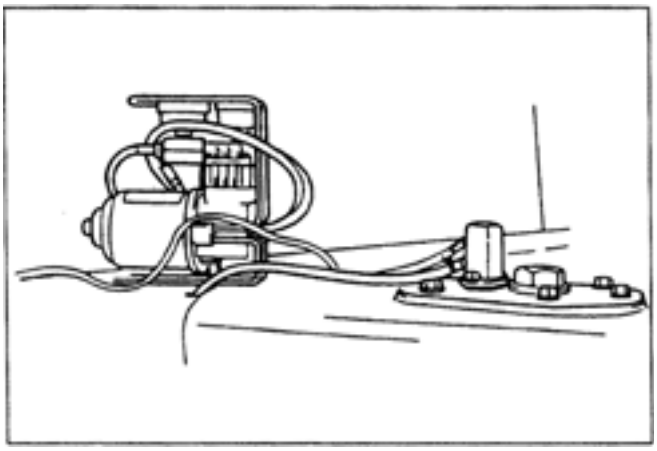
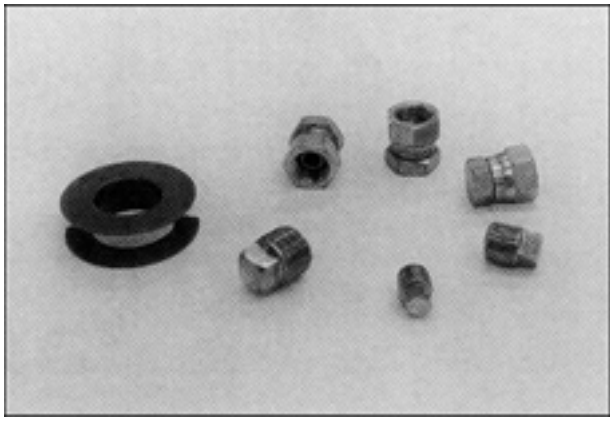
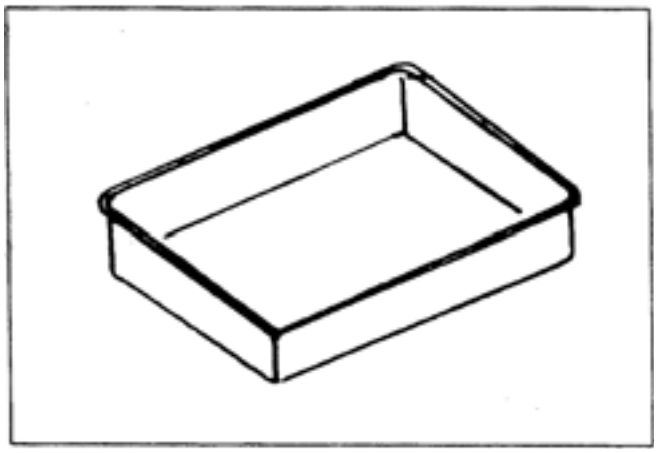
CONTENTS

E.SERVICING FUNDAMENTALS

Locking adhesive







a.Items for Servicing

1) Tighten bolts, nuts, adapters,and similar parts to their specified torques which are given in the list of tightening torques and adhesive as well as in this manual. Be sure to observe the specified torques for important tightened parts and components.
2) Wipe out water, oil and grease off the screws on which loctite adhesive is to be applied. Be sure to apply the adhesive to specified locations.

Types of screw adhesive
Equivalent to LOCTITE 271 (Heavy-duty) Equivalent to THREE-BOND 1305P (Heavy-duty) Equivalent to THREE-BOND TB1401B (Light-duty) Unless specified otherwise, use THREE-BOND 1324 (Medium-duty).

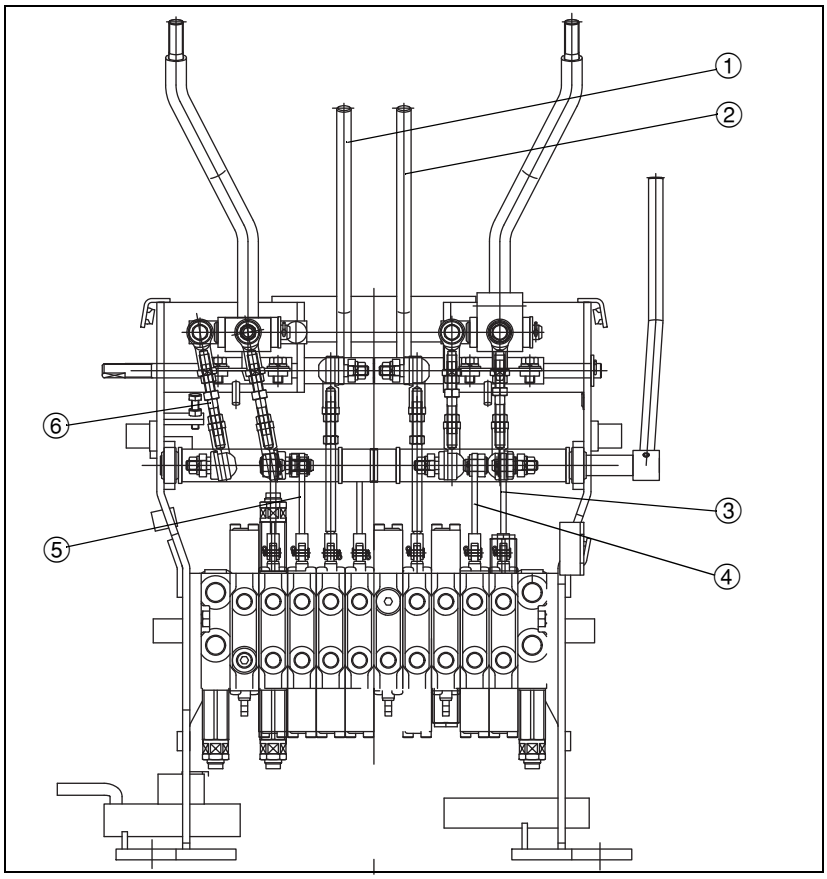
Type of instantaneous adhesive
Use THREE-BOND 1733 or 1741E

The word “LOCTITE“ in this manual denotes the red-color type.

3) Precautions in disassembling the hydraulic equipment
   - Use a vacuum pump, pulgs, oil pans, waste cloth and the like to prevent oil from running out or splashing.
   - Wipe out leaking oil completely first and then add oil as required.
   - Protect the openings with plugs, covers or the like to keep off foreign matters. Most of hydraulic system troubles are caused by the entry of foreign matters.
   - Before reassembling, clean up the parts and components and apply hydraulic oil on them.
   - The system consists of precision parts. Be careful not to scratch them and apply excessive force on them.

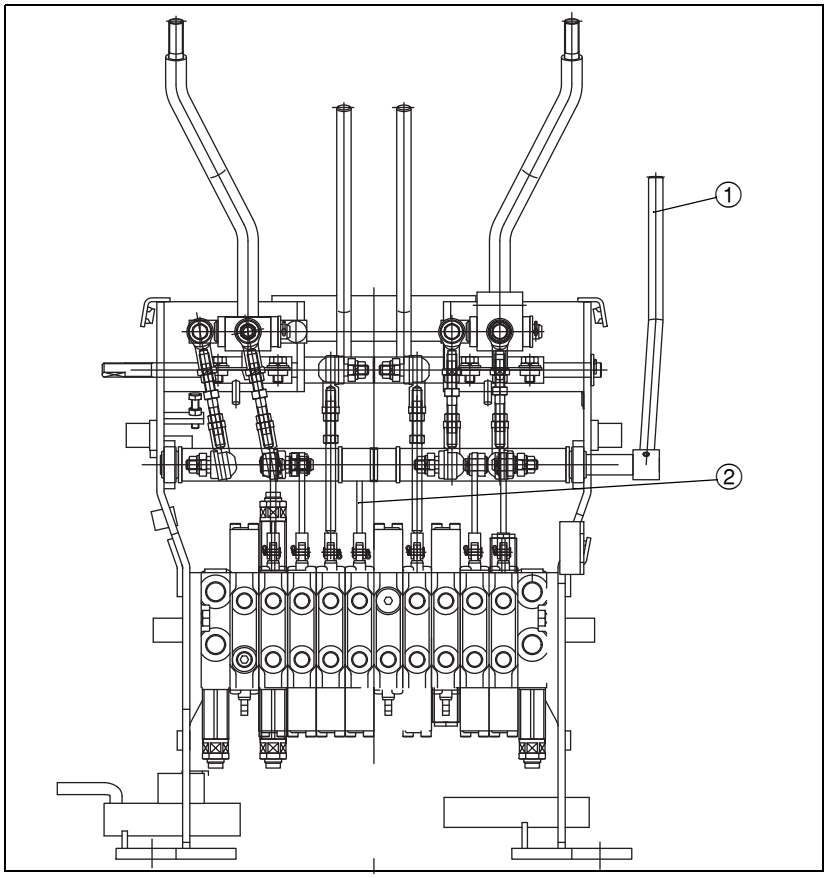
No		Specificatios Items			Unit	K008-3		Remarks
Q5	Work performance							
1	1	Boom lifting capacity			kgf	91.8<		Front end, Arm extend bucket crowd, at tooth"
					kN	0.9<		
					lbf	202<		
	2	Arm digging force			kgf	505		Bucket tooth root
					kN	4.3<		
					lbf	1113		
	3	Bucket digging force			kgf	1000		Machine stance to JIS bucket tooth root
					kN	9.3<		
					lbf	2205		
	4	Dozer force		down	kgf	1089		Cutting edge down force at ground level
					kN	10.1<		
					lbf	2400		
2	1	Boom speed	Canopy	up 1st	sec	2.5 ± 0.3		Oil temp. 50 ± 5 °C(122±41°F) Ground to max. height (exculude cushioning)
	2			up 2nd	sec	3.7 ± 0.3		
	3			down 1st	sec	2.8 ± 0.3		
	4			down 2nd	sec	4.0 ± 0.3		
3	1	Arm speed		crowd	sec	3.0 ± 0.3		
	2			extend	sec	2.2 ± 0.3		
4	1	Bucket speed		crowd	sec	2.9 ± 0.3		Oil temp. 50 ± 5 °C(122 ± 41 °F)
	2			dump	sec	2.0 ± 0.3		
5	1	Dozer speed		up 1st	sec	-		
	2			up 2nd	sec	1.6 ± 0.3		Max. down to max. up
	3			down 1st	sec	-		
	4			down 2nd	sec	1.2 ± 0.3		Max. up to max. down
6	1	Arm cylinder cavitation			mm	5>		Oil temp. 95 ± 5 °C (203 ± 41 °F) 1300 rpm. heaped.
					inch	0.2>		
7	1	Max. digging height radius			mm	1302 ± 130		
					inch	51.26 ± 5.12		
	2	Max. dump height radius			mm	1183 ± 71		at bucket pin
					inch	46.575 ± 2.8		
	3	Bucket wrist angle			degree	189		
Q6	Swivel, swing performance							
1	1	Swivel torque		L	kgf·m	118<		Arm extend,show/ Quick
					kN·m	1159<		
					ft·lbf	855<		
	2			R	kgf·m	118<		
					kN·m	1159<		
					ft·lbf	855<		
2	1	Swivel angle		L	deg	27<		Bucket load=JIS heaped×1.8
				R	deg	27<		
3	1	Swivel block performance		L	deg	20>		Engine stop, 1 min. 20 degree slop Engine idle, Load condition.
	2			R	deg	20>		
4	1	Swivel start-up speed		L	sec	2.1 ± 0.3		0~90 deg swivel
				R	sec	2.1 ± 0.3		
5	1	Swing speed		L	sec	4.2 ± 0.3		
				R	sec	4.1 ± 0.3		
6	1	Swing Lock		Swivel R&L	mm	7.0>		90 deg-swivel, 100 times actual digging cylinder dislocation
					inch	0.28>		

2. K008-3:KTC, KCL, KTA version



①Operating lever LH
②Operating lever RH
③Arm
④Bucket
⑤Boom
⑥Swivel

(4) Dozer (K008-3)



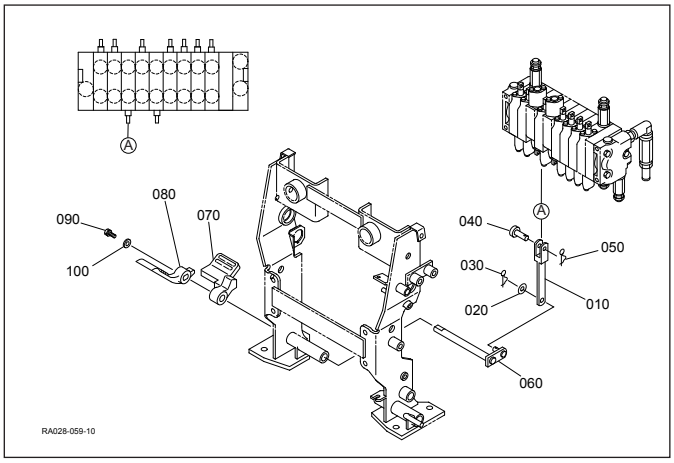
①Dozer lever
②Rod

2) K008-3 KTC, KCL, KTA version

	Unit	K008-3	Remarks
Track frame	kg lbs	32 14.5	Side (left)
	kg lbs	32 14.5	Side (right)
	kg lbs	47 21.3	Center
Swivel frame	kg lbs	82 37.2	
Boom	kg lbs	70 18.1	
Arm	kg lbs	17 7.7	
Bucket	kg lbs	16 7.3	
Dozer	kg lbs	30 13.6	
Weight (rear)	kg lbs	74 33.6	
Weight (left)	kg lbs	29 13.2	
Weight (right)	kg lbs	28 12.7	
Gear pump	kg lbs	4 1.8	
Control valve	kg lbs	12 5.4	
Swivel motor	kg lbs	8 3.6	
Travel motor	kg lbs	20 9.1	
Swivel bearing	kg lbs	15 6.8	
Swing bracket	kg lbs	13 5.9	
Oil tank	kg lbs	13 5.9	
Swivel joint assy	kg lbs	4 1.8	
Bonnet	kg lbs		
Rubber crawler	kg lbs	30 13.6	
Sprocket	kg lbs	4 1.8	
Idler assy	kg lbs	8 3.6	
Boom cylinder	kg lbs	12 5.4	
Arm cylinder	kg lbs	9 4.1	

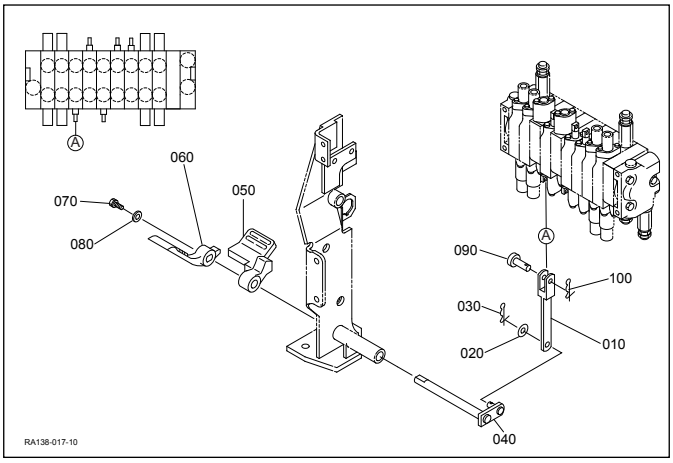
c. Swing pedal

K008-3

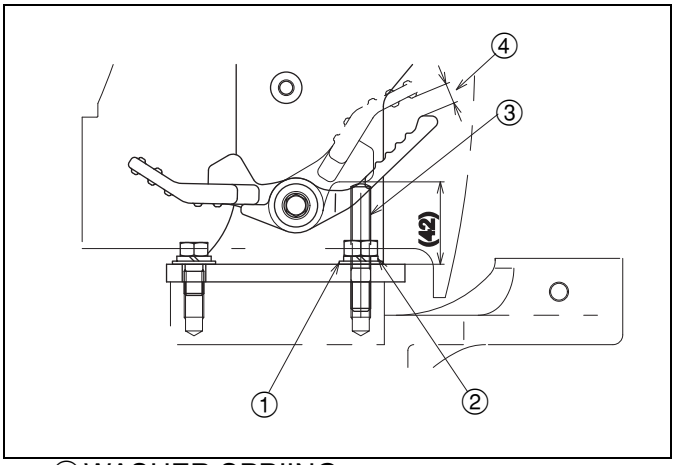


010	Link	060	Shaft, Swing
020	Washer, Plain	070	Pedal, Swing
030	Pin, Snap	080	Pedal, Swing
040	Pin, Joint	090	Bolt
050	Pin, Snap	100	Washer, Plain

U10-3



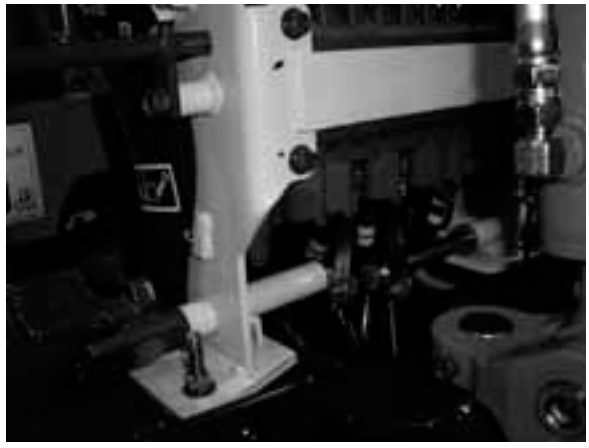
010	Link	060	Pedal, Swing
020	Washer, Plain	070	Bolt
030	Pin, Snap	080	Washer, Plain
040	Shaft, Swing	090	Pin, Joint
050	Pedal, Swing	100	Pin, Snap



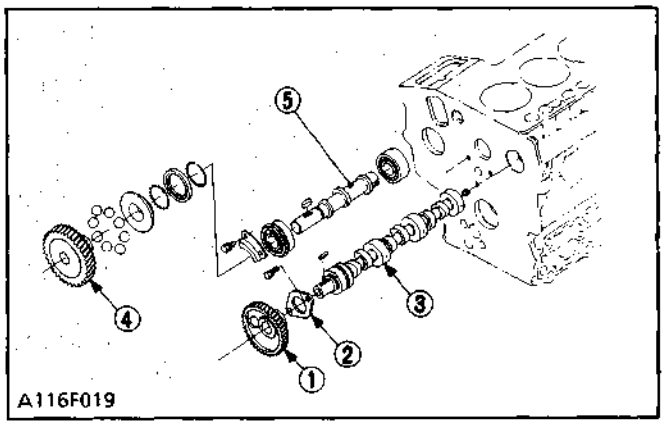
①WASHER SPPIING
②NUT
③Stud Bolt
④Provide clearance of 5 ~ 15 mm.

■ Assembly procedure

1) Adjust the stopper bolt length so that the swing spool stays neutral even when the swing 1 pedal is locked and stepped on.



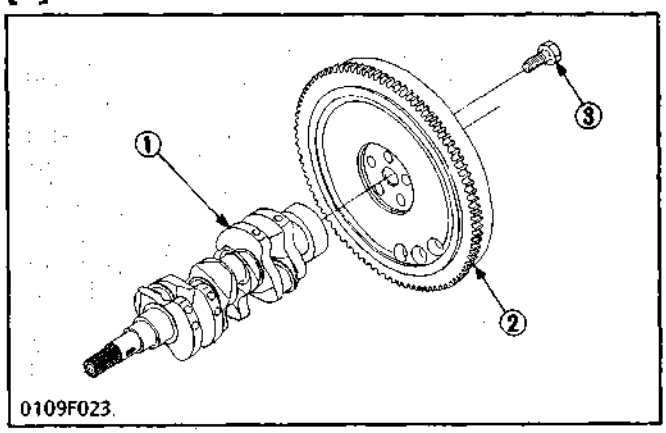
[6] CAMSHAFT



The camshaft (3) is made of special cast iron and the journal and cam sections are chilled to resist wear. The journal sections are force-lubricated. The fuel camshaft (5) controls the reciprocating movement of the injection pump. The fuel camshaft is made of carbon steel and the cam sections are quenched and tempered to provide greater wear resistance.

(1) Cam Gear
(2) Camshaft Stopper
(3) Camshaft
(4) Injection Pump Gear
(5) Fuel Camshaft

[7] FLYWHEEL



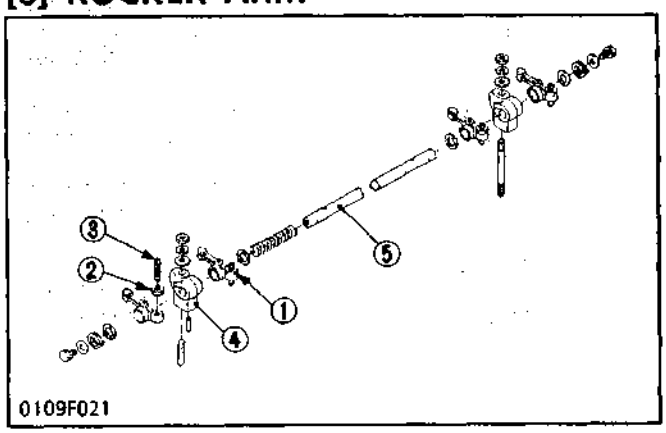
The flywheel stores the rotating force in the combustion stroke as inertial energy, reduces crankshaft rotating speed fluctuation and maintains the smooth rotating conditions.

The flywheel periphery is inscribed with the marks showing top dead center mark TC.

The flywheel has gear teeth around its outer rim, which mesh with the drive pinion of the starter.

(1) Crankshaft
(2) Flywheel
(3) Flywheel Screw

[8] ROCKER ARM

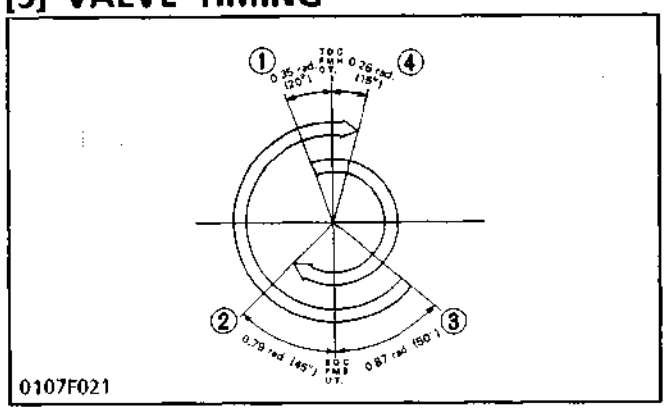


The rocker arm assembly includes the rocker arms (1), rocker arm brackets (4) and rocker arm shaft (5) and converts the reciprocating movement of the push rods to an open/close movement of the inlet and exhaust valves.

Lubricating oil is pressurized through the bracket to the rocker arm shaft, which serves as a fulcrum so that the rocker arm and the entire system are lubricated sufficiently.

(1) Rocker Arm
(2) Lock Nut
(3) Adjusting Screw
(4) Rocker Arm Bracket
(5) Rocker Arm Shaft

[9] VALVE TIMING

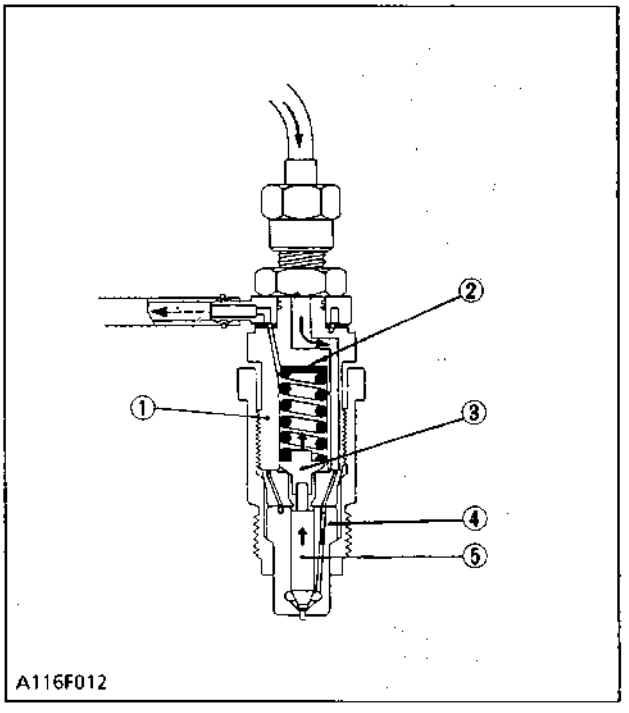


The timing for opening and closing the valve is extremely important to achieve effective air intake and sufficient gas exhaust.

The appropriate timing can be obtained by aligning the marks on the crank gear and the cam gear when assembling.

Inlet valve open ①	0.35 rad. (20°) before T.D.C.
Inlet valve close ②	0.79 rad. (45°) after B.D.C.
Exhaust valve open ③	0.87 rad. (50°) before B.D.C.
Exhaust valve close ④	0.26 rad. (15°) after T.D.C.

[5] INJECTION NOZZLE



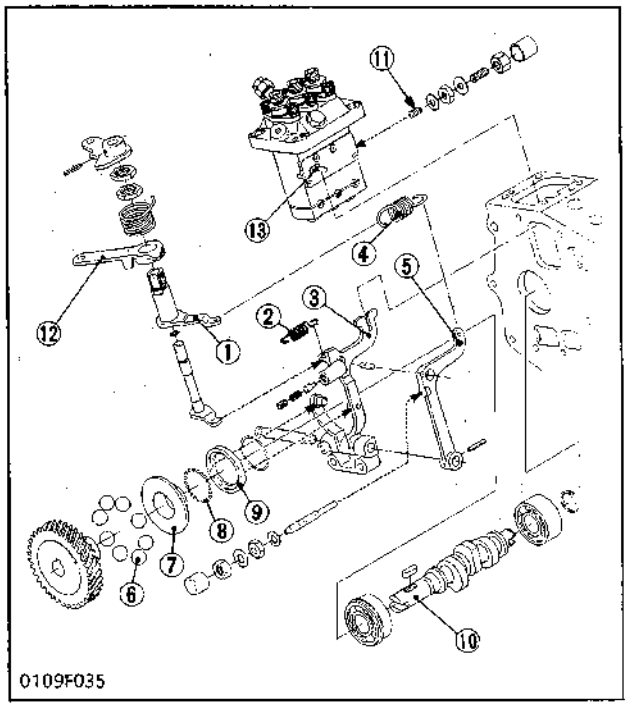
This nozzle is throttle-type. The needle valve (5) is pushed against the nozzle body (4) by the nozzle spring via the push rod (3). Fuel pressurized by the injection pump pushes the needle valve up and then is injected into the sub-combustion chamber.

Excessive flow passes from nozzle holder center through the eye joint and the fuel overflow pipe to the fuel tank.

The injection pressure is 13.73 to 14.71 MPa (140 to 150 kgf/cm^2, 1991 to 2133 psi), and is adjusted with adjusting washers (2).

(1) Nozzle Holder Body
(2) Adjusting Washer
(3) Push Rod
(4) Nozzle Body
(5) Needle Valve

[6] GOVERNOR



(1) Governor Lever
(2) Start Spring
(3) Fork Lever 1
(4) Governor Spring
(5) Fork Lever 2
(6) Steel Ball
(7) Governor Sleeve
(8) Steel Ball
(9) Governor Ball Case
(10) Fuel Camshaft
(11) Idling Ajust Spring
(12) Speed Control Lever
(13) Control Rod

The governor controls the amount of the fuel to be fed in the entire speed range to prevent the engine from changing its speed according to the load.

The fork lever 1 (3) is held where two forces on it are balanced. One is the force that fork lever 2 pushes, which is caused by the tension of the governor spring (4) between the governor lever (1) and fork lever 2 (5). Another is the component of the centrifugal force produced by the steel balls (6) which are rotated by the fuel camshaft (10).

■ At start

The steel ball (6) has no centrifugal force.

Fork lever 1 (3) is pulled by the start spring (2) and the control rod (13) moves to the maximum injection position for easy starting.

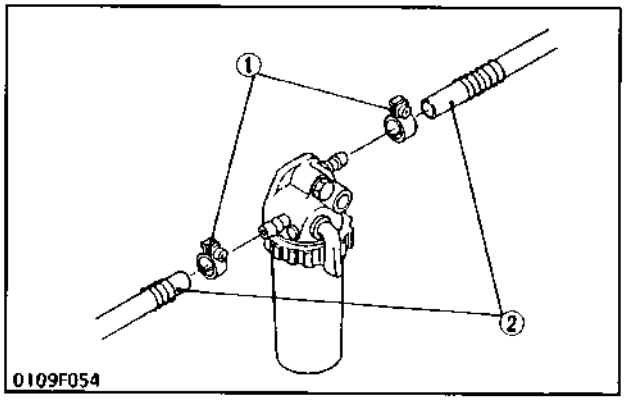
■ At idling

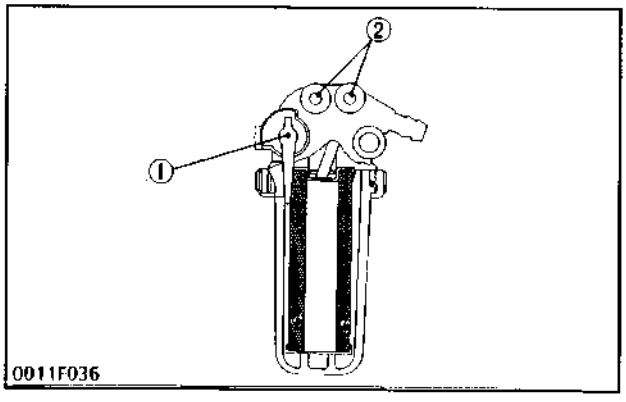
When the speed control lever (12) is set at the idling position, the governor spring (4) is pulled slightly.

As the camshaft rotates, the steel ball (6) increase their centrifugal force and push the governor sleeve (7). Fork lever 1 (3) pushed by the governor sleeve, pushes the control rod (13) and the control rod compresses the idling adjust spring (11).

The control rod is kept at a position where the centrifugal force is balanced with the spring tensions on the control rod, providing stable idling.

(2) Check Point of Every 50 hours





Checking Fuel Pipe

1. If the clamp (1) is loose, apply oil to the threads and securely retighten it.
2. The fuel pipe (2) is made of rubber and ages regardless of the period of service.
   Change the fuel pipe together with the clamp every two years.
3. However, if the fuel pipe and clamp are found to be damaged or deteriorate earlier than two years, then change or remedy.
4. After the fuel pipe and the clamp have been changed, bleed the fuel system.

⚠ CAUTION

- **Stop the engine when attempting the check and change prescribed above.**

(1) Clamp
(2) Fuel Pipe

(When bleeding fuel system)

1 Fill the fuel tank with fuel, and open the fuel cock (1).
2. Loosen the air vent plug (2) of the fuel filter a few turns.
3. Screw back the plug when bubbles do not come up any more.
4. Open the air vent cock on top of the fuel injection pump.
5. Retighten the plug when bubbles do not come up any more.

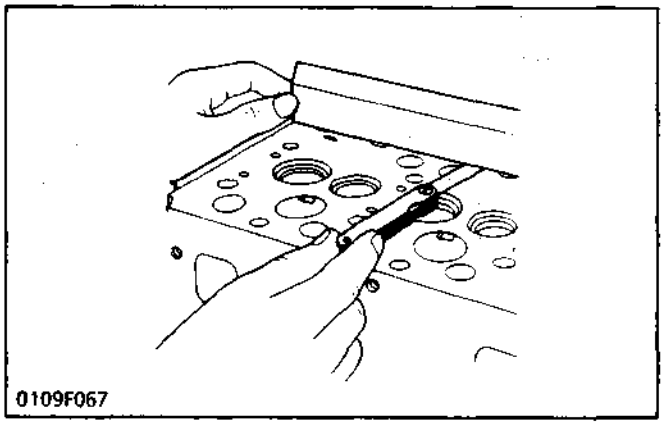
■ NOTE

- **Always keep the air vent plug on the fuel injection pump closed except when air is vented, or it may cause the engine to stop.**

(1) Fuel Cock
(2) Air Vent Plug

SERVICING

[1] CYLINDER HEAD AND VALVES


0109F067

Cylinder Head Surface Flatness

1. Thoroughly clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal as shown in the figure.
3. Measure the clearance with a feeler gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

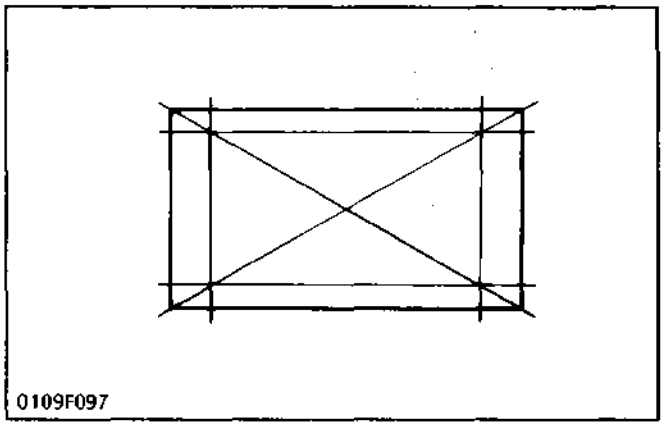
■ NOTE

- **Do not place the straightedge on the combustion chamber.**

■ IMPORTANT

- **Be sure to check the valve recessing after correcting.**

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.
Finishing	8 μR max ▽▽	8 (320) unit: μm (μin.)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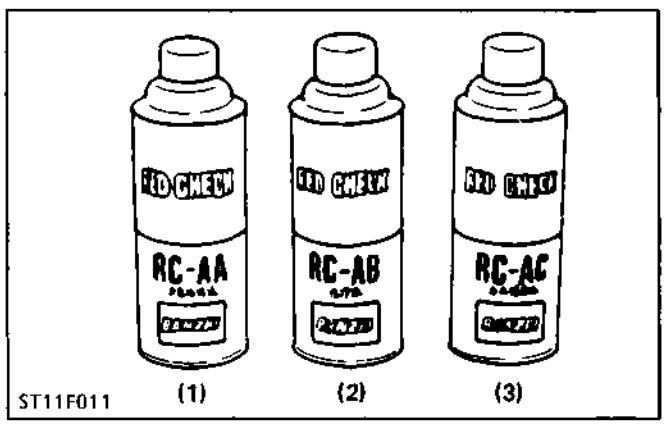


ST11F011

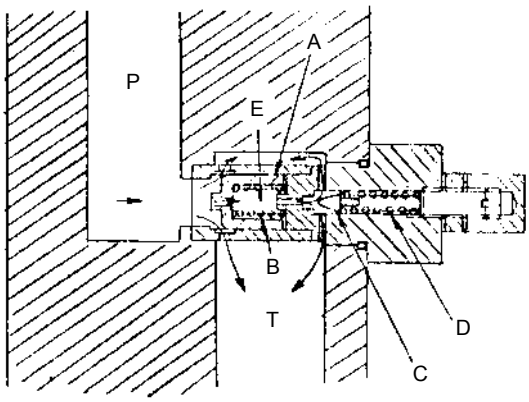
(1) Detergent
(2) Red Permeative Liquid
(3) White Developer

Cylinder Head Flaw

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with detergent (1).
3. Spray the cylinder head surface with the red permeative liquid (2).
   Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface with the detergent (2).
5. Spray the cylinder head surface with white developer (3).
   If flawed, it can be identified as red marks.

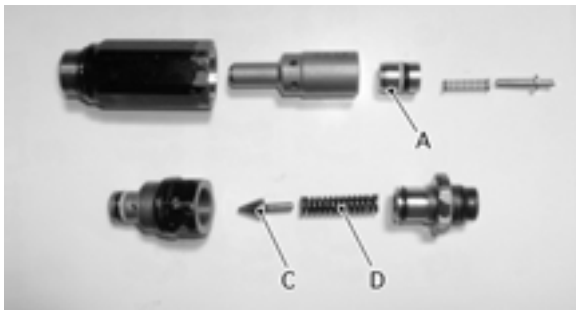
d. Structure and function

(1) Relief valve function



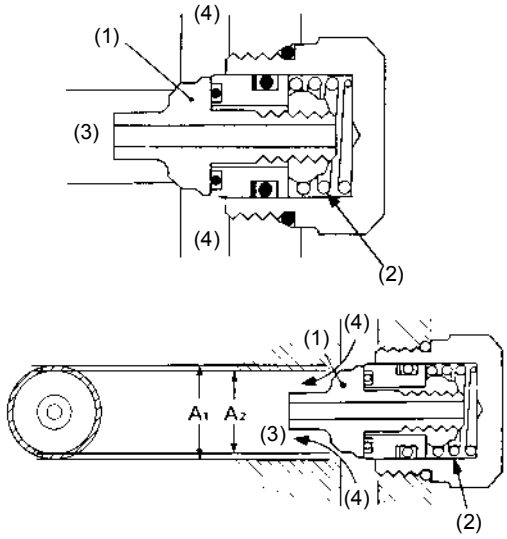
(Operating mechanism of the relief valve)
The higher the working load rises, the higher the circuit pressure goes up. At a preset pressure level, however, the relief valve gets activated. When the sircuit pressure has reached the setting of the pilot valve spring (D), the oil flows through the orifice of the main poppet (A) into the main poppet spring chamber (E). This pushes up the pilot poppet (C) and lets the oil flow into the tank. Now a pressure difference takes place across the orifice of the main poppet (A), and the main poppet (A) gets released the seat. In this way, the pressure oil starts flowing out of the circuit to the tank, which keeps the circuit pressure at a preset level.

Inner parts, relief valve



Check point
(1) To seeif the relief valve itself is in trouble, replace it with new one of the same pressure level and check for similar sympom.
(2) The relief valve malfunctions probably due to foreign matters that are caught in between the poppet (A to C) and the seat. Carefully check these parts for dust, metal chippings and the like. Check also the seat for dents and repair it as required.
(3) Check the springs for looseness and the seals for degrading.

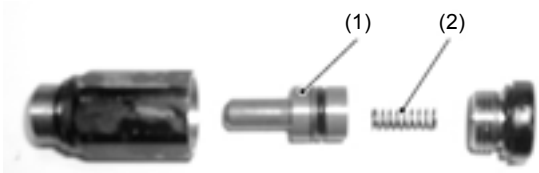
(2) Anti cavitations valve function



If the pressure (3) at the cylinder causes cavitation, the anti-void valve opens itself, feeding the oil from the tank and filling the space.

(1) The cylinder port pressure (3) is applied over the large area at the back of the O-ring, which activates the poppet (3) and its seat.
(2) When the pressure (3) drops below the atmosphiric pressure, the tank pressure (4) applies upon the circular area between A1 and A2. This pressure will overcome the cylinder port pressure and the force of the spring (2), thereby opening the poppet (1).
(3) With the space full of oil, the spring forces back the poppet and the cylinder port presure (3) works tightly upon the seat.

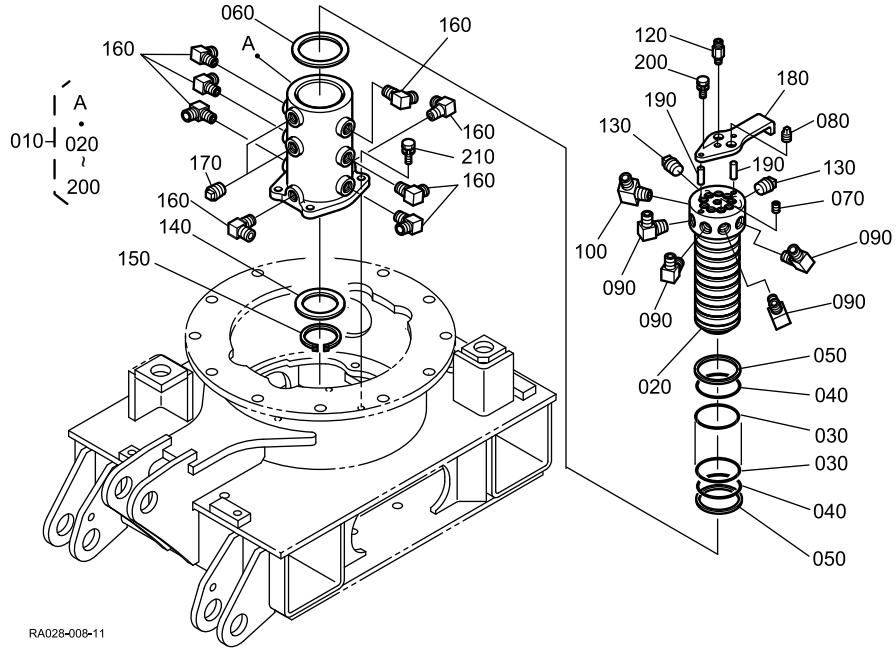
Inner parts, anti-void valve



Check point
(1) Check the poppet seat for scratches, the spring for looseness and the seals for degrading.

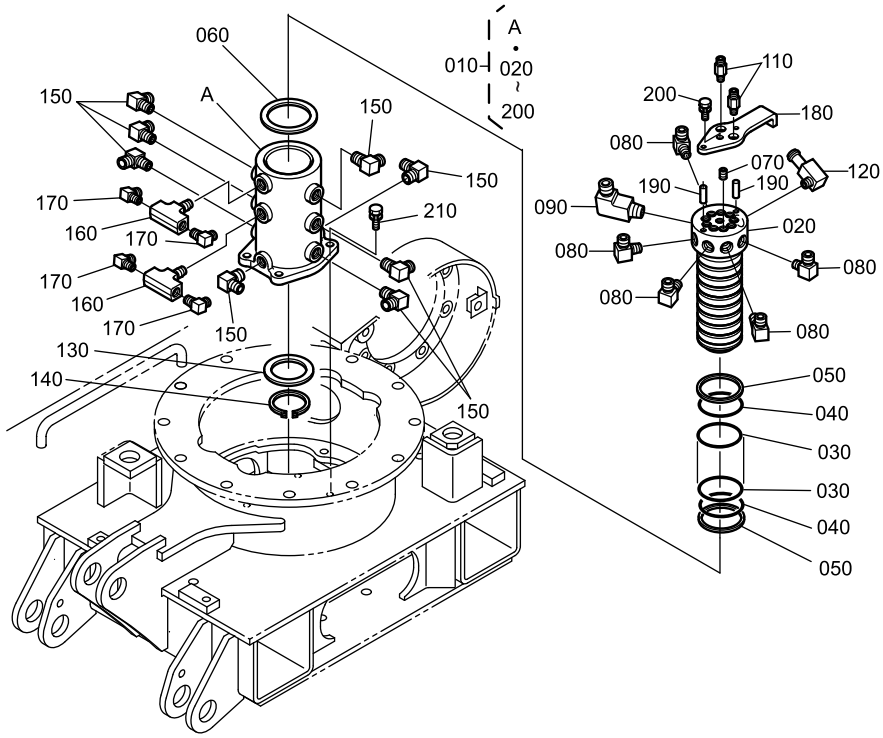
G.Rotary joint (Swivel Joint)

K008-3 Single speed travel (Retractable track)



No.	Part Name.	Q'ty
010	Assy joint, Swivel	1
020	Shaft, Swivel joint	1
030	O-ring	8
040	O-ring	2
050	Rng, Backup	2
060	Collar	1
070	Plug	7
080	Plug	1
090	Joint	4
100	Joint, Pipe	1
110	brank	-
120	Joint	1
130	Plug	2
140	Collar	1
150	Circlip, External	1
160	Joint	8
170	Plug	2
180	Stopper	1
190	Pin, Straight	2
200	Bolt	1
210	Bolt	4

K008-3 Two speed travel (Retractable track)



No.	Part Name.	Q'ty
010	Assy joint, Swivel	1
020	Shaft, Swivel joint	1
030	O-ring	8
040	O-ring	2
050	Rng, Backup	2
060	Collar	1
070	Plug	7
080	Joint	5
090	Joint, Pipe	1
100	brank	-
110	Joint	2
120	Joint, Pipe	1
130	Collar	1
140	Circlip, External	1
150	Joint	8
160	Joint	2
170	Joint	4
180	Stopper	1
190	Pin, Straight	2
200	Bolt	1
210	Bolt	4

		Unit	K008-3	U10-3	Remarks
P p	Actual measured value	MPa kgf/cm^2 psi	-	3.4 35 -	
	Operating part		-		
	Independent set pressure	MPa kgf/cm^2 psi	-	3.4 35 -	
	Secondary pressure	MPa kgf/cm^2 psi	-	2.2 22.5 -	
Overload relief valve					
Boom rod/Bottom		MPa kgf/cm^2 psi	-	-	
Arm rod/Bottom		MPa kgf/cm^2 psi	-	-	
Dozer rod/Bottom		MPa kgf/cm^2 psi	-	-	
Swivel system		MPa kgf/cm^2 psi	6.9 70 996	6.9 70 -	
Bucket rod/Bottom		MPa kgf/cm^2 psi	-	-	

Photo 7-1

Photo 7-2

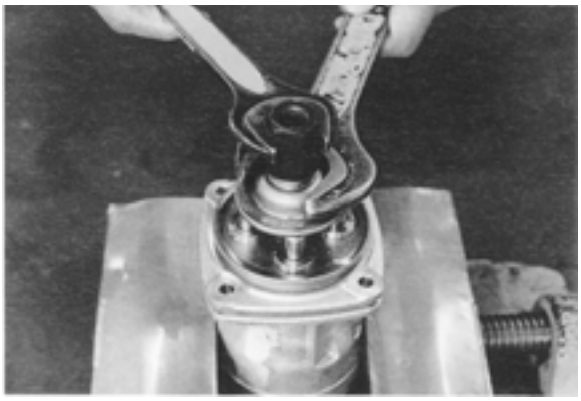


Photo 7-3

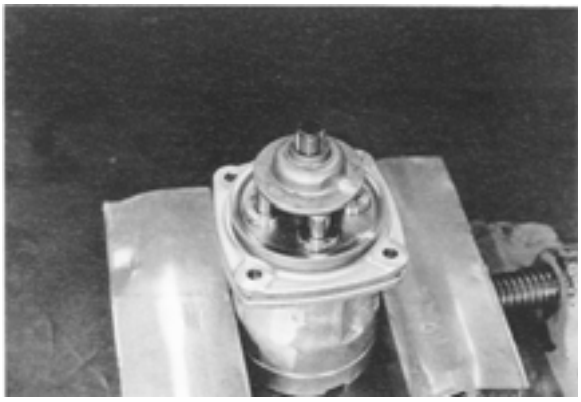


Photo 7-4

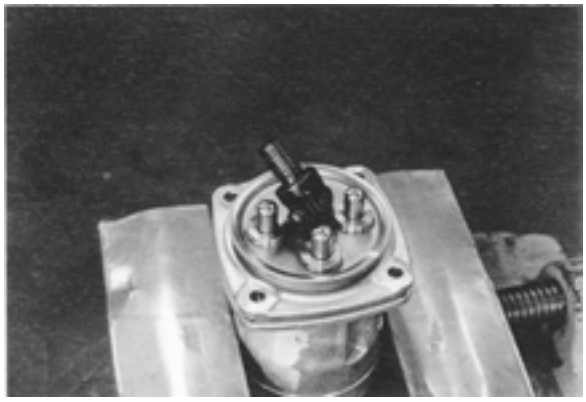
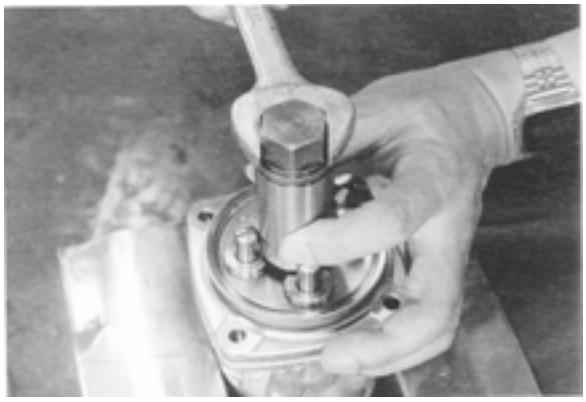
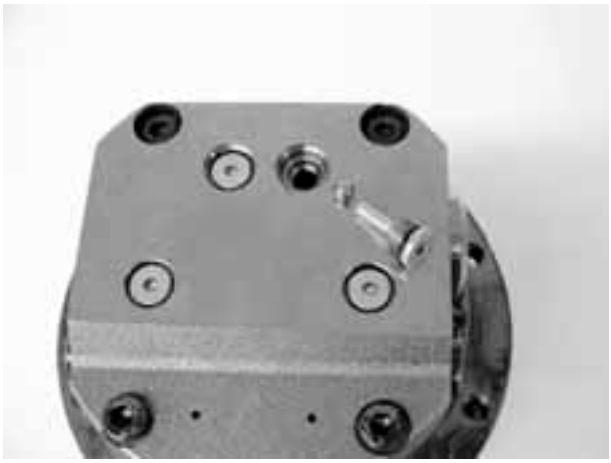


Photo 7-5

Photo 7-6



15) Remove the plug (V19), and then remove the pilot poppet (V20), spring (V21) and orifice plate (V23). Use care not to confuse right and left combination of the pilot poppets.
This procedure is not needed for TRBF (1-speed motor).



16) Remove the check plug (V16) and take out the ball (V18).

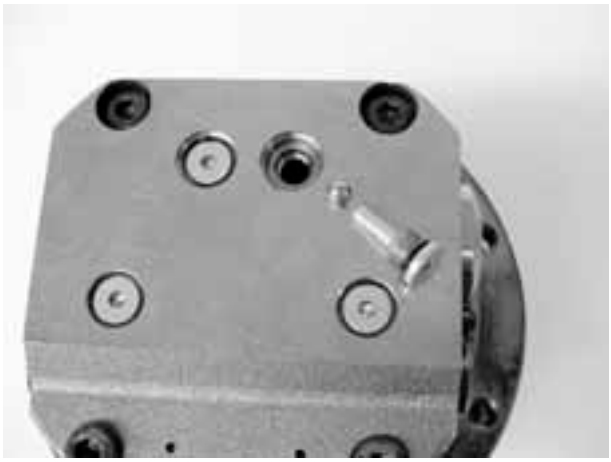
48.1 ~ 55.9 N·m (4.9 ~ 5.7 kgf·m)

[7] Motor assembly procedure

Assembly procedure

[Cautions]

1. Remove dents, scratches, burrs, etc. from parts.
2. Wash parts clean. Remove loctite sticking to the threaded holes by tapping tool and degrease parts completely with trichloroethylene.S
3. When re-assembling the motor, replace oil seals, O-rings etc. with new ones.



1) Put in the ball (V18) and tighten the check plug (V16) with specified tightening torque.
   • Tightening torque: 0.8 kgf·m