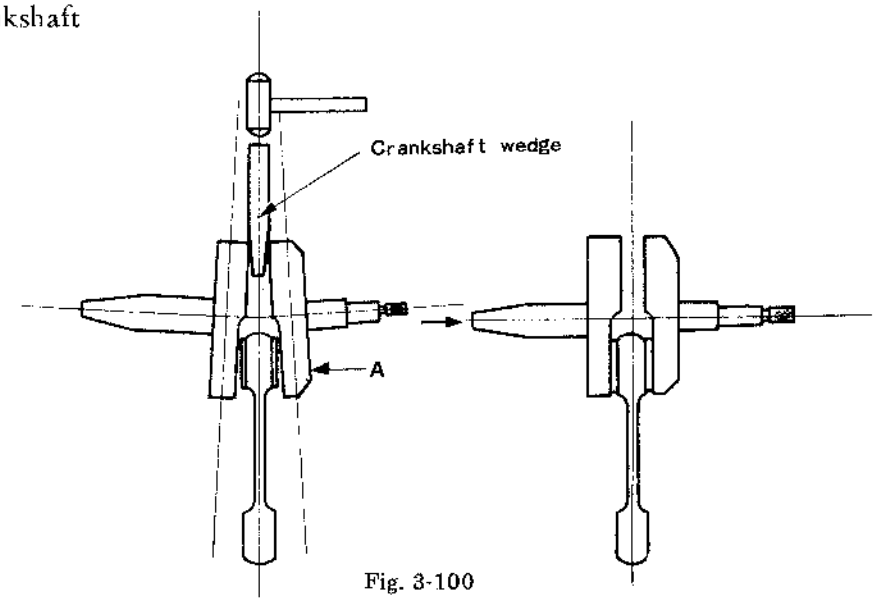


Fig. 3-100

Do not hammer the crankshaft at the part "A" to correct deflection, or descreased side clearance will result.

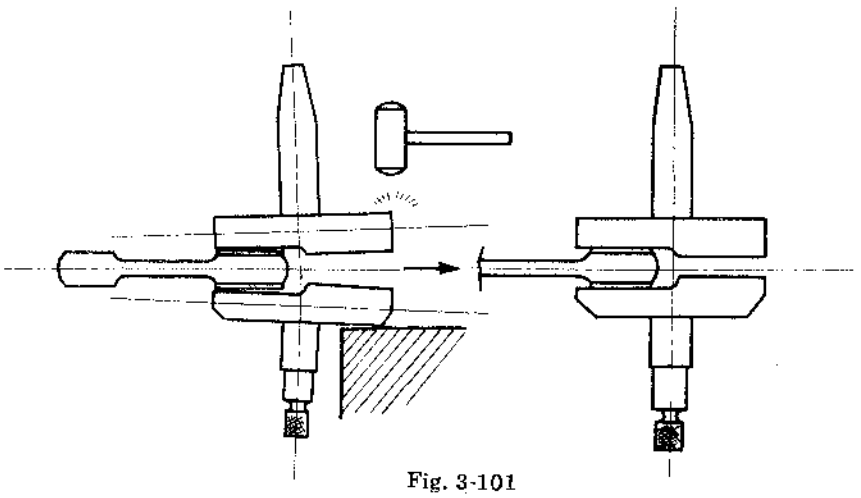


Fig. 3-101

Recheck corrected crankshaft for warp in the same manner.

d. Recheck of Big end side clearance

After correcting crankshaft warp, recheck side clearance. If side clearance exceeds its limit, correct it in the same manner as 3) -b.

After correction of side clearance, check crankshaft for warp again.

4) Small end radial clearance

Check radial clearance of small end.

If it exceeds the repair limit, replace needle bearing and piston pin together.

When it exceeds standard limit, replacement of needle bearing and piston pin is recommended.

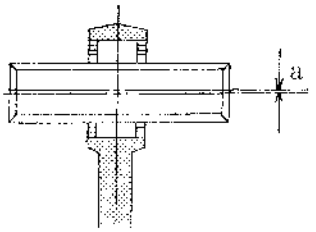


Fig. 3-102

Table 3-21

Item / Model	Smaller end radial clearance	Repair limit
All Model	0.00012 ∼ 0.00086 in (0.003 ∼ 0.022 mm)	0.002 in (0.05 mm)

16. Transmission

The engine performance curve shows that the engine has maximum output at high speed. To effectively use this performance, the reduction (primary and secondary) should be carried out to convert the crankshaft power into the proper driving force and speed in accordance with the running condition such as starting, acceleration, climbing, high speed running, stopping, etc.
In other words, the engine output can be used most effectively when the gear ratio (reduction ratio) of the transmission meets the running performance curve.
When the change pedal is actuated, the change drum rotates and the selector forks move to the right or left, along the cam groove. At the same time, the selector forks, set on the gears, shift each gear to the right or left. The selection of gear ratio of the transmission is thus carried out.
The following table shows the gear ratio (Drive gear : Output gear) for each model.

Table 3-22 **Number of transmission gear teeth**

Model	GA-1A	GA-2A G3SS-A G3TR-A G4TR	G31M	B1L-A	F5. F7	F5. F8	F81M
Low drive	12	12	14	15	12	11	11
out put	35	35	33	40	32	27	27
gear ratio	2.92	2.92	2.36	2.67	2.67	2.45	2.45
2nd drive	17	17	18	21	16	14	15
out put	29	30	29	34	28	24	24
gear ratio	1.71	1.77	1.61	1.62	1.75	1.71	1.60
3rd drive	21	20	20	25	20	18	19
out put	26	26	26	30	24	21	24
gear ratio	1.24	1.30	1.30	1.20	1.20	1.17	1.26
4th drive	23	22	22	29	23	20	23
out put	23	24	24	26	21	18	25
gear ratio	1.00	1.09	1.09	0.90	0.91	0.90	1.09
Top drive	——	24	24	——	25	28	20
out put		23	23		18	20	19
gear ratio		0.96	0.96		0.72	0.71	0.95

1) Construction

5 speed return change

GA1-A G3SS-A G3TR-A G4TR, G31M-A

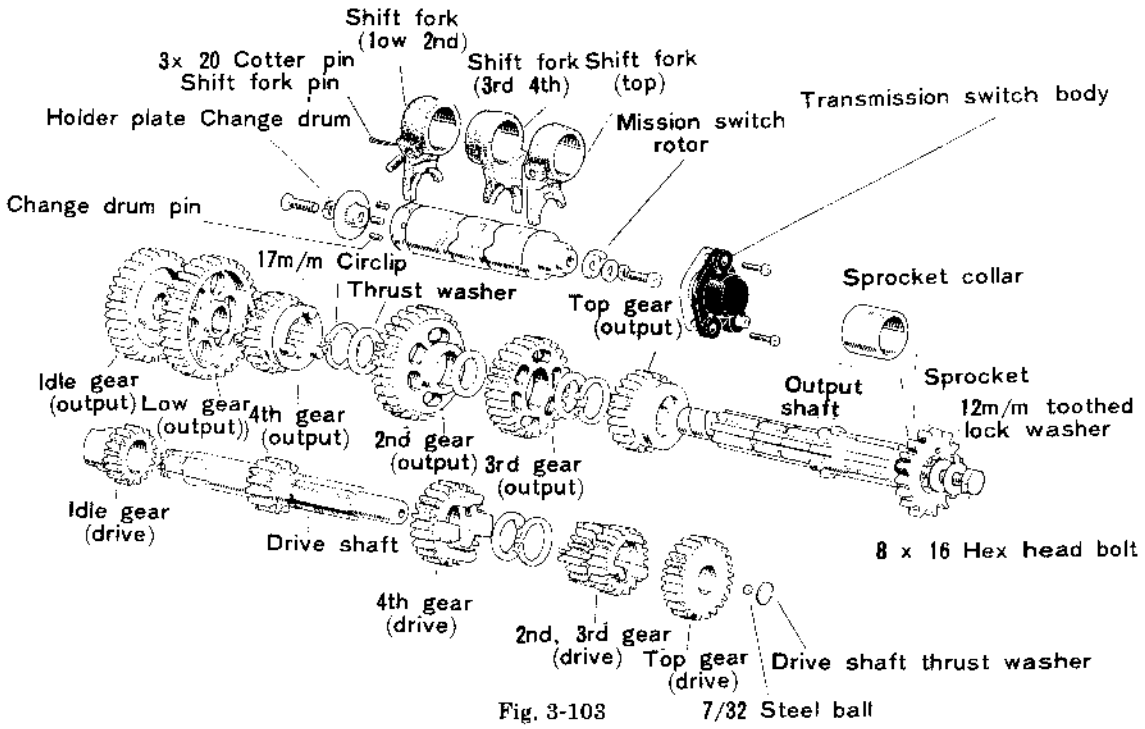


Fig. 3-103

In the case of the Model G Series transmission gears are of the return change, constant mesh type. Fig. 3-103 shows the parts breakdown, and Fig. 3-104 illustrates a section of engagement of gears. Three shift forks are respectively located on the second third, gear (drive shaft), the fourth gear (output shaft) and the top gear (output). The shift fork pin follows the cam groove on the outer circumference of the change drum. As the change drum rotates the shift fork moves right and left along the cam groove and moves gears right and left.

The 7/32" steel ball on the left end of the drive shaft is used to eliminate the influence of thrust produced by a clutch operation on the drive shaft, and to make it easy to change the gears. The idle gears on the output shaft and the drive shaft, which are meshed with each other in the transmission chamber, transmit the rotation of the kick gear to the primary gear, through the clutch housing gear. The transmission switch is attached to the crankcase. It is used to light the green neutral lamp when the gears are in the neutral position.

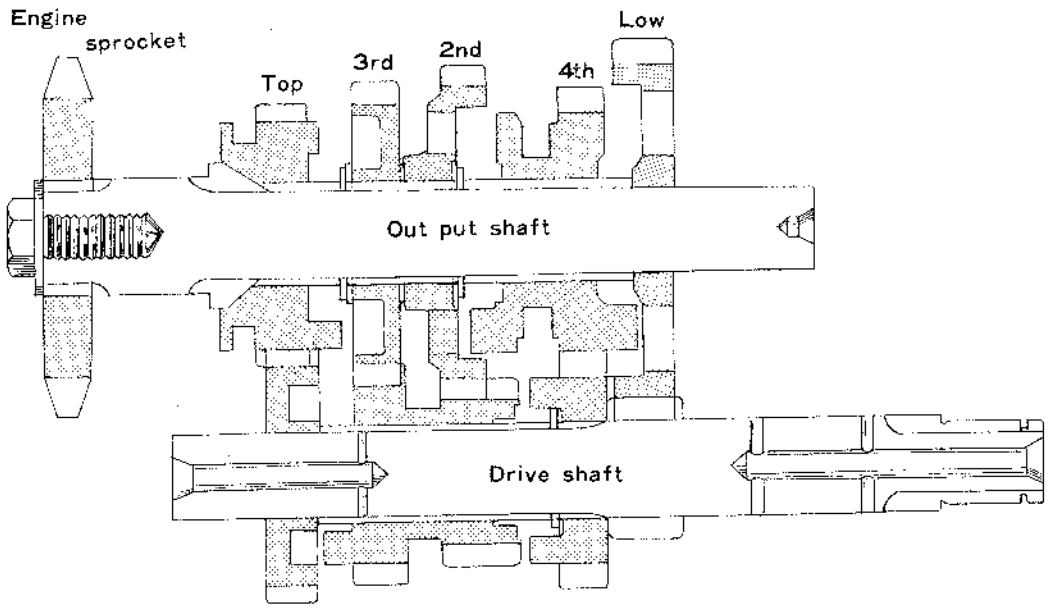


Fig. 3-104

The change drum is provided with 6 pins. By actuating the change pedal once, the change drum rotates 1/6 of a turn. It is designed so that 5/6 of a turn of the change drum will coincide with the change of five stages, neutral, low, second, third, fourth and top by kicking up the pedal.

The location of selector forks is as shown in Fig. 3-105

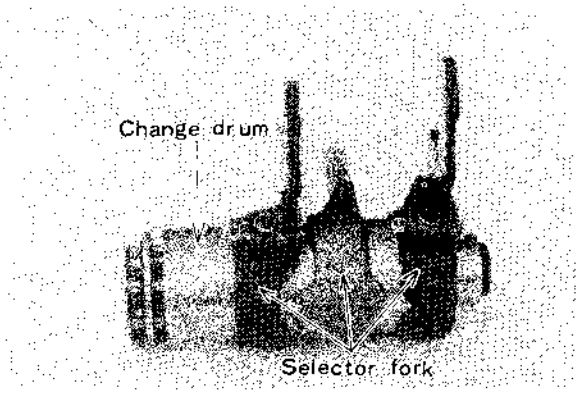


Fig. 3-105

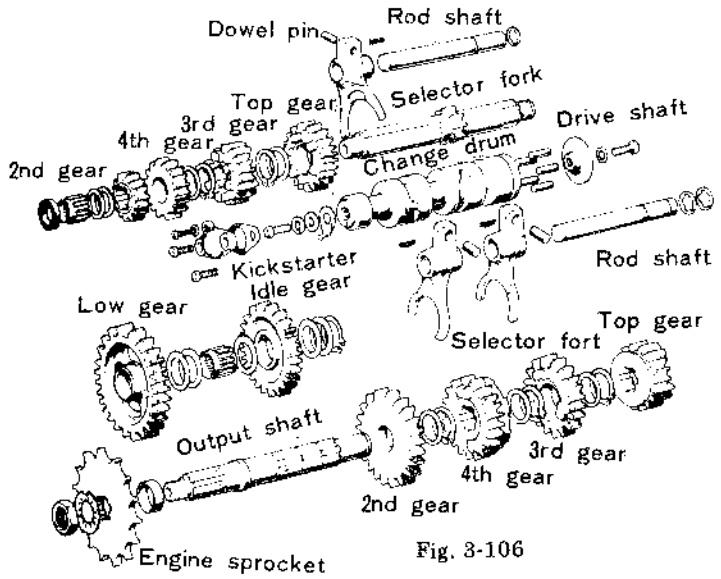


Fig. 3-106

fig.3-106 shows the parts breakdown and Fig. 3-107 shows a cross sectional view. Three selector forks are meshed on the drive shaft third gear, the output shaft fourth gear and the output shaft top gear respectively. Those selector forks slide on the fork guide bars as illustrated. The selector fork pins are inserted into the grooves on the change drum.

The gear sequence is, from low position, low, neutral, second, third, fourth and top. In top gear, three small steel balls are set around at every 120° on the output shaft. They are used to make it easy to set the neutral position which is located between the low and second positions.

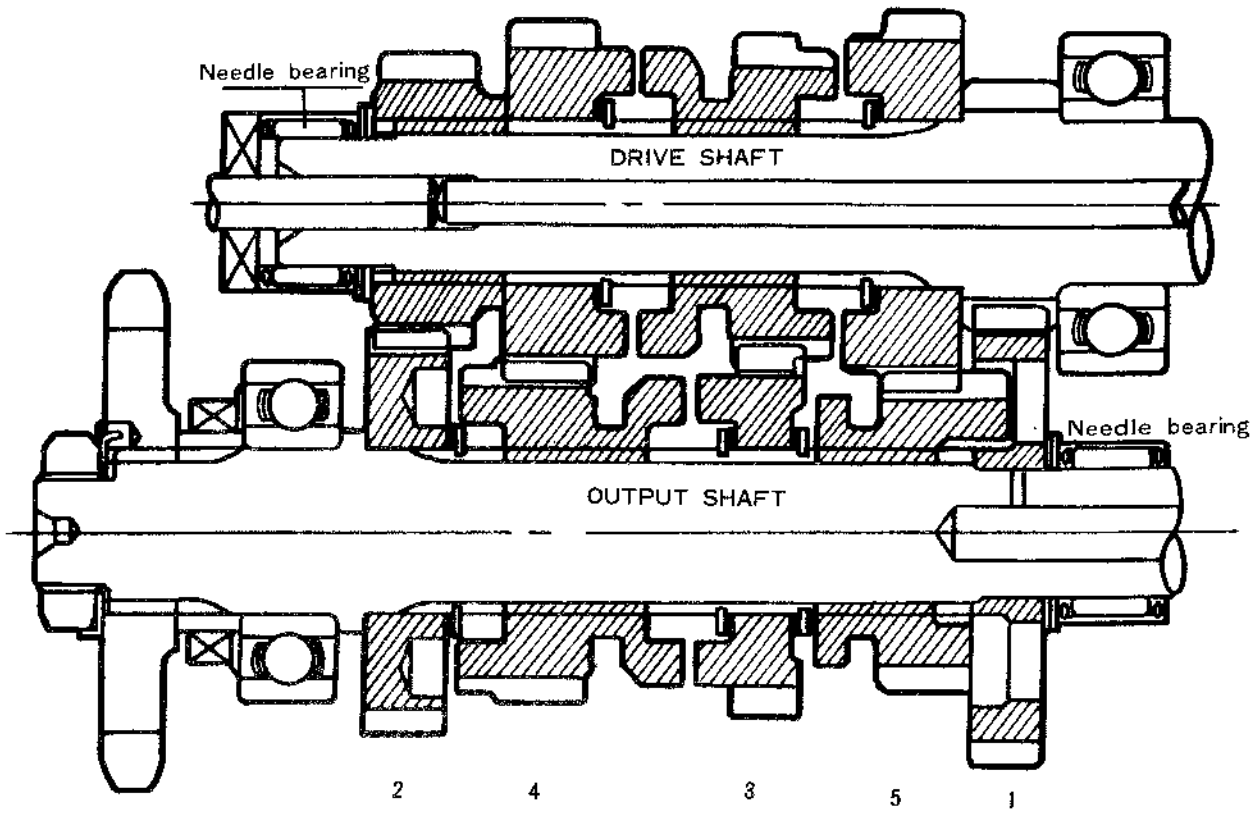


Fig. 3-107

Fig. 3-108 and Fig. 3-109 show the shift forks of F series.

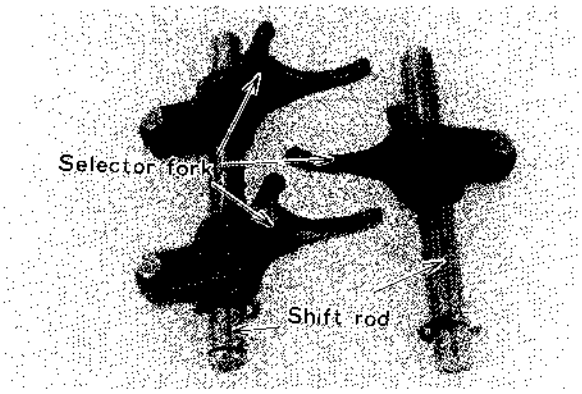


Fig. 3-108

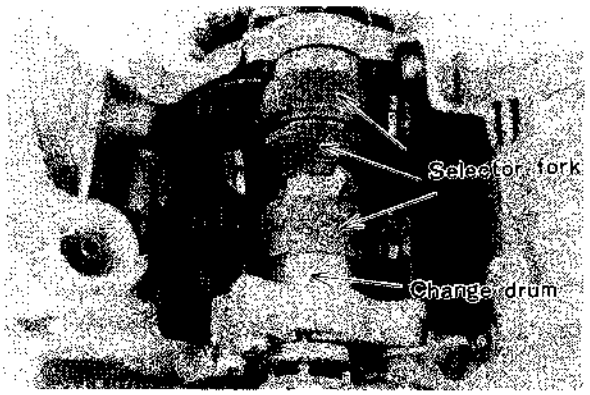


Fig. 3-109

2) 4 Speed return change

BA1, B1L

The Model GA-1 is of the rotary change system with constant mesh type four speeds. Fig. 3-110 shows the components.

Shift forks are meshed over the second gear (drive) and the third gear (output)

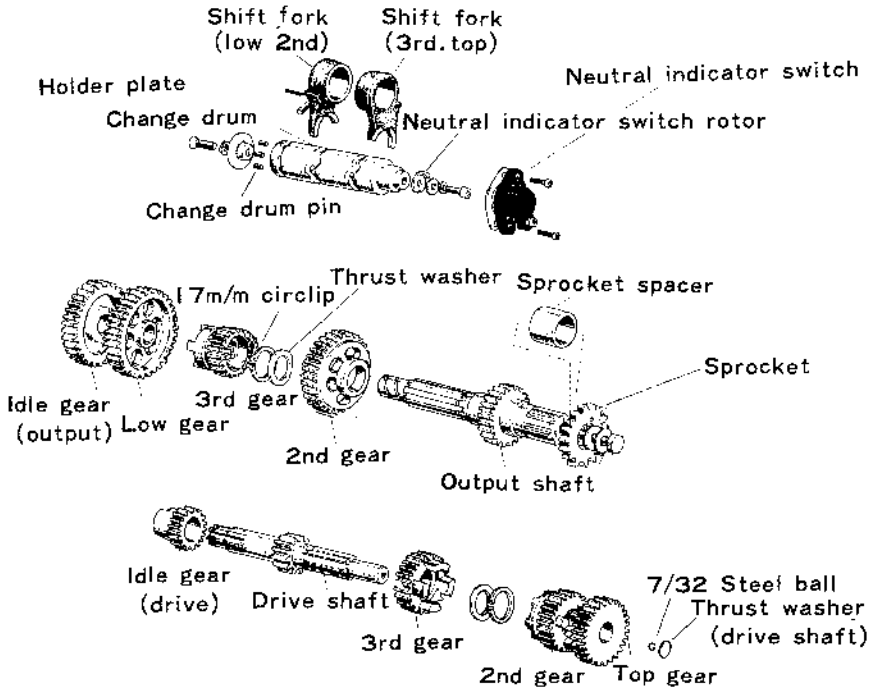


Fig. 3-110

The change drum is provided with five pins. One step on the change pedal makes the change drum turn 1/5. With forward stepping, the four changes-neutral, low, second, third, and top-are made while the change drum rotates a full turn. Through the rotation of the change drum, the shift forks move right and left along the cam groove, effecting necessary engagement at every stage.

The kick mechanism of B1L is not the primary type, differing from that of the other models and does not have two idle gears.

3) Disassembly

a. Change drum

Remove the shift fork from the change drum by drawing out the cotter pins and the shift fork pins.

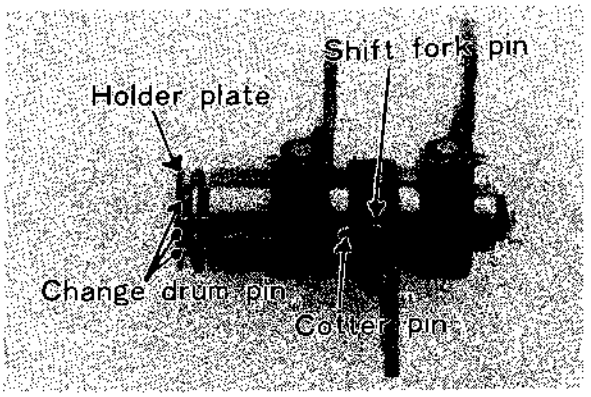


Fig. 3-111

Note: The shift forks of F5 and F8 are mounted on the shift rods, and are easily removed when the fork pin is taken off the change drum, as in the case of the other models.

b. Gears

When the circlip of each gear is removed, as shown in Fig. 3-112, the thrust washer and the gears are disassembled.

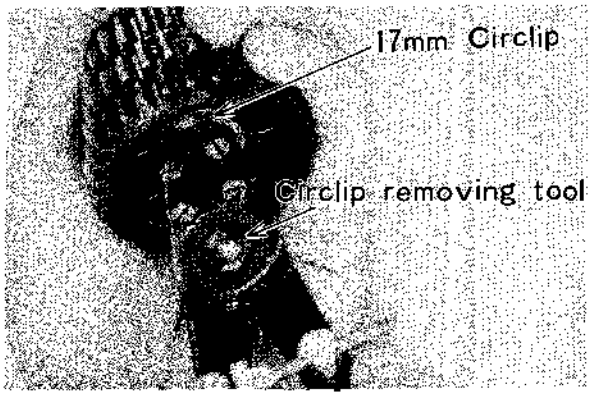


Fig. 3-112

4) Inspection

a. Inspection of shift groove and shift fork

If the shift groove on the gear where the shift fork is inserted is worn, the gear may not engage fully or may disengage during operation. Insert a thickness gauge between the shift groove on the gear and the shift fork to measure the clearance. If the clearance is beyond the permissible limit, replace gear or shift fork.
Also if the shift fork is burned or otherwise damaged, repalce it.

Table 3-23 Clearance between shift fork and gear slot

Model	Standard	Repair limit
All Model	0.1 ∿ 0.25 m/m	0.6 mm

b. Inspection of gear meshing

Any burr or roughness on the teeth surface will cause wearing of other gears. A gear with such irregularities should be replaced.

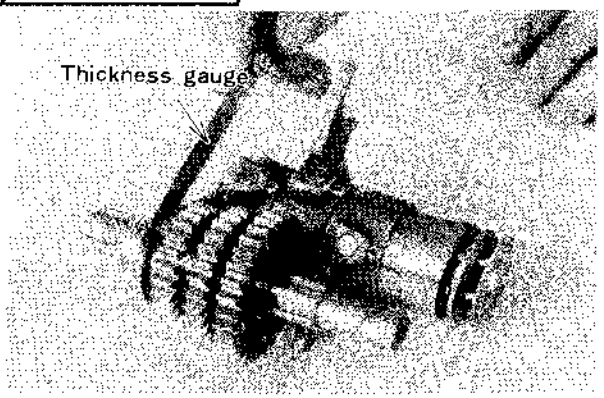


Fig. 3-113

5) Installation

a. Combine the shift forks of the change drum with the transmission gears and insert the gears into the right crankcase.
In the case of the G series model, make sure that the kick gear and the two idle gears completely engage with each other.

b. Fix the change drum to the right crankcase with the set plate.

Note: When applying the grease to install steel balls on output shaft, wash them out with gasoline and assure that three steel balls can move properly.

17. Kickstarter

1) Construction of the primary kick

In the case of Models GA2-A, G3SS-A, G3TR-A, G4TR, G31M-A, and F series models the kickstarter equipment is of the primary kick system, not being affected by clutch action.
Even when the gear is in a position other than neutral, the engine can be started by disengaging the clutch and kicking.
Fig. 3-114 shows a cross-section of kick starting system of GA.

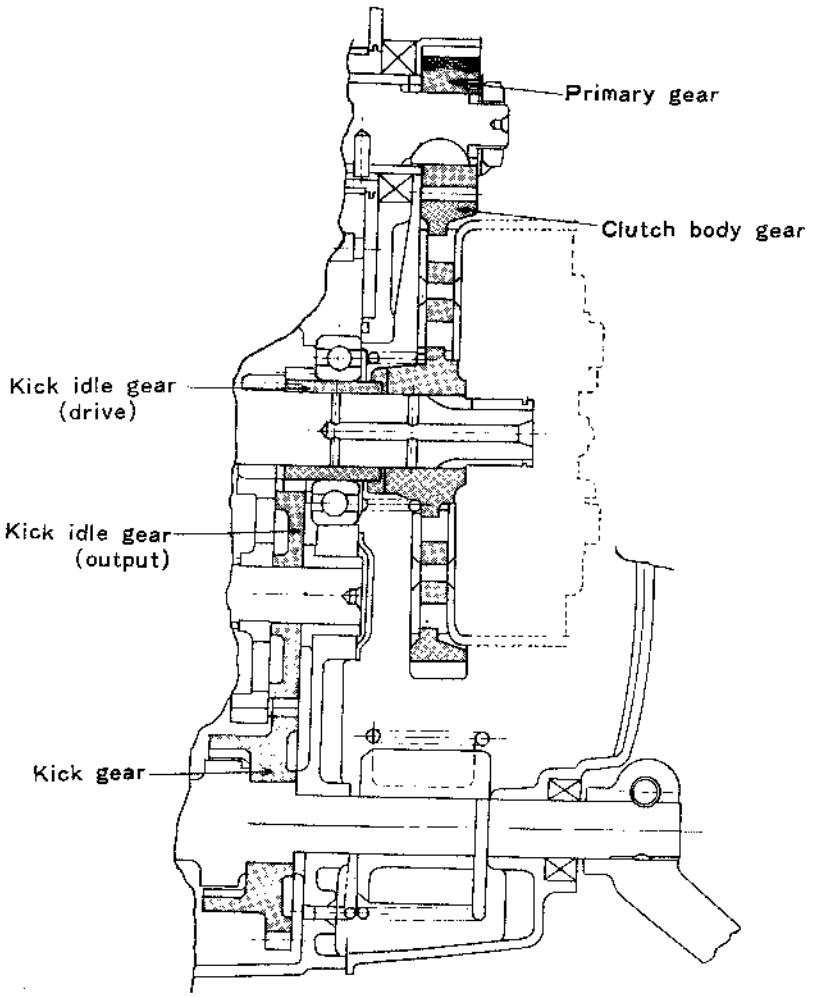


Fig. 3-114

The primary kick system is characterized by the fact that the kick gear train does not include the clutch mechanism. In other words, not only can the engine be started with the gears in neutral, but by disengaging the clutch, the engine can be started in any gear.

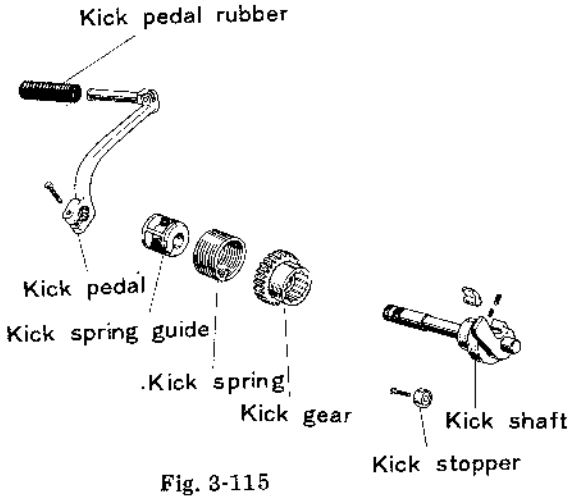


Fig. 3-115

The kickshaft turns in the direction indicated by arrow A in the Fig. 3-116. At this time the kick pawl is separated from the kick stopper and coming out to engage with the internal teeth of the kick gear pushed by the kick pawl spring. Thus the kick gear is turned with the kick shaft for starting the engine. After starting, the kick gear is returned by the kick spring attached on the shaft in the reverse direction B in the Fig. 3-117.
The kick pawl being engaged with the kick gear is pressed under the kick stopper at the end of return process, disengaging it from the kickgear. Thus the kick gear is released from the kick starter mechanism for normal driving.

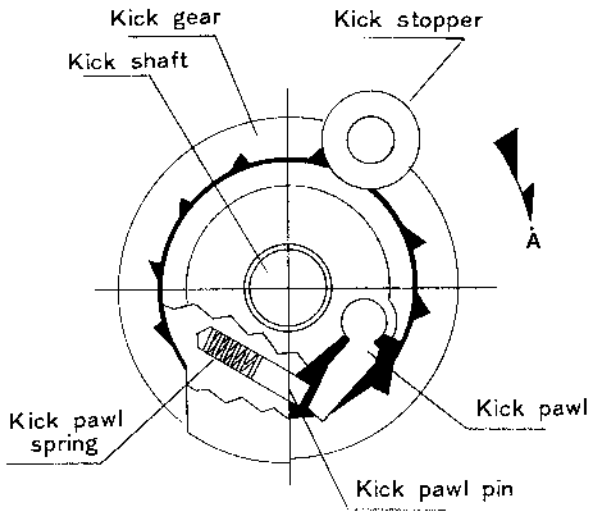


Fig. 3-116

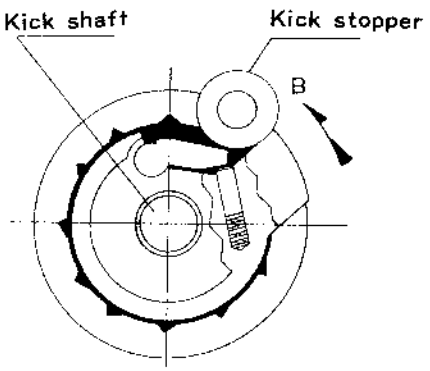


Fig. 3-117

F6, F7

The mechanism of this system is as follows:

In the center of the kick starter shaft, the threaded guide is machined, on which internal teeth of the kick gear is interlocked. According to the rotation of the kick shaft, the kick gear slides on the guide in the axial direction. Thus, the kick gear and the low gear on the output shaft are engaged only with a kick. While the engine running, the engagement does not occur and the kick gear returns to its normal position.

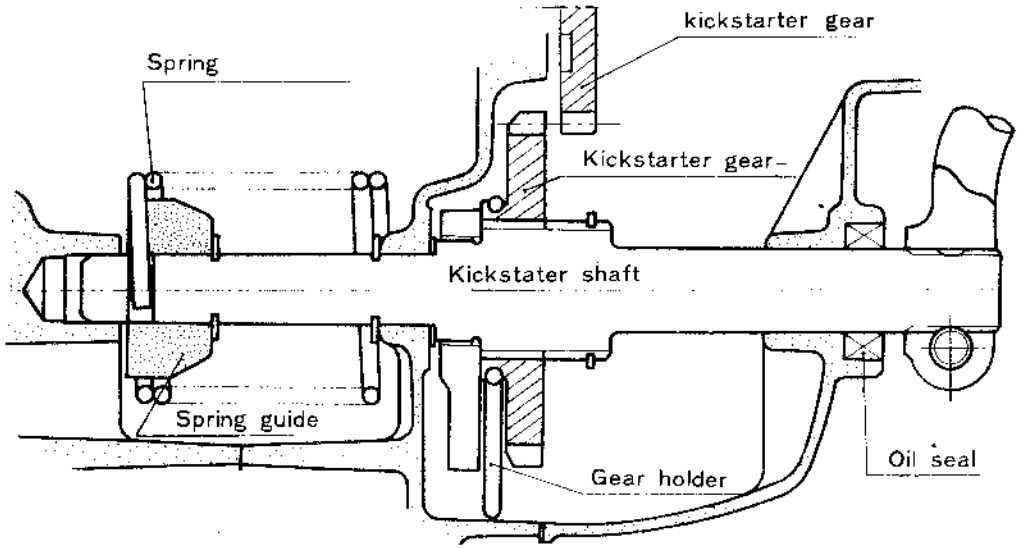


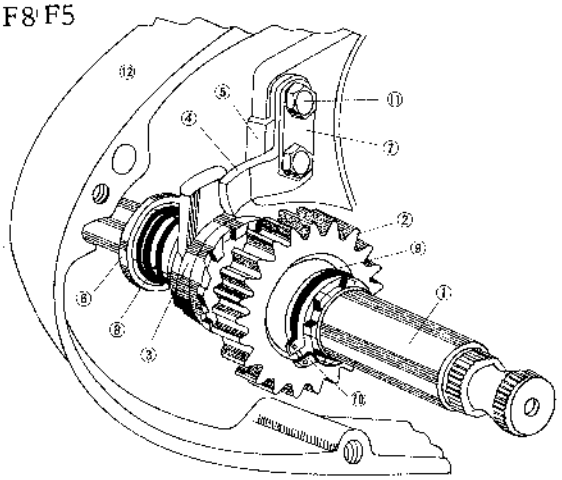
Fig. 3-118

The kick shaft rotates in the direction of arrow A by stepping on the kick starter pedal, and the kick gear slides rotating on the guide of the kick shaft in direction B and interlocks to the low gear of the output shaft. Thus, the torque of the kick pedal is transmitted in the following order.

Kick shaft – kick gear – output shaft (low gear) – drive shaft (low gear) – clutch -- crankshaft (primary gear)

When engine starts, the kick gear is driven by the idle gear on the out put shaft and shoved off in the reverse direction B due to the thrust, resulting in disengagement from the idle gear. When releasing the kick pedal, the kick shaft is turned clockwise back with the return spring, and stopped at the original position by the kick stopper on the crankcase. To stop rotation of the kick shaft as the kick stopper, there is a stopper lever fixed or the kick shaft which is indicated as "C" in the illustration.

F8, F5



①	13066-026	Kick Shaft	1
②	13068-022	Kick Geav	1
③	13078-004	Ratchet	1
④	13206-006	Kick Guide	1
⑤	13072-010	Kick Stopper	1
⑥	13077-003	Spring Holder	1
⑦	92031-006	Washer	1
⑧	92081-093	Spring	1
⑨	92024-033	Claw Washer	1
⑩	92033-010	Circlip	2
⑪	110B 0616	Bolt	2
⑫	14033-058	Crank Case R.H	1

Fig. 3-119

F8, F5

This ratchet slide system looks like the kick system of the F6. In this system, the ratchet slides to the right or left along the spline on the kick shaft. On the side of the kic gear, other ratchet, teeth are cut, with which the ratchet engages. The engine is started when the ratchet engages with these teeth on the kick gear. The kick gear is fixed to the kick shaft with circlips and races meshed with the idle gear of the output shaft when engine turns.

When the kick pedal moves down, the ratchet slides along the kick guide until it separates from the guide plate. When separated, the ratchet, which is loaded with a spring, immediately moves in the direction of the spline on the kick shaft and engages with the teeth on the kick gear. Thus, the rotation of the kick shaft is transmitted to the kick gear, idle gear and so on to the crankshaft. When the engine starts, the kick gear is driven by the idle gear, and the ratchet is shoved off the kick gear with the thrust raised on the ratchet teeth of the kick gear. When the kick pedal is released, the kick shaft is returned by the kick spring. The ratchet which is interlocked with the spline on the kick shaft, is also turned with the shaft and forced to move inward against the spring force along the kick guide plate until it reaches the kick stopper fixed with the kick guide on the crankcase.

3) Disassembly

G Series, B1L

a. By removing the kick gear from the kick shaft, disassemble the kick pawl assembly.

b. The kick stopper can be removed from the left crankcase.

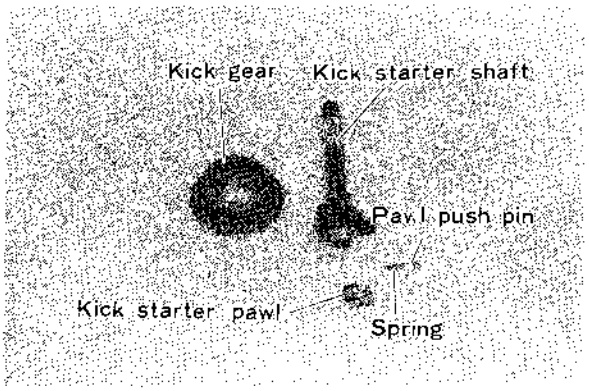


Fig. 3-120

F6, F7

a. Remove the spring guide the spring and the two circlips after separating the crankcase.

b. Remove the snap rings and the kick gear from the kick shaft guide.



Fig. 3-121

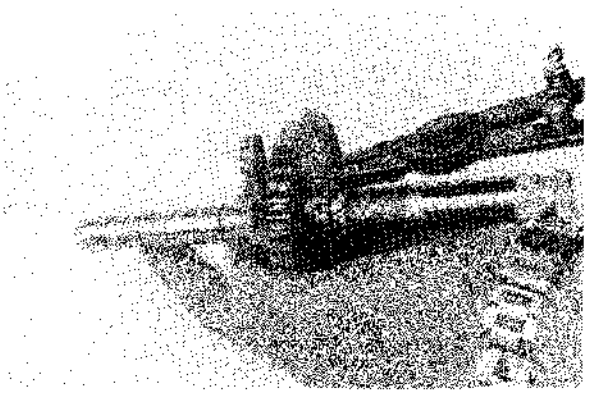


Fig. 3-122

F8, F81M, F5

a. Remove the snap ring of the kick gear, and take the kick gear off the kick shaft.

b. The ratchet, spring holder plate and spring can be removed from the spline without removing the kick shaft from the right crankcase.

Note: The kick spring, spring holder and two circlips on the kickshaft can be removed when separating the crankcases inside the right hand crankcase.

4) Inspection

G Series, B1L-A

a. Inspection of Kick Gear

The inner surface of the kick gear has a shape resembling that of the inner gear. If the inner gear is deformed by wear, the pawl will not engage causing slippage when kicking.

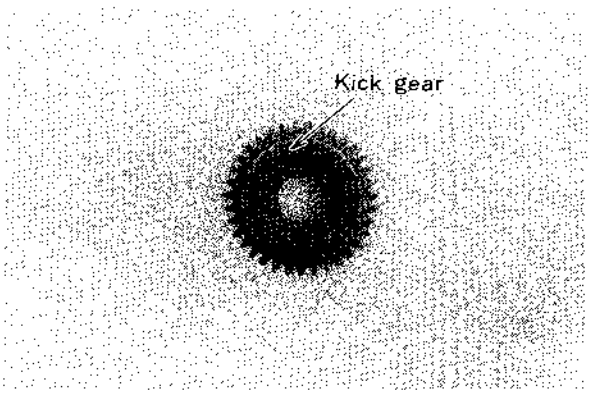


Fig. 3-123

b. Kick pawl

Check if the tip of the kick pawl is worn out. Excessive wear may also cause slippage.

c. Inspection of kick pawl push pin and spring

Any foreign matter in the kick pawl push pin hole will cause slippage when kicking. Check carefully, as shown in Fig. 3-124, by inserting the spring and the push pin into the shaft. Check if they work smoothly up and down when pushed.

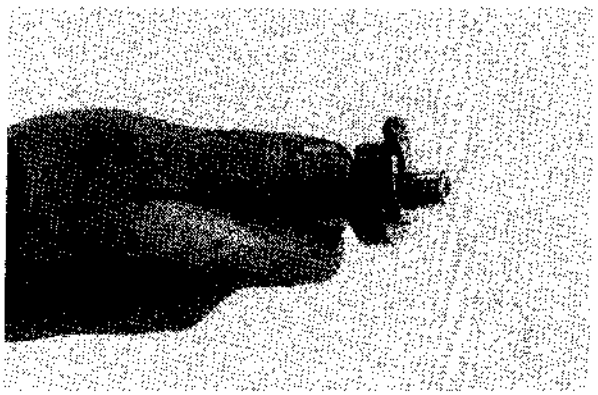


Fig. 3-124

F6, F7

Check the kick gear guide and kick gear splines for fitting. Check if the kick shaft is bent or cracked.

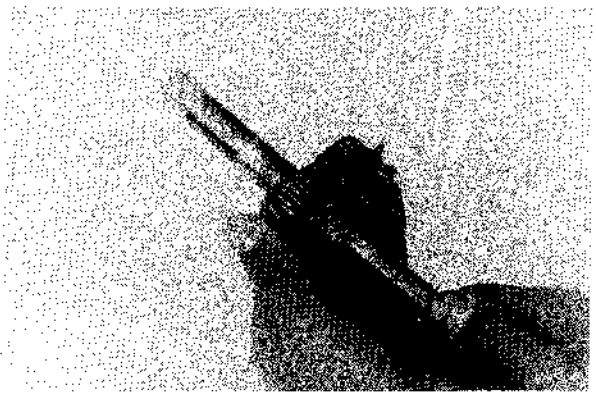


Fig. 3-125

F8, F81M, F5

a. Check if the ratchet properly slides along the kick guide.
b. Check if the kick shaft is bent or cracked.

5) Installation

G Series, B1L-A

a. Install the kick stopper in the left crankcase.
b. Put the kick pawl spring and then the kick pawl push pin into the hole of the kick shaft. Install the kick pawl and put on the kick gear while pushing the kick pawl not to move out, and then insert the assembly into the right crankcase. Place in position the kick spring and the holder according to the following steps before the left crankcase is installed.
   (1) Insert one end of the kick spring into the hole of the right crankcase, and insert the other end into the kick spring hole of the kick shaft by twisting that end clockwise by about 120°.
   (2) Put the holder into the kick shaft.

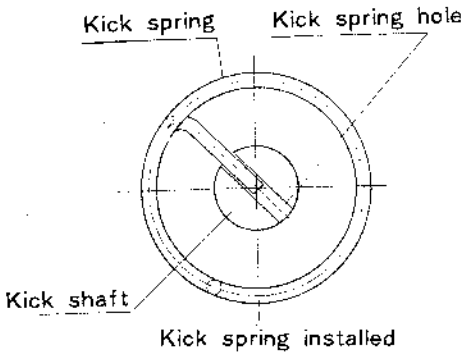


Fig. 3-126

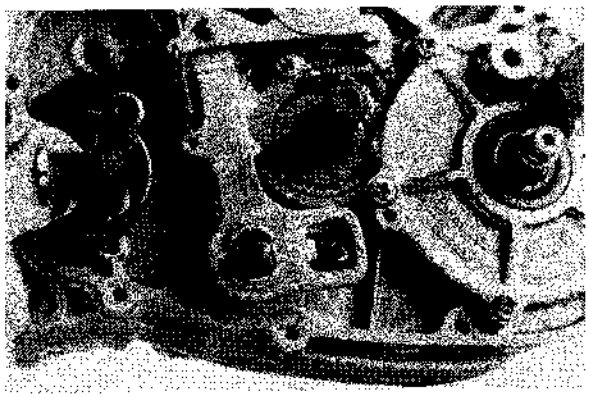


Fig. 3-127

F6, F7

a. Mount the kick guide and kick stopper on the crankcase with two screws.
b. Insert the kick shaft into the kick shaft hole on the crankcase and fix with the collar two snap rings, set the spring holder plate and spring.
c. Mount the return spring, spring holder and collar from the left end of the shaft as in the F6.
d. Align the marks on the ratchet and the spline of the kick shaft, and insert the ratchet.
e. Finally, amount the kick gear and fix it with circlips.

F8, F81M, F5

a. Insert the kick shaft into the right hand crankcase and fix it with the snap rings. Insert one end of the return spring inside the right crankcase.
b. Fix the other end into the spring hole of the kick shaft by twisting the spring 120°.
c. Set the spring guide in the kick shaft.
d. Insert the kick gear (with the holder) from outside of the right crankcase, and set the circlip on the shaft groove.

18. Lubricating system

1) General

The ordinary two stroke engine is designed to use fuel mixture (fuel and lubricating oil.) The mixture ratio should be decided considering the maximum output and the rotating speed to supply sufficient oil for that condition. Generally the mixture ratio for the 2 stroke motorcycle engine is supposed to be 20 to 1 considering the above condition. Using this mixture, it is not necessary to have a separate oil supplying system including oil pump and injection nozzle as is widely used in recent two-stroke engine design. The problem with this system is that the mixture ratio of oil and gasoline constant for any engine speed. Therefore, in the low and medium speed ranges the oil supplied to the engine is more than actually necessary. Wasting oil in the cylinder, and exhausting too much oil from the muffler result in increased carbon deposit in exhaust pipe, muffler and combustion chamber which usually causes a decrease in compression, and pre-ignition, as well as irregular combustion and poor cooling efficiency. In some cases, if too much oil is sucked inside the carburetor, the carburetion is likely to be affected. To solve these problems, the Kawasaki Superlube and the Injectolube (Separate Oil Supplying System) developed. The developed system is designed for improving the oil supply to meet every engine condition, output and rotating speed. When climbing, the engine is more strained than during usual flat-road driving. Therefore the quantity supplied should be increased in proportion to not only the engine speeds but to the output of the engine. In this separate oil supplying system, supplying ratio of oil is adjusted automatically according to engine revolution and opening of the throttle valve. Thus, the problem of exhaust and the choice of mixed ratio are solved perfectly. Efficiency to engine is superior to the other type, particularly, the injectolube type which lubricates directly supplying needed fresh and high viscosity oil to main bearings. Thus, durability of the two stroke big displacement engine is very much improved.

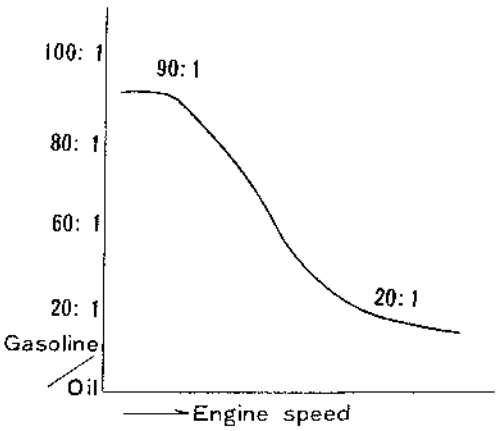


Fig. 3-128

2) Oil passage

a. Superlube type

G series, B1L, F6 and F7

Oil which flows into the check valve through the outlet oil pipe from the oil tank is injected into the gas intake pipe inside the valve cover through the nozzle. This oil is sprayed and mixed with flowing mixed gas from the carburetor and lubricates the crankcase, main bearings, large and small ends of connecting rod, cylinder wall, piston and piston rings.

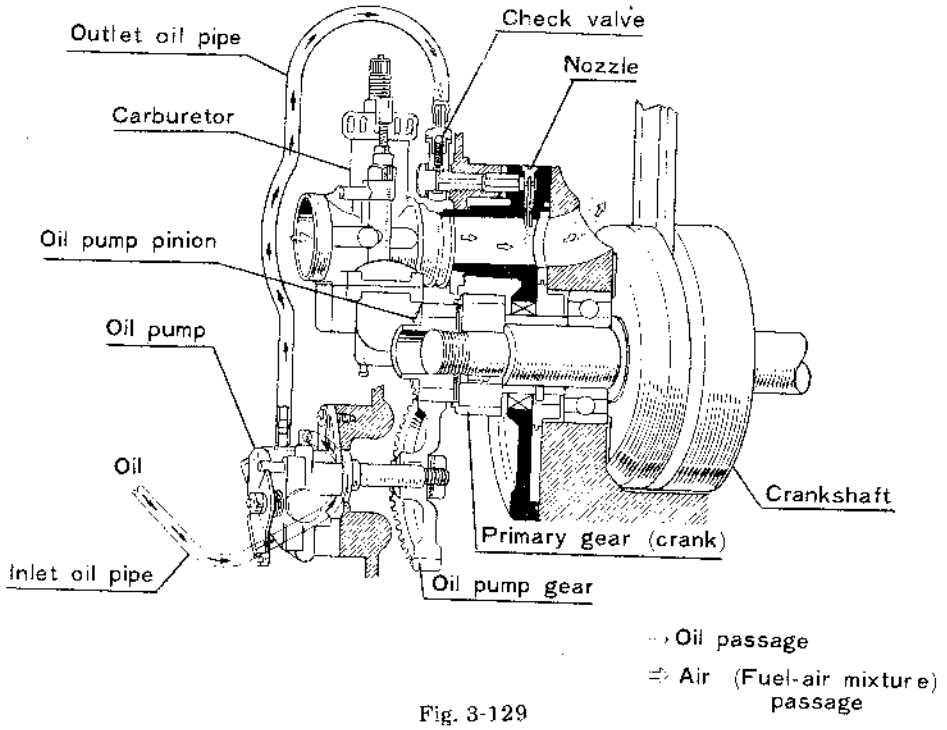


Fig. 3-129

b. Injectolube type (F5, F8)

Oil is supplied by the oil pump to the engine through two oil routes from the check valve. One oil route is for supplying the oil into fuel mixture injecting oil through the nozzle into gas in the intake pipe. The other route is a oil hole machined in the crankcase; oil is directly injected to main bearings as shown in Fig. 3-130. Through these two routes oil lubricates each part of engine.

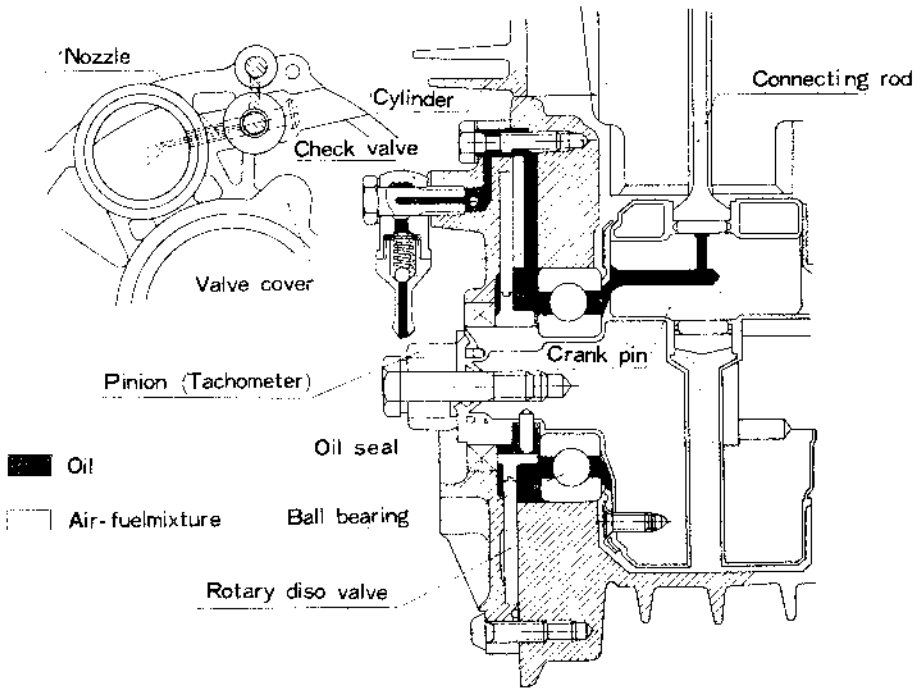


Fig. 3-130

3) Oil pump

a. Construction

Rotation of the crankshaft is reduced by the oil pump pinion on the crankshaft end and the oil pump gear on the oil pump shaft. The oil pump shaft has a worm gear at the end of it, which meshes with the teeth machined on the plunger inside the oil pump. Thus the plunger is turned, reciprocating inside the oil pump by the spring force and the cam at the end of the plunger. When the plunger is turned, the cam on the plunger slides along the plunger guide attached to the pump housing resulting in reciprocating motion. The top of the plunger is pressed with the spring of the differential plunger, which follows the movement of the plunger. The bottom of the plunger rests against the control cam which is attached to the control lever and dictates the length of the reciprocating stroke of the plunger.

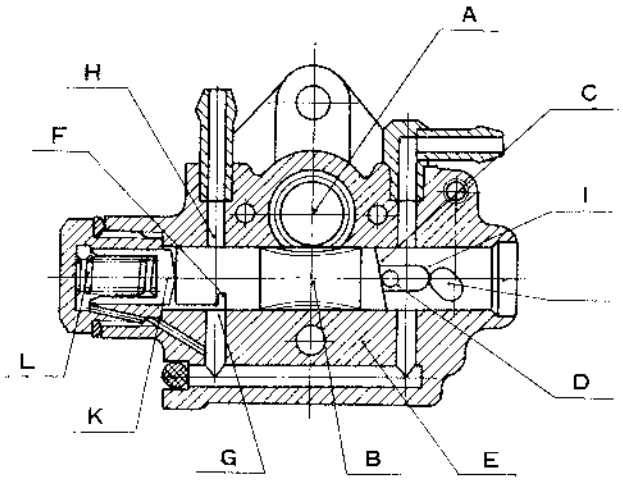


Fig. 3-131

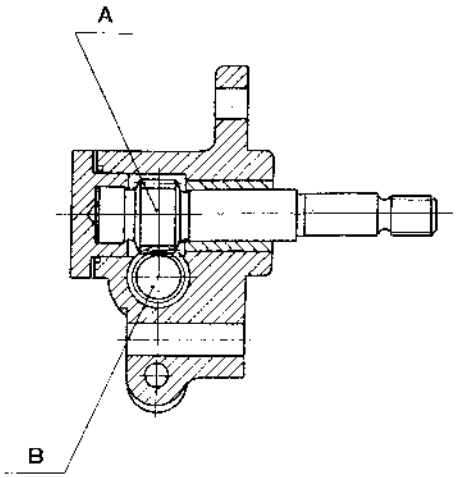


Fig. 3-132

b. Action

(1) Suction stroke (plunger down stroke)

After the discharge stroke, the plunger comes down lowering the pressure in the cylinder.

(2) Suction stroke (Near plunger bottom dead center).

The inlet port of the cylinder overlaps the notch of the plunger on this stroke and the oil is sucked into the cylinder. (the pressure is already low from the former stroke.)

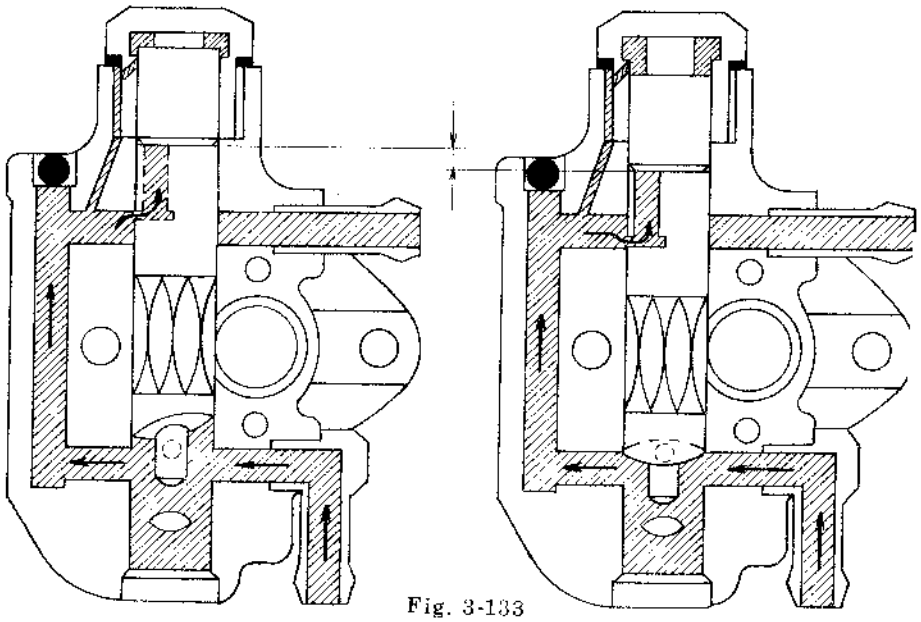


Fig. 3-133

(3) Pre-compression stroke (Plunger up stroke)
After the suction stroke, the plunger starts its up stroke and begins to compress the oil.

(4) On the discharge stroke the outlet port of the cylinder aligns with the notch of the plunger and the compressed oil is discharged. All four of the above strokes are taken and the action is completed during one revolution of the plunger.

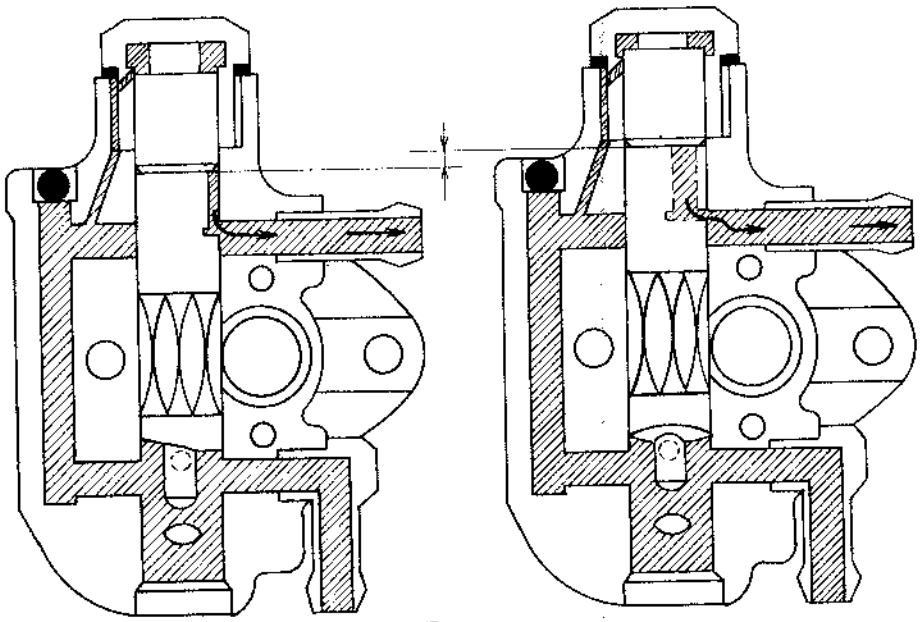


Fig. 3-134

c. Discharge flow control

The flow of oil increases according to the number of revolutions of the engine. However, necessary oil quantity for the engine varies according to the speed and output so, control according to throttle opening is needed. This is accomplished by a cam on the control lever. Fig. 3- shows the lead part which rotates the plunger. This plunger is pushed by a differential spring against the plunger guide and a cam. This cam is linked with the throttle valve.

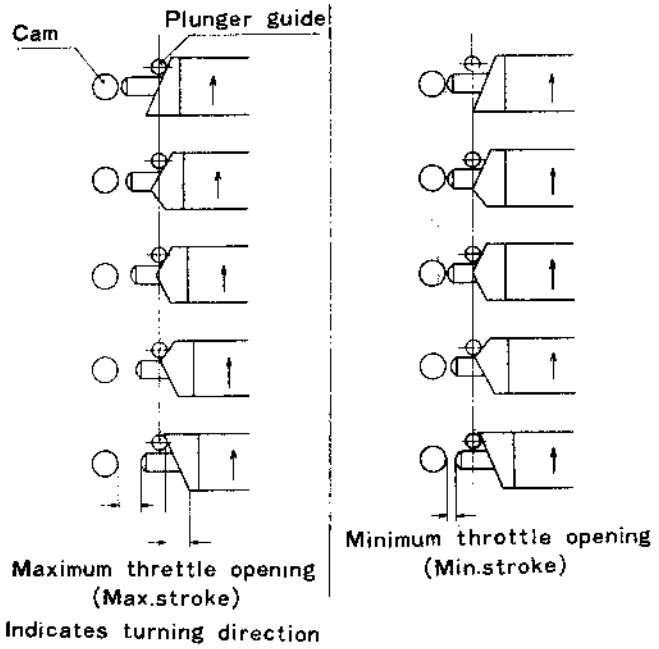


Fig. 3-135

The tip of the plunger rests against the rate control cam pressed by the differential spring on top of the plunger. The left figure in Fig. 3-135 indicates that the cam lift is minimum, obtaining maximum stroke of the pump. The right figure, in turn, indicates maximum cam lift which results in minimum pump stroke. When the cam lift is maximum, the control lever opening is practically none, the plunger guide, the follower of the plunger cam surface, does not touch the plunger at the beginning of the plunger rotation. Therefore, the plunger does not move until the follower begins to touch the plunger cam surface. When the cam lift is minimum, the follower directly touches the plunger from the beginning of the rotation, so that the plunger moves its full stroke. The rate control cam shaft is turned by the oil pump lever which changes the lift of the cam from maximum to minimum, that is the minimum pump stroke to the maximum pump stroke. The step 1 to the step 5 show the difference of the plunger strokes in both maximum and minimum lifts.

In the left figure, the lower part of the cam comes to the plunger side, this plunger is not controlled by the cam at its bottom dead center, and moves along the plunger guide.

4) Oil for Superlube and Injectolube

Besides being compounded exclusively for 2-stroke engines, the most important requirements for superlube oil is to have good liquidity at low temperatures.

5) Maintenance and inspection of oil pump

a. Oil pump main body

Checking the efficiency of the oil pump is done in the following.

Remove check valve (outlet pipe). Run engine at 2,000 rpm. Measure volume of oil, three minutes after pulling up the control lever of oil pump fully. The proper discharge oil volume is shown in the Table 3-24.

Table 3-24

Model	G Series	B1L-A	F6	F7	F8	F5
Discharge per 3 minutes	0.095 oz (2.8 cc)	0.112 oz (3.6 cc)	0.139 oz (4.1 cc)	0.186 oz (5.5 cc)	0.203 oz (6.0 cc)	0.338 oz (10.0 cc)

Caution: Use mixed fuel 20 : 1 to run the engine during the above testing.

b. Adjustment of the control lever opening angle

Refer to the item on oil pump in II- 5.

c. Air bleeding

Air bubbles existing in the outlet pipes between the pump and check valve, and in the inlet pipe between the tank band pump when removing oil pump or oil pipes prevents oil from flowing:

(1) Outlet pipe

While pulling up control lever of oil pump (full open) run engine at about 2,000 rpm until there is no air in pipe. If air bubbles are still in the pipe, check the following parts.

(i) Connection points of suction, discharge port of oil pump and banjo connection, especially looseness of banjo bolt.
(ii) Connection point, banjo bolt and pipe.

(2) Inlet pipe
Loosen the banjo bolt of the oil pump suction side and fill the pipe with oil until no bubbles appear.

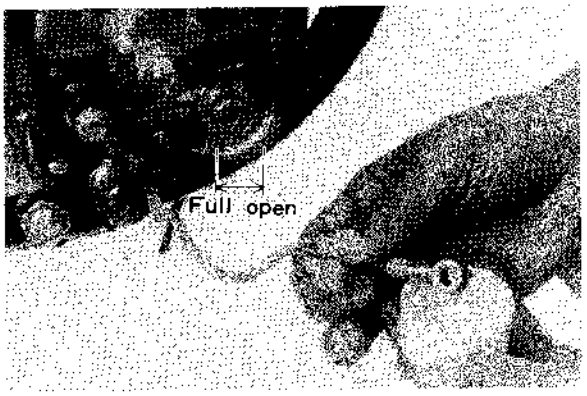


Fig. 3-136

b. Check valve

If check valve is pressed in the direction of the arrow by a pressure of more than 0.3 kg/cm² (4 lbs/in²), oil flows to the arrow direction and will not flows backwards. Thus, the check valve stops oil flowing when the engine stops. Avoid disassembly of the check valve. If it is assembled carelessly, it will not perform its function.

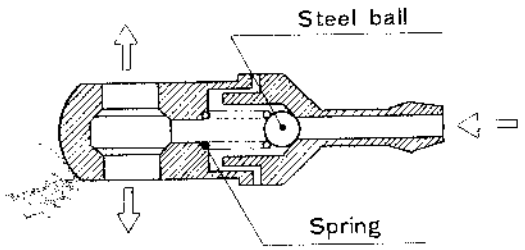


Fig. 3-137

19. Carburetor

1) Construction and Function

The carburetor consists of a float mechanism for maintaining the fuel in the carburetor at a constant level a pilot system for supplying fuel during low-speeds, a main fuel system for supplying fuel during medium and high speeds, and a starter system for feeding a gas mixture of special concentration required when starting the engine.

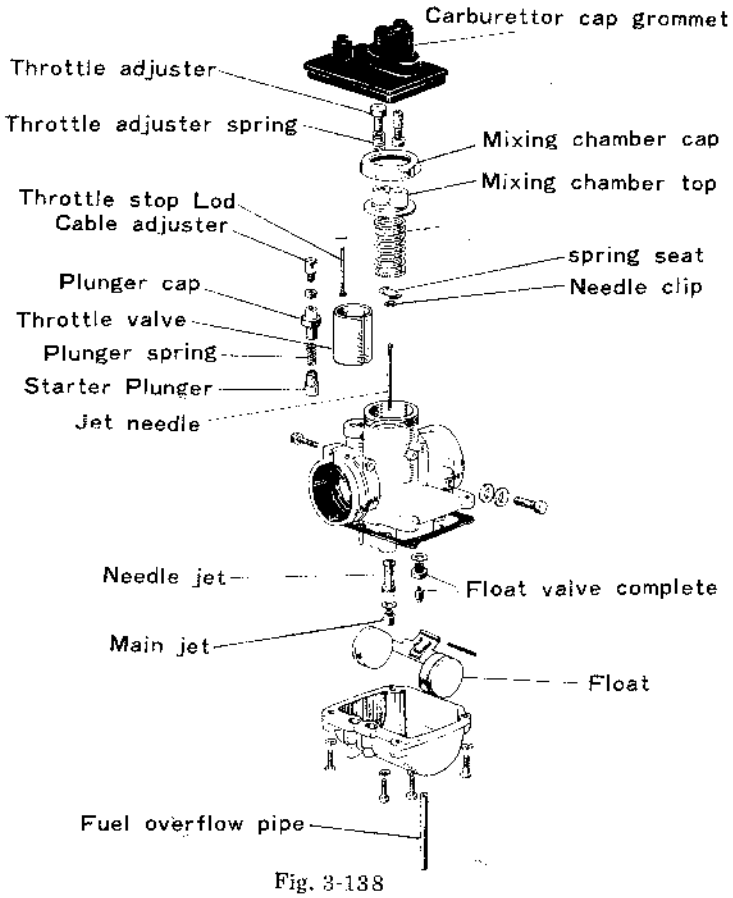


Fig. 3-138

a. Float mechanism

In the float chamber, the floats, the needle valve and the related parts are assembled to maintain the specified fuel level during running. In case the fuel level varies when the motorcycle is banked or rapidly accelerated or climbing, the fuel air mixture ratio will be effected resulting in lowering the engine performance. The fuel flow into the float chamber through the needle valve raises the fuel level to the specified position. At the same time the floats are also lifted up and press the valve needle on the valve seat stopping the fuel flow into the chamber. The fuel level is thus maintained. Two types of floats are available; one is the double float type with two floats symmetrically mounted on the float arm, and another is the separated type (F5) with floats separated each other.

b. Pilot system

The pilot system is composed of the pilot jet (8), the pilot air screw (7), and the pilot outlet (9) as shown in Fig. 3-139. At idling and low speeds, the throttle valve is in an almost closed position and accordingly, the air is sucked in mainly through the pilot air inlet (6). The amount of air coming through the pilot air inlet is adjusted by means of the pilot air screw (7) (tapered end). The air is then mixed with the fuel drawn up through the pilot jet (8) into a rich air-fuel mixture. The mixture is jetted from the pilot outlet (9) into the main bore, where it is further mixed with a small amount of air into a proper air-fuel mixture, which is then drawn into the engine.

c. Main fuel system

The main fuel system, as shown in Fig. 3-139, is made up of the main jet (3), the needle jet (4), the jet needle (2), and the air jet (5). When the throttle valve opens more than about one-eights of its full opening, the air begins to be drawn in chiefly through the main air suction port (1), passing under the throttle valve through the main bore. At this time this air stream causes a negative pressure to be built up around the jet needle (2), leading the fuel to the main bore after passing through the main jet (3) and a gap between the needle jet (4) and the jet needle (2). A part of the air bleed past the air jet (5) goes through the needle jet bleed-air inlet (16) into the needle jet, where the air is mixed with the fuel coming up from the main jet. The air-fuel mixture is led into the main bore after thus passing the main fuel system and is further mixed with the main air and atomized to be fed into the engine.

In the carburetor of F series, the main jet holder is placed outside the float chamber. The main jet can be changed by removing the carburetor cover plug from outside the engine, without removing the float chamber and the carburetor cover.

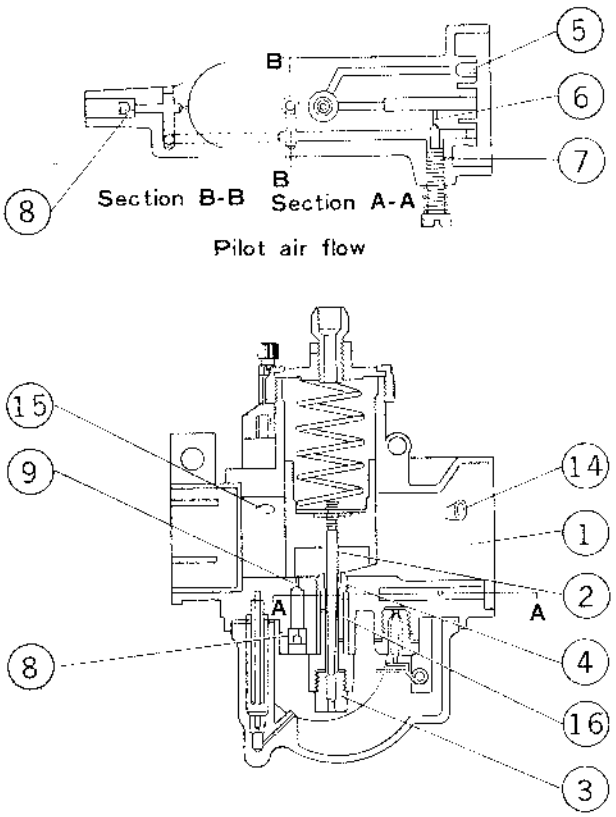


Fig. 3-139

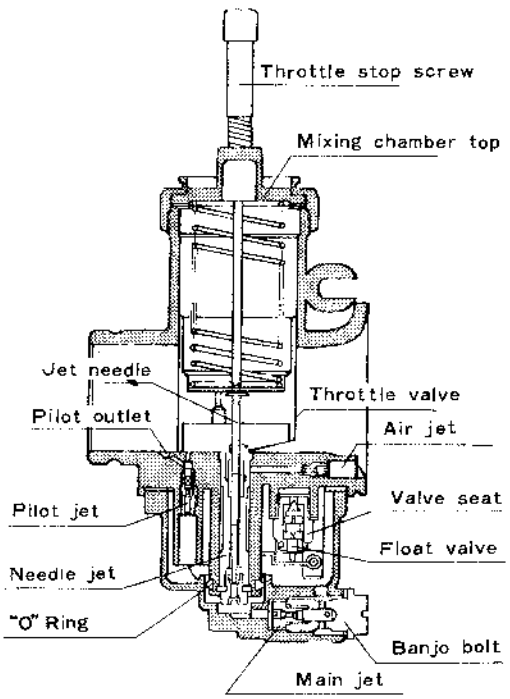
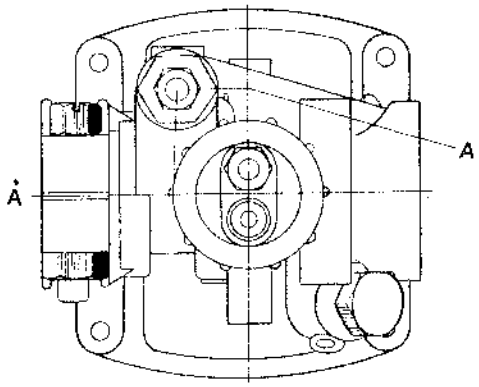


Fig. 3-140

d. Starter system

The starter jet system is used as a subsidiary device for starting the engine easily when it is cold instead of using a choke valve as in 4-stroke engines or old-fashioned 2-stroke engines. Push the starter lever fully in the direction of the arrow, and the starter plunger (13) shown in Fig. 3-141 is pulled upward. With the plunger in this state, start the engine (throttle must be fully closed), and the fuel is drawn upward by the negative pressure established by the suction, through the starter jet (10) and is mixed with the air inside the float chamber (12) coming from the bleed-air port (11). The air-fuel mixture is further mixed with the starter primary air coming in through the passage (14), being jetted out from the port (15) at the back of the throttle valve into the main bore and finally drawn into the engine. (At this time, this mixture is also mixed with the main air-fuel mixture flowing from the pilot system into the main bore.) The conventional two-stroke engine with a choke valve has such a disadvantage that the suction negative pressure at the time of engine starting is smaller than in the four-stroke engine, resulting in unsatisfactory choke valve operation. Another disadvantage lies in the fact that the driver must become accustomed to throttling operation in order to obtain a proper throttle opening.

On the other hand, this starter system provides a fuel mixture rich enough for engine starting if only proper selection is made of the starter jet. With an operation unlike that of the choke valve system, the starter lever and the throttle are simply kept fully opened when the driver can expect an adequate starting operation.



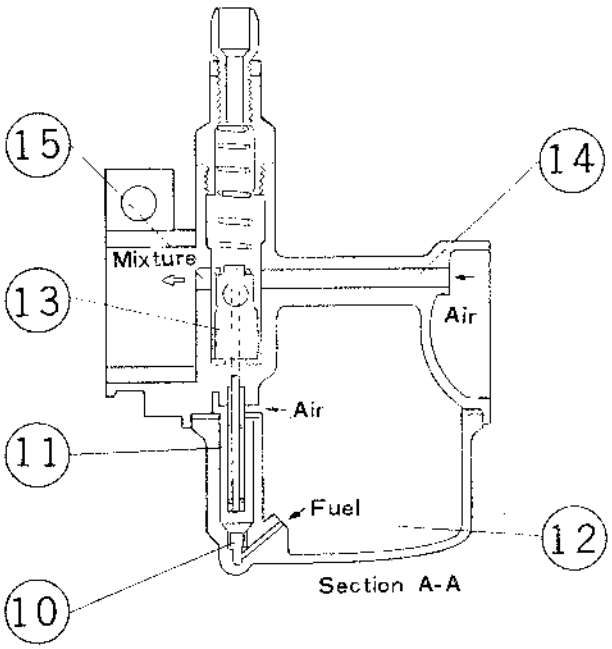


Fig. 3-141

2) Setting table

Table 3-25

Model	Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Cut Way	Air Screw
GA1-A GA2-A G3SS-A	VM19SC	160	E-4	51 2-3	17.5	2.0	1 1/2
G3TR-A	VM19SC	170	0-2	4L 6-3	17.5	2.5	1 3/4
G4TR	VM19SC	180	E-6	5I 1-3	17.5	2.5	1 3/4
G31M-A	VM24SC	180	0-6	4DG 6-3	35	3.0	1 1/2
B1L-A	VM22SC	190	0-0	4L 6-2	30	2.0	1 1/2
F6	VM24SC	125 R	0-2	4J 13-3	25	2.5	1 3/4
F7	VM26SC	105 R	0-2	4EJ 3-3	30	2.5	1 1/2
F8	VM30SC	117.5 R	0-8	5EL 9-2	30	2.5	1 3/4
F81M	VM30SC	130 R	0-6	5EH 7-3	40	2.5	1 1/4
F5	VM32SC	132.5 R	0-8	5FL 11-2	35	2.5	1 1/4

Note: For F5, the spare part MJ #127.5 is available.
For F21M, Spare part MJ's #125,#127.5 #132.5 #135 are available.

The above setting table is based on many tests covering all the conditions usually expected, therefore, it is not necessary to adjust the setting for normal conditions. Carburetor adjusting given in paragraph III- 3) are for special conditions. Avoid adjusting the setting of carburetor unless it is absolutely necessary.

3) Adjusting carburetor

Carburetor adjusting is generally not necessary except for adjusting idling speed by turning the throttle adjuster. Adjustments at various throttle valve openings given here are for special conditions such as for improving fuel consumption, riding in high altitudes and for racing after tuning up the engine.

Note: "Opening" of throttle valve stated in this section indicates the proportion of throttle valve opening "a" against "b" as shown in Fig. 3-142.

Example:
full throttle opening a/b=1
throttle closed a/b=0

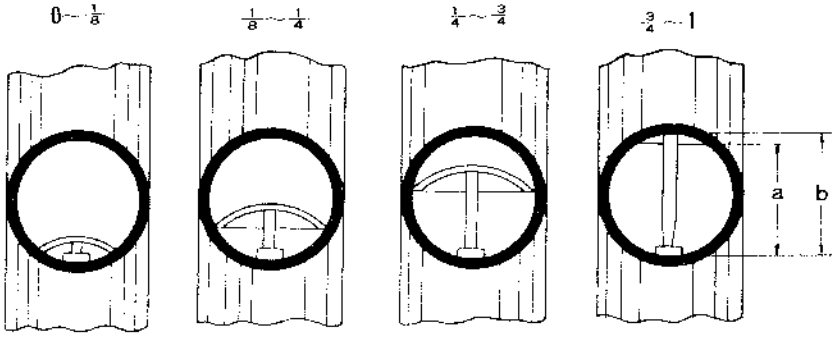
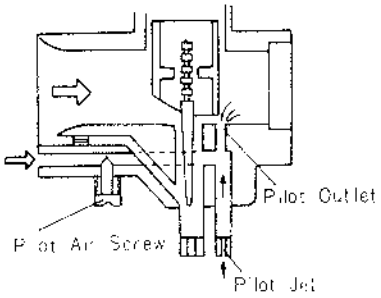
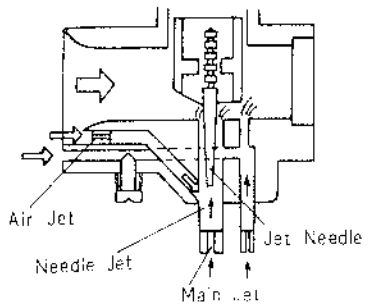
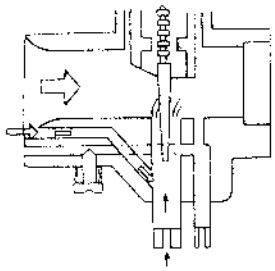
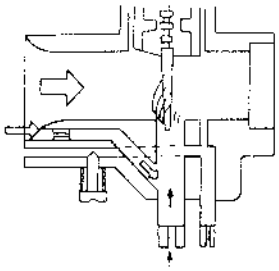


Fig. 3-142

Opening & Running Condition	Adjusting
0 1/8 Idling 	(1) Adjust after warming up engine. (2) Shut off throttle valve before adjusting. (3) Raise engine speed a little by turning out throttle adjuster. (4) Turn air screw in and out until engine attains highest speed. (5) Lower engine speed to normal idling speed by turning in throttle adjuster. (6) Repeat steps (4) and (5) alternately until engine idling is stable.
1/8 1/4 Increasing speed 	In case engine does not increase speed smoothly when opening throttle valve from idling, turn air screw in to make mixture a little richer. If above defect was due to lean mixture, turning air screw in will make up for it. In case defect remains after adjusting air screw, return the air screw and replace the throttle valve with one which has smaller cut-away. On the contrary, if engine turns heavy due to rich mixture, use throttle valve which has larger cut-away.
1/4 3/4 Normal speed 	Mixture can be adjusted by changing the jet needle clip position to higher groove or lower groove. Clip in higher groove gives a leaner mixture and clip in lower groove gives a richer mixture as compared to original position.
3/4 Full speed 	In case engine performs better when pulling the starter lever or backing off the throttle grip a little, change the main jet to lager number one to raise mixture ratio. On the contrary, if engine turns heavy or has too much smoke at exhaust muffler, change the main jet to smaller number one.

Note: Pilot air screw can be adjusted by backing the screw out from the completely screwed in position. Pilot air screw setting is stated in number of turns backed out.
If the pilot air screw is backed out correctly, idling speed can be usually adjusted by only turning the throttle adjuster in and out.

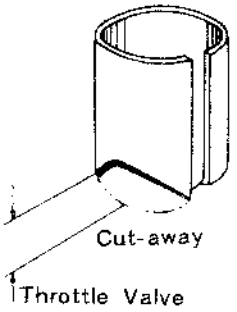


Fig. 3-143

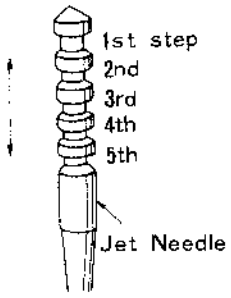


Fig. 3-144

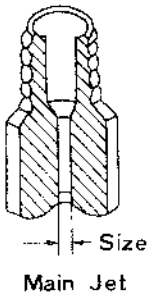


Fig. 3-145

a. Notes on adjusting

(1) To decrease fuel consumption at low speeds, turn the pilot air screw out a little from standard setting position. Be careful not to turn it out excessively to prevent engine from misfiring at low speeds.

(2) For improving fuel consumption at medium speed, it is effective to change the needle jet clip position to one step higher. Be careful not to induce engine over-heating due to lean mixture especially at more than 1/2 throttle opening.

(3) As for influence of altitude, it becomes approximately 12% richer at 2,000 meters and 20% at 3,000 meters. It is better to change main jet to smaller number one in accordance with altitude.

Note: Gasoline flow is appromixately in proportiaon to main jet number.

(4) Main jet has influence not only over 3/4 to full throttle openings but also over a considerably wide range. In case of changing the main jet, be careful that it does not affect other speeds.

b. How to Check mixture

It is not easy to check whether the mixture is rich or lean without special skills.

Followings are typical cases indicating rich and lean mixtures.

Rich

Too much exhasut smoke.

Engine turns heavy with some misfiring.

Spark plug is fouled and becomes black with carbon deposit.

Engine performs worse as warmed up.

Lean

Engine overheats.

Revolution not smooth when idling.

Poor acceleration.

Engine performs better with starter lever open.

Engine, rpm is unsteady at constant throttle valve opening.

Spark plug burns and becones white.

c. Adjusting Summary

Throttle Opening	Part	Rich	Lean
0 ∿ 1/8	Pilot air Screw.	Turn out.	Turn in.
1/8 ∿ 1/4	Cut-away of Throttle valve.	Use larger cut-away.	Use smaller cut-away.
1/4 ∿ 3/4	Clip on Jet Needle.	Clip one step higher.	Clip one step lower.
3/4 ∿ 1	Main Jet.	Use smaller number.	Use larger number.

Note: Adjusting pilot air screw and jet needle clip is sufficient for most purposes.

4) Fuel Level Adjustment

It is necessary to keep the fuel level in the float chamber at the specified position in order to work the carburetor on its best performance.

Remove the float chamber body, turn the mixing chamber body over and measure the distance, as shown in Fig. 3-146. between the gasket fitting surface of the mixing chamber body and the top of the float. The fuel level is proper if the measured value meets the value in the following table.

Model F5 employs a separate float system in order to aid the features as off-the-road motorcycle. In this case, measure the distance in a manner as shown in Fig. 3-147. The actual fuel level will be 32 m/m high (a prescribed value) when the measured value is 11 m/m.

Note: Although the fuel level can be set approximately by adjusting measurement "A" as explained above, the actual fuel level of an assembled carburetor is a little difficult to measure. "Fuel level" is defined as the measurement taken from the center of the main bore to the surface of the gasoline in the float chamber, with the carburetor held horizontal. To make a true measurement of this level, proceed as follows:

1. Drill a hole in the bottom of the float chamber, and thread it so that a plug can be fitted into it after completion of measurement.
2. Attach a clear plastic hose to the hole, and curve the hose up so that its top is higher than the fuel level.
3. Measure the vertical distance from the gasoline level in the hose, to a horizontal line drawn from the center of the main bore.

Table 3-26 Float Level

Model	G Series	G31M-A	B1L-A	F6 F7	F8 F81M	F5
Actual level	1.10 ± .04 in 28 ± 1 mm	1.10 ± .04 in 28 ± 1 mm	0.91 ± .04 in 23 ± 1 mm	1.10 ±.04 in 28 ± 1 mm	1.34 ±.04 in 34 ± 1 mm	1.26 ±.04 in 32 ± 1 mm
Measurement "A"	0.94 ±.04 in 24 ± 1 mm	1.04 ±.04 in 26.5 ± 1 mm	1.01 ±.04 in 25.7 ± 1 mm	1.04 ±.04 in 26.5 ± 1 mm	1.00 ±.04 in 25.5 ± 1 mm	0.43 ±.04 in 11 ± 1 mm

Fuel level method for other models

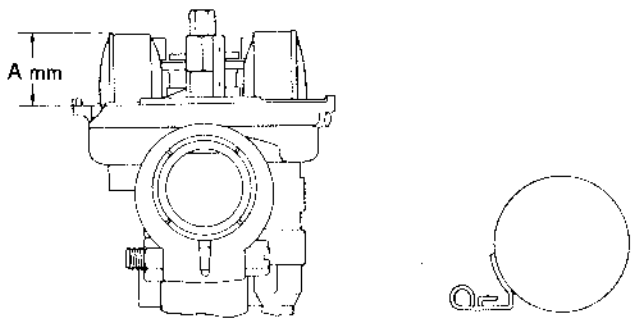


Fig. 3-146

Fuel level mothod for Model F5

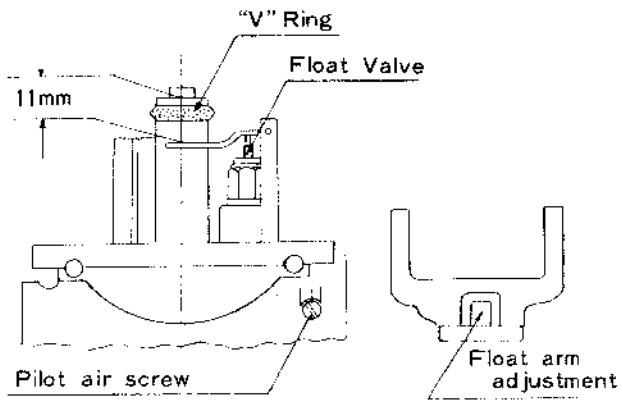


Fig. 3-147

20. Drain Pump

1) Construction

The drain pump attached to the outside of the crankcase, which is used in Models F5 and F7. has been developed and incorporated to discharge gasoline and oil which may accumulate inside, the carburetor chamber. Thus, the possibility of unwanted gas and oil being sucked into the carburetor and engine is minimized.

The following figures are the parts breakdown and the cross section of the drain pump.

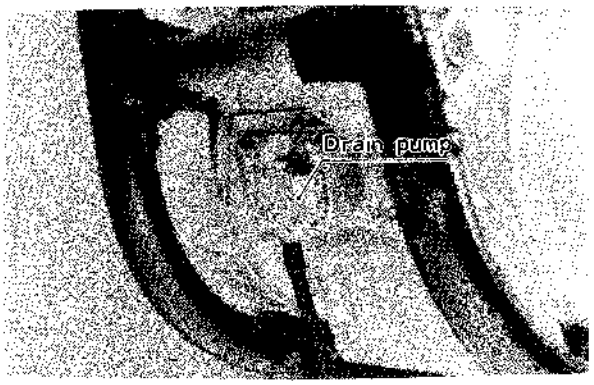


Fig. 3-148

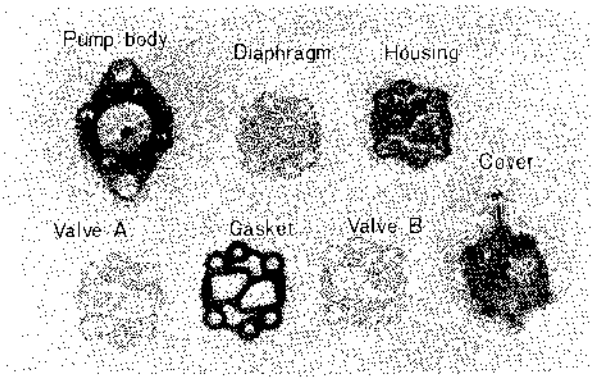


Fig. 3-149

2) Operation

When the piston moves up in the cylinder making the crankcase pressure negative, the diaphragm between the body and the housing is pulled in, consequently, the inlet reed valve "A" on the suction side moves in the direction of the dotted arrow, which results in sucking the contents inside the carburetor chamber into the chamber "C". At the same time, the exhaust reed valve "B" in turn closes in the direction shown with the dotted arrow and prevents any air form being sucked into the chamber "C".

When the piston moves down in the cylinder, pressurizing the crankcase, the diaphragm is pushed out.

Then, the exhaust valve "B" opens the passage to the exhaust hose, releasing the contents of chamber "C". The inlet valve "A" shuts off the suction passage, moving in the direction of the arrow mark.

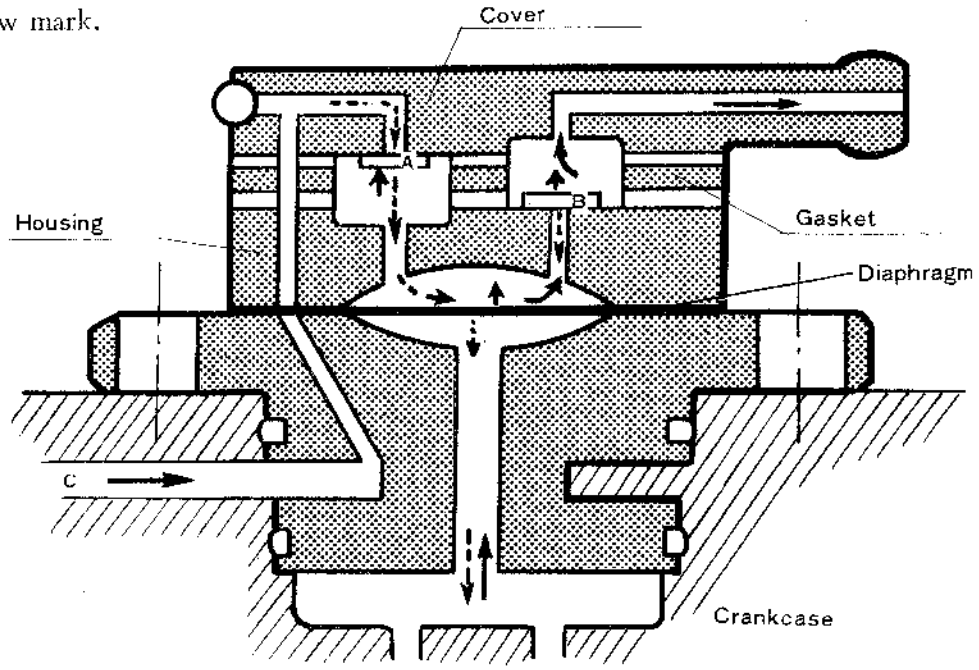


Fig. 3-150

Ⅳ. MAINTENANCE OF FRAME COMPONENTS

1. Frame Compoments
2. Handlbars
3. Wheels Brake Drums
4. Brakes
5. Frant Fork
6. Steering Stem
7. Rear Shock Absorber
8. Front fender, Rear fender
9. Swinging Arm
10. Fuel Tank, Oil tank and Fuel Cock
11. Dual Seat
12. Center Stand Side Stand and Foot Rests
13. Exhaust Pipe and Muffler
14. Drive Chain

1. Frame components

The chassis can be divided roughly into the following components.

1) Frame
2) Handlebars and Grips
3) Front Fork and Front Fender
4) Front Wheel
5) Front Hub
6) Rear Fork
7) Rear Cushion Unit
8) Rear Hub
9) Rear Wheel
10) Footrests, Pedals and Stands
11) Fuel Tank
12) Oil Tank
13) Seat
14) Side Cover and Chain

2. Handlebars

1) Construction

The handlebar is constructed of solid-drawn steel pipe. It is designed for long-distance, high-speed driving and for the safety of the driver. The right-hand of the handlebar is provided with a rear view mirror, a front brake lever, a throttle grip, and the right grip set containing a flasher lamp switch. The left-hand is equipped with a starter lever, a clutch lever, and the left grip set containing a headlight switch and a horn switch. The wiring of the right and left grip assemblies enters the head lamp, where all wires are connected to the wiring harness.

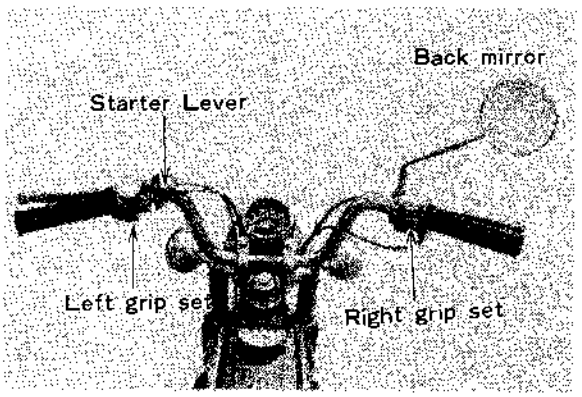


Fig. 4-1

2) Disassembly

a. Removal of clutch cable

Loosen the clutch cable lock nut and turn in the adjusting bolt to provide the clutch inner wire with sufficient slack to remove the clutch cable from the clutch lever.

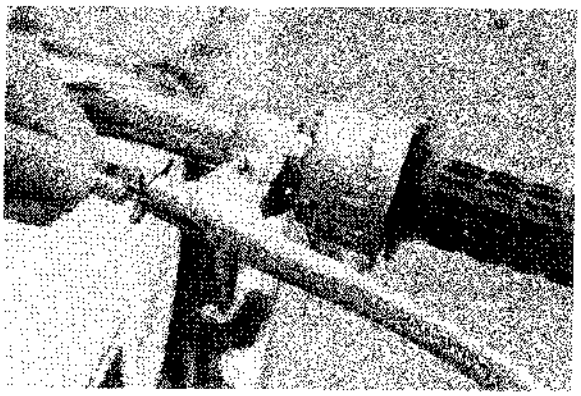


Fig. 4-2

b. Removal of front brake

Loosen the adjusting nut of the front brake, remove the brake cable from the brake lever.

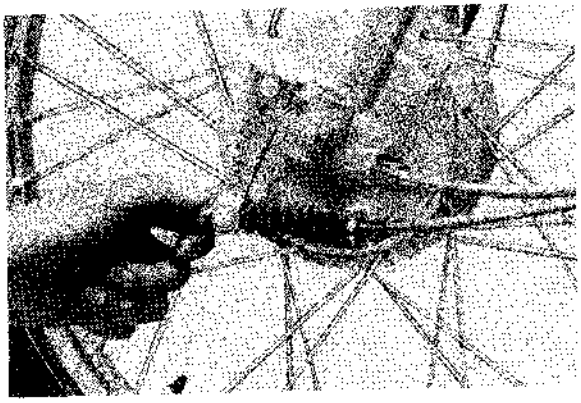


Fig. 4-3

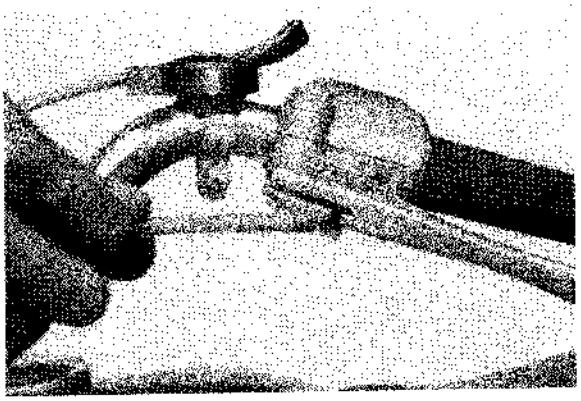


Fig. 4-4

Model F series

The stop lamp switch is built into the front brake cable. Disconnect the stop lamp switch lead (in the head lamp) from the main wire harness before removing the cable.

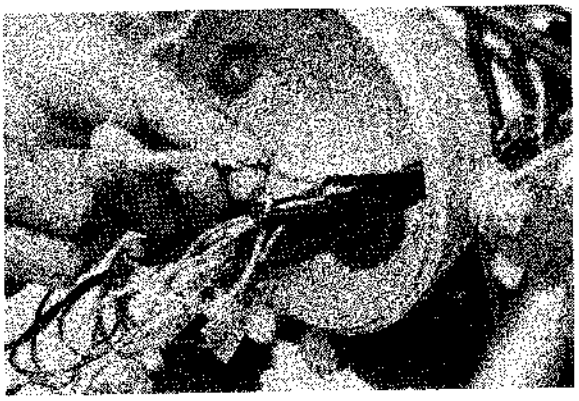


Fig. 4-5

c. Removal of throttle cable

Disassemble the R.H. case assembly (the throttle grip holder) and remove the control cable.

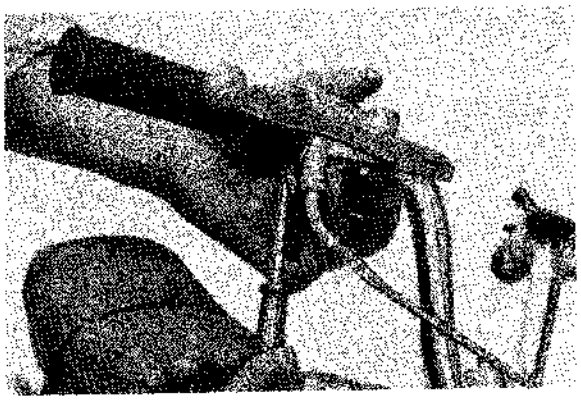


Fig. 4-6

d. Removal of starter cable

Disassemble that starter lever and remove the starter cable.

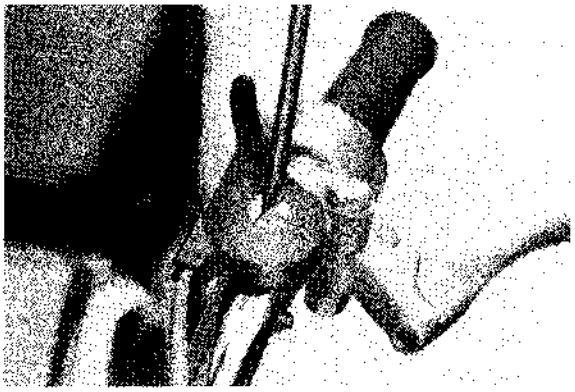


Fig. 4-7

Model F series and G4TR

The throttle cable and the starter cable are built into the R.H. throttle assembly.

e. Disassembling L.H. case assembly

Remove the connectors of each lead for the horn, flasher and head light from the main wire harness inside the head lamp, and disassemble the L.H. case assembly.

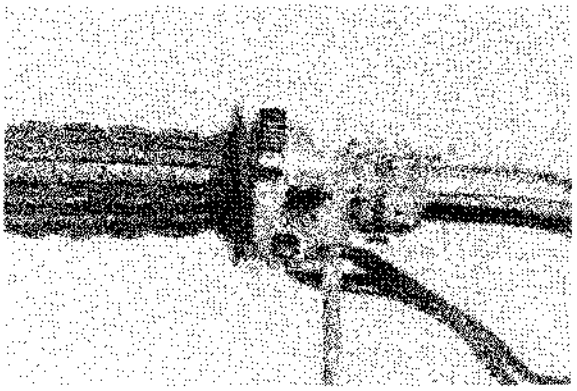


Fig. 4-8

f. Removing the handlebars

Take off the upper holder, remove the handlebars from the upper bracket.

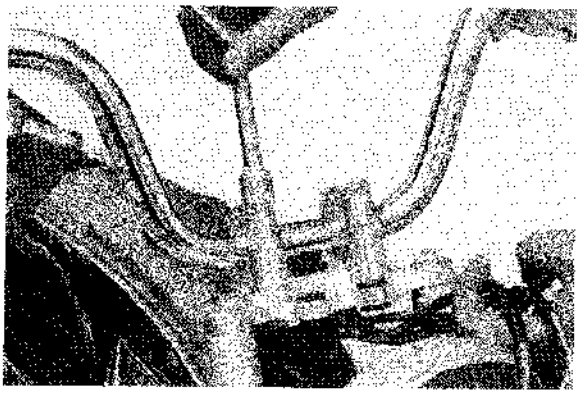


Fig. 4-9

3) Inspection

Check to see if the handlebar is bent or cracked. Straighten it, or replace if required.

4) Assembly

a. Reverse the disassembly procedure.

b. Install the handlebars along the fitting angle of the front fork.

c. After attaching the cord protector to the head lamp, pass the wire harness through it.

d. Tighten the handlebar fitting bolts with a torque wrench, referring to paragraph VI-3 for torque value.

5) Adjustment

a. Adjust play of the throttle grip, clutch lever, and starter lever. For individual steps of adjustment, refer to paragraph II-5.

b. Adjust play of the front brake lever to 0.8 to 1.2 in (20 to 30 mm) by means of brake cable adjusting nut on the brake panel.

3. Wheels, brake drum

1) Construction

The wheel consists of the tire, tube, rim, spoke, hub, etc.

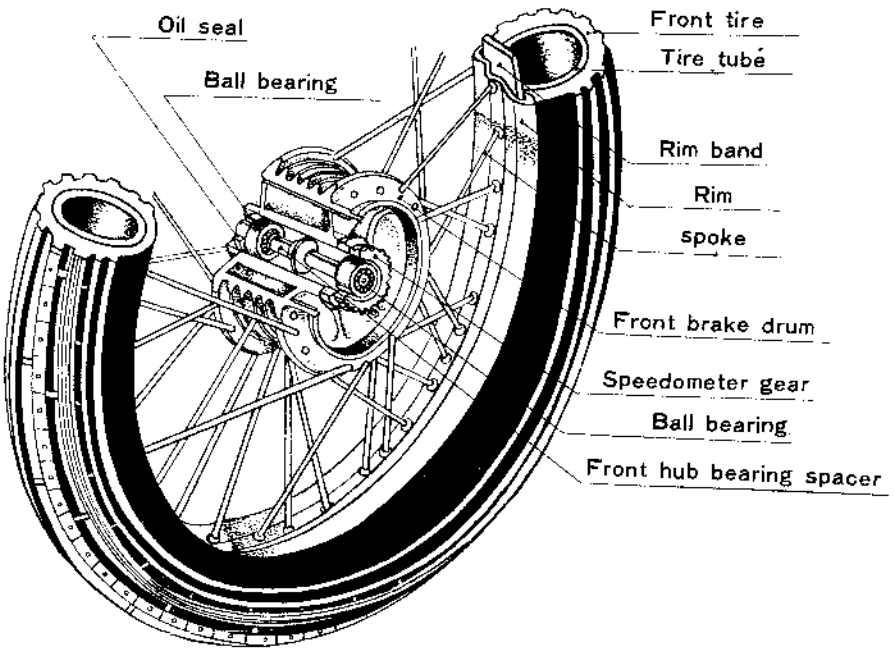


Fig. 4-11

a. Tire construction

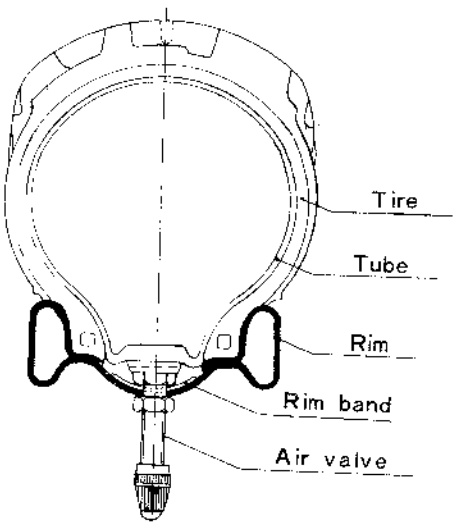


Fig. 4-12

These parts of the tire have the following respective functions. The crown contributes to driving and braking in the case of ordinary running. The shoulder part contributes to road holding when negotiating a curve. The side wall functions as a cushion. The bead section is for assembly with the rim. The cross section of the tire, shows that the surface is made of tread rubber under which there is a cushion layer and a cord layer which is called a carcass. In the innermost part, there is an inner lining to make the tube slide smoothly. There are various kinds of patterns in the treads of the tires.

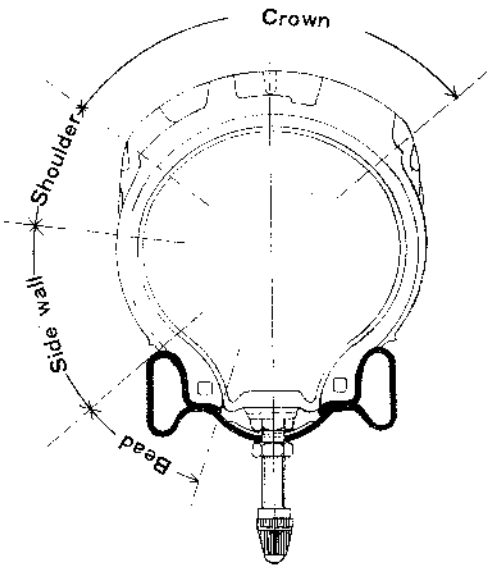


Fig. 4-13

There are many knife cuts on the tread. Water is exhausted through them when there is water between the tire and the road surface.

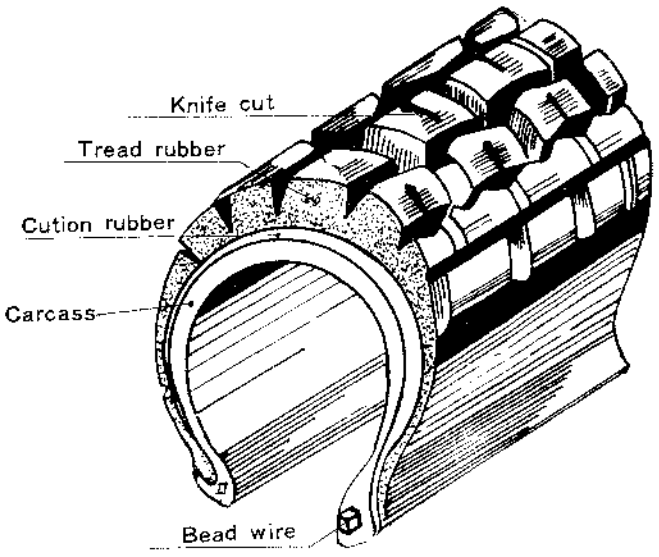


Fig. 4-14

b. Rim

The tire is held on the rim with the elasticity of the bead and tire tube is pressed directly on to the rim by air pressure. To protect the tube, a rim band is provided between the rim and tire tube. The rim of F5 is made of aluminum to lighten the weight for off road riding.

c. Sokes

The spokes support the weight of the motorcycle and load. The head of the spoke is inserted into the rib of the brake drum and tightened inside the rim as the figure shows. The spokes in (A) support the weight of the motorcycle and other loads; spokes (B) work when the wheel turns forward; spokes (C) absorb shock when braking.

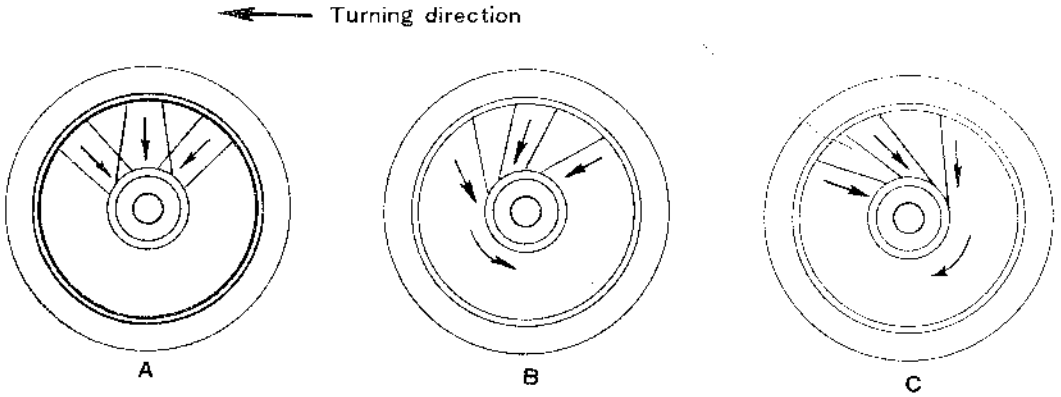


Fig. 4-15

Table 4-1 Tire specifications

Model	Tire Size		Tire air Pressure	
	Front	Rear	Front	Rear
GA1-A GA2-A	2.50-18 4PR	2.50-18 4PR	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
G3SS-A	2.75-18 4PR	2.75-18 4PR	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
G3TR-A	2.75-18 4PR (Trial)	2.75-18 4PR (Trial)	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
G4TR	3.00-18 4PR (Knobby)	3.00-18 4PR (Knobby)	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
G31M-A	3.25-18 4PR	3.25-18 4PR	14 lb/in² (1.0 kg/cm²)	14 lb/in² (1.0 kg/cm²)
B1L-A	3.00-16 4PR	3.00-16 4PR	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
F6	3.00-18 4PR (Knobby)	3.25-18 4PR (Knobby)	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
F7	3.00-19 4PR (Knobby)	3.50-18 4PR (Knobby)	23 lb/in² (1.6 kg/cm²)	28 lb/in² (2.0 kg/cm²)
F8	3.25-19 4PR (Knobby)	4.00-18 4PR (Knobby)	24 lb/in² (1.7 kg/cm²)	31 lb/in² (2.2 kg/cm²)
F81M	3.00-21 4PR (Knobby)	4.00-18 4PR (Knobby)	14 lb/in² (1.0 kg/cm²)	14 lb/in² (1.0 kg/cm²)
F5	3.00-21 4PR (Knobby)	4.00-18 4PR (Knobby)	24 lb/in² (1.7 kg/cm²)	31 lb/in² (2.2 kg/cm²)

Note: Tire air pressures for the G31M-A and the F81M indicate the figures for motocross racing.

Table 4-2 Rim and spoke specifications

Models	Rim Size		Spoke Size	
	Front	Rear	Front	Rear
GA1-A,GA2-A	1.40 x 18	1.40 x 18	0.126 in (3.2 mm)	0.126 in (3.2 mm)
G3SS-A,G3TR-A	1.6A x 18W	1.6A x 18W	0.126 in (3.2 mm)	0.126 in (3.2 mm)
G31M-A	1.85B x 18W	1.85B x 18W	0.126 in (3.2 mm)	0.126 in (3.2 mm)
G4TR	1.6A x 18W	1.6A x 18W	0.126 in (3.2 mm)	0.126 in (3.2 mm)
B1L-A	1.60A x 16	1.60A x 16	0.126 in (3.2 mm)	0.126 in (3.2 mm)
F6	1.60A x 18W	1.85B x 18W	0.126 in (3.2 mm)	0.138 in (3.5 mm)
F7	1.60A x 19W	1.85B x 18W	0.138 in (3.5 mm)	0.138 in (3.5 mm)
F8	1.85B x 19W	1.85B x 18W	0.138 in (3.5 mm)	0.138 in (3.5 mm)
F81M, F5	1.60A x 21W	1.85B x 19W	0.138 in (3.5 mm)	0.138 in (3.5 mm)

Note: Number of spoke is 36 x 36 in all models.

d. Beed protector

Since the Model F series motorcycle is designed as a high-speed motorcycle, the front wheel (except F6, F7) and the rear wheel are equipped with a bead protector to prevent the tire and rim from slipping. Therefore the tire will not damage the mouthpiece section of the tube when braking during high-speed running.

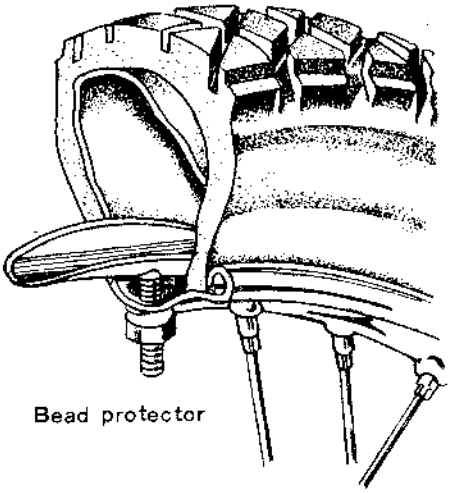


Fig. 4-16

e. Wheel balancing

(1) In order to balance the wheel for high speed running, the spokes are provided with balance weights.
When the wheel turns at high speeds, centrifugal force is generated in the wheel according to the square of the speed. Therefore, in an unbalanced wheel, the tire violently beats the road surface or jumps; (it often appears as vibration to the right and left) and safe running is not assured. Since this very dangerous, especially in heavy motorcycles, weights are applied to balance the wheel.

(2) Before balancing, ensure that the wheel is completely free and rotates easily. With the wheel clear of the ground, spin it slowly and allow it to stop on its own. If it is out of balance, attach balance weights to the lighter spokes as required. Ascertain the balance, and try to shift the weight until it is completely balanced.

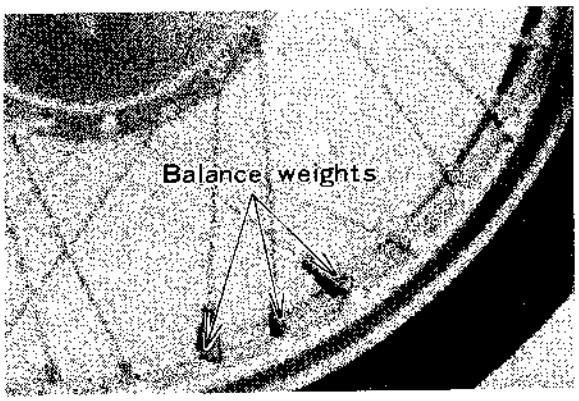


Fig. 4-17

f. Front hub

The front hub consists of the brake drum which plays a part as the axis and support of the front wheel, brake panel with the brake mechanism and brake shoes. Bearings are inserted into each side of the hub shaft hole. The brake drum is cast inside the hub and functions on the braking surface of the brake shoe. The speedometer gear and pinion are installed inside the brake panel. The rotation of the front wheel is transmitted to the speedometer through the speedometer cable.

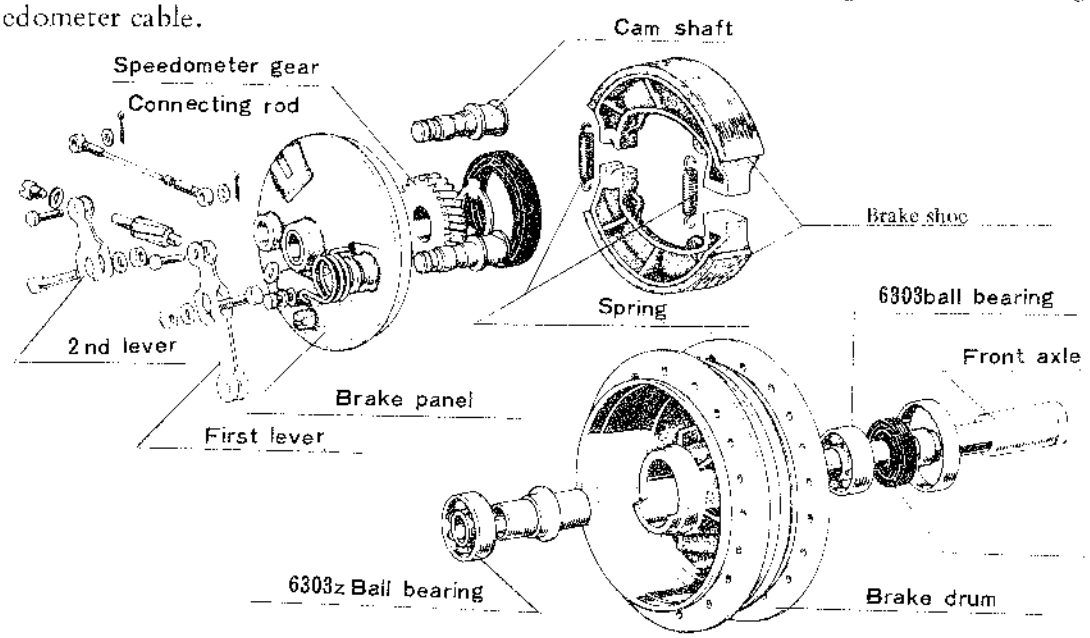


Fig. 4-18

g. Rear hub

The rear hub consists of three parts; they are the rear brake drum which acts as the bearing support section of the rear wheel, the rear brake panel equipped with the brake mechanism, and the sprocket coupling, which receives the engine power and drives the rear wheel. The brake panel is installed in the right side of the rear brake drum, and the coupling in the left side. The structure of the rear brake drum is similar to that of the front. The bearing and oil seal are inserted into the hub shaft hole of the coupling. In addition, the sprocket is mounted with bolts in this coupling.

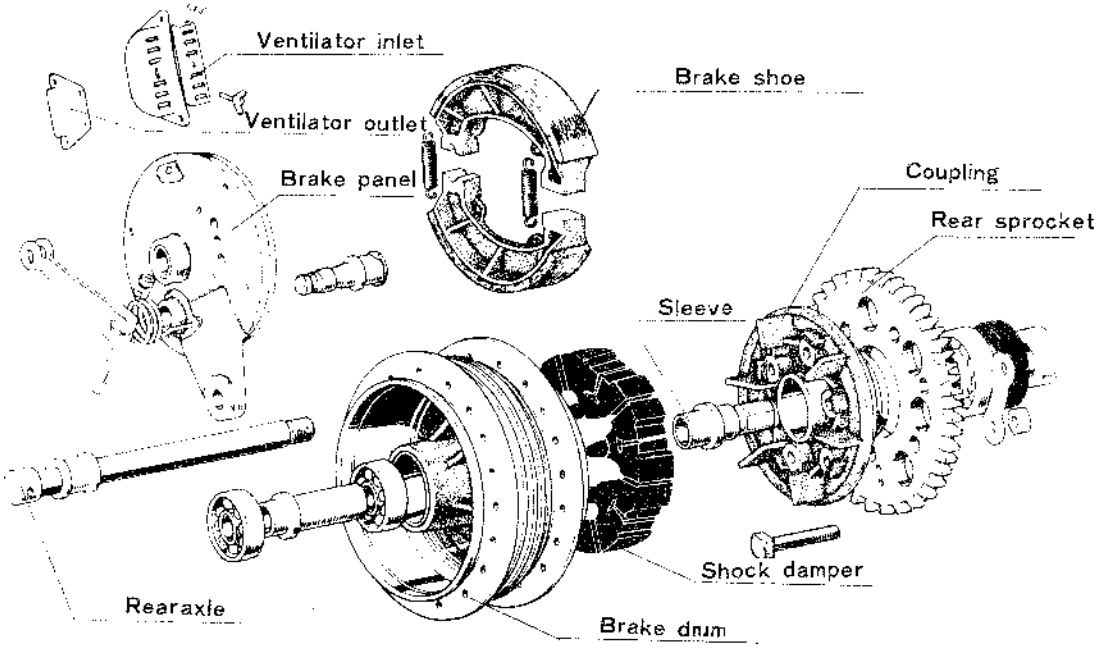


Fig. 4-19

To lighten the weight, the rear sprocket is directly installed to the hub, so there is no damping effect for torque fluctuation of engine. The rear sprocket of the F5 is made of aluminum to reduce the weight further.

Recommended bearings and oil seals

Table 4-3 Front hub

Model	Bearing		Oil seal	
	Brake drum	Front panel	Brake drum	Front panel
G Series	# 6200	# 6300Z	15 31 9.5 D	PJN 43587
G31M-A	# 6301	# 6301Z	18 38 10	—
B1L-A	# 6202	# 6202Z	AJN 22357	PJN 48627
F6, F7	# 6301	# 6301Z	18 38 10	PJN 48627
F8, F81M, F5	# 6202	# 6202Z	AJN 22357	PJN 48627

Table 4-4 Rear hub

Model	Bearing			Oil seal
	Brake drum panel end	Brake drum coupling end	Coupling	Coupling
GA1-A GA2-A G3TR-A G4TR	# 6301Z	# 6201	# 6203	PJN 25406
G3SS	# 6301Z	# 6301	—	PJN 18376
G31M-A	# 6302Z	# 6202	# 6004	AJN 26428
B1L-A	# 6202Z	# 6202	# 6004	AJN 26428
F6, F7	# 6302Z	# 6302	—	AJN 26428
F8,F81M,F5	# 6303Z	# 6303	—	# 25478

2) Wheel removal

a. Front wheel

(1) First of all, loosen the brake adjusting nut and remove the brake cable. Next loosen the speedometer cable nuts with pliers and remove the speedometer cable.

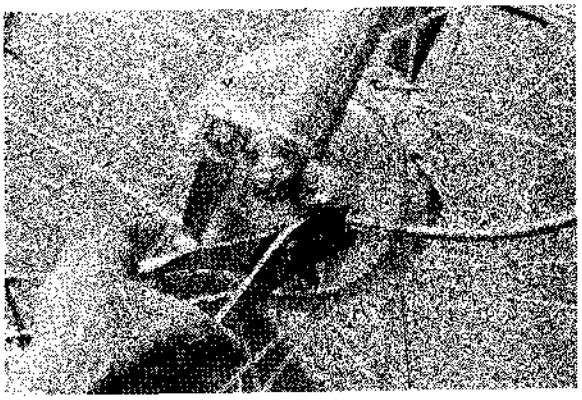


Fig. 4-20

(2) Place a stand under the engine and loosen the front hub shaft nut on the side of front brake panel to pull out hub shaft.

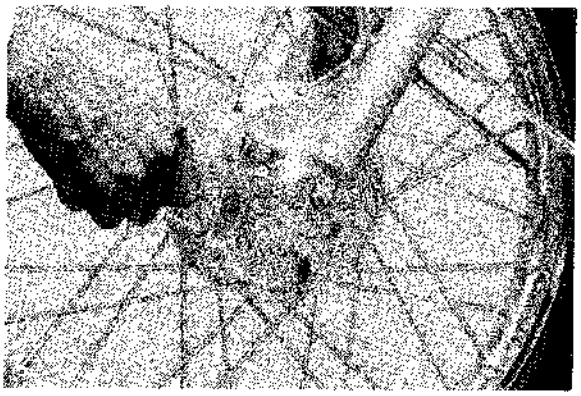


Fig. 4-22

Caution: Do not remove the hub shaft nut, becasue it is caulked in the hub shaft.

On F5, F8 and F81M, the torque arm is separated from the front fork. Remove them when removing the front wheel.

b. Rear wheel

(1) Remove the brake adjusting nut and brake inner wire from lever, applying foot brake.

(2) Remove torque arm, loosening mounting nut and locking pin.

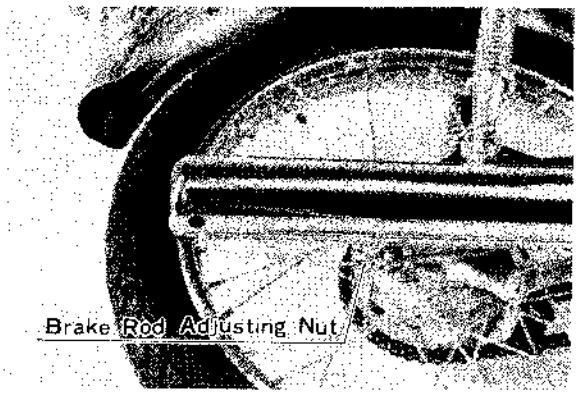


Fig. 4-23

(3) Loosen chain cover fitting screw with a phillips screwdriver and remove chain cover. Next remove clip from master link with pliers to remove chain.

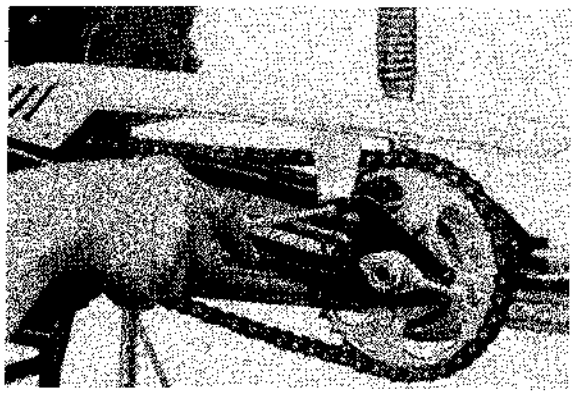


Fig. 4-24

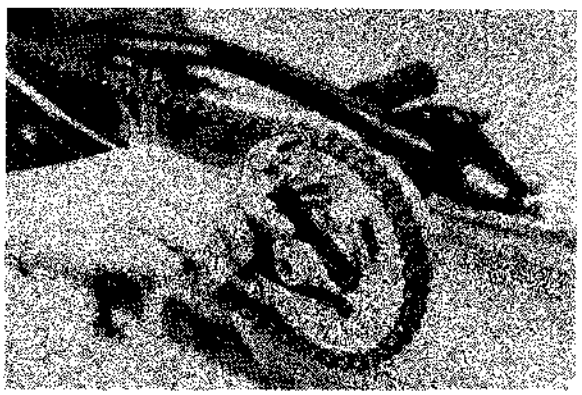


Fig. 4-25

Note: In the case of GA and B1L, it is unnecessary to remove the chain for servicing the rear brake drum.

(4) Pull the rear hub shaft out of the rear wheel, after loosening the mounting nut on the sprocket side.

Note: Do not remove hub shaft nut, because it is caulked.

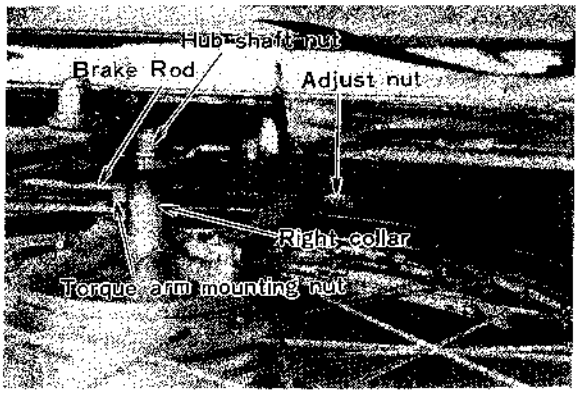


Fig. 4-26

(5) Remove the distance collar and remove the wheel with brake panel, holding the frame leaning to the left side.

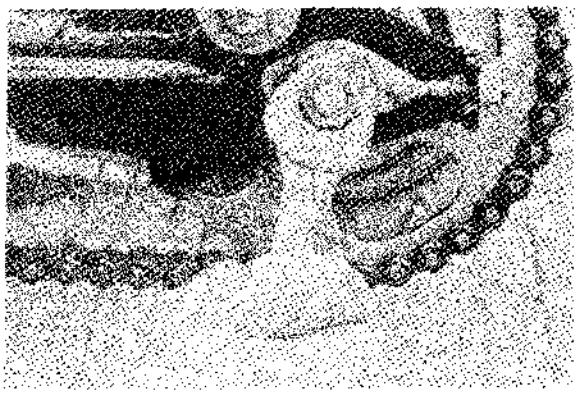


Fig. 4-27

3) Disassembly

a. Brake shoe

Remove both brake shoes by inserting a screwdriver or similar tool between one brake shoe and the brake panel and pushing out the brake shoe.

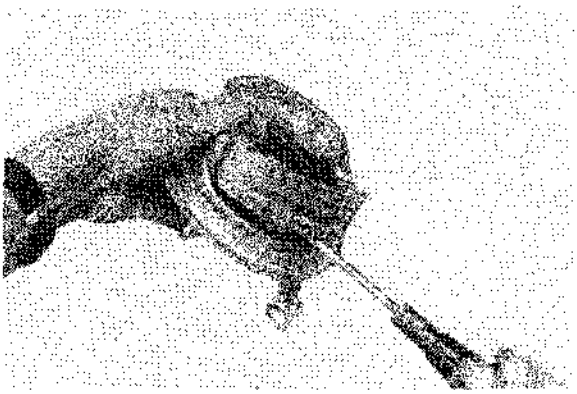


Fig. 4-28

b. Bearing

Remove bearing and oil seal from inside front brake drum according to the following steps:

(1) Insert the bar from inner side of the brake drum to press inner race and hammer the bar. Take off oil seal and outside bearing at same time.

(2) Insert the bar from outside of brake drum to press inner race and hammer the bar when removing inside bearing.

Note: Be sure to tap around the whole circumference of inner race of the bearing with uniform force so as not to damage the hub shaft hole.

4) Inspection

a. Hub shaft

Inspect front hub shaft, and repair or replace if bent over 0.016 in (0.4 mm), measured using a dial indicator.

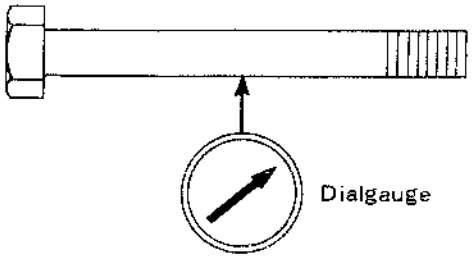


Fig. 4-29

b. Rim shake

The rim shake must be checked periodically inspecting looseness of the spokes.
If needed, tighten spokes and adjust the rim shake within the standard limit.

Note: (1) Tightening spokes is very important to prevent the rim from shaking. Especially with the aluminum rim, since a spoke comes loose until it fits itself well inside the rim.
(2) The spokes must be tightened after the first 50 miles, and after that every 50 miles until they fit well and stop coming loose.

Table 4-5 Rim runout

Standard value under	Repair limit over
0.04 in (1.0 mm)	0.12 in (3.0 mm)

Note: Replace bent spokes with new ones.

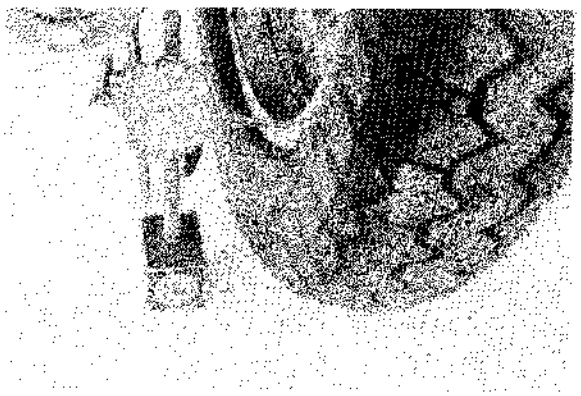
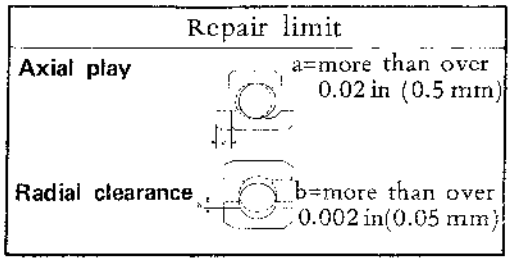


Fig. 4-30

c. Bearing

(1) Check inner and outer race for rust.

(2) If radial and axial clearances of the bearing are excessive, the front wheel will tend to produce abnormal shaking during running, preventing driver from having proper control over the handlebar, or emitting an abnormal sound from the bearing. Check clearance. If measurement exceeds the standard limit, replace the bearing.



d. Oil seal

The oil seal, as illustrated in Fig. 4-31, is made up of a metal ring, a spring and packing. The packing is further divided into main and auxiliary lips. The main lip prevents leak of oil from the inside of the front hub shaft (on the bearing side), while the auxiliary lip prevents the entry of dust, earth particles and water from outside which may damage the bearing.

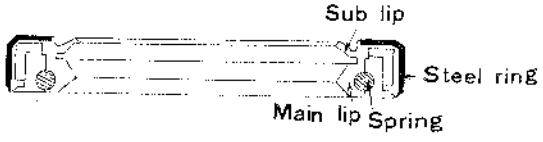


Fig. 4-31

(1) Inspect main and auxiliary lips of oil seal. Replace if deformed or damaged.

(2) If main and auxiliary lips of oil seal are hardened, clearance will be formed with front hub shaft, where dust and water will enter. If the lips are hard to the touch or visual inspection shows discoloration, replace the seal.

(3) Replace metal ring of oil seal, if deformed or damaged.

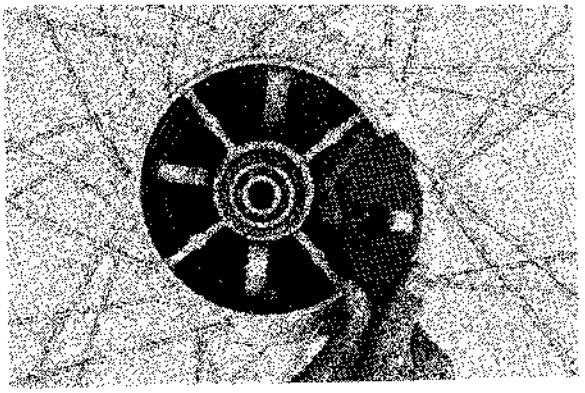


Fig. 4-32

e. Rubber dampers

Rubber dampers are installed between hub drum and drive flange to absorb shocks while running. Replace rubber damper if broken or distorted.

5) Assembly

Reverse the removal procedure.

Note: (1) When pressing bearing and oil seal into brake drum, employ press or similar tool with care taken to place bearing and oil seal in parallel with hole of hub shaft. After they are pressed in, be sure to apply grease over lips of oil seal.

(2) Scratches, oil or dirt smears on the inner surface of the brake drum and brake shoe lining will result in dangerous malfunction of the braking system. Clean the contact surface thoroughly with thinner and/or emery cloth.

(3) Secure the axle nut and the torque link nut with cotter pins after rightening them.

(4) The torque values should be as follows.

Table 4-6 Wheel torque value

	Front	Rear
Axle nut	48 ∿ 61 ft-lb (6.7 ∿ 8.5 kg-m)	55 ∿ 68 ft-lb (7.7 ∿ 9.8 kg-m)
Torque link	8.5 ∿ 11 ft-lb (1.2 ∿ 1.5 kg-m)	16 ∿ 22 ft-lb (2.2 ∿ 3.1 kg-m)

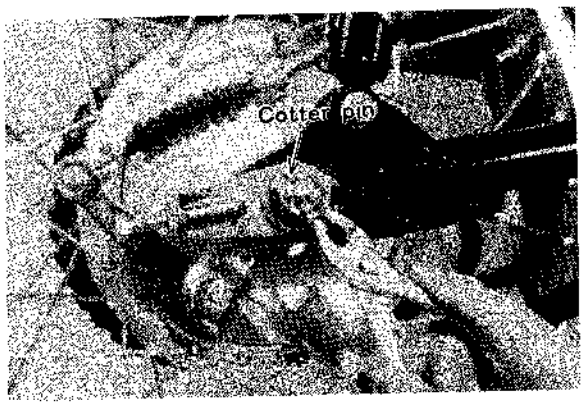


Fig. 4-33

4. Brake

1) Construction

The brake consists of the brake lever (or brake pedal), brake cable, brake panel assembly and brake drum. The brake panel consists of the cam lever, cam shaft, brake shoe, brake shoe spring, and brake panel body.

The brake shoe is an internal expanding type, both in the front brake and in the rear brake.

As shown in Fig. 4-34, there is only one cam shaft in the brake panel. Therefore, two brake shoes which are palced symmetrically work with the same cam shaft.
When the brake pedal is stepped on, the cam shaft begins operation through the brake cable and the cam lever, pushing out the two brake shoes.
In this case, one brake shoe begins contact (leading shoe) in the reverse direction of rotation of the brake drum, while the other brake shoe begins contact in the direction of rotation of the brake drum (trailing shoe).
On F series models to insure driving safety, both the front brake and the rear brake are equipped with brake lights.

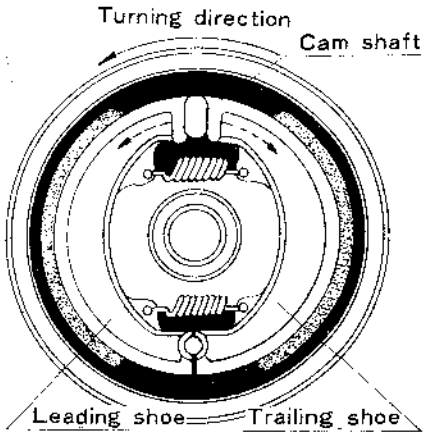


Fig. 4-34

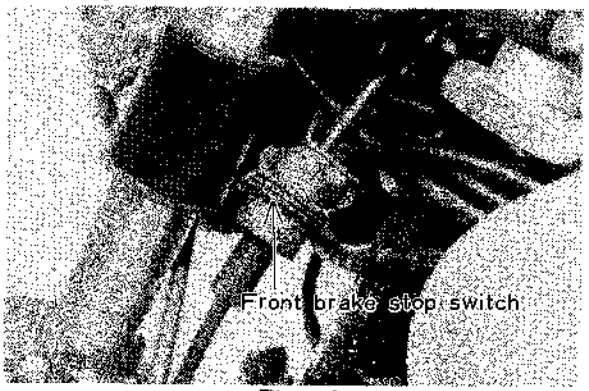


Fig. 4-35

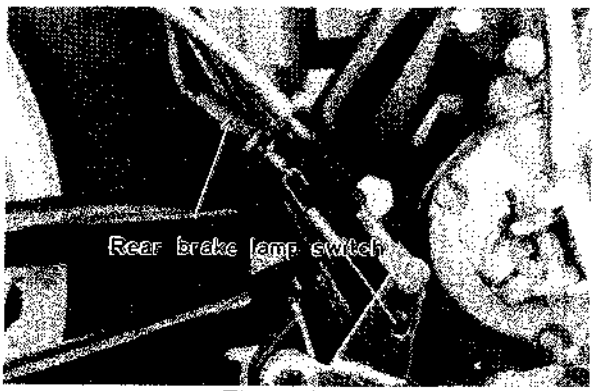


Fig. 4-36

2) Disassembly

a. Removal of the front brake cable
Refer to paragraph 2-2-b.

b. Removal of the front wheel and panel
Refer to paragraph 3-2-a.

c. Removal of the rear brake wire
Refer to paragraph 3-2-b.

d. Removal of the brake pedal
Pull out the cotter pin, take off the brake pedal.

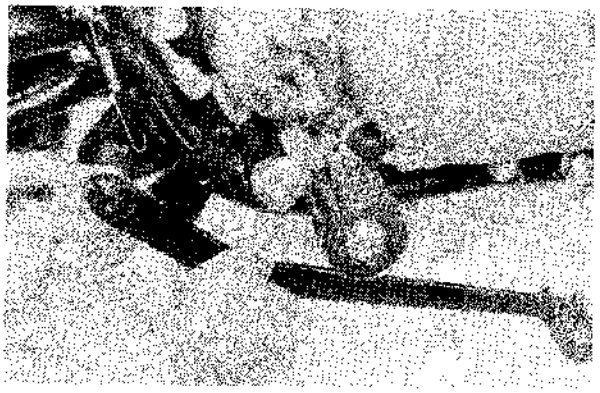


Fig. 4-37

3) Inspection

a. Brake drum

The inner sleeve of the brake drum wears out due to friction with the brake shoe after a long period of service. Measure the inside diameter of the brake drum with a slide calipers.

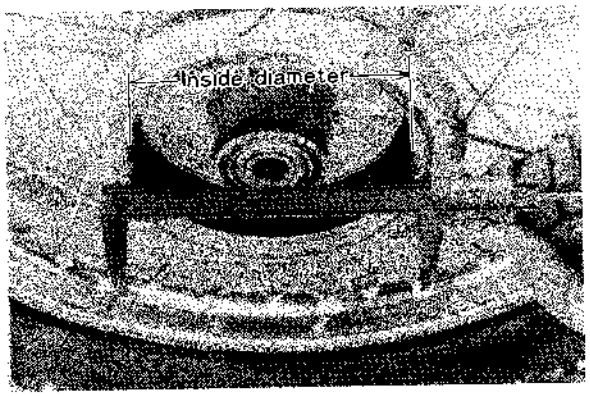


Fig. 4-38

Table 4-7 Standard drum inside diameters

Model	Standard value	Repair limit
G Series	4.33 in (110 mm)	4.36 in (110.75 mm)
G31M-A F6 F7	5.12 in (130 mm)	5.15 in (130.75 mm)
B1L-A F8 F81M F5	5.91 in (150 mm)	5.94 in (150.75 mm)

b. Brake lining

If the abrasion of the brake lining is considerable, measure the thickness of the lining. If the lining is only half in contact, it will reduce the braking effect and make abnormal noise. If this is the case, correct the lining with sandpaper or emery cloth. If there is foreign matter on the surface of the lining, remove it with a wire brush.

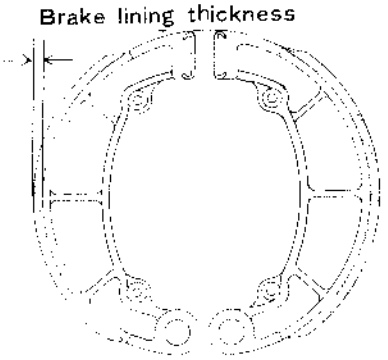


Fig. 4-39

Table 4-8 Lining thicknesses

Model	Standard value	Repair limit
G Series F6 F7	0.138 in (3.5 mm)	0.079 in (2 mm)
B1L-A F8, F81M, F5	0.197 in (5 mm)	0.118 in (3 mm)

c. Brake shoe spring

If the shoe spring is stretched out, the brake shoe cannot return completely and the brake may drag. Measure the free length of the spring.

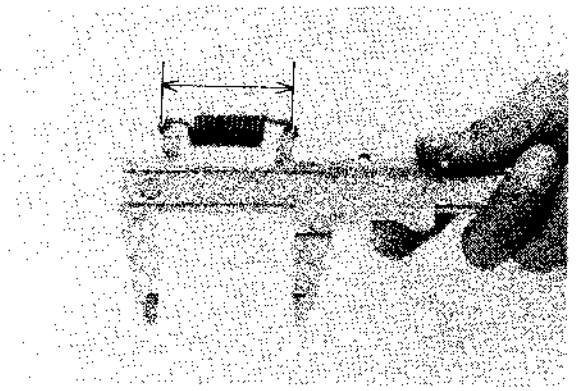


Fig. 4-40

Table 4-9 Free length of brake shoe spring

Model	Standard value	Repair limit
G Series F6 F7	1.23 in (31.2 mm)	1.34 in (34.0 mm)
B1L-A	1.87 in (47.5 mm)	1.97 in (50.0 mm)
F8, F81M, F5	1.89 in (48.0 mm)	2.01 in (51.0 mm)

d. Gap between the brake cam shaft and the brake panel bushing

When the gap between the brake cam shaft and the brake panel bushing becomes excessive, the cam shaft cannot extend the brake shoe completely, resulting in incomplete braking.

Table 4-10 Gaps between the brake cam shaft and the bushing

Model	Standard value	Repair limit
All models	0.0008 ∼ 0.0028 in (0.02 ∼ 0.07 mm)	0.02 in (0.5 mm)

4) Assembly

The order of assembly is the reverse of disassembly.

a. Fitting angle of the brake cam lever

When fitting the brake cam lever, install it so that the brake cable will become perpendicular to the cam lever when braking.

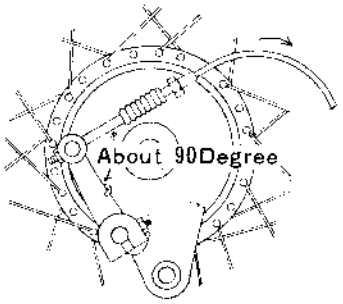


Fig. 4-41

b. Apply grease to the bearing of the brake pedal, brake lever, and the brake cam shaft bearing in the brake panel.

5) Adjustments

a. Play of the front brake lever

Adjust the front brake lever with the cable adjusting nut on the brake panel so that the brake will begin operation when pulling the front brake lever by 0.8" ∿ 1.2" (20 ∿ 30 mm). Fine adjustment is done by the adjusting screw on the handlebar. No adjustment is required for the front brake stop lamp since the switch is built into the front brake cable.

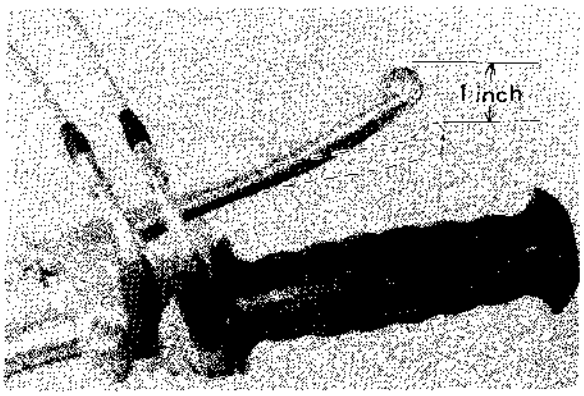


Fig. 4-42

c. Play of the rear brake lever

Adjust the rear brake lever with the adjusting nut of the rear brake panel so that the brake will begin operation when stepping on the rear brake lever by 1.0" ∿ 1.4" (25 ∿ 35 mm). In this case, adjust the upper and lower adjusting nuts in the main body of the brake lamp switch so that the brake lamp lights after the brake pedal has traveled 0.6" ∿ 0.8" (15 ∿ 20 mm).

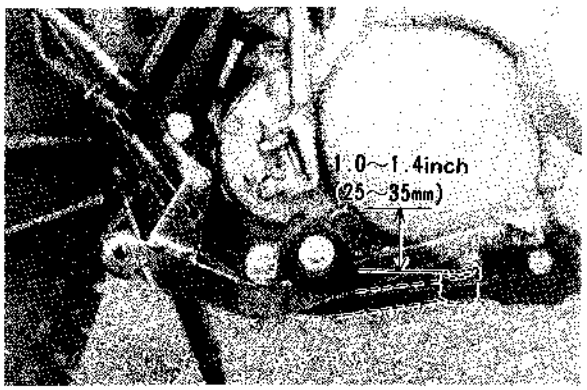


Fig. 4-43

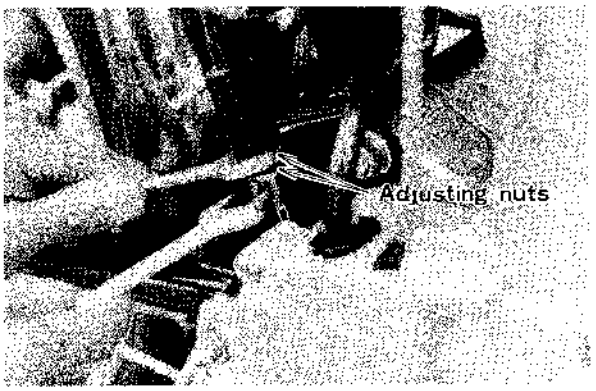


Fig. 4-44

5. Front fork

1) Construction

GA1-A, GA2-A, G3SS-A, G3TR-A, B1L-A

The front fork is a holding device for the front wheel and absorbs the vertical shock of the front wheel through the spring and oil. The front fork consists of an inner tube and an outer tube which slide against each other. There is an oil orifice in the center of the lower end of the inner tube. Oil chambers are formed between the inner tube and the outer tube in the place which is surrounded by the inner tube and the spacer.

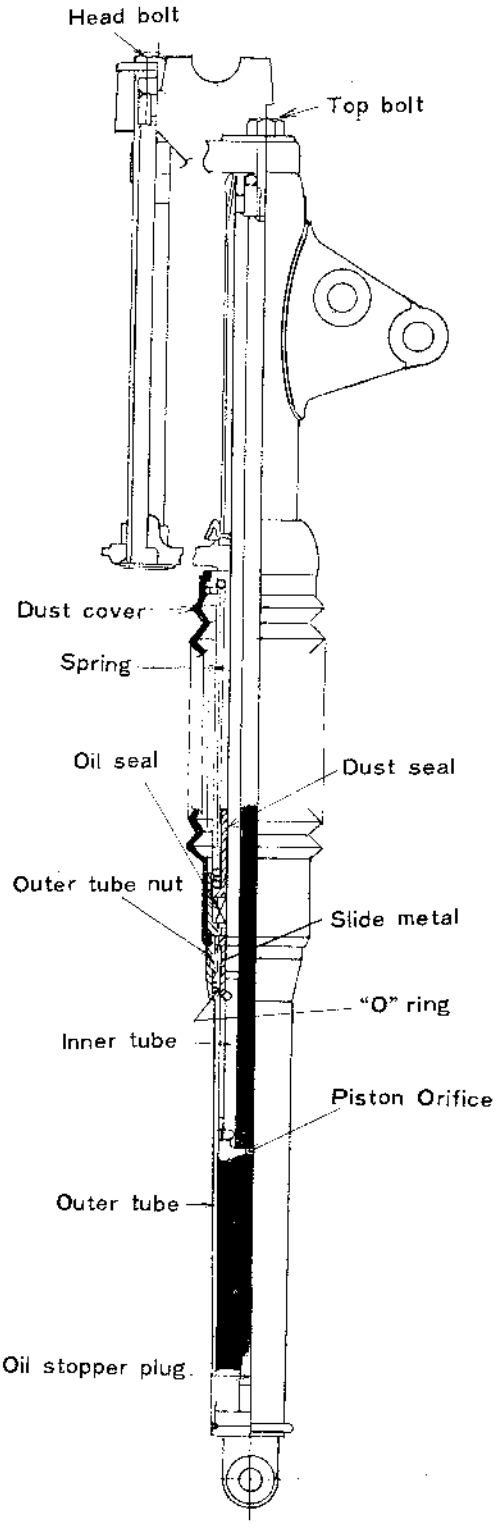


Fig. 4-45

F series G4TR and G31M

The front fork which is employed in above models is called "ceriani type". The spring and the spring holder are placed inside the inner tube. The lower part of this inner tube forms an orifice between the lower part of the inner tube and the inner tube guide.

Models F5, F7 and F8 employ the Hatta type front forks uniquely developed by Kawasaki. The feature of this Hatta type fork is that the caster, trail and stroke can be freely adjusted according to the road conditions, loading conditions and rider's preference. For F6, only the stroke can be adjusted.

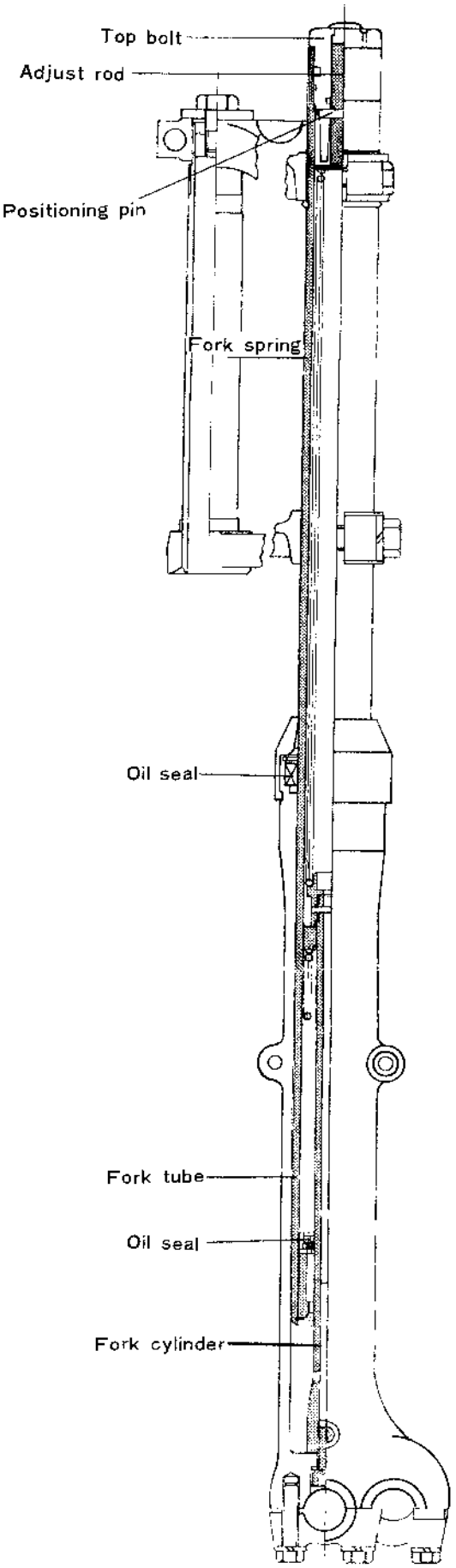


Fig. 4-46

2) Operation

a. In the case of receiving a load

If the front fork is loaded, the spring is compressed and deflected. Since the outer tube is pushed up at the same time, oil in the outer tube flows into the inner tube through the piston orifice of the inner tube. Oil partially enters the space between the inner tube and the outer tube through the orifice on the side wall of the inner tube. Since the oil flow makes the space smaller in the upper part of the inner tube, internal air is compressed. Also, the front fork increases the flow resistance of the oil which flows between the piston orifice and the orifice guide of the outer tube and reaches the oil lock state immediately before the whole compression stroke so that noise is prevented in the full stroke.

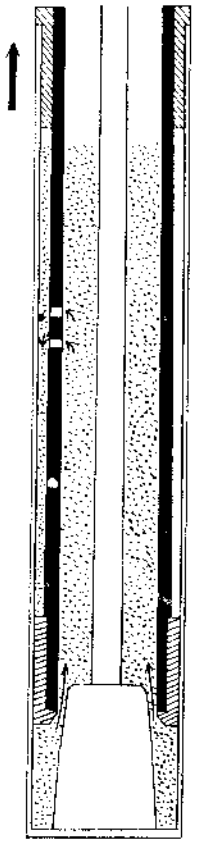


Fig. 4-47

b. Stretching

The front fork stretches by the reaction of the spring. At the same time, damping is conducted due to oil resistance, when oil between the inner tube and the outer tube counterflows into the inner tube. When it stretches more, the oil increases its flow resistance greatly and reaches the oil lock state since the orifice on the side wall of the tube is closed by the tube guide. Thus, the stroke is finished.

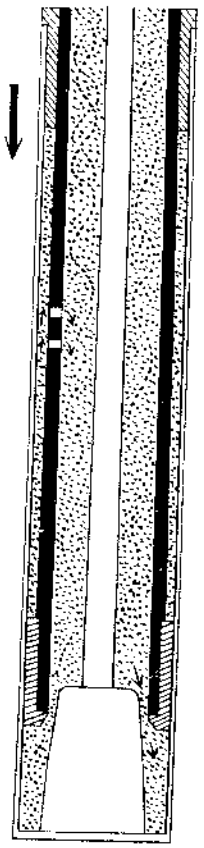


Fig. 4-48

3) Removal

Remove the front fork after taking off the front wheel and the front fender.

a. Taking off the head lamp

Remove all the connectors in the head lamp from the main wire harness and pull out the main wire harness from the head lamp, remove the head lamp.

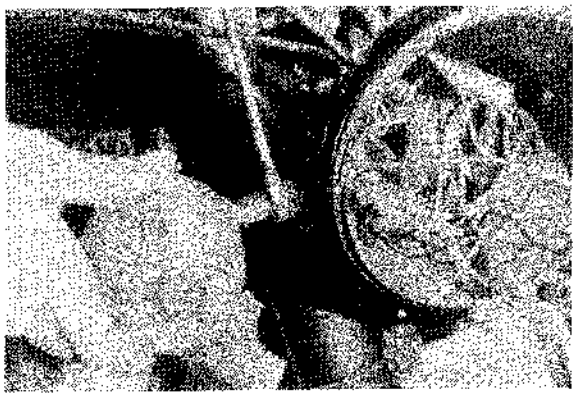


Fig. 4-49

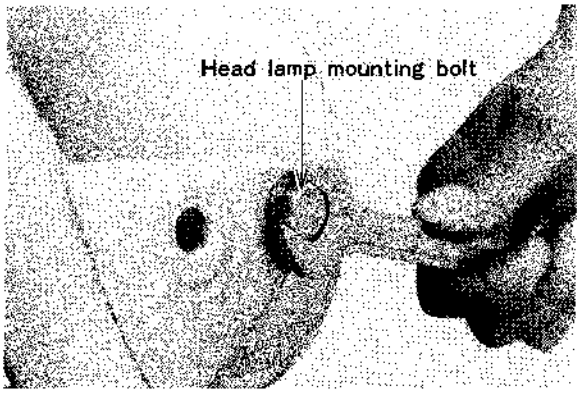


Fig. 4-50

b. Taking off the speedometer and the tachometer

After removing the cables of the speedometer and tachometer, take off the speedometer and the tachometer from the bracket.

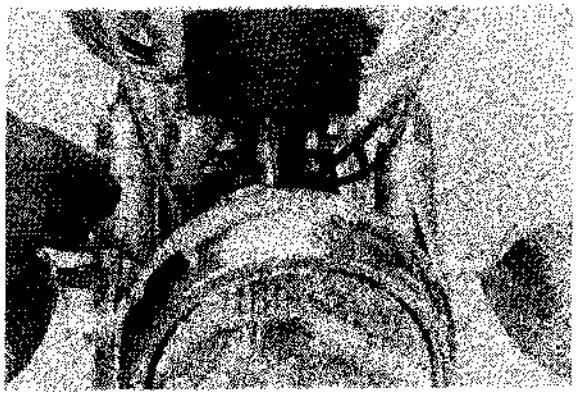


Fig. 4-51

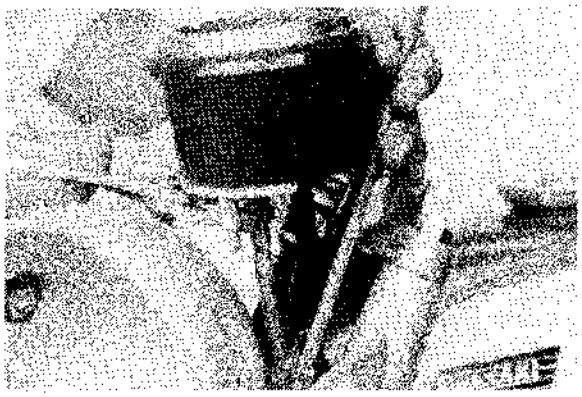


Fig. 4-52

c. Front fork

GA1-A, GA2-A, G3SS-A, G3TR-A, G4TR, B1L-A

Loosen top bolt on upper holder and inner tube clamping bolt of underbracket, and then draw out from fork downward from underbracket.

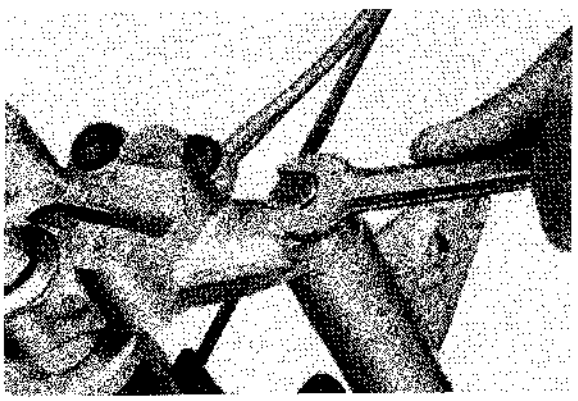


Fig. 4-53

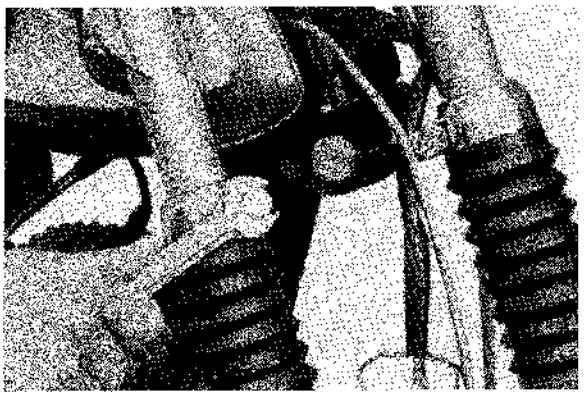


Fig. 4-54

Note: When removing the front fork and underbracket in assembled state, follow the steps listed below.

1. Loosen the top bolts (right and left) on the upper holder and the head bolt to remove the upperbracket. It is unnecessary to remove the inner tube fitting bolt.
2. Loosen the lock nut of the underbracket with a special tool, and take off the front fork and underbracket as assembled from underneath of the head pipe of the frame.

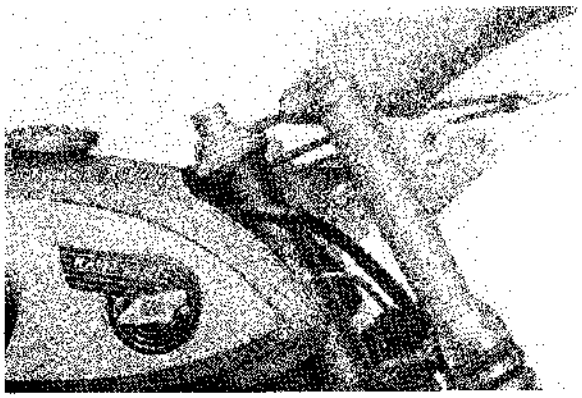


Fig. 4-55

Loosen the front fork fitting bolts of the upperbracket, and head lamp stay then remove the positioning circlip out of the front fork. Pull the front fork downward.

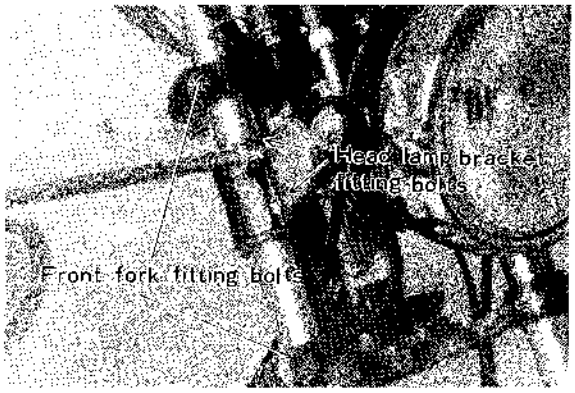


Fig. 4-56

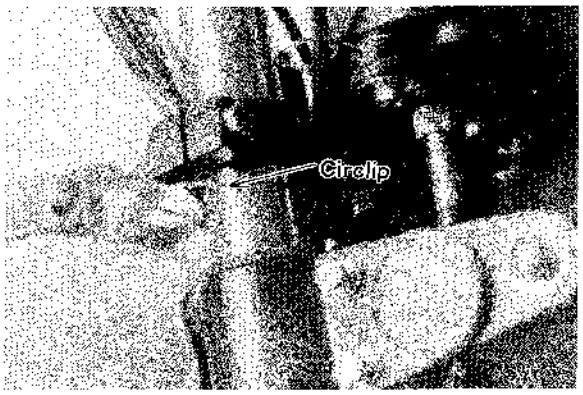


Fig. 4-57

4) Disassembly

a. Remove from front fork, first of all, dust seal, spring, dust boots, and spring guide. Then drain oil from inside front fork.

Note: 1. Turn front fork upside down and drain oil from fitting port of top bolt.
2. On G4TR an oil drain port is provided at the bottom of the outer tube.

b. Place a rubber sheet or tire tube around the outer tube nut, and clamp it with a vice.

Note: Take care not to deform the outer tube when clamping it with the vice.

c. Fit the front wheel shaft in the outer tube, and turn it counterclockwise. The inner tube can be separated from the outer.

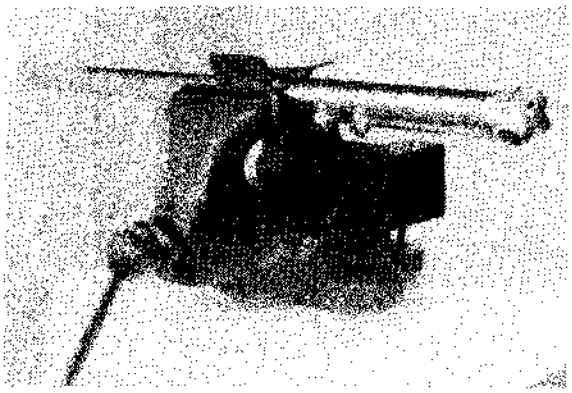


Fig. 4-58

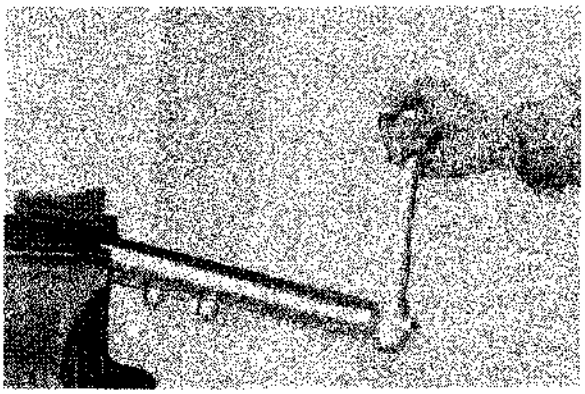


Fig. 4-59

F Series models

a. Drain out the oil from the oil drain port at the bottom of the front fork.

Note: For F8 and F5, remove the fork cylinder bolt at the bottom of the front fork.

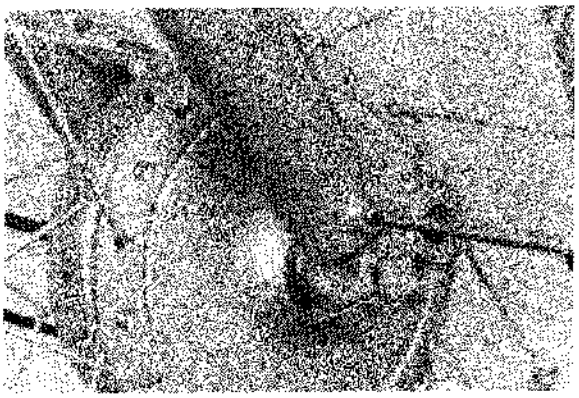


Fig. 4-60

b. Remove the fork top bolt.

c. Place a rubber sheet or tire tube around the outer tube nut, and clamp it with a vice, as for the GA and B1 L.

d. Mount the front axle on the outer tube and turn it to left to separate the outer tube from the inner tube.

5) Inspection

a. Inner tube and outer tube

Insert inner tube into the outer tube and install slide. Check that inner tube slides smoothly. Clatter in sliding parts indicates wear, and tube must be replaced.

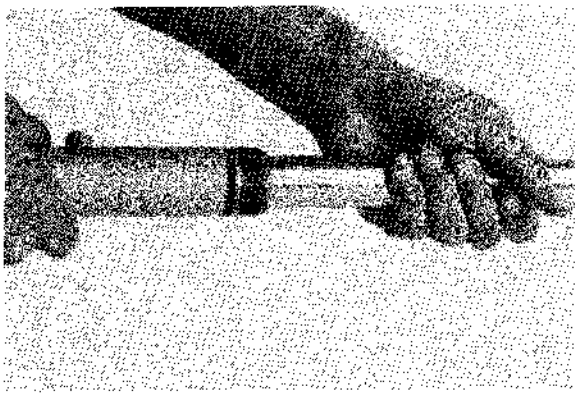


Fig. 4-61

b. Inner tube

If there is a scratch or rough spot on the sliding part of the inner tube, the lip of the oil seal which is inserted into the outer tube or into the outer tube nut will be damaged during operation and oil will leak. Inspect carefully the sliding part of the inner tube and correct or replace it if it is dented or scratched.

c. Dust seal

The dust seal prevents dust from entering the front fork. If it is broken, dust adheres to the sliding part of the inner tube or hard foreign matter enters it, and the sliding part of the inner tube or the lip of the oil seal may be damaged. Oil may leak due to such failures. Inspect the dust seal carefully and replace it if it is broken. Clean it of dust and foreign matter.

d. Front fork spring

If the spring is damaged, the damping action of the front fork is impaired. Hence, riding will be uncomfortable. Inspect the free length of the front fork springs.

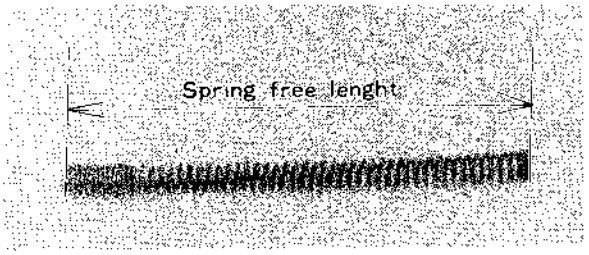


Fig. 4-62

Table 4-11 Spring free length

Model	Standard value	Repair limit
G Series	6.46 in (164 mm)	6.06 in (154 mm)
G4TR	12.05 in (306 mm)	11.65 in (296 mm)
G31M-A F7	4.96 in (126 mm) 13.63 in (346 mm)	4.76 in (121 mm) 13.23 in (336 mm)
B1L-A	7.24 in (184 mm)	6.85 in (174 mm)
F6	12.29 in (490 mm)	18.90 in (480 mm)
F8, F81M, F5	18.66 in (474 mm)	18.27 in (464 mm)

Note: Two kinds of the springs are used in the fork leg of the G31M-A and F7.

e. Front fork oil

The characteristics of the front fork oil is likely to change due to oxidation, etc., resulting in a stiffening the steering or wearing inside the fork tubes. If the oil is changed, wear decreases until it becomes negligible. So, it is necessary to change oil around 300 miles (500 km) and after that every 3000 miles (5000 km). The quantity of the fork oil can be ascertained by measuring the depth to the oil level from the upper end of the inner tube, while setting the fork in the stretched position by lifting up the front wheel.

Fork oil quantity

Table 4-12 Fork oil quantity

Model	Working oil quantity	Depth	Mixing ratio	
			Motor #30	Spindle #60
G Series	0.135 U.S. qt (130 cc)	12.40 in (315 mm)	8	2
G4TR	0.18 U.S. qt (170 cc)	13.98 in (355 mm)	6	4
G31M-A F7	0.12 U.S. qt (115 cc)	19.29 in (490 mm)	6	4
B1L-A	0.185 U.S. qt (175 cc)	13.58 in (345 mm)	8	2
F6	0.160 U.S. qt (152cc)	19.49 in (495 mm)	6	4
F8 F81M F5	0.185 U.S. qt (175 cc)	18.90 in (480 mm)	6	4

Note: SAE # 10W motor oil can be used in place of the specified mixture.

6) Assembly

a. When the front fork is disassembled, be sure to replace the oil seal and O-ring which are attached to the outer tube.
b. After that reverse the order of disassembly.
c. Then supply oil, which should be a mixture of mobile #30 and spindle #60.

Note: Shortage or excess of fork oil will produce noise or stiffen the cushion, so maintain the oil level as specified.

7) Installation

Install the front fork to the underbracket after assembling of the inner and outer tubes.

GA1-A, GA2-A, G3SS-A, G3TR-A, B1L-A

In these models it is necessary to follow the steps described below for correct installation.

a. First install the fork cover gasket, fork cover ring, and fork cover to underbracket (steering stem).
b. Next, insert front fork from under the underbracket and raise the front fork (inner tube) with a front fork raising rod (special tool). When it is raised as far as it goes, secure the front fork with the inner tube clamping bolt to prevent the front fork from falling off.
c. Then remove the front fork raising tool, clamp the front fork provisionally with the top bolt, and loosen the inner tube clamping bolt temporarily then clamp the top bolt completely and clamp the inner tube clamping bolt fully.

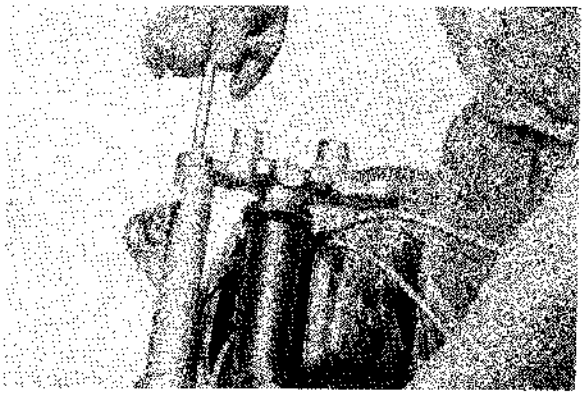


Fig. 4-63

G4TR

a. Insert the front fork from the bottom of the steering stem. Pushing up the inner tube until the end point of the inner tube reaches the step portion in the steering stem head, fasten it with the top bolt.
b. Next, fasten the steering stem bolt.

G31M and F Series

Place the right and left lamp brackets and the damper rubber at the center between the upper and under brackets, insert the front fork from underneath and set the fitting bolts. Three lines are marked on the inner tube of the front fork. These lines should be symmetrically adjusted, according to the adjusting procedure mentioned below.

8) Adjustment

For the front forks of models G31M-A, F7, F8, F81M and F5 the following three points are adjustable.

(i) Position of the front axle.
(ii) Position of the steering stem.
(iii) Mounted length of the fork spring.

Note: For Model F6, only the second (ii) is adjustable.

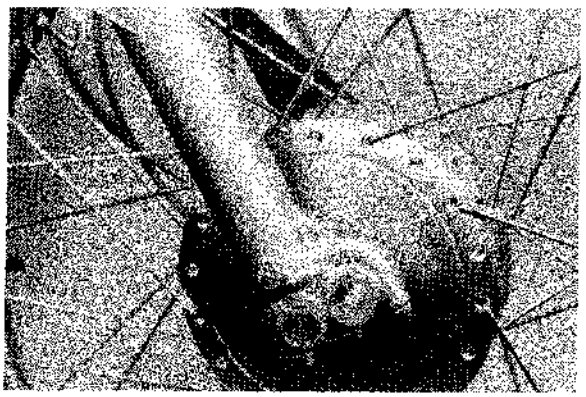


Fig. 4-64

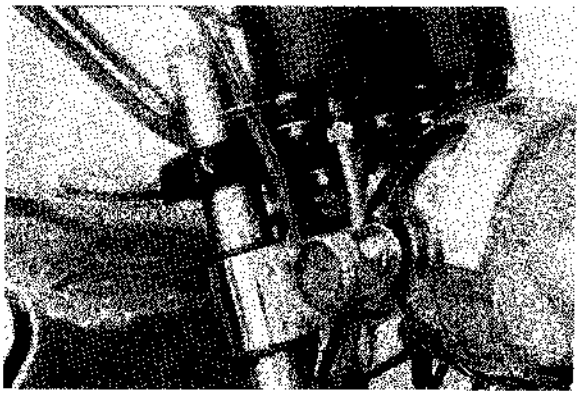


Fig. 4-65

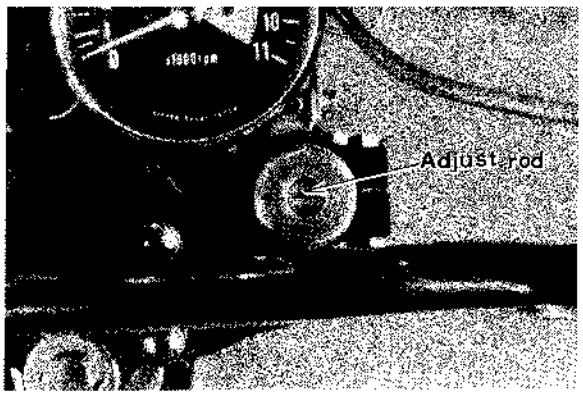


Fig. 4-66

Adjusting either of the positions mentioned in (i) and (ii) above will change the steering castor and trial.
The relation of the castor and trail is shown in the drawing below.

The castor as illustrated here, stands for the angle of the steering stem axis to the ground level; the trail is the distance between the vertical line at the center of the front axle and the point where an extension of the steering stem axis meets ground level. Adjustment of both castor and trail directly affect the handling characteristics and the stability of the motorcycle.

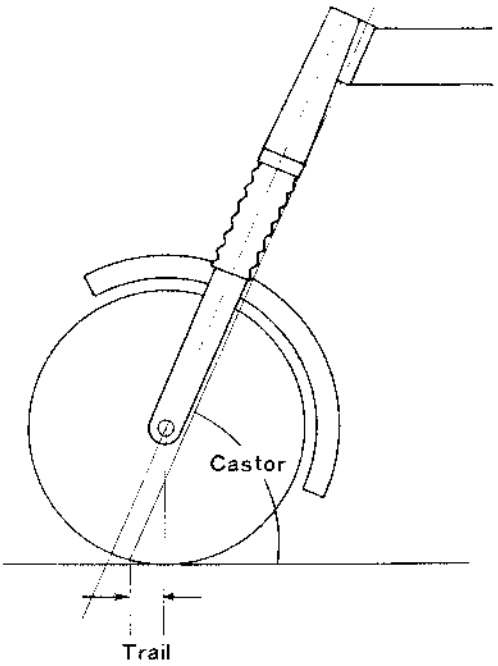


Fig. 4-67

Note: The stability of the motorcycle, as refered to in this section, is defined as the tendency of the motorcycle to self-steer a straight course while in for ward motion.

When the castor is changed to a smaller angle with the trail increased, this stability of the motorcycle increases, resulting in good straight running. In other words, the tendency to self-steer makes the motorcycle try to stay upright in zigzagging or cornering action. Therefore, it is desirable to set the castor small and the trail relatively large for high speed riding such as on highways. In case the settings are reversed (large castor small trail), steering effort becomes lighter, i.e., turning the motorcycle handlebar is easier in zigzagging or cornering, but this sacrifices stability to some extent. So it is recommended to set the castor a little bit large for off the road driving or in urban traffic. The castor and the trail of the front fork in its neutral position are shown in table 4-13 and 4-14.

a. Position of front axle

(1) A is the standard position.

(2) B is the off road position.
Loosen the torque link bolts, drop the front wheel and secure the front axle at "B" position. Install the axle clamps and retighten the torque link bolts.
By shifting the axle shaft to "B" position, the castor will become larger and the trail smaller than at position "A".
The castor and trail of the fork at position "B" are shown in tables 4-13and 4-14.
This position eases steering effort and permits faster turning action. These are distinct improvement for off-road riding and low-speed street operation.

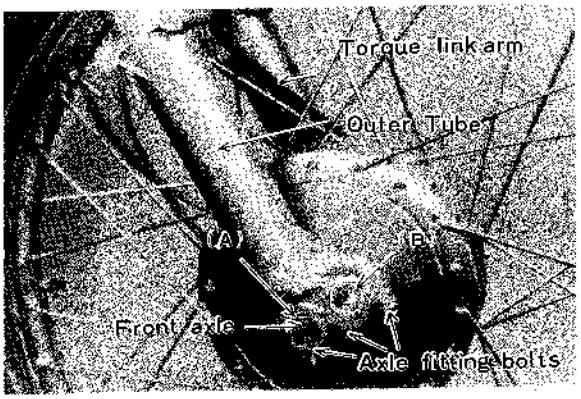


Fig. 4-68

(3) C the position for high speed
After removing the torque link and the front wheel, turn the fork legs 180° backwards, in the direction as shown by the arrow mark, and secure the axle at position "C".
Install the torque link and make sure the link bolts are secured.
By shifting the position of the axle to "C", the relation of the castor and trail will be changed are shown in tables 4-13 and 4-14.
Stability will be good in high speed riding. This will be most noticeable on highways when traveling at speeds more than 60 mph.

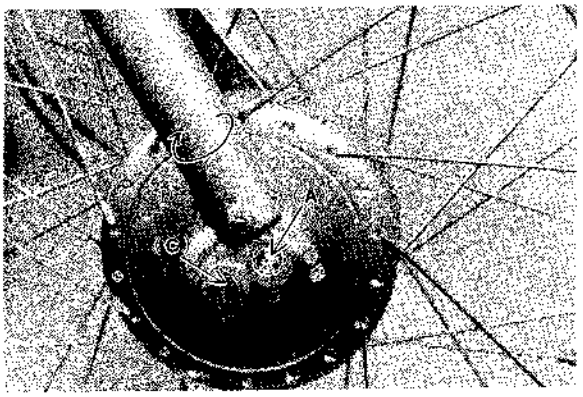


Fig. 4-69

b. Position of steering stem

(1) "D" is the standard position.

(2) E and F are the positions for high speed.
Loosen the four clamp bolts on the steering stem which secure the fork legs, and slide the right and left fork legs to position "E" respectively. At position "E", the castor will be smaller and the trail will be larger than in the standard position "D".

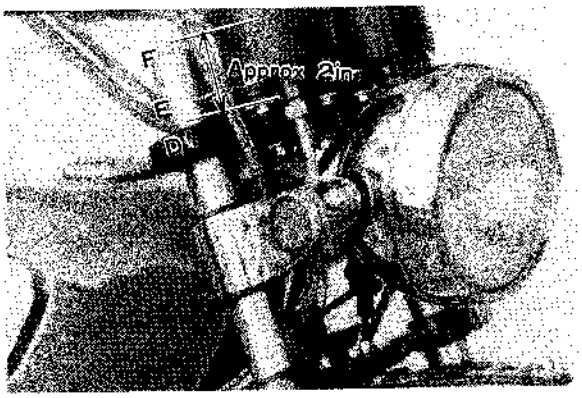


Fig. 4-70

The result is identical to that mentioned in a-(3).
By shifting further to position "F", additional stability can be obtained for high-speed riding.
The relation between the castor and trail at "D", "E" and "F" positions are shown in tables 4-13and 4-14.
Also for F6, the adjustment described in section (ii) are possible, changing the trail and castor as shown in the following table.

Steering stem Postion	D	E	F
Castor Trail	62° 3.86 in	61° 4.09 in	60° 4.33 in

Table 4-13 F5

Axle shaft	Steering stem Position	D	E	F
A	Castor Trail	60° 5.16 in	59° 5.46 in	58° 5.76 in
B	Castor Trail	60°23′ 4.06 in	59°54′ 4.36 in	58°26′ 4.66 in
C	Castor Trail	59°40′ 6.26 in	58°07′ 6.56 in	57°34′ 6.86 in

Table 4-14 F7

Axle shaft	Steering stem Position	D	E	F
A	Castor Trail	61° 4.37 in	60° 4.61 in	59° 4.88 in
B	Castor Trail	61°37′ 2.91 in	60°41′ 3.14 in	59°46′ 3.88 in
C	Castor Trail	60°23′ 5.85 in	59°26′ 6.12 in	58°30′ 6.39 in

Note: 1. For the relation between the castor and trail of the front fork of the F8 and F81M, refer to the table for the F5. The front forks of F5, F8 and F81M are same. However, their castors and trails are different more or less becasue their wheels are different.

2. The combinations shown in this table are possible; however, the following precautions must be taken when making adjustments. For high-speed driving, it is dangerous to set the castor over the specified angle. Setting the castor to a larger angle will greatly improve handling capability and reduce steering effort; however, it will sacrifice the high speed stability and the straight driving of the motorcycle.

Do not set the castor so large as to make the trail extremely small.

c. Length of fork spring

Other than carrying out adjustments as mentioned under (1) and (2), the fork spring is so designed that it can be adjusted in 3 stages, namely the strength of the spring. Adjustment is normally made depending on the condition of load and the preference of the rider; however, for good cornering in high speeds or for driving off the rood which require rigidness of the chassis, the spring is ordinarily set for "hard-damping". Thus adjustment is made by controling the length of the fork spring. "A" stands for the standard position.

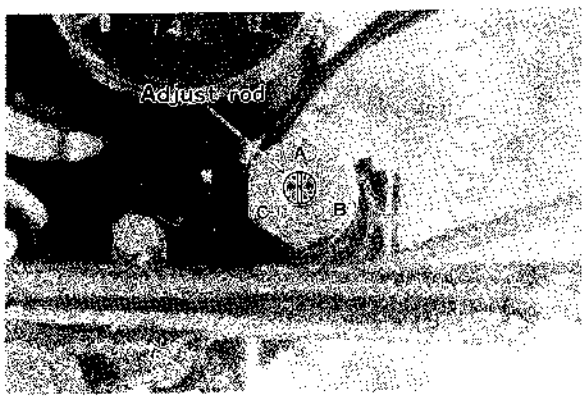
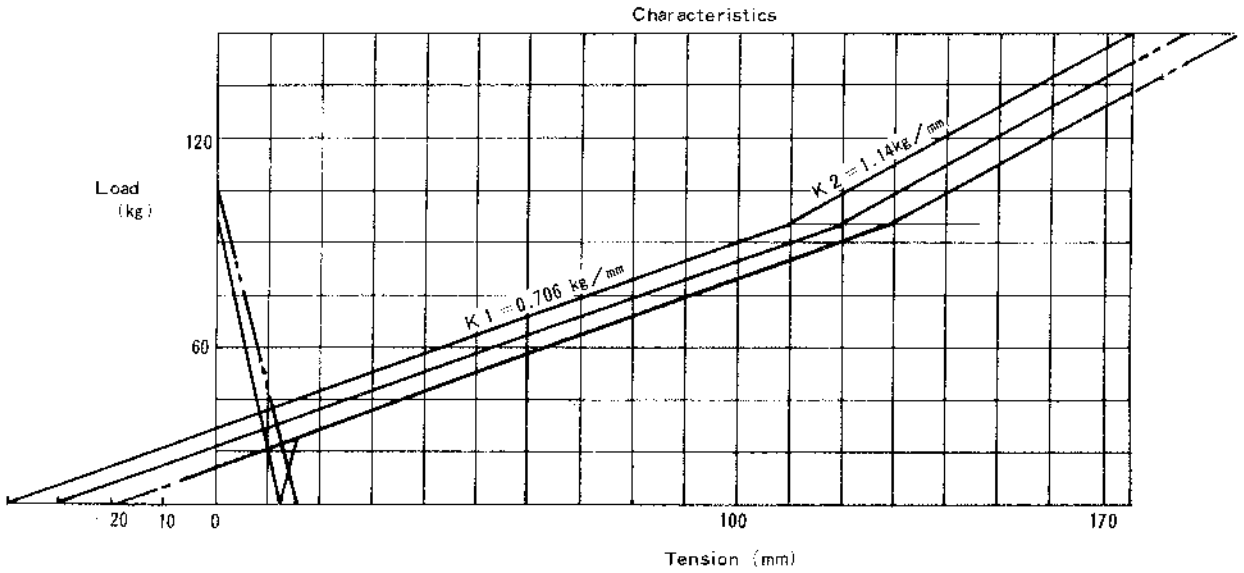


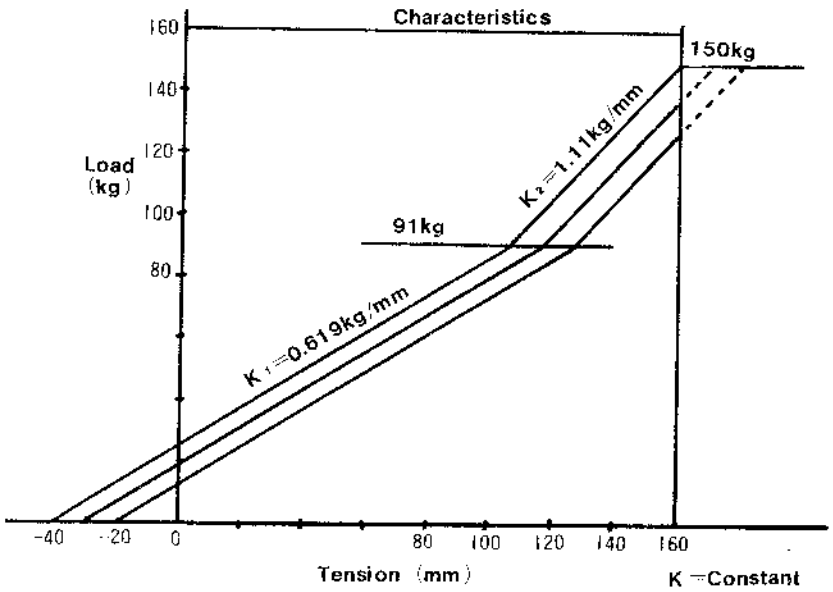
Fig. 4-71

Remove the rubber cap, turn the adjusting rod 120° clockwise and set the rod to "B" position. With the rod in this position, the length of the fork spring will be shorter than the length in standard position "A".
The rod additionally turned 120° to the right from "C" position will make it shorter resulting in maximum spring strength.
In other words, by shortening the length of the fork spring, the initial load of the spring is increased as shown in Fig 4-71, and the fork itself will become stiffer.
The characteristics of the fork spring at position A, B and C are shown below.

F5, F8 Front Fork



G31M-A and F7 Front Fork



Note: Before riding do not forget to check the right and left fork springs and see if they are adjusted to the same position. Riding with unbalanced fork springs is dangerous at high speed. Use extraordinary precaution when adjusting the fork spring tension.

6. Steering system

1) Construction

The underbracket supports the right and left front forks, acting as the central shaft inside the frame head pipe when the handlebar is turned to the right and the left. The frame head pipe and the underbracket are provided, on top and bottom, with ball bearings to help smooth the action of the underbracket for steering. Whenever defective steering is experienced, it can be corrected by adjusting the clamping of the lock nuts.

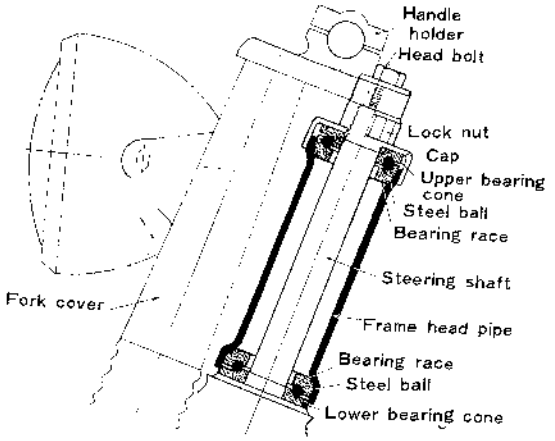


Fig. 4-72

2) Disassembly

Before disassembling the underbracket, remove the handlebar, tachometer, speedometer and front fork. (Refer to paragraph IV-2-2 and IV-4-4)

a. First remove the upperbracket by loosening the head bolt on the top of the upper holder.

b. Then loosen the lock nut (with a special tool) to pull out the underbracket downward. Take care not to lose steel balls contained in the upper and lower ball races during this step.

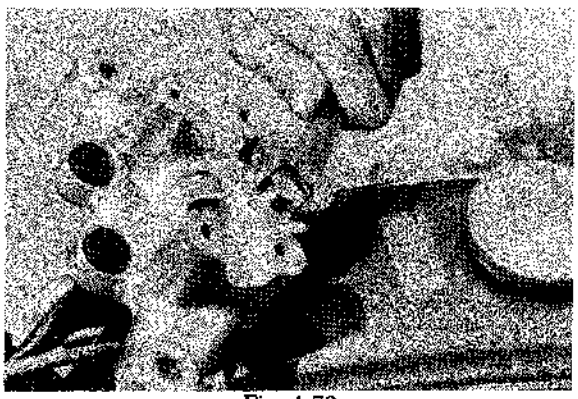


Fig. 4-73

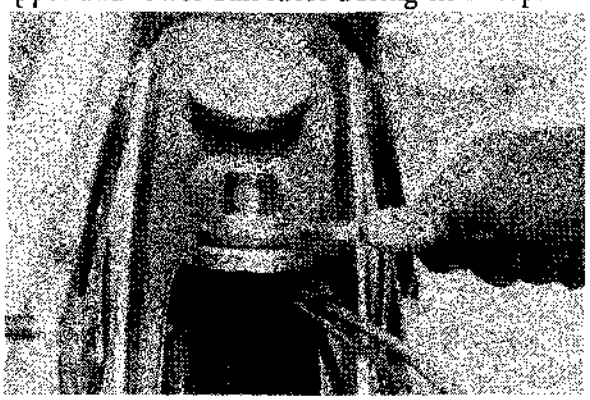


Fig. 4-74

c. Remove the upper and lower cups and the lower ball pusher in the following manner.

(1) In order to remove upper and lower ball races from the inside steering head pipe, insert the bar into the head pipe and press the upper and lower races. Remove the races while tapping the bar with hammer.

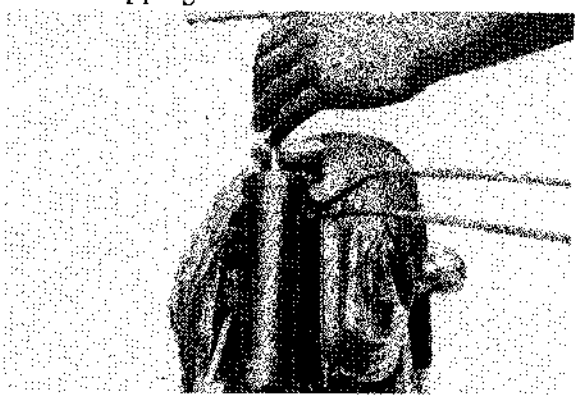


Fig. 4-75

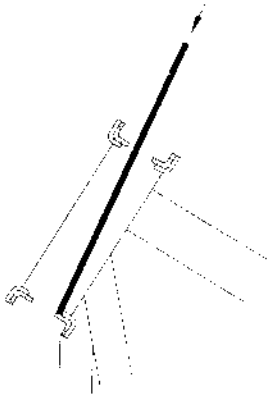


Fig. 4-76

(2) To remove the lower race pressed into the underbracket, insert a chisel between the outer circumference of the lower race and the underbracket, and remove the lower race while tapping the chisel with a hammer.

Note: Uniform tapping is required on the outer circumference of the upper and lower races.

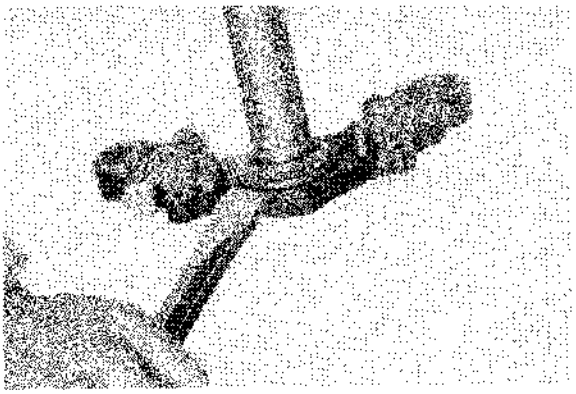


Fig. 4-77

3) Inspection

a. Underbracket

Correct or replace shaft of underbracket, if bent.

b. Ball bearings and races

Check the races and balls for wear. If they are found worn or cracked, replace all of them, because defective races or balls adversely affect the maneuverability of the motorcycle. Replace any race having scratches or streaks resulting from wear.

Note: Do not use a combination of new balls and used races. If any of these is found defective, replace the whole ball bearing assembly.

4) Assembly

a. Press in the upper and lower races with a press or similar means, taking care to exert uniform force on the entire circumference of the upper and the lower races.

b. Apply grease to the steel balls, and attach balls on the upper and lower ball races. Insert the underbracket from beneath the frame head pipe, the top of which is provisionally clamped with a lock nut.

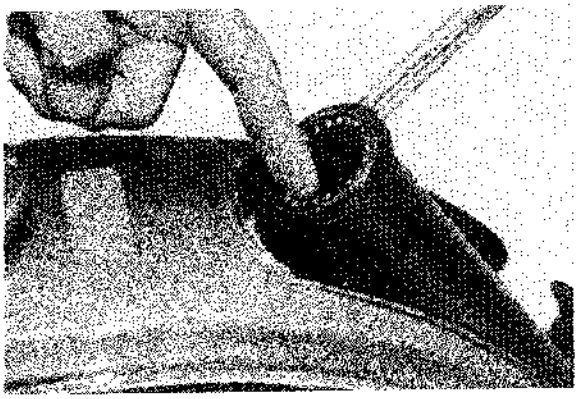


Fig. 4-78

Table 4-15

Models	Standard ball size	Number of ball
G Series	3/16"	23 x 2
B1L-A	1/4"	18 x 2
F Series	1/4"	19 x 2

c. Turn the underbracket to the right and the left until it rotates smoothly without rattling. Then torque the lock nut further and attach the upper holder to it, clamping the head bolt provisionally.

Note: After installing the front fork, retorque the head bolt further.

d. It is imperative that the underbracket turn without rattling and enable the handlebar to rotate smoothly. For this reason, inspection of the front fork and the front wheel must be followed by the checks given below.

(1) By moving the tip of front fork back and forth check that the underbracket does not rattle.

(2) Check that the handle bar can rotate under the weight of the front fork if slight impetus is given to handlebar, either rightward or leftward with the front wheel allowed to move freely.

Note: If the foregoing checks make it clear that the underbracket rattles, it means that retightening of the lock nut is necessary. On the contrary, if the steering feels heavy, loosen the lock nut.

7. Rear Shock Absorber

1) Construction

The rear shock absorber is a suspension system for the rear part of the chassis. The upper portion of the rear shock absorber is attached to the chassis, and the lower portion is attached to and supports the rear swing arm, attenuating the vibration from the rear wheel. As illustrated, the rear shock absorber is composed of upper and lower bottom metals, spring, cylinder, piston and piston rod.

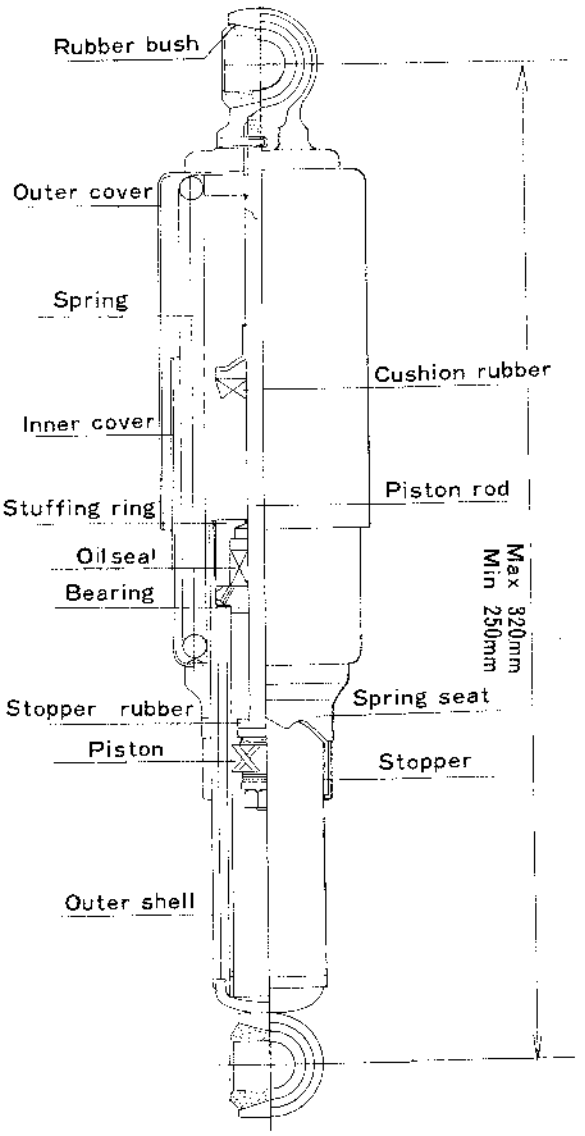


Fig. 4-79

G4TR, G31M-A and F Series

The rear shock absorber is designed carefully so that the initial pressure of the spring may be adjusted in five steps according to the load weight of the motorcycle and road condition (uneven road or pavement). Therefore, a comfortable drive and excellent operation can always be obtained.

Namely, by shortening (or lengthening) the stroke of the spring, the pressure applied to the spring is increased (or decreased). When the adjuster of the spring seat is moved around the outer shell from (A)→(B) or (D)→(E) the initial pressure of the spring increases as shown in table,

It is decreased when the adjuster is moved in the opposite direction.

Note: The rear shock absorber of B1L-A is adjustable in three steps.

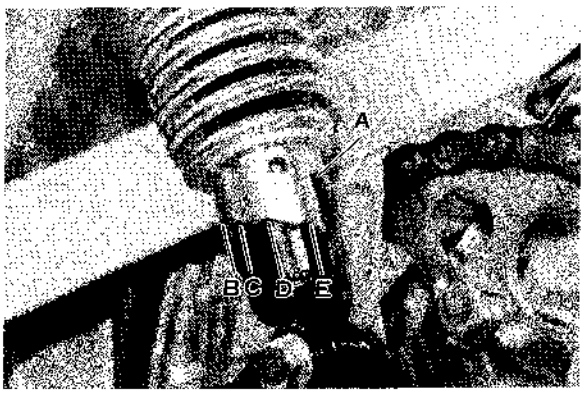
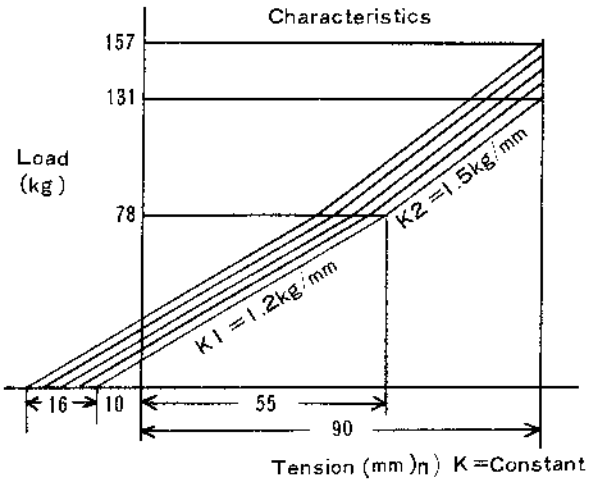
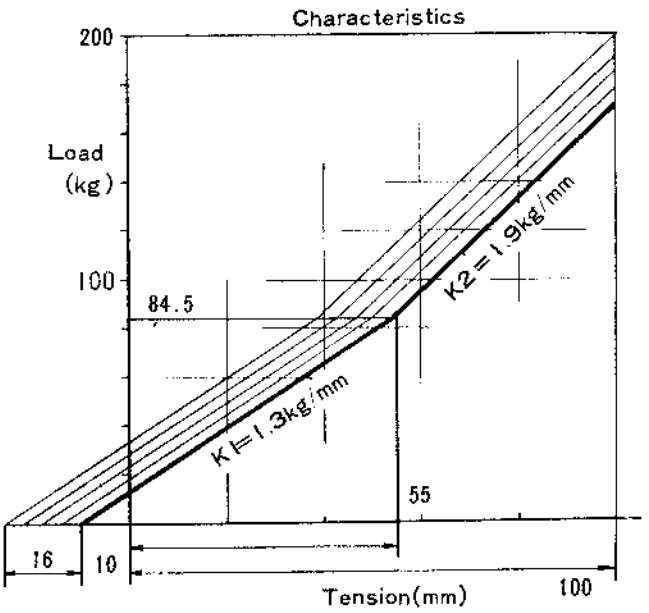


Fig. 4-80

F6,F7Rear Shock Absorber



F5, F8 Rear Shock Absorber



GA1-A, GA2-A, G3SS-A, G3TR-A

The cylinder contains nitrogen gas and oil. Like the front fork, the unit attenuates vibration by mobile resistance of the oil. The working oil constantly pressurized by nitrogen gas, prevents vapor locks in flowing oil assuring a satisfactory attenuation effect.

2) Operation

As shown in Fig.4-81 and 4-82, there are two oil paths in the piston; one is from the upper part of the piston to the lower surface, the other is from the lower surface of the piston to the upper surface of the piston.

There is a valve in the outlet of the oil path. When the shock absorber is at rest, it closes the oil path. The number of valves differs in the upper part and the lower part of the piston. There are three leaf valves in the lower part of the piston, and the upper part of the piston, while there is only one non-return valve that is pressed on the lead spring.

a. When the rear shock absorber is contracted

When the rear shock absorber is compressed with a load, the outer shell with the cylinder in it goes up and the spring contracts. Pressure is generated in the oil which is confined in the lower part of the piston by the non-return valve. It passes through the oil passage in the piston and pushes up the non-return valve with the oil pressure, which surpasses the tension of the leaf spring pressing the non-return valve. Then it moves to the upper part of the piston. When the shock absorber contracts and the spring is entirely compressed, the packing case comes into contact with the cushion rubber which is fixed on the upper part of the piston rod.

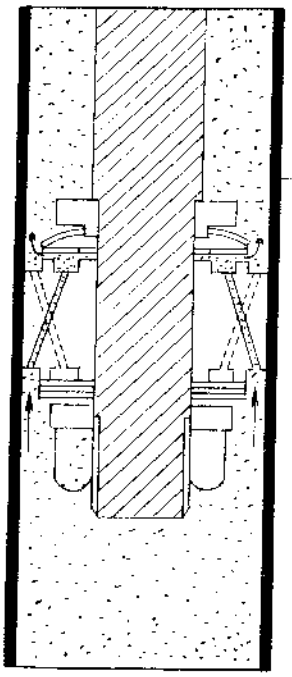


Fig. 4-81

b. When the rear shock absorber is expanded

Since in the expansion stroke of the rear cushion the spring expands and the outer shell and the cylinder fall, oil in the upper part of the piston tends to move and enters the oil path of the piston from the upper part of the piston. It pushes up three leaf valves and moves to the lower part of the piston. In the case of pushing up three leaf valves, oil resistance increases greatly and restricts the force of the spring which would tend to return violently. Therefore, the spring expands slowly and free motion of the spring, i.e. "spring back" is prevented. This is called a damping action in the expansion stroke. Since the cylinder falls in the final stage of the expansion stroke, the bearing comes into contact with the stopper in the upper part of the piston. Thus, the stroke comes to an end. The rubber bushings in the upper and lower bottom absorb the vibration transmitted from the road surface.

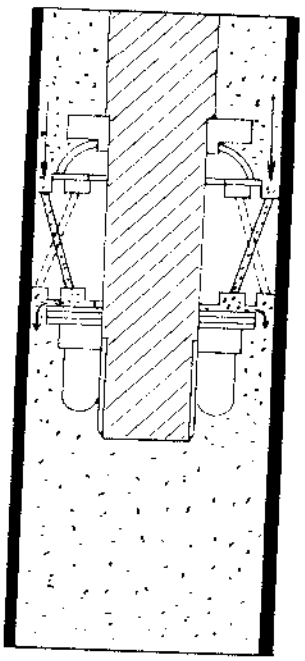


Fig. 4-82

3) Assembly and disassembly

Loosen upper and lower fitting bolts to take the rear shock absorber from off the frame and swing arm. Assembly is the opposite.

Note: Take care not to damage cushion rubbers surrounding fitting bolt holes.

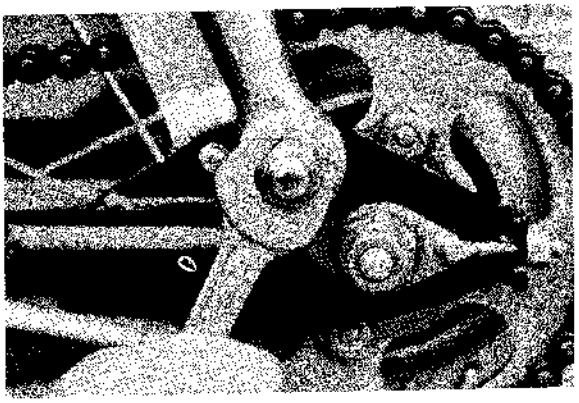


Fig. 4-83

4) Inspection

a. Since damping force acts in the expansion of the rear shock absorber, inspect damping force by pulling and pressing it.

b. Replace it as a unit if oil leaks out of unit.

Note: The rear shock absorber can be removed but cannot be disassembled. Therefore, the unit has to be replaced if it is defective.

8. Front fender, Rear fender

1) Construction

The front fender and the rear fender are independent of the frame. The front fender is fixed with a stay to the front fork while the rear fender is fixed to the frame through the bracket.

Note: 1. To lighten the motorcycle, the front and rear fenders of F5 are made of aluminum.

2. Front fenders of F series models are fixed with stays to the under part of frame head pipe.

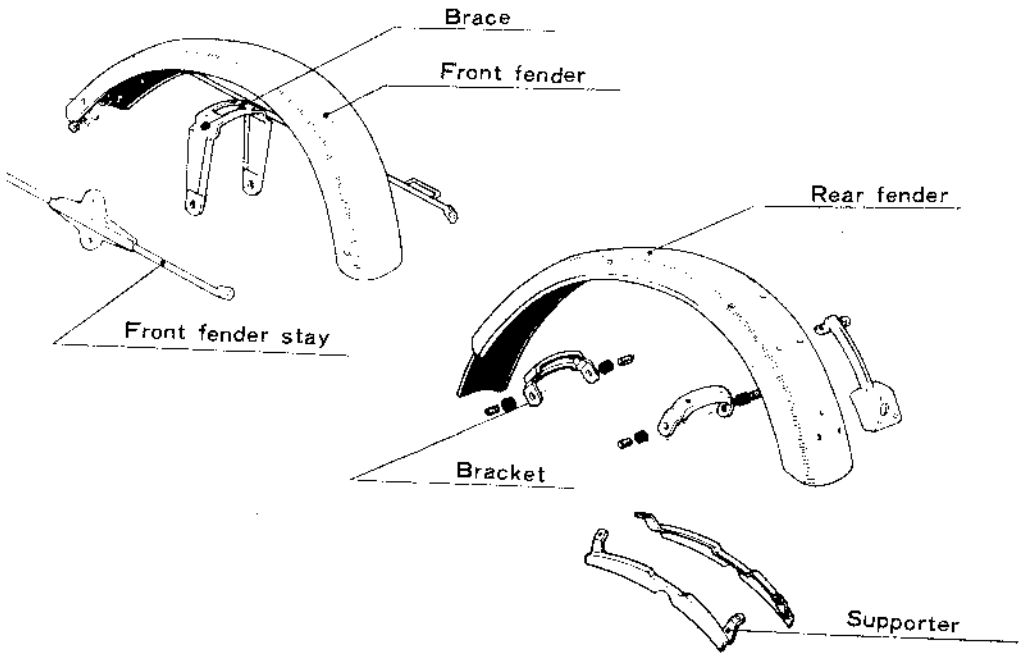


Fig. 4-84

2) Assembly and disassembly

Front fender and rear fender can be easily taken off after the wheels are taken off.

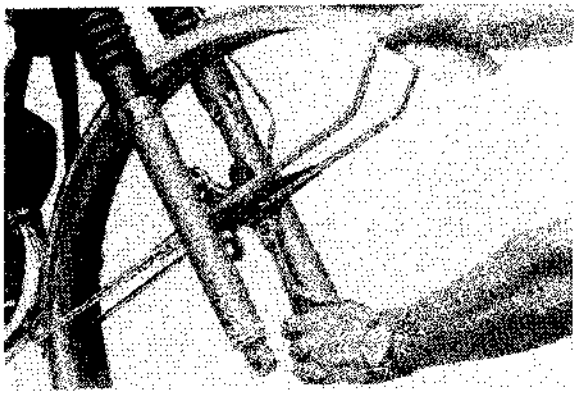


Fig. 4-85

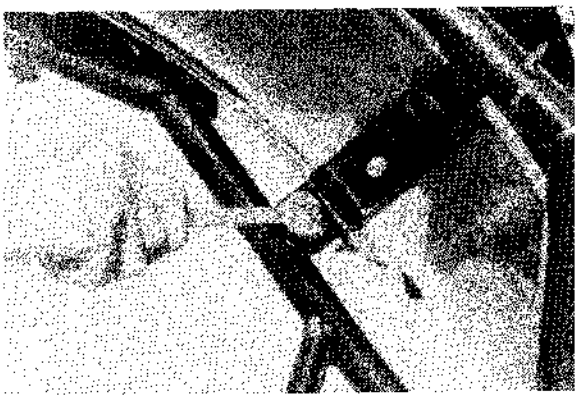


Fig. 4-86

Note: Take care not to damage wiring, tail lamp unit when taking off the rear fender.

9. Swinging arm

1) Construction

The swinging arm is a shock absorber for the rear part of the frame working with the rear shock absorber units. The front part of the swinging arm is attached to the frame with the pivot shaft, while the rear part of the swinging arm is connected to the frame through the rear shock absorbers and operates up and down around the pivot shaft.

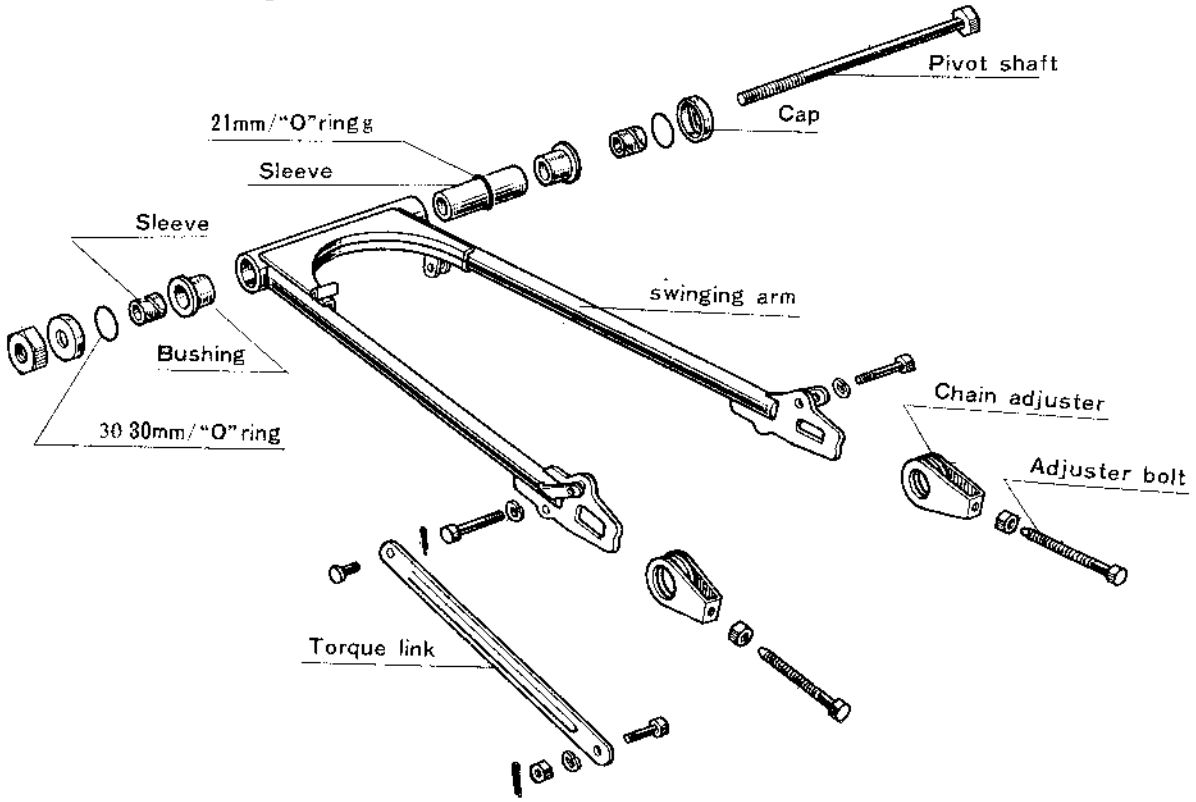


Fig. 4-87

2) Disassembly

a. Rear sprocket and coupling

Take off the drive chain then remove the sprocket coupling set loosening the coupling fitting nut. When removing the sprocket from the coupling, take out the caulking of the lock washer and remove the bolts.

Note: In the F series, the coupling and the brake drum are one-bodied. Therefore, the rear wheel and rear sprocket are removed together.

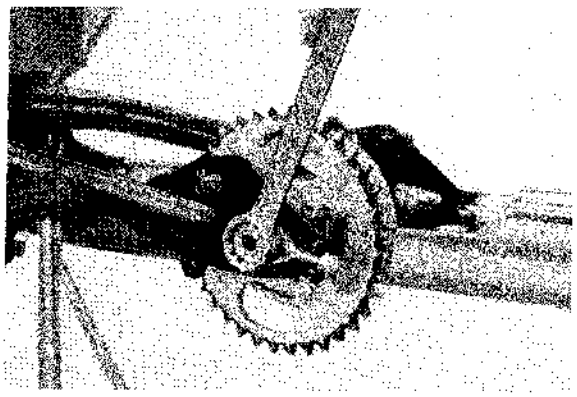


Fig. 4-88

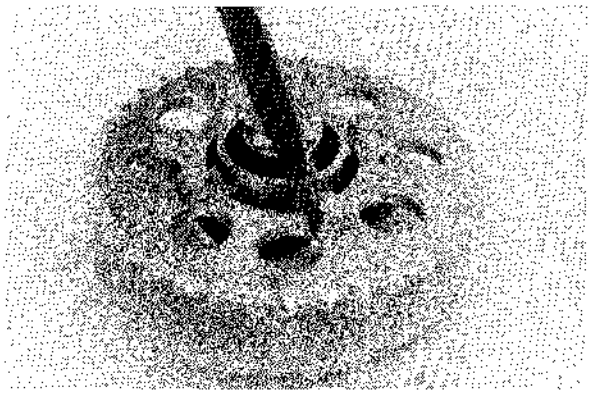


Fig. 4-89

b. Swinging arm

After taking off the pivot shaft, take off the swinging arm.

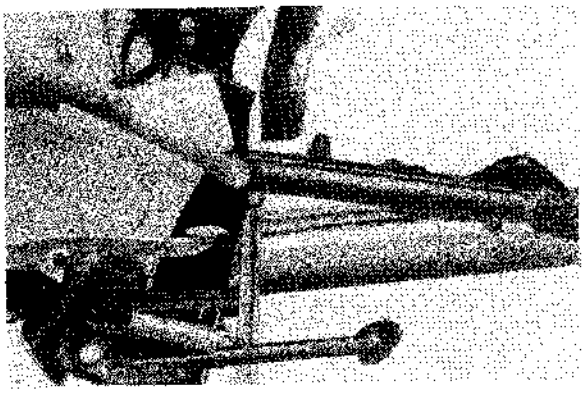


Fig. 4-90

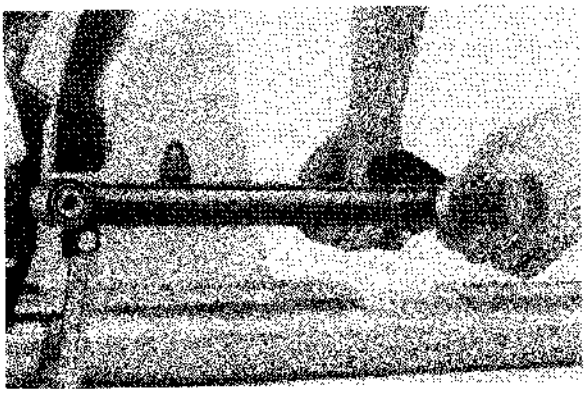


Fig. 4-91

3) Inspection

a. Sleeve

The pivot section (part fitting to the frame) of the swinging arm always moves with the vibrating wheel. It bears almost the whole weight of the frame. Inspect carefully the fastening of the nut, abrasion of the sleeve, etc. The sleeve tends to be damaged especially in the drive end (loaded with the chain). If there is play in this part, steering becomes unstable.

Table 4-16 Gap between the sleeve and the bushing

Model	Standard value	Repair limit
F Series	0.005 ∿ 0.008 in (0.128 ∿ 0.199 mm)	0.014 in (0.35 mm)

b. Pivot shaft

Measure the bending of the pivot shaft with a dial gauge.

Table 4-17

Model	Standard value	Repair limit
All model	Under 0.004″ (0.1 mm)	0.02″ (0.5 mm)

c. Bending of the swinging arm

If the arm of the swinging arm is bent, the center of the rear wheel is not in a proper alignment with that of the front wheel. Therefore, the handlebar becomes hard to turn. Inspect, repair or replace it if it is defective. Replace it if the weld is cracked.

d. Sprocket distortion and wear

(1) If the sprocket is badly distorted, not only is it difficult to adjust the chain properly, but there is a good chance the chain might break or come off the sprocket at higher speed.

To measure sprocket distortion, place the sprocket on a flat surface and check the gap between the surface and various points on the sprocket with a feeler gauge.

Table 4-18

Model	Standard value	Repair limit
All model	Under 0.012″ (0.3 mm)	0.02″ (0.5 mm)

(2) When the sprocket teeth are worn, the chain might slip off the sprocket while running, or teeth may be damaged. Measure the diameter of the socket at the base of the teeth.

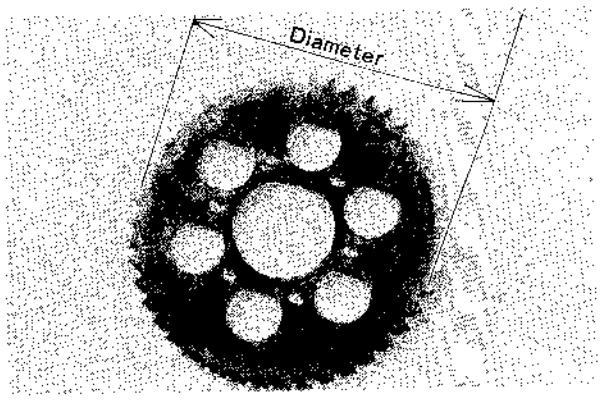


Fig. 4-92

Table 4-19 **Root diameter of the sprocket**

Model	Number of teeth	Standard value	Repair limit
GA1-A	39	5.88 in (149.33 mm)	5.79 in (147 mm)
GA2-A	36	5.40 in (137.22 mm)	5.31 in (135 mm)
G3SS-A	37	6.56 in (141.26 mm)	5.47 in (139 mm)
G3TR-A G4TR B1L-A	42	6.36 in (161.45 mm)	6.26 in (159 mm)
G31M-A F7	50	7.63 in (193.76 mm)	7.56 in (192 mm)
F6	55	8.42 in (213.95 mm)	8.35 in (212 mm)
F8, F81M	45	8.56 in (217.42 mm)	8.46 in (215 mm)
F5	41	7.77 in (197.23 mm)	7.68 in (195 mm)

4) Assembly

The order of assembly is the reverse of disassembly.

Table 4-20 Self locking nut fastening torque value.

Model	Fastening torque
G Series	22 ft-lb (3.1 kg-m)
G4TR G31M-A B1L-A F6 F7	37 ft-lb (5.1 kg-m)
F8 F81M F5	61 ft-lb (8.5 kg-m)

10. Fuel tank, oil tank and fuel cock

1) Construction

a. Fuel tank

In the fuel tank, special steel plate which has excellent resistance to corrosion is used. In the lower part of the fuel tank, there is the fuel cock which filters the gasoline and feeds it to the carburetor.

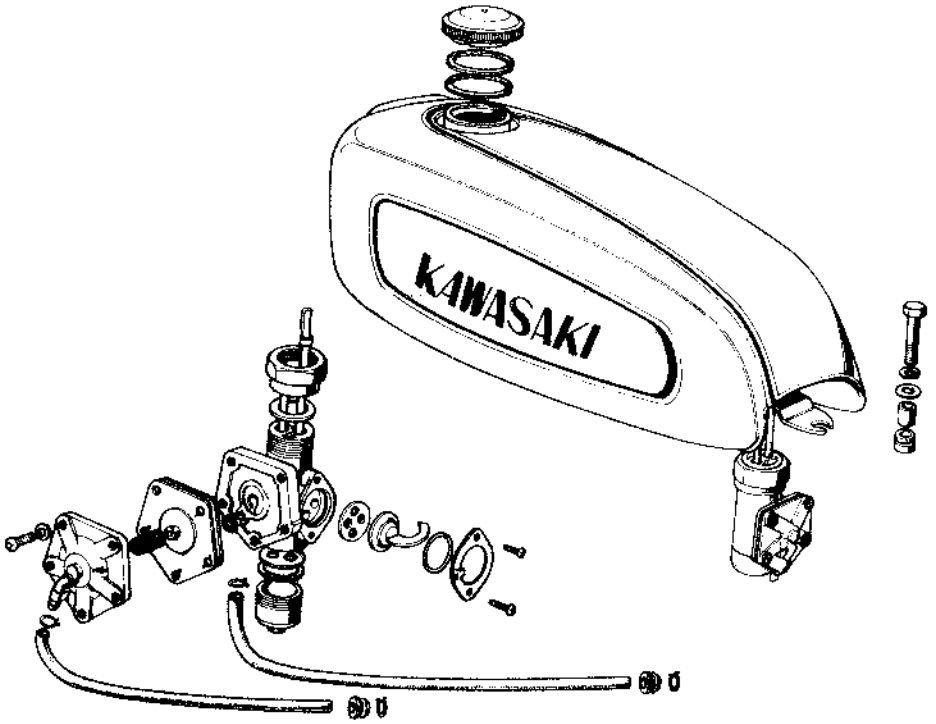


Fig. 4-93

b. Oil tank

The oil tank is located in the right lower part of the dual seat. Oil is fed to the crankcase by the oil pump in the engine. In F5 and F8 in addition to the above, oil is supplied directly to the big end of crankshaft.

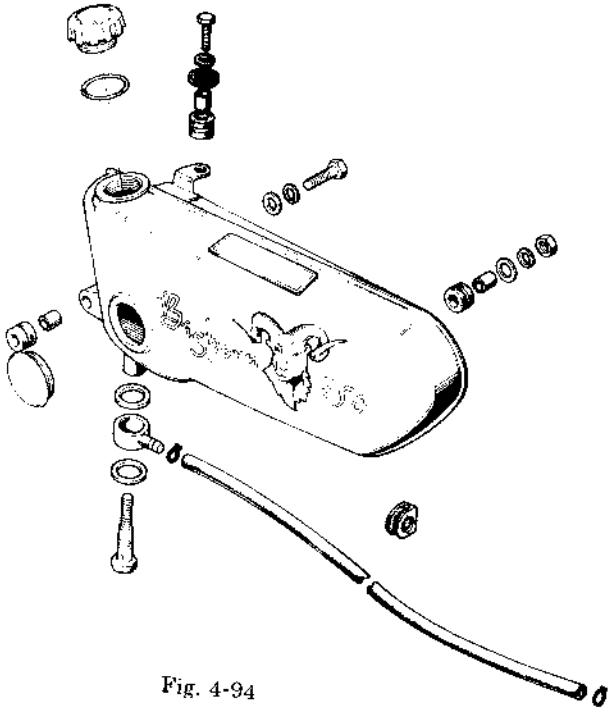


Fig. 4-94

Table 4-21 Fuel tank and oil tank capacites

Model	Fuel tank	Oil tank
GA1-A	1.73 U.S. gal (6.5 ℓ)	1.3 U.S. qt (1.2 ℓ)
GA2-A G3SS-A G3TR-A	2.26 U.S. gal (8.6 ℓ)	1.3 U.S. qt (1.2 ℓ)
G4TR	2.5 U.S. gal (9.5 ℓ)	1.3 U.S. qt (1.2 ℓ)
G31M-A	1.73 U.S. gal (6.5 ℓ)	——
B1L-A	2.24 U.S. gal (8.5 ℓ)	1.9 U.S. qt (1.8 ℓ)
F6, F7	2.4 U.S. gal (9 ℓ)	1.6 U.S. qt (1.5 ℓ)
F8, F5	3.3 U.S. gal (12.5 ℓ)	1.7 U.S. qt (1.6 ℓ)
F81M	3.3 U.S. gal (12.5 ℓ)	——

Note: Fuel tank of 1972 F8, is 2.9 US gal (11.0 ℓ).

c. Fuel cock

The fuel cock filters gasoline from the fuel tank and feeds it to the carburetors. The lever is used to send gasoline to the carburetor. If the fuel cock lever is switched to the number "1" or "2" (stamped on the fuel cock body), gasoline flows into the carburetor from the fuel tank. If the fuel cock lever is switched to "O", gasoline stops flowing. When there is plenty of gasoline left in the fuel tank, drive with the fuel cock lever adjusted to "1". If gasoline stops flowing at "1", switch the fuel cock lever to "2". "2" stands for RESERVE at which the fuel quantity in the fuel tank is less than about 1 liter.
Be sure to switch the fuel cock lever to "0" when the engine stops.

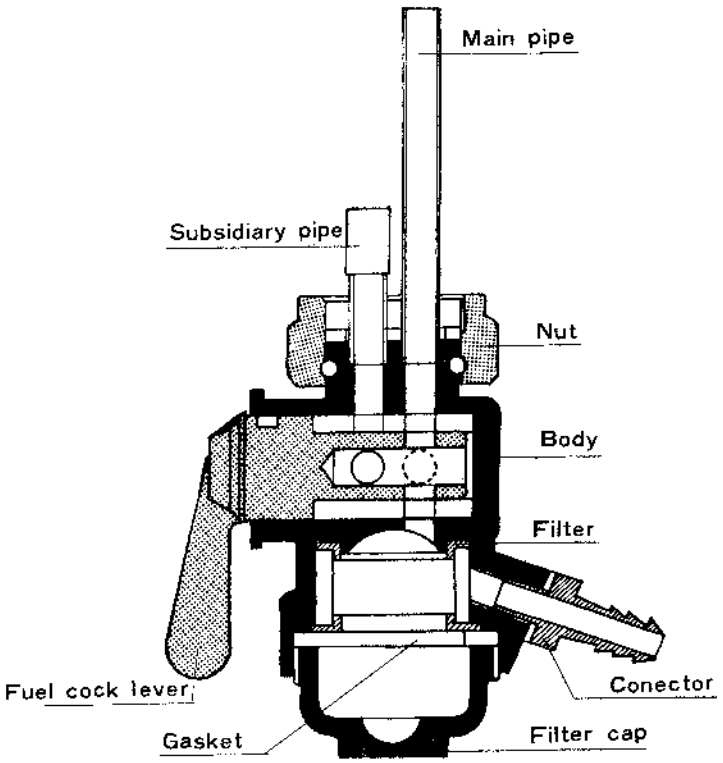


Fig. 4-95

d. Automatic type fuel cock

F5, F7

The fuel cock used in the model F5 and F7 is the automatic type. When the fuel cock lever is set to the ON or RES position, gasoline is automatically supplied while the engine is running and automatically shut off when the engine stops.

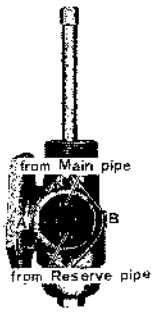


Fig. 4-96

Both the fuel coming down the main standpipe and the reserve supply pipe are sent by turning the lever to the position "ON" and "RES" to the passage "A" where are automatic control device is working to measure the flowing quantity of the fuel to the carburetor. When the cock lever is turned to the position "PRI", which stands for the priming, the fuel coming down the reserve supply pipe is channeled to the passage "B" and directly supplied to the carburetor by-passing the automatic device.

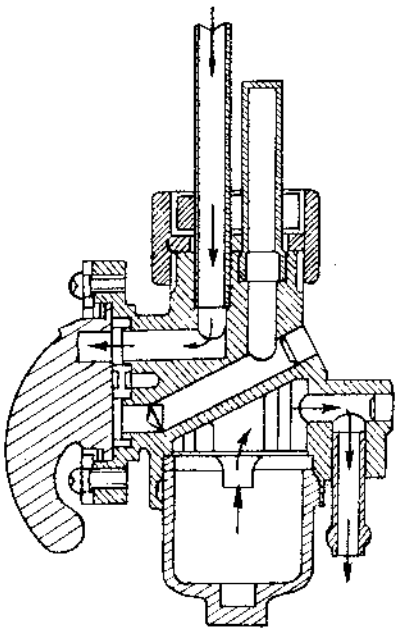


Fig. 4-97

The automatic device to control the fuel, located at the end of the passage "A", is a kind of diaphragm valve. The diaphragm is moved by the negative pressure developed in the carburetor when the engine is running. This pressure is conveyed to the diaphragm housing by a pipe.

When the diaphragm is pulled by the negative pressure from the carburetor main bore, the valve stem attached in the center of the diaphragm is also moved with it against the spring tension resulting in separating the "O" ring from the valve seat. Thus the fuel is allowed to flow down the passage to the filter cup in proportion to the negative pressure applied on the diaphragm.
Consequently, when the engine stops and no negative pressure is applied on it, the valve stem returns to its normal position pressing the "O" ring to the valve seat with spring tension, and stopping the fuel flow. The pin hole drilled in the valve seat side housing helps to pull the diaphragm by allowing atmospheric pressure behind the diaphragm.

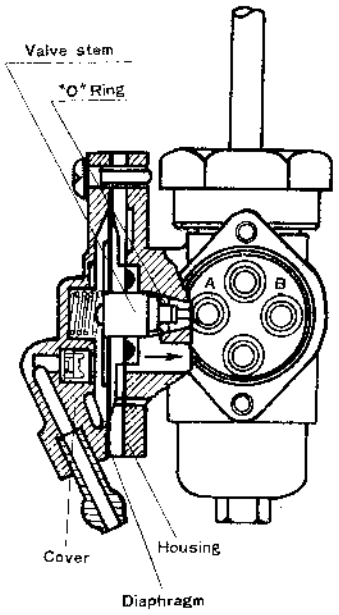


Fig. 4-98

2) Disassembly

a. Taking off the fuel tank

First of all, switch the fuel cock lever to the "0" point (Stop) and pull out the fuel pipe from the fuel cock body, after stopping the gasoline. Next, take off the fuel tank.

Note: There is a harness between the pipe frame and the lining of the fuel tank. Therefore, be careful not to pick up the main wire harness with the fuel tank when taking off the fuel tank.

Since the fuel cock in the Model F5 and F7 is an auto-cock, the fuel cock lever has to be switched to the position "ON" or "RES".

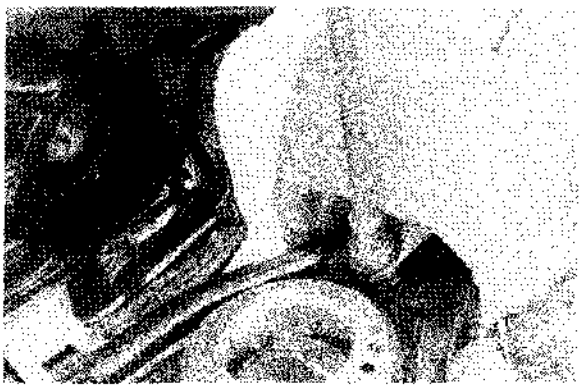


Fig. 4-99

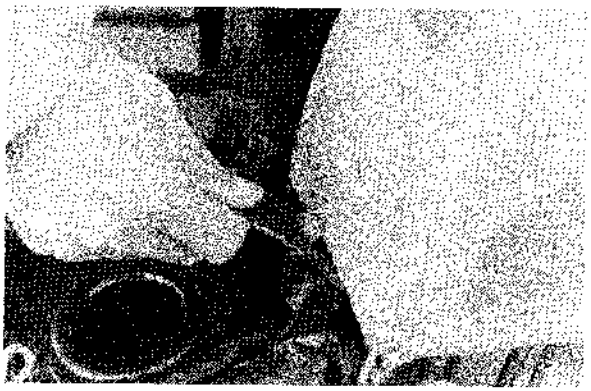


Fig. 4-100

b. Taking off the fuel cock

After draining gasoline from the fuel tank, take off the fuel cock.

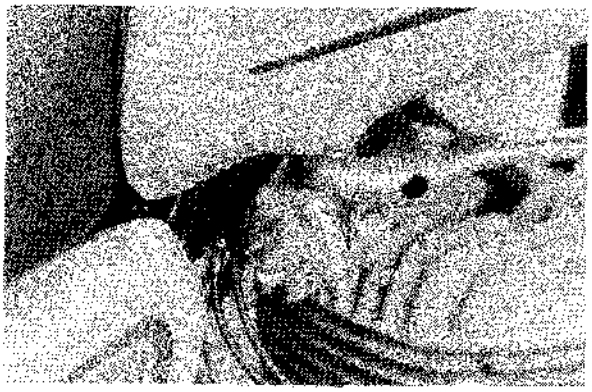


Fig. 4-101

c. Taking off the oil tank

After draining the oil entirely from the oil tank or putting the spigot on the oil tank tube tube to stop the oil, take off the oil tank.

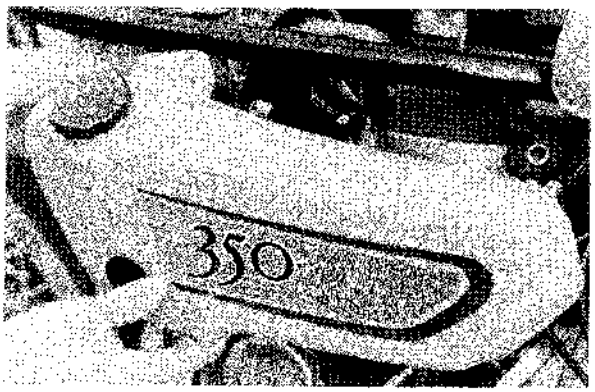


Fig. 4-102

3) Inspection

a. Fuel tank and oil tank

After a long period of service, dust gathers at the bottom of the fuel tank and the oil tank, resulting in problems with the fuel cock and the oil pump. Periodically wash the interior of the fuel tank and the oil tank with gasoline.

b. Fuel tank cap and oil tank cap

The tank cap not only prevents oil or gasoline from leaking, but also feeds air to the tank. If no air flows into the tank, neither gasoline nor oil flows. Inspect the air vent of the tank cap. Replace the tank cap gasket of expanded.

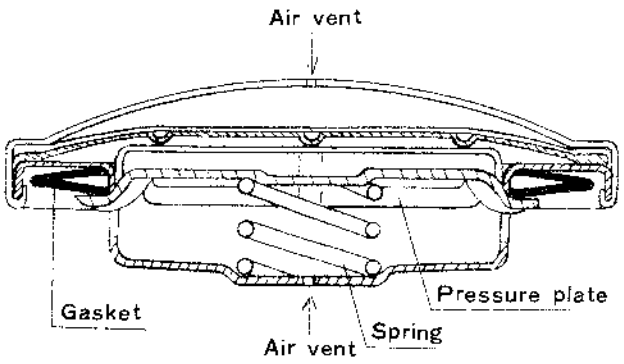


Fig. 4-103

c. Oil tank cap "0" ring and banjo bolt gasket

A damaged "0" ring or banjo bolt gasket will cause oil leakage. Replace them if they are damaged.

d. Fuel cock

G Series, B1L-A, F6, F8, F81M

(1) Inspect every part of the fuel cock, and replace a damaged gasket to prevent oil leakage.

(2) Since dust gathers in the cup under the fuel cock, remove and clean it occasionally.

(3) Clean the gasoline path with compressed air if it is clogged in the fuel cock body.

e. **Automatic fuel cock**

F7, F5

If the fuel cock leaks, loosen the screw of the diaphragm cover; take off the diaphragm from the body and clean the valve and seat section with fresh gasoline and compressed air.

* Take care to adjust the positions of the air holes in the spacer and diaphragm to the hole position in the body when assembling.

Take care not to open an air leak in the boost tube which connects the fuel cock to the negative pressure outlet of the carburetor. Air leakage will cause poor fuel supply.

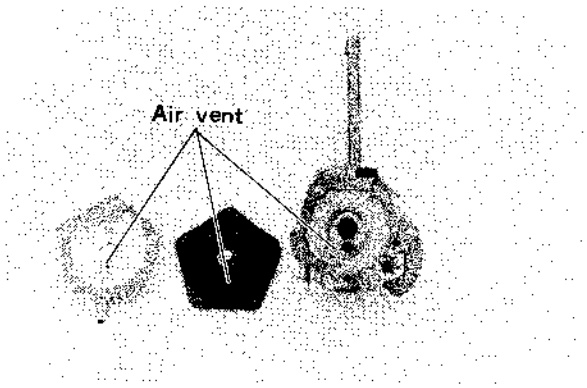


Fig. 4-104

4) Assembly

The order of assembly is the reverse of disassembly.

11. Dual seat

1) Construction

There is elastic sponge in the dual seat.

The dual seats in B1L-A series are fixed to the frame with bolts but these in other models are fixed to the frame with pivot holders and hooks.

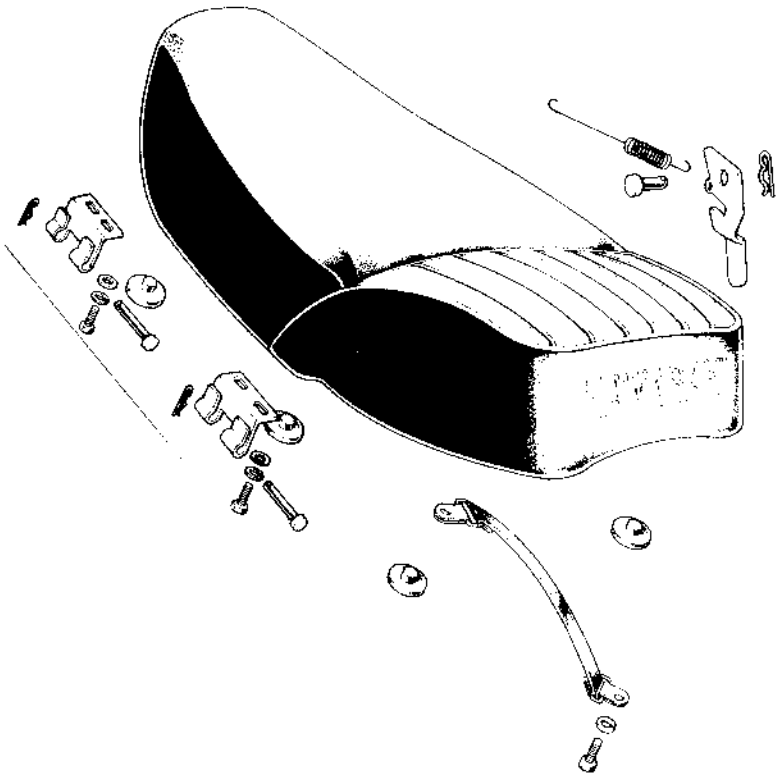


Fig. 4-105

2) Disassembly

Open the dual seat and take off the cotter pins of pivot holders and remove the dual seat.

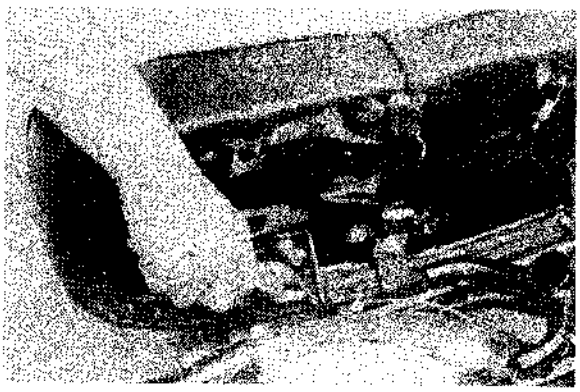


Fig. 4-106



Fig. 4-107

3) Assembly

The order of assembly is the reverse of disassembly.

12. Center stand, side stand and foot rests

1) Construction

The center stand and the side stand support the whole weight of the motorcycle while it is stopped. They are made of highly rigid material.

On G4TR, F5, F6, F7 and F8, only the side stand is attached.
On G31M and F81M neither side stand nor center stand is attached but they are provided with a separate portable stand.

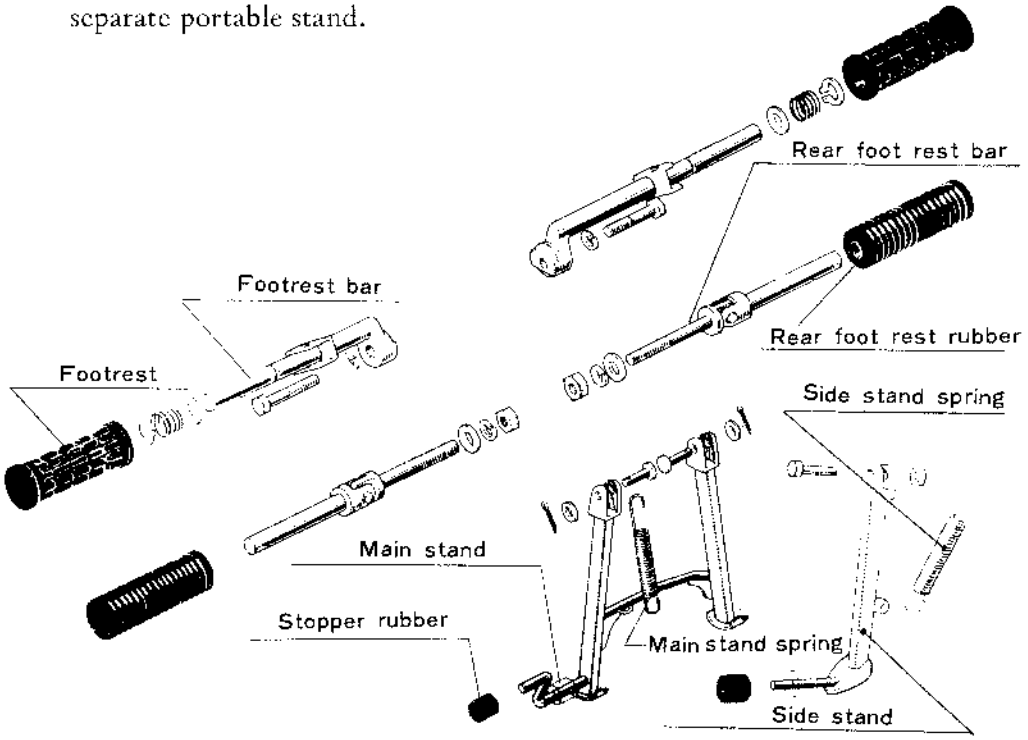


Fig. 4-108

2) Disassembly

a. Center stand

Take off the cotter pin and pull out the shaft. Then remove the spring.

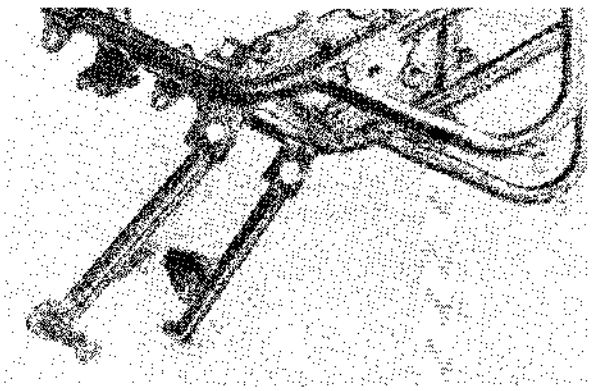


Fig. 4-109

b. Side stand

After removing the spring, take off the side stand.

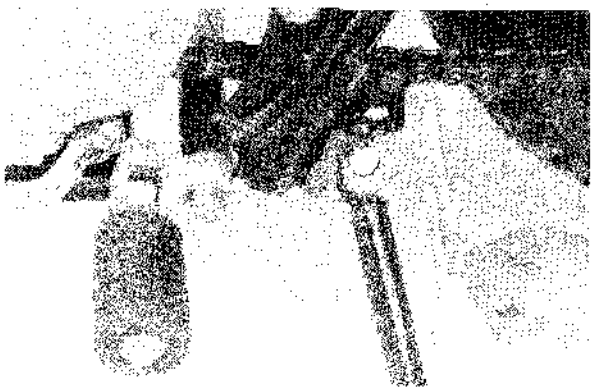


Fig. 4-110

c. **Foot rest**

The right and left foot rests are attached to the frame independently in the case of model G4TR, G31M, F5, F6, F7, F8 and F81M.

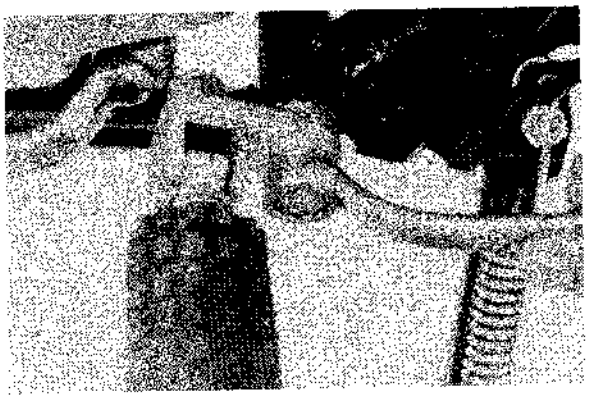


Fig. 4-111

3) Inspection

a. **Side stand spring and center stand spring**

If the spring is expanded and the stand is hard to return, replace the spring.

b. **Foot rest rubber**

Replace a cracked or worn foot rest rubber with a new one.

4) Assembly

The order of assembly is the reverse of disassembly.

13. Exhaust pipe and muffler

1) Construction

The exhaust pipe guides the exhaust gas from the cylinder to the muffler. One end of the exhaust pipe is inserted in the exhaust port of the cylinder and the other is inserted into the muffler. The joint seal is employed in the joint section to prevent gas from leaking. The model GA, G3SS and B1L-A have exhaust pipe separate from mufflers. Other models have mufflers incorporated with exhaust pipes. Exhaust from the engine passes through the exhaust pipe, enters the muffler and expands. It collides with the baffle plates, and its path is obstructed. It enters the baffle tube. (Part of it enters the baffle tube directly.) The combustion gas in the baffle tube enters the resonant box (the chamber surrounded by the muffler body, baffle plate and baffle tube) through many holes in the baffle tube. Then it circulates in the baffle tube and the resonant box repeatedly. While it is trying to expand, the sound is muffled and it is exhausted outside.

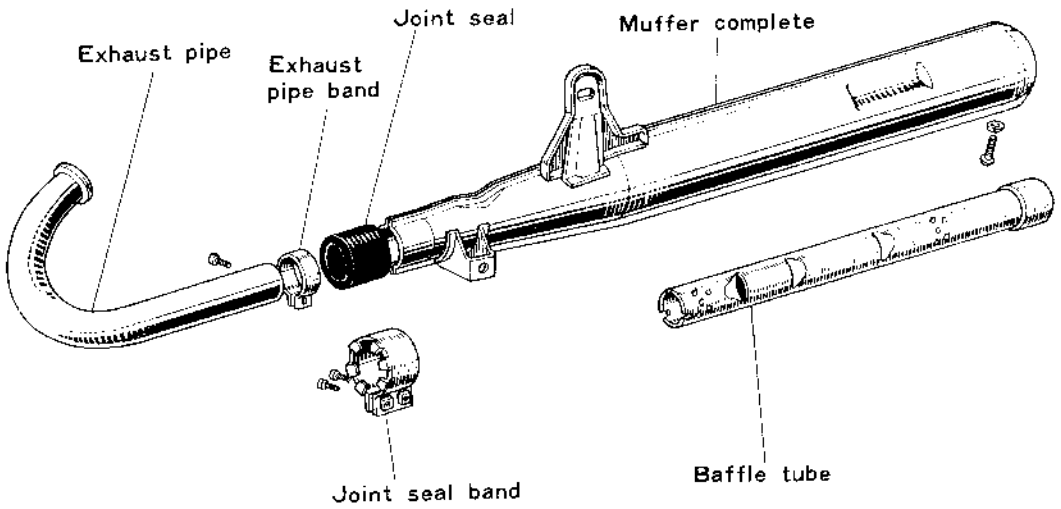


Fig. 4-112

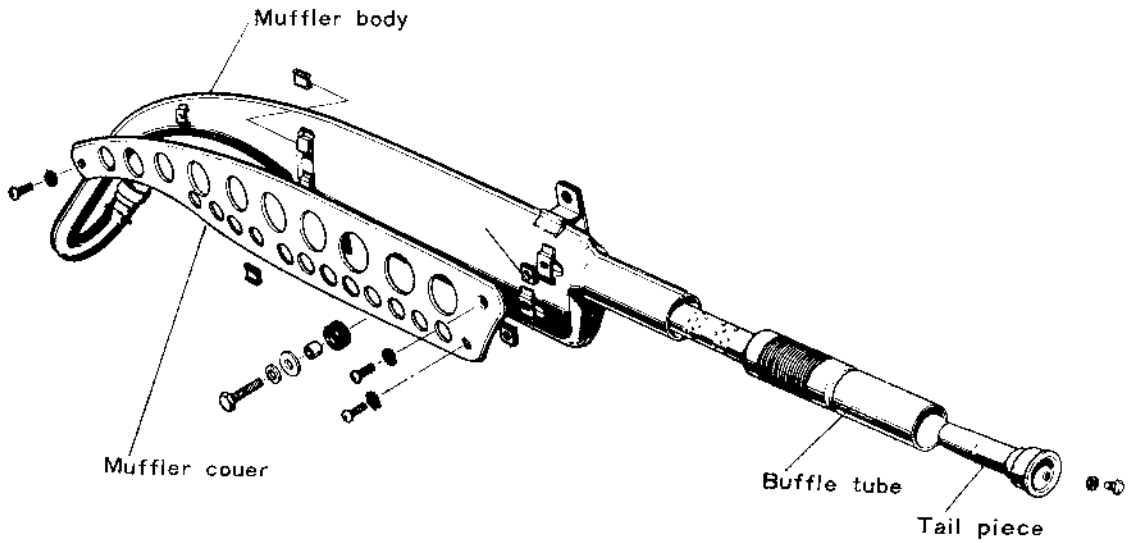


Fig. 4-113

2) Disassembly

a. Muffler G31M-A, G4TR, F series

Take off the mounting bolts in the rear side of the muffler then remove the hook springs which fit the muffler to the cylinder flange.

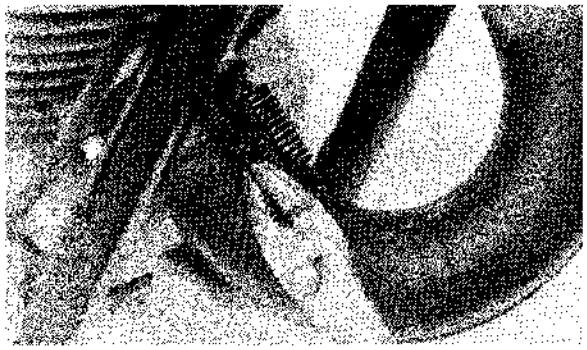


Fig. 4-114

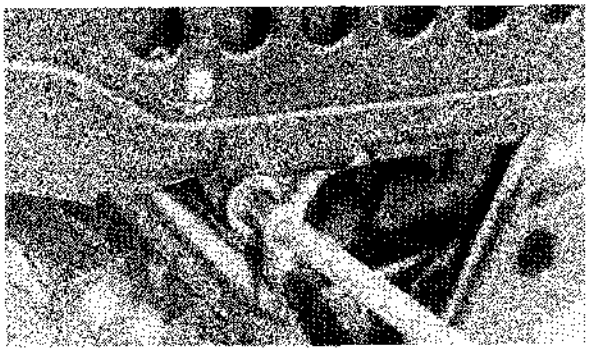


Fig. 4-115

b. Muffler and exhaust pipe GA1-A, GA2-A, G3SS-A, G3TR-A

Loosening the muffler and cylinder flange, take off the exhaust pipe. Then take off the muffler by removing the front and rear mounting bolts of the muffler.

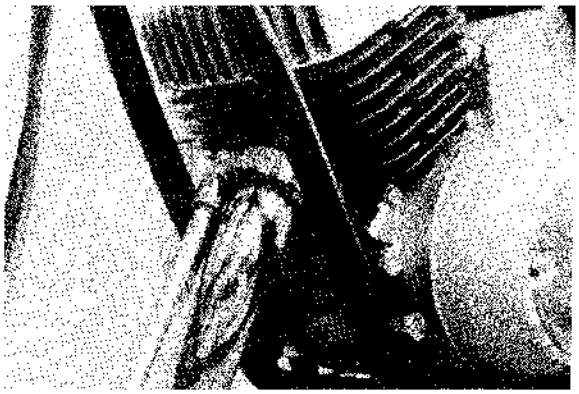


Fig. 4-116

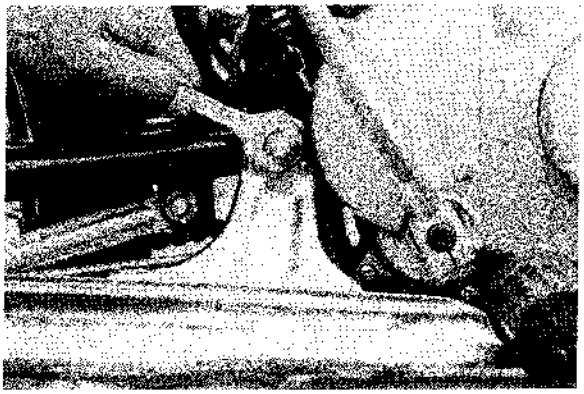


Fig. 4-117

The exhaust pipe in Models G3TR-A, G31M-A, G4TR and F series is of a one body type.

c. Taking off the baffle tube

After removing the phillips screw at the back of the muffler, pull out the baffle tube with a pair of pliers.

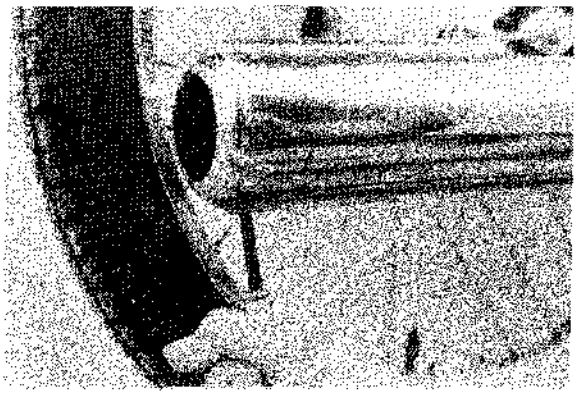


Fig. 4-118

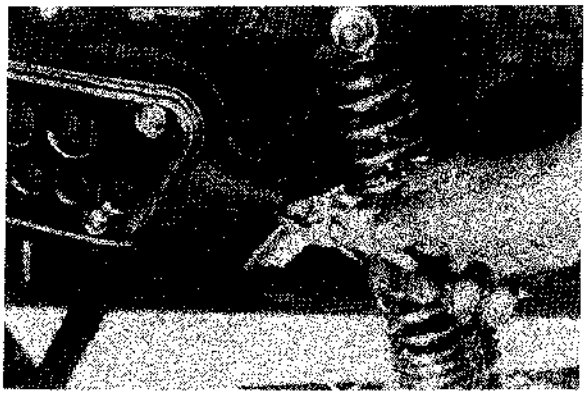


Fig. 4-119

3) Inspection

a. If carbon builds-up inside of the exhaust pipe or the muffler is heavy, the exhaust efficiency is reduced and the engine power is reduced. When disassembling the muffler, clean the carbon out according to the following procedure.

(1) By using a wire brush, clean carbon from the baffle tube. If it is too thick and cannot be removed with a wire brush, heat the baffle tube with a torch, and it can be removed by tapping it on the ground.

(2) Clean carbon from the exhaust pipe, by putting a used chain or a long screw-driver into it.

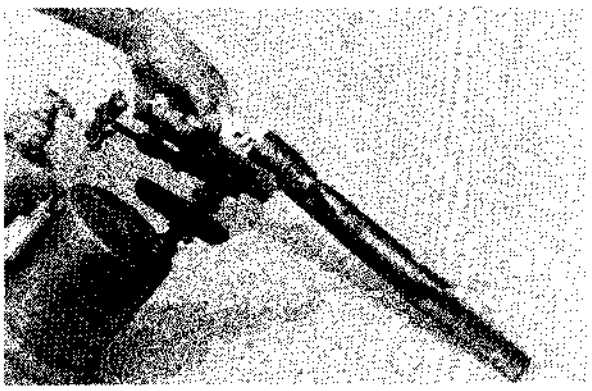


Fig. 4-120

b. When the muffler gets old, gas leaks from the joint section between the exhaust pipe and the muffler. Inspect the muffler and replace it if the rubber is old or broken.

c. If the cylinder fitting surface of the exhaust holder is bent or cracked, replace it.

4) Assembly

The order of assembly is the reverse of disassembly.

Note: Be sure to replace the exhaust gasket and muffler connector with new ones. The gasket or muffler connector which has been previously used will not uniformly connect the pipe and exhaust may leak.

14. Drive chain

Generally, tension and friction due to sliding occur between the pin and the bushing of the drive chain, and the bushing and the roller, causing the chain to expand. In addition, abrasion due to sliding occurs on the surface of the roller and teeth of the sprocket. Therefore, careful maintenance is required for them.

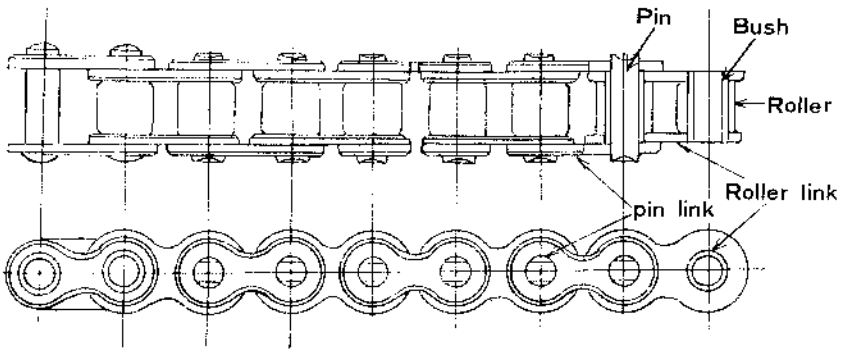


Fig. 4-121

Table 4-22 Specification of sprocket and drive chain

Model	Number of teeth of the sprocket		Gear ratio	Chain	
	Engine	Rear	(Secondary)	Type	Link
GA1-A	14	39	2.79	EK428	104
GA2-A	14	36	2.57	EK428	102
G3SS-A	14	37	2.64	EK428	104
G3TR-A	14	42	3.00	EK428	106
G4TR	15	42	2.80	EK428	110
G31M-A	14	50	3.57	EK428SH	114
B1L-A	15	42	2.80	EK428	112
F6	14	55	3.93	EK428SH	118
F7	14	50	3.57	EK428SH	114
F8, F81M	14	45	3.21	EK525SH	96
F5	14	41	2.93	EK525SH	94

1) Inspection

If there is no oil left on the drive chain, the joints do not move easily and the sprocket is adversely affected. Lubricate it periodically.

a. If the roller or link palte of the drive chain is cracked, replace it.

b. Raising the center stand and grounding the wheel, adjust the tension of the drive chain. As shown in Fig. 4-122, inspect the center of the chain. If there is vertical play of over 40 mm or under 10 mm, adjust it again because it will adversely affect running.

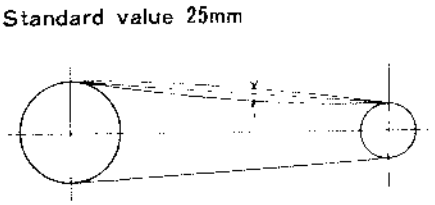


Fig. 4-122

Adjust the chain with the right and left chain adjuster bolts. Taking advantage of the scales marked on the right and left sides of the swinging arm ends, and the marks stamped on the chain tensioner, adjust the chain adjuster bolts so that the right and left marks of the chain tensioner are positioned in the same places on the right and left scales. If the position of the chain tensioner is different on the right side and the left side, the rear wheel will not be aligned. Since the brake adjustment varies according to the chain adjustment, be sure to adjust the brake after adjusting the chain.

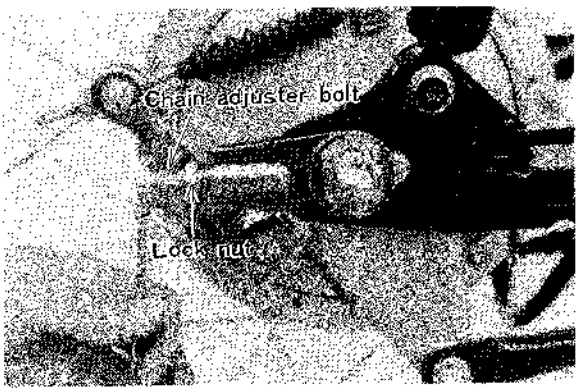


Fig. 4-123

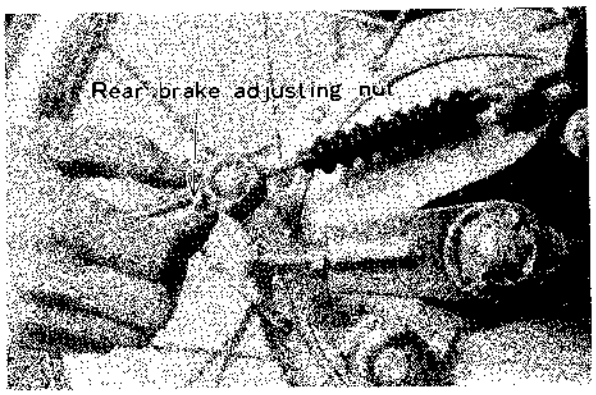


Fig. 4-124

c. If the chain cannot be adjusted due to over stretching, cut off one link of the drive chain with chain cutter and/or chisel.

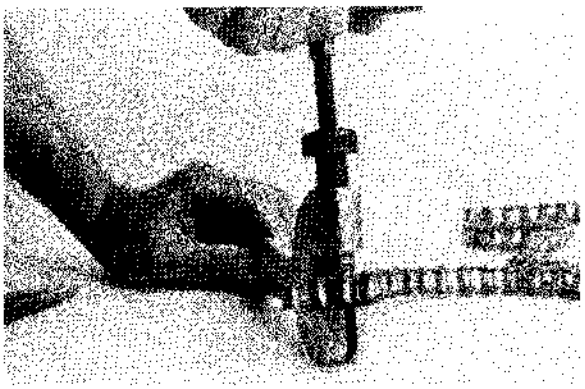


Fig. 4-125

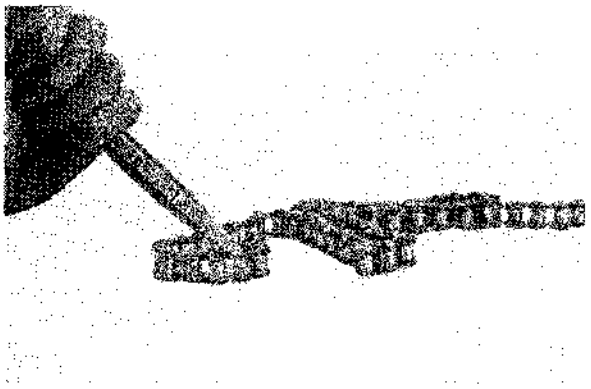


Fig. 4-126

2) Installing the master link

As shown in Fig. 4-127, install the master link so that the opening of the clip faces in the reverse direction of rotation.

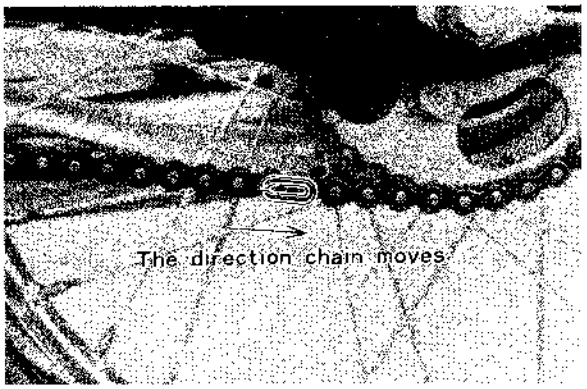


Fig. 4-127

Note: If it is reversed by mistake, the clip may come off during driving and the drive chain may break.

Ⅴ. ELECTRICAL EQUIPMENT

1. Flywheel Magneto
2. Starter Dynamo
3. Ignition Coil
4. Rectifier
5. High Tenston Cord
6. C.D. Ignition System
7. Voltage Regulator
8. Electrical Equipment for Chassis

1. Flywheel Magneto

1) General

The flywheel magneto is a simple mechanism, consisting of a stator and rotor which is called magneto base and flywheel, and is generally used on motorcycles not requiring much electrical power. The magneto base, installed on the L.H. crankcase, comprises a lighting coil, an ignition primary coil, a contact breaker, and a capacitor. The flywheel with symmetrical cast-in magnets, has a fitting hole column at the center of it, in which L.H. crankshaft end is inserted and locked with a nut. The fitting hole column of flywheel magneto operates as a cam for opening and closing the contact breaker when it turns. Electrical current generated in the flywheel magneto is alternating current and available directly for the head lamp, ignition coil and tail/brake lamp, but it must be converted to direct current by a rectifier to charge the battery. Horn and turn signal lamps are also supplied with direct current.

Table 5-1 Flywheel magneto specification

Model	Type	Manufacturer	Cut-in rpm		Battery
			Day time	Night time	
GA1-A GA2-A	FE101	KOKUSAN	1400	1600	6V 4AH
G3SS-A G3TR-A	FE109	KOKUSAN	s.t.d. 1800 spare 2700	2100	6V 4AH
G4TR	FE109	KOKUSAN	s.t.d. 1800 spare 2700	2100	6V 2AH
G31M-A	NJ101	KOKUSAN	—	—	—
F6	F6079BL	MITSUBISHI	s.t.d. 2000 spare 3000	3000	6V 4AH
F7	HM-01	KOKUSAN	s.t.d. 2000 spare 3000	1800	6V 4AH
F8	FP6309	KOKUSAN	s.t.d. 1600 spare 3000	2000	6V 2AH
F81M	X016	KOKUSAN	—	—	—
F5	HM-01	KOKUSAN	1000	1800	6V 2AH

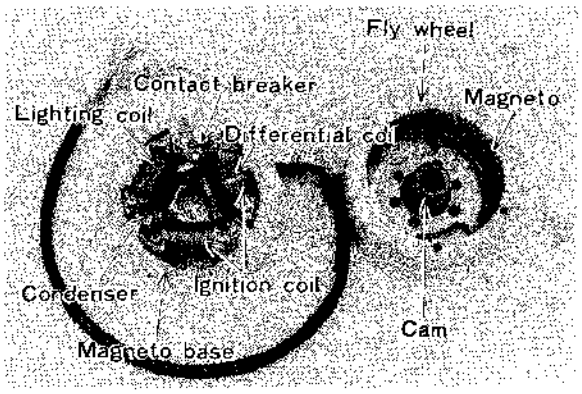


Fig. 5-1

The flywheel magneto of the F5 and F7 is basically the same as a conventional one, only replacing the ignition primary coil with an exciter coil and a signal coil for the CD ignition system.
The schematic below shows the circuit of the F5 magneto.

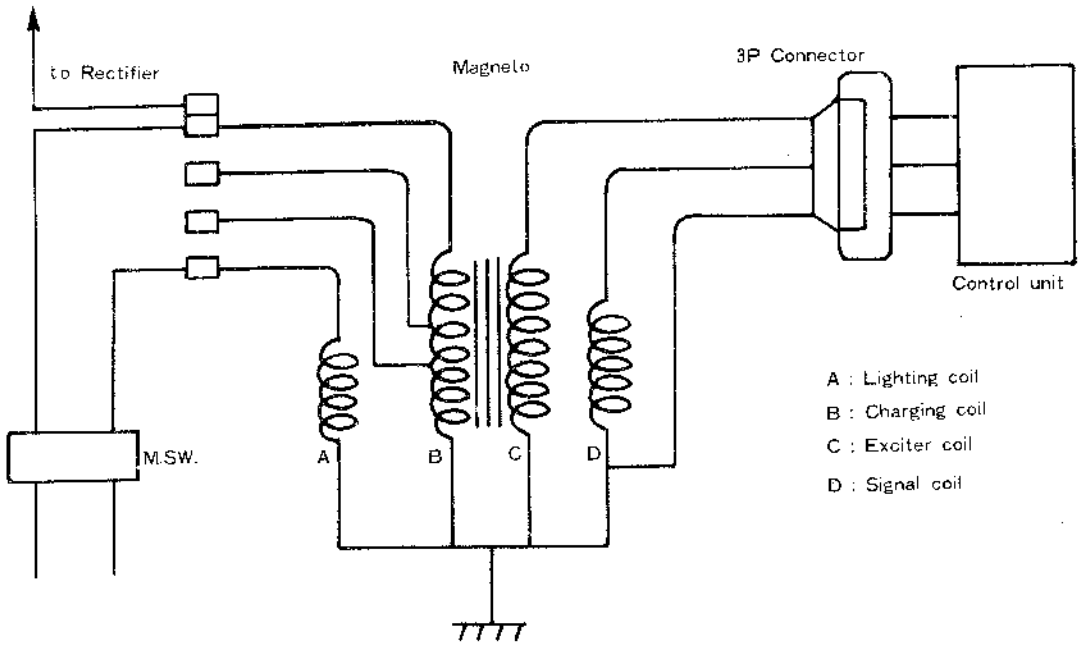


Fig. 5-2

Note: Two taps from the charging coil are not actually connected and not necessary for ordinary service.

2) Function

Electric current in the coils on the magneto base is generated by the magnetic induction of permanent magnets revolving around the windings and changing the flux passing through the windings and their iron cores.

a. Ignition System

The primary winding in the ignition coil is not supplied with any current when the contact breaker is closed and the induced current in the magneto ignition coil attains approximately 4 amperes when passing through the closed contact breaker circuit.
When the contact breaker is opened, the magneto ignition coil momentarily continues the same current of 4 amperes through the ignition primary coil which develops approximately 200 to 300 volts. Due to the high turns ratio between the secondary and primary windings of the ignition coil, an extremely high voltage is induced in the secondary winding.
This high voltage current is discharged inside the cylinder through the spark plug as the ignition spark.
A condenser connected in prallel with the contact breaker prevents contact breaker from sparking when it opens and protects the contact breaker from damage.

Note: Concerning the ignition of F7 and F5, refer to page 5 - 19 C.D.I. SYSTEM

b. Lighting and charging system

There is a considerable difference of the load on the flywheel magneto between the night running and the daytime running.

Supplying the ignition coil and charging battery of the daytime load is light, while lighting the head lamp in addition to the daytime load results in a heavy load during the night running. To supply the necessary current to the electrical equipment in each load, a heavy load wire and a light load are tapped from the generator coil and connected with the main switch.

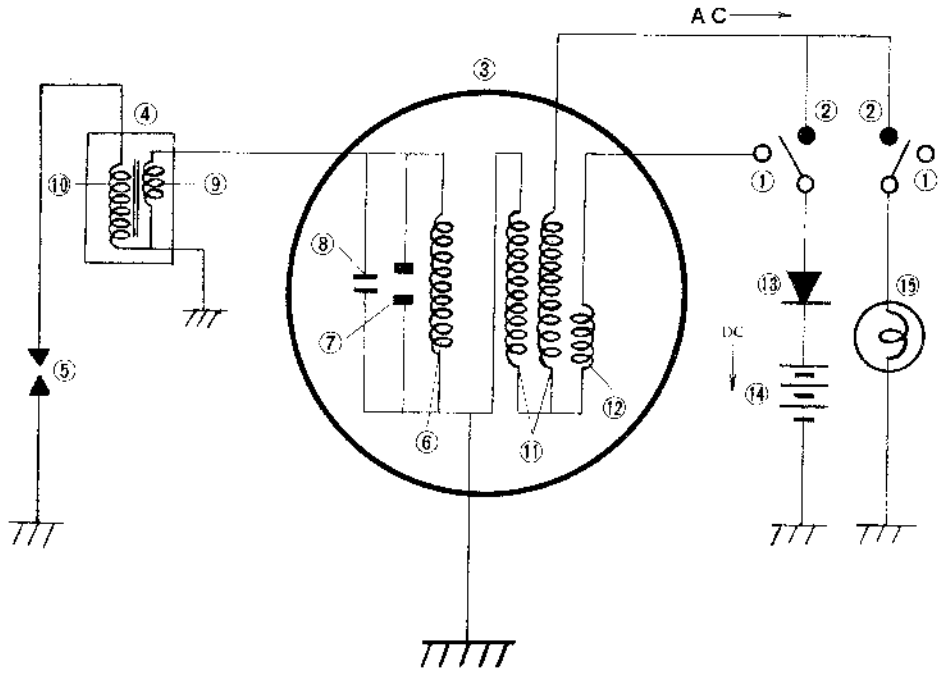


Fig. 5-3

(1) Daytime running	(6) Magneto coil	(11) Lighting coil
(2) Nighttime running	(7) Contact breaker	(12) Differential winding coil
(3) Flywheel magneto	(8) Capacitor	(13) Rectifier
(4) Ignition coil	(9) Ignition primary coil	(14) Battery
(5) Spark plug	(10) Ignition secondary coil	(15) AC lamp load (head lamp and tail lamp)

Three charging taps are attached to the magneto of F6 and F8. The pink wire is used when the switch key of the main switch is set at "Night running" position.

The blue and yellow/green wires are used when the switch key is set "Daytime running" position. The charging current is changed by connecting the blue wire of the main switch with the blue wire when the battery is under-charged, or with the yellow/green wire when it is over-charged.

In the case of the F5 the alternating current generated in the charging coil is furnished to the battery through the selenium rectifier. The terminal voltage of the battery is detected and controlled by a silicon voltage regulator as in the schematic diagram shown here.

Note: The contacts in the main switch in above diagram are closed only when the key is turned to the daytime riding position.

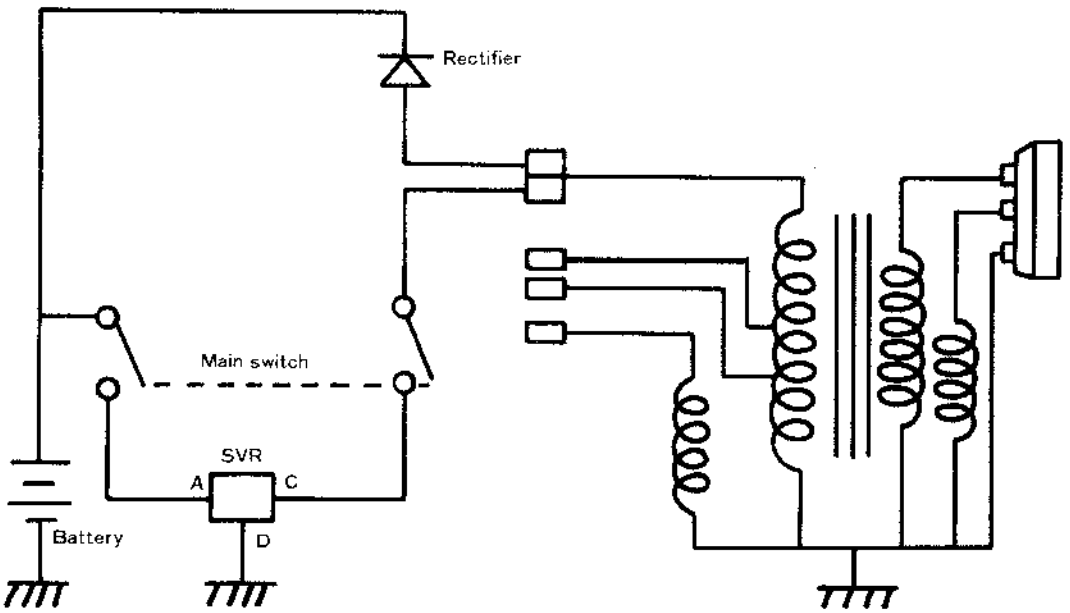


Fig. 5-4

When the terminal voltage of the battery exceeds the specified voltage in the electrical system, the SVR (connected between the magneto and battery (+), in other words, in parallel with the rectifier) will be actuated by the excess voltage and leads the generated AC to the ground in proportion to the excess voltage detected.
Thus the battery terminal voltage is controlled not to exceed the service voltage, regardless of the electrical load connected.

Caution: When the key is turned to the night riding position, the SVR is disconnected and not in service, therefore, in case the DC electrical load is reduced (tail light bulb or brake light bulb burn out) the battery may be overcharged.

The lighting coil is mainly connected to the head light but also lights the speedometer, tachometer and high beam indicator lamp bulbs, therefore, if the head light burns out, the speedometer and tachometer bulbs will burn out from the excessive AC voltage.
Refer to page 5 26 5 Voltage Regualtor, 1) SVR.

3) Inspection

Follow the procedure given here to check the G series, F6 and the F8 magneto with a hand tester.

a. Magneto ignition coil

Separate the contact breaker with a piece of paper and measure the resistance of the coil and the insulation resistance.

(1) Resistance of coil
Measure the resistance between the black lead wire and the ground by using a hand tester with its dial set to R X 1 position.
The coil is good if the measured value is approximately 0.5Ω.

(2) Insulation resistance

Using a 500 V megger, measure the insulation resistance between the iron core and the coil. The value should be over 5 MΩ. When measuring the insulation resistance, the ground wire of the coil to the magneto base should be disconnected.
The inductance measuring method is not given here because it is of no practical use, and because the quality of an ignition coil can be judged by the two measurements given above.

b. Condenser

In case the condenser is defective or its capacity, is reduced, misfiring or poor functioning, will result during high speed running. Usually the condenser is judged to be defective, when blue sparking is observed between the points of the contact breaker.
Check the condenser as follows:

(1) Capacity

The capacity of the condenser is 0.18 to 0.25μF.
The capacity can be measured by a condenser tester. But the quality of condenser also can be tested by connecting the plus and minus lead wires of the condenser to a 6VDC power source for a few seconds to charge it, then remove it from the power and touch the leads together.
If it sparks when the leads are touched, it is good.

(2) Insulation resistance

As in the case of the ignition coil, disconnect the ground wire of the condenser and measure the insulation resistance between the outer case and the positive (+) terminal. The condenser is good if the measured value is over 5 MΩ.

c. Contact breaker

(1) Check the insulation between the contact points and the contact breaker base. In case the insulation becomes inadequate due to loose mounting or damage, the primary current of the ignition coil can not be cut at the breaker point.

(2) The point surface is burnt or worn in use, necessitating periodical check. Smooth it using an oil stone or #400 emery cloth. At the same time check and adjust the ignition timing by resetting the point gap. Refer to section 4), Ignition Timing Adjustment for adjusting the point gap.
Be careful not to get oil on the points as the result may be loss of sprak even if the points are working mechanically.

d. Lighting coil, charging coil

(1) Resistance of each coil
Measure the resistance of each coil with a hand tester.

Table 5-2

Model	Lighting coil		Charging coil	
	Yellow	Pink	Blue	Yellow/Green
GA1-A GA2-A	0.41 Ω ± 10%	——	0.36 Ω ± 10%	——
G3SS-A G3TR-A G4TR	0.55 Ω ± 10%	0.55 Ω ± 10%	1.20 Ω ± 10%	0.29 Ω ± 10%
F6	0.48 Ω ± 10%	0.48 Ω ± 10%	0.60 Ω ± 10%	0.54 Ω ± 10%
F8	0.30 Ω ± 10%	0.30 Ω ± 10%	0.58 Ω ± 10%	0.57 Ω ± 10%

Note: The lighting coil for the model GA1-A and GA2-A also serves as a charging coil when the key is turned to the might riding.

(2) Insulation resistance
Again, disconnect the ground wire and measure the insulation resistance between the iron core and the coil. It is good if the measured value is over 0.5 MΩ.

4) Ignition timing adjustment

a. Remove the change pedal and the left cover.

b. Align mark "B" on the spherical surface of the flywheel with mark "A" on the L.H. crank case by turning the flywheel.

c. Loosen the fitting screw "E" and adjust the contact breaker points so they are just about to open, by moving the contact breaker assembly with a screw driver inserted in pry points "F" and "G".
Be sure to tighten screw "D" after adjustment.

d. After that, turn the flywheel in the normal direction (to the left), and the points will begin to open where mark (B) on the external circumference of the flywheel is aligned with mark (C) on the side of the crankcase.

e. When timing is adjusted correctly, maximum gap between the contact points will become 0.012 ∿ 0.016 in (0.3 ∿ 0.4 mm) automatically, so it is not necessary to adjust the poing gap separately.

Note: The mounting holes in the F8 magneto base are slotted for adjustment. The marks on the magneto base and the crankcase must be aligned.

Table 5-3 Ignition timing

Model	Standard ignition timing	Piston Position Before TDC								
		17°	18°	19°	20°	21°	22°	23°	24°	25°
G Series	20°	0.055in (1.40mm)	0.061in (1.56mm)	0.068in (1.72mm)	**0.077in (1.96mm)**	0.083in (2.11mm)	0.091in (2.32mm)	0.099in (2.51mm)	0.110in (2.78mm)	—— ——
G31M-A	23°	0.055in (1.40mm)	0.061in (1.56mm)	0.068in (1.72mm)	0.077in (1.96mm)	0.083in (2.11mm)	0.091in (2.32mm)	**0.099in (2.51mm)**	0.110in (2.78mm)	—— ——
F6	23°	0.064in (1.62mm)	0.071in (1.81mm)	0.080in (2.02mm)	0.088in (3.23mm)	0.097in (2.46mm)	0.106in (2.69mm)	**0.116in (2.94mm)**	0.125 in (3.19mm)	0.136in (3.46mm)
F8	20°	0.074in (1.88mm)	0.083in (2.10mm)	0.092in (2.34mm)	**0.102in (2.59mm)**	0.112in (2.85mm)	0.123in (3.12mm)	0.134in (3.41mm)	0.145in (3.70mm)	0.158in (4.01mm)
F81M	19°	0.074in (1.88mm)	0.083in (3.10mm)	**0.092in (2.34mm)**	0.102in (2.59mm)	0.112in (2.85mm)	0.123in (3.12mm)	0.134in (3.41mm)	0.145in (3.70mm)	0.158in (4.01mm)

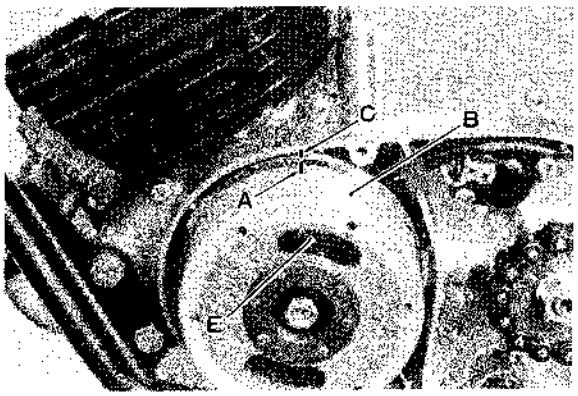


Fig. 5-5

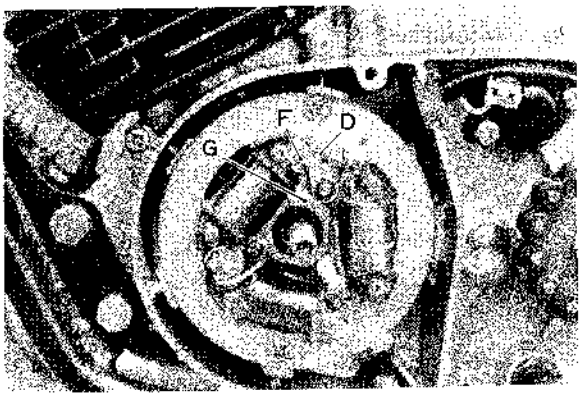


Fig. 5-6

2. Starter-dynamo and regulator

1) Outline of the starter-dynamo

The starter-dynamo consists of the starting motor and the DC generator which charges the battery, and supplies current for the lights and ignition system while the engine is running. Assembled to the above are the constant-voltage relay (automatic voltage regulator), the cut-out relay (automatic charging switch), the electro-magnetic switch for the starter, etc., which supplement the functions of the starter-dynamo. When the starter-dynamo serves as a starter, it converts the electric energy (input) provided by the battery into the mechanical energy (torque). When it serves as dynamo, it converts the mechanical energy generated by the engine into electric energy producing the necessary current for the lights, ignition, battery-charging, etc.

Specification Starter Dynamo and Regulator

Model	Starter Dynamo				
	Manufacturer	Type	Cut-in rpm	Rated output	Type
B1L-A	MITSUBISH	CE-T1R	1,260 ∿ 1,550	100 W	KC-T

2) Mechanism

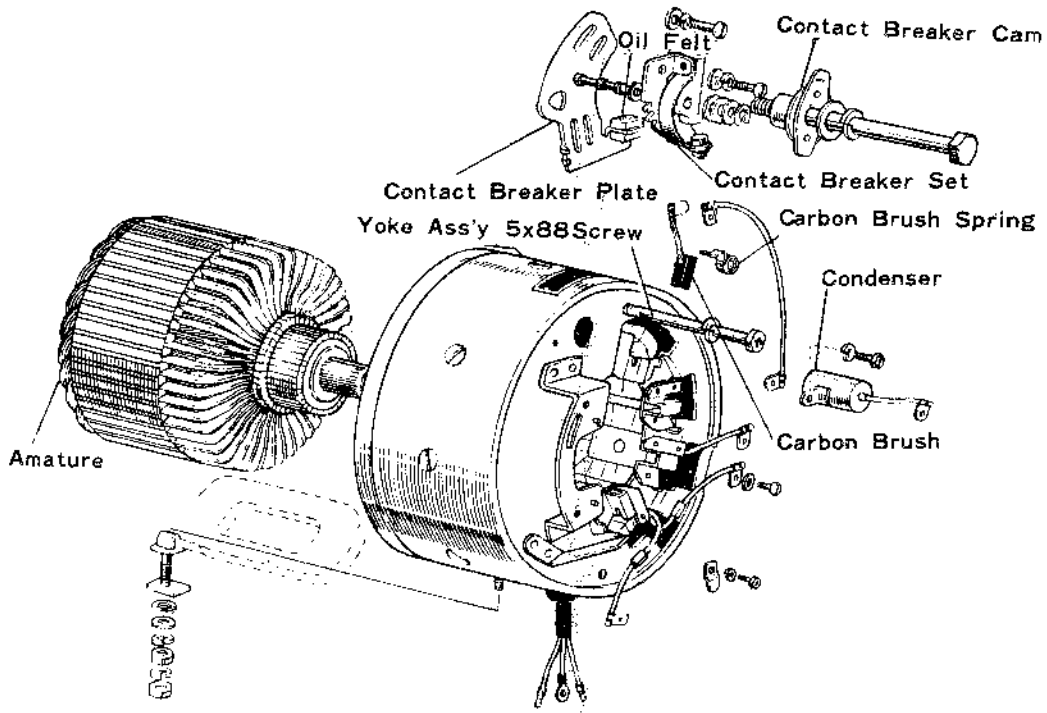


Fig. 5-7

This is a direct-coupling type in which the inner armature revolves, while the outer stator is composed of an 8-pole magnetic field. The armature always revolves when the engine operates, since it is directly coupled to the engine crankshaft at the tapered end. Affixed to the end of it is the cam for the contact breaker.

The main parts of the stator are the magnetic poles and the yoke. The yoke is fixed to the engine by means of the left cover, to which it is attached by 2 screws. The yoke has a brush holder, a breaker and a condenser on the front. The multi-purpose relay (simply named "regulator" in the machine parts list) is composed of the following 3 elements: the constant-voltage relay (the regulator itself in the strict sense), which works when the dynamo is operating, the automatic charge switch (cut-out relay) to switch the charge-circuit off when the engine is not running, and the electro-magnetic switch for the starter-circuit to operate when the engine starts.

3) Explanation of the function

a. Electro-magnetic switch

First, turn on the key-switch (the charge lamp will light) and push the starter button. The electric current flows from the battery to the exciting coil (1) of the electro-magnetic switch to close the contact point (2). (Since an ordinary small switch is likely to be damaged by a large current such as is applied to the starter, the electro-magnetic switch becomes necessary, utilizing an electro-magnet of small current).

b. Electric motor (Starter motor)

When the starter circuit is closed by the electro-magnetic switch, a large current is applied from the battery to the armature via the contact points (2) of the terminal electro-magnetic switch (B), the terminal (M) and the starter-dynamo terminal (M). Thus, the starter drives the engine as a compound motor which is very like a series motor.

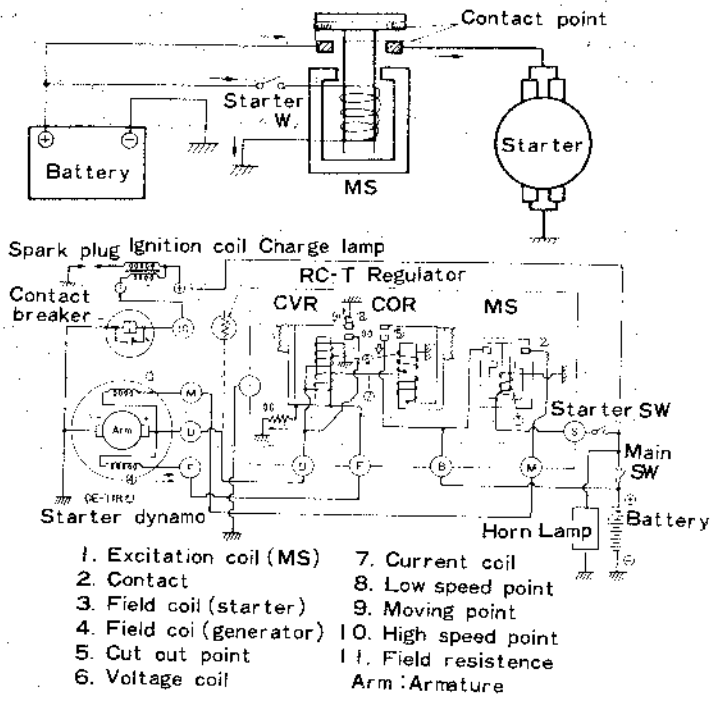


Fig. 5-8

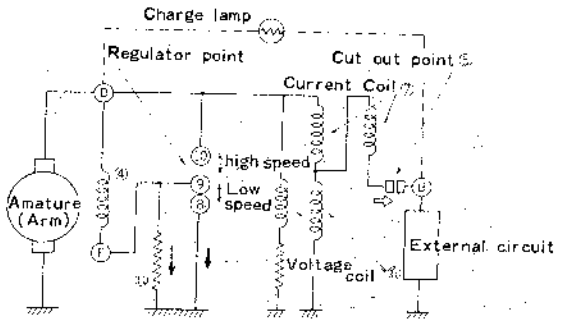


Fig. 5-9

c. Regulator and cut-out relay

When the engine is running at low speed, the contact point (5) of the cut-out relay remains open, and the electric current does not flow to the load (battery, lamps, etc.) from the generator. When the voltage reaches a certain level as the revolution increases, the electro-magnetic force of the coil (6) moves the contact point and closes the cut-out point (5) to turn on the electric current in the direction shown by the mark (⇧), and charging of the battery begins (the charge lamp goes off). As the revolutions increase and the dynamo voltage continues increasing, the electro-magnetic force of the coil (6) becomes larger and attracts the contact points considerably more. The movable point (9), in the middle of the three points for the voltage control of the regulator (hence the name three-point-type), parts from the low-speed point (8), when the voltage control starts. At this point in the dynamo field coil (4), the electric current, which flowed in the direction indicated by (↑) through the low-speed point (8), changes direction as indicated by (↑) to flow through the field resistance.

Because of the resistance, the field current decreases and consequently the dymano voltage is lowered. This results in the closing of the movable point by the spring force which overcomes the force of the coil (6), and subsequent recovery of voltage. Thus the voltage regulation is conducted by means of the quick and frequent alternation between the condition where the movable point contacts the low-speed point (8) and the condition where they are apart and the resistance (11) functions. The coil (7) plays two roles: one is to strongly attract point (5) when the load current becomes large in the direction shown by ⇧. The other is to quickly open point (5) by receiving the back-current from the battery and eliminating the force of the coil (6) when the generated voltage is lowered due to revolution decreases. When the revolution speed goes higher and higher, the voltage tends to exceed the controllable range of the resistance (11). In such a case, the force of the coil (6) becomes strong enough to attract the movable point toward the high-speed point (10) and cause the field coil to short-circuit. Since the electric current does not flow in the field coil during a short-circuit, the generated voltage is lowered. Thus voltage regulation is conducted by the quick alternation of field coil short-circuits and the effects of the resistance (11). The characteristics of the voltage regulation as described above is illustrated in Fig.5-10. This figure shows how the characteristics of the dynamo itself (shown by a dotted line) is changed with the help of the regulator, "a" represents the point where the contact points of the cut-out relay close, while "b" and "c" indicate the points where voltage regulation begins at low and high speed revolution, respectively.

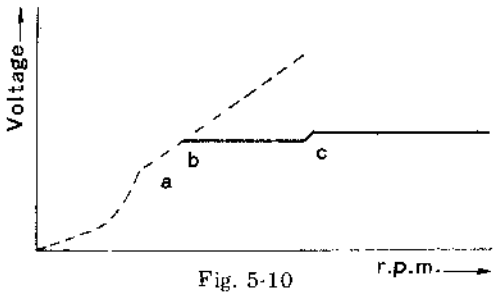
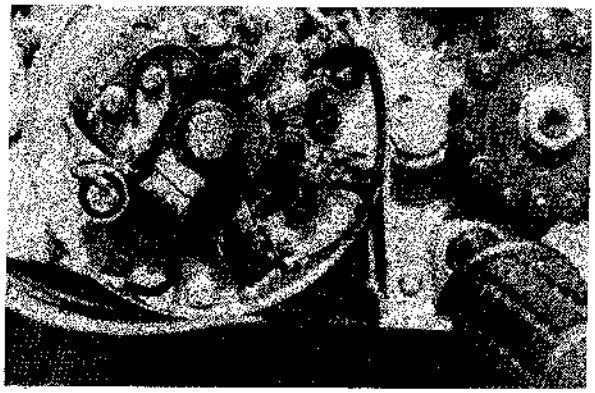
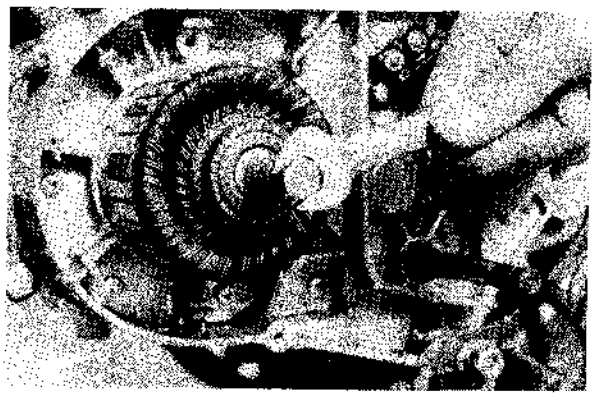


Fig. 5-10


Fig. 5-11

4) Removal

a. Remove the change pedal.
b. Remove the left cover.
c. Unscrew contact breaker cam mounting bolt with 14mm open end wrench to remove contact breaker cam.
d. Remove yoke fitting screw and then yoke assembly.
e. Take off armature from crankshaft with armature puller (special tool).
f. Remove woodruff key from crankshaft.


Fig. 5-12

5) Installation

Reverse the disassembly procedure.

Note: (1) Fit armature into L.H. end of crankshaft with woodruff key.
(2) Fit carbon brushes and carbon brush springs, after installing yoke assembly.

6) Ignition Timing Adjustment

a. To adjust ignition timing first adjust the contact breaker points gap at 0.012 ~ 0.016 in (0.3 ~ 0.4 mm) by moving the breaker plate (B).
Be sure to tighten screw (A) after adjusting.

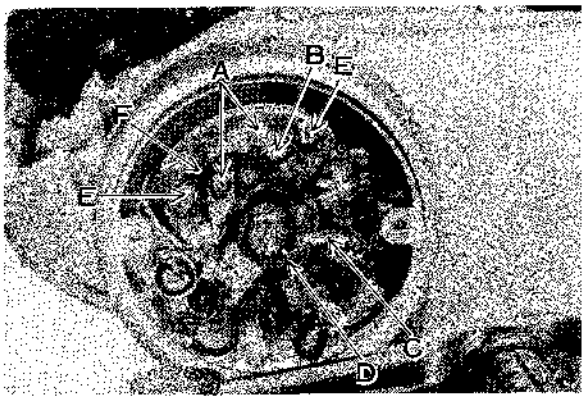


Fig. 5-13

b. Align ignition timing pointer (C) to mark (D). Loosen two mounting screws (E) and move the breaker adjusting plate (F) up and down. When the points are just about to open, tighten screws (E). After adjusting the ignition timing, turn the engine in its running direction several times without starting it and check to make sure the points just begin to open when the pointer aligns with mark.

Table 5-4 Ignition timing and piston position

Model	Standard timing	Piston Position Before TDC								
		17°	18°	19°	20°	21°	22°	23°	24°	25°
31L-A	20°	0.055in (1.40mm)	0.062in (1.57mm)	0.069in (1.75mm)	0.076in (1.93mm)	0.084in (2.13mm)	0.088in (2.33mm)	0.100in (2.55mm)	0.110in (2.77mm)	—

7) Trouble shooting

a. Problem 1

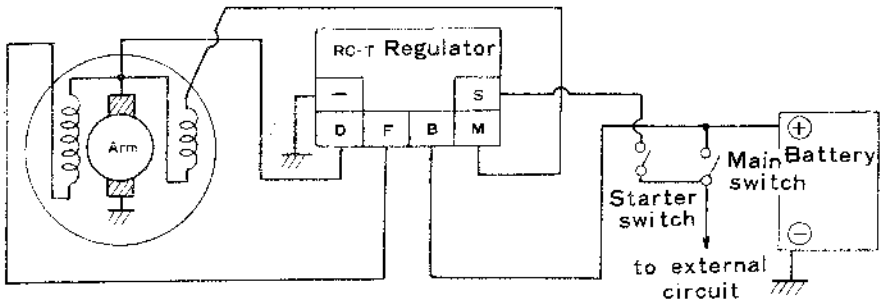


Fig. 5-14

If the engine does not start when you turn on the main switch and the starter switch, you should first check to see if the battery is sufficiently charged. Secondly, you should examine the effectiveness of the contact points of the electro-magnetic switch as well as the switch itself. A check of the condition of the starter-dynamo itself, should also be included.

(1) Measure the battery voltage and the specific gravity of the battery liquid. The battery voltage should be higher than 12V. (A specific gravity reading below 1.20 indicates that the battery is discharging too much).

(2) Turn on the main switch and push the starter switch to see if any sharp metallic sound can be heard inside the regulator. A sharp metallic sound proves that the electric circuit from the battery through the starter swtich, (S) and the exciting coil is in good order and that the electro-magnetic switch is operating. Even when the switch operating, the electric current does not flow to the starter-dynamo if the contact point of the electro-magnetic switch is damaged. Therefore, besides the check for the metallic sound, be sure to measure the voltage between (M) of the regulator and ground. If the voltage measurement is extremely small, either the battery circuit or the contact point of the electro-magnetic switch is faulty. If the starter-dynamo does not rotate in spite of normal voltage measurement, then either the connection, brush or magnetic coil of the starter-dynamo itself is faulty.

b. Problem 2

(1) The charge lamp takes a long time to go off after the engine is started.

(2) The charge lamp does not turn off or it turns on again after it once went off.

(3) The battery seems to be discharging, although the charge lamp is off.

(4) The battery is always in an over-charged condition, and battery water goes down quickly.

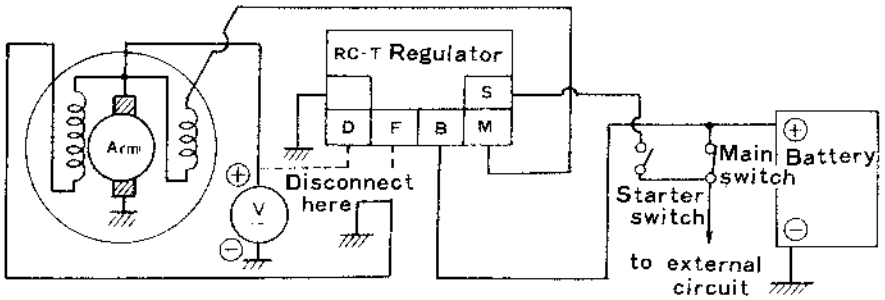


Fig. 5-15

There are two causes which bring about these phenomena: a malfunction of the starter-dynamo itself or a malfunction of the regulator when the dynamo is in good condition. Take the following steps to determine the actual cause.

(1) Start the engine after removing the connecting lead-wires from the terminals (D) and (F) of the regulator.

(2) Ground the lead-wire (F) to the body of the motorcycle and measure the voltage between the lead-wire (D) and the ground (ref. Fig.5-15). If the voltage measurement is above 13V at 2200 rpm, it can be surmised that the starter-dynamo is in good condition, but the regulator is not.

(3) If the dynamo is proven good by the procedure mentioned above, measure the voltage between the terminal (B) of the regulator and the ground (ref. Fig.5-15). Before the measurement, make sure that the regulator is free from any load by taking off the lead-wire from the terminal (B) and keep it from being grounded, prior to the start-up. Voltage should be in the range of 14.7-15.7V at 2500 rpm, if it is normally regulated. In case the regulated voltage fails to be in this range, adjustment of the regulator becomes necessary.

(4) Symptoms and causes of trouble with the charge lamp are briefly explained below.

i. When the charge lamp does not go off.
The trouble is usually found in the dynamo when the generated voltage does not exceed the battery voltage. This trouble can be often attributed to a break-off or short-circuit of the field coil or armature coil or faulty grounding.

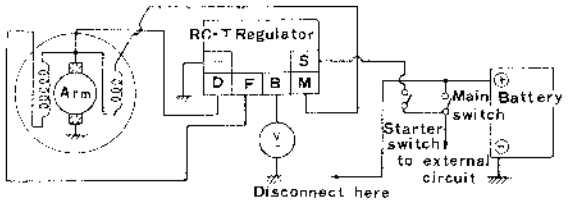


Fig. 5-16

ii. When the charge lamp is dimly lit.
The dynamo generates regular voltage but the regulator is malfunctioning and the cut-out point fails to close or closes insufficiently. This trouble is caused by either the break-off of the coil, short-circuiting, or the grounding of the regulator. Other possible causes are, insufficient contact due to reduced spring force in closing the cut-out point or a damaged point surface.

iii. The charge lamp flickers after it was once off.
When the coil of either the dynamo or the regulator is in the transition state of break-off, short-circuiting or grounding.

3. Ignition coil

1) Mechanism

The ignition coil serves to generate the very high voltage which is required to produce an electric spark between the central and outer electrodes of the spark plug. The ignition coil is a kind of transformer, which utilizes the mutual induction function of the electric coil. As shown in the Fig. 5-17, a transformer has two coils around the iron core, one being the input (primary) side and the other the output (secondary) side. When alternating current is applied to the input coil, the output coil generates voltage corresponding to the ratio of the number of turn of the two coils. This is the principle of the ignition coil.



Fig. 5-17

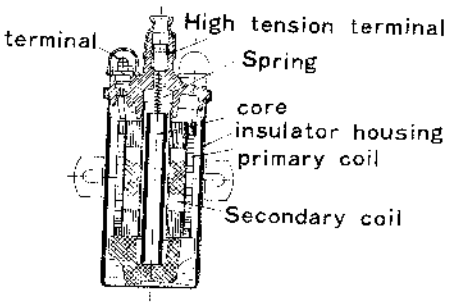


Fig. 5-18

The primary winding of the B1L ignition coil is excited by a battery. The DC current flows constantly in the primary winding until the points of the contact breaker are opened. In the G series, F6 and F8 adopting the magneto ignition system, the primary winding is excited by the ignition coil of the magneto. The current does not flow in the primary winding when the points are closed. When the points are opened, a large current flows in the winding which induces a high voltage current in the secondary winding the voltage in proportion to the ampere turn ratio between the primary and secondary windings.

Fig. 5-18 shows how an ignition coil is made. It consists of an iron core, primary and secondary coils, on insulation case, high and low voltage terminals, etc.
Mild steel or silicon steel plates are laminated to form the iron core in order to quicken the alternation between magnetization and non-magnetization. The iron core is put in an insulation case, which consists mainly of paper. The insulation case also serves as a coil base, around which is formed the secondary coil having 13000 ∿ 18000 turns of enamelled wire (0.08 ∿ 0.12 mm in diameter). About the secondary coil is wound thick insulation paper, around which is formed the primary coil having 160 ∿ 250 turns of enamelled wire (0.7 ∿ 1.2mm in diameter). At the bottom of the assembly, there is an insulator to support the coils. The secondary high voltage terminal and the primary low voltage terminal are located at the top of the assembly. All of these parts are put in the case and fixed by insulation pitch.

Table 5-5 Specification of ignition coil

Model	GA1-A GA2-A	G3SS-A G3TR-A G4TR G31M-A	B1L-A	F6	F7 F5	F8 F81M
Type	ST94	ST98	TU-25	HD-D	SU101	IG3125
Manufacturer	KOKUSAN	KOKUSAN	DIAMOND	MITSUBISHI	KOKUSAN	KOKUSAN

2) Characteristics

To examine the spark characteristics of the ignition coil, a spark gap with three electrodes is employed, since sparking in compressed air at a narrow gap is unstable and hard to measure. Speed characteristics, temperature characteristics and insulation characteristics are important for the ignition coil.

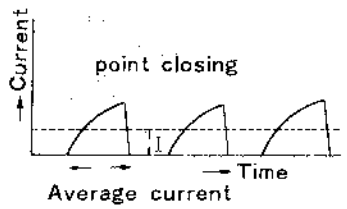


Fig. 5-19

3) Inspection

When the spark plug does not work or the spark is poor, the ignition coil as well as the contact breaker should be checked. Measure the resistance of the primary and secondary coils to check the ignition coil separately.

Note: In the case of the battery ignition method (12V system), the primary coil current is constant. So regardless of the manufacturer of the ignition coil, the spark characteristic can be measured by an electro-tester, using a 12V battery as a power source. In the case of the fly-wheel-magnet ignition method, it is difficult to judge characteristics by measuring with an electro-tester since the number of turns of the ignition coil depends on the nature of the fly-wheel-magneto.

4. Rectifier

1) Outline of the rectifier

The selenium rectifier, is used to convert alternating current generated by the fly-wheel-magneto, into direct current. The rectifier permits the flow of the half cycle of alternating current generated by the lighting coil and interupts the remaining half (half-wave-rectifier). It also serves to keep the electric current flowing one-way and prevents back-current to the fly-wheel-magnet from the battery.

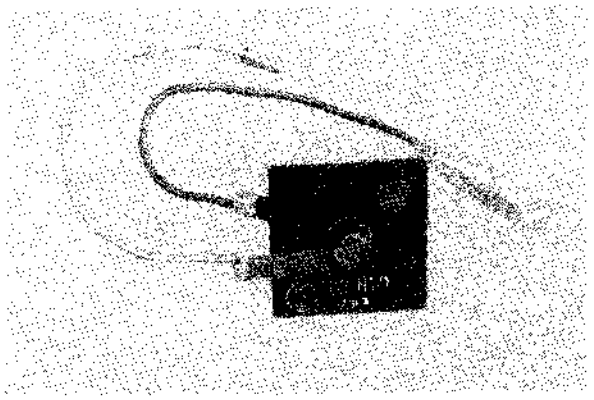


Fig. 5-20

2) Mechanism

Rectifying means to keep in one direction the electric current which periodically changes its flow direction. Take the water flow in Fig. 5- 21 for example. Hydraulic pressure is alternately applied from both B and C ends. The check valve A cuts off the flow from C to B and allows the flow from B to C.



Fig. 5-21

The rectifier performs operation electrically. A selenium rectifier is generally used, which utilizes the electric characteristic of the semiconductor, whose the resistance is very small in one direction, while very large in the opposite direction. The rectifying piece is composed, as shown in Fig. 5-22 , of a nickel-plated iron plate, 0.1mm in thickness, as the base plate, upon which selenium is thinly coated. A metal with a low melting point is sprayed on the surface and protective paint is applied all over. When the rectifying piece is exposed to alternating current, the electric resistance is very small if the current flows in the direction from the base plate to the alloy, while the resistance is extremely large in the opposite direction. The ratio of resistance reaches as high as thousands of times. This makes the current flow only in the direction shown by the arrow in the figure, which results in the rectification. The rectifying piece is called "element". Some elements are used in sereis or parallel circuits depending on voltage and current. Half-wave-rectifying and full-wave-rectifying, respectively shown in Fig. 5-23 and Fig. 5-24 , are obtained by the combination of the elements. In Fig. 5-23 , one selenium rectifier is illustrated and the electric current is allowed to flow in the direction shown by the arrow mark, but is prevented from flowing in the opposite direction.

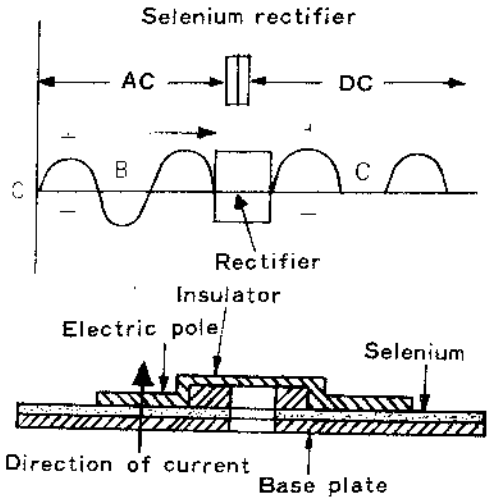


Fig. 5-22

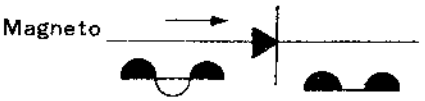


Fig. 5-23

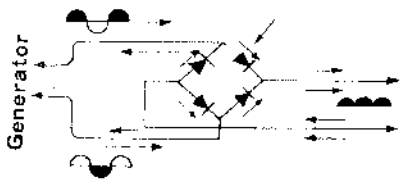


Fig. 5-24

The circuit made by four elements, as is shown in Fig. 5-24, produces full-wave-rectifying. In this case, the charge current generated by the generator flows to the battery via two elements after being rectified and not any of the generator current is wasted. This full-wave-rect circuit, which makes the most use of the generated current, is widely called a "bridge circuit".

3) Caution in handling

Removing the battery in daytime, or running a long distance at high speed without a fuse will cause reverse flow current in the selenium rectifier causing it to lose its rectifying ability. If this is continued for a prolonged period the rectifier will heat up and may not work at all. Be sure to check that the fuse is not blown and is properly installed.

4) Checking

To test the rectifier, proceed as follows:

Connect the negative lead from the 6 volt battery to the blue/white wire on the rectifier. Rig a 6 volt taillight bulb in series with the positive battery lead and connect it to the brown wire on the rectifier. If the bulb lights, the rectifier is defective and must be replaced. Reverse the leads, (negative battery lead to brown wire, positive lead to blue/white wire) the bulb should then light. If the bulb does not light, rectifier is defective and must be replaced.

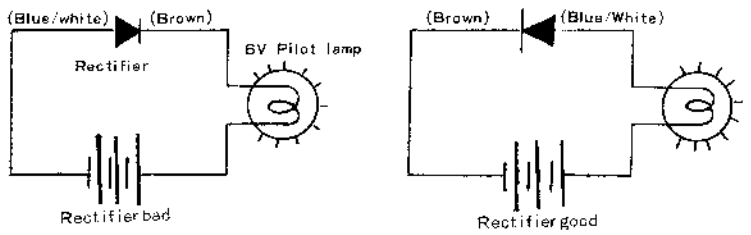


Fig. 5-25

6. High Tension Cable

The high tension cable carries high voltage electricity from the ignition coil to the plug cap. So if the cord is sharply bent or allowed to bite into the frame or some other cord, then the affected parts will collect electricity to the extent that a slight discharge called the "corona discharge" will occur. Ozone that is produced by this discharge will make holes in the rubber, and the holes will in turn cause sparking to the frame. Therefore, pay special attention to the wiring.

6. C.D. Ignition System

1) Outline

The ignition Systems of the model F5 and F7 are the capacitor discharge type which are characterized by fast rising time of the secondary voltage and an electronic switching device replacing the conventional contact breaker.

In a conventional ignition system with the contact breaker, the primary winding of the ignition coil is magnetized with a current from the magneto during the period the contact breaker is closed. When the contact breaker opens the primary circuit with the ignition coil magnetized, high tension is induced in the secondary windings due to self and mutual induction.

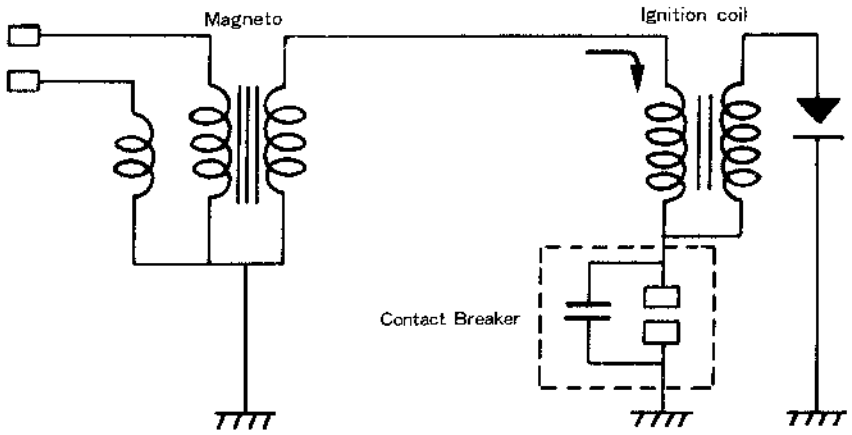


Fig. 5-26

In the case of the capacitor discharge system, as compared to the conventional one, the primary winding of the ignition coil is not supplied with current except at the time of ignition. In other words, the ignition coil is actuated only when current is released from the capacitor into the primary circuit in response to a timing signal.

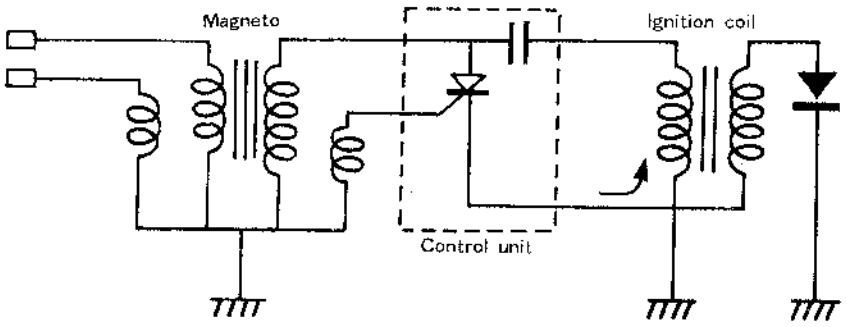


Fig. 5-27

Instead of opening the primary circuit with a switch and waiting for the magnetic field to collapse, the ignition coil can also be actuated by supplying the current to the primary coil rapidly to give rise to self induction during magnetic field build up.

By making the capacitor discharge the current to the primary windings instantly, high voltage is induced in the secondary windings of the ignition coil similar to the contact breaker system due to mutual induction.

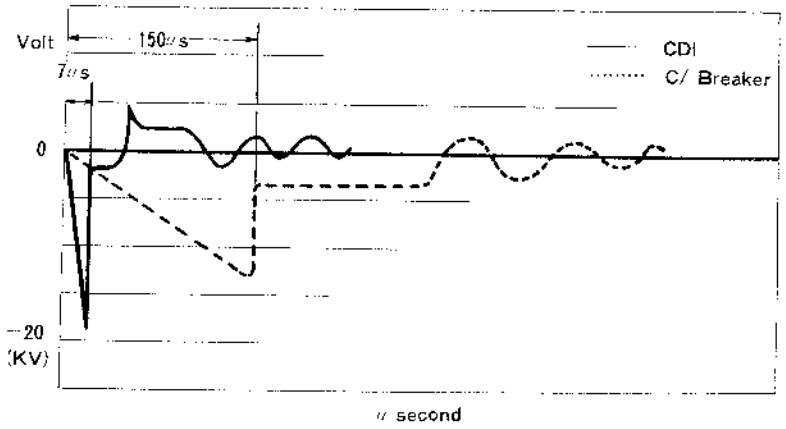


Fig. 5-28

Moreover, it is proved that the self induction in the primary winding occurs faster and more effectively with the capacitor discharge system than with the contact breaker system. This is why the capacitor discharge ignition can give shorter rise time and a stronger spark than the conventional contact breaker system does. A shorter rise time is benefical in assuring a strong spark across an oil-fouled or fuel-wetted spark plug.

To discharge current, being accumulated in the capacitor, at the specified crankshaft angle, it is necessary to have a sensing switch to detect the ignition timing properly. In the case of conventional systems, the contact breakers operate as a timing detector and as a mechanical switch at the same time, actuated by the breaker cam at the specified angle (ignition timing) of the crankshaft.

In the capacitor discharge ignition, these two basic functions are separated into an electronic switching device and an electric timing detector, thus eliminating potential problems from moving parts, like the contact breaker.

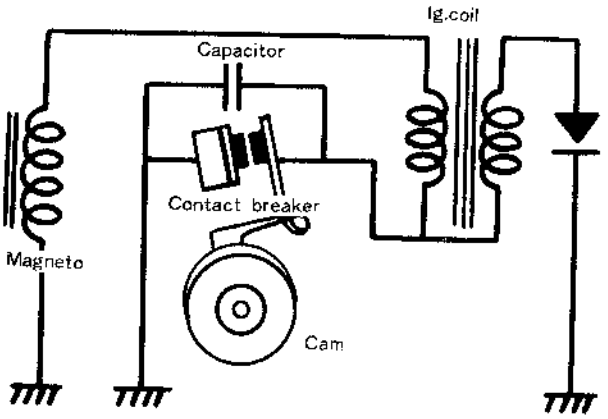


Fig. 5-29

2) Operation

As explained in the previous section, the CD ignition system of the F5 and F7 consists of the capacitor, an electronic switch, and an electrical timing detector which are used to actuate the ignition coil for obtaining the sparks. Those three functions of the system are briefly reviewed in this section.

The schematic diagram shows the whole ignition system including the magneto and the control unit.

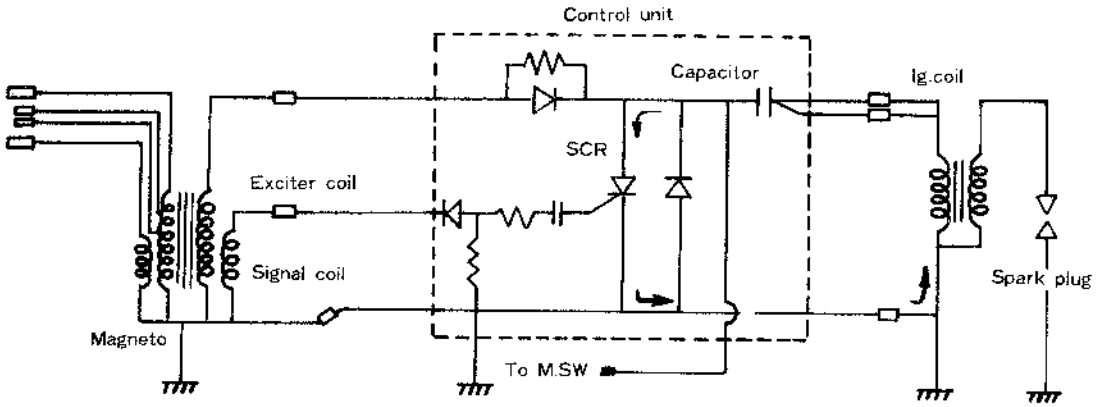


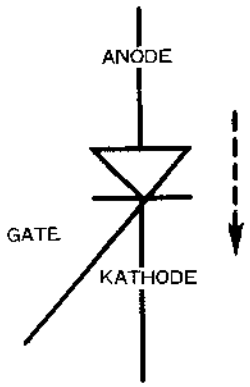
Fig. 5-30

The control unit is the most important part of the CD ignition system, it contains the capacitor and the Silicon Controlled Rectifier (SCR), which is also referred to as a thyristor.

a. Electronic switch

An SCR is a class of semi conductor having the peculiar property of blocking current flow through it, while it is in a normal condition. But when a certain signal is sent to the gate of the SCR, it allows the current to flow through it.
This function can be compared to a switch; the SCR is used to control the discharge of the capacitor in this system.

The advantage of using an SCR as an electronic switch is the fact that it has no moving contacts. Therefore, unlike an ordinary switch such as a contact breaker, the high voltage produced by the system can be increased without fear of a voltage reduction caused by arcing across the contact points.



Thyristor(SCR)

Fig. 5-31

b. Capacitor

The capacitor is continually charged with rectified current supplied from the exciter coil in the magneto as long as the engine is rotating, and discharges the accumulated current when the thyristor (SCR) is given the signal to its gate from the signal coil attached on the exciter coil.

c. Signal coil, the electrical timing detector

The signal coil (comparable to contact breaker as a timing detector) generates a small voltage at every ignition timing and sends it to the SCR gate as a timing signal. This causes the SCR allow the capacitor to discharge its accumulated current.

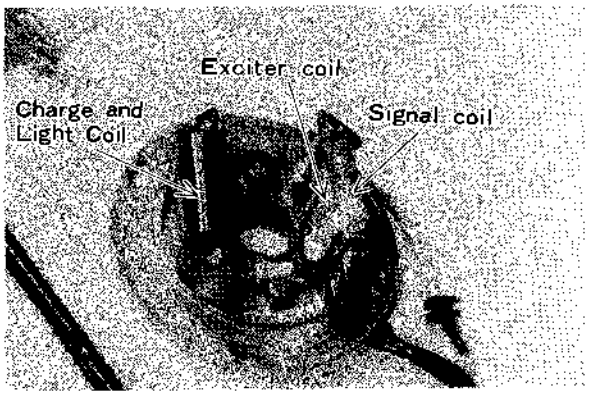


Fig. 5-32

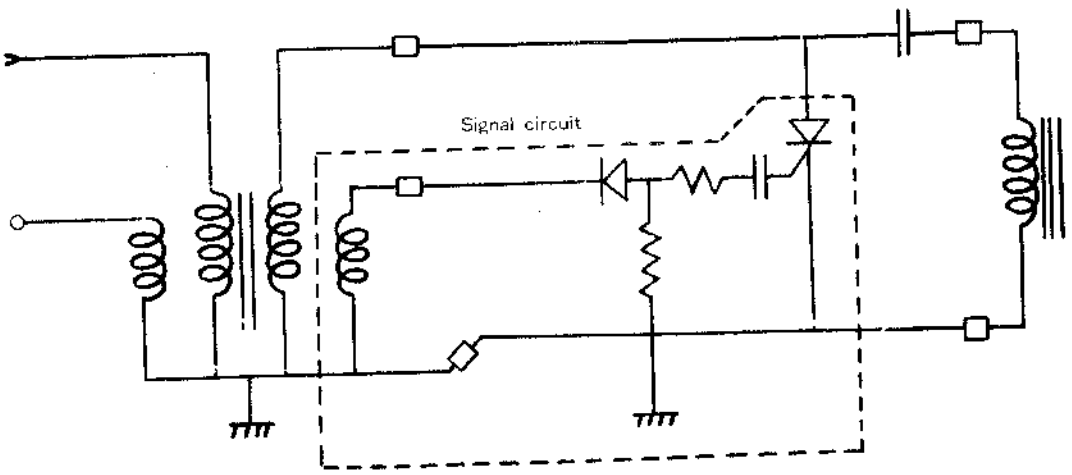


Fig. 5-33

The small voltage generated in the signal coil is sent to the signal circuit and rectified to a proper signal pulse before reaching the SCR gate.

3) Ignition timing

The ignition timing of the C.D.I. is detected electrically by a coil in the magneto which has no moving contact. Therefore, it is usually not necessary to adjust the ignition timing after the initial setting.

a. Inspecting ignition timing

(1) Remove the magneto cover

Note: Before removing the magneto cover, chain case cover must be removed.

(2) Connect the strobo light as illustrated here.

(3) Start the engine and keep the RPM at exactly 4,000 RPM.

(4) Check with the strobo light the timing mark on the flywheel is aligned with the static mark on the case.

If these marks are aligned at 4,000 RPM, the ignition timing is correctly adjusted to 23° before TDC.

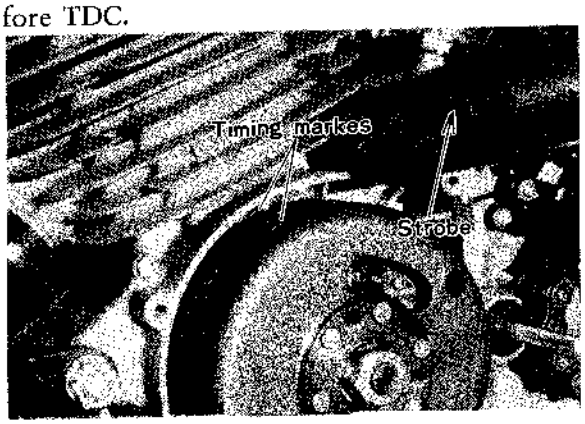


Fig. 5-34

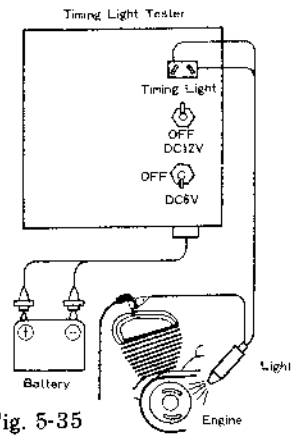


Fig. 5-35

Table 5-6

Model	Standard ignition timing	Piston Position Before TDC								
		17°	18°	19°	20°	21°	22°	23°	24°	25°
F7	23°/ 4000rpm	0.064in (1.62mm)	0.071in (1.81mm)	0.080in (2.02mm)	0.088in (2.23mm)	0.097in (2.46mm)	0.106in (2.69mm)	0.116in (2.94mm)	0.125in (3.19mm)	0.136in (3.46mm)
F5	23°/ 4000rpm	0.074in (1.88mm)	0.083in (2.10mm)	0.092in (2.34mm)	0.102in (2.59mm)	0.112in (2.85mm)	0.123in (3.12mm)	0.134in (3.41mm)	0.145in (3.70mm)	0.158in (4.01mm)

b. Adjusting ignition timing

(1) Loosen the three magneto base fitting screws B, C and D by inserting a screw driver through the hole in the flywheel.

(2) Turn the magneto base by prying notch "A" with a screw driver. Turning it counterclockwise retards ignition timing and turning it clockwise advances the timing.

(3) Be sure to tighten the screws B, C and D after adjusting.

(4) Recheck the timing with the strobe light as illustrated in Fig. 5–36.

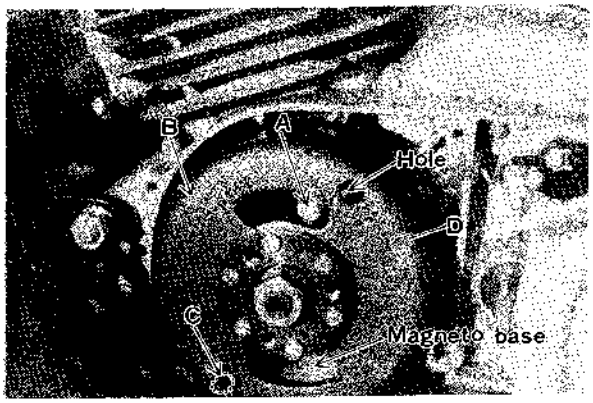


Fig. 5-36

4) Ignition system adjustment

a. Flywheel magneto

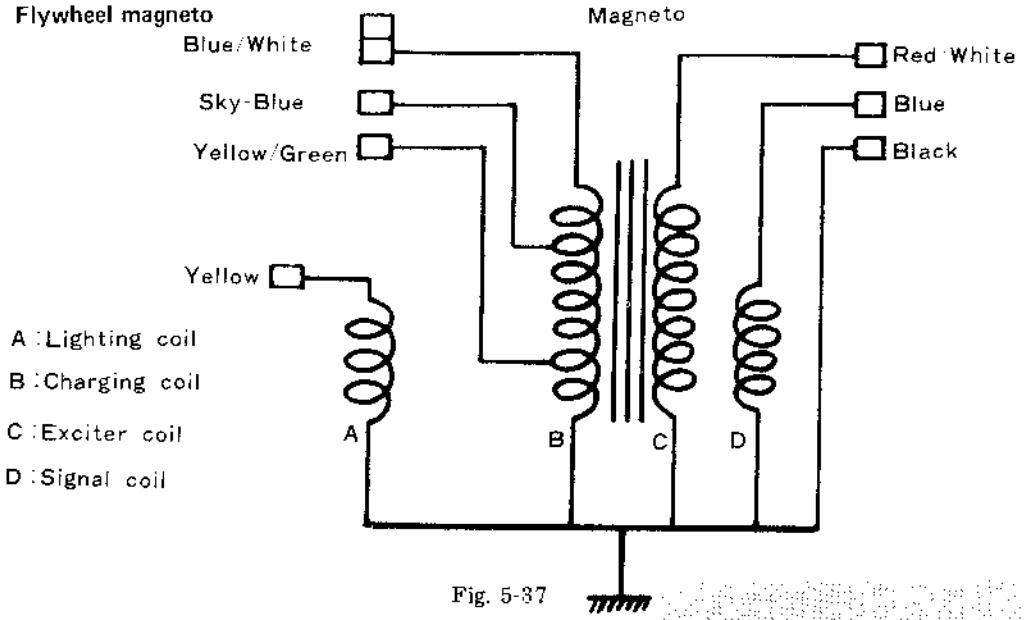


Fig. 5-37

The coils installed in the magneto should be checked electrically by measuring their resistance values with a hand tester.

Note: When testing the resistance values of the coils disconnect the wires from the control unit, the rectifier and the main switch.

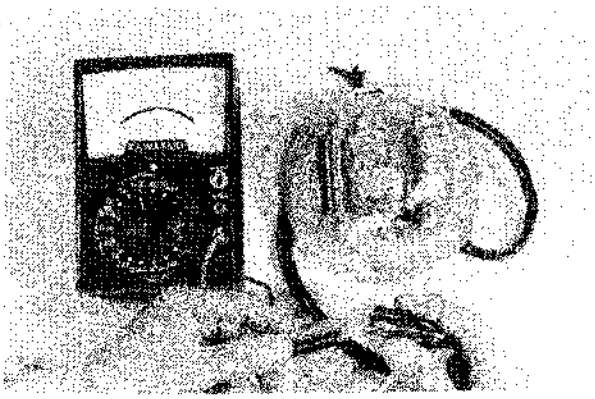


Fig. 5-38

Table 5-7 Resistance values of the coil

Coils	Connection of tester		Standard resistance
Exciter Coil	Red/White	Black	220Ω±10%
Signal Coil	Blue	Black	75Ω±10%
Charging Coil	Blue/White	Black	0.23Ω±10%
Lighting Coil	Yellow	Black	0.23Ω±10%

b. Ignition coil

The ignition coil can be checked with a hand tester by connecting it to the terminals of each of the windings, the primary winding and secondary winding.

Table 5-8 Resistance of the ignition coil

Coils	Connection of tester		Standard resistance
Primary Coil	Green/White	Black	0.21Ω±10%
Secondary Coil	High voltage terminal	Black	1.8Ω ± 10%

c. Control unit (CDI)

The control unit must be checked with the special tester developed for the magneto type CD ignition system. This section gives complete instructions for using the special CDI unit tester. Follow the instructions for inspecting the control unit of model F5 and F7.

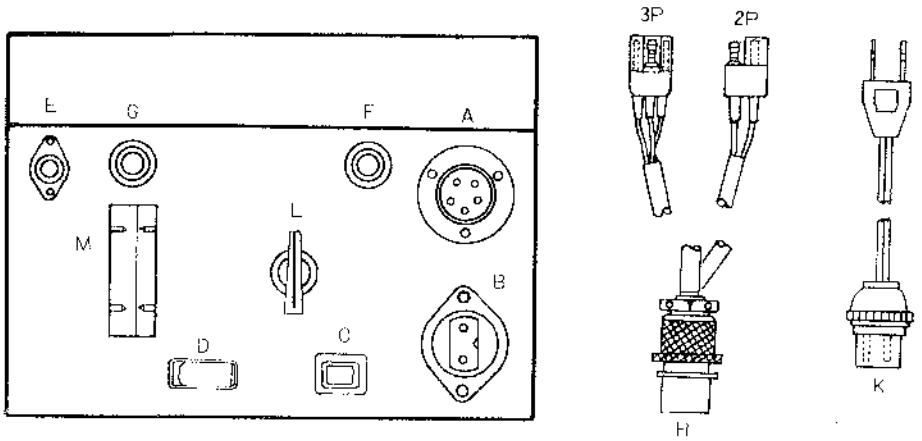


Fig. 5-39

This tester is used to evaluate the quality of the ignition coil and CDI unit that are manufactured exclusively for the model F5 and F7. Directions for operating the tester are as follows.

Test 1, the ignition coil

In testing the ignition coil, follow the directions below in the order given.

(1) Insert power supply cord (K) into socket (B) and connect to a 100V power supply. Leave the switch (D) in "OFF".

(2) Insert the metal socket cord accessory (H) into the metal socket (A).

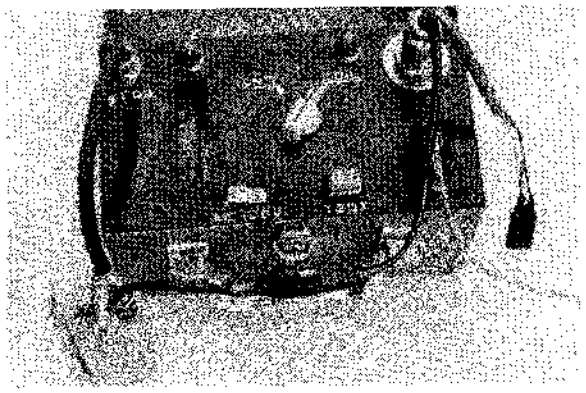


Fig. 5-40

(3) Insert the high voltage cable of the ignition coil into the terminal "E" and the connector of the ignition coil into the 2p connector of cord "H" covered with a red insulator.
(4) Turn switch "L" to the COIL side.
(5) Turn switch "D" to the ON. (Pilot lamp "G" turns on).
(6) Press button "C".

When all the above steps are carried out, the spark should discharge across gap "M". If there is no spark, the ignition coil is defective.

Test 2, the CDI Unit

In testing the CDI unit, follow the directions in the order given.

(1) (1) and (2) as above.
(3) Insert the 3p waterproof connector of the coupler cord "H" into the 3p waterproof connector of the CDI unit.
(4) Turn switch "L" to the UNIT side.
(5) Turn switch "D" to "ON" (Pilot lamp "F" will light).

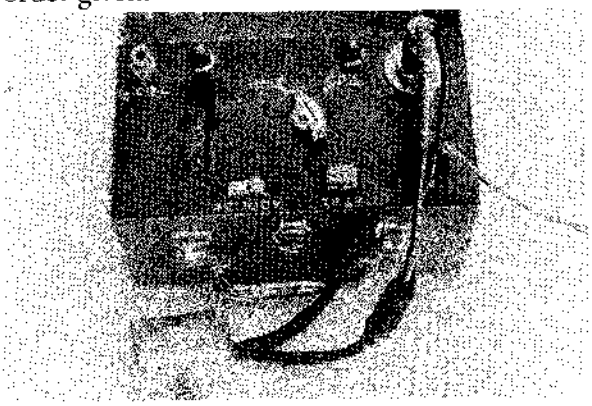


Fig. 5-41

(6) Press button "C"

When the above steps are carried out, pilot lamp "G" should light and the spark discharge in the 3 needle gap should be strong. If there is no spark, the CDI is defective and must be replaced.

Test 3, Combined test of the ignition coil and the CDI unit.

Carry out this test in the order given below.

(1) (1) and (2); same as in previous tests.
(3) Connect the 3p waterproof connector of the coupler cord's "H" (black) to the 3p waterproof connector of the CDI unit. Next, connect the 3p waterproof connector of the CDI unit and the 3p waterproof connector of the ignition coil. Insert the high voltage cable of the ignition coil into high voltage terminal "E".
(4) Turn switch "L" to the UNIT side.
(5) Turn switch "D" to "ON" (Pilot lamp "F" will light).

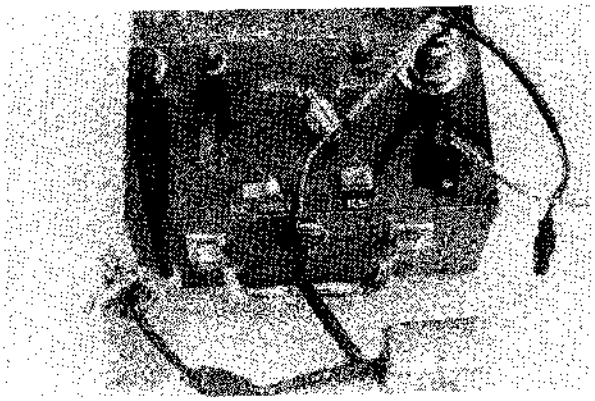


Fig. 5-42

(6) Press button "C"

When all the above steps are carried out, pilot lamp "C" should light and the spark should discharge in the gap "M" indicating both the ignition coil and the CDI unit are good. If there is no spark, one of the two is bad and they must be tested separately.

7. Voltage regulator

The electricity which is generated in the magneto increases as the rotating speed of the engine, and the charging current which flows into the battery increases accordingly. Therefore, if it is supplied directly, the battery will overcharge. In order to avoid such trouble, the voltage must to limited to a certain value. This is the work of the voltage regulator. There are two types of voltage regulators. One is a contact points type regulator (constant-voltage relay), the other is a no-contact type regulator (silicon voltage regulator or SVR).

1) SVR

The F5 voltage regulator is a kind of controlling rectifier where properties of a semiconductor called a silicon controlled rectifier are adopted.

A semiconductor is an intermediate material between an insulator and a conductor. One which conducts only when a signal is sent to it is called an SCR. When an SCR is employed as a voltage regulator, there are no moving parts and it lasts almost indefinitely.

a. SVR operations

(1) The voltage regulator in the model F5 is called a silicon voltage regulator (SVR) and works to keep the terminal voltages of the magneto charging coil within the limits (7V ± 0.5V). Wiring diagrams are shown in Figs. 5-43 to 5-46.

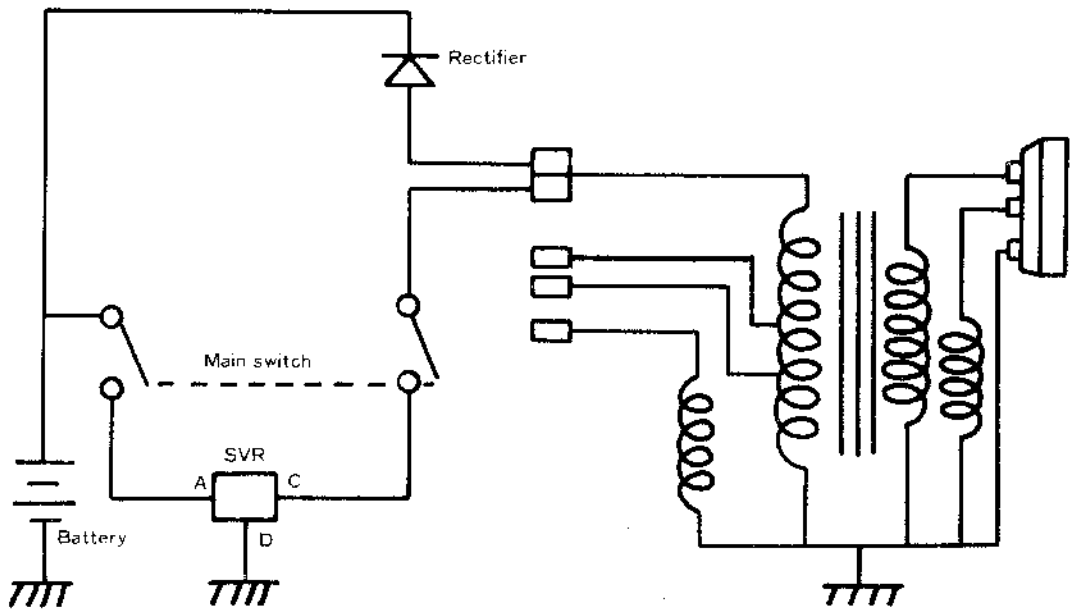


Fig. 5-43

When the rotating speed of the Flywheel increases to the point where the voltage at "A" exceeds 7V ± 0.5V, a signal is sent from "B" to the SCR and opens the gate in SCR which allows the current from "C" to flow down to ground "D" until the voltage drops below 7V ± 0.5V. When the voltage drops below 7V ± 0.5V, the signal from "B" stops, and the voltage begins to increase. This procedure is repeated to maintain the magneto terminal voltage at a constant value.

(2) SVR internal structure and wiring
Fig. 5- shows the internal wiring.
The operation of each part is shown below.

(3) ZD (Zener diode)
In usual commutators, i.e. diodes, selenium, etc., the current flows only in the normal (positive) direction. However, in the Z.D, it also flows in the reverse direction when the voltage which exceeds a certain value is applied in the reverse direction (B).

(4) SCR (Silicon controlled rectifier)
No usual rectification is performed unless the required signal is given to the gate from outside in the direction of the arrow which is shown in the symbol.
In other words, when a certain signal is given to the gate, the gate allows current flow from the anode to the cathode in the direction of the arrow.

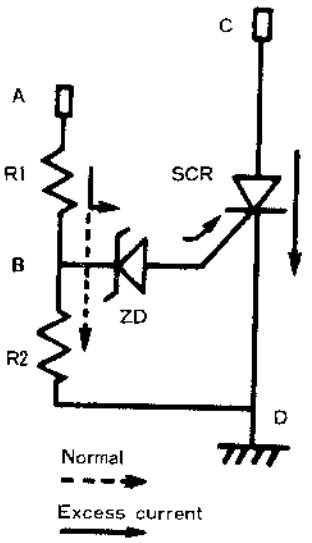


Fig. 5-44

(5) Operation
When the battery is fully charged, the battery voltage is likely to go up to 7V. At this time, if the AC generator is still charging the battery the terminal voltage at A might naturally exceed 7V. Therefore, current passes through resistor (R1) and through the Zener diode, sending a signal to the gate. When the SCR receives the signal, it opens the gate and sends the generator output to the ground to prevent the battery from overcharging. If any, large current flows towards S through the Z.D., the diode would be damaged, so R2 is provided to keep this current to a minimum.

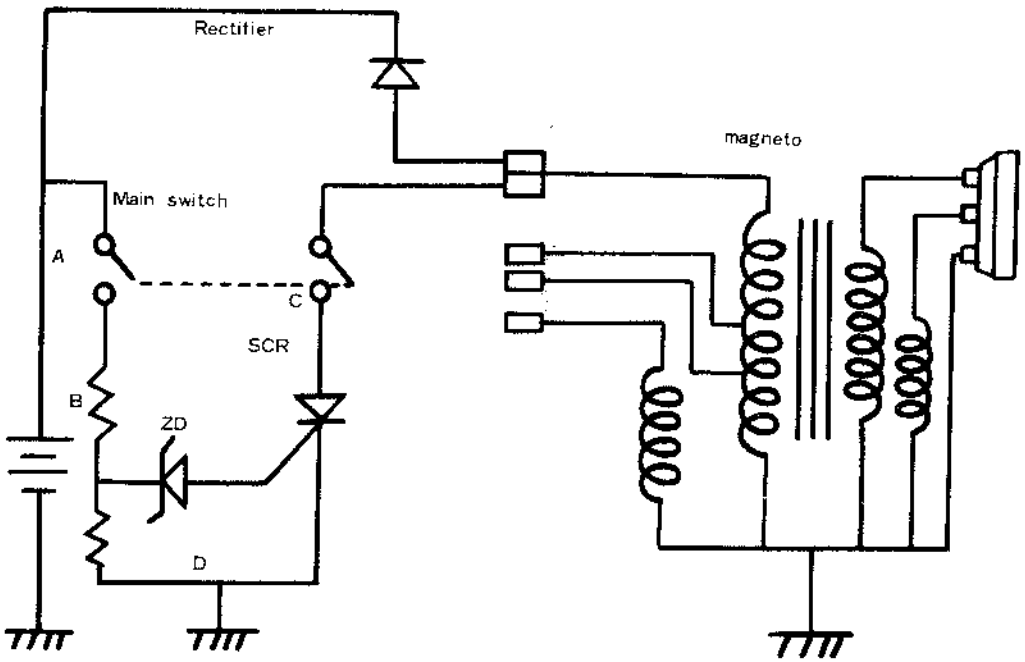


Fig. 5-45

Resistance of this current path is small compared with that including the thermic wire and more current flows to the lamps making them brighter. At the same time, this current through the points magnetizes the coil and pulls the spring panel against the force of the shrinking thermic wire, keeping the point closed for a time. When the power of shrinking thermic wire overcomes the magnetic attraction of the coil, the points open and the cycle starts again. Thus the lamp flickers on and off or actually, they vary between bright and dark. When the transmission is in the neutral position, the neutral lamp is also turned on and off.

(2) F Series

Figure 5-51 shows the construction of the turn signal relay used on the F6, F8 and F5. When the turn signal lamp switch is turned on, a current flows from the positive terminal to the electromagnetic thermic plate through the points, and to the negative terminal through the steel spring, and the turn signal lamps begin to light. The thermic-plate, heated and expanded, actuates the spring to open the points, as shown in Fig. (B), so that the current is interrupted and the lamp is turned off. When current stops flowing through the thermic plate, it begins to shrink and is pushed by the spring force, closing the points, as shown in Fig. (A). The expansion and shrinkage are repeated and the turn signal lamps flicker on and off. The time of the switching cycle can be adjusted with an adjusting plate.

b. Remarks on turn signal

The flash cycle of the turn signal relay depends partially on the size of the bulbs employed. So if bulbs of different wattage are used, the frequency of the switching action becomes irregular.
The standard bulb must be used at all times.

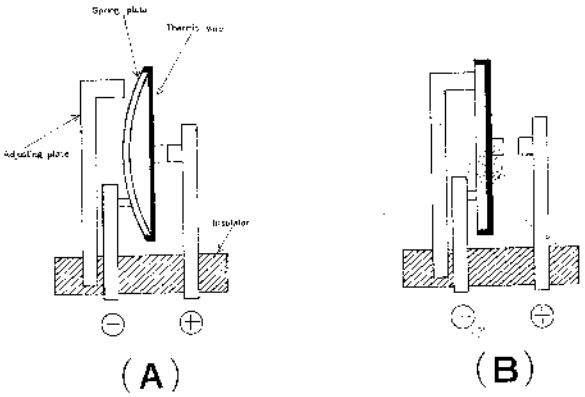


Fig. 5-51

4) Horn

Current to power the horn is supplied by rectified alternator current and the battery. Horn operation is controlled by a grounding button on the dimmer switch body.

Principles of Operation

When the horn button is pressed, current passes through the terminal, coil and contact points to the grounded horn switch. As current passes through the coil, the core becomes magnetized and pulls the armature. At an adjusted point, the edge of the armature trips the contact points, cutting off the flow of current. The diaphragm spring then returns the armature to its rest position and at the same time the contact points are closed, completing the circuit again. This process repeats rapidly. The striking of the armature against the end of the core produces the sound, and the disc resonator amplifies it.

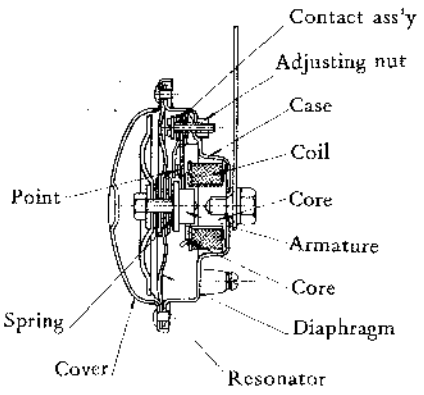


fig. 5-52

5) Spark plug

a. Standard spark plug

(Refer to Service Manual Appendix-I)

Table 5-9

Model	GA1-A GA2-A G4TR	G3SS-A G3TR-A F8	G31M-A	B1L-A	F6 F81M	F7	F5
Standard spark plug	NGK B-7HZ	NGK B-8HC	NGK B-8HN	NGK B-6H	NGK B-9HC	Champion L-19V	NGK B-10H-15

b. Spark plug

The standard spark plugs fitted to the Kawasaki single cylinder two stroke engines are the NGK Spark Plugs.

There is little to be gained by experimenting with various brands of plugs as the type fitted to the engine is best suited to its needs.

There is, however, consideration to be made regarding the heat range series of the plug.

Spark plugs are designed in several "Heat Ranges".

"Heat Range" refers to the ability of spark plugs to absorb and dissipate heat.

Spark plugs with long insulator noses retain heat enough to burn off oil and combustion deposits under light service conditions. Spark plugs with short insulator noses will transfer heat rapidly and prevent pre-ignition and detonation under severe service conditions.

(1) Change of spark plug heat value

B—6H (for low speed) Inside of plug dirty, sooty or wet.

B—7H

B—8HC (for high speed) Overheated condition.

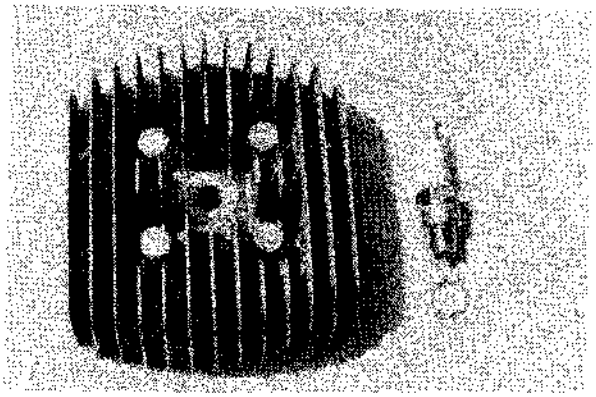


Fig. 5-53

(2) Setting spark plug gap

Riding wears the electrode and consequently changes the plug gap, which therefore is to be adjusted to 0.024 to 0.027 in (0.6 to 0.7 mm) after the plug is washed.

(3) Installation

Before installing the plug to the cylinder head, clean off dust and oil around the region where connection is to be made.

Be sure to use a gasket for installing the plug to prevent compression leakages.

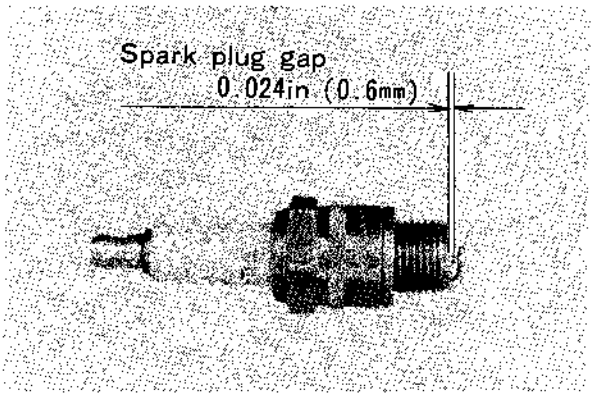


Fig. 5-54

c. Spark plug cap

(1) Construction

The conventional plug cap uses a screw (A) to secure the high voltage cord, while the Model GA2 employs a new noise suppression device (B), which requires a structural change as illustrated in Fig. 5-55, with the high voltage cord screwed into the screw (C).

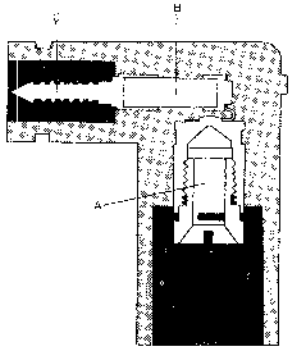


Fig. 5-55

(2) Removal and installation

Remove the plug cap from the high voltage cord by gripping the cord at an end of the plug cap and by turning the plug cap to the left.
Install the plug cap by driving in.

Note: When removing the plug cap from the spark plug, taking care not to apply too much force as the high voltage cable might be pulled apart, too.

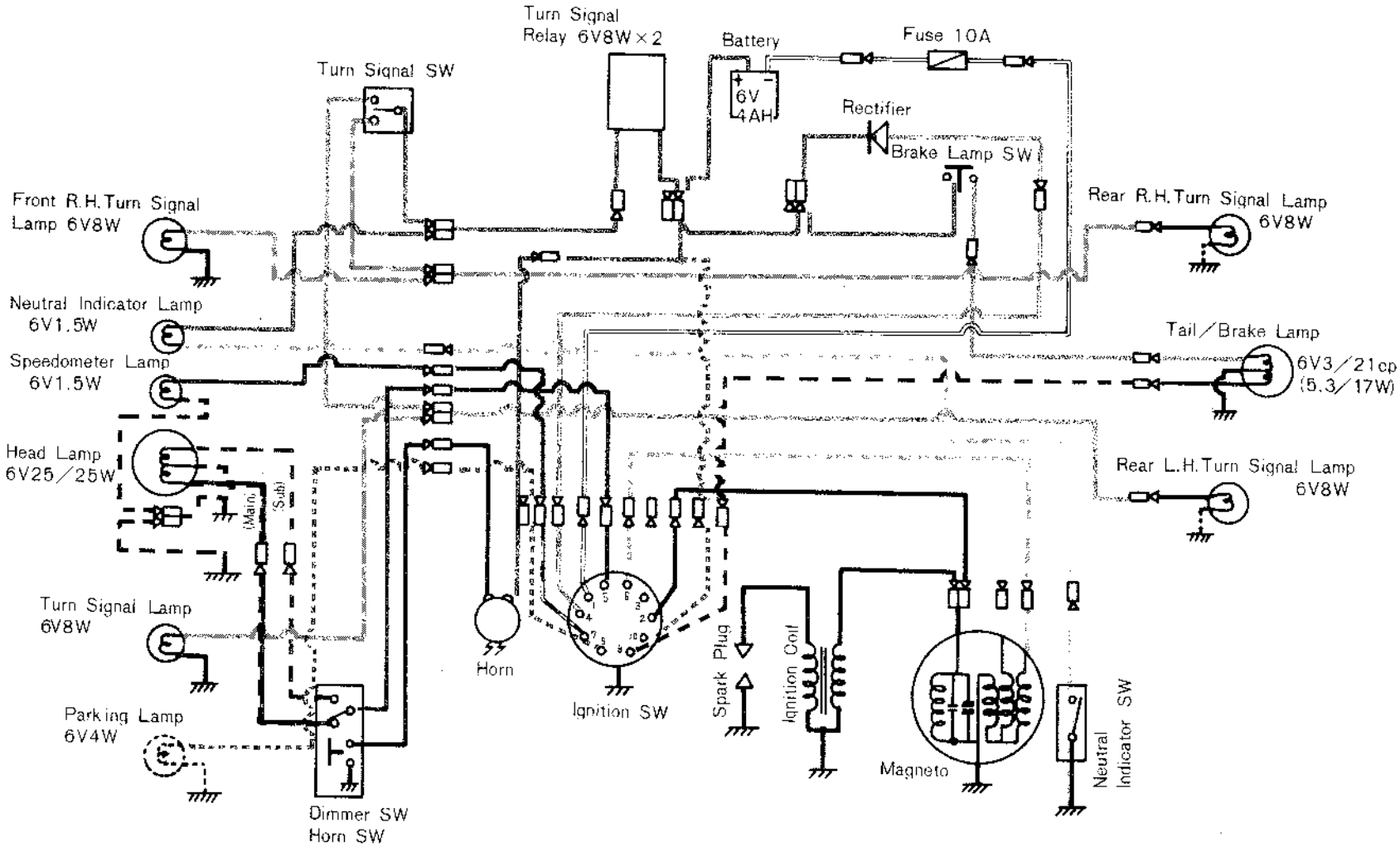
6) Battery

(Refer to Service Manual Appendix-II)

Table 5-10

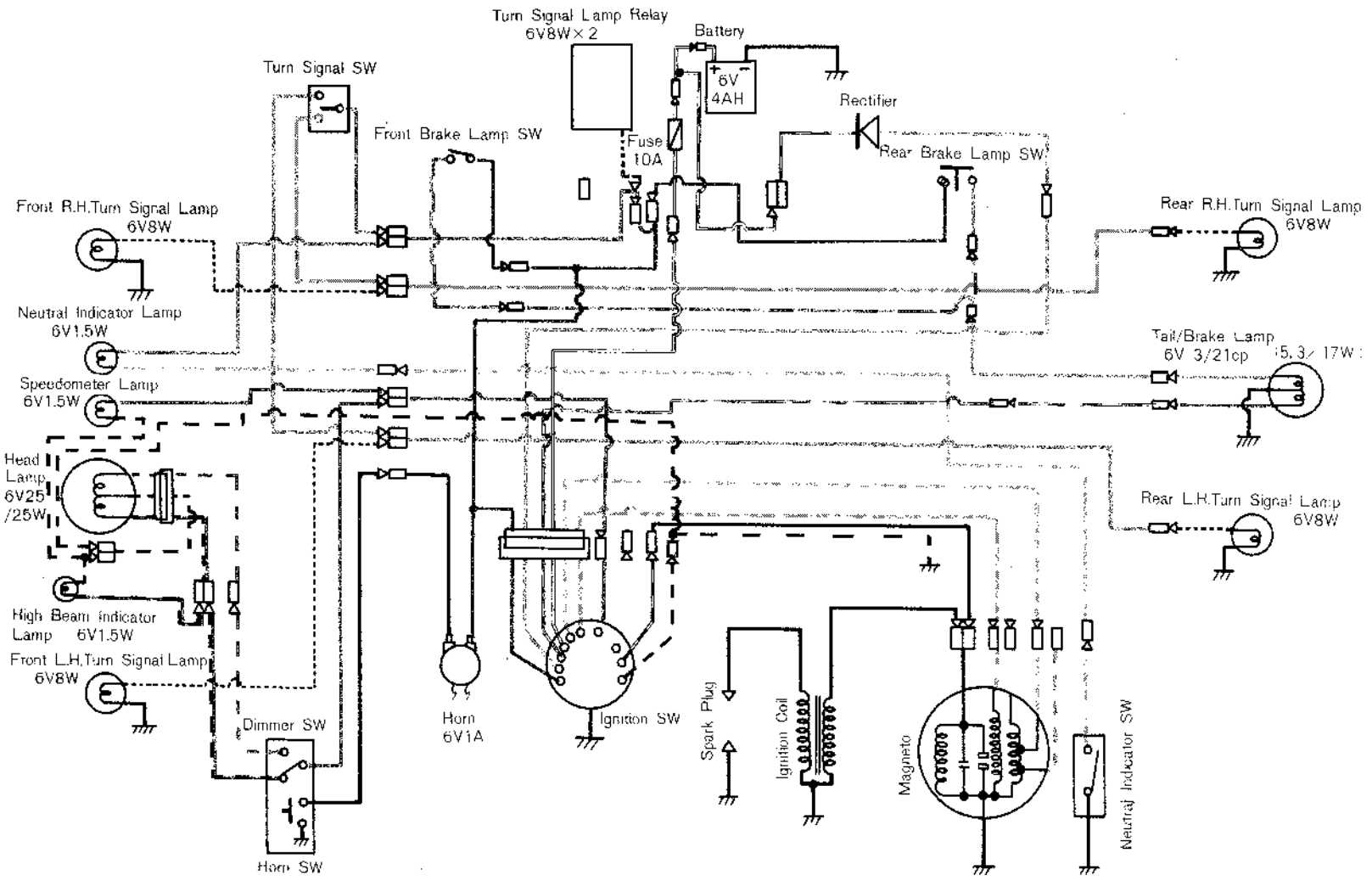
Model	Type	Manufacturer	Voltage	10-hour rating capacity	Specific gravity	
					At full charge	At lower limit charge
GA1-A GA2-A G3SS-A	6N4-2A-3	FURUKAWA	6V	4AH	1.280	1.220
G3TR-A F6 F7	6N4-2A-5	FURUKAWA	6V	4AH		
G4TR F8 F5	6N2-2A-5	FURUKAWA	6V	2AH		
B1L-A	12N12-3B	YUASA	12V	12AH		

GA1-A GA2-A



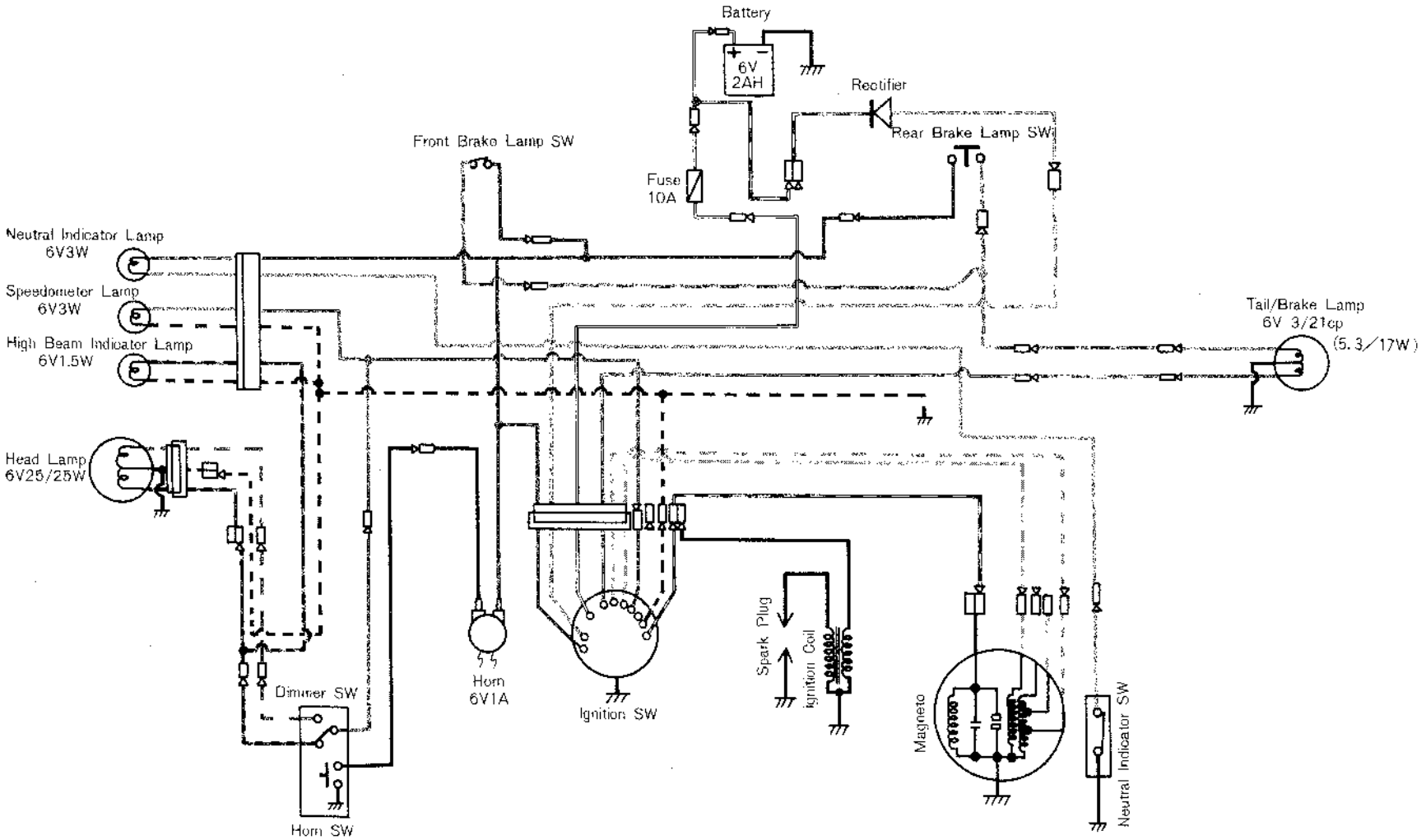
USE	2	Body	1	6	4	3	5	7	8
STOP	○—○								
DAY		○—○		○—○					
NIGHT		○—○			○—○—○—○—○—○				

NOTE: Parking lamp and Ignition SW(5-position) are optional parts which are shown dotted line.



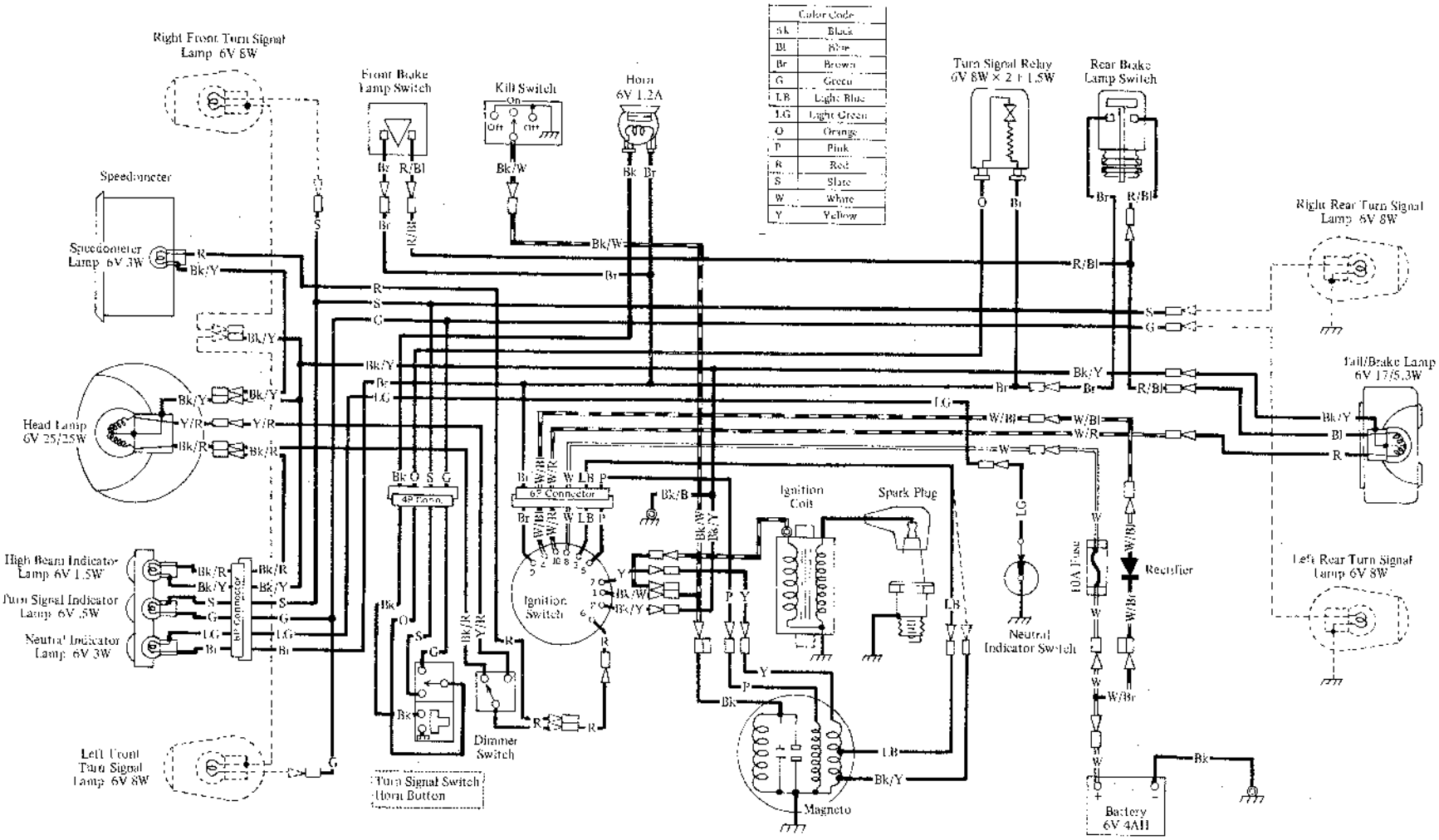
TERMINAL	IG	E	MAG-1	SEL	MAG-2	HL	MAG-3	BAT	HORN	TAIL
Cord Color	Black/ White	Black/ Yellow	Sky-Blue	Blue-White	Pink	Red	Yellow	White	Brown	Red/ White
Stop	○	○								
Day			○	○				○	○	
Night				○	○	○	○	○	○	○

NOTE : Turn Signal Lamps and the Relay are optional parts which are shown with dotted line.

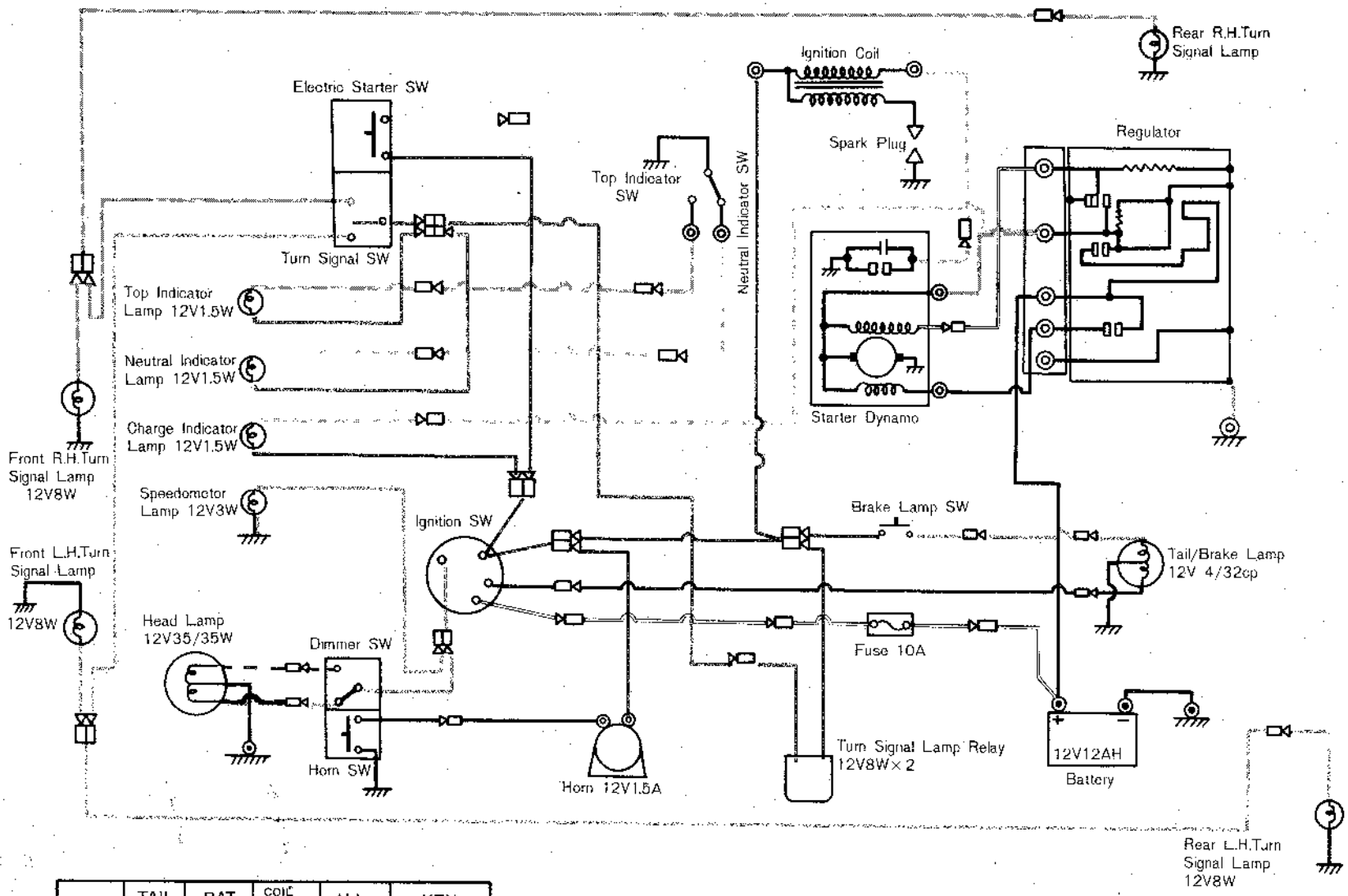


TERMINAL	IG	⏚	MAG1	SEL	MAG2	HL	MAG3	BAT	HORN	TAIL
Cord Color	Black	Black/Yellow	Sky-Blue	Blue/White	Pink	Red	Yellow	White	Brown	Red/White
Stop	○—○									
Day			○—○	○—○				○—○		
Night				○—○		○—○		○—○—○		

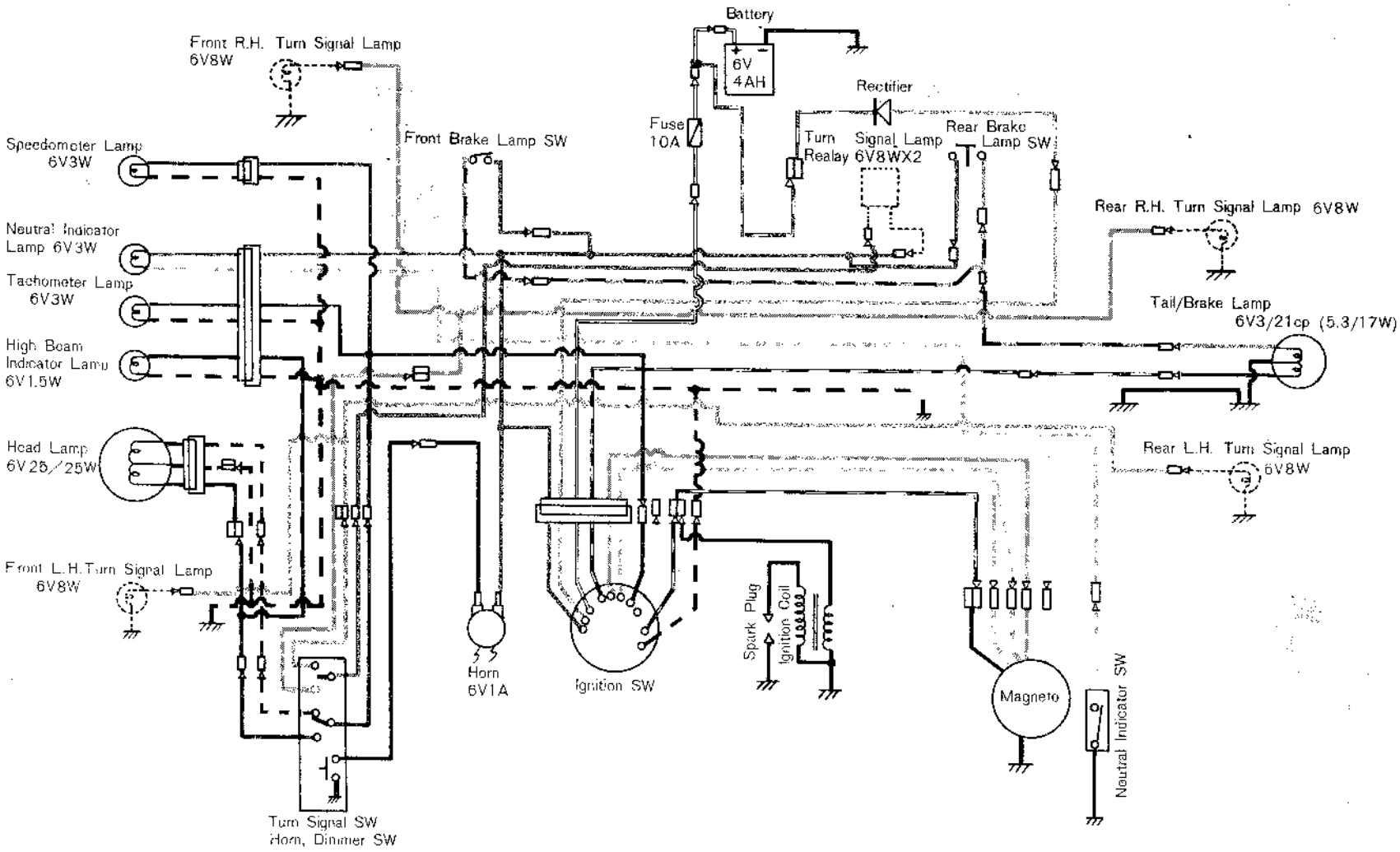
Wiring Diagram
100-G5



	1	2	3	4	5	6	7	8	9	10
Terminal	Ig.	Gnd.	Mag. 1	Rect.	Mag. 2	H.L.	Mag. 3	Batt.	Horn	Tail
Color	Bk/Wh	Bk/Yel	Light Blue	Bl/Wh	Pink	Red	Yellow	White	Brown	R/Wh
OFF	●	●								
DAY			●					●	●	
NIGHT				●	●	●		●	●	●

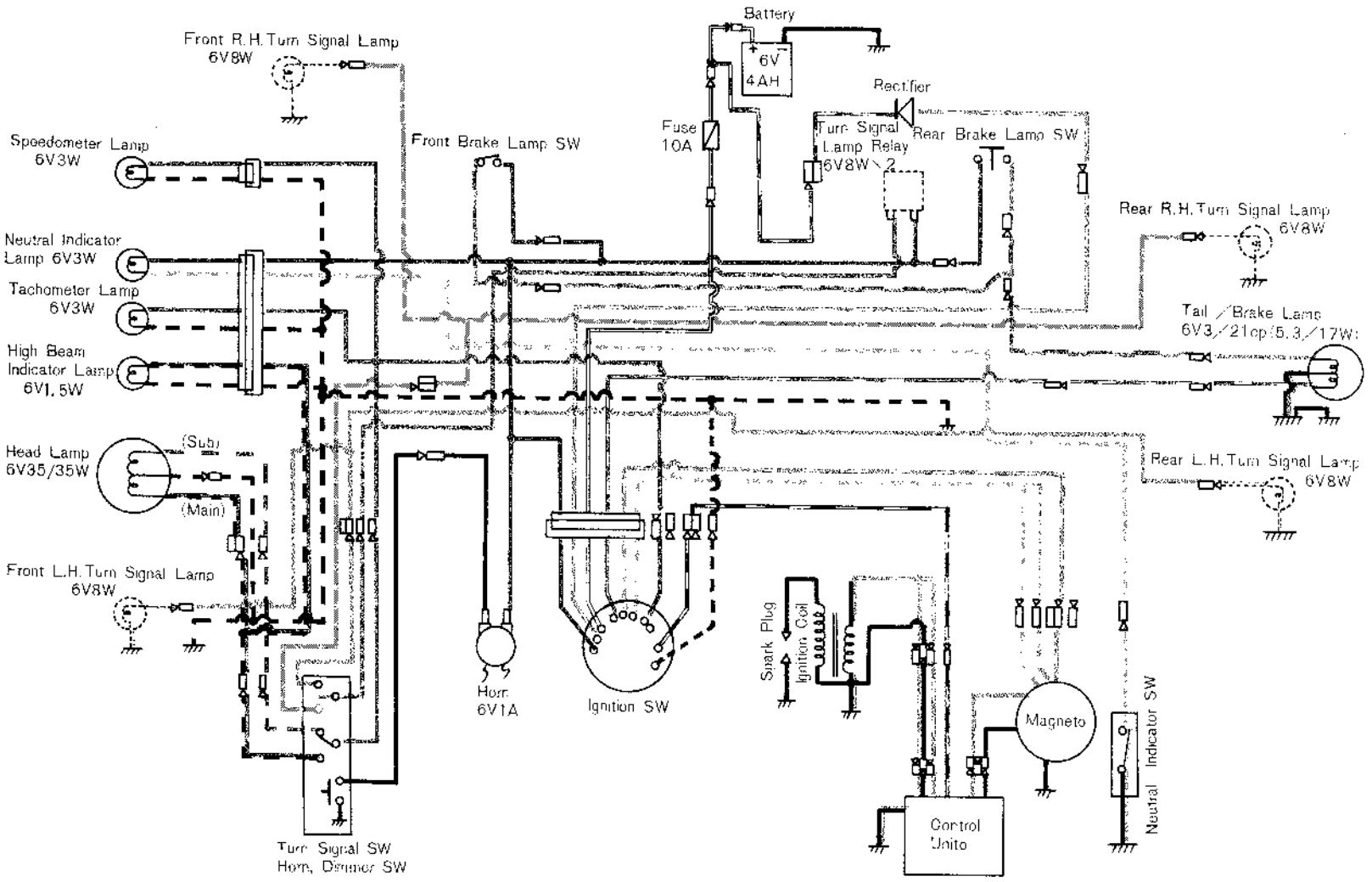


	TAIL	BAT	COIL HORN	H.L.	KEY
Stop	—	—	—	—	Removable
Day	—	○—○	—	—	
Night	—	○—○	○—○	○—○	
Parking	○—○	○—○	—	—	Removable



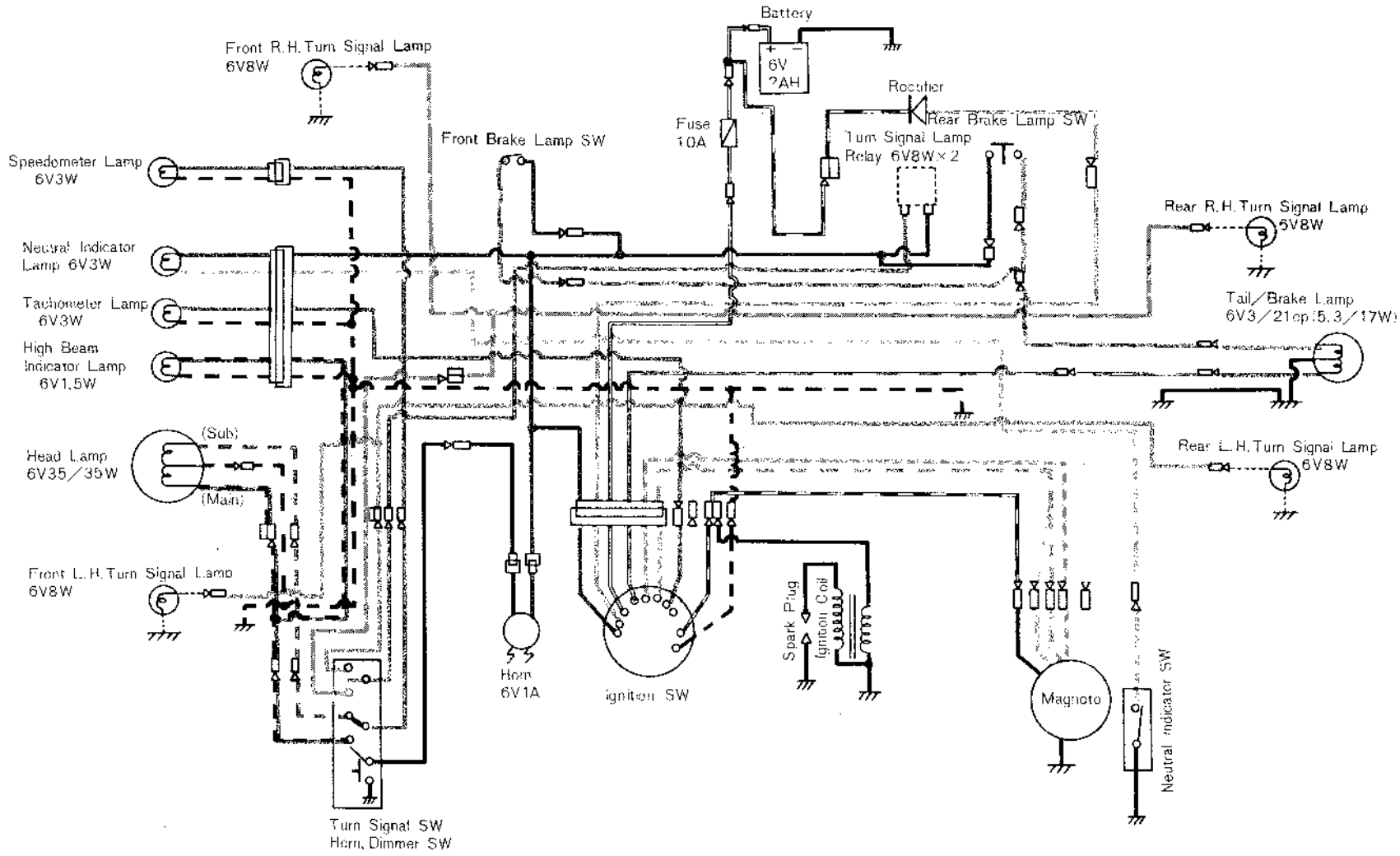
USE	IG	E	MAG-1	SEL	MAG-2	HL	MAG-3	BAT	HORN	TAIL
Cord Color	Black/White	Black/Yellow	Sky-Blue	Blue/White	Pink	Red	Yellow	White	Brown	Red/White
Stop	○—○									
Day			○—○	○—○				○—○		
Night				○—○		○—○		○—○—○		

NOTE: Turn Signal Lamps and Turn Signal Relay are optional parts which are shown with dotted lines.



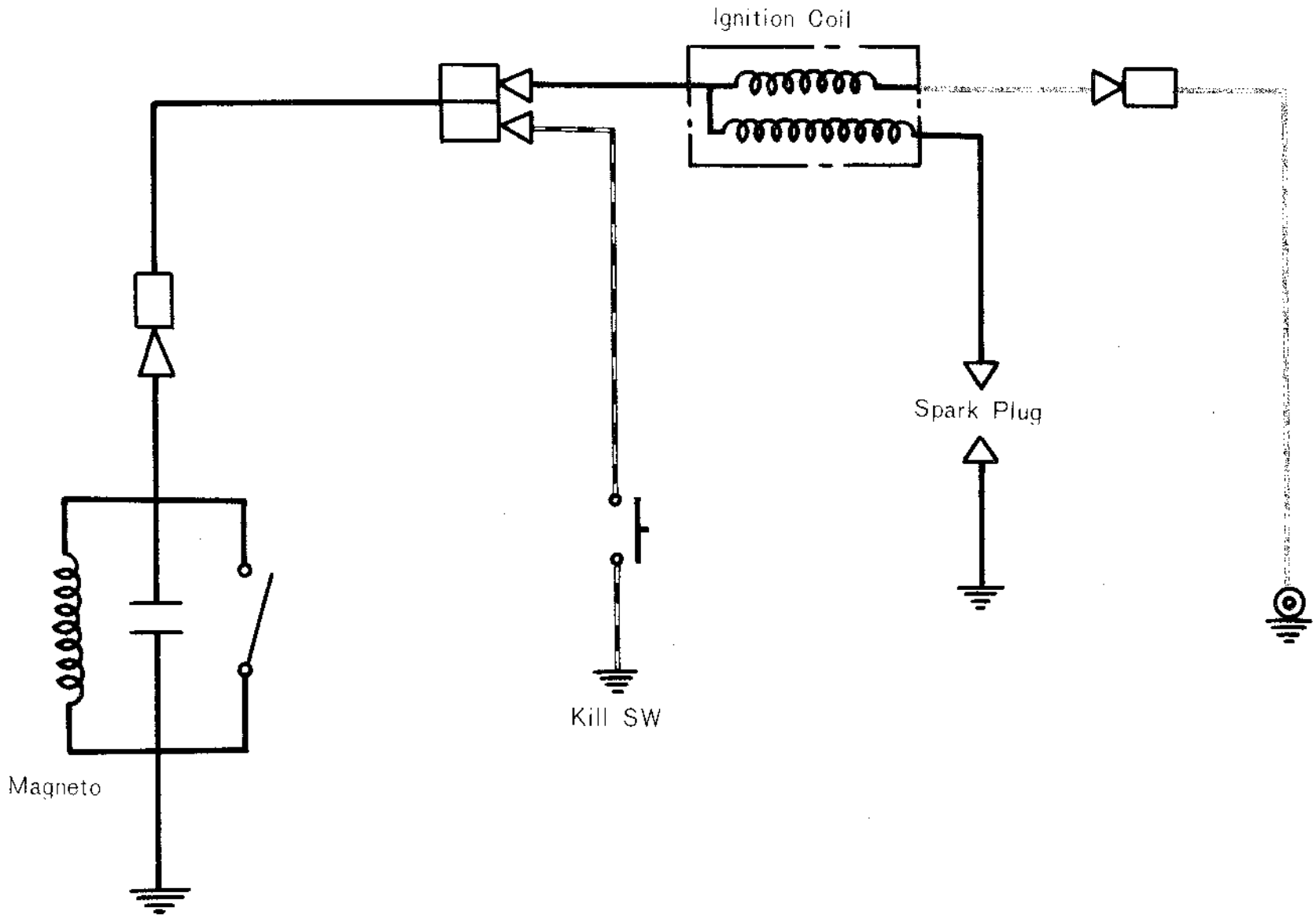
USE	IG	E	MAG-1	SEL	MAG-2	HL	MAG-3	BAT	HORN	TAIL
Cord Color	Black/White	Black/Yellow	Sky-Blue	Blue/White	Pink	Red	Yellow	Blue White	Brown	Red/White
Stop	○—○									
Day			○—○	○—○				○—○		
Night				○—○	○—○	○—○	○—○	○—○	○—○	○—○

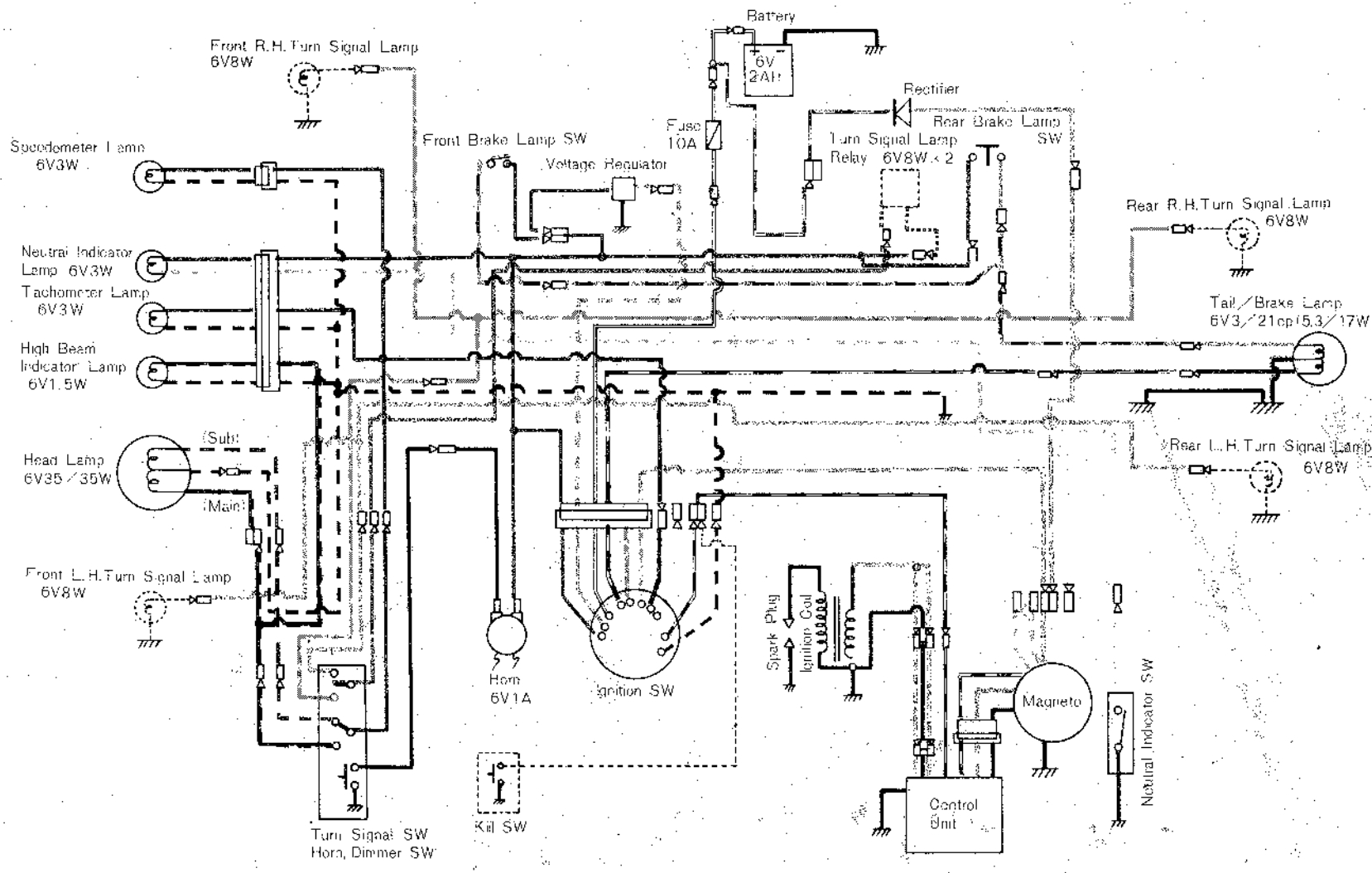
NOTE: Turn Signal Lamps and Turn Signal Lamp Relay are optional parts which are shown with dotted lines.



USE	IG	E	MAG-1	SEL	MAG-2	HL	MAG-3	BAT	HORN	TAIL
Cord Color	Black/White	Black/Yellow	Sky-Blue	Blue/White	Pink	Red	Yellow	White	Brown	Red/White
Stop	○—○									
Day			○—○					○—○		
Night				○—○		○—○		○—○		○—○

NOTE: Turn Signal Lamps and Turn Signal Lamp Relay are optional parts which are shown with dotted line.


Ignition Coil
Spark Plug
Kill SW
Magneto



USE	IG	E	MAG-1	SEL	MAG-2	HL	MAG-3	BAT	HORN	TAIL
Cord Color	Black/White	Black/Yellow	Sky Blue	Blue/White	Pink	Red	Yellow	White	Brown	Red/White
Stop	○—○									
Day			○—○					○—○		
Night				○—○	○—○	○—○		○—○	○—○	

NOTE: Turn Signal Lamps, Turn Signal Lamp Relay and Kill SW are optional parts which are shown with dotted lines.