

Fig.65

Remove main bearing bolt. Take out the main bearing cap carefully. Arrange them according to the sequence. Read the bearing clearance according to the proportion stated in the cover of plastic clearance gauge. Check the bearing clearance from the third main bearing and extending to the two sides. The clearance of main bearing is 0.011—0.058m m.

——Check clearance of connecting rod bearing

Use the above method to check clearance of connecting rod bearing.

Clearance of connecting rod bearing is 0.006—0.06mm.

——The size of connecting rod journal and connecting rod bushing :

unit : mm

Level	The diameter of connecting rod journal	The thickness of connecting rod bushing
standard	47.89—47.91	1.480—1.487
Undersize 0.025	47.89—47.91	1.492—1.499
undersize 0.25	47.64—47.66	1.605—1.612
undersize 0.5	47.39—47.41	1.730—1.737
undersize 0.75	47.14—47.16	1.855—1.862
undersize 1.0	46.89—46.91	1.980—1.987

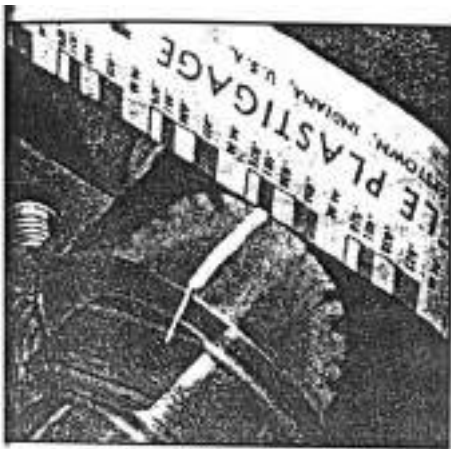


Fig. 66

——The size of main journal and main bearing half :

unit : mm

Level	The diameter. of main journal	The diameter of main bearing bore of cylinder body	The thickness of main bearing half shell
Standard	57.98—58.00	62.2935 ± 0.0065	2.131—2.138
oversize 0.4	57.98—58.00	62.6935 ± 0.0065	2.331—2.338
undersize 0.002	57.98—58.00	62.2935 ± 0.0065	2.141—2.148
undersize 0.25	57.73—57.75	62.2935 ± 0.0065	2.256—2.263
undersize 0.50	57.48—57.50	62.2935 ± 0.0065	2.381—2.388
undersize0.75	57.23—57.25	62.2935 ± 0.0065	2.506—2.513
undersize 0.25 oversize 0.4	57.73—57.75	62.6935 ± 0.0065	2.456—2.463
undersize 0.50 oversize 0.4	57.48—57.50	62.6935 ± 0.0065	2.581—2.588
undersize 0.75 oversize 0.4	57.23—57.25	62.6935 ± 0.0065	2.706—2.713

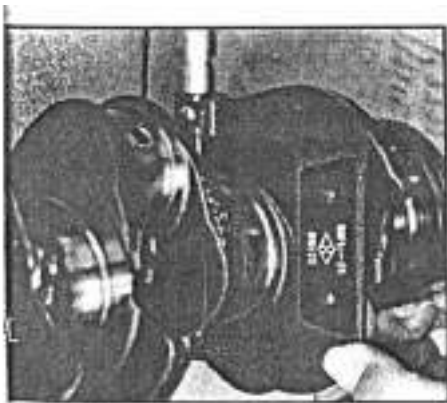


Fig. 67



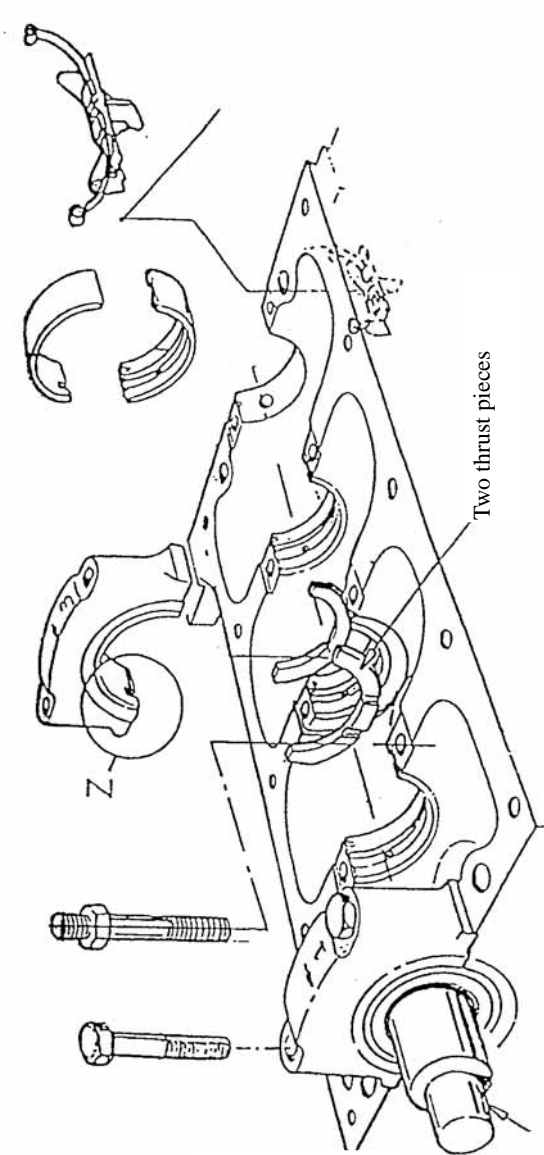


Fig. 68

—the size of crankshaft thrust, thrust washer and cylinder block thrust : unit : mm

level	The size of cylinder body thrust	The size of crankshaft thrust	The thickness of thrust washer
standard	$24 \pm 0.03$	28.825—28.875	$2.326 \pm 0.025$
oversize 0.38	$24 \pm 0.03$	29.205—29.255	$2.516 \pm 0.025$

Installation :

—Before installation, use the second screw tap taps the threaded hole in cylinder body, especially the threaded hole of cylinder head bolt and main bearing bolt.

The threads of cylinder head bolt is  $M10 \times 1.5-6H$  , the threaded hole of main bearing bolt is  $M12 \times 1.75-6H$ .

—The installation of crankshaft woodruff key

Drive the semicircular key into key groove lightly. The magnitude of interference for key and key groove is  $0.00-0.051mm$ . After the semicircular key is installed, check the protrusion height. It should be  $1.392-1.739mm$ .

—Crankshaft thrust washers are two pieces. They are only installed on the front and back thrust surface of cylinder block.

Before installation, apply the engine oil on the surface with oil groove of thrust washer. position the surface with oil groove towards the cylinder body and the surface with oil groove towards crankshaft.

—During installing crankshaft, engine oil should be applied main journal, connecting rod journal, thrust surface and bearing half.

—The character like 1,2,3,4,5 are casted on the top of main bearing cap and also an arrow. During assembling, install them from the front according to the sequence. At the same time, have the arrow pointing to the front end surface of cylinder block. The width of main bearing cap 1,2,4,5 is same, but the width of main bearing cap 3 is larger than others.

The main bearing cap is retained by rabbet. It is press fit between rabbet and cylinder body. The press fit clearance is  $0.025-0.145mm$ . After installation, the surface of the first and the fifth main bearing caps should be even or lower than the front and back end surface of cylinder body.



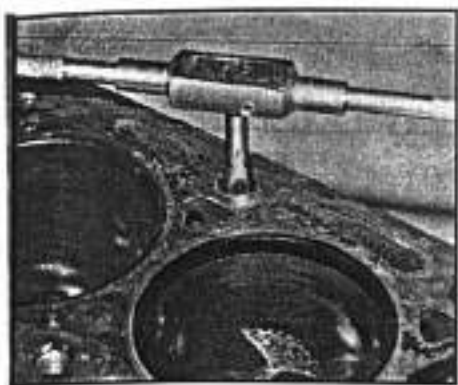


Fig. 69

——Nine main bearing bolts are hex head flange side bolts, and one is stud. For horizontal engine, the stud is mounted in the left threaded hole of the second main bearing cap (see from the front) which is for installing the carrier of oil collector. For the vertical engine, it should be mounted on the left threaded hole of the forth main bearing cap (see from the front).

Before installing the main bearing bolt, engine oil should be applied on the joint surface of head end.

The main bearing bolt and stud should be screwed by hand first and tightened to 90—100Nm.

——The max rotating torque of the crankshaft (with piston rod assembly) is 16Nm.

#### 【12】. The removal and installation of oil baffle assembly



Fig. 70

##### Removal :

——Take out the oil baffle assembly from the right of the back end of the cylinder body.

##### Installation :

——Install the oil baffle assembly from the right of the back end of the cylinder body (viewed from the front). The oil baffle assembly should be tensioned. The spring should be lower than the flange surface of cylinder block oil pan.



【13】. Engine oiling system:

1). The description of the oiling system:

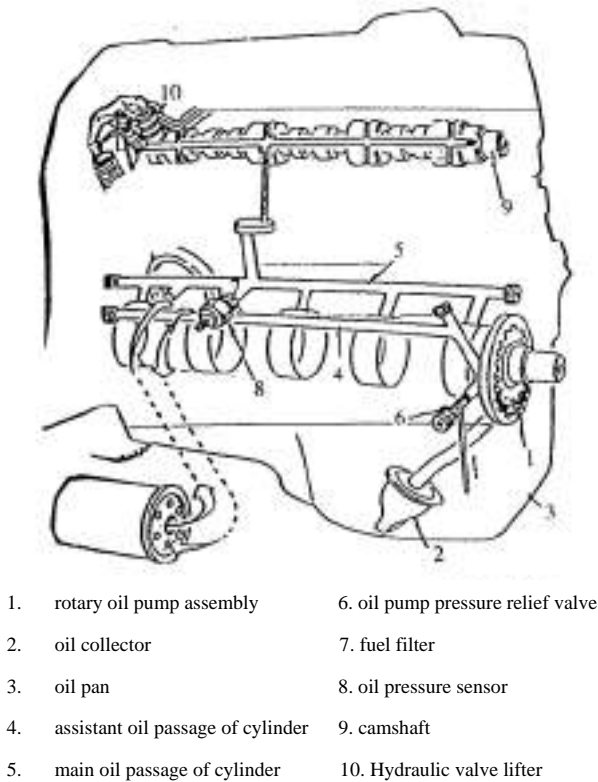
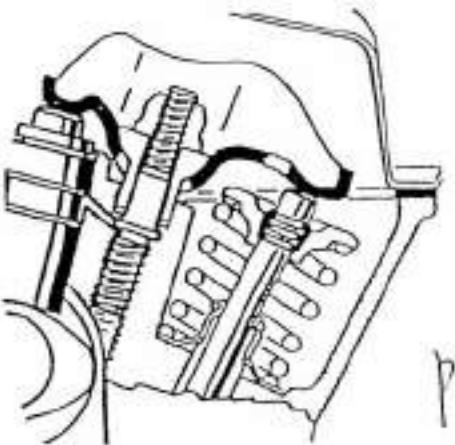


fig. 71



Through oil collector (2), the rotary oil pump(1) which is installed in the front end of crankshaft draws oil from oil pan (3) and pressurizes. The pressure oil comes into the full flow type oil filter through the assistant oil passage (4) on the left of cylinder body (viewed from the front). The pressure relief valve (6) is installed inside the oil pump case to control main oil passage pressure . The pressure relief valve will be opened under the pressure within  $440\text{kPa} \pm 20\text{kPa}$ . The filtered oil comes out from the center hole of oil filter and comes into the main oil passage of engine (5) through the center hole of filter connector.

From the main oil passage, oil lubricates the main bearing through the bore in the cylinder body and lubricates the connecting rod bearing through oil passage in the crankshaft.

There is a small oil port in the connecting rod bearing bore near the exhaust side in the connecting rod body. The oil sprays out from this small oil port to lubricate the piston pin and cylinder bore.

Oil pressure sensor (8) is located near the oil filter. It is connected with the main oil passage by a inner oil passage. Oil is provided to the third journal of camshaft through this oil passage.

Other journals of camshaft are lubricated by the oil provided by the middle oil passage of camshaft. Two sides of the middle oil passage are sealed by steel ball.

Hydraulic lifter oil comes from oil gallery on cylinder head, which is supplied from oil channel on camshaft neck

The oil provided by the oil port inside the hydraulic valve lifting rod lubricates the contact face of valve rocker and hydraulic valve lifting rod.

The oil to lubricate the rocker carrier is provided by the oil passage of cylinder head.

The contact face of the tip end of valve and rocker is lubricated by splashing.



2) The removal and installation of oil pan :

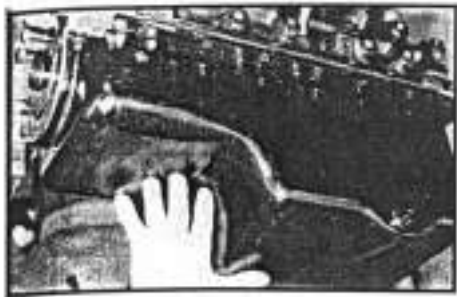
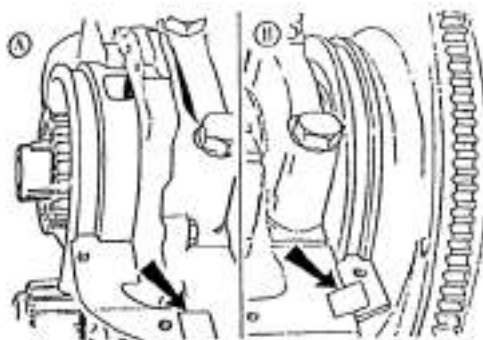


Fig. 73

- removal :
- Loosen drain plug and drain oil
  - Loosen eighteen M6 × 20 bolts
  - Take out the sealing gasket of oil pan
  - Check if the left and right reinforced plates are still clipped on the back face of oil pan flange face



- A. crankshaft to oil pump shell
- B. crankshaft to rear oil seal carrier

fig. 74

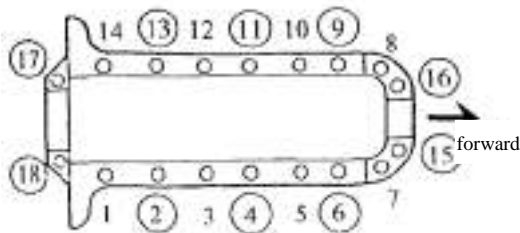


Fig.75

- Installation :
- Apply locite 598 sealant and G Y409 anaerobic sealant on the joint place between flange surface of oil pan of cylinder body and oil pump case, and carrier of real oil seal.
  - Put the new rubber seal gasket on the cylinder body and have the two sides of sealing gasket enter into the grooves of carrier of real oil seal and oil pump.
  - Install the oil pan with the two sides of sealing gasket in the grooves of oil pan.
  - Screw the bolt by hand (the bolt with washer indicated in the left upper figure is precedent.)
  - Tighten bolts to 5.0—8.0Nm according to the sequence of the left figure.
  - Replace the sealing gasket of drain plug. Screw in the drain plug by hand and tighten to 21—25Nm.



### The removal and installation of oil collector assembly

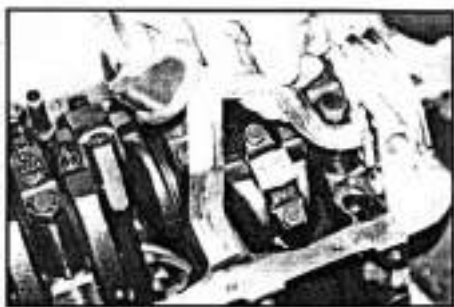


Fig. 76

#### removal :

- Loosen locknut of oil collector assembly and take out the nut and flat washer
- Loosen carrier bolts and take out the bolts.
- Loosen flange face bolt of oil collector (two ) and take out the two bolts with spring washers

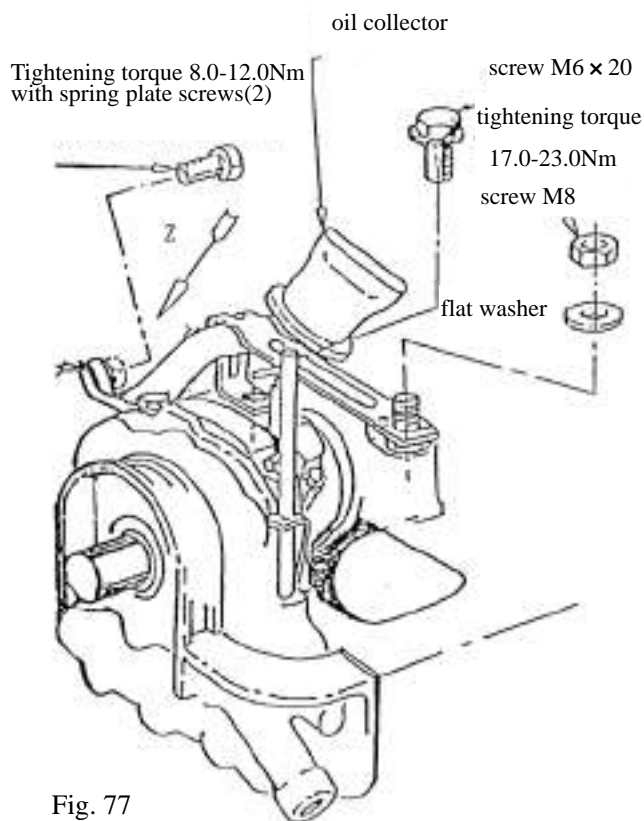


Fig. 77

#### Installation :

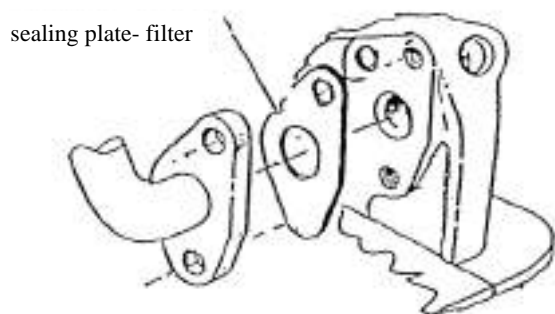
- Install a new sealing gasket of oil collector on the flange face of oil pump and then install oil collector assembly. Screw two bolts with gasket by hand.

- Screw the oil collector carrier into the cylinder body with M8 bolt. At the same time, hitch the carrier into the stud which is in the left of the second bearing cap. Install the flat washer and screw in the nut by hand.

- Tighten the flange face bolt of oil collector to 8.0—12.0Nm.

- Tighten carrier bolt to 17—23Nm

- Tighten the locknut to 17—23Nm



Z direction

Fig. 78



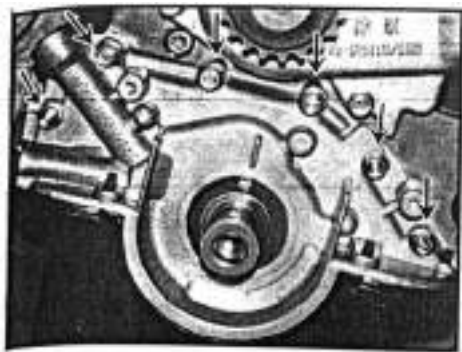


Fig. 79

#### 4. The removal and installation of oil pump with oil seal assembly

removal :

- Loosen six M6 × 30 hexagonal flange surface bolts.
- Remove the bolts (as the figure indicates )
- Remove oil pump with oil seal assembly

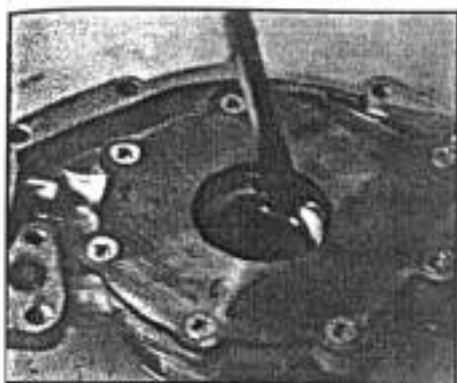


Fig. 80

- Pry out the front oil seal of crankshaft by screwdriver or chisel. Note: Don't damage the front oil seal bore.

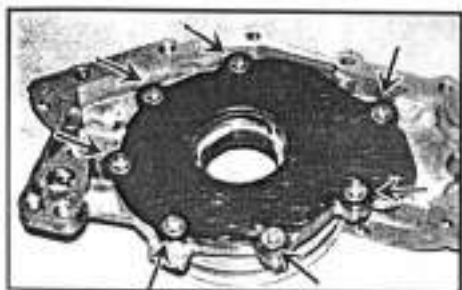


Fig. 81

- Remove seven M6 countersunk head screws (as the arrow in figure indicates )
- Remove oil pump cover

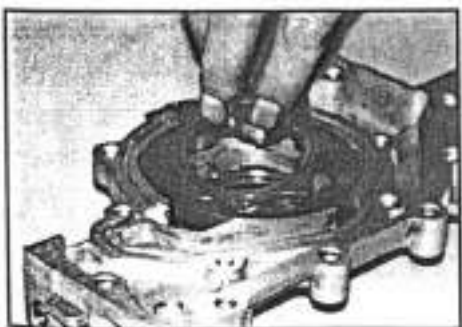


Fig. 82

- Take out the inner and outer rotor



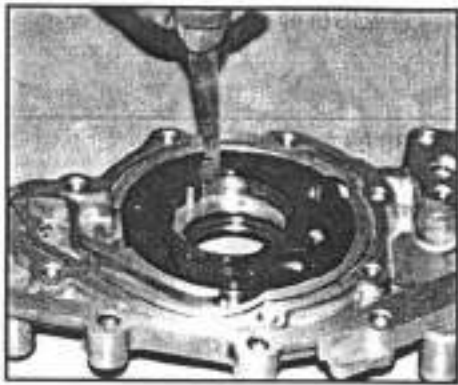


Fig. 83

——Check the clearance between outer rotor of oil pump and case bore of oil pump.

The clearance between outer rotor of oil pump and case bore of oil pump should be 0.06—0.19mm.

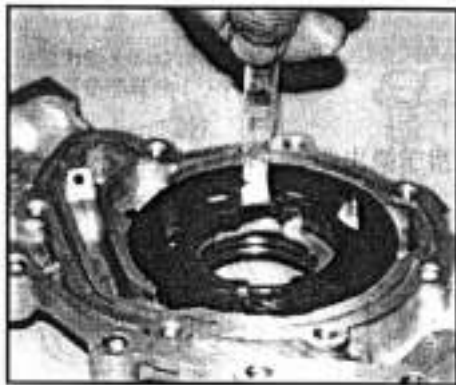


Fig. 84

——Check the radial clearance between inner rotor and outer rotor of oil pump.

The radial clearance between inner rotor and outer rotor of oil pump should be 0.05—0.18mm.



Fig. 85

——Check the end play of rotor

The end play of rotor should be 0.014—0.100mm.

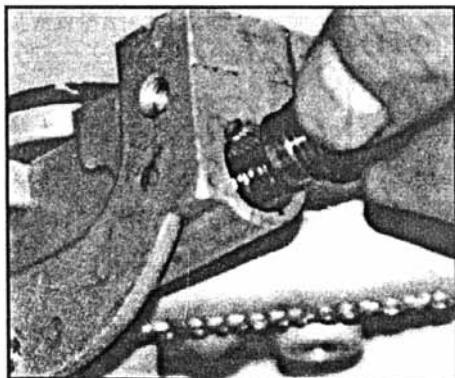


Fig. 86

——Remove horizontal hexagonal socket head plug (small one)

——Take out the spring of relief valve and plunger of relief valve.

——Check the spring load and free length

spring free length is 46mm.

spring load is  $32.8N \pm 2N$  when the length is 29mm.

installation length of relief valve spring is 38.5mm.