Robin Industrial Engines®

SERVICE MANUAL

Models
EH36, EH41
Engines

PUB-ES1282
Rev. 4/99

Robin
SUBARU

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1. SPECIFICATIONS

MODEL		EH36			
		EH36B	EH36BS	EH36D	EH36DS
Type		Air-Cooled, 4-Cycle, Single-Cylinder, Horizontal P.T.O. Shaft, OHV Gasoline Engine			
Bore x Stroke		89 x 65 mm (3.50 x 2.56 in.)			
Piston Displacement		404 cm^3 (24.65 cu.in.)			
Compression Ratio		8.3			
Output	Continuous	6.3 kW (8.5 HP) /1800 r.p.m.		6.3 kW (8.5 HP) /3600 r.p.m.	
	Max.	8.5 kW (11.5 HP) /1800 r.p.m.		8.5 kW (11.5 HP) /3600 r.p.m.	
Max. Torque		54.9 N · m (5.60 kgf · m) /1250 r.p.m.		27.4 N · m (2.80 kgf · m) /2500 r.p.m.	
Direction of Rotation		Counterclockwise As Viewed From P.T.O. Shaft Side			
Cooling system		Forced Air Cooling			
Valve Arrangement		Overhead Valve			
Lubrication		Splash Type			
Lubricant		Automobile Oil SAE #20, #30 or 10W-30 ; Class SE or higher			
Capacity of Lubricant		1.2 liters (0.32 U.S. gal.)			
Carburetor		Horizontal Draft, Float Type			
Fuel		Automobile Unleaded Gasoline			
Fuel Consumption Ratio		310 g/kW · h (230 g/HP · h) At Continuous Rated Output			
Fuel Feed System		Gravity Type			
Fuel Tank Capacity		7.0 liters (1.85 U.S. gal.)			
Ignition System		Flywheel Magneto (Solid State)			
Spark Plug		NGK BP6ES			
Charging Capacity		——	12V-1.3A	——	12V-1.3A
Starting System		Recoil Starter	Electric Starter & Recoil Starter	Recoil Starter	Electric Starter & Recoil Starter
Speed Reduction		1/2 Camshaft Drive		——	
Governor System		Centrifugal Flyweight Type			
Air Cleaner		Double Element Type			
Dry Weight		32.0 kg (70.6 lb.)	35.0 kg (77.2 lb.)	31.0 kg (68.4 lb.)	34.0 kg (75.0 lb.)
Dimensions (L x W x H)		389 mm x 431 mm x 433 mm (15.31 in. x 16.97 in. x 17.05 in.)			

Specifications are subject to change without notice.

MODEL		EH41			
		EH41B	EH41BS	EH41D	EH41DS
Type		Air-Cooled, 4-Cycle, Single-Cylinder, Horizontal P.T.O. Shaft, OHV Gasoline Engine			
Bore x Stroke		89 x 65 mm (3.50 x 2.56 in.)			
Piston Displacement		404 cm^3 (24.65 cu.in.)			
Compression Ratio		8.3			
Output	Continuous	7.0 kW (9.5 HP) /1800 r.p.m.		7.0 kW (9.5 HP) /3600 r.p.m.	
	Max.	9.9 kW (13.5 HP) /1800 r.p.m.		9.9 kW (13.5 HP) /3600 r.p.m.	
Max. Torque		56.8 N · m (5.80 kgf · m) /1250 r.p.m.		28.4 N · m (2.90 kgf · m) /2500 r.p.m.	
Direction of Rotation		Counterclockwise As Viewed From P.T.O. Shaft Side			
Cooling system		Forced Air Cooling			
Valve Arrangement		Overhead Valve			
Lubrication		Splash Type			
Lubricant		Automobile Oil SAE #20, #30 or 10W-30 ; Class SE or higher			
Capacity of Lubricant		1.2 liters (0.32 U.S. gal.)			
Carburetor		Horizontal Draft, Float Type			
Fuel		Automobile Unleaded Gasoline			
Fuel Consumption Ratio		310 g/kW · h (230 g/HP · h) At Continuous Rated Output			
Fuel Feed System		Gravity Type			
Fuel Tank Capacity		7.0 liters (1.85 U.S. gal.)			
Ignition System		Flywheel Magneto (Solid State)			
Spark Plug		NGK BP6ES			
Charging Capacity		——	12V-1.3A	——	12V-1.3A
Starting System		Recoil Starter	Electric Starter & Recoil Starter	Recoil Starter	Electric Starter & Recoil Starter
Speed Reduction		1/2 Camshaft Drive		——	
Governor System		Centrifugal Flyweight Type			
Air Cleaner		Double Element Type			
Dry Weight		32.0 kg (70.6 lb.)	35.0 kg (77.2 lb.)	31.0 kg (68.4 lb.)	34.0 kg (75.0 lb.)
Dimensions (L x W x H)		389 mm x 431 mm x 433 mm (15.31 in. x 16.97 in. x 17.05 in.)			

Specifications are subject to change without notice.

2. PERFORMANCE

2-1 MAXIMUM OUTPUT

The maximum output is the output of an engine with its throttle valve fully opened under the condition that all the moving parts are properly broken in after the initial break-in period.

A new engine may not produce full maximum output while its moving parts are still not broken-in.

NOTE :
Power curves shown in the following charts are made in conformity with SAE internal combustion engine standard test code J1349.

2-2 CONTINUOUS RATED OUTPUT

The continuous rated output is the output of an engine at optimum governed speed which is most favorable from the view point of engine's life and fuel consumption.

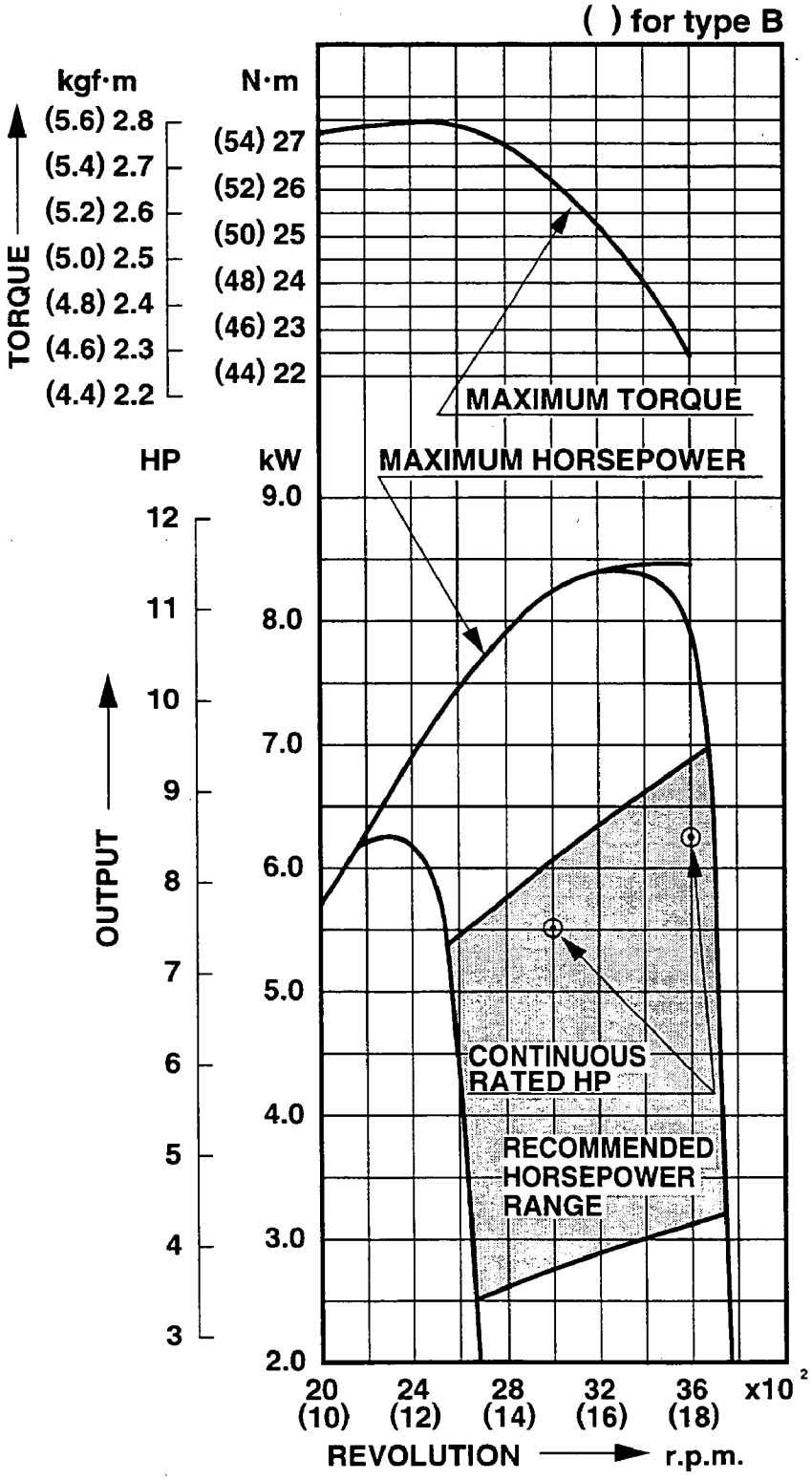
When the engine is installed on a certain equipment, it is recommended that the continuous output required from the engine be kept below this continuous rated output.

2-3 MAXIMUM TORQUE

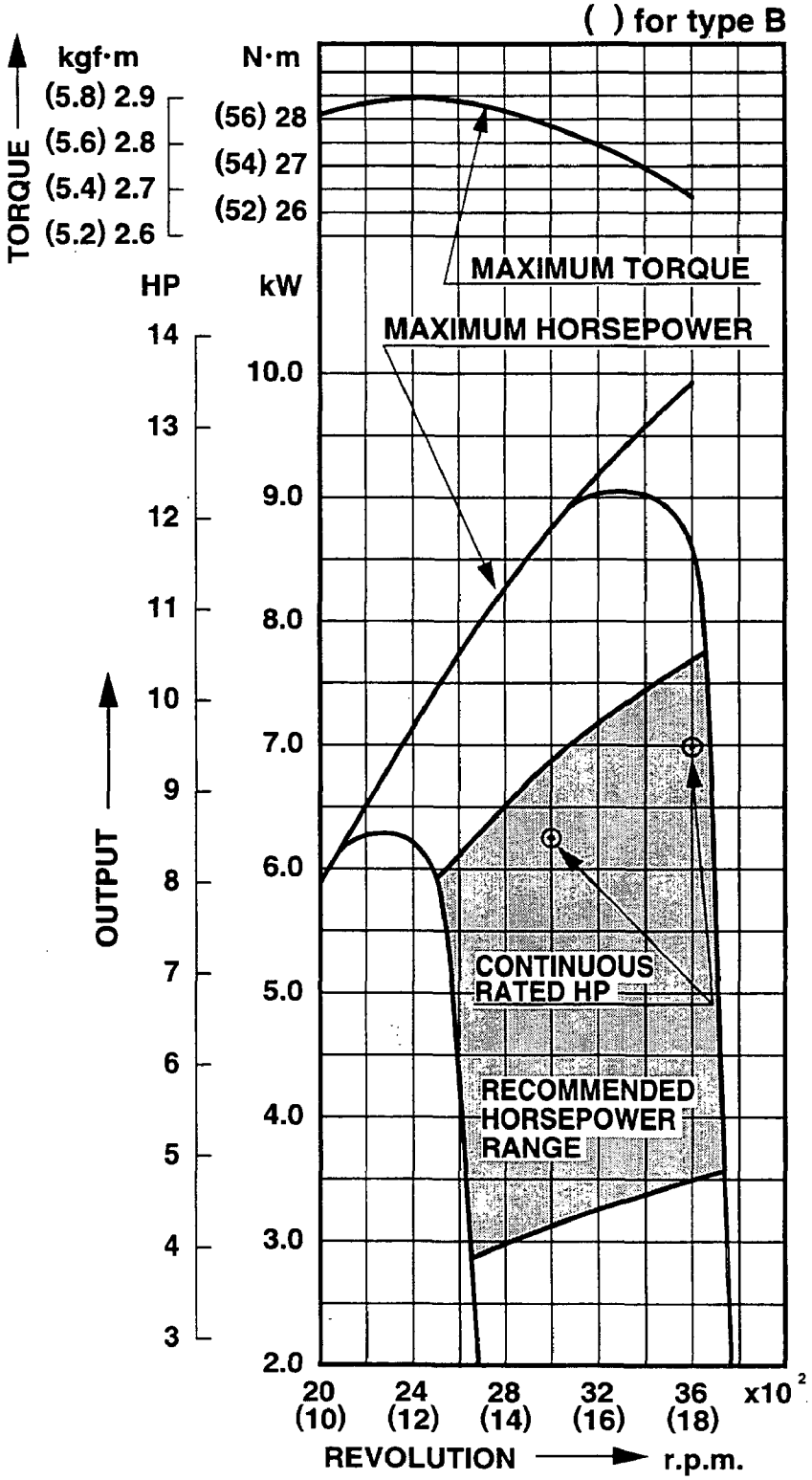
The maximum torque is the torque at the output shaft when the engine is producing maximum output at certain revolution.

2-4 PERFORMANCE CURVES

EH36



EH41


( ) for type B
kgf·m
N·m
TORQUE
(5.8) 2.9
(5.6) 2.8
(5.4) 2.7
(5.2) 2.6
(56) 28
(54) 27
(52) 26
MAXIMUM TORQUE
MAXIMUM HORSEPOWER
HP
kW
OUTPUT
14
13
12
11
10
9
8
7
6
5
4
3
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
CONTINUOUS RATED HP
RECOMMENDED HORSEPOWER RANGE
20 (10)
24 (12)
28 (14)
32 (16)
36 (18)
x10²
REVOLUTION
r.p.m.

3. FEATURES

1. The overhead valve design offers a compactness, light weight and ideal combustion characteristics resulting in more power from less fuel and prolonged engine life.
2. The adoption of an inclined cylinder offers low height of engine, making the arrangements for installing the engine much easier for various powered equipments.
3. The vibration free design with a balancer system and lighter reciprocating parts.
4. Combustion and mechanical noises have been analized acoustically and improved for better tonal quality and lower engine noise.
5. The automatic decompression system lightens the recoil pull force by 50% comparing to the conventional SV engine.

4. GENERAL DESCRIPTION OF ENGINE COMPONENTS

4-1 CYLINDER AND CRANKCASE

The cylinder and crankcase is a single piece aluminum die-casting.

The cylinder liner, made of special cast iron, is molded into the aluminum casting.

The crankcase has a mounting surface on the output shaft side, where the main bearing cover is attached.

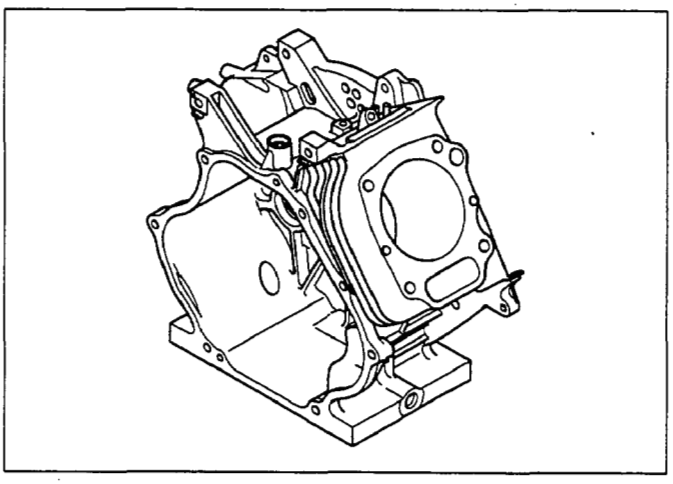


Fig. 4-1

4-2 MAIN BEARING COVER

The main bearing cover is an aluminum die-casting, which is mounted on the output shaft side of the crankcase.

Remove the main bearing cover to inspect inside of the engine.

Pilots and bosses are machined on the cover for direct mounting of the engine onto such machines as generators and pumps.

Oil gauges (fillers) are on both sides of the cover for easy maintenance.

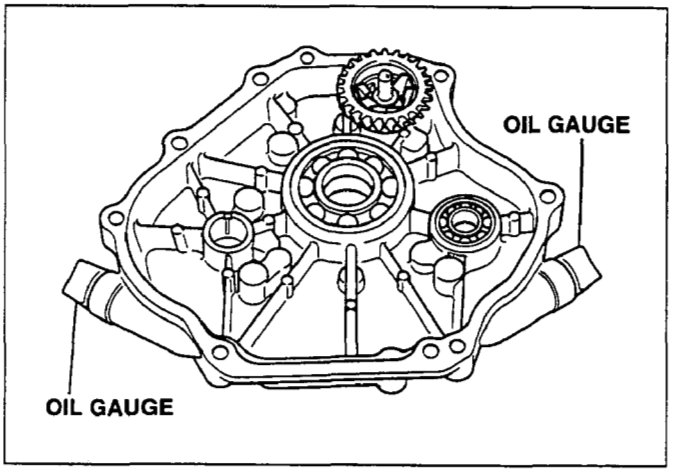


Fig. 4-2

4-3 CRANKSHAFT

The crankshaft is forged carbon steel, and the crank pin is induction-hardened.

The output end of the shaft has a crankshaft gear and balancer gear that are pressed into position.

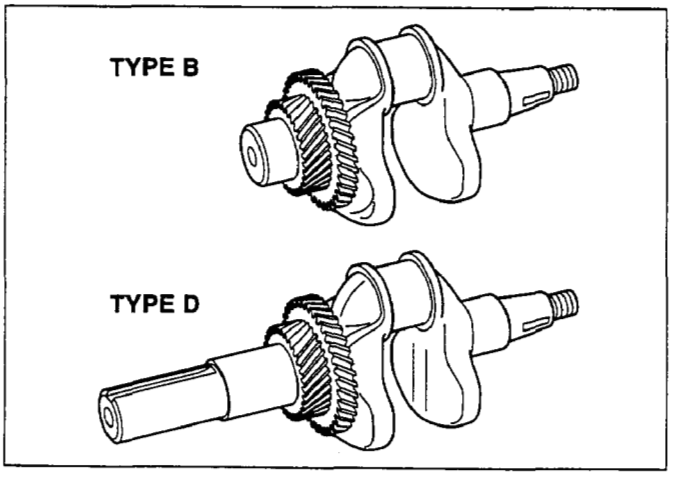


Fig. 4-3

4-4 CONNECTING ROD AND PISTON

The connecting rod is an aluminum alloy die-casting and its large and small ends function as bearings.

The piston is an aluminum alloy casting, and carries two compression rings and one oil ring.

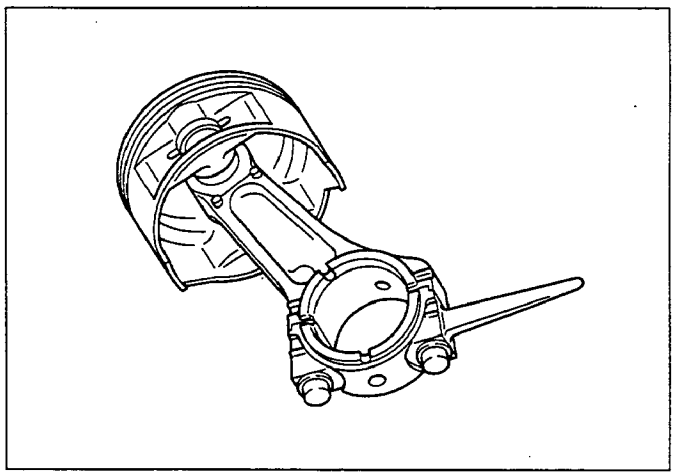


Fig. 4-4

4-5 PISTON RINGS

The piston rings are made of special cast iron.

The profile of the top ring is a barrel face and the second ring has a tapered face.

The oil ring is designed for better sealing and less oil consumption, in combination with 3 pieces.

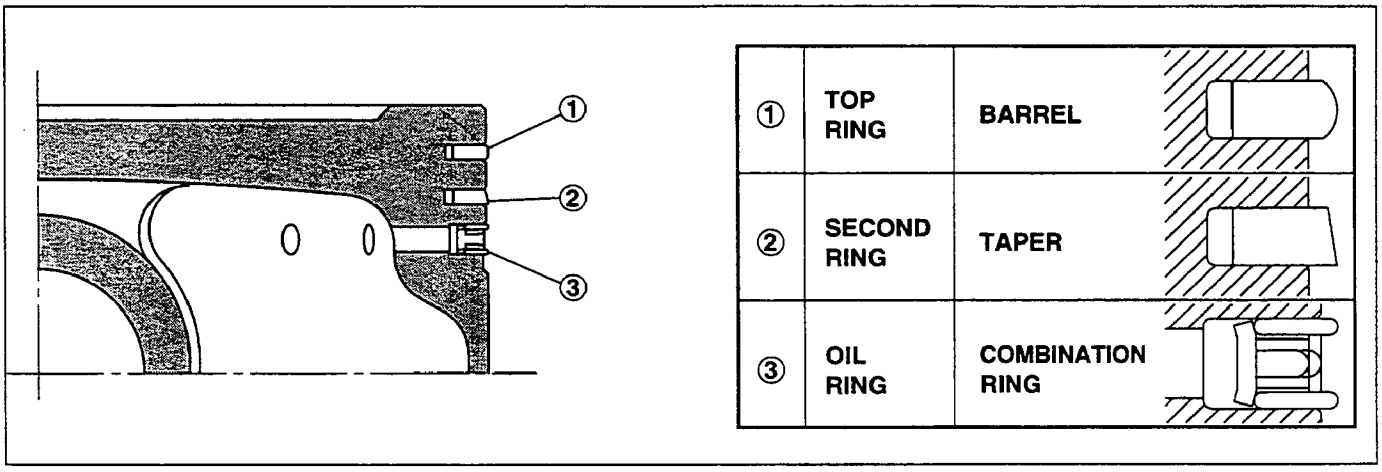


Fig. 4-5

4-6 CAMSHAFT

The camshaft for the D-type engine is made of special cast iron and camshaft gears are casted together in one piece.

Both sides of the shaft fit into the plane bearings on the crankcase and main bearing cover.

The camshaft for B-type engine is made of forged carbon steel and also functions as PTO shaft.

Cam gear is press fitted on the shaft and ball bearings are employed on the both sides for supporting the shaft.

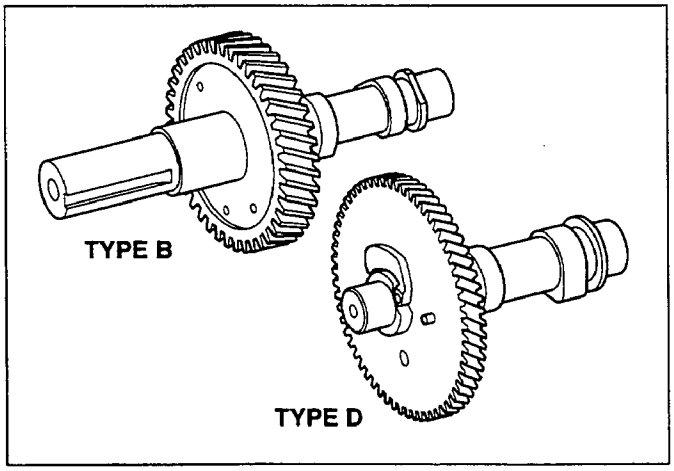


Fig. 4-6

4-7 VALVE ARRANGEMENT

The intake valve is located on flywheel side of the cylinder head.

Hard alloy valve seats are molded in the cylinder head and stellite is fused to the exhaust valve face.

The cylinder baffle leads cooling air to the exhaust valve area for the optimum cooling.

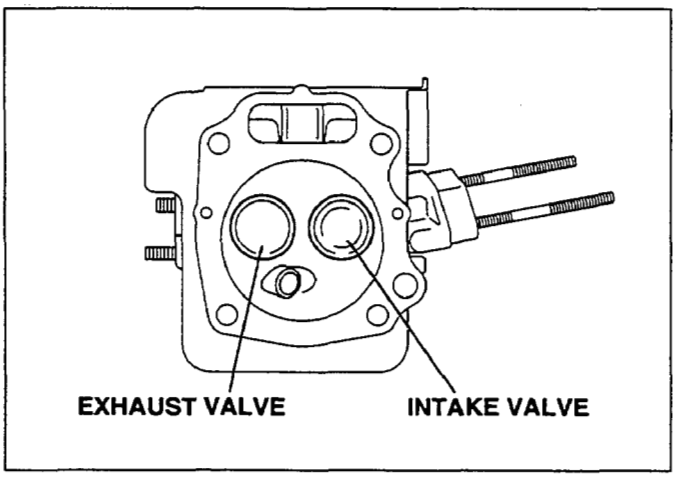


Fig. 4-7

4-8 CYLINDER HEAD

The cylinder head is an aluminum die-casting which utilizes semi-spherical type combustion chamber for the high combustion efficiency.

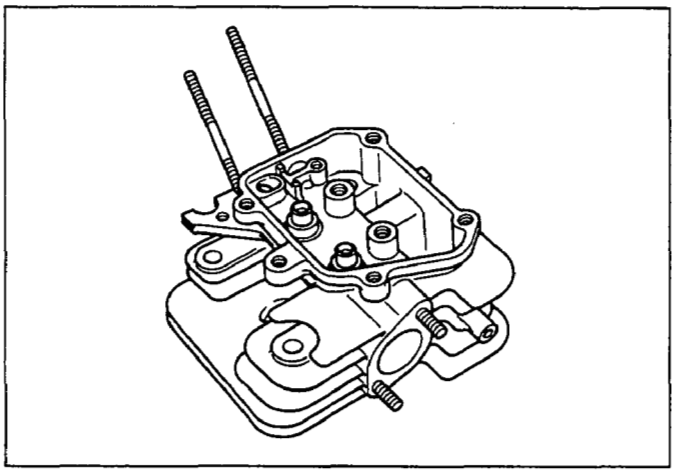


Fig. 4-8

4-9 GOVERNOR SYSTEM

The governor is a centrifugal flyweight type which ensures constant operation at the selected speed against load variations.

The governor gear with governor weights is installed on the main bearing cover.

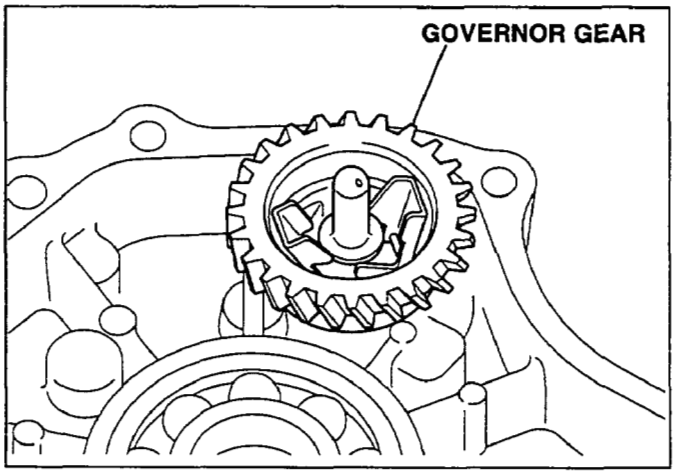


Fig. 4-9

4-10 COOLING SYSTEM

The large fins on the flywheel provide sufficient cooling air capacity for the inlet and exhaust area and cylinder.

The cylinder baffle helps the cooling air flow efficiently.

4-11 LUBRICATION SYSTEM

All the rotating and sliding parts are splash- lubricated by the oil splasher on the connecting rod.

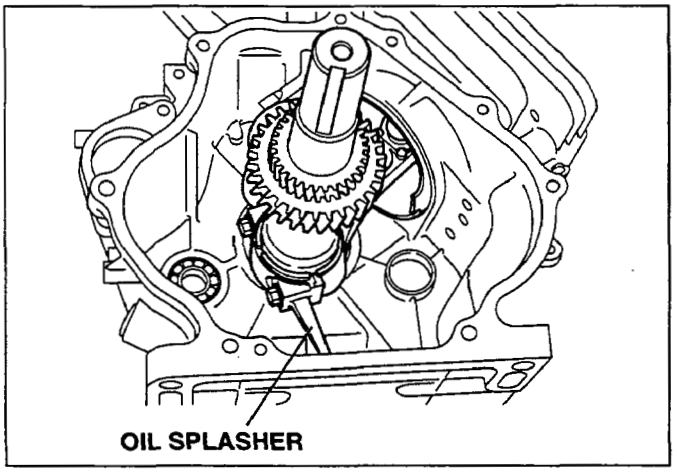


Fig. 4-10

4-12 IGNITION SYSTEM

The ignition system is a transistor controlled magneto system which consists of a flywheel and an ignition coil with a built-in transistor mounted on the crankcase.

This system has an automatic ignition timing advance characteristic for easy starting.

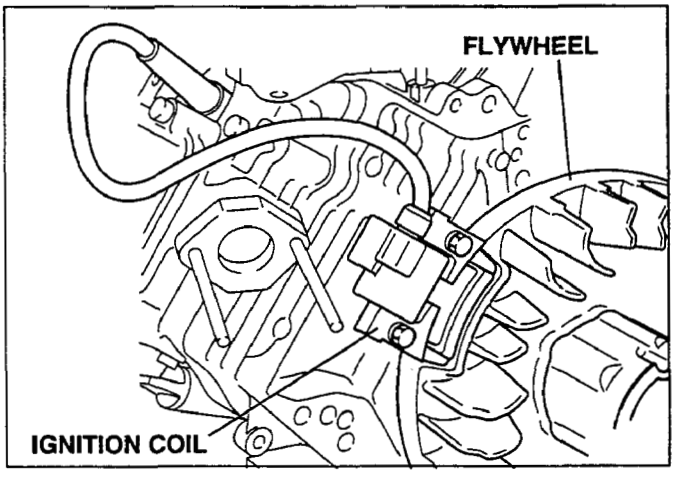


Fig. 4-11

4-13 CARBURETOR

The engine is equipped with a horizontal draft carburetor that has a float controlled fuel system and a fixed main jet.

The carburetors are calibrated carefully for sure starting, good acceleration, less fuel consumption and sufficient output.

For details, refer to page 47, section "8 CARBURETOR".

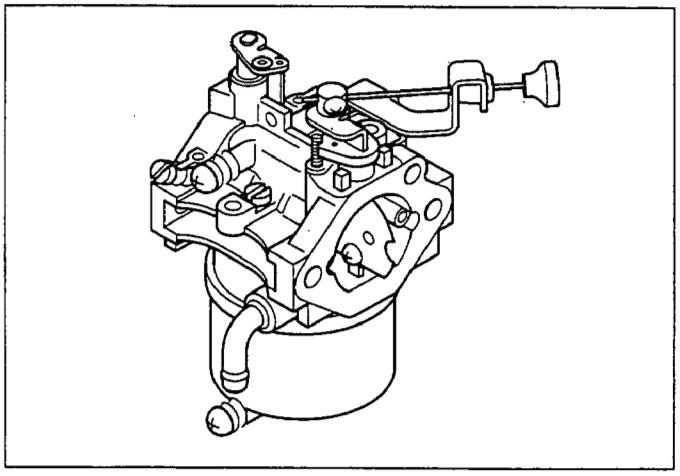


Fig. 4-12

4-14 AIR CLEANER

Air-cleaner is a heavy-duty type with a dual element system ; the primary one is an urethane foam (semi-wet) and secondary one is a dry type paper element.

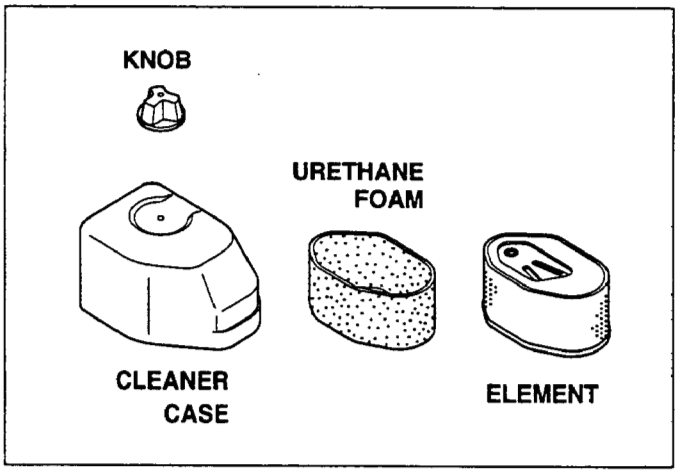


Fig. 4-13

4-15 BALANCER

Unbalanced inertia force is cancelled by the balancer which rotates in the same speed as the crankshaft to effectively reduce vibration.

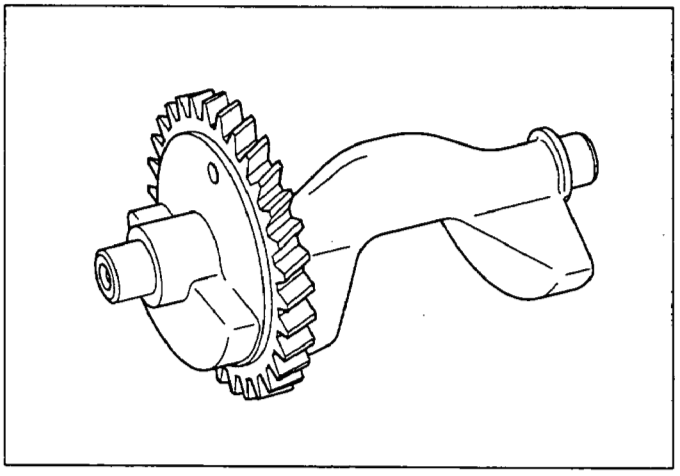


Fig. 4-14

4-16 DECOMPRESSION SYSTEM

An automatic decompression mechanism which opens exhaust valve before the piston reaches compression top is assembled on the camshaft for easy starting.

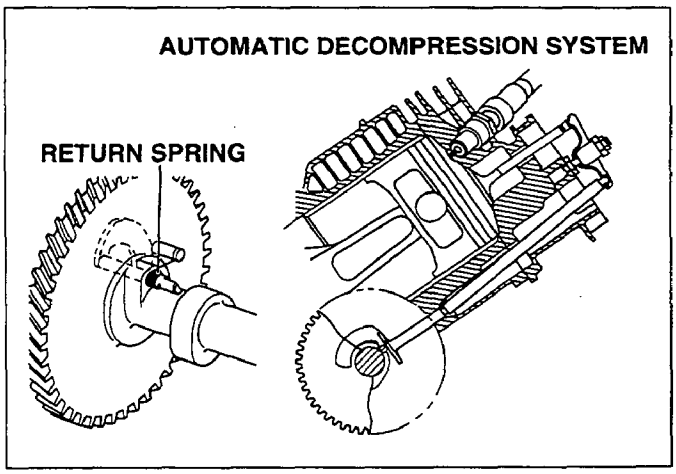


Fig. 4-15

4-17 SECTIONAL VIEW OF ENGINE

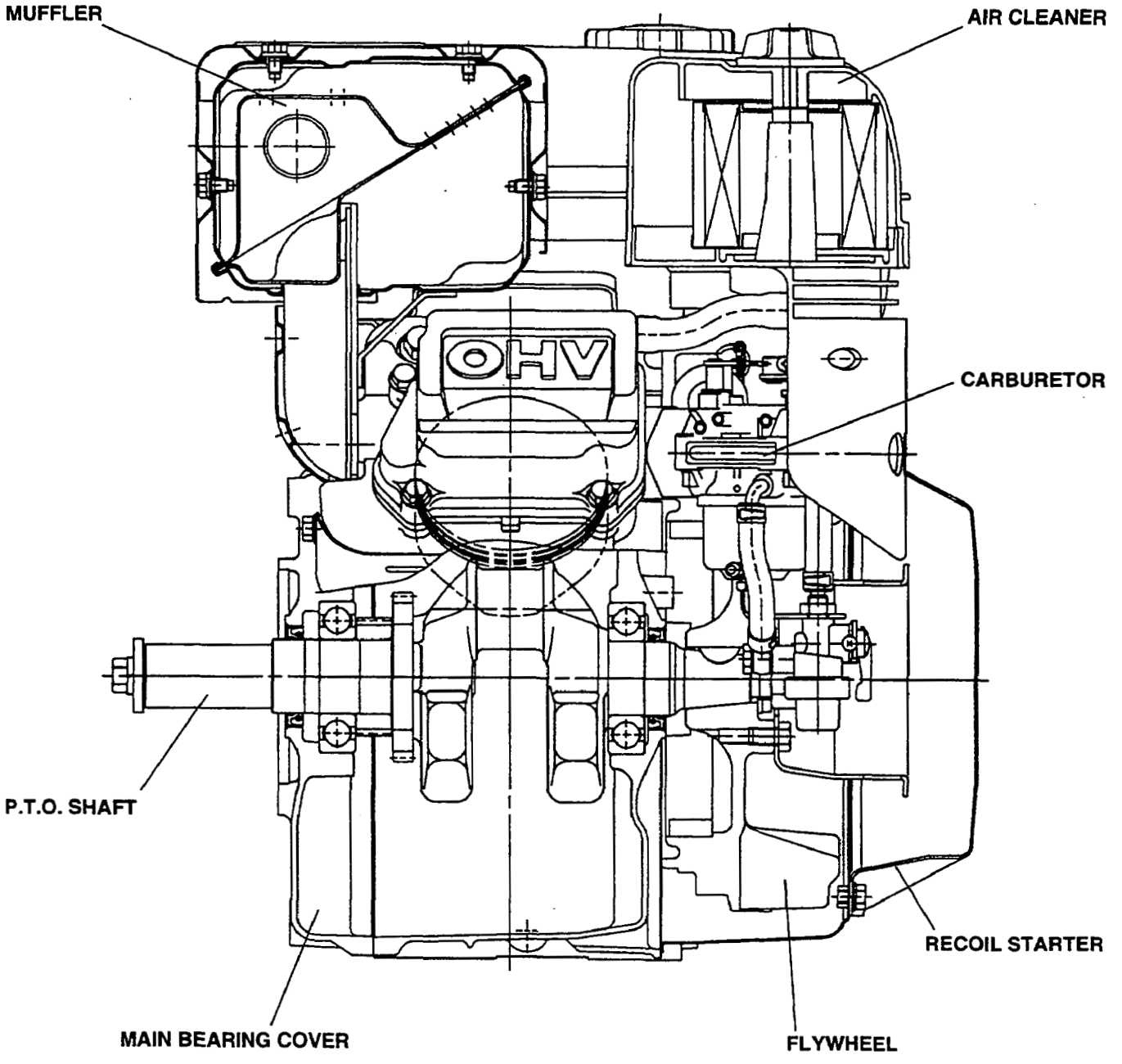


Fig. 4-16

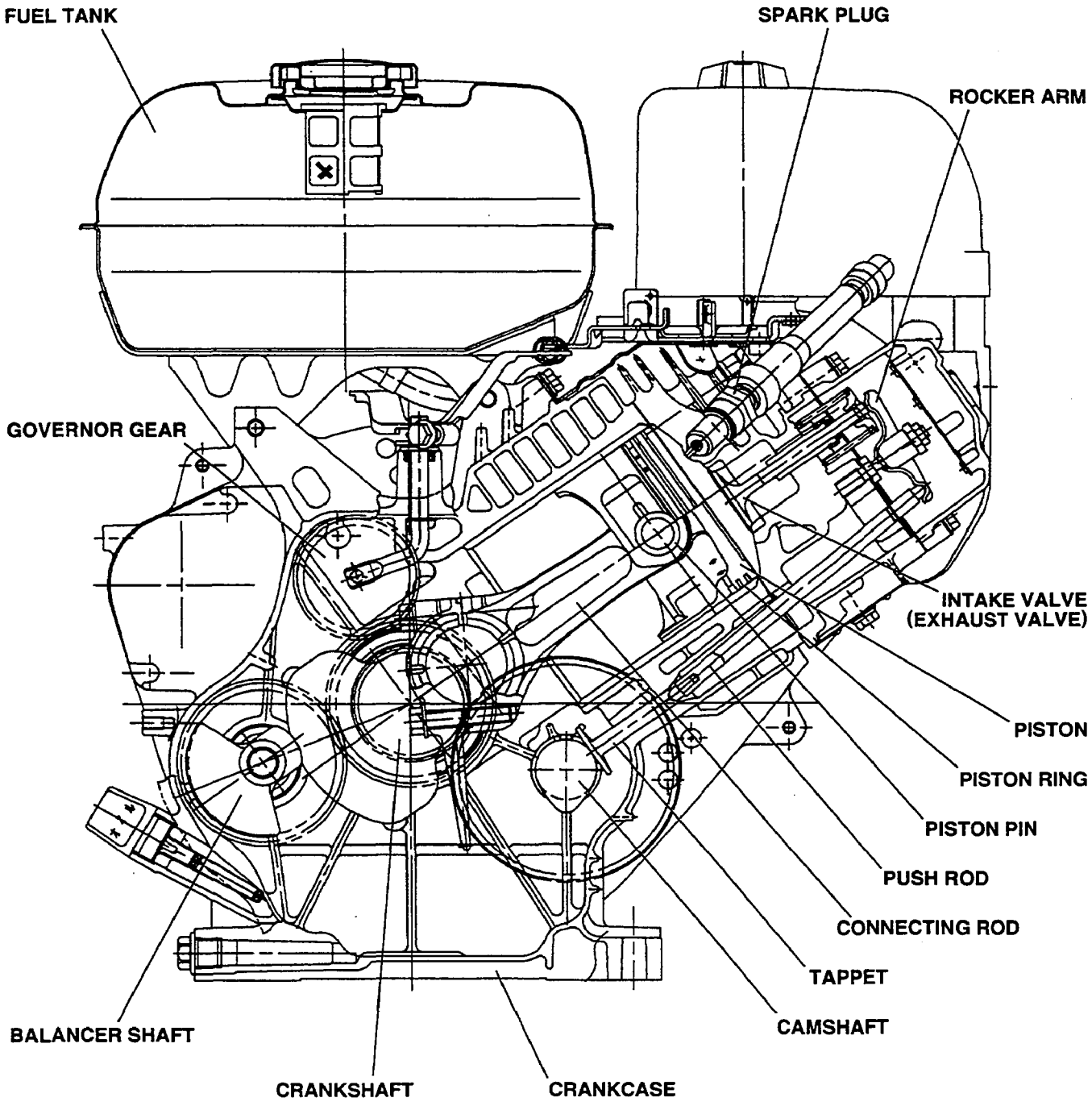

FUEL TANK
SPARK PLUG
ROCKER ARM
GOVERNOR GEAR
INTAKE VALVE
(EXHAUST VALVE)
PISTON
PISTON RING
PISTON PIN
PUSH ROD
CONNECTING ROD
TAPPET
CAMSHAFT
BALANCER SHAFT
CRANKSHAFT
CRANKCASE

Fig. 4-17

5. DISASSEMBLY AND REASSEMBLY

5-1 PREPARATIONS AND SUGGESTIONS

1) When disassembling the engine, memorize the locations of individual parts so that they can be reassembled correctly. If you are uncertain of identifying some parts, it is suggested that tags be attached to them.
2) Have boxes ready to keep disassembled parts by group.
3) To prevent losing and misplacing, temporarily assemble each group of disassembled parts.
4) Carefully handle disassembled parts, and clean them with washing oil if necessary.
5) Use the correct tools in the correct way.

5-2 SPECIAL TOOLS

Tool No.	Tool	Use
209-95004-07	Flywheel puller with bolt	For pulling off the flywheel

FLYWHEEL PULLER

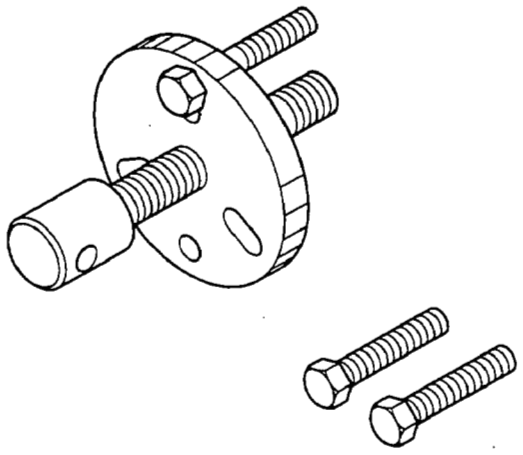


Fig. 5-1

5-3 DISASSEMBLY PROCEDURES

Step	Parts to remove	Remarks and procedures	Fasteners
1	Engine oil drain	(1) Remove oil drain plug and drain oil. (2) To discharge oil quickly, remove oil gauge.	

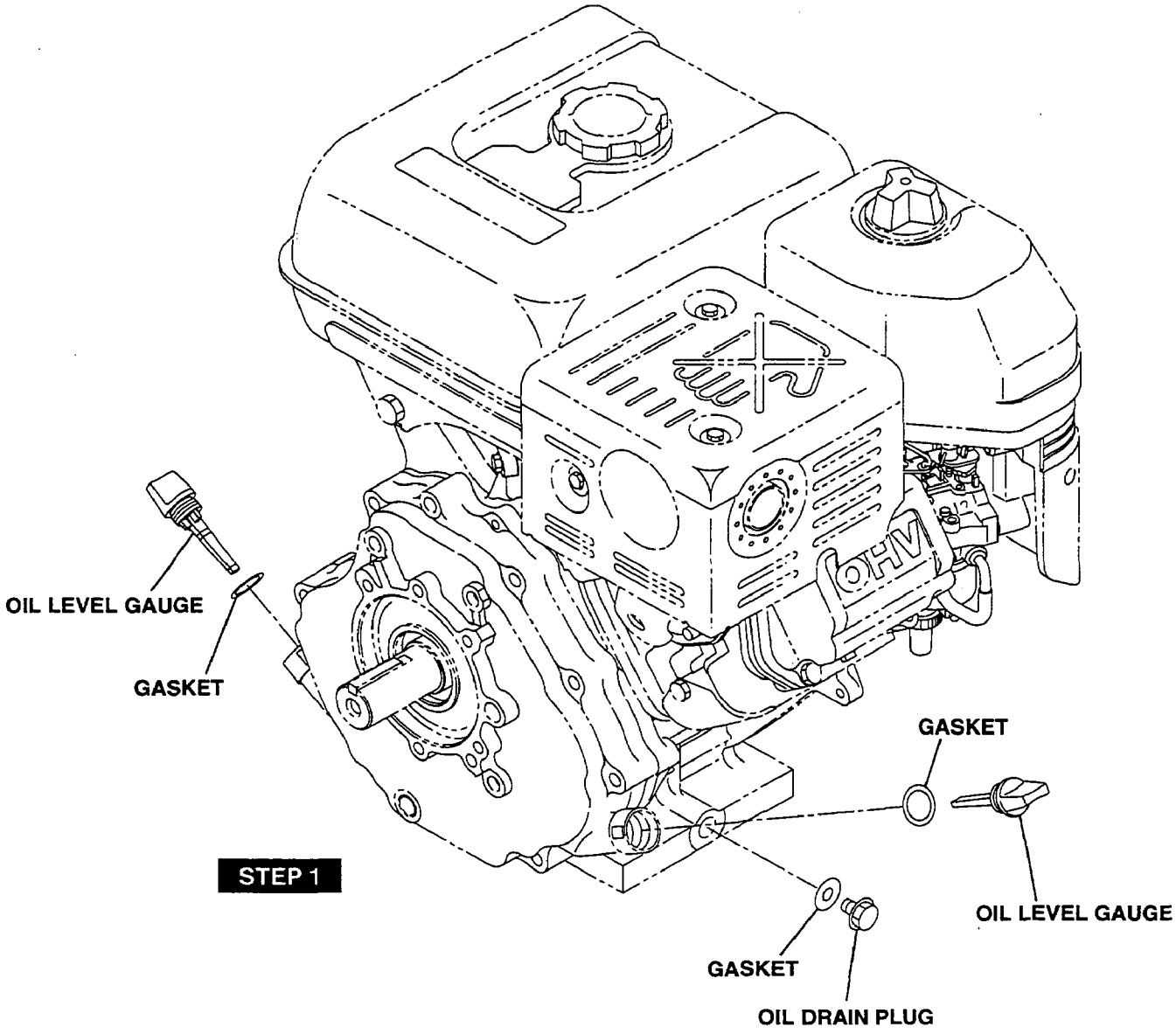


Fig. 5-2

Step	Parts to remove	Remarks and procedures	Fasteners
2	Air cleaner cover and elements		cap nut
3	Air cleaner base and gasket	Remove breather pipe from cylinder head.	M6 flange nut : 2 pcs. M6 x 28 : 1 pce.

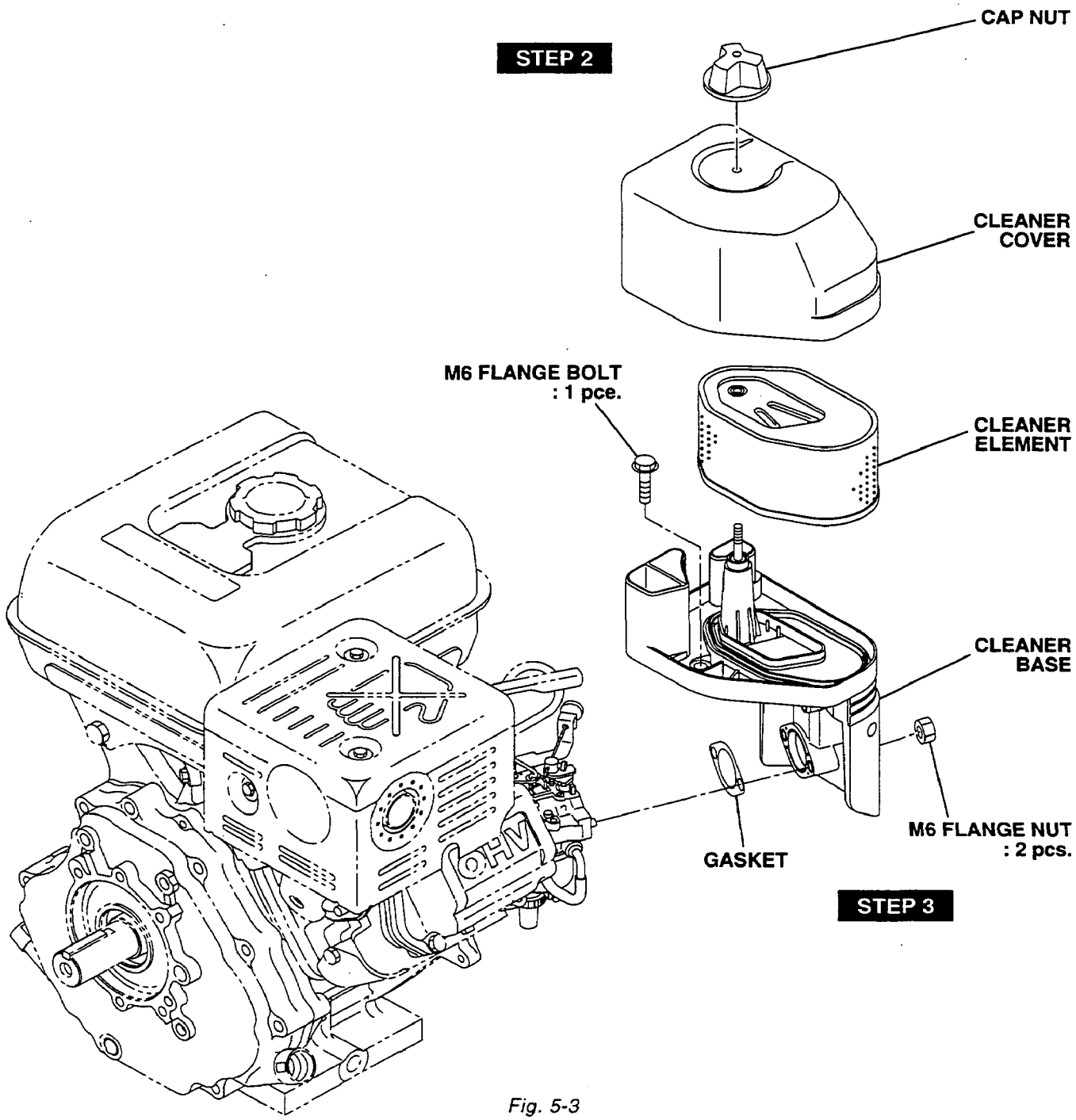


Fig. 5-3

Step	Parts to remove	Remarks and procedures	Fasteners
4	Fuel tank	(1) Close fuel cock. (2) Loosen the nut of fuel strainer and remove it. (3) Disconnect fuel pipe from fuel strainer. * Wipe off spilt fuel thoroughly.	M8 x 20 ; 4 pcs.
5	Stop switch	Disconnect wire complete. Remove stop switch.	M4 tapping screw ; 2 pcs.

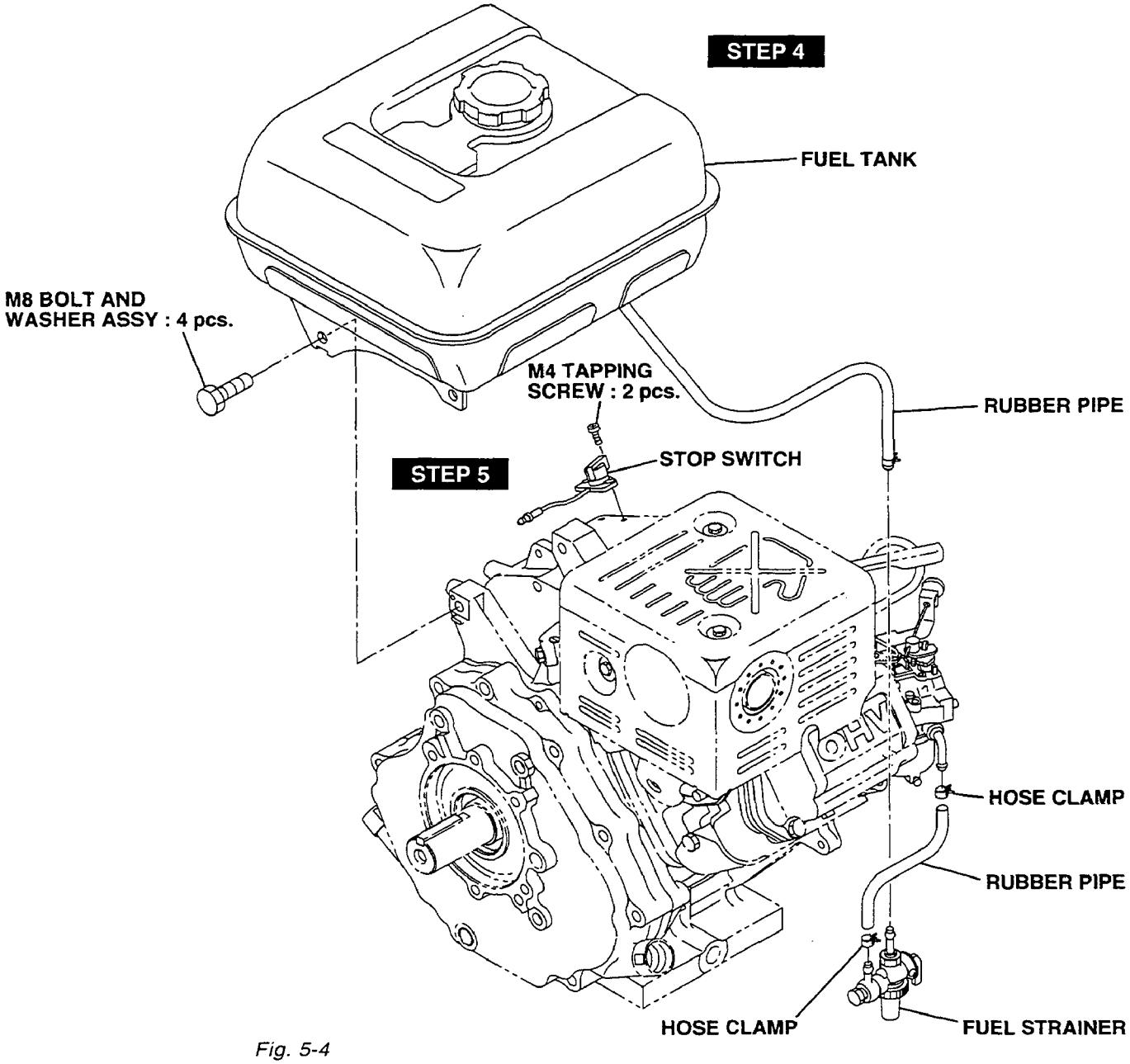


Fig. 5-4

Step	Parts to remove	Remarks and procedures	Fasteners
6	Control box, Diode rectifier, Magnetic switch and Electric starter (Option)	(1) Disconnect wires and remove control box. (2) Remove black wires from electric starter. (3) Loosen two bolts and remove electric starter.	M8 ; 2 pcs.

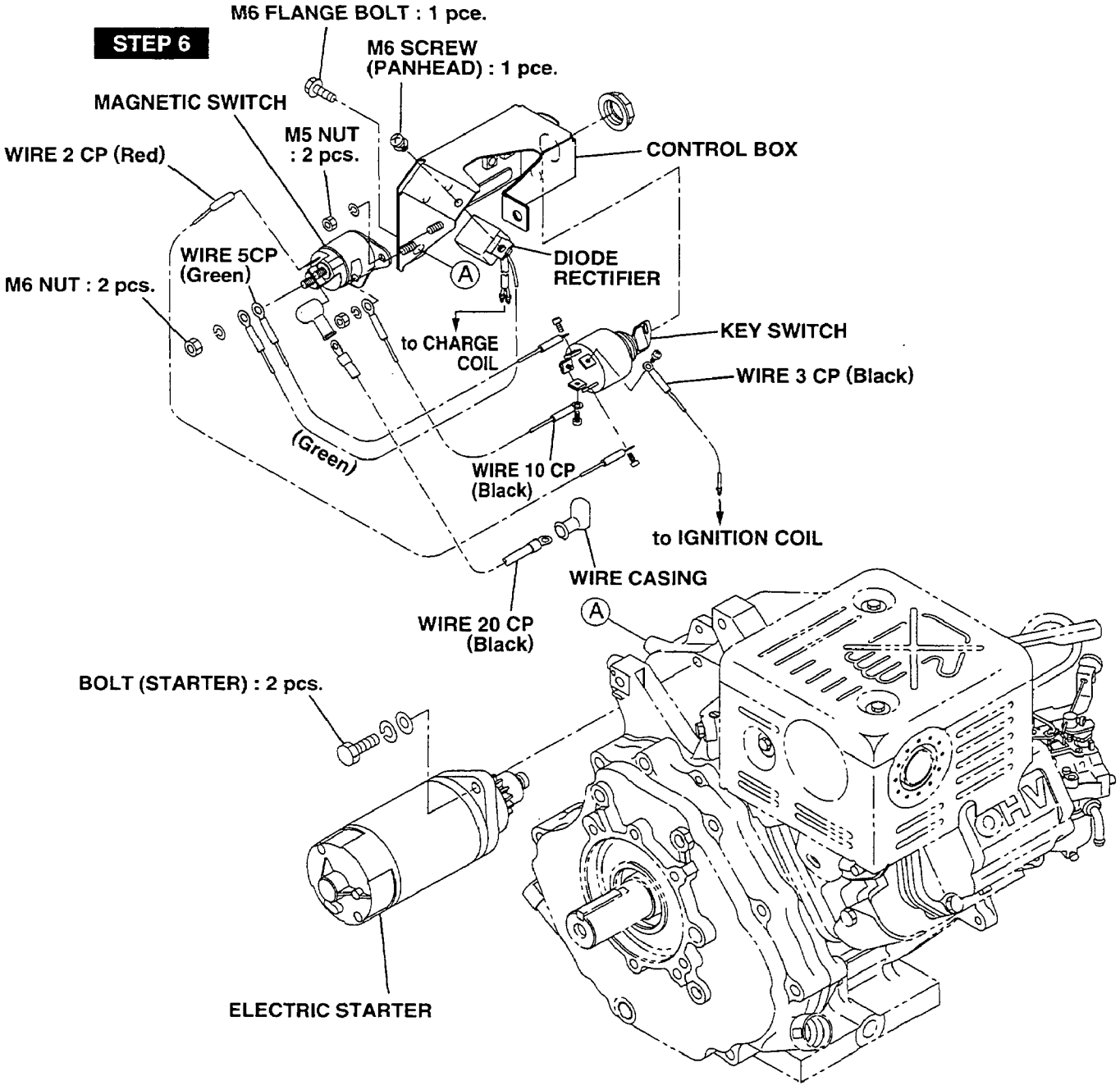


Fig. 5-5

Step	Parts to remove	Remarks and procedures	Fasteners
7	Muffler and muffler bracket	Be careful not to lose muffler gasket.	M8 nut ; 2 pcs. M8 x 16 ; 2 pcs.
8	Carburetor	Remove carburetor carefully unhooking governor rod and rod spring from governor lever.	

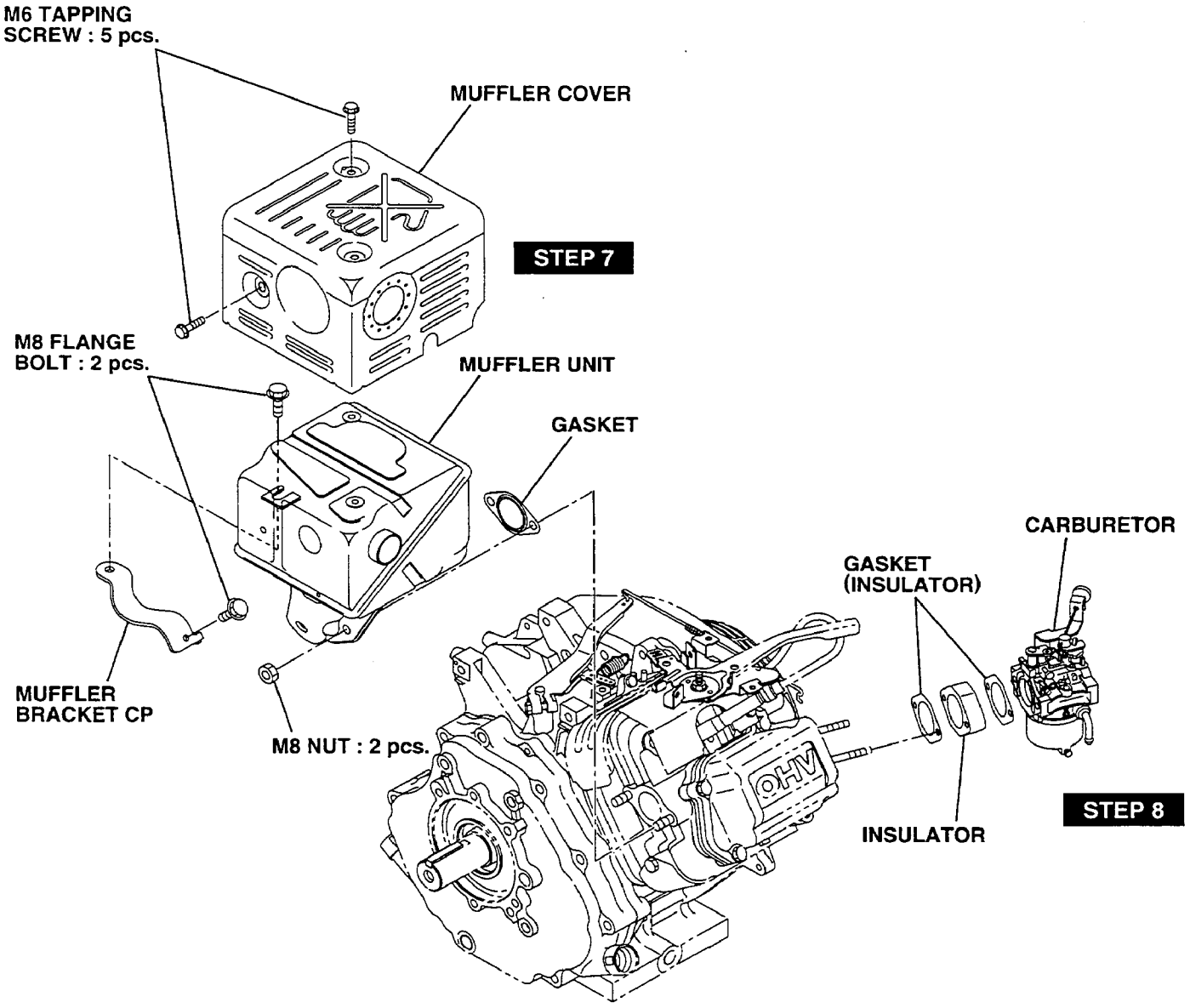


Fig. 5-6

Step	Parts to remove	Remarks and procedures	Fasteners
9	Governor lever	(1) Unhook governor spring from governor lever. Mark the hole on which the governor spring is hooked. (2) Loosen the bolt and remove governor lever.	M6 bolt

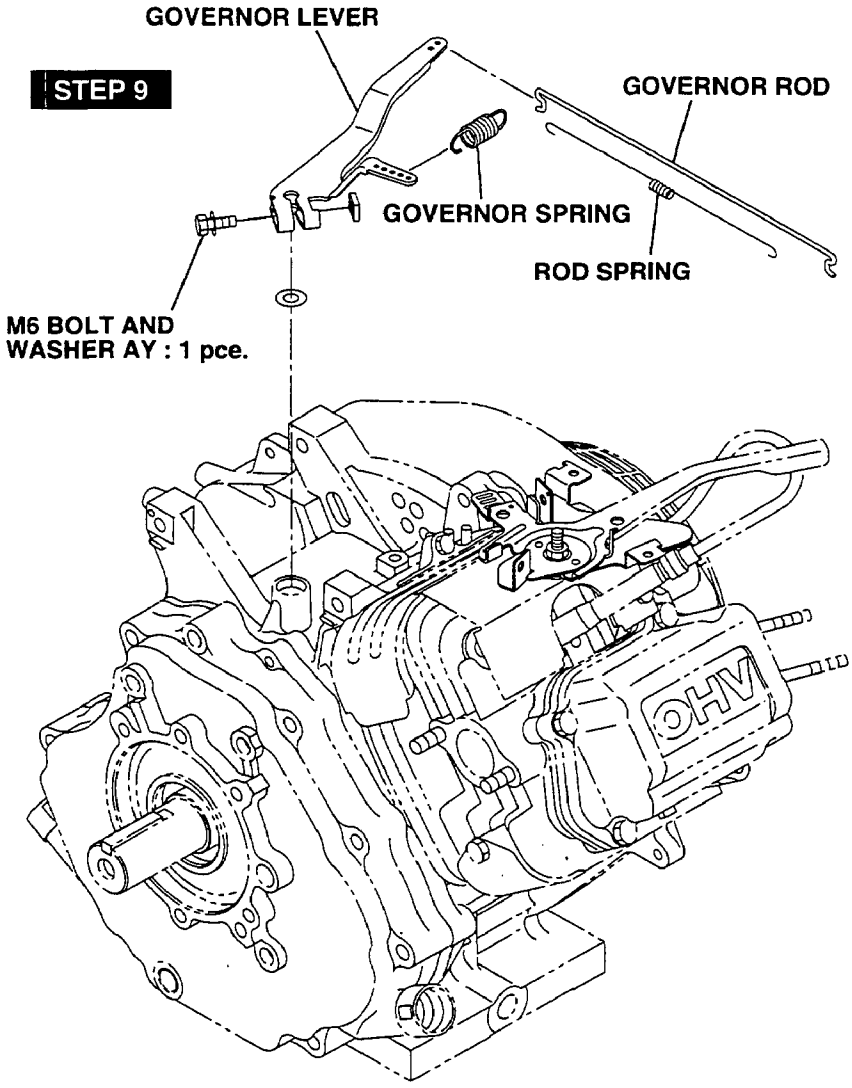


Fig. 5-7

Step	Parts to remove	Remarks and procedures	Fasteners
10	Recoil starter (Pulley cover ; type DS and type BS)		M6 x 8 ; 4 pcs.
11	Blower housing		M6 x 12 ; 5 pcs.

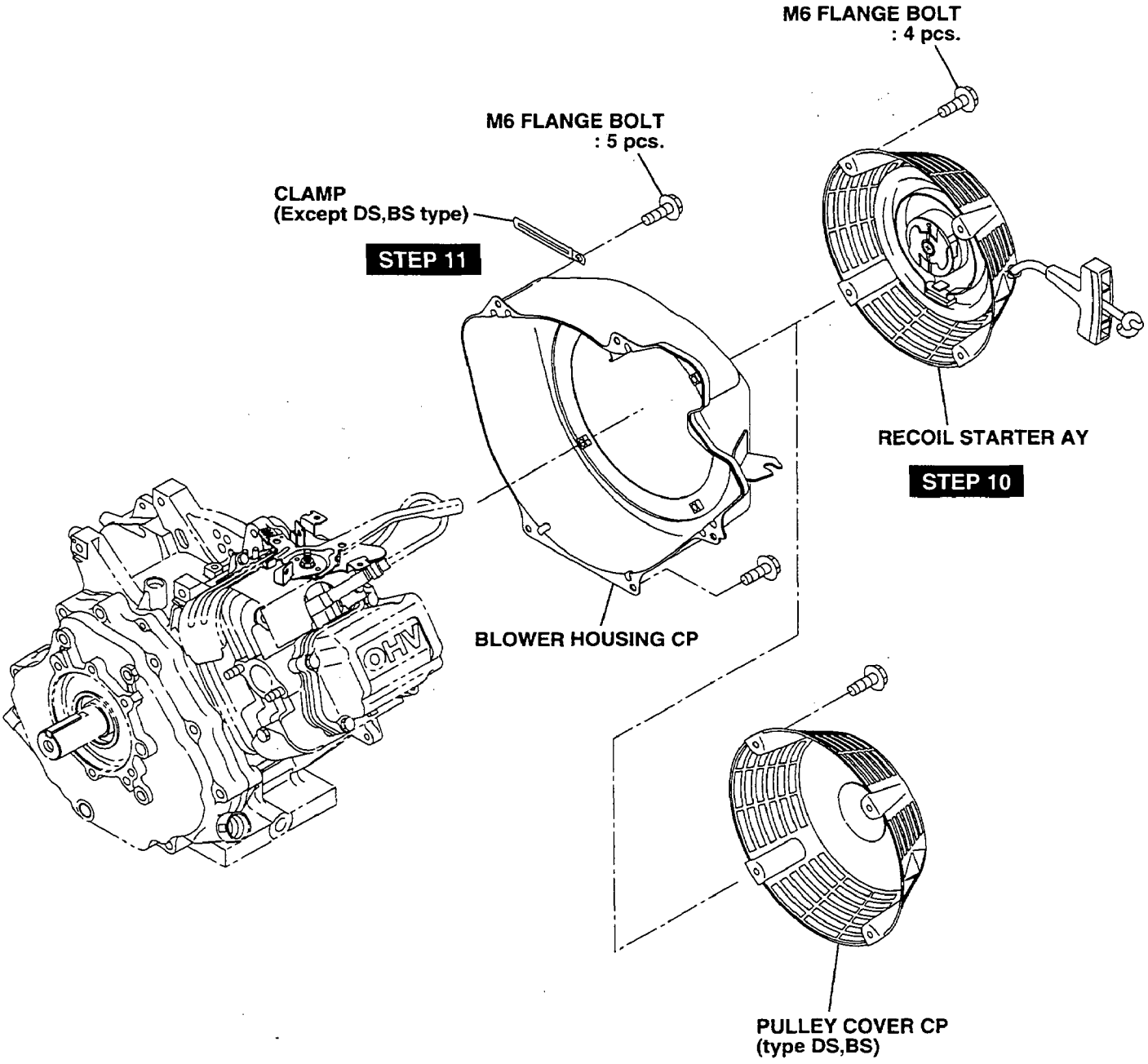


Fig. 5-8

Step	Parts to remove	Remarks and procedures	Fasteners
12	Ignition coil	(1) Remove spark plug cap from spark plug. (2) Remove ignition coil from crankcase.	M6 x 25 ; 2 pcs.
13	Flywheel	(1) Remove the starting pulley. (2) Remove nut from crankshaft. (See Fig. 5-9.) (3) Remove flywheel using the flywheel puller. (See Fig. 5-10.) (4) Remove the key from crankshaft. (See Fig. 5-11.)	M8 x 12 ; 3 pcs. M18 nut, washer, spring washer

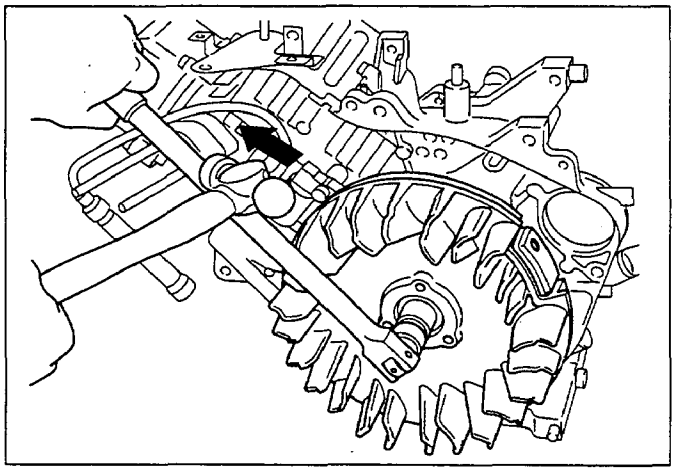


Fig. 5-9

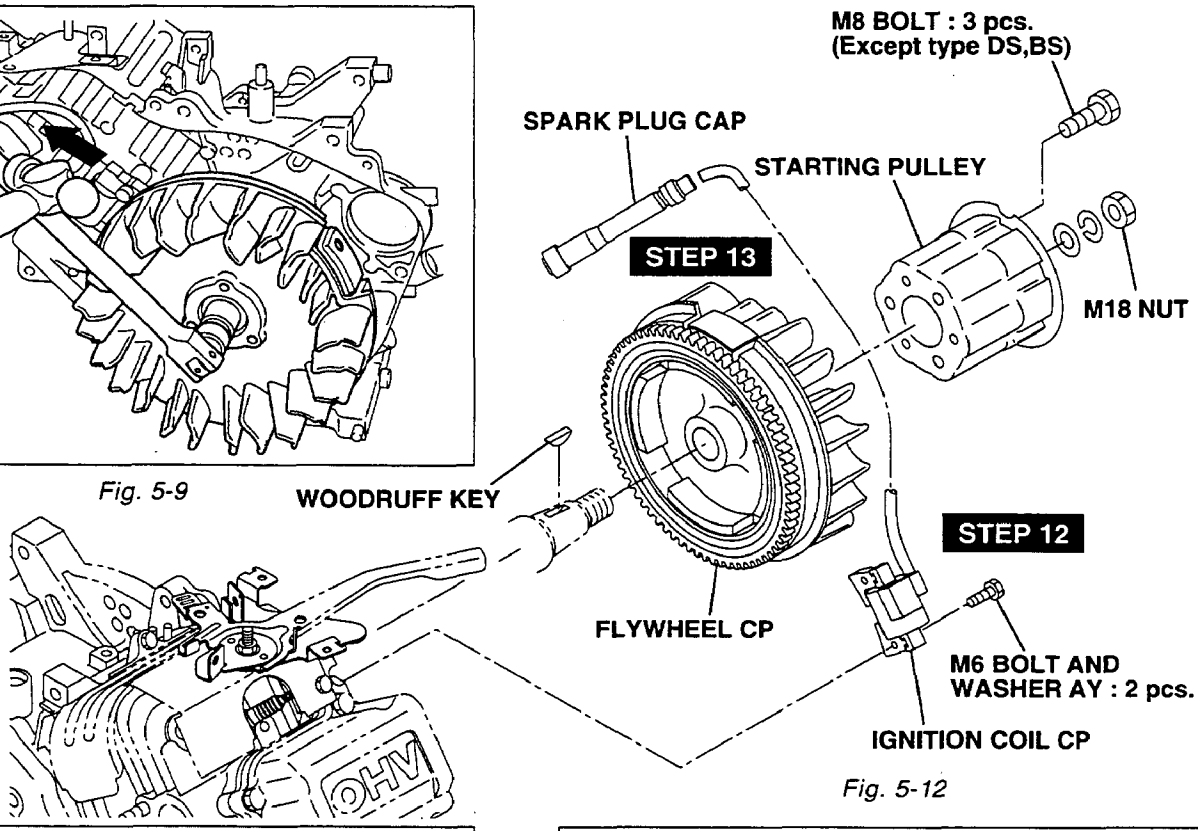


Fig. 5-12

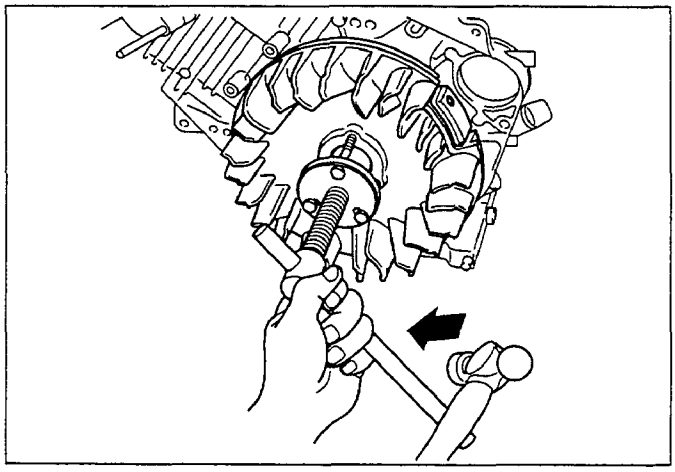


Fig. 5-10

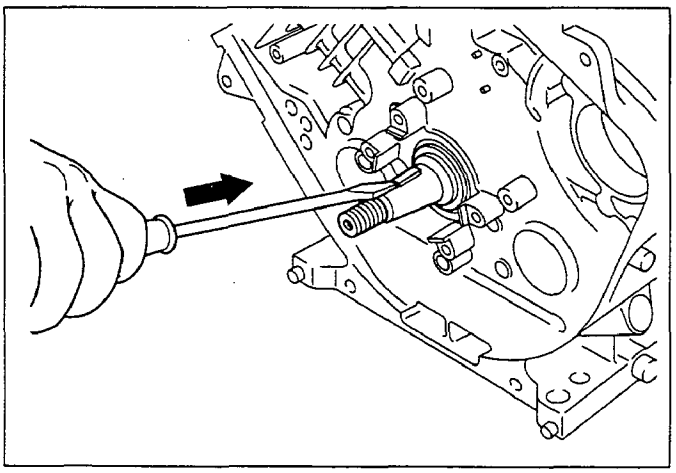


Fig. 5-11

Step	Parts to remove	Remarks and procedures	Fasteners
14	Charge coil (Option)	Remove the charge coil.	M6 x 20 ; 2 pcs.
15	Cylinder baffle		M6 x 8 ; 4 pcs.
16	Spark plug	NGK ; BP6ES	

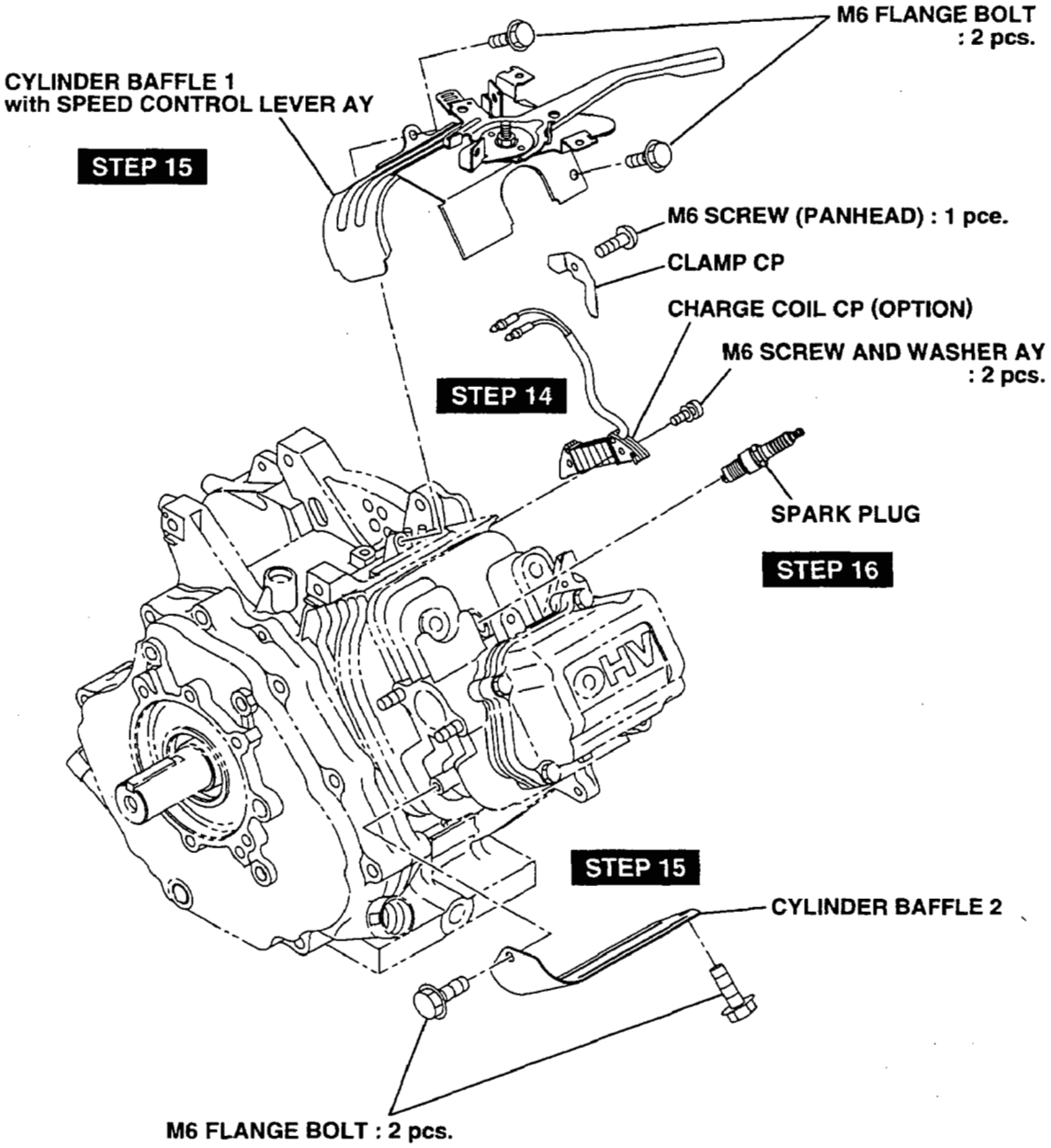


Fig. 5-13

Step	Parts to remove	Remarks and procedures	Fasteners
17	Rocker cover	Remove rocker cover and gasket from cylinder head.	M6 x 25 ; 4 pcs.
18	Rocker arm and push rod	(1) Loosen nut and pivot on rocker arm. (2) Remove push rods from cylinder.	
19	Cylinder head	Remove cylinder head and gasket from crankcase.	M10 x 65 ; 4 pcs.

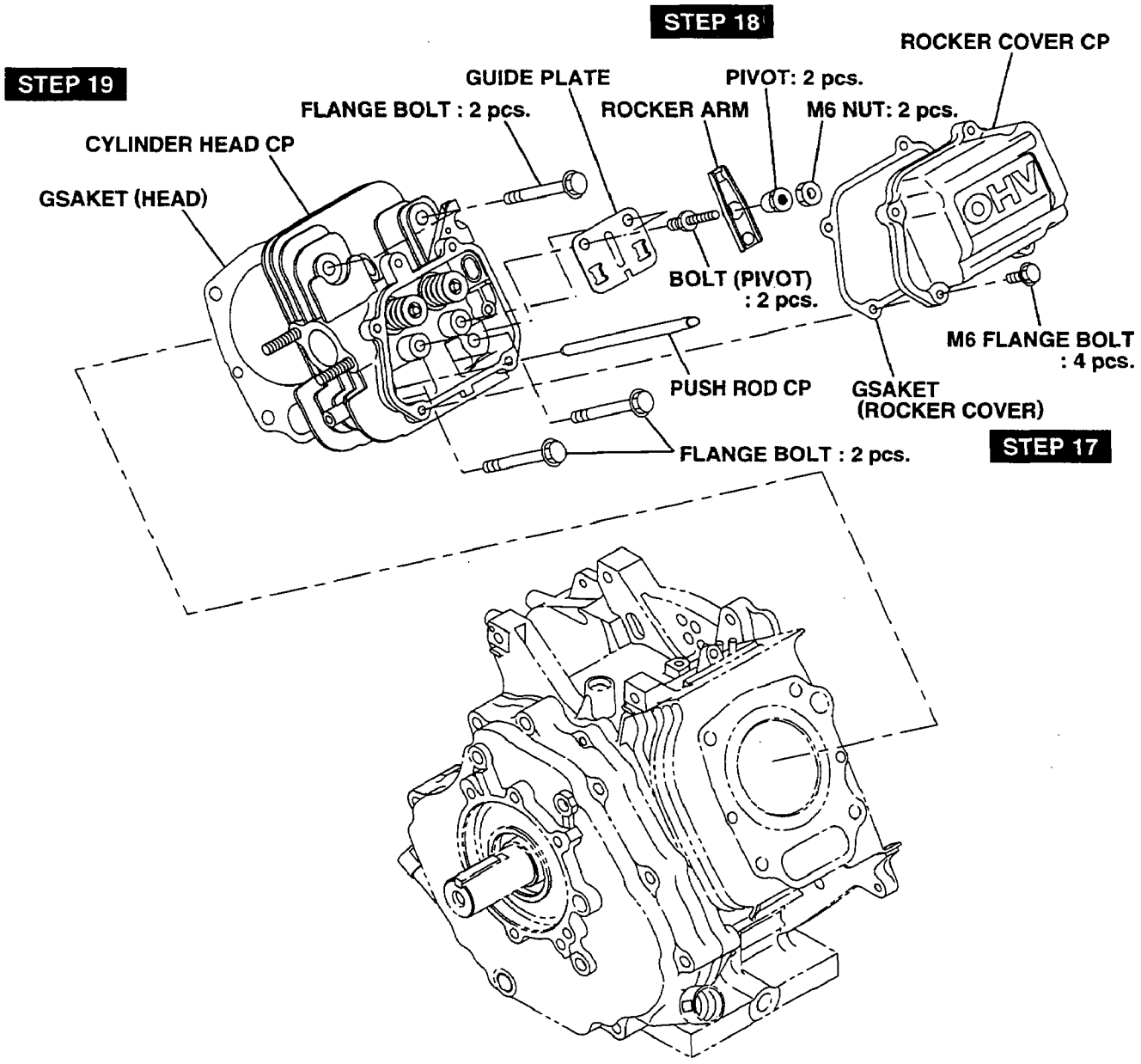


Fig. 5-14

Step	Parts to remove	Remarks and procedures	Fasteners
20	Intake and exhaust valves	(1) Press down spring retainer, take out collet valve, and then remove spring retainer and valve spring. (2) Remove intake and exhaust valves from cylinder head. • Clean carbon and gum deposit from the valves, valve seats, ports and guides. Inspect valves, valve seats and guides.	

STEP 20

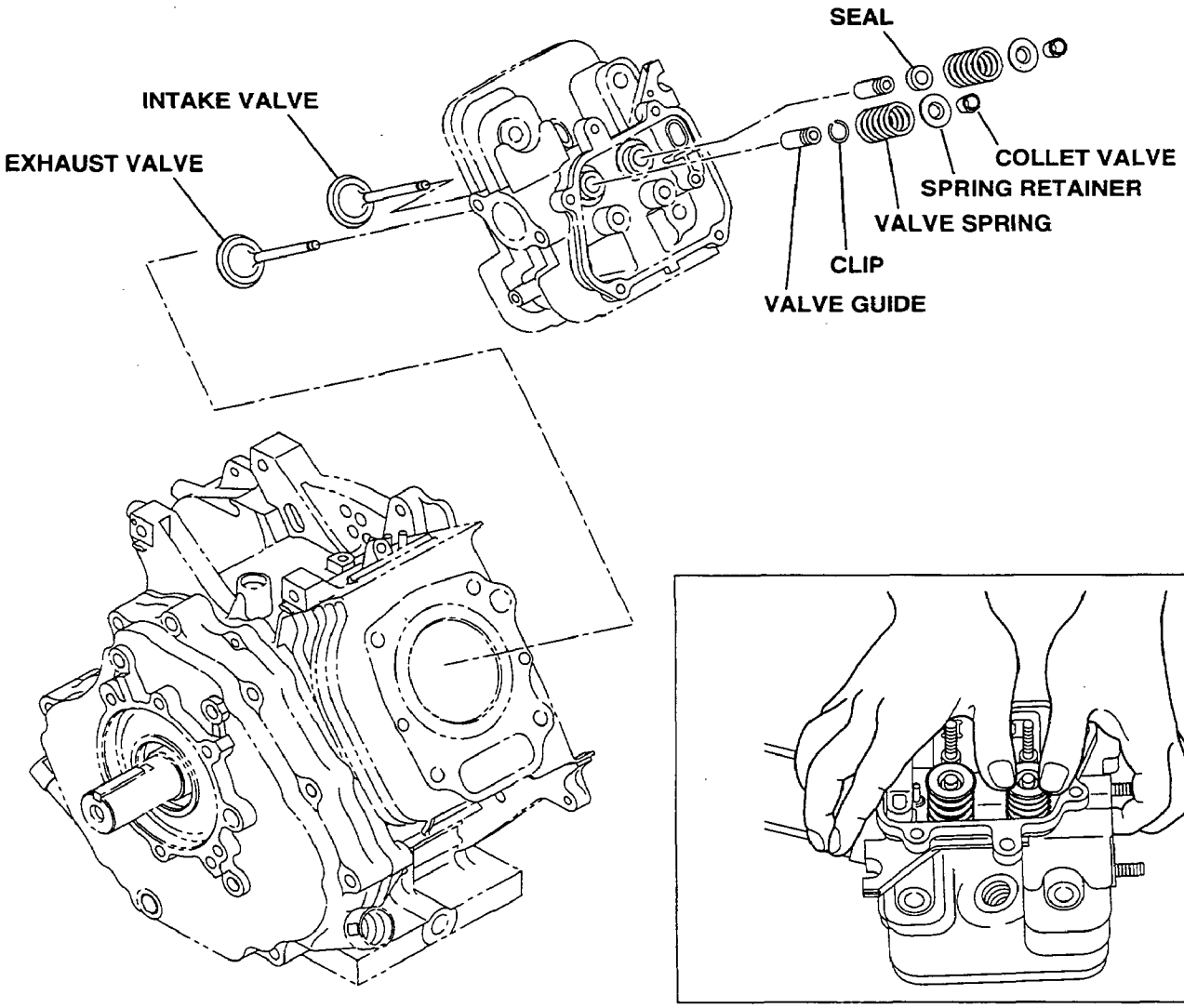


Fig. 5-16

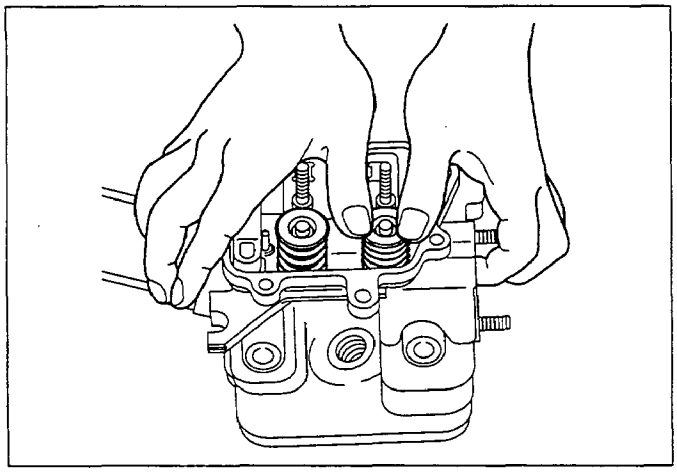


Fig. 5-15

Step	Parts to remove	Remarks and procedures	Fasteners
21	Main bearing cover	Be careful not to damage the oil seal. Use a soft hammer and evenly tap around outer surface of cover.	M8 (7T)x 40 ; 5 pcs. M8 (12T)x 40 ; 2 pcs.

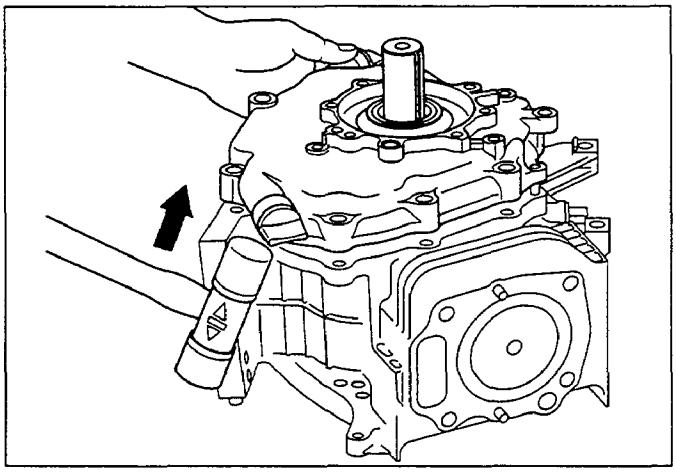


Fig. 5-17

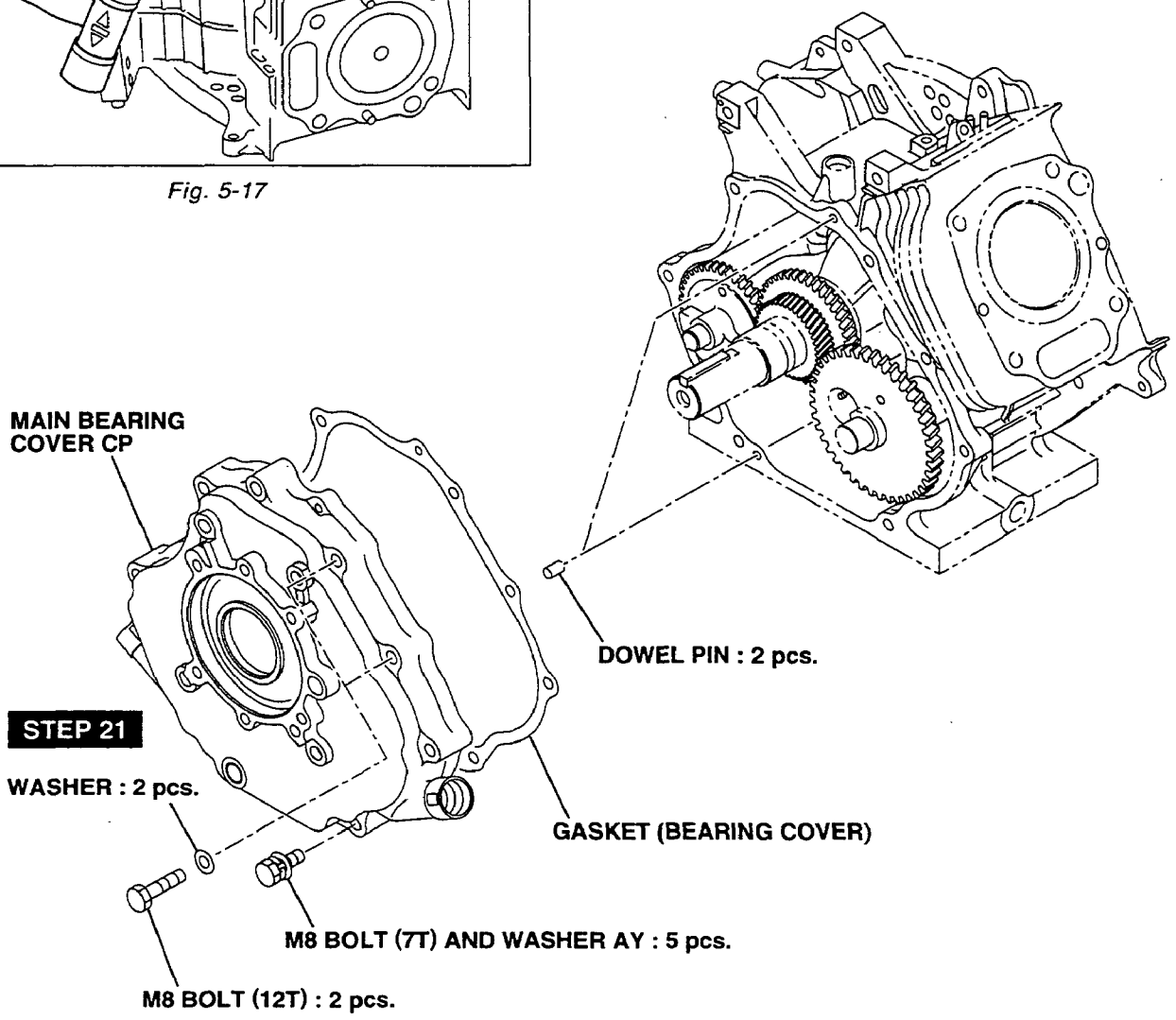


Fig. 5-18

Step	Parts to remove	Remarks and procedures	Fasteners
22	Camshaft and tappets	Be careful not to damage camshaft and tappets.	
23	Balancer	Position piston at top dead center and remove balancer.	

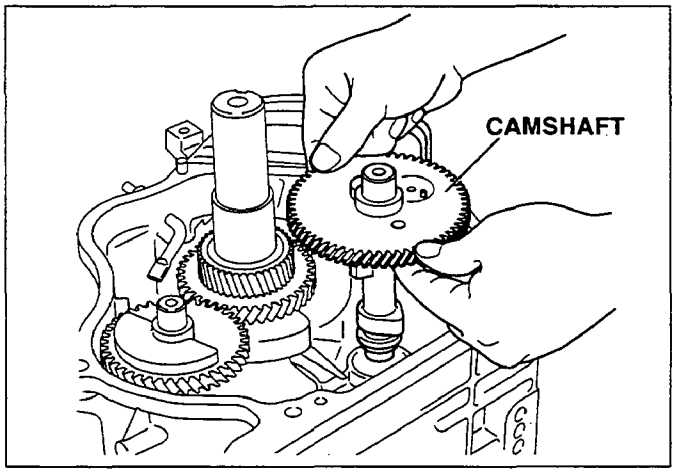


Fig. 5-19

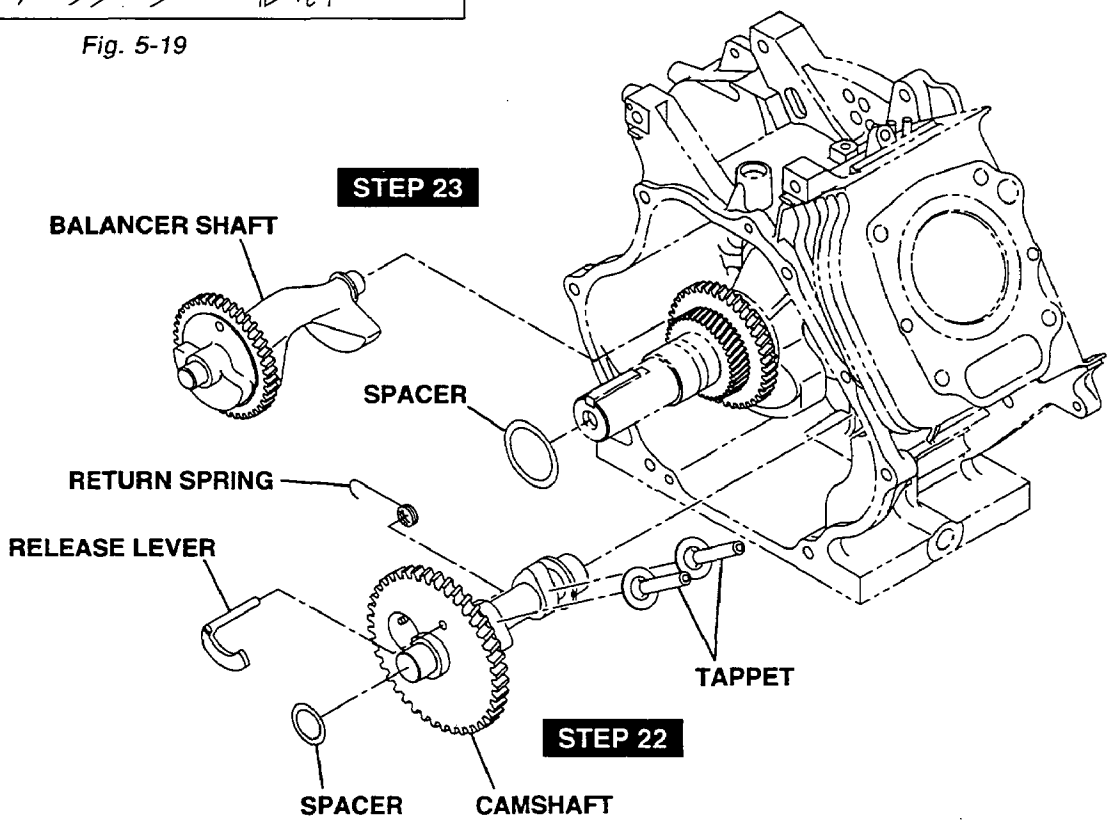


Fig. 5-20

Step	Parts to remove	Remarks and procedures	Fasteners
24	Connecting rod and piston	(1) Remove connecting rod bolts and connecting rod cap. (2) Turn crankshaft until piston comes to top dead center, push out connecting rod and piston assembly through top of cylinder. *Scrape off all carbon deposits that might interfere with removal of piston from upper end of cylinder.	M8 x 40 ; 2 pcs
25	Piston and piston pin	(1) Remove clips and piston pin to remove connecting rod from piston. (2) Remove piston rings from piston. *Be careful not to give damages to piston and connecting rod. Be careful not to break rings by spreading too much or twisting.	

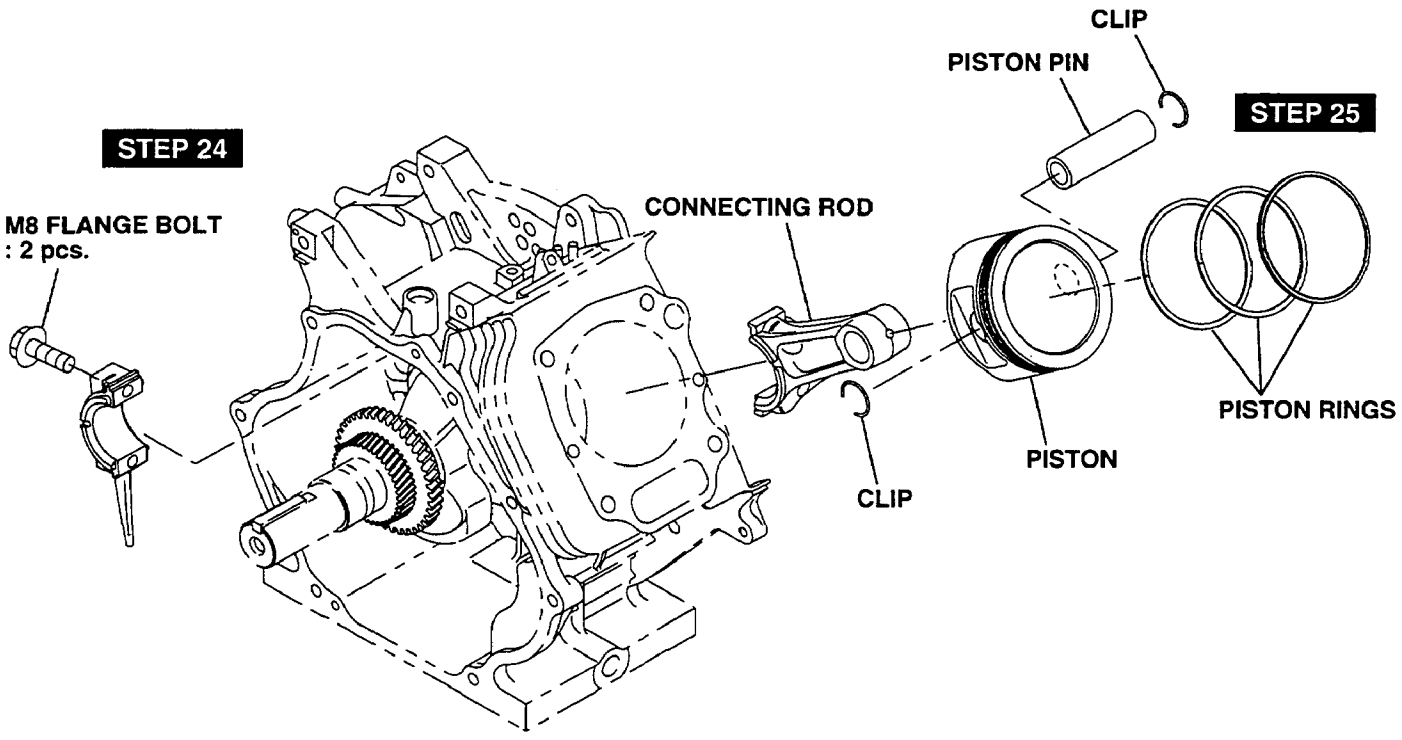


Fig. 5-21

Step	Parts to remove	Remarks and procedures	Fasteners
26	Crankshaft	Tap lightly on flywheel end of crankshaft to remove from crankcase.	

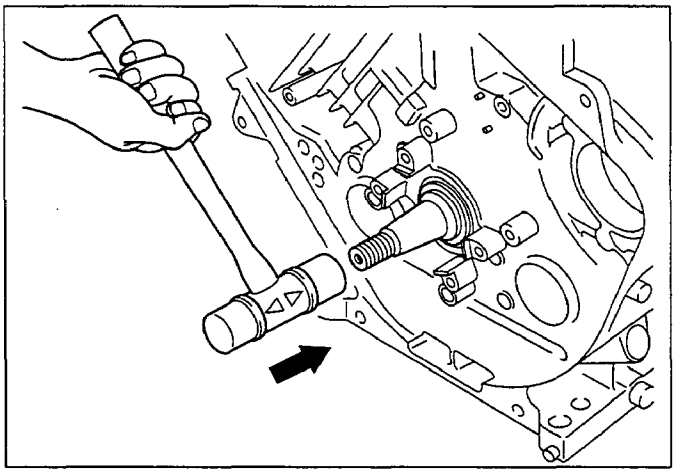
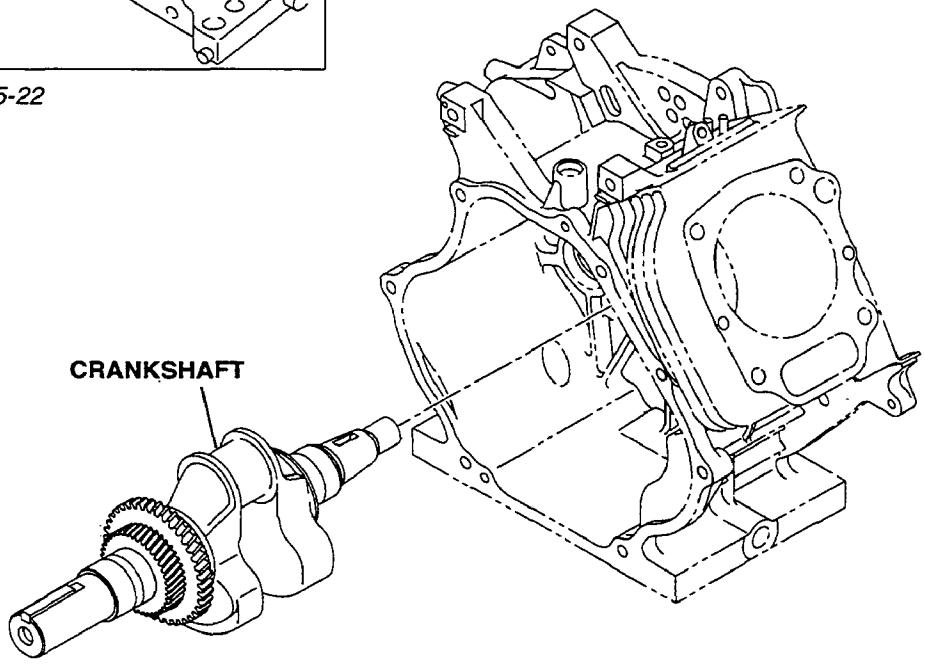


Fig. 5-22



STEP 26

Fig. 5-23

5-4 REASSEMBLY PROCEDURES

● PRECAUTIONS FOR REASSEMBLY

1) Clean parts thoroughly before reassembly.

   Pay most attention to cleanliness of piston, cylinder, crankshaft, connecting rod and bearings.

2) Scrape off all carbon deposits from cylinder head, piston top and piston ring grooves.

3) Check lip of oil seals. Replace oil seal if the lip is damaged. Apply oil to the lip before reassembly.

4) Replace all the gaskets with new ones.

5) Replace keys, pins, bolts, nuts, etc., if necessary.

6) Torque bolts and nuts to specification referring to the "TORQUE SPECIFICATIONS".

7) Apply oil to rotating and sliding portions.

8) Check and adjust clearances and end plays where specified in this manual.

5-4-1 CRANKSHAFT

(1) Install crankshaft on crankcase wrapping the key-way with polyvinyl tape to avoid damage to oil seal.

(2) Install woodruff key for flywheel on crankshaft.

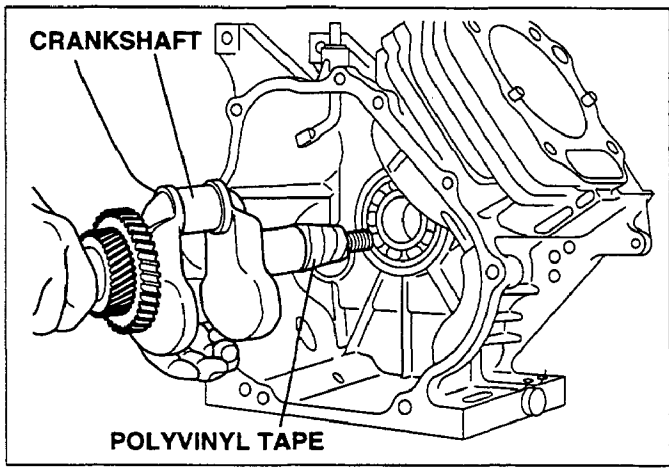


Fig. 5-24

5-4-2 PISTON AND PISTON RINGS

(1) Install oil ring first, then second ring and top ring.

   Spread ring only far enough to slip over piston and into correct groove. Use care not to distort ring.

   Install second ring with punched mark beside the gap face upward. (See Fig. 5-27)

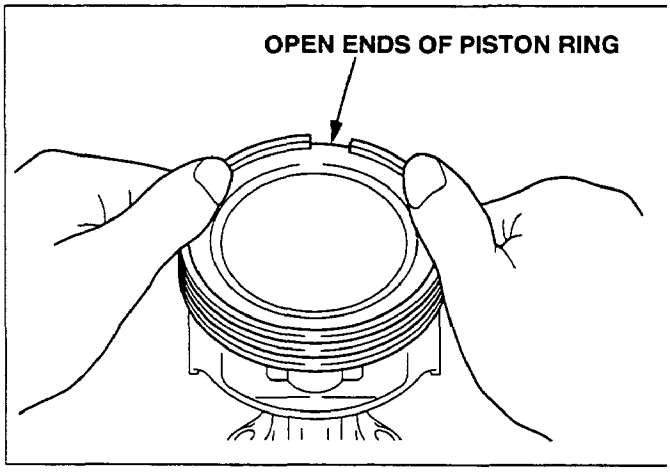


Fig. 5-25

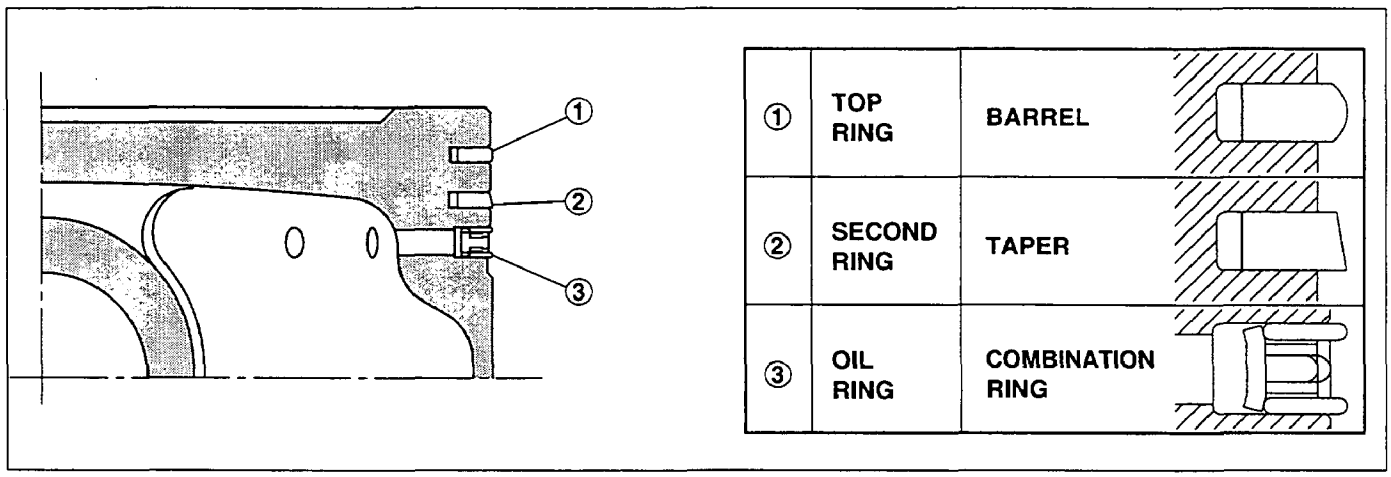


Fig. 5-26

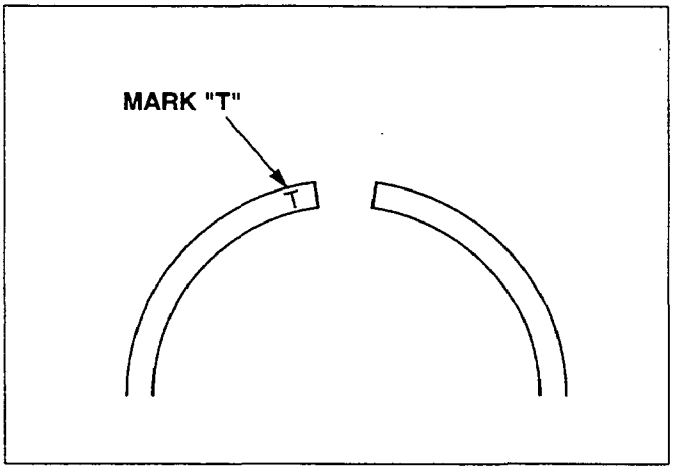


Fig. 5-27

5-4-3 PISTON AND CONNECTING ROD

The direction of piston on connecting rod is not specified.

Apply oil to the small end of connecting rod before assembling piston and piston pin.

Use clips on the both side of the piston pin to secure piston pin in position.

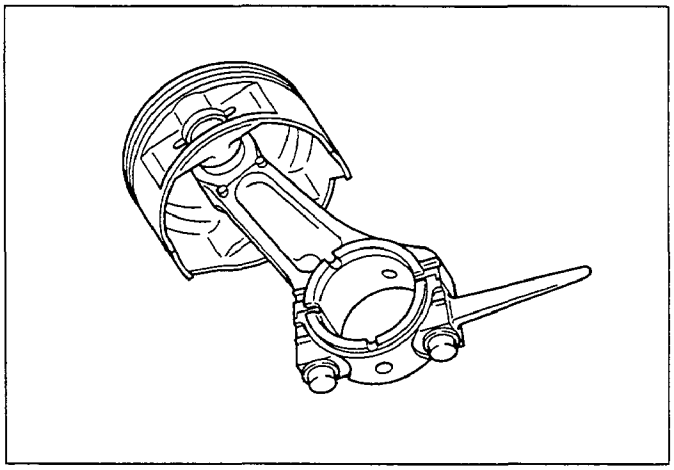


Fig. 5-28

(2) Install piston and connecting rod assembly into cylinder.

Use a piston ring compressor to hold piston rings.

The "FAN" mark of the connecting rod is to face flywheel side when assembled.

Note:

(1) Apply enough oil to piston rings, connecting rod bearings and cylinder bore before assembly.

(2) Set gaps of the piston rings 90 degrees apart from each other before assembly.

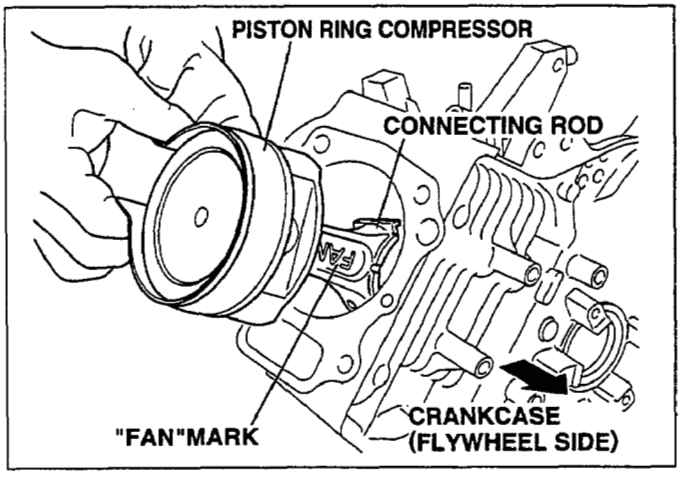


Fig. 5-29

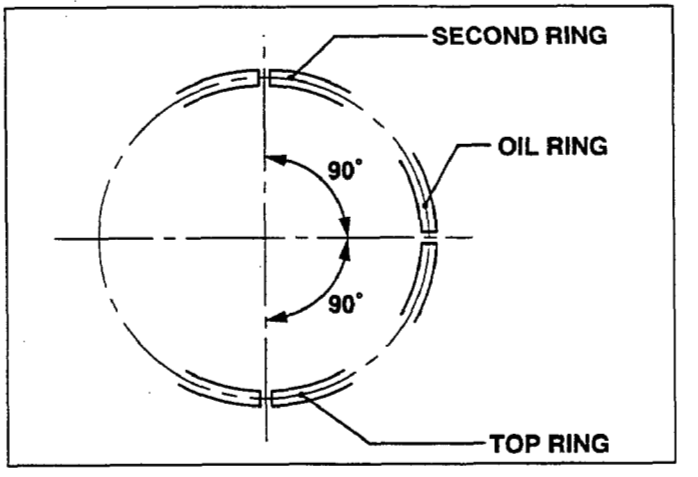


Fig. 5-30

5-4-4 CONNECTING ROD

(1) Turn crankshaft to bottom dead center, lightly tap top of the piston until large end of the rod meet crank pin.

(2) Install connecting rod cap to connecting rod matching alignment marks.

Torque connecting rod bolts to specification.

M8 x 40 mm connecting rod bolt : 2 pcs.

Tightening torque : 22.1 - 27.0 N·m
(225 - 275 kg·cm)
(16.3 - 19.9 ft·lb.)

(3) Check for free movement of connecting rod by turning crankshaft slowly.

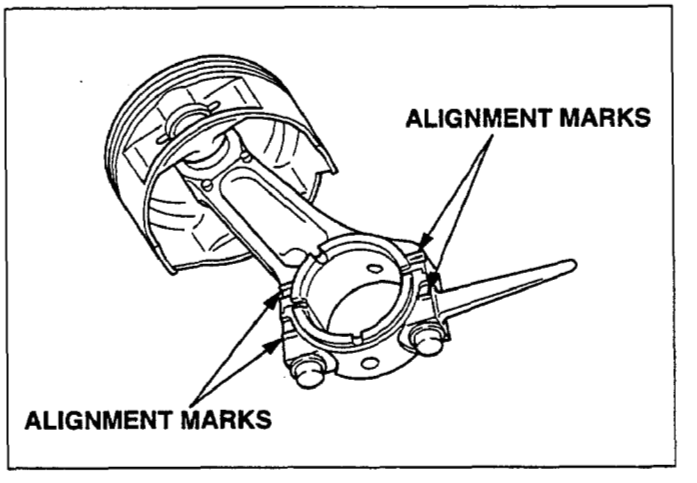


Fig. 5-31

5-4-5 BALANCER SHAFT

Install balancer shaft to crankcase aligning matching mark of balancer gear and crank gear as shown in the illustration.

CAUTION :

Incorrect timing of the gears will cause malfunction of the engine and may results in damage due to interference of the parts.

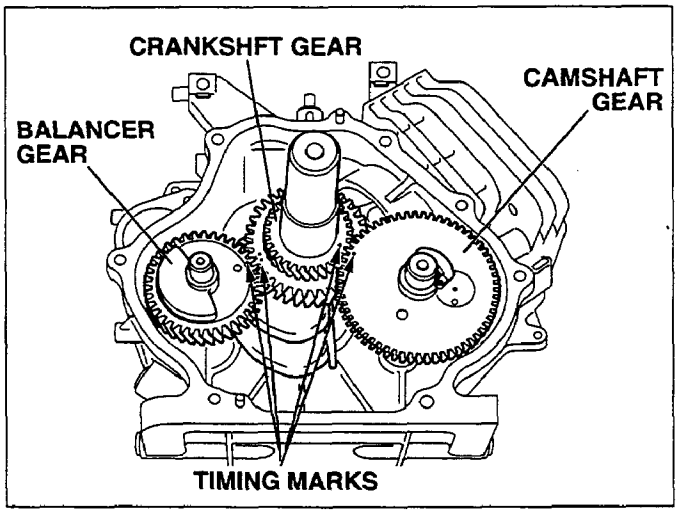


Fig. 5-32

5-4-6 TAPPETS AND CAMSHAFT

(1) Oil the tappets and install them.

Push in fully to avoid damage during camshaft installation.

(2) Lubricate bearing surfaces of camshaft.

Align the timing mark on crankshaft gear with the timing mark on camshaft and install camshaft in the crankcase. (See Fig. 5-32)

CAUTION :

Incorrect valve timing will cause malfunction of the engine.

5-4-7 ADJUST CRANKSHAFT AND CAMSHAFT END PLAY

(1) Adjust end play to the specified values using the proper spacer.

The proper spacer may be determined following manner.

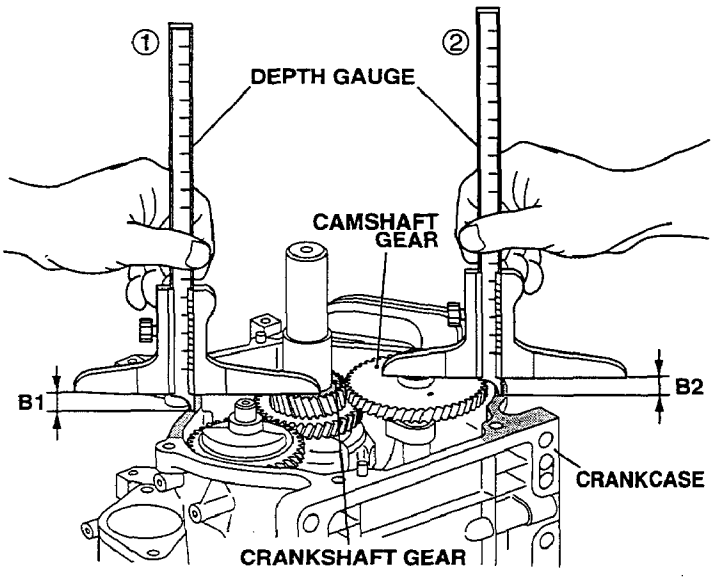


Fig. 5-33

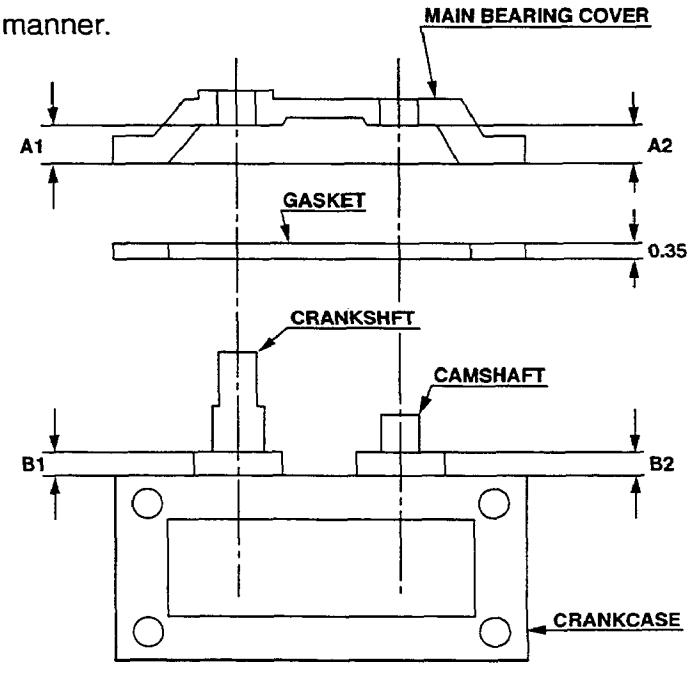


Fig. 5-34

5-4-7-1 CRANKSHAFT END PLAY (For type D and type B)

1) Measure the depth "A1" (From the mating surface to the inner race of the ball bearing.)
2) Measure the height "B1" (From the mating surface to the crank gear.)

(A1+0.35)−B1= SIDE CLEARANCE (mm)

(SIDE CLEARANCE)−0.2 mm = THICKNESS OF CRANKSHAFT SHIM (mm)

(A1+0.014)−B1= SIDE CLEARANCE (in.)

(SIDE CLEARANCE)−0.008 in.= THICKNESS OF CRANKSHAFT SHIM (in.)

Following are available spacer shims.

	CRANKSHAFT
SPACER SHIMS	T= 0.6 mm (0.024 in.) T= 0.8 mm (0.031 in.) T= 1.0 mm (0.039 in.)

Table. 5-1

5-4-7-2 CAMSHAFT END PLAY (For type D and type B)

1) Measure the depth "A2" (From the mating surface to the inner race of the ball bearing.)
2) Measure the height "B2" (From the mating surface to the cam gear inner boss.)

(A2+0.35)−B2= SIDE CLEARANCE (mm)

(SIDE CLEARANCE)−0.2 mm = THICKNESS OF CAMSHAFT SHIM (mm)

(A2+0.014)−B2= SIDE CLEARANCE (in.)

(SIDE CLEARANCE)−0.008 in.= THICKNESS OF CAMSHAFT SHIM (in.)

Following are available spacer shims.

	CAMSHAFT	
	For type D	For type B
SPACER SHIMS	T= 0.6 mm (0.024 in.) T= 0.7 mm (0.028 in.) T= 0.8 mm (0.031 in.)	T= 0.6 mm (0.024 in.) T= 0.8 mm (0.031 in.) T= 1.0 mm (0.039 in.)

Table. 5-2

(2) Lubricate the oil seal and bearing surfaces. Add a light film of oil on main bearing cover face to hold the gasket in place. Place spacers chosen at procedure (1) on crankshaft and camshaft.

Use an oil seal guide when installing main bearing cover to avoid damaging the seal.

Tap the cover into place with a soft hammer.

NOTE ;

Be sure to use two M8 (12T) BOLTS and WASHERS in two locations just the root of cylinder to fasten the main bearing cover to crankcase. For other five locations, use M8 (7T) BOLT & WASHER ASSY.

Tightening torque	
M8 (12T) BOLT	**M8 (7T) BOLT**
22.5 - 24.5 N · m (230 - 250 kg · cm) (16.7 - 18.1 ft · lb.)	16.7 - 18.6 N · m (170 - 190 kg · cm) (12.3 - 13.7 ft · lb.)

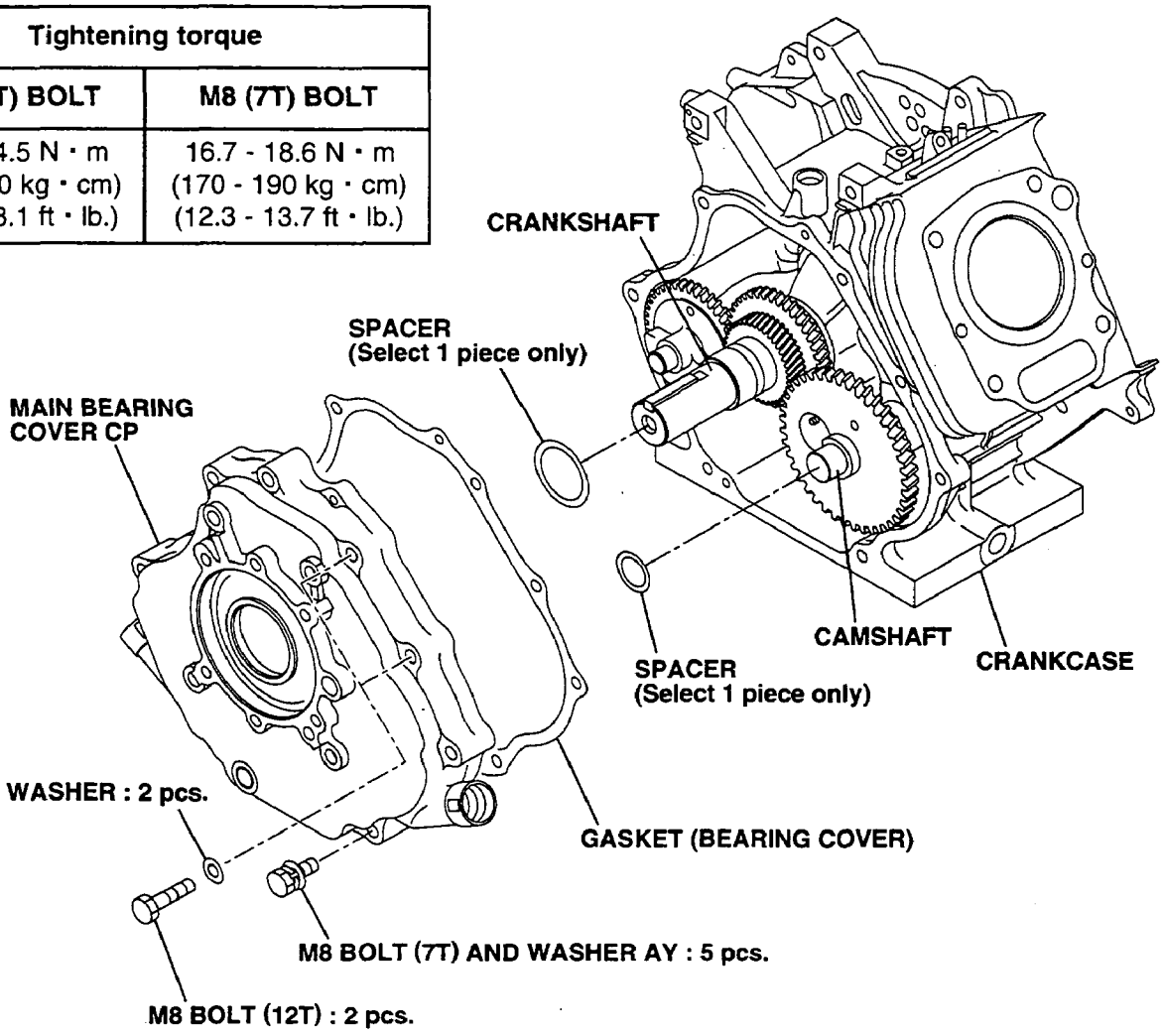


Fig. 5-35

5-4-8 CYLINDER HEAD

(1) Clean carbon and gum deposits from the valves, seats, ports and guides. Inspect valves, valve seats and valve guides.

(2) Replace valves that are badly burned, pitted or warped.

(3) When installing valves in cylinder head, oil the valve stems and insert them into valve guide.

Then place cylinder head on flat table, install valve spring and spring retainer.

(4) Valve guides should be replaced when valve stem clearance exceeds specifications (See "SERVICE DATA").

Draw valve guides out and press new guides in.

Refer to "SERVICE DATA" for clearance specifications.

After replacing valves and guides, lap valves in place until a uniform ring shows around the face of the valve. Clean valves and wash cylinder head thoroughly.

(5) Install cylinder head to cylinder with new head gasket.

Tighten four flange bolts evenly in three steps by the following tightening torque:

Cylinder head M10 x 65 mm bolt : 4 pcs.

Tightening torque		
1 st step	**2 nd step**	**Final Step**
9.8 N · m (100 kg · cm) (7.2 ft · lb.)	19.6 N · m (200 kg · cm) (14.5 ft · lb.)	33.3-41.2 N · m (340-420 kg · cm) (24.6-30.4 ft · lb.)

5-4-9 ROCKER ARMS AND PUSH RODS

(1) Insert push rods into crankcase. Put push rod tip in the hollow of tappet top.

(2) Apply oil to rocker arms and assemble them to cylinder head using pivot and nut.

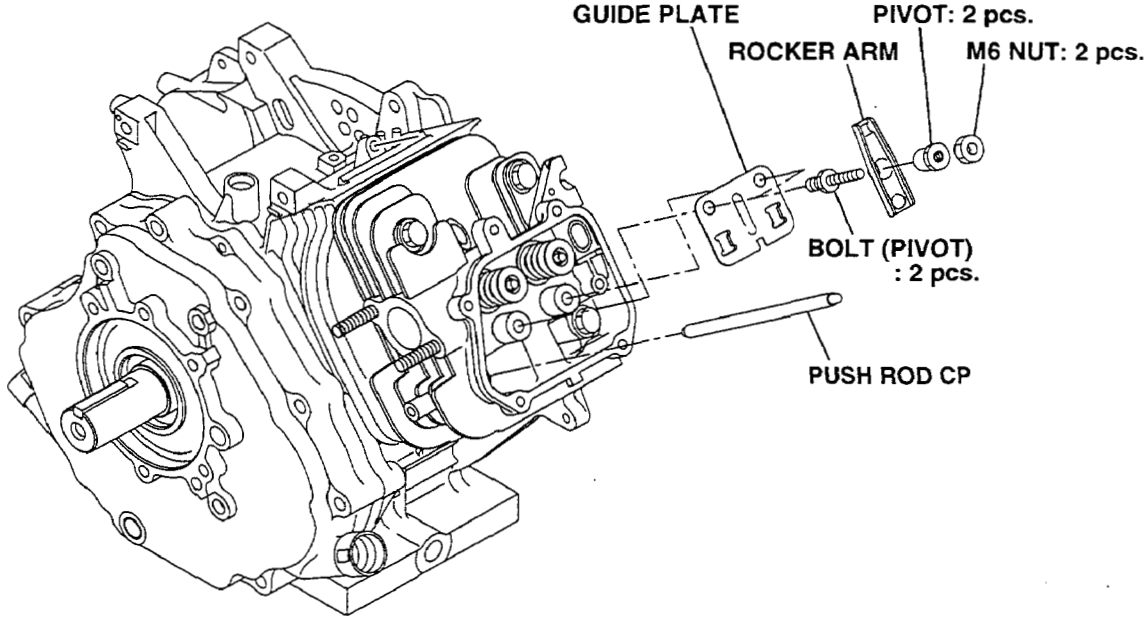


Fig. 5-36

5-4-10 VALVE CLEARANCE ADJUSTMENT

Note:

Temporally fit the flywheel in position for easy operation.

(1) Position piston at top dead center of compression stroke by matching the mark "T" of flywheel with the thread hole (ⓐ) of crankcase.

(2) Loosen the nut on rocker arm and turn the pivot to adjust the clearance between rocker arm and valve stem end.

Tighten the nut on rocker arm.

Valve clearance : 0.085 - 0.115 mm (0.0034 - 0.0045 in.)

Note:

Check and adjust valve clearance while engine is cold.

Check operation of valves by turning crankshaft. Then recheck the valve clearance.

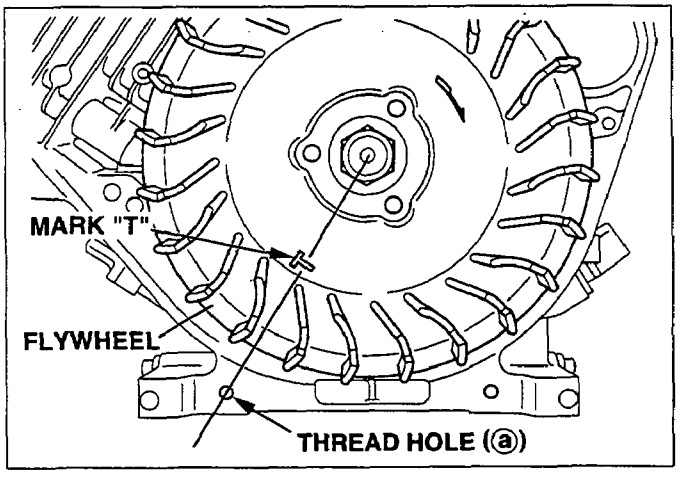


Fig. 5-37

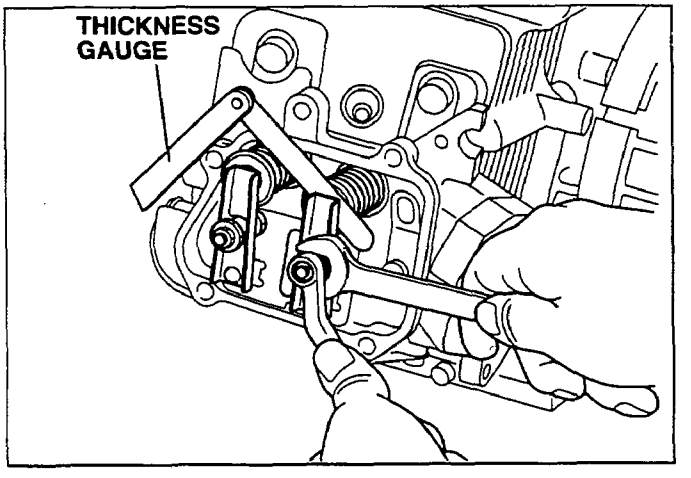


Fig. 5-38

(3) Install rocker cover and gasket.

Rocker cover M6 x 25 mm bolt : 4 pcs.

5-4-11 SPARK PLUG

Install spark plug to cylinder head.

Spark plug : NGK BP6ES

Tightening torque	
New spark plug	**Retightening**
11.8 - 14.7 N • m (120 - 150 kg • cm) (8.7 - 10.9 ft • lb.)	22.6 - 26.5 N • m (230 - 270 kg • cm) (16.6 - 19.5 ft • lb.)

5-4-12 CYLINDER BAFFLE

Install cylinder baffle to cylinder head.

M6 x 8 mm flange bolt : 4 pcs.

5-4-13 FLYWHEEL MAGNETO

(1) Install charge coil to crankcase. (Option)

Clamp coil wire to crankcase.

> **Note:**
>
> **Be careful not to pinch coil wire between charge coil and crankcase.**

(2) Put woodruff key in keyway of crankshaft. Wipe off oil and grease thoroughly from tapered portion of crankshaft and flywheel center hole.

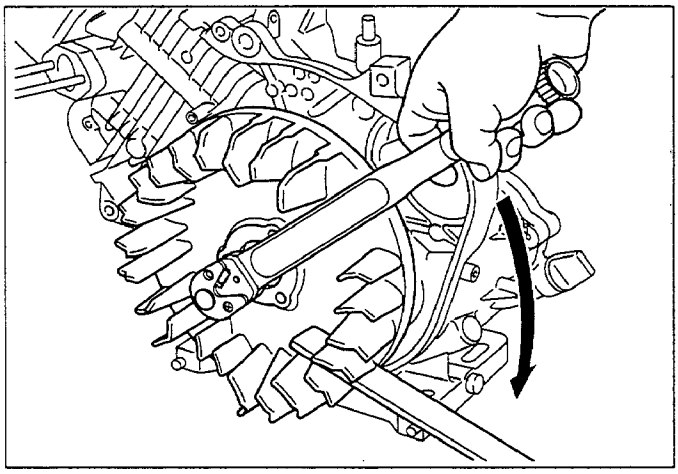


Fig. 5-39

(3) Install flywheel to crankshaft.

Tighten flywheel nut with spring washer and washer.

Tightening torque : 78.4 - 98.0 N·m (800 - 1000 kg·cm) (58.0 - 72.5 ft·lb.)

(4) Install starting pulley to flywheel.

M8 x 12 mm bolt : 3 pcs.

Tightening torque : 6.9 - 8.8 N·m (70 - 90 kg·cm) (5.1 - 6.5 ft·lb.)

5-4-14 IGNITION COIL

Install ignition coil to crankcase.

Adjust air gap between ignition coil and flywheel using a thickness gauge and tighten bolts.

M6 x 25 mm bolt : 2 pcs.

Air gap : 0.3 - 0.5 mm (0.012 - 0.020 in.)

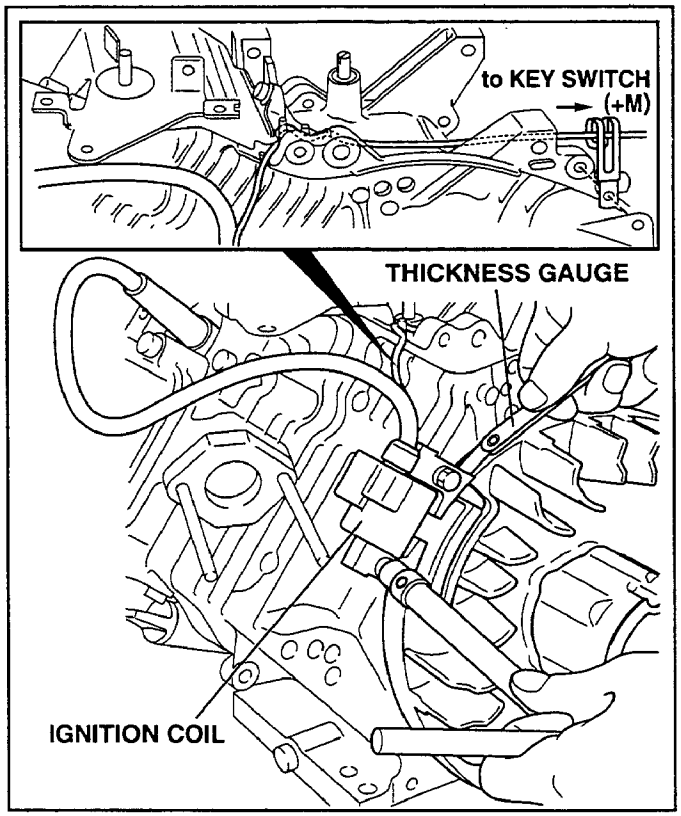


Fig. 5-40

5-4-15 BLOWER HOUSING AND RECOIL STARTER

(1) Attach blower housing to crankcase. Tighten five flange bolts.

M6 x 12 mm flange bolt : 5 pcs.

Insert the high tension cord from the ignition coil into the notch of the blower housing so that not to pinch the cord.

(2) Install recoil starter to blower housing.

M6 x 8 mm flange bolt : 4 pcs.

Note:

Be careful of pulling direction of starter rope.

5-4-16 GOVERNOR, SPEED CONTROL SYSTEM AND CARBURETOR

(1) Install governor lever to governor shaft.

Tighten locking bolt temporarily.

(2) Install speed control lever to cylinder baffle, friction washer, self lock nut, etc. as shown in illustration.

(3) Hook governor spring to proper holes of governor lever and speed control lever. (See Fig. 5-42 and below.)

Hooking position	Fig.5-42
Rated 3000 rpm (50 Hz) applications	5-C
Rated 3600 rpm (60 Hz) applications	4-C

(4) Install insulator and gaskets for carburetor to cylinder head.

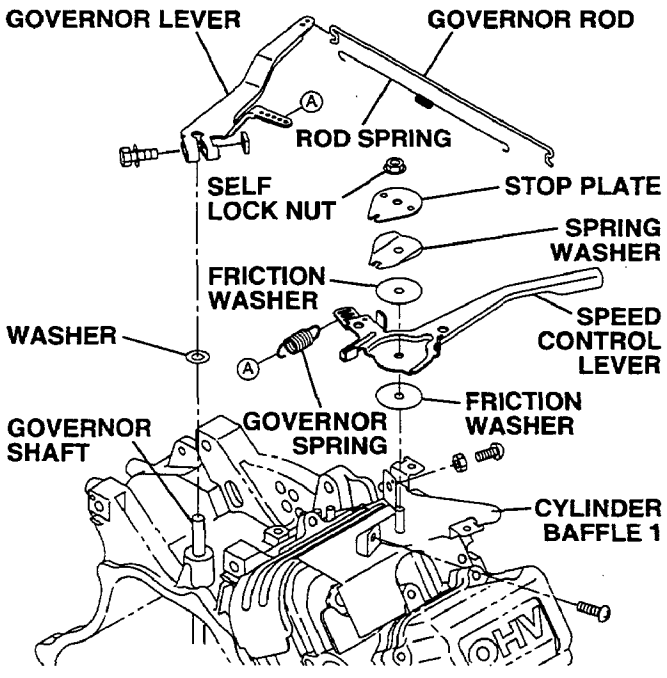


Fig. 5-41

(5) Install carburetor to cylinder head hooking governor rod to governor lever and throttle lever of carburetor. Hook rod spring over governor rod.

(6) Attach air cleaner base to carburetor. Tighten two flange nuts and a bolt. Connect breather pipe from rocker cover to cleaner base.

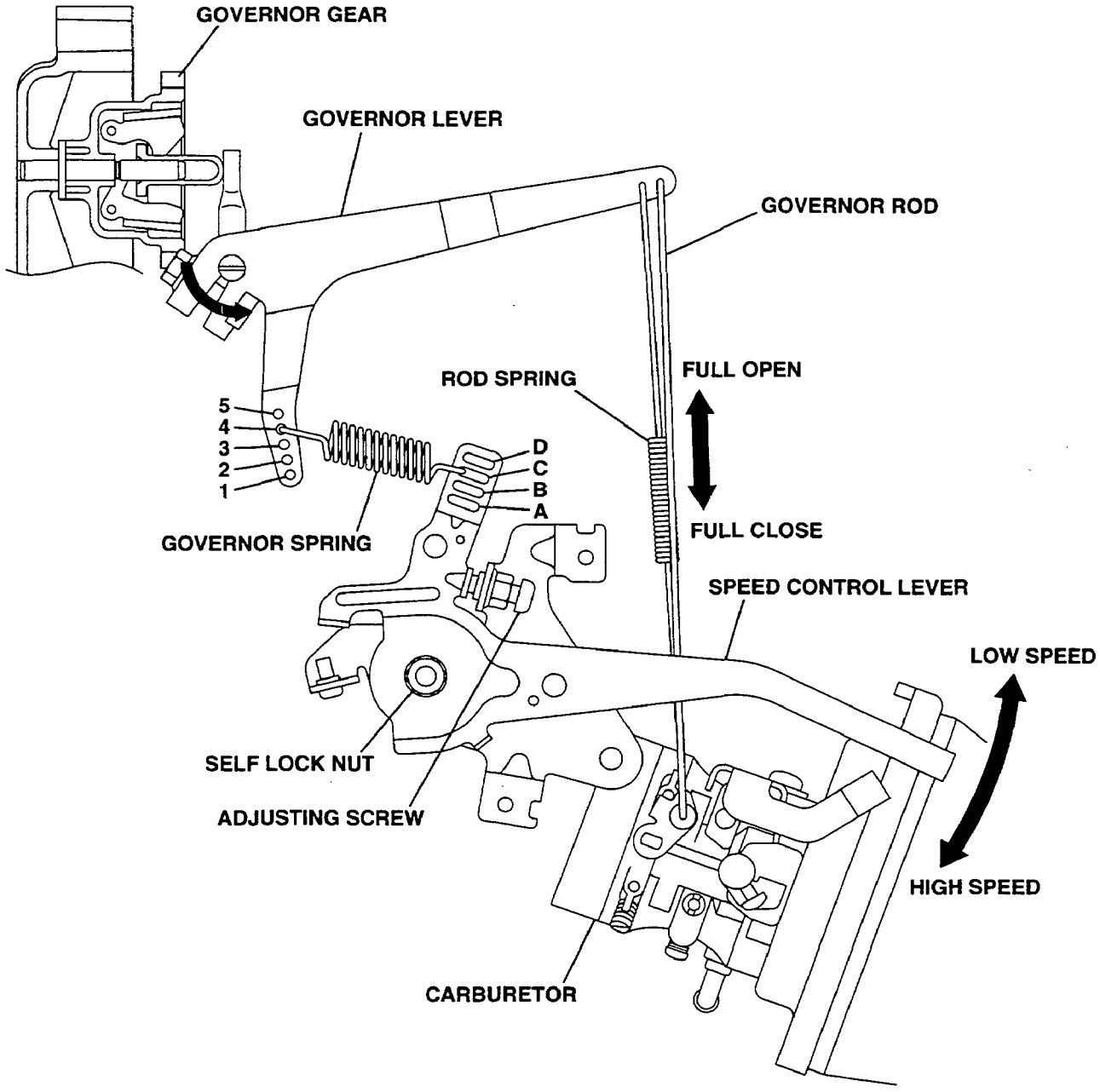


Fig. 5-42

(7) Adjust governor system.

(a) Turn the speed control lever all the way toward the high speed position and fix it by tightening self lock nut.

(b) Check that governor lever is pulled by governor spring and carburetor throttle valve is fully open.

(c) Turn governor shaft counterclockwise all the way using a screw driver, and tighten lock bolt to secure the lever on the shaft.

(d) Loosen the self lock nut to allow the speed control lever to move freely.

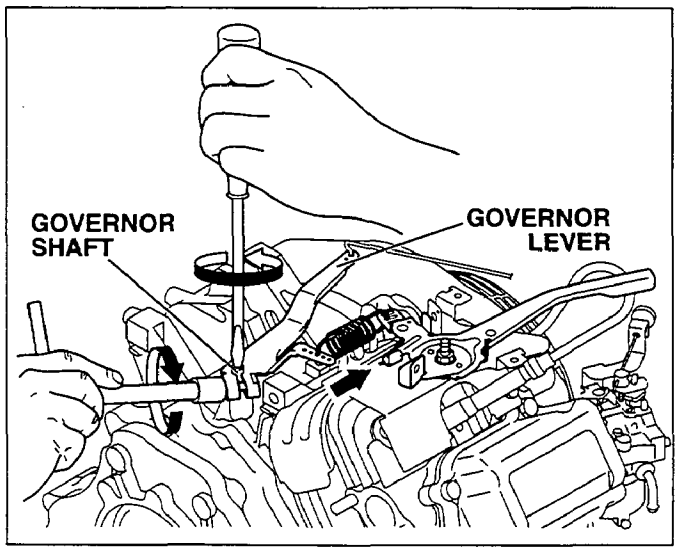


Fig. 5-43

5-4-17 MUFFLER

(1) Install muffler bracket to cylinder head. M8 x 16 mm bolt : 2 pcs.

(2) Install muffler to muffler bracket. M8 flange nut : 2 pcs.

(3) Install muffler cover. M6 tapping screw : 5 pcs.

5-4-18 STOP SWITCH

(1) Install stop switch to blower housing.

(2) Connect wires referring to the wiring diagram.

5-4-19 ELECTRIC STARTER AND CONTROL BOX CP (Optional equipment)

(1) Install electric starter to crankcase.

(2) Install control box cp (include magnetic switch, diode rectifier and key switch) to crankcase.

(3) Connect wires referring to the wiring diagram.

5-4-20 FUEL TANK

(1) Install fuel tank to crankcase.

M8 x 20 mm bolt : 4 pcs.

(2) Connect fuel strainer and fuel inlet of carburetor with the fuel hose. Be sure to clamp securely.

5-4-21 AIR CLEANER

Install air cleaner element and cleaner cover.

– End of the reassembly –

5-5 BREAK-IN OPERATION

An engine that has been completely overhauled by being fitted with a new piston, rings, valves and connecting rod should be thoroughly RUN-IN before being put back into service.

Good bearing surfaces and running clearances between the various parts can only be established by operating the engine under reduced speed and loads for a short period of time.

While the engine is being tested, check for oil leaks.

Make final carburetor adjustment and regulate the engine operating speed.

Step	Load		Engine Speed	Time
Step 1	No Load		2,500 rpm	10 min.
Step 2	No Load		3,000 rpm	10 min.
Step 3	No Load		3,600 rpm	10 min.
Step 4	EH36	3.2 kW (4.3 HP)	3,600 rpm	30 min.
	EH41	3.5 kW (4.8 HP)		
Step 5	EH36	6.3 kW (8.5 HP)	3,600 rpm	60 min.
	EH41	7.0 kW (9.5 HP)		

Table. 5-2

6. MAGNETO

6-1 FLYWHEEL MAGNETO

The ignition system of the EH36/EH41 is a pointless flywheel magneto with automatic advancing characteristic.

Being different from the breaker point type ignition system, this system is completely free from such troubles as starting-up failure due to dirty, burnt or corroded point surface.

The electronic automatic advancing ensures extremely easy starts and stable high performance at operating speed by advancing the ignition timing to the most suitable point.

6-2 BASIC THEORY

(1) Revolution of the flywheel generates electricity on the primary side of the ignition coil, and the base current I_1 flows to the power transistor.

Current I_1 turns the power transistor "ON" and the electric current I_2 flows.

(2) At lower engine revolution, when the flywheel reached the ignition point the low speed ignition timing control circuit operates to run the base current I_3 to turn the signal transistor A "ON" allowing the current I_1 to bypass as current I_4.

At this moment the power transistor turns "OFF" and the current I_2 is abruptly shut resulting in the high voltage generated in the secondary coil which produces sparks at the spark plug.

(3) At higher engine revolution, the advancing control circuit operates at the ignition timing to run the base current I_5 to turn the signal transistor B "ON" allowing the current I_1 to bypass as current I_6.

At this moment the power transistor turns "OFF" and the current I_2 is abruptly shut resulting in the high voltage generated in the secondary coil which produces sparks at the spark plug.

The operating timing of the advancing control circuit advances in accordance with the increase of engine speed resulting in the advancing of ignition timing as shown in Fig. 6-1(b).

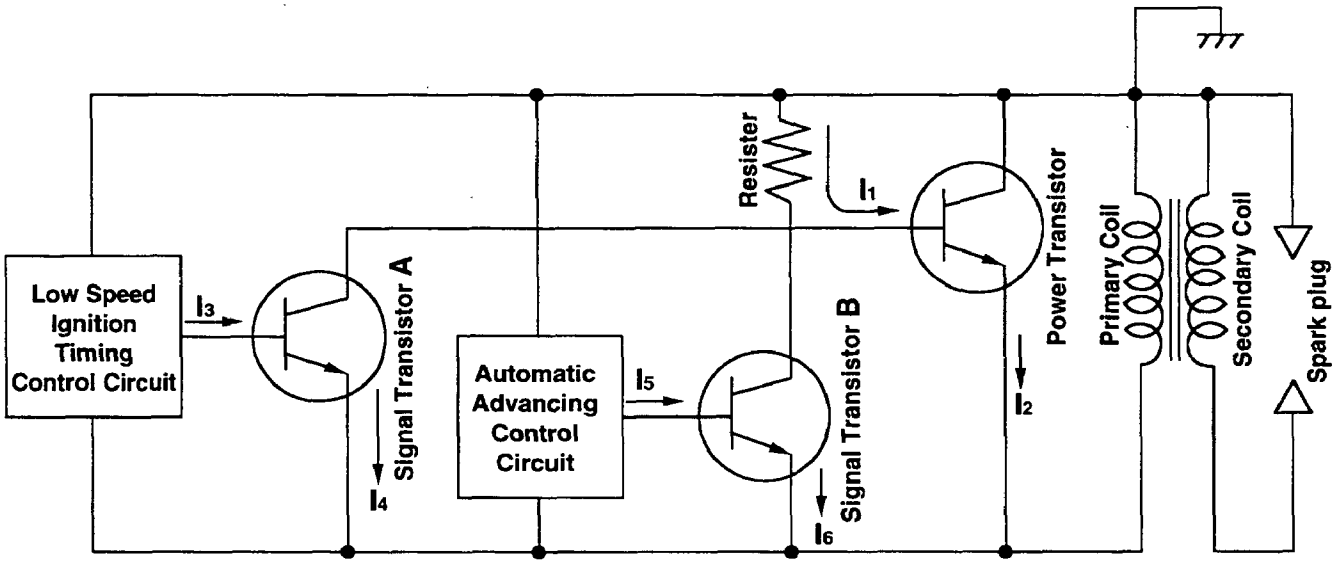


Fig. 6-1 (a)

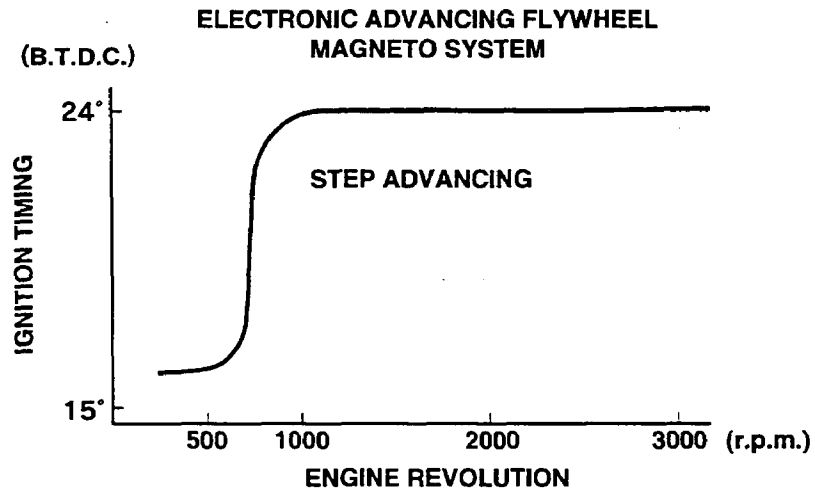


Fig. 6-1 (b)

6-3 WIRING DIAGRAM

● STANDARD

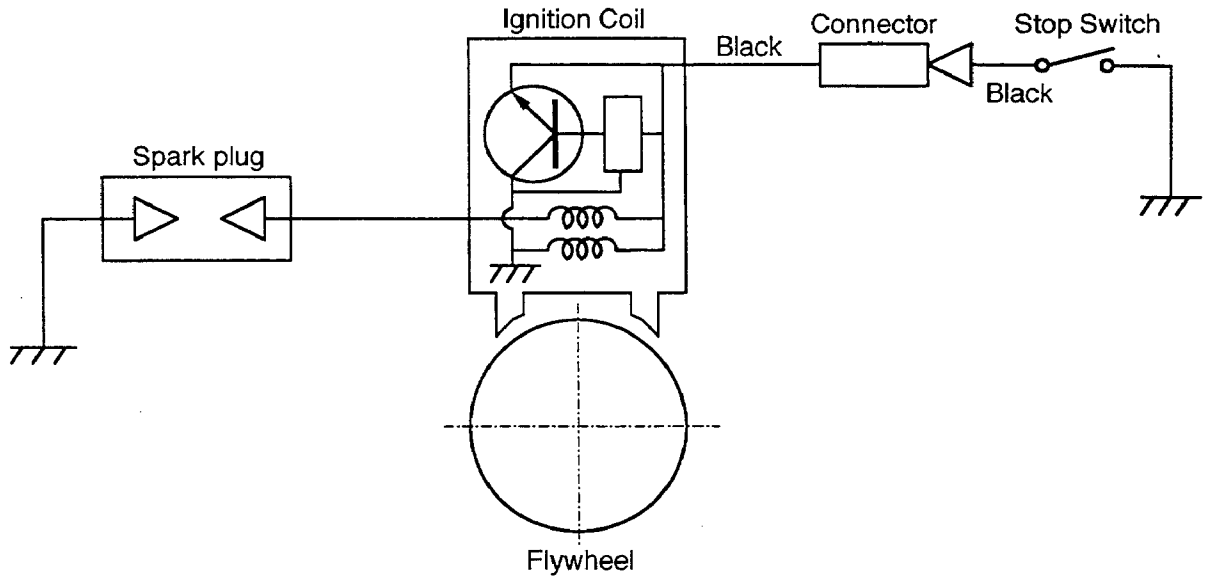


Fig. 6-2

● ENGINE WITH ELECTRIC STARTER

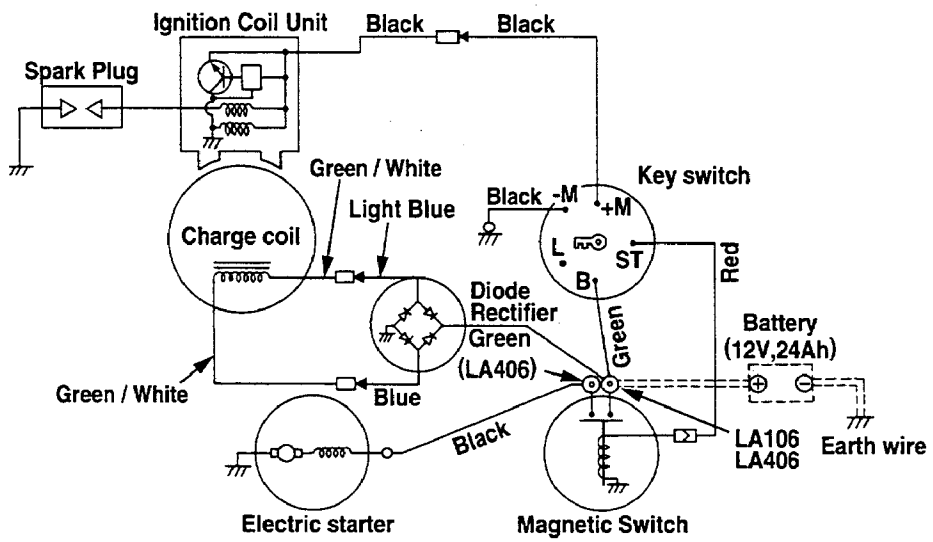


Fig. 6-3

7. AUTOMATIC DECOMPRESSION SYSTEM

EH36, 41 engines are employing the automatic decompression system as a standard feature.
This enables easy and light start of the engine.
The automatic decompression system releases the compression of the engine by lifting up the exhaust valve at the cranking. Following are the explanation using type "D" engine as a sample how the system works. The components of the systems are different for the type "D" and "B" engines, however, the pinciple of the function is same.

At the end of the compression process, the release lever lifts up the tappet which in turns opens up the exhaust valve slightly to release the compression. The release lever has a flyweight on its end and another end of the lever is a crescent cam.
When the engine is cranked, the cresent cam projects the camshaft cam profile and lifts up the tappet because the gravity force on the weight is larger than the centrifugal force on the weight.

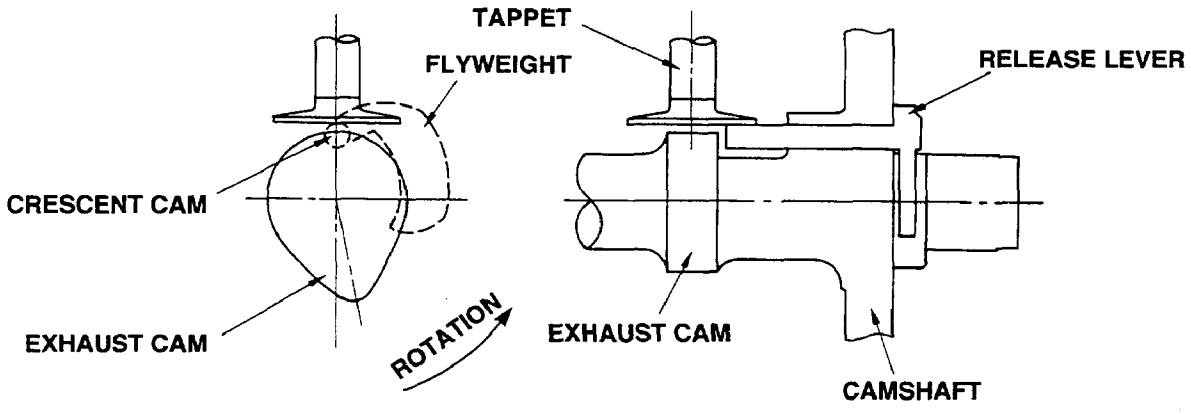


Fig. 7-1

When the crank speed reaches up to a certain revolution, the cresent cam is retracted into the camshaft cam profile because the centrifugal force applied onto the flyweight becomes larger than the gravity force and the weight and is shifted to the position shown in the illustration.

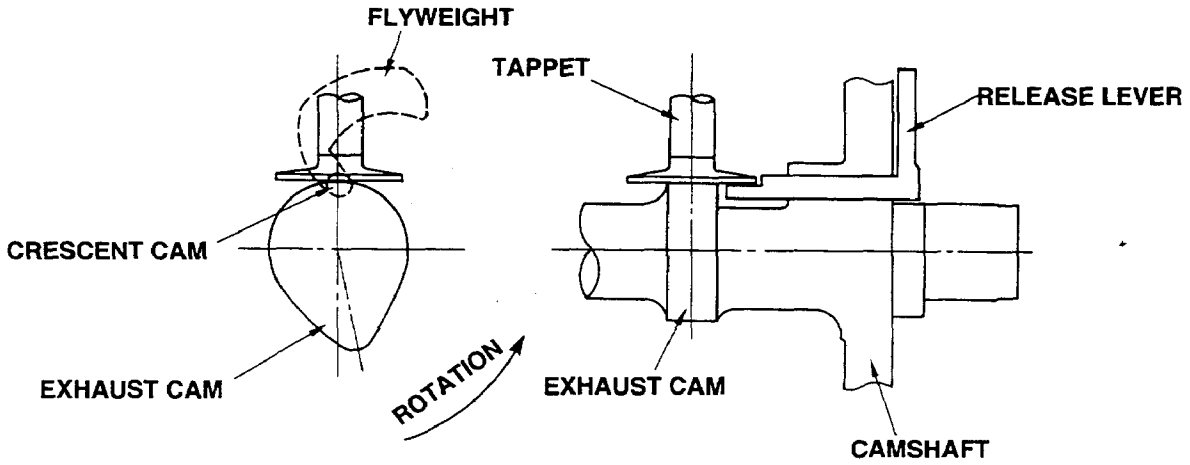


Fig. 7-2

8. CARBURETOR

8-1 OPERATION AND CONSTRUCTION

8-1-1 FLOAT SYSTEM

The float chamber is located below the carburetor body and, with a float and a needle valve, maintains a constant fuel level during engine operation.

The fuel flows from the fuel tank into the float chamber through needle valve. When the fuel rises to a specific level, the float rises, and when its buoyancy and fuel pressure are balanced, the needle valve closes to shut off the fuel, thereby keeping the fuel at the predetermined level.

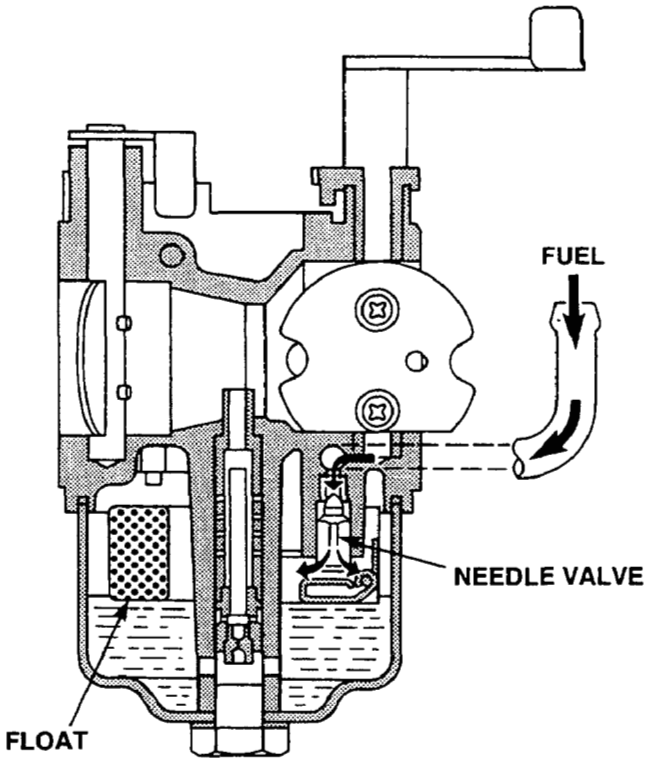


Fig. 8-1

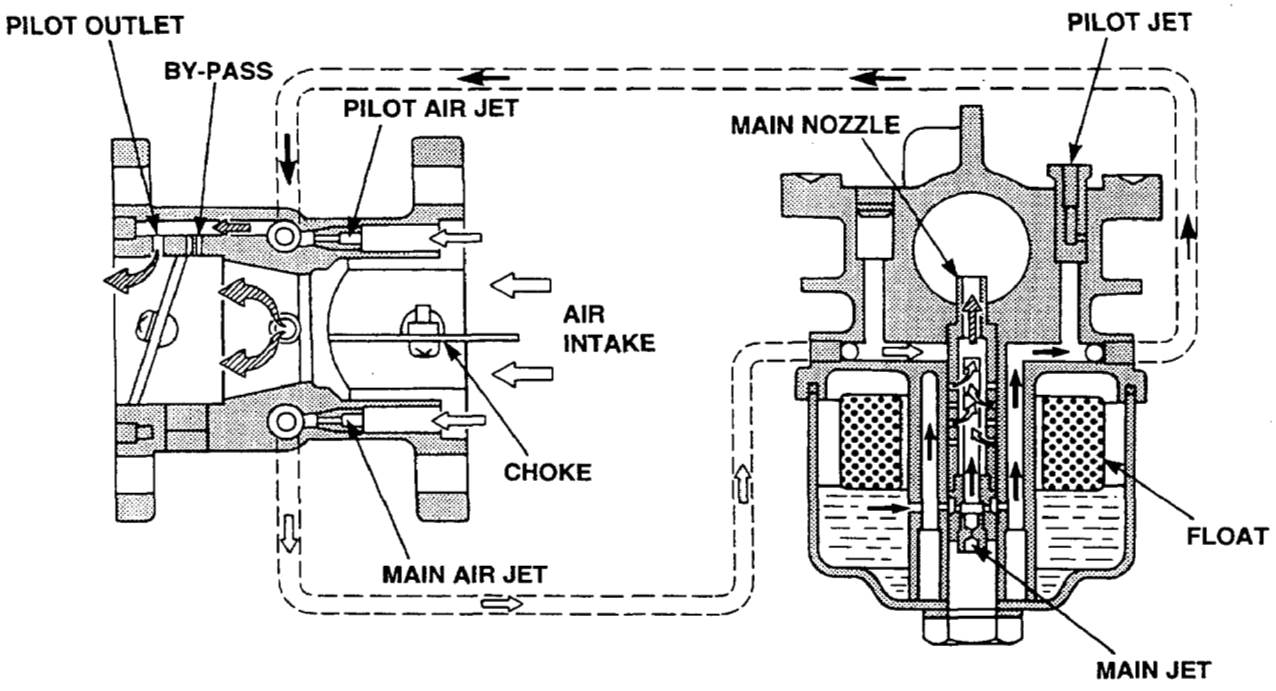


Fig. 8-2

8-1-2 PILOT SYSTEM

The pilot system feeds the fuel to the engine during idling and low-speed operation. The fuel is fed through the main jet to the pilot jet, where it is metered, and mixed with the air metered by the pilot air jet. The fuel-air mixture is fed to the engine through the pilot outlet and the by-pass. At idling speed, the fuel is mainly fed from the pilot outlet.

8-1-3 MAIN SYSTEM

The main system feeds the fuel to the engine at medium and high-speed operation. The fuel is metered by the main jet and fed to the main nozzle. The air metered by the main air jet is mixed with the fuel through the bleed holes in the main nozzle, and the mixture is atomized out of the main bore. It is mixed again with the air taken through the air cleaner into an optimum fuel-air mixture, which is supplied to the engine.

8-1-4 CHOKE

The choke is used for easy start when engine is cold. When the starter is operated with a closed choke, the negative pressure applied to the main nozzle increases and draws much fuel accordingly ; thus easily start up the engine.

8-2 DISASSEMBLY AND REASSEMBLY

Apart from mechanical failures, most of carburetor troubles are caused by an incorrect mixing ratio, which may arise mainly due to a clogged up air or fuel passage in jets, or fuel level variations. In order to assure proper flow of air and fuel, the carburetor must be kept clean at all times. The carburetor disassembly and reassembly procedures are as follows.

8-2-1 THROTTLE SYSTEM

(1) The spring (4) can be taken out by removing the throttle stop screw (5).

(2) Remove the phillips screw (1) and throttle valve (2), and pull out the throttle shaft (3).

*Exercise care not to damage throttle valve ends.

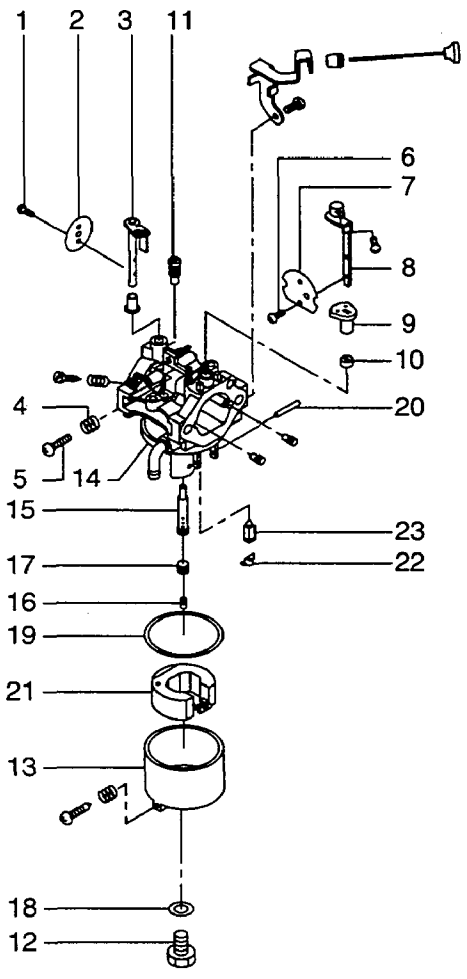


Fig. 8-3

8-2-2 CHOKE SYSTEM

(1) Remove the phillips screw (6) and choke valve (7), and pull out the choke shaft (8).

(2) When reassembling the choke shaft, make sure that the cutout in the choke valve faces the pilot air jet. Meantime, when reassembling set the rings (9) and (10) at the right position.

8-2-3 PILOT SYSTEM

(1) Remove the pilot jet (11), using correct tool to avoid damage to it.

(2) Reassembly

Tighten the pilot jet securely. Otherwise, the fuel may leak, causing engine malfunction.

8-2-4 MAIN SYSTEM

(1) Remove the bolt (12) and take out float chamber body (13).

(2) From the body (14) remove the main jet (16) and guide holder. And then remove the main nozzle (15).

(3) Reassembly

a) Fasten the main jet and main nozzle securely to the body. Otherwise, the fuel may become too rich and cause engine malfunction.

b) The bolt (12) tightening torque is 90 kg-cm. Be sure to set the gasket (19) and washer (18) for chamber (13).

8-2-5 FLOAT SYSTEM

(1) Pull out the float pin (20) and remove the float (21) and then remove the clip (22) and needle valve (23). If the needle valve need to be replaced, replace it with rubber needle.

CAUTION :

When cleaning the jets, use neither a drill nor a wire (because of possible damage of the orifice which will adversely affect fuel flow). Be sure to use compressed air to blow them clean.

(2) When removing the needle valve and float, gently tap the reverse side using the rod more slender than the float pin and remove, since the float pin is calked to the carburetor body.

9. STARTING SYSTEM

9-1 RECOIL STARTER

Trouble in the recoil starter rarely happens while it is in normal operation.

If the starter develops trouble or when it is lubricated, carry out in accordance with following disassembling and assembling procedures.

Tools ; Box spanner (spanner)

Pliers

Screwdriver

Nippers or Knife

9-1-1 HOW TO DISASSEMBLE (type D)

(1) Remove the recoil starter from engine.

(2) Pull the starter knob to draw out the starter rope by about 30 cm and tie a tentative knot as show in Fig. 9-1.

(3) Untie the knot inside the knob to remove the knob.

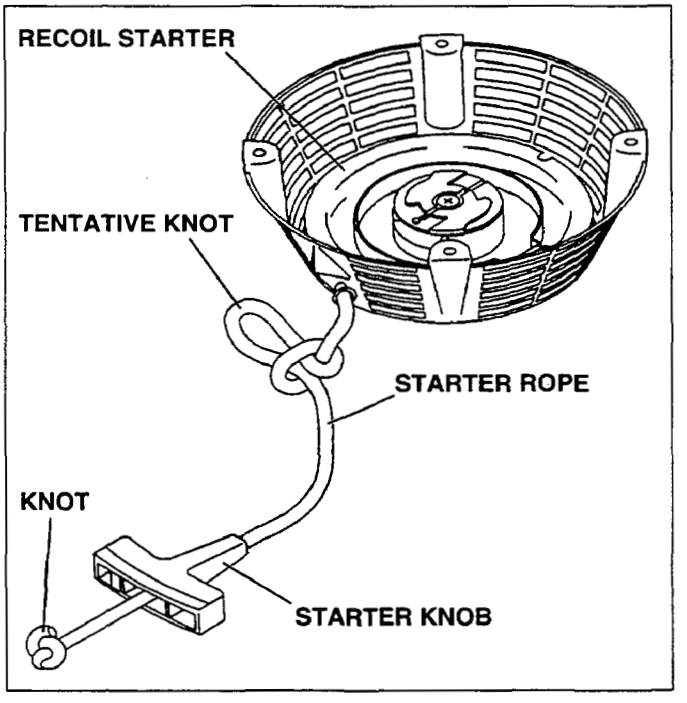


Fig. 9-1

(4) Hold the starter case and the reel firmly with your left hand and untie the tentative knot with your right hand.

Continue to hold the case and the reel with your left hand and hold the reel center with your right hand, then loosen both hands alternately to allow the reel gradually to turn to the arrow direction until the spring is completely released.

(Do this carefully to avoid dangers caused by spring-back.)

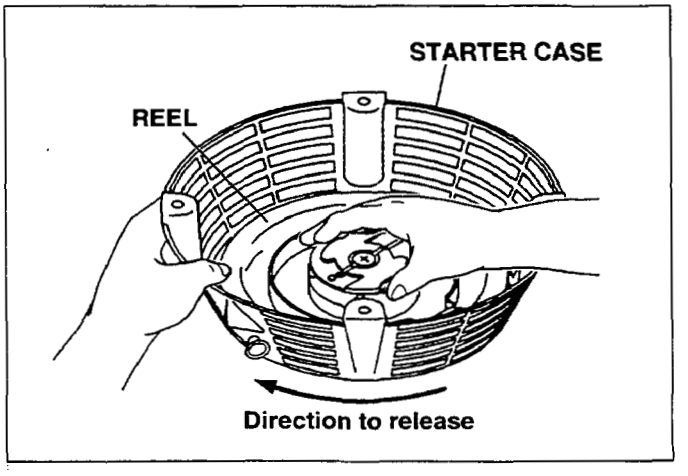


Fig. 9-2

(5) Remove each part in accordance with Fig. 9-3

1. Center screw
2. Friction plate
3. Friction spring
4. Ratchet
5. Ratchet spring
6. Reel

Take out the reel slowly while turning it back and forth gently, otherwise the spring may escape from the case which may invite danger.

(If the spring escapes, put it in the housing by following procedures shown in Fig. 9-8.)

Untie the starter rope knot at reel end and withdraw it to complete disassembling.

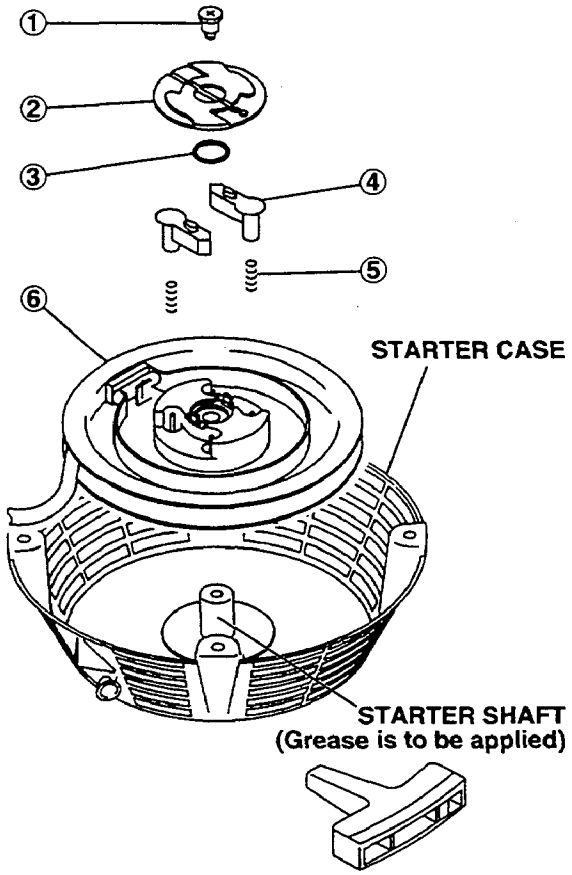


Fig. 9-3

9-1-2 HOW TO REASSEMBLE (D-Type)

(1) Cut off a part of the reel shown in Fig. 9-4 with a nippers or a knife to form a which is required when pre-winding the spring.

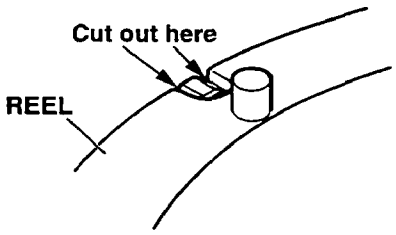


Fig. 9-4

(2) Check that the spring is securely set in the reel and form the spring end to measure 1mm to 2 mm for clearance between inner end of the spring and the reel bushing edge so that the hook catches securely as shown in Fig. 9-5.

The shape of spring inner end (approx. 10 cm from the end) may be adjusted with a plier if necessary.

(3) Apply a small amount of grease to the starter shaft and to the spring.

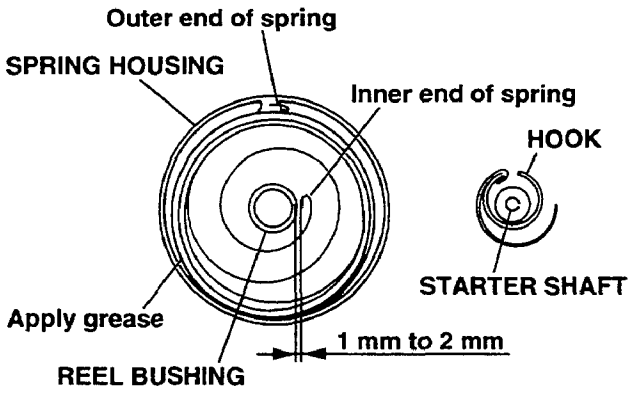


Fig. 9-5

(4) Pass the starter rope through the starter knob and tie the rope end to make a tight overhand knot as shown in Fig. 9-6. Then put the knot into the knob.

(5) Pass the other end of the rope from the starter case to the reel and make a knot as illustrated above, then put the rope end securely into the rope housing in the reel.

(6) Wind the starter rope by 1.5 turns in the arrow direction as shown in Fig.9-7 to let the rope out of the reel through the notch, then install the reel securely in the starter case so that the hook catches inner end of the spring.

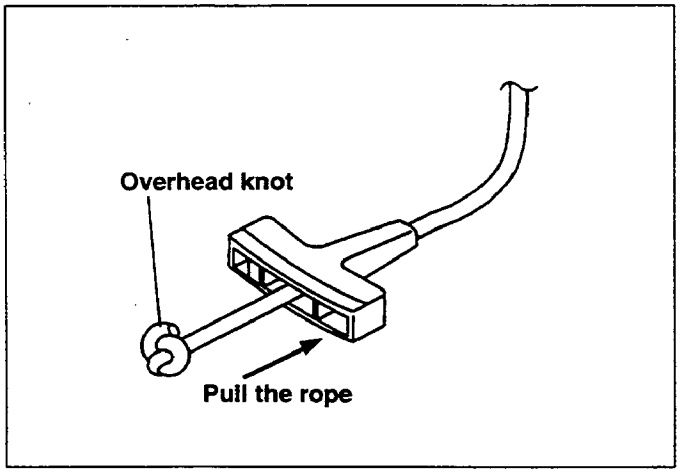


Fig. 9-6

(7) Hold the starter rope as shown in the Fig.9-7 and rotate the reel 6 turns by applying the force directly to the reel notch. (pre-winding)

Hold the reel securely to prevent it from reverse turn and pull the starter knob to stretch the rope tight then release the knob slowly.

Reassemble the parts in reverse order of disassembling shown in Fig. 9-3.

Tighten the center screw securely.

*This concludes

disassembling/reassembling.

Be sure to check the following to make sure of it.

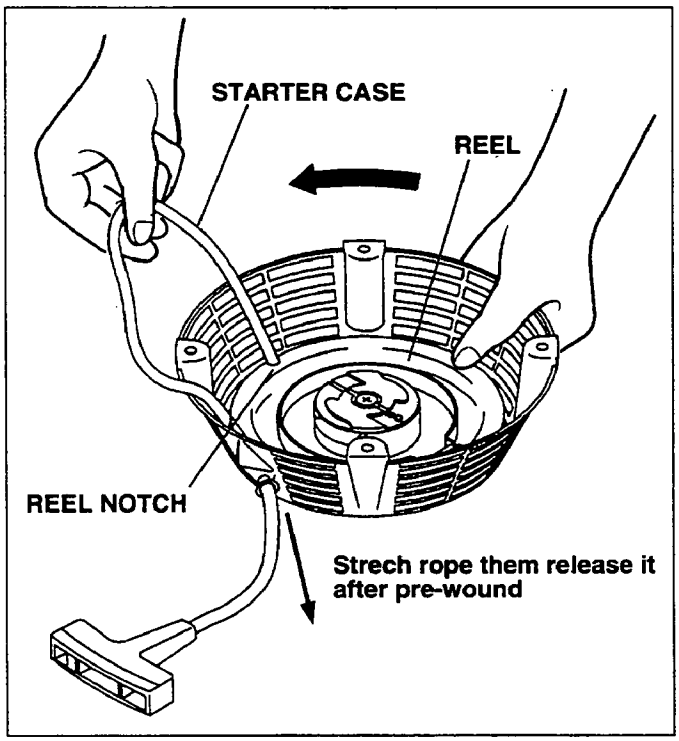


Fig. 9-7

9-1-3 CHECK AFTER REASSEMBLY

(1) Pull the starter knob a few times to check if :

A. The starter knob is too heavy to pull, check that each part has been assembled as specified.

B. The ratchet fails to function, check that parts such as friction spring have been missing.

(2) Pull out the starter knob to extend the rope to its extreme to see if:

A. The starter rope still remains in the rope slot in the reel, unwind the rope by 1 mm to 2 mm turns as the spring may be over-stressed.

B. The starter rope is found weak to recoil or droops in halfway, apply grease or mobile oil to the rotating part and to the friction parts.

If this persists, wind-up the spring by 1 mm to 2 mm turns. (In this case, check that the spring is not over-stressed.)

C. The spring escapes with a sound and the starter rope fails to spring back to its original position, reassemble the starter from the beginning.

9-1-4 OTHER GUIDES

(1) When the spring escapes from the reel:

Make a ring having a rather small diameter than spring housing using a thin wire.

Hook the outer end of the spring onto a part of the ring and re-wind the spring into the wire ring as shown in Fig. 9-8 then put it into the housing.

Remove the ring slowly while holding down the spring to avoid getting out of place.

The ring can easily be removed by prying it with the tip of a screwdriver.

Refer to Fig. 9-5 for which way the spring must be placed.

If the wire ring is not available, re-wind the spring directly into the housing.

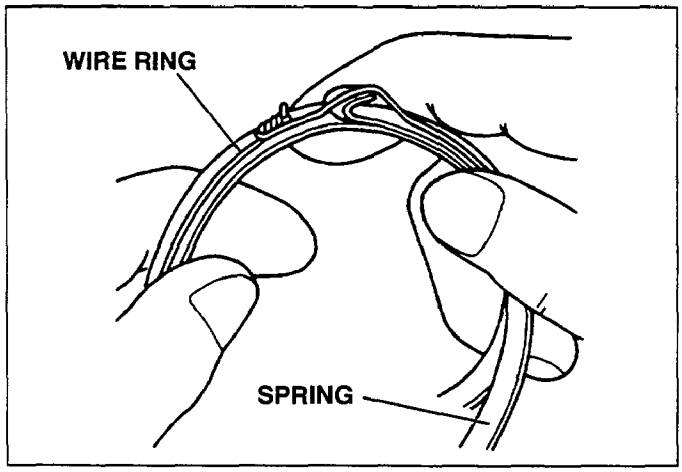


Fig. 9-8

(2) When it is lubricated:

Lubricate the starter shaft and the spring with a grease (If possible, heat-resistant type is preferable) or a mobile oil when the starter is being disassembled and prior to long term storage.

9-2 ELECTRIC STARTER

NOTE ;

For Electric starter operation, electric wiring should be connected among electric starter, magnetic switch, key switch and battery as shown in the diagram.

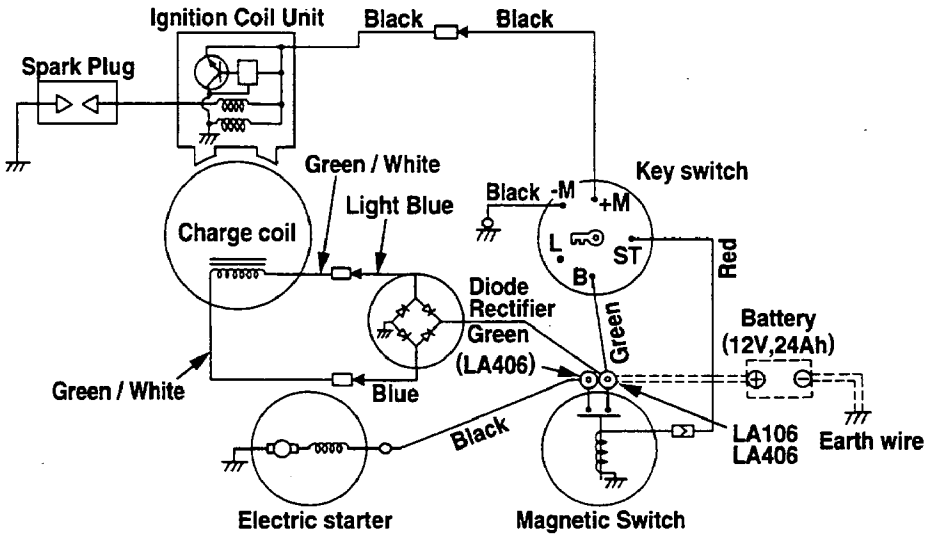


Fig. 9-9

9-2-1 OPERATION AND FUNCTION

When key switch is turned ON, lower electric current (M →) flows through coil of magnetic switch and the coil is excited. The plunger is pulled and higher current (S →) flows through electric starter.

When electric starter is operated, pinion gear is pushed out by means of centrifugal force of weight located in the spline of armature shaft. The pinion gear is engaged with ring gear and flywheel and crankshaft are rotated.

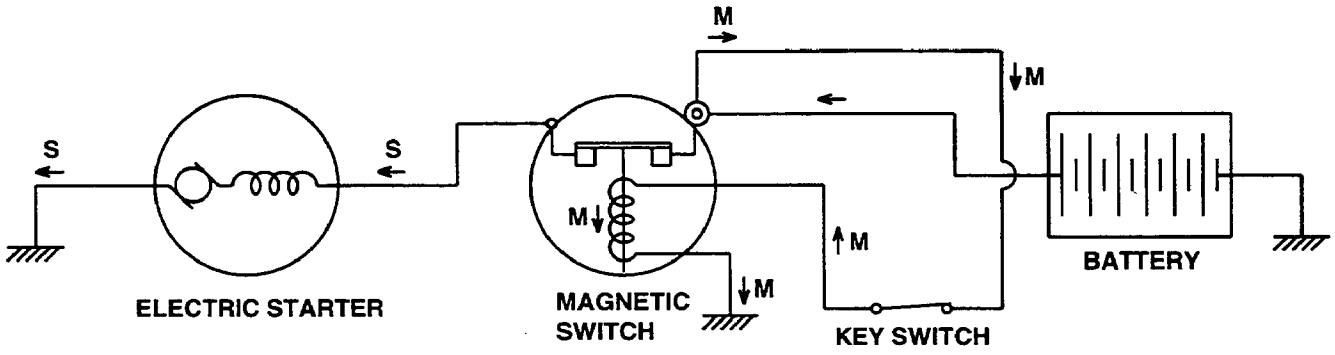


Fig. 9-10

9-2-2 COMPORNENT PARTS

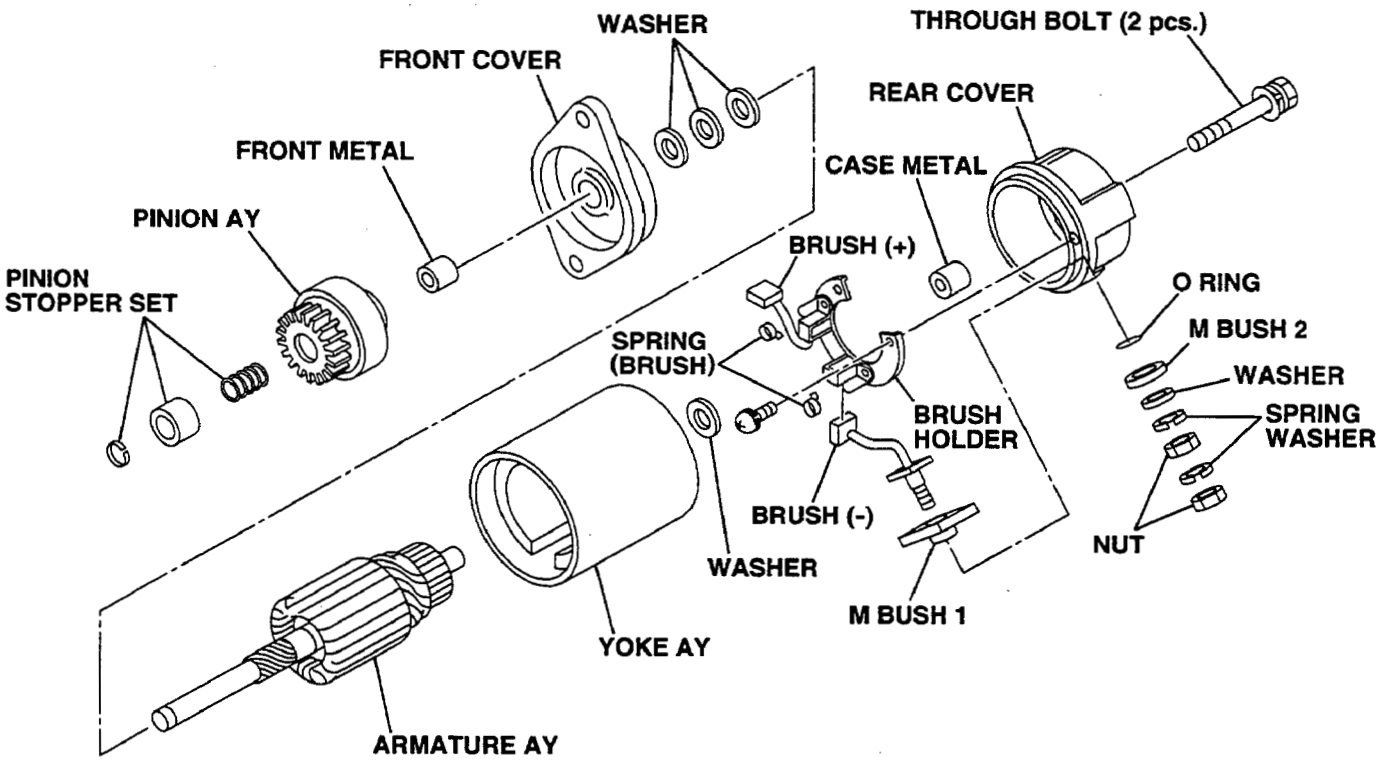


Fig. 9-11

10. TROUBLESHOOTING

The following three conditions must be fulfilled for satisfactory engine start.

1. The cylinder filled with a proper fuel-air mixture.
2. Good compression in the cylinder.
3. Good spark, properly timed, to ignite the mixture.

The engine cannot be started unless these three conditions are met. There are also other factors which make engine start difficult, e. g., a heavy load on the engine when it is about to start at low speed, and a high back pressure due to a long exhaust pipe.

The most common causes of engine troubles are given below :

10-1 STARTING DIFFICULTIES

10-1-1 FUEL SYSTEM

(1) No gasoline in the fuel tank, or the fuel cock closed.

(2) The carburetor is not choked sufficiently especially when the engine is cold.

(3) Water, dust or gum in the gasoline interfering the fuel flow to the carburetor.

(4) Inferior grade gasoline or poor quality gasoline not vaporized enough to produce the correct fuel-air mixture.

(5) The carburetor needle valve is held open by dirt or gum. This trouble can be detected as the fuel flows out of the carburetor when the engine is idling. (Overflow)

This trouble may be remedied by lightly tapping the float chamber with the grip of a screwdriver or the like.

(6) If the carburetor overflows, excessive fuel runs into the cylinder when starting the engine, making the fuel-air mixture too rich to burn. If this happens, remove the spark plug, and turn the starting pulley a few turns in order to let the rich fuel-air mixture out of the spark plug hole into the atmosphere. Keep the choke valve open during this operation.
Dry the spark plug well, screw it into place, and try to start again.

10-1-2 COMPRESSION SYSTEM

If starting difficulties and loss of power are not due to the fuel system or ignition system, the followings must be checked for possible lack of compression.

(1) Engine inside is completely dried up because of a long period of storage.

(2) Loose or broken spark plug. This causes a hissing noise made by mixture gas running out of cylinder in compression stroke during cranking.

(3) Damaged head gasket or loose cylinder head. A similar hissing noise is produced during compression stroke.

(4) Incorrect Valve clearance

If the correct compression is not obtained even after remedying the above, disassemble the engine and check further as follows :

a) Valve stuck open due to carbon or gum on the valve stem.

b) If the piston rings are stuck on the piston, remove the piston and connecting rod from the engine. Clean or replace the parts.

10-1-3 IGNITION SYSTEM

Check the followings for lack of sparks.

(1) Wires of the ignition coil, spark plug or contact breaker disconnected.

(2) Ignition coil damaged and shorted.

(3) Spark plug cable wet or soaked with oil.

(4) Spark plug dirty or wet.

(5) Spark plug electrode gap incorrect.

(6) Spark plug electrodes are connected or bridged.

(7) Incorrect spark timing.

10-2 ENGINE MISFIRES

(1) Incorrect spark plug electrode gap. Adjust it to anywhere between 0.7 and 0.8 mm.

(2) Ignition cable worn and leaking.

(3) Sparks weak.

(4) Ignition wire connections loose.

(5) Water in gasoline.

(6) Insufficient compression.

10-3 ENGINE STOPS

(1) Fuel tank empty. Water, dirt, gum, etc. in gasoline.

(2) Vapor lock, i. e., gasoline evaporating in the fuel lines due to overheat around the engine.

(3) Vapor lock in the fuel lines or carburetor due to the use of too volatile winter gas in the hot season.

(4) Air vent hole in the fuel tank cap plugged.

(5) Bearing parts seized due to lack of oil.

(6) Magneto or ignition coil faulty.

10-4 ENGINE OVERHEATS

(1) Crankcase oil level low. Add oil immediately.

(2) Spark timing incorrect.

(3) Low grade gasoline is used, or engine is overloaded.

(4) Cooling air circulation restricted.

(5) Cooling air path misdirected causes loss of cooling efficiency.

(6) Cylinder head cooling fins clogged up with dirt.

(7) Engine operated in an enclosed space without sufficient cooling air.

(8) Exhaust gas discharge restricted, or carbon deposits in the combustion chamber.

(9) Engine running on low-octane gasoline detonates due to heavy load at low speed.

10-5 ENGINE KNOCKS

(1) Poor quality gasoline.

(2) Engine operating under heavy load at low speed.

(3) Carbon or lead deposits in the cylinder head.

(4) Spark timing incorrect.

(5) Loose connecting rod bearing due to wear.

(6) Loose piston pin due to wear.

(7) Curses of engine overheat.

10-6 ENGINE BACKFIRES THROUGH CARBURETOR

(1) Water or dirt in gasoline, or low-grade gasoline.

(2) Intake valve stuck.

(3) Valves overheated, or hot carbon particles in the combustion chamber.

(4) Engine cold.

11. INSTALLATION

Engine life, ease of maintenance and inspection, frequency of checks and repairs, and operating cost all depend on the way in which the engine is installed. Review the following instructions carefully for installing the engine.

11-1 INSTALLING

When mounting the engine, carefully examine its position, the method of connecting it to a machine, the foundation, and the method of supporting the engine.
When determining its mounting position, in particular, make sure that gasoline and oil can easily be supplied and checked, the spark plug can easily be checked, the air cleaner can easily be serviced, and that the oil can easily be discharged.

11-2 VENTILATION

Fresh air is necessary for cooling the engine and burning the fuel.
In the case the engine is operated under a hood or in a small room, temperature rise in the engine room can cause vapor lock, oil deterioration, increased oil consumption, loss of power, piston seizure, shorter engine life, etc., making it impossible to operate the engine properly. It is necessary, therefore, to provide a duct or baffle to guide cooling air to the engine to prevent recirculation of he hot air used for engine cooling, and temperature rise of the machine. Keep the engine room temperature below 50°C even in the hottest period of the year.

11-3 EXHAUST GAS DISCHARGE

Exhaust gas is noxious. When operating the engine indoors, be sure to discharge the exhaust gas outdoors. If a long exhaust pipe is used in such a case, the internal resistance increases causing loss of engine power. Thus pipe inside diameter must be increased in proportion to exhaust pipe length.
Exhaust pipe : Less than 3 m long, pipe inside diameter 30 mm ,
Less than 5 m long, pipe inside diameter 33 mm.

11-4 POWER TRANSMISSION TO DRIVEN MACHINES

11-4-1 BELT DRIVE

Take the following notes into consideration.

* V-belts are preferable to flat belts.
* The driving shaft of the engine must be parallel to the driven shaft of the machine.
* The driving pulley of the engine must be in line with the driven pulley of the machine.
* Install the engine pulley as close to the engine as possible.
* If possible, span the belt horizontally.
* Disengage the load when starting the engine.

If no clutch is used, use a belt tension pulley or the like.

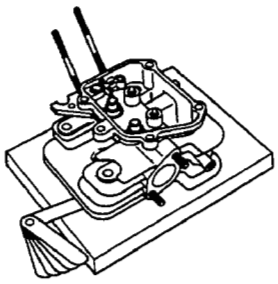
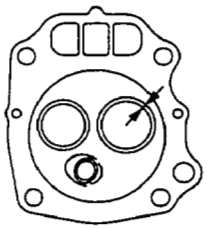
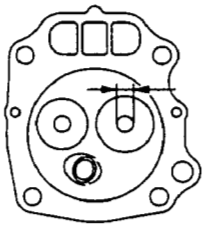
11-4-2 FLEXIBLE COUPLING

When using a flexible coupling, run out and misalignment between the driven shaft and engine shaft must be minimized. Run out and misalignment tolerance are specified by the coupling manufacturer.

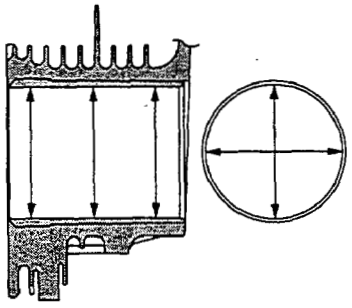
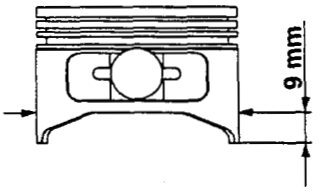
12. SERVICE DATA

12-1 CLEARANCE DATA AND LIMITS

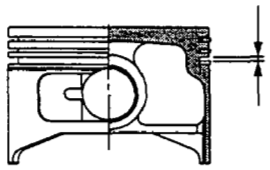
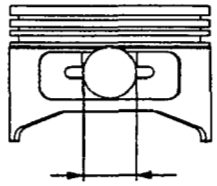
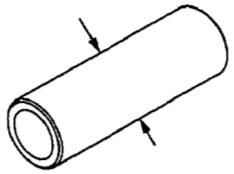
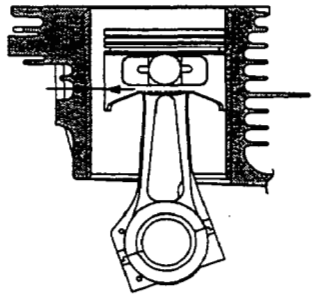
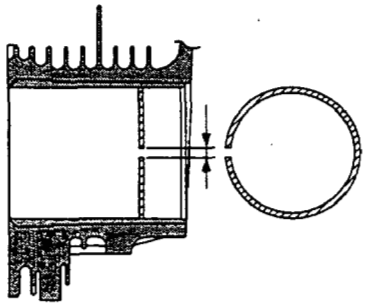
Unit : mm (in)

ITEM		EH36/EH41	
		STD	Limit
CYLINDER HEAD * Flatness 		0.05 or less (0.002 or less)	0.1 (0.004)
* Valve seat contact width 	IN. EX.	0.7 - 1.0 (0.028 - 0.039)	2.0 (0.079)
* Valve guide inside dia. 		6.035 - 6.053 (0.2376 - 0.2383)	6.15 (0.242)

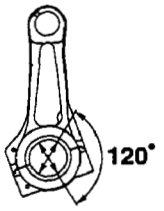
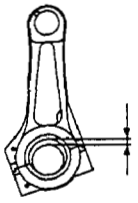
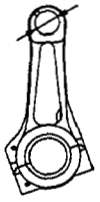
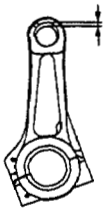
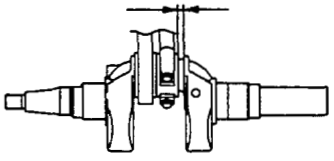
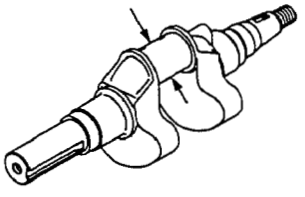
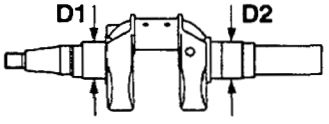
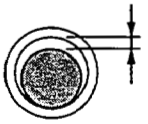
Unit : mm (in)

ITEM		EH36/EH41	
		STD	Limit
CYLINDER * Inside dia. 	STD	89.000 - 89.022 (3.504 - 3.505)	To be rebored when the difference between max. and min. of diameter reached to 0.1 (0.004).
	1 st reboring	89.250 - 89.272 (3.514 - 3.515)	Ditto
	2 st reboring	89.500 - 89.522 (3.524 - 3.525)	———
* Roundiness after reboring.		0.01 (0.004)	———
* Cylindricity after reboring.		0.015 (0.0006)	———
PISTON * Piston size (At skirt in thrust direction) 	STD	88.96 - 88.98 (3.502 - 3.503)	88.87 (3.499)
	1 st o / s	89.21 - 89.23 (3.512 - 3.513)	89.12 (3.509)
	2nd o / s	89.46 - 89.48 (3.522 - 3.523)	89.37 (3.519)

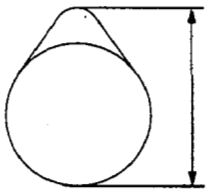
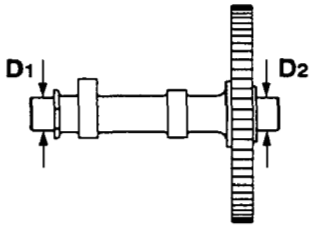
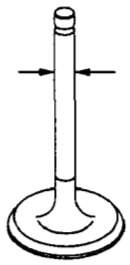
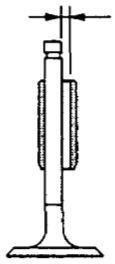
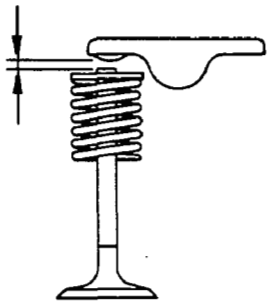
Unit : mm (in)

ITEM		EH36/EH41	
		STD	Limit
PISTON * Ring groove side clearance 	Top	0.05 - 0.09 (0.002 - 0.0035)	0.15 (0.006)
	2nd	0.03 - 0.07 (0.0012 - 0.0028)	0.15 (0.006)
	Oil ring	0.045- 0.140 (0.0018 - 0.0055)	0.20 (0.008)
* Piston pin hole 		20.989 - 21.002 (0.826 - 0.827)	21.035 (0.8281)
* Piston pin outside dia. 		20.991 - 21.000 (0.8264 - 0.8268)	20.960 (0.8251)
* Clearance between piston and cylinder at skirt area. 		0.025 - 0.064 (0.0010 - 0.0025)	0.25 (0.0098)
* Piston ring end gap 	Top	0.15 - 0.35 (0.0059 - 0.0138)	1.5 (0.0591)
	2nd	0.4 - 0.6 (0.0157 - 0.0236)	1.5 (0.0591)
	Oil ring	0.2 - 0.7 (0.0079 - 0.0276)	1.5 (0.0591)

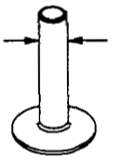
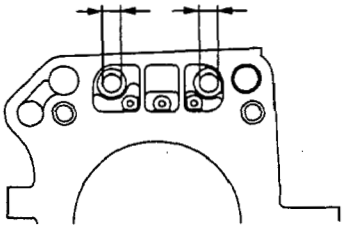
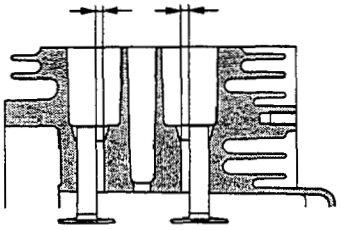
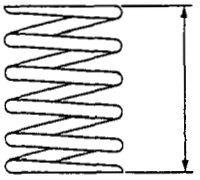
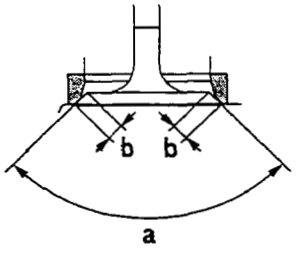
Unit : mm (in)

ITEM	EH36/EH41	
	STD	Limit
CONNECTING ROD * Big end inside dia. 	38.000 - 38.016 (1.4961 - 1.4967)	38.100 (1.5000)
* Clearance between big end and crankpin 	0.030 - 0.060 (0.0012 - 0.0024)	0.2 (0.0079)
* Small end inside dia. 	21.010 - 21.023 (0.8272 - 0.8277)	21.080 (0.8299)
* Clearance between small end and piston pin 	0.010 - 0.032 (0.0004 - 0.0013)	0.12 (0.0047)
* Big end side clearance 	0.1 - 0.7 (0.0039 - 0.0276)	1.0 (0.0394)
CRANKSHAFT * Crankpin outside dia. 	37.956 - 37.970 (1.4943 - 1.4949)	37.85 (1.4902)
* Journal dia. 	34.986 - 34.997 (1.3774 - 1.3778)	———
* Clealance between journal and main bearing 	–0.009 - 0.014 (–0.00035 - 0.00055)	———

Unit : mm (in)

ITEM		EH36/EH41	
		STD	Limit
CAMSHAFT * Cam height (IN. and EX.) 		35.26 - 35.46 (1.3882 - 1.3961)	35.11 (1.3823)
* Journal outside dia. "D" type 	D1	24.967 - 24.980 (0.9830 - 0.9835)	24.950 (0.9822)
	D2	19.967 - 19.980 (0.7861 - 0.7866)	19.950 (0.7854)
VALVE * Valve stem outside dia. 	IN.	5.970 - 5.985 (0.2350 - 0.2356)	5.850 (0.2303)
	EX.	5.960 - 5.975 (0.2346 - 0.2352)	5.850 (0.2303)
*Clearance between valve stem dia. and valve guide. 	IN.	0.050 - 0.083 (0.0022 - 0.0033)	0.30 (0.0118)
	EX.	0.060 - 0.093 (0.0024 - 0.0037)	0.30 (0.0118)
* Valve clearance 	IN. / EX. (cold)	0.085 - 0.115 (0.0034 - 0.0045)	

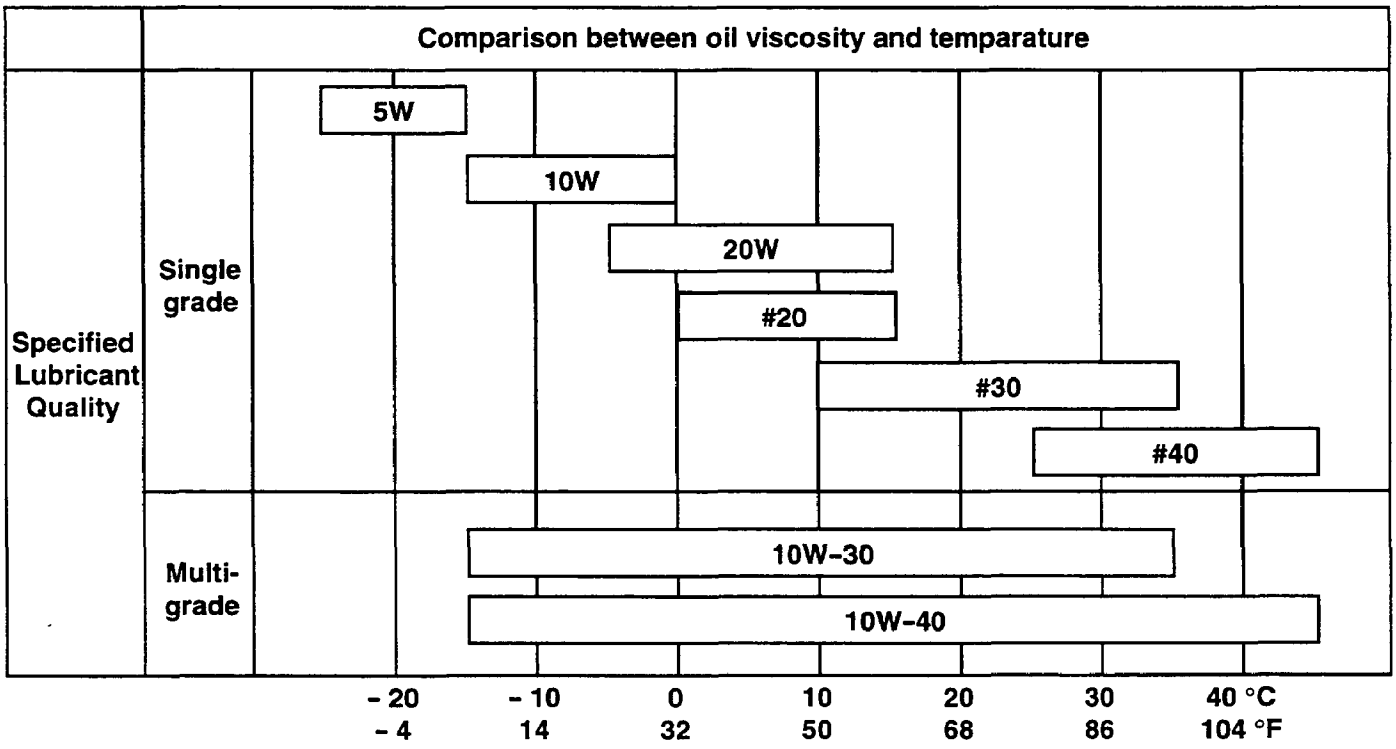
Unit : mm (in)

ITEM	EH36/EH41	
	STD	Limit
TAPPET * Stem outside dia. 	7.960 - 7.975 (0.3134 - 0.3140)	7.93 (0.3122)
* Guide inside dia. 	8.00 - 8.015 (0.3150 - 0.3156)	8.08 (0.3181)
* Tappet guide clearance 	0.025 - 0.055 (0.0010 - 0.0022)	0.15 (0.0059)
VALVE SPRING FREE LENGTH 	36.5 (1.4370)	——
VALVE SEAT ANGLE (IN. and EX.) * Valve cutter angle (a) * Valve contact width (b) 	a : 90° b : 0.7 - 1.0 (0.028 - 0.039)	2.0 (0.079)

12-2 TORQUE SPECIFICATIONS

ITEMS		Tightening torque		
		N • m	Kg • cm	ft • lb.
Cylinder head bolts		33.3 - 41.2	340 - 420	24.6 - 30.4
Connecting rod cap bolts		22.1 - 27.0	225 - 275	16.3 - 19.9
Flywheel nut		78.4 - 98.0	800 - 1000	58.0 - 72.5
Main bearing cover bolts	M8(12T)-2pcs.	22.5 - 24.5	230 - 250	16.7 - 18.1
	M8 (7T)-5pcs.	16.7 - 18.6	170 - 190	12.3 - 13.7
Spark plug	New one	11.8 - 14.7	120 - 150	8.7 - 10.9
	Retightening	22.6 - 26.5	230 - 270	16.6 - 19.5

12-3 OIL GRADE CHART



Use oil classified as SE or higher.

Multi-grade oil tends to increase its consumption at high ambient temperature.

13. MAINTENANCE AND STORAGE

The following maintenance jobs apply when the engine is operated correctly under normal conditions. The indicated maintenance intervals are by no means guarantees for maintenance free operations during these intervals.

For example, if the engine is operated in extremely dusty conditions, the air cleaner should be cleaned every day instead of every 50 hours.

13-1 DAILY MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Clean away dust and chaff from engine.	Governor linkage is especially sensitive to dust.
2) Check fuel leakage from fuel system. If any, retighten fasteners or replace necessary parts.	
3) Inspect for loose hardware and retighten if necessary.	Loose bolts and nuts may come off and result in breakage of other parts.
4) Check oil level and add to full mark.	

13-2 INITIAL 20 HRS. MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Clean crankcase oil.	To remove sludge from run-in operation.

13-3 EVERY 50 HRS. (10 DAYS) MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Change crankcase oil.	Contaminated oil quickens wear.
2) Clean air cleaner.	
3) Check and clean spark plug.	If dirty, wash in gasoline or polish with emery paper.

13-4 EVERY 100–200 HRS. (MONTHLY) MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Clean fuel filter and fuel tank.	
2) Inspect cooling system and remove dirt and chaff.	Remove blower housing and clean up between fins and housing.

13-5 EVERY 500–600 HRS. MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Remove carbon from cylinder head.	Carbon deposits in combustion chamber causes lack of power.
2) Disassemble and clean carburetor.	

13-6 EVERY 1000 HRS. (YEARLY) MAINTENANCE

MAINTENANCE ITEMS	REMARKS
1) Overhaul engine.	Clean and correct parts. Replace piston rings and other necessary parts.
2) Replace fuel lines once a year.	Avoid hazards caused by fuel leakage.

13-7 ENGINE STORAGE

(1) Perform the above 13-1 and 13-2 maintenance jobs.

(2) Drain fuel from the fuel tank and carburetor float chamber.

(3) To prevent rust in the cylinder bore, apply oil through the spark plug hole and turn the crankshaft several turns by hand. Reinstall the plug.

(4) Turn the starting pulley by hand and leave it where the resistance is the heaviest.

(5) Clean outside of the engine with oiled cloth.

(6) Put a plastic cover or the like over the engine and store the engine in dry place.

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SUBARU
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