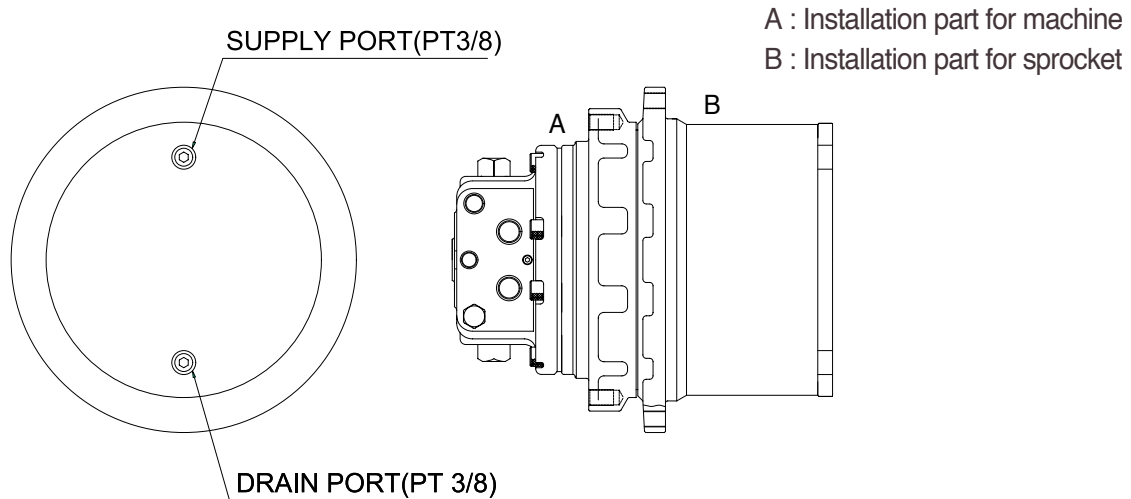


GROUP 4 TRAVEL MOTOR

A. TRAVEL MOTOR (GM09VL, UP TO #0698)

1. PRECAUTIONS FOR OPERATION

1) METHOD OF INSTALLATION



R55NN7TM01-1

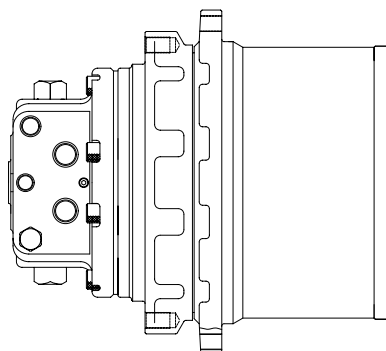
· Tightening torque for installation bolt

	Quantity	Dimension	Tightening torque
Installation bolt for machine	12	M16 (P2.0)	25.7 ± 4.0 kg · m
Installation bolt for sprocket	12	M14 (P2.0)	16.6 ± 2.5 kg · m

2) CHANGE OF GEAR OIL

- (1) Make oil filling port and oil drain port be vertical position on horizontal place.
- (2) Change oil after loosening both port plug and draining gear oil.
For supplement, loosen the plug of oil filling port.
- (3) Fill amount of gear oil at oil filling port until oil is overflowed.
- (4) Wash the plug and reinstall it with sealing tape.

- Oil capacity : Each 0.45 U.S.gal
- Service interval : Every 1000 hr (Initial service : 500 hr)



R55NN7TM01-2

2. TOOLS FOR DISASSEMBLY AND ASSEMBLY

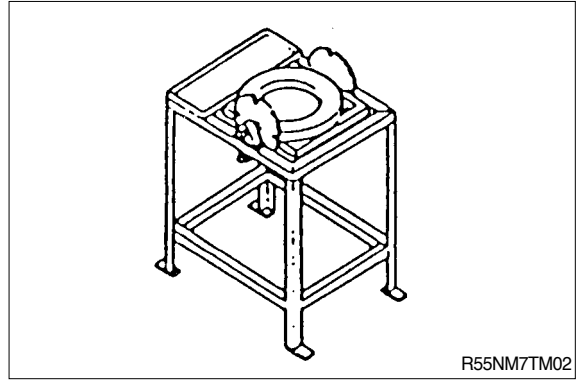
1) STANDARD TOOLS

Serial No. of applied item (See page 2-23, 24 in this manual)	Tool name	Size & type	Quantity (EA)
126,143,121,152,33	Torque wrench	Dial type, #1800	1
19,124	Torque wrench	Dial type, #5600	1
152	Hexagon wrench	Nominal 6 mm	1
33,143	Hexagon wrench	Nominal 8 mm	1
126	Hexagon wrench	Nominal 10 mm	1
33,143	Hexagon socket	Nominal 8 mm	1
126	Hexagon socket	Nominal 10 mm	1
19	Hexagon socket	Nominal 27 mm	1
124	Socket, Adapter	Nominal 36 mm	1
19	Extension bar	Nominal 27 mm	1
1,11,21,132,165	Hand hammer	Nominal 12 mm	1
8,10,102,112	Plastic hammer	79.25 U.S.gal	1
24,25	Snap ring plier	For shaft	1
20,145	Snap ring plier	For hole	1
1	Center punch	Ø 9.5 x 100	1
21	Pin punch	Ø 4 x 100	1
For washing	Washing brush		1
For washing	Wire washing brush		1
For washing	Paint marker	White color	1
17	Metal net gasket		2
149	Leather gloves		1 Pair
11	Vinyl sheets	500 x 500 x 1.0	1
For filling oil	Oil pot with handle		2
33	Sealing tape		1
21	Gear puller		1 Set
Hanger for 1,2	Shackle, wire rope		1 Set

2) TOOLS

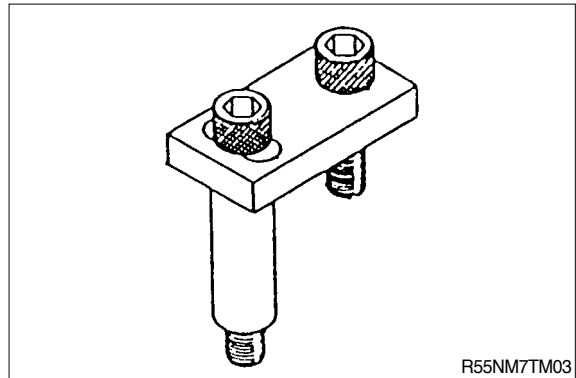
(1) Work table

This is used for safe assembly and disassembly of track motor.



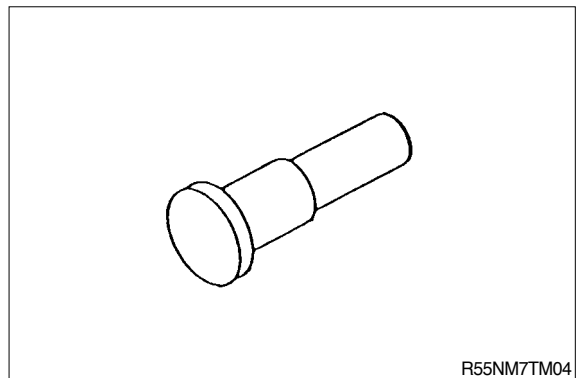
(2) Clamp

This is used for connecting hub and spindle together.



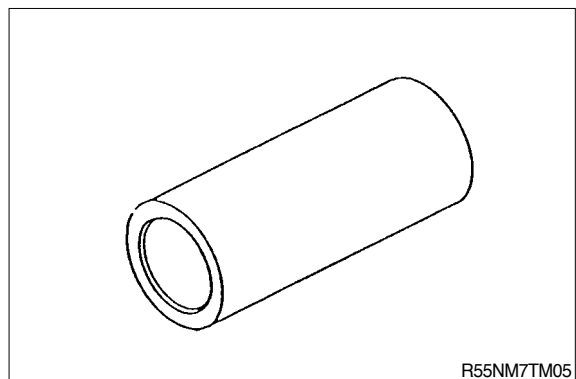
(3) Retainer (I)

This is used for installing coil spring (114), washer (110) and snap ring (145), used for removing coil spring (114) from cylinder block.



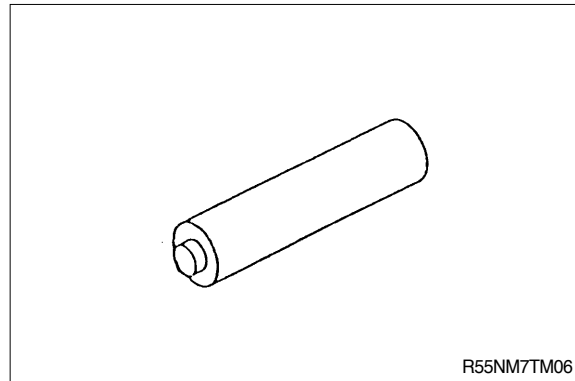
(4) Retainer (II)

This is used for removing ball bearing from shaft, used for pressing bearing.



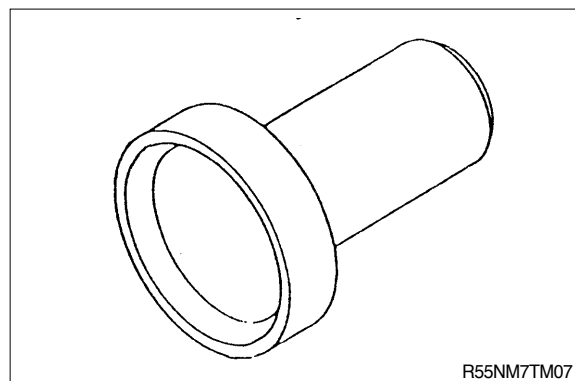
(5) Retainer (III)

This is used for installing oil seal in the hole of spindle.



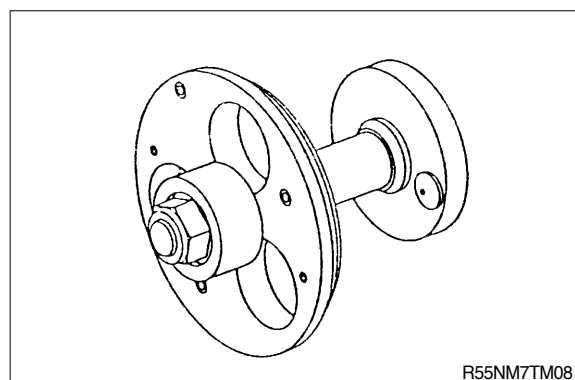
(6) Retainer (IV)

This is used for installing RV gear sub assembly in spindle.



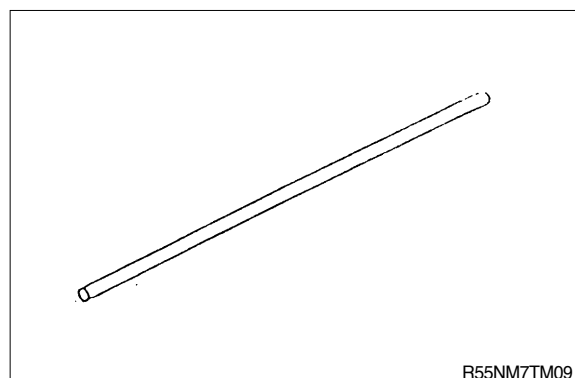
(7) Tool for adjusting bearing

This is used for adjusting an interval of shaft between flange and ball bearing when installing ball bearing in hub.



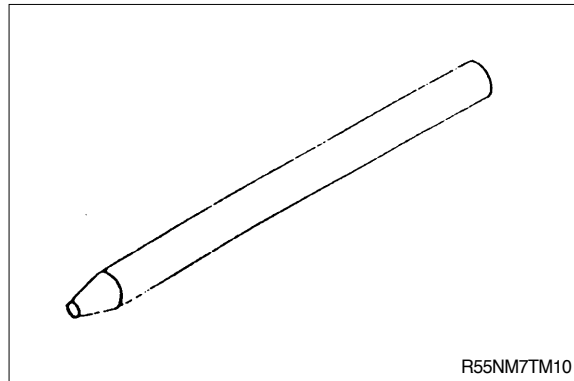
(8) Steel bar

This is used for removing ring from hub.



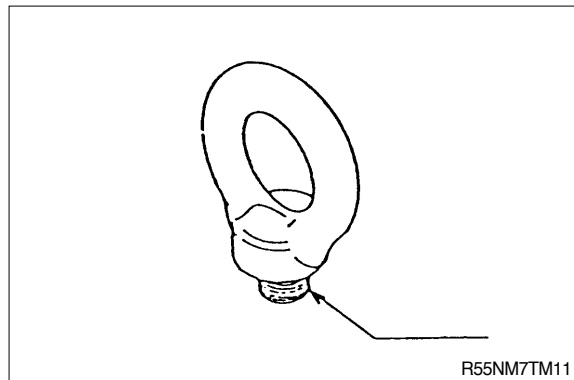
(9) Aluminum rod

This is used for removing oil seal from spindle.



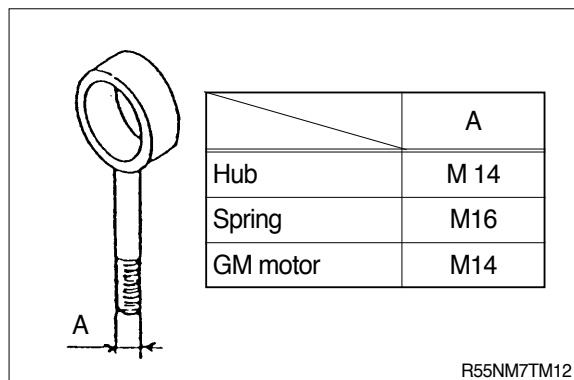
(10) PT eye bolt

This is used for lifting cover from hub by crane and wire rope..



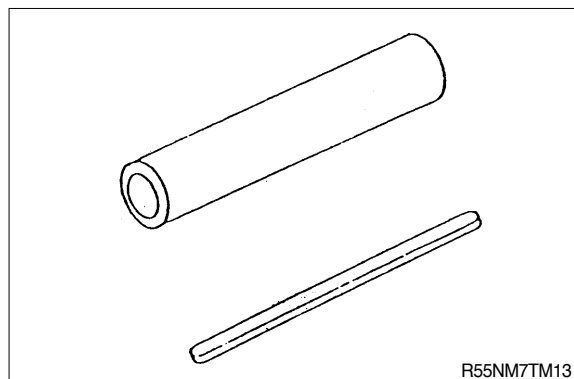
(11) Long eye bolt

This is used for lifting motor, spindle and hub.



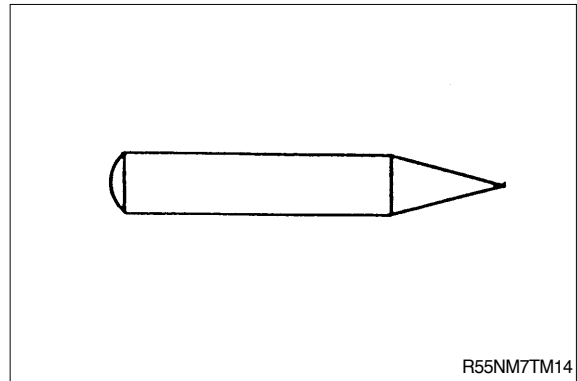
(12) Flat bar and steel pipe

This is used for removing inlet parts of ball bearing from spindle, used for removing timing belt from rear flange.



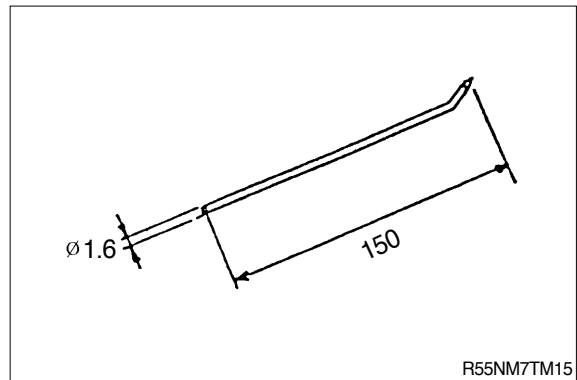
(13) Punch

This is used for removing ring from rear flange.



(14) Steel bar

This is used for removing ring from rear flange.



3) PREPARATIONS

Item No	Tool name	Description	Q'ty
For disassembling and assembling work	Standard work table		1
Motor and items to be washed	Washing sink	For initial washing and final washing	2
104, 149	Press machine	Capacity : 200 kgf	1
149	Heating vessel	Capacity : 500 × 500 × 500 Heating temperature : 100 ℃ more	1
1	Electric drill	Hand drilling machine, Ø5	1
1	Drill	Diameter : 2mm	1
Motor	Crane		1
3	Lathe		1
	Grinder		1
Items to be dried	Compressed air	3 - 5 kgf/cm ²	1

4) TOOLS FOR ADJUSTING

Item No	Name	Size	Q'ty
20 (For adjusting thickness of snap ring)	Gauge for adjusting thickness	Adjustment range : 0.04 ~ 0.3mm	2
20 (For adjusting thickness of snap ring)	Micrometer for adjusting outside	Adjustment range : 0 ~ 25mm Minimum scale : 0.01	1
21 (For adjusting pre-pressure of snap ring)	Micrometer for adjusting depth	Adjustment range : 0 ~ 25mm Minimum scale : 0.01	1

5) TIGHTENING TORQUE

Item No	Name	Size	Contact width (mm)	Tightening torque (kgf · cm)
19	Rimmer bolt	M20 P2.5	22	4200
33	Socket plug	PT 3/8	8	400
124	Plug	M30 P1.5	36	3600
126	Plug	M24 P1.5	20	1300
143	Socket bolt	M10 P1.5	8	590
146	Socket bolt	PT 1/8	3	125
121	Plug	M20	26	600
152	Socket plug	PT 1/4	6	300
160	Plug	M30 P1.5	36	3600
170	Socket plug	P1.25	6	300

6) WEIGHT TABLE

Item No	Item description	Weight (kg)
Motor	Assembly	90
1	Hub	21.75
2	Spindle	26.65
101	Rear flange sub assembly	11.85

3. DISASSEMBLY

1) PREPARATION FOR DISASSEMBLY

- (1) Prepare work table and work bench
 - Prepare useful work table
 - Prepare wide and robust work bench that parts don't move under working
- (2) Preparation of tool and matters
 - Prepare standard tool and matters for work

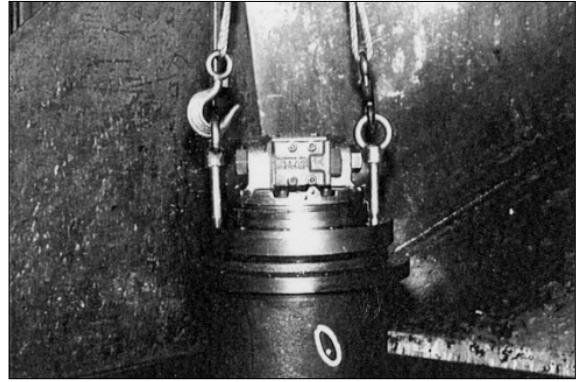
2) GENERAL PRECAUTIONS

- (1) Read this manual thoroughly before disassemble motor
- (2) Be care to deal with inlet parts of motor because they are precisely machined
- (3) Be care not to get rusty on the surface of disassembled parts

3) DISASSEMBLY

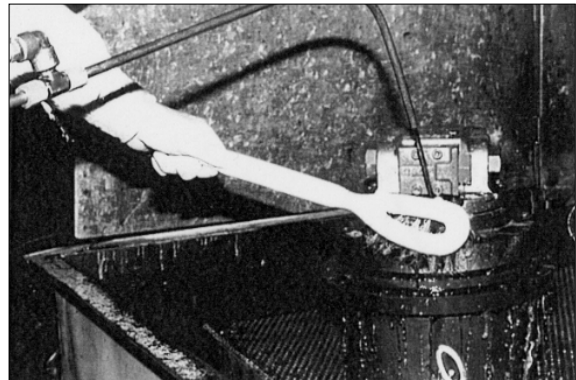
(1) Washing GM motor

Enclose oil port of rear flange.
Install 2(two) eye-bolts in the tapped holes of spindle so that they can be parallel each other.



R55NM7TM16

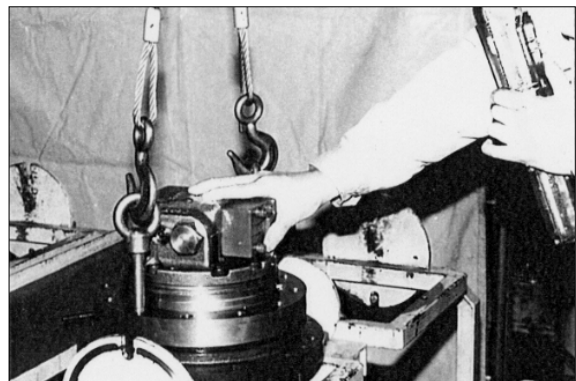
Wash each part of motor with brush when washing in the washing sink.
Remove matters between hub and spindle.



R55NM7TM17

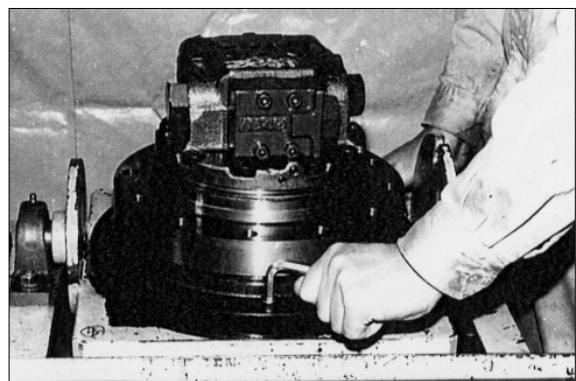
(2) Installation of motor

Install motor in work table.
Fit the bolt hole of hub to the hole of work table when installing motor in work table.



R55NM7TM18

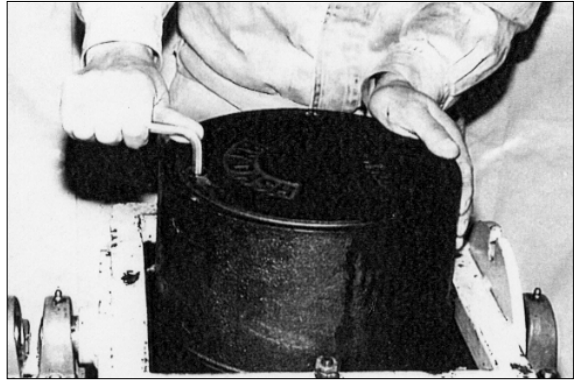
Tighten 2(two) socket bolt in order to connect motor to work table.



R55NM7TM19

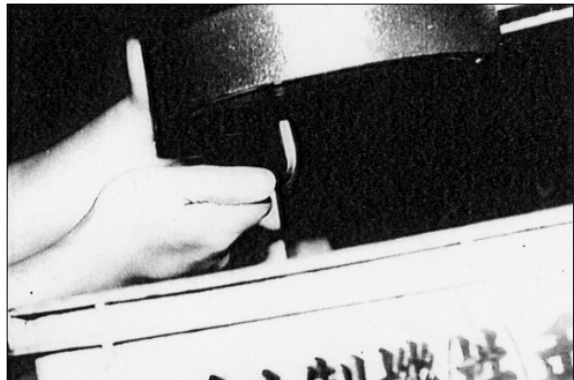
(3) Drain of gear oil

Turn the motor to be upper direction.
Loosen 3(three) plug with socket wrench.
At this time, leave 1-2 thread of plug in
the cover.



R55NM7TM20

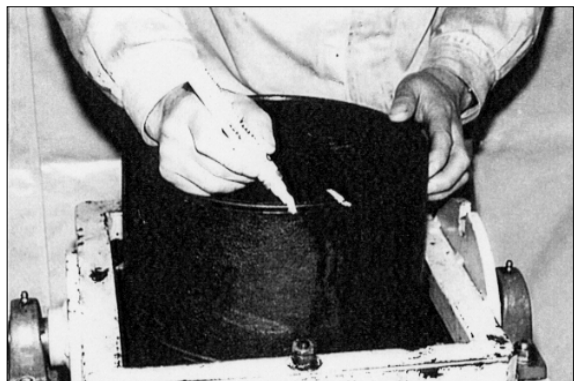
Turn the work table in order that rear
flange can be upper direction.
Remove 3(three) plug, put the vessel for
draining gear oil.



R55NM7TM21

(4) The removal of cover

Turn the work table in order that motor
cover can be upper direction.
Mark paint on contact point between hub
and cover in order to reassemble again.



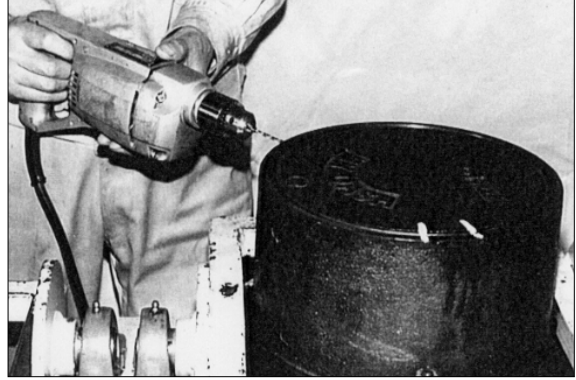
R55NM7TM22

Finding the split gap of ring, punch
marking for drilling at the point of inside
20mm from front edge of ring and 7mm
from end edge.



R55NM7TM23

Drill Ø2 hole at the punch marking by use of electric drilling machine.
Remove chip after piercing hub.



R55NM7TM24

Insert steel bar in the hole of drill, push it in order that ring can be rised on the cover.



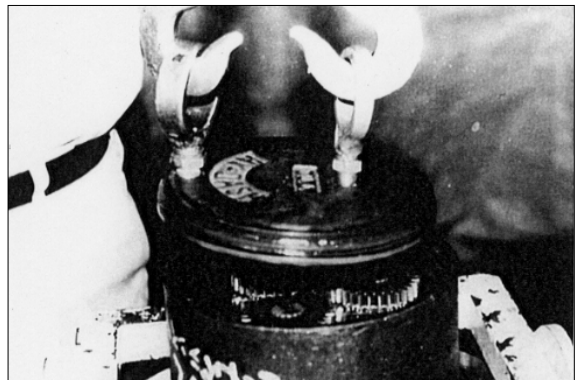
R55NM7TM25

After taking hold of edge of ring, remove the ring from groove.



R55NM7TM26

Tighten PT I type bolt in the hole of plug on the cover.
Remove the cover by use of crane.



R55NM7TM27

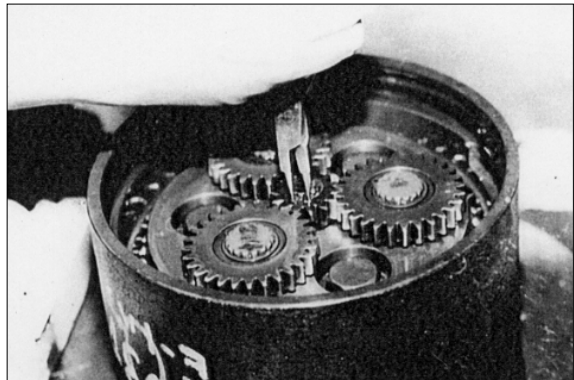
Remove O-ring from the cover.
Do not use the removed O-ring again.



R55NM7TM28

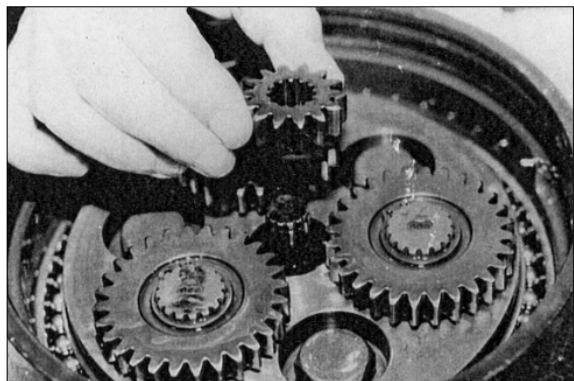
(5) Removal of input gear

Remove snap-ring from shaft.



R55NM7TM29

Remove input-gear from shaft.
Remove shaft from coupling.
Remove steel-ball from shaft.
Remove coupling from shaft.

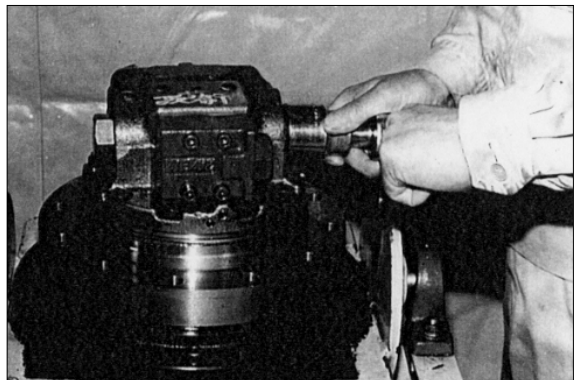


R55NM7TM30

(6) Removal of rear flange

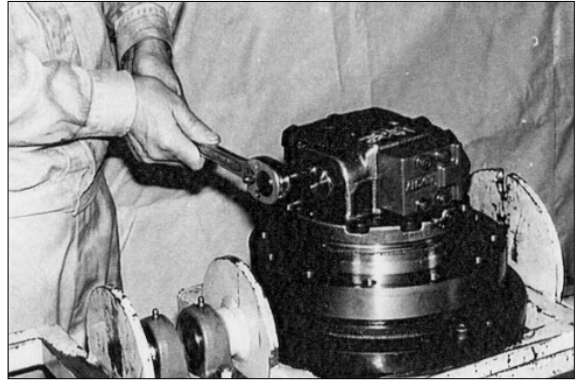
Turn the work table in order that rear flange can be upper direction.
Loosen right / left plug and plug.

This is only required for disassembling inlet parts of rear flange.



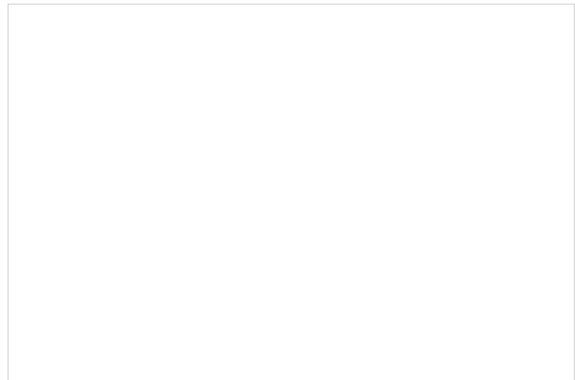
R55NM7TM31

Loosen right and left plug.
This is required disassembling the inlet
parts of rear flange.

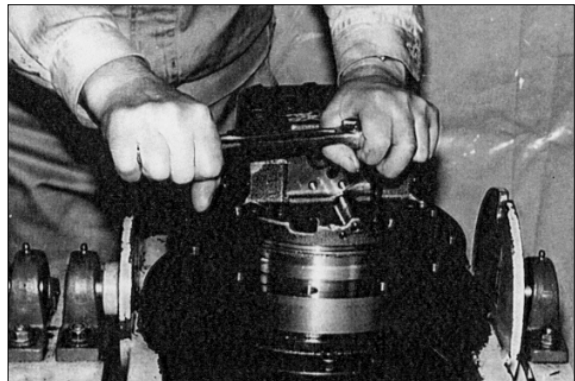


R55NM7TM32

Loosen socket bolt from rear flange, then
remove housing.
At this time, O-ring is removed with
housing.

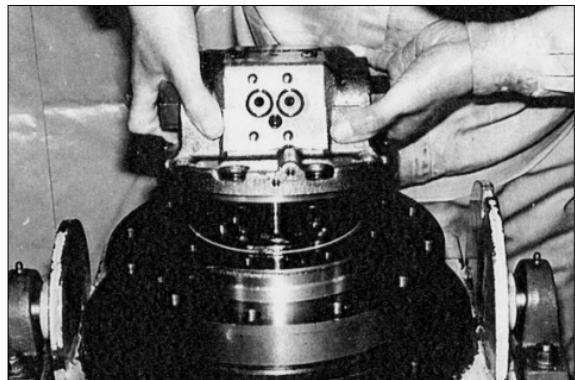


Loosen the socket bolt to protect the rear
flange from spindle.



R55NM7TM33

Loosen rear flange from spindle on the
cover.
Taking out rear flange, be care not to
damage the timing plate.



R55NM7TM34

Remove spring of parking brake.
Remove parallel pin from spindle.



R55NM7TM35

Remove O-ring from spindle.
Do not use it again.



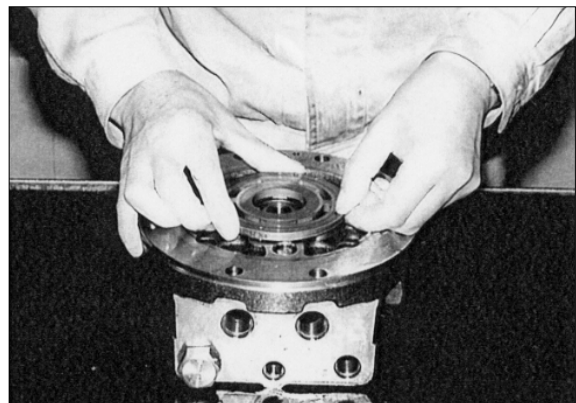
R55NM7TM36

(7) The removal of inlet parts from rear flange

Put the rear flange on the work table, at this time, let the inside of rear flange be upper direction.

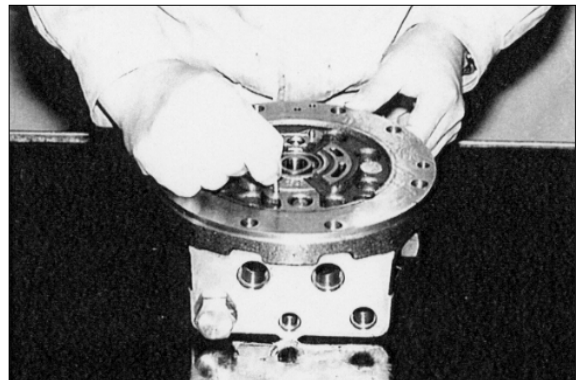
Remove timing plate from rear flange.

When it is difficult for the timing plate to be removed due to the adhesion of oil between rear flange and it, insert the plane bar in the groove of rear flange and then remove timing plate.



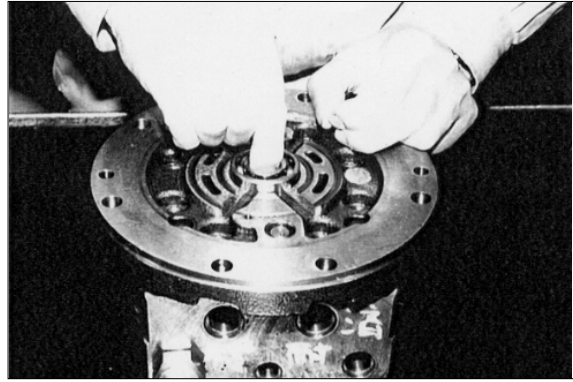
R55NM7TM37

Remove parallel pin from rear flange.



R55NM7TM38

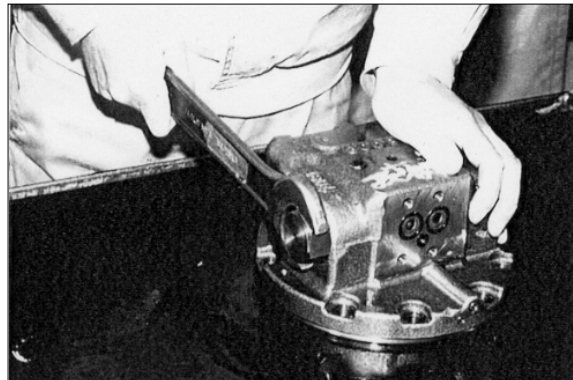
Remove ball bearing.



R55NM7TM39

(8) Removal of brake valve

Remove 2(two) plug from rear flange.



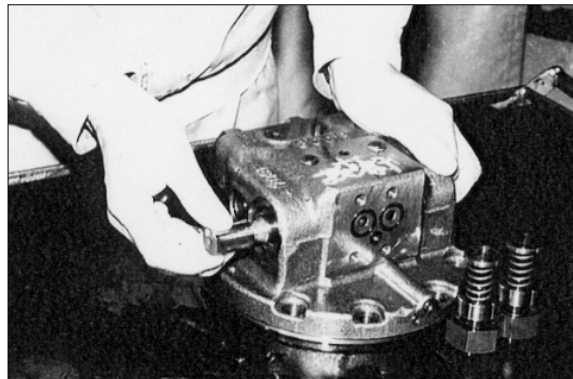
R55NM7TM40

Remove coil spring and stopper from rear flange.

Remove spool from rear flange.

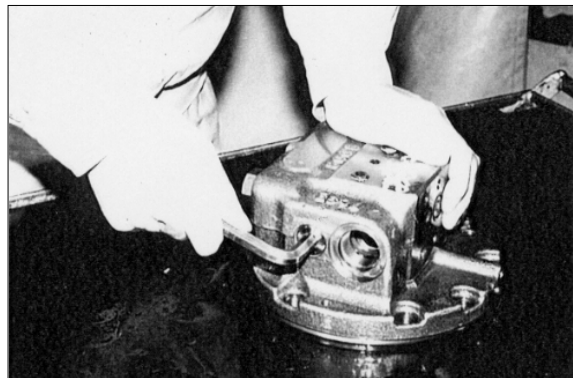
When removing spool, if spool shaft of rear flange is to the lower direction, spool become fall down.

Therefore, take hold of spool, then remove it again.



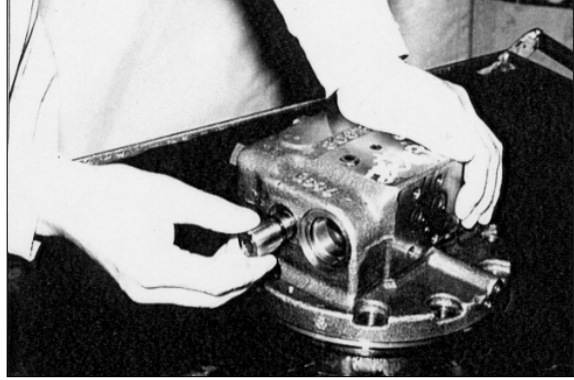
R55NM7TM41

Remove 2(two) plug from rear flange.



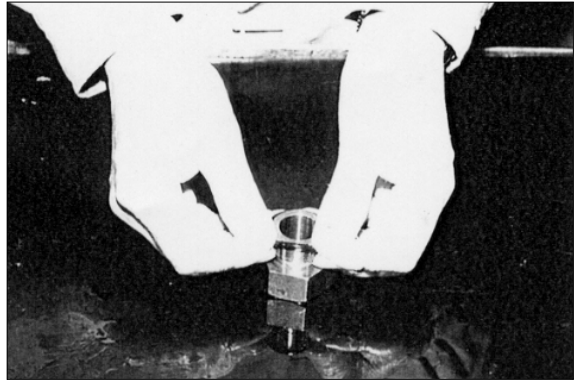
R55NM7TM42

After removing plug, remove spring and valve.



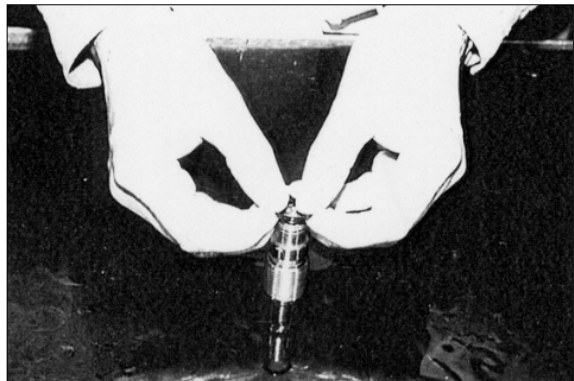
R55NM7TM43

Remove O-ring from plug.
Do not use it again.



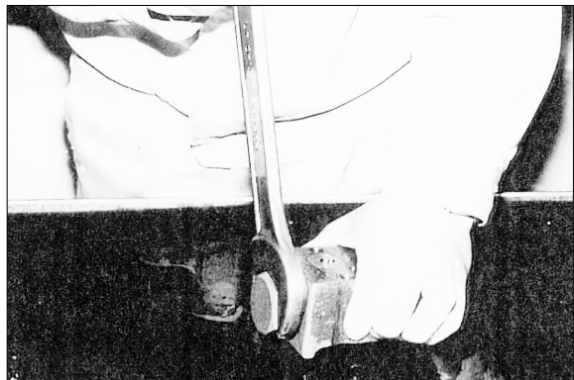
R55NM7TM44

Remove O-ring from plug.
Do not use it again.



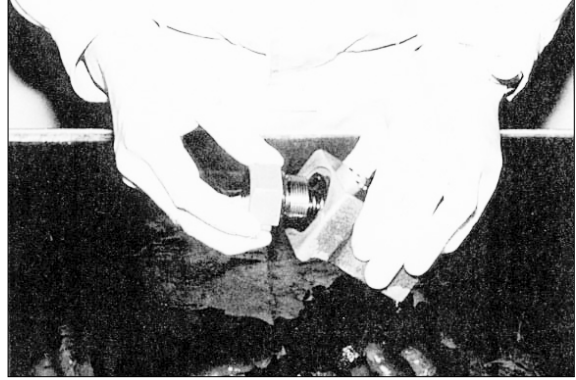
R55NM7TM45

(9) Disassembly of valve
Remove plug from housing.



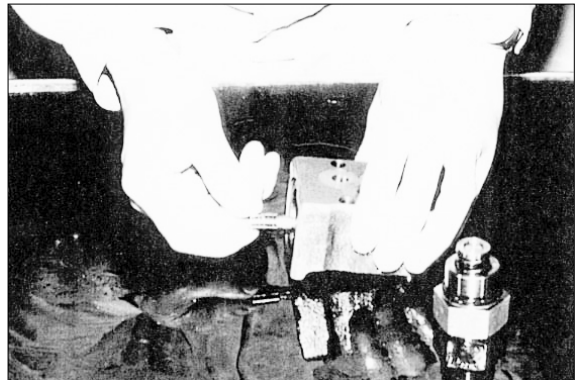
R55NM7TM200

Remove spring and stopper from housing.



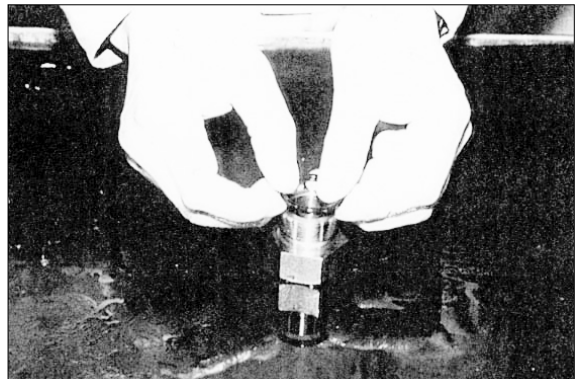
R55NM7TM201

Remove spool from housing.
Because housing and spool are composed of one set, if there is a damage in any part of them, replace it together.



R55NM7TM202

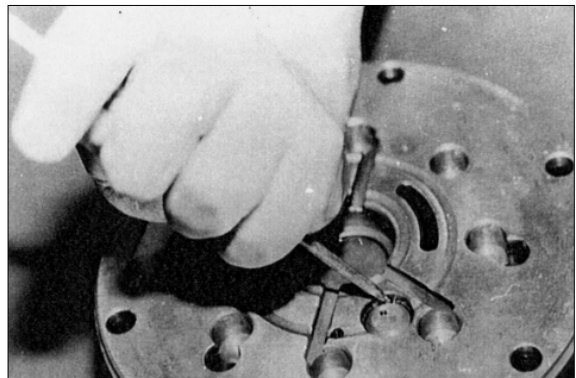
Remove O-ring from plug.
Do not use it again.



R55NM7TM203

(10) Disassembly of pilot valve

Apply a sharp-point punch at the notch of ring, hit a hammer on the punch to remove ring.

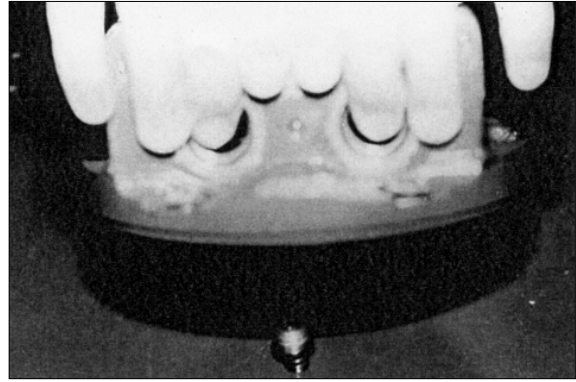


R55NM7TM46

After removing ring, lift rear flange and take the hole of that to the lower direction, then stopper, spring and valve are removed from rear flange. In spite of using the above method, if they were not removed, remove them by use of compressed air .

Do not use removed ring again.

Unless pilot valve is not replaced, don't remove ring.

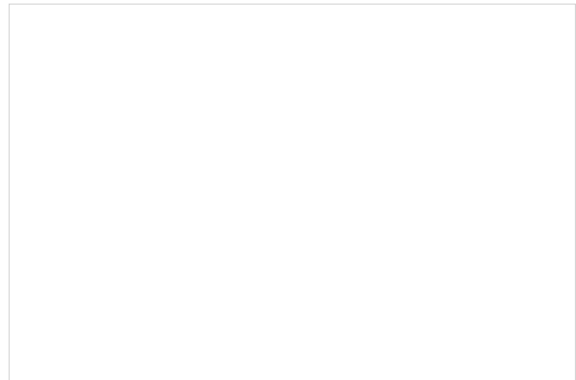


R55NM7TM47

(11) Disassembly of plug

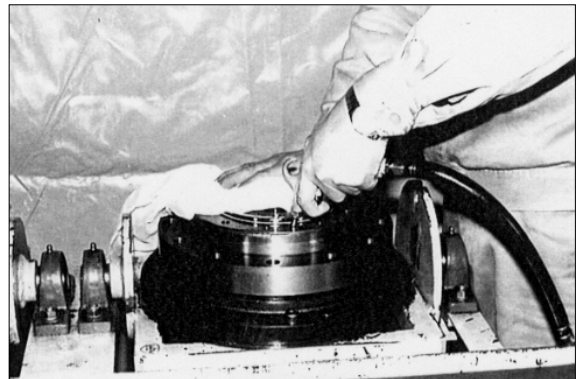
Do not disassemble plug except necessary case. If plug is closed by dust and etc, remove them by washing.

Be careful that steel sphere is not removed.



(12) Disassembly of parking brake

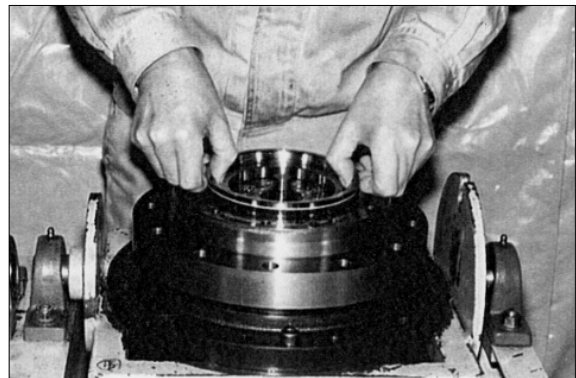
Remove piston by pouring compressed air into the hole parking brake, at this time, be care not to pouring air suddenly. For operator's safe, install cover for protector on piston.



R55NM7TM48

Remove O-ring from piston.

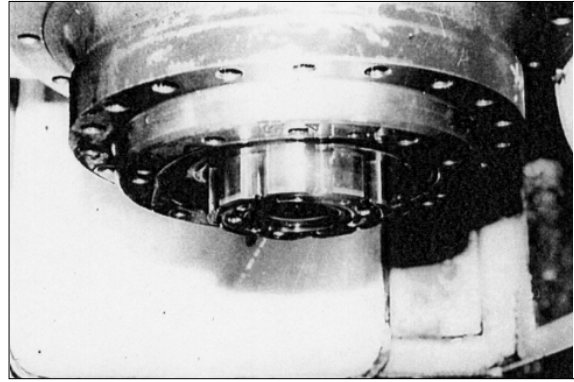
Do not use removed ring again.



R55NM7TM49

(13) Disassemble of hydraulic motor

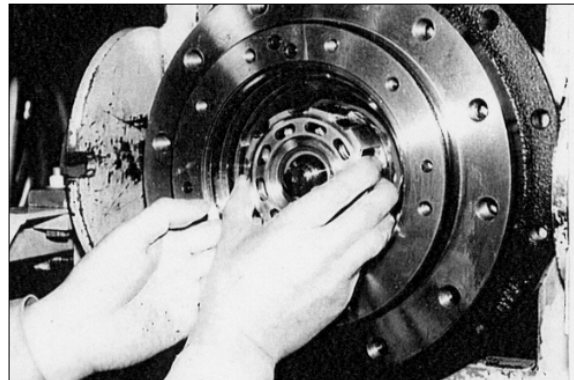
Turn the motor to 90 ° direction, drain hydraulic oil.



R55NM7TM50

Take hold of cylinder block, pull motor shaft slowly, then remove it.

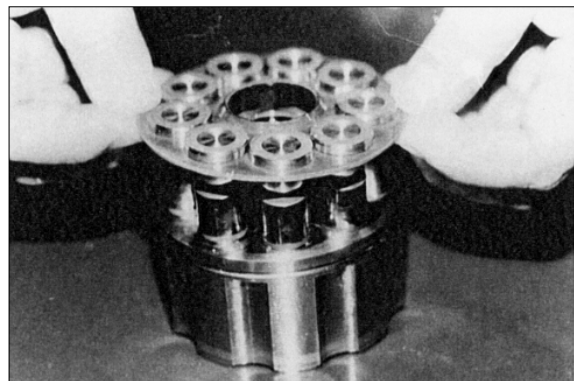
Before pull it, turn cylinder block 2-3 times in order that shoe is not removed from inside sliding edge of swash plate, then remove friction plate and other plate.



R55NM7TM51

Take hold of retainer plate by both hands, remove piston kit and retainer plate.

Because piston and shoe are not disassembled without a damage of any part among them, if replacement is required, replace them together.



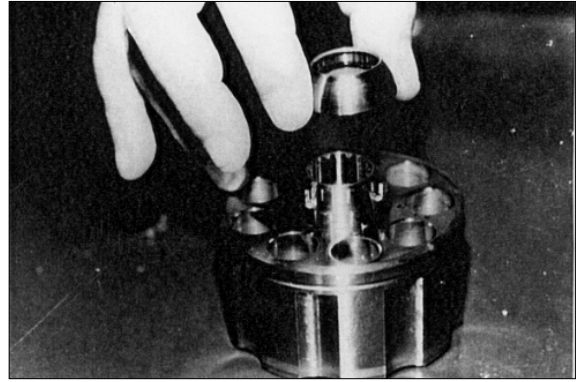
R55NM7TM52

Remove 9(nine) piston sub assembly from retainer plate.



R55NM7TM53

Remove thrust ball from cylinder block.



R55NM7TM54

Remove 3(three) parallel pin from cylinder block.



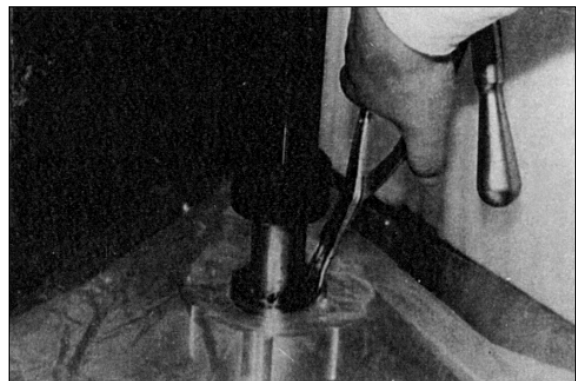
R55NM7TM55

(14) Removal of spring from cylinder block

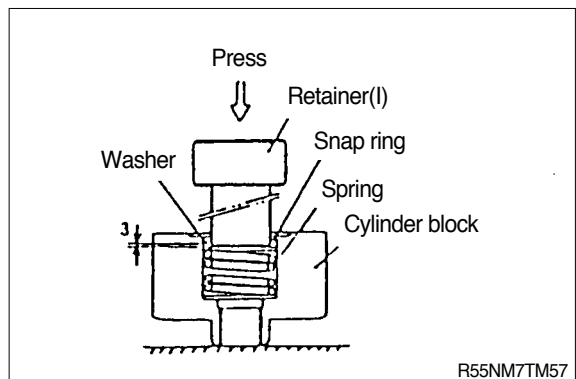
Put cylinder block on the press machine as shown on drawing.

Pressing retainer on washer, remove snap ring from cylinder block by snap ring pleyer.

- Before pressing spring, put cylinder block, retainer and presser absorber on a straight line to prevent a damage.
- To prevent a damage of cylinder block, envelop the surface of that with vinyl.

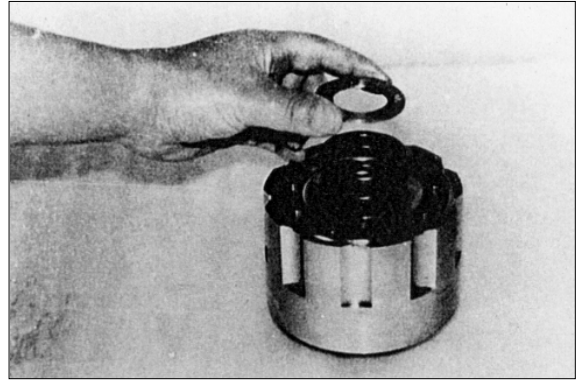


R55NM7TM56



R55NM7TM57

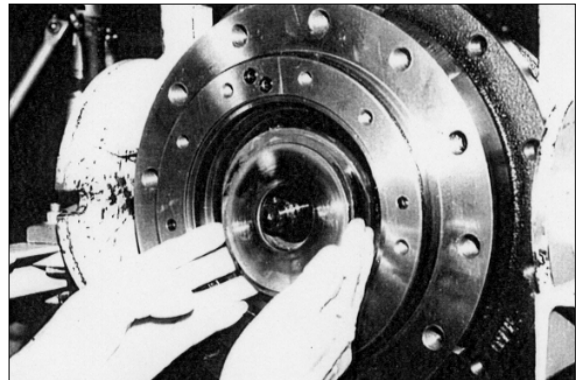
Remove snap-ring, washer, spring from cylinder block.



R55NM7TM58

(15) Removal of motor shaft

Remove swash plate from motor shaft.



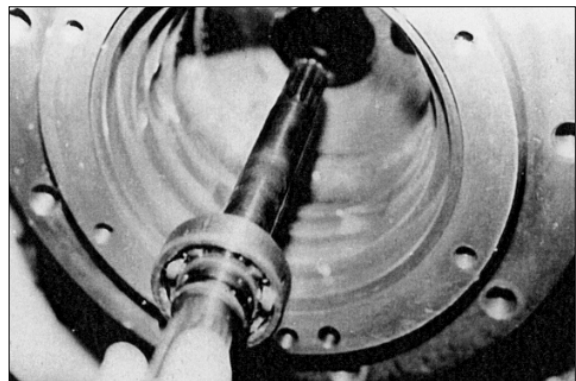
R55NM7TM59

Remove shaft and ball bearing from spindle.

- If hit a plastic hammer on the shaft end point of reducer gear, they will be removed easily.

Remove thrust plate from swash plate

- In case that they're not removed due to the oil between swash plate and thrust plate, remove them by inserting a small bar.



R55NM7TM60

Remove 2(two) pivot and parallel pin.

Remove piston assembly from spindle by pouring compressed air into the hole of spindle.

Piston assembly is composed of piston and shoe.

- Pressure of compressed air : 3-5kg/cm²
- Because piston and shoe are not disassembled without a damage of any part among them, if replacement is required, replace them together.



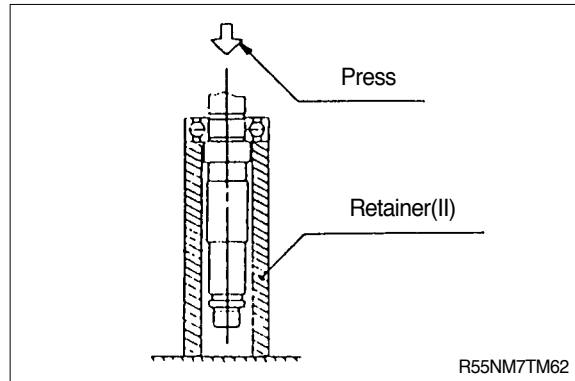
R55NM7TM61

(16) Removal of bearing from motor shaft

Put retainer on work table of presser, install shaft in retainer.

Pressing shaft end point by press machine, remove ball bearing from shaft.

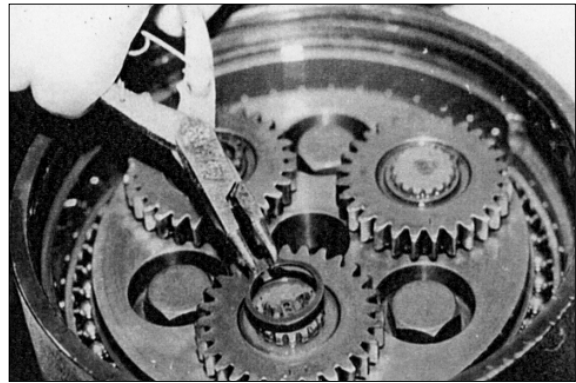
- Use the above method only when replacement is required.



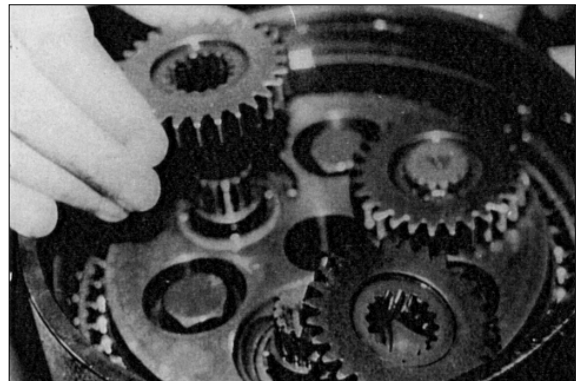
(17) Removal of spur gear

Turn the motor in order that the side of spur gear is to the upper direction.

Remove the snap ring from crank shaft.



Remove spur gear from each crank shaft.



Remove distance piece from each shaft.

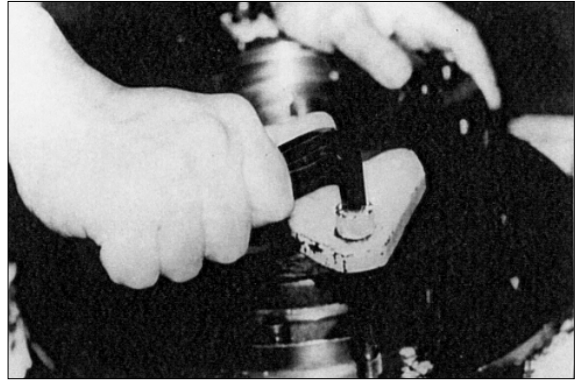


(18) Removal of hold flange

Turn the motor in order that the side of spindle is to the upper direction.

Fix hub and spindle to be parallel by use of 2(two) clamp.

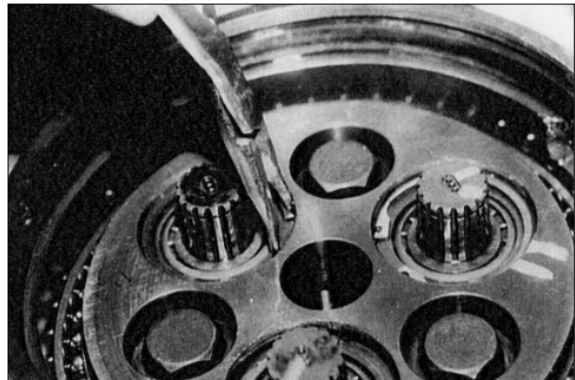
- Hub to be fixed between spindle and hold by clamp.



R55NM7TM66

Turn the motor in order that hold flange is to the upper direction.

Remove 3(three) snap ring from each hole.



R55NM7TM67

Mark hold flange and each snap ring with paint for reassembly.



R55NM7TM68

Loosen 3(three) reamer bolt supporting hold flange of spindle.

- Tightening torque : $42 \pm 6.5 \text{kgf} \cdot \text{m}$
($411.8 \pm 63.7 \text{N} \cdot \text{m}$)



R55NM7TM69

Remove the hold flange from spindle.
Mark hold flange and spindle with paint for reassembly.

- If replacement is required, replace assembly composed of spindle and hold flange.



R55NM7TM70

(19) Removal of clamp

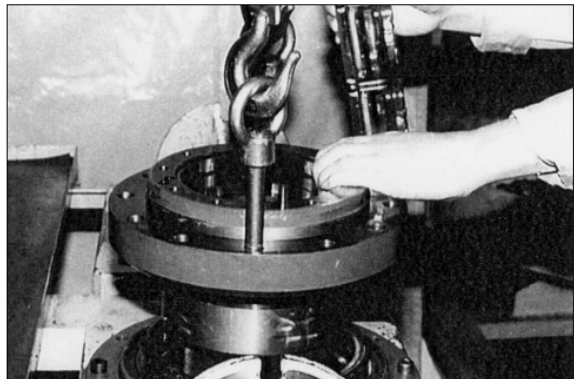
Turn the motor to be the lower direction.
Remove 2(two) clamp in order to remove spindle from hub.



R55NM7TM71

(20) Removal of spindle

Tighten 2(two) eye type bolt into the hole of spindle.
Remove spindle from hub by use of crane, at this time, remove roller bearing and seals together.



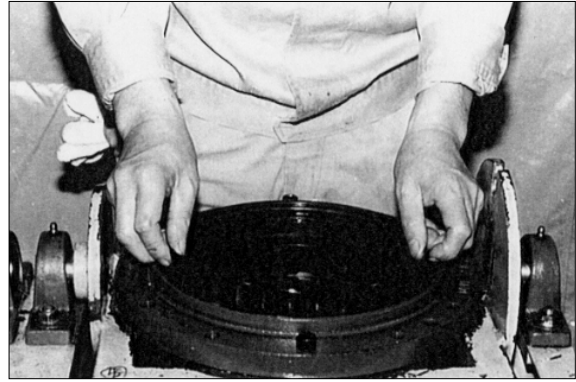
R55NM7TM72

Remove distance piece from hub.
Do not use O-ring again.



R55NM7TM73

Remove O-ring from hub.
Do not use O-ring again.



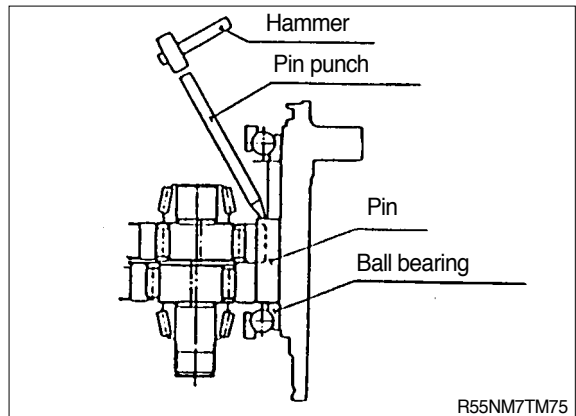
R55NM7TM74

(21) Removal of ball bearing, RV gear assembly and pin

Remove ball bearing from hub.
At this time, remove RV gear assembly, crank shaft, taper roller bearing, needle roller bearing, spacer and pin in sequence.

- When removing ball bearing from hub, install rubber mat on the work table to prevent a damage of each item.

Do not disassemble RV gear assembly, if disassemble it, quality assurance is not applied to.



R55NM7TM75

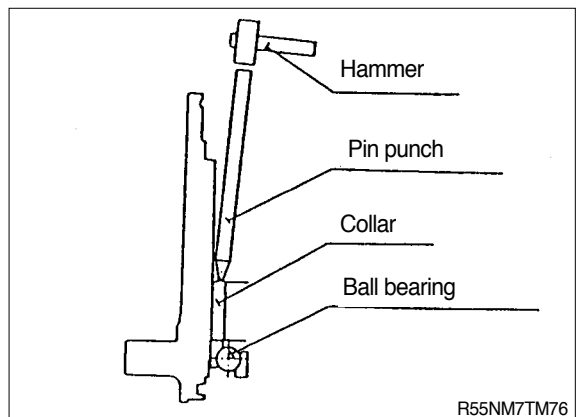


R55NM7TM73

(22) Removal of ball bearing and collar

Turn the motor to the lower direction.
Remove ball bearing and collar from hub.

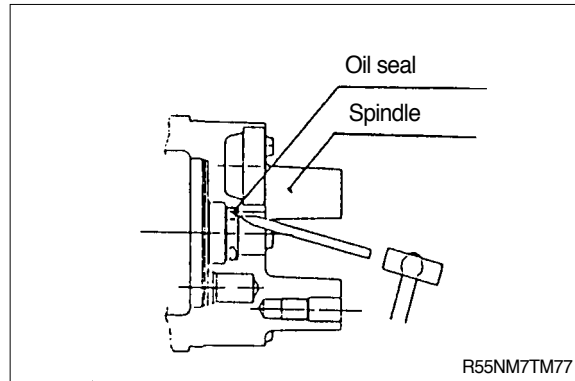
- When removing ball bearing and collar from hub, install the rubber mat to prevent a damage.



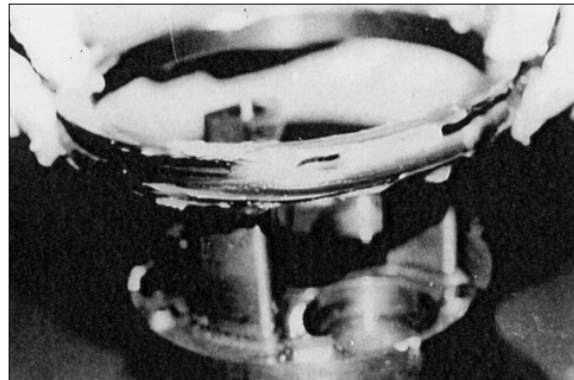
R55NM7TM76

(23) Disassembly of fittings for spindle

Remove oil seal from spindle.
Do not use removed oil seal again.



Remove floating seal from spindle.



Remove the outlets of 3(three) tape roller bearing from spindle.
When it is difficult to remove tape roller bearing due to oil, remove oil by inserting aluminum bar into the hole of spindle.



(24) Disassembly of bolt flange

Remove outlets of tape roller bearing.



(25) Washing of parts

Remove hub, spindle, cover and rear flange.

Wash hub, cover, spindle and rear flange in container for washing and remove dust on the surface.

Make clean inlet parts by use of oil.

- After removing sufficiently dust of each part to prevent a damage, wash each part.



R55NM7TM81

(26) Finish for washing

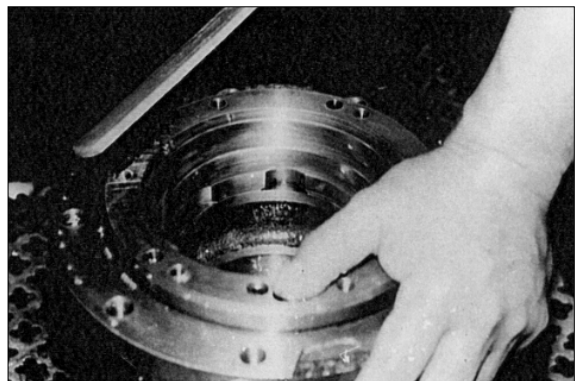
Apply oil to the each part for finishing wash.

Put each part into container for washing, rotating it slowly, make clean inside of them.



R55NM7TM82

Remove dust with soft brush, apply oil to them.



R55NM7TM83

4) REASSEMBLY

Follow the procedure used to disassemble in the reverse order when reassembling it.

(1) General cautions

Follow cautions for disassembly.

Remove dust from all disassembled parts, use sand paper and oil stone in order to remove burrs and sharp edges of them.

Replace O-ring, oil seal, floating seal, etc with new one.

Apply a thin coat of grease to the seals before fitting them.

Apply a thin coat of grease to the parts of motor and to each side of valve.

Follow regular tightening torque.

Enclose all ports of motor after assembling it completely.

B. TRAVEL MOTOR (TM07VA, #0698 AND UP)

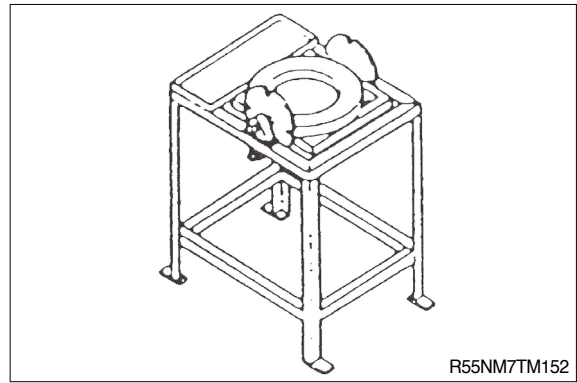
1. DISASSEMBLY

1) GENERAL PRECAUTIONS

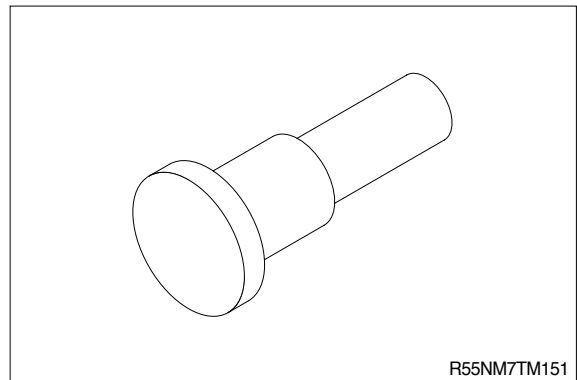
- (1) Before disassembling the TM motors, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.
- (2) To disassemble the motor, use the disassembling procedures described in section 2-2, and select a clean place.
- (3) Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.
- (4) During disassembly, give a match mark to the mating surfaces of each part.
- (5) Arrange removed parts in order so that they will not become damaged or missing during disassembly.
- (6) Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

2) SPECIAL TOOLS

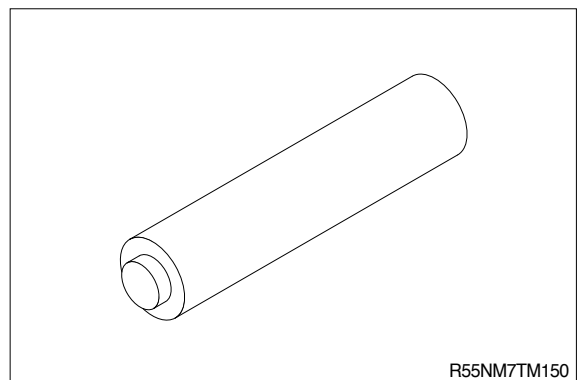
(1) Inversion working bench.



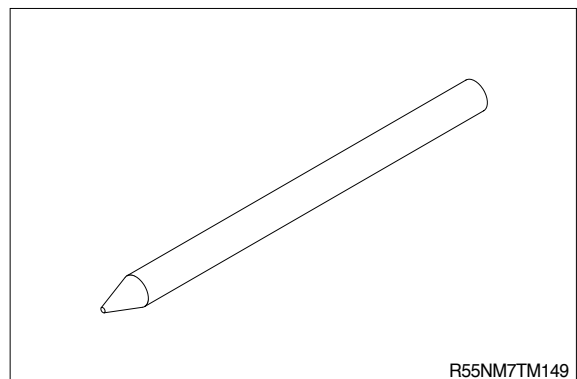
(2) Retainer (I).



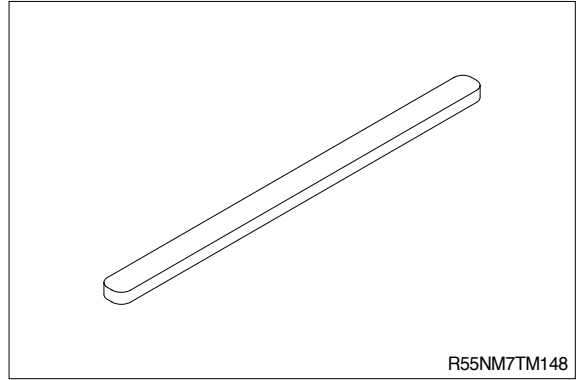
(3) Retainer (II).



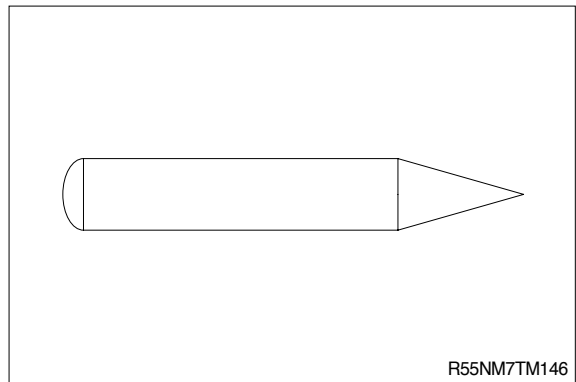
(4) Aluminum rod.



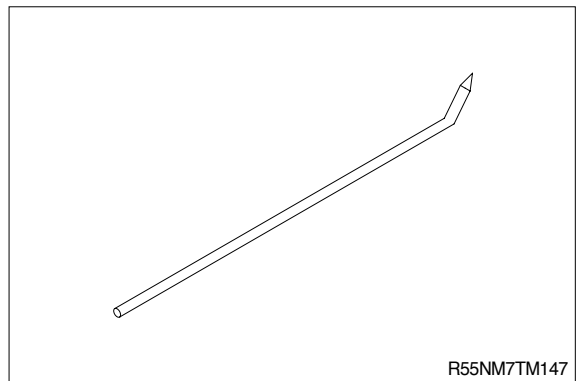
(5) Retainer (I).



(6) Retainer (II).

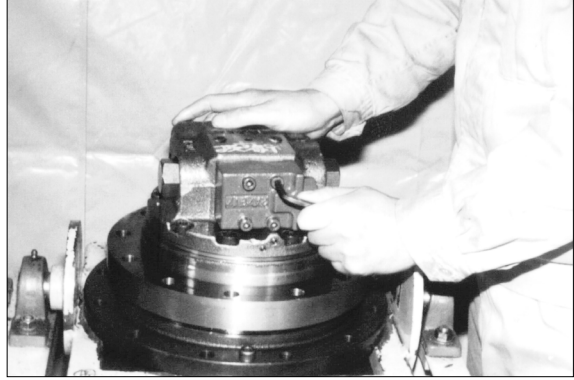


(7) Aluminum rod.



3) REAR FLANGE

- (1) Loosen the four hex.(hexagon) socket head bolts(70) and remove the S.C.V valve body(55) from the rear flange(1).
- (2) Remove the two O-rings(40), (46) from the rear flange(1).



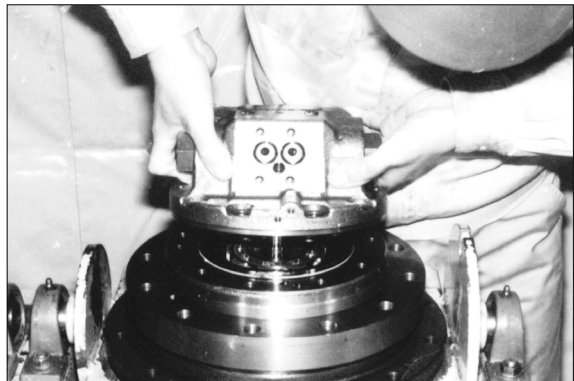
R55NM7TM120

- (3) Remove the hex. socket head bolts(43).



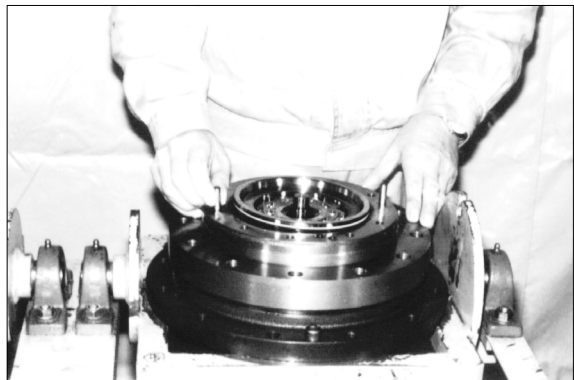
R55NM7TM119

- (4) Remove the rear flange(1) from the holder flange(10).



R55NM7TM121

- (5) Remove the timing plate(9), the two pins(41), the eight springs(13), the ball bearing(50), and O-ring(126) from the rear flange(1) and holder flange(101).



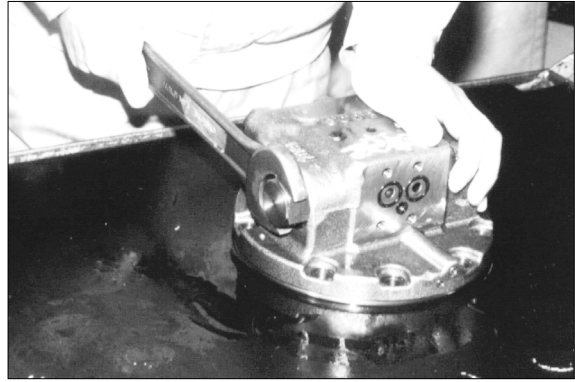
R55NM7TM122

4) BRAKE VALVE

(1) To remove the spool

Remove the two plugs(24) from the rear flange(1).

Remove the O-ring(36) from the plug(24).



R55NM7TM110

Remove the two springs(28), the two spring retainers(25), and the spool(23) from the rear flange(1).

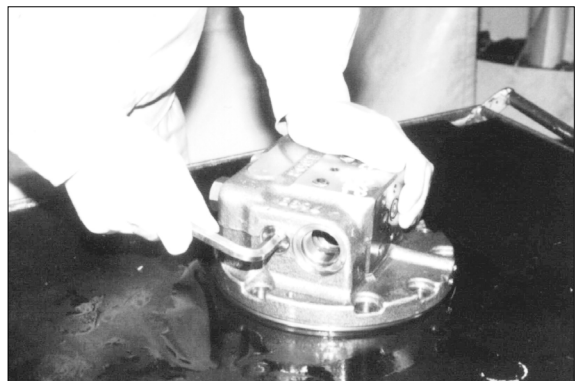
Be careful not to damage the outer surface of the rear flange(1).



R55NM7TM108

(2) To remove the check valves

Remove the two plugs(26) from the rear flange(1).

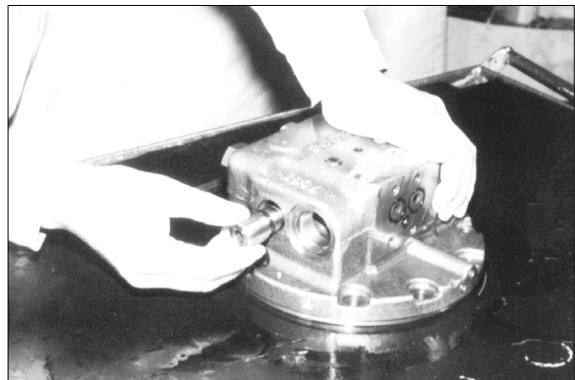


R55NM7TM101

Remove the two springs(30) and the two valves(27) from the rear flange(1).

Be careful not to damage the seat section of valves(27) or rear flange(1).

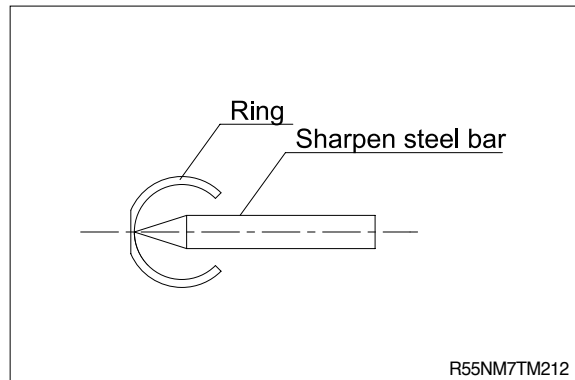
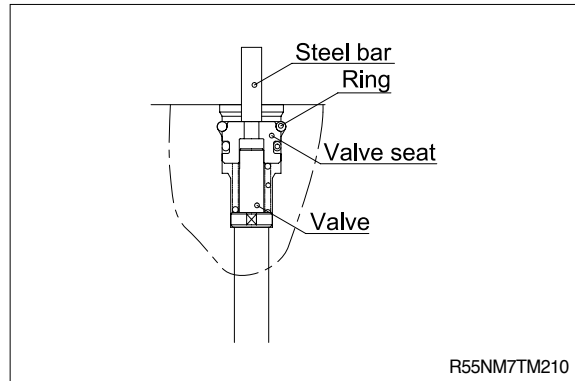
Remove the O-ring(34) from the plug(26).



R55NM7TM136

(3) To remove the T-valve(19) from the rear flange(1)

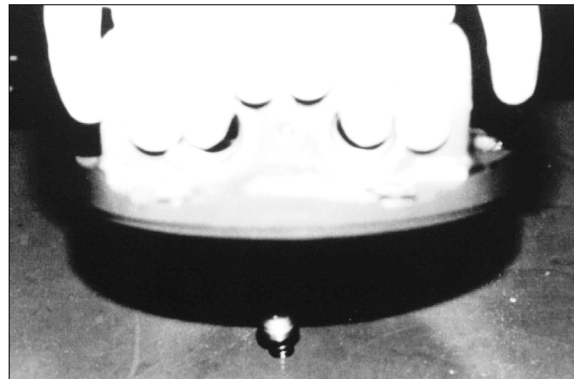
Press and hold down the valve seat(18) using a steel bar, and in that state, as shown in the diagram at right, press the notch in the ring(22) using a sharp pointed steel bar. This deforms the ring(22), disengaging it from the ring groove in the rear flange(1). The ring(22) can now be removed from the rear flange(1).



After filling up the hole section of the valve seat(18), inject compressed air from the parking brake access hole and remove the valve seat(18).

Holding the rear flange(1) by hand and lightly shaking it with its hole section facing downward allows the T-valve(19) and the spring(20) to be removed or using tweezers or any other such tool, remove the T-valve(19) and the spring(20) from the rear flange(1)

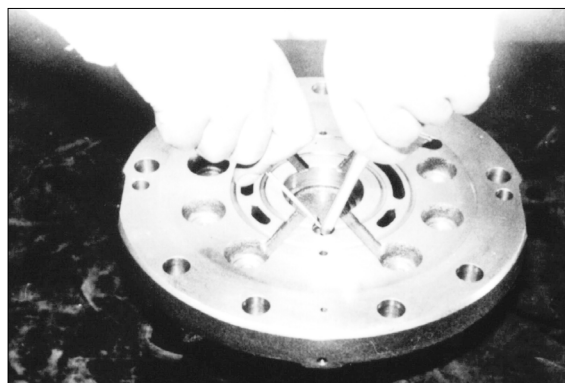
Remove the O-ring(33) from the valve seat(18).



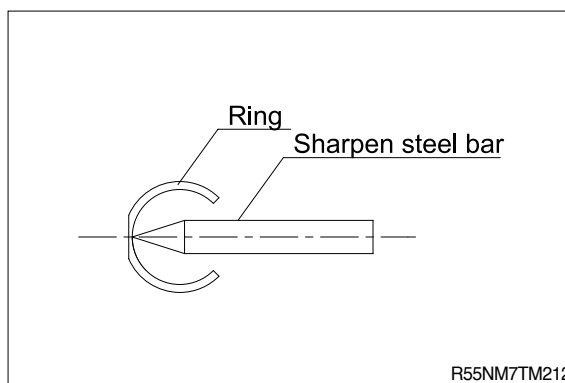
(4) To remove the valve(63) from the rear flange(1)

Press and hold down the stopper(64) using a steel bar, and in that state, as shown in the diagram at right, press the notch in the ring(65) using a sharp pointed steel bar.

This deforms the ring(65), disengaging it from the ring groove in the rear flange(1). The ring(65) can now be removed from the rear flange(1)

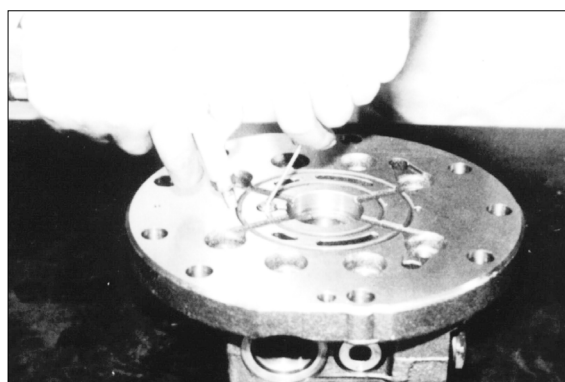


R55NM7TM104



R55NM7TM212

Make the hole section of the removed ring(65) face downward, and lift the rear flange(1). This allows the stopper(64), the spring(166) and the valve(63) from the rear flange(1).



R55NM7TM106

(5) To disassemble the internal parts of the body kit

Remove the plug(24) from the body(55).

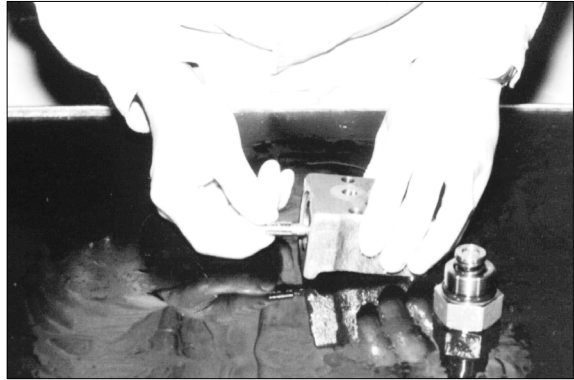
Remove the O-ring(36) from the plug(24).



R55NM7TM124

Remove the springs(58), (59), the stopper(57) and the spool(56), in that order, from the body(55).

Be careful not to damage the other surface of the spool(56) and the sliding surface of the rear flange.



R55NM7TM112

5) HYDRAULIC MOTOR

(1) To remove the parking brake parts

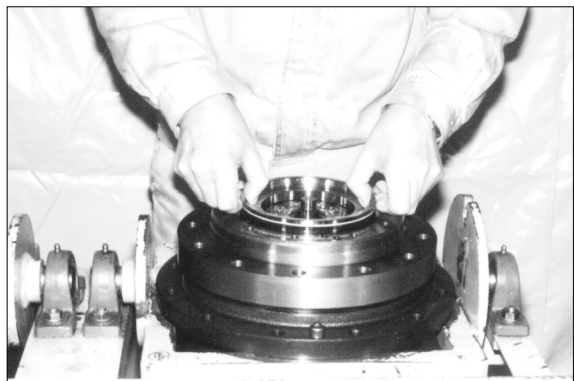
Remove the piston(12) by injecting compressed air from the parking brake access hole in the holder flange(101).

Take care that abrupt injection of compressed air may cause the piston(12) to pop out.



R55NM7TM127

Remove the O-rings(35), (39) from the piston(12).



R55NM7TM129

(2) To remove the internal parts of the motor

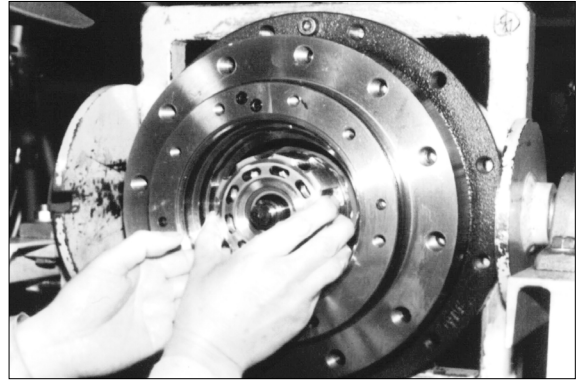
Lay the TM motor body on the side.

Drain out the oil from the TM motor.

Hold the cylinder block(4) with both hands, and remove it from the holder flange(101)

Before removal, hold the cylinder block(4) with both hands and turn it two to three times in a clockwise and a counterclockwise direction alternately to detach the shoe(6) from the swash plate(3).

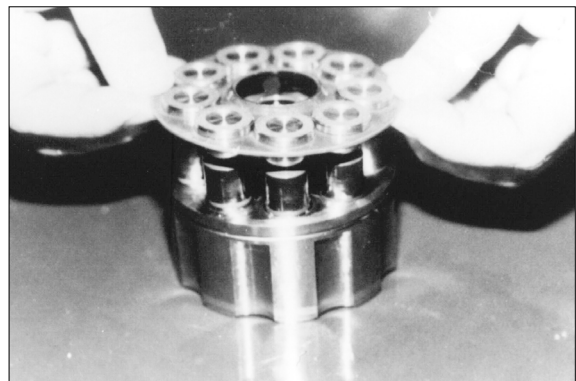
Becareful that if an attempt is made to remove the cylinder block(4) without detaching the shoe(6) from the swash plate(3), then the piston, shoe and other parts that are connected to the cylinder block may come loose and fall into the spindle.



R55NM7TM131

Remove the four mating plates(16) and three friction plates(15) that are mounted on the outer surface of the removed cylinder block(4).

Remove the piston assy piston(5), shoe(6), retainer plate(7), thrust ball(8), and three rollers(51) from the removed cylinder block(4).

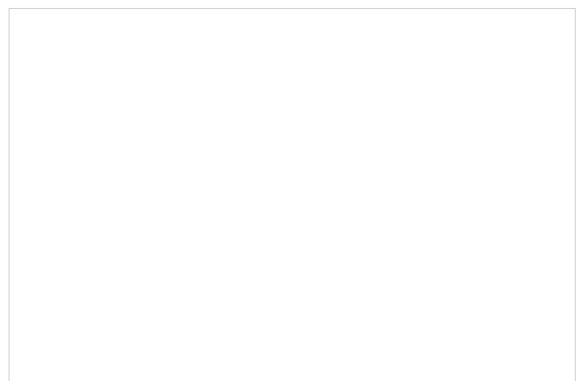


R55NM7TM132

Remove the swash plate(3) from the holder flange(101).

Remove the two steel balls(67) from the holder flange(101).

Remove the speed selector piston assy piston(61) and shoe(62) from the holder flange(101) by feeding compressed air(3 to 5kgf/cm²) from the access hole in holder flange(101).



(3) To disassembly the inside of the cylinder block(4)

Place the cylinder block(4) on a press working bench, and then while pressing and holding down a retainer(1) against the washer(10), remove the snap ring(45) using snap ring pliers.

Press load : 120 kgf or more.

Protect the sliding surface of the cylinder block with a vinyl sheet.



R55NM7TM133

Remove the snap ring(45) the washer(10), the spring(14), and the washer(10), in that order, from the cylinder block(4).



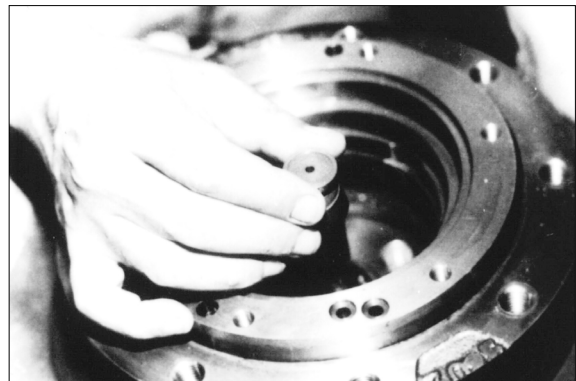
R55NM7TM137

(4) To remove the shaft(2) and the roller bearing(49)

Remove the shaft(2) from the holder flange(101).

At this time, the roller bearing(49) can also be removed in conjunction with the shaft(2).

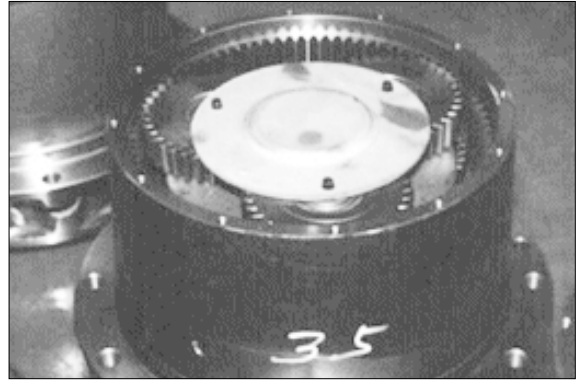
The oil seal(32), however, cannot be removed.



R55NM7TM118

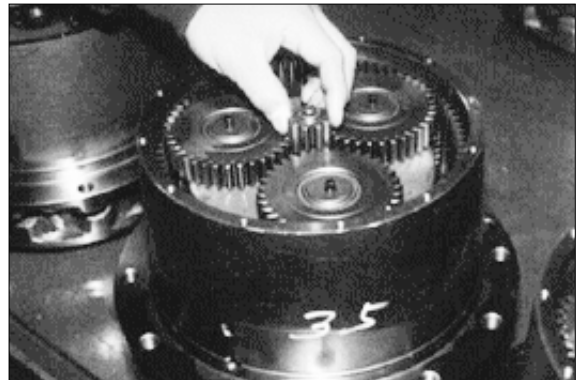
6) REDUCTION GEAR

- (1) Remove the plugs(10) from the cover(123).
- (2) Loosen the socket bolts(124) and remove the cover(123) from the housing(105).



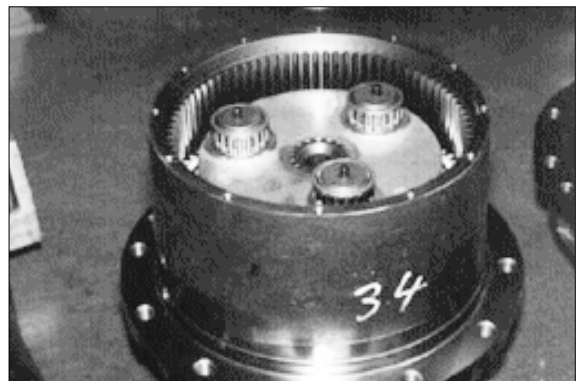
R55NM7TM103

- (3) Remove the thrust plate(R)(122) and the drive gear(121).



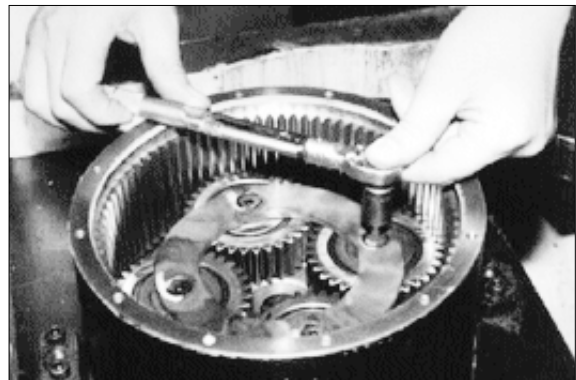
R55NM7TM105

- (4) Remove the planetary gear(R)(117), the needle bearing(118), the inner race(119) and the holder(116).



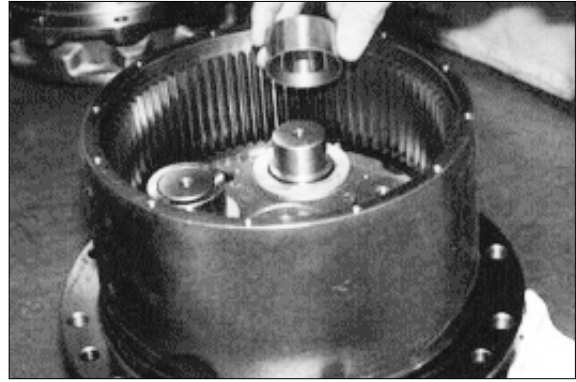
R55NM7TM123

- (5) Remove the sun gear(114), the screw(110), the thrust plate(F)(113) and the needle bearing(111).



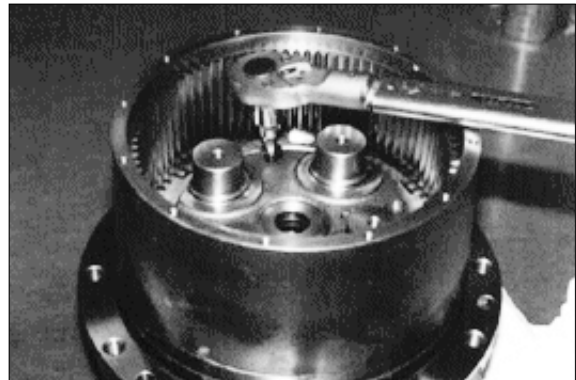
R55NM7TM125

(6) Remove the collar(112) and the thrust washer(109).



R55NM7TM126

(7) Remove the plugs(124).



R55NM7TM128

(8) Remove the nut ring(103).



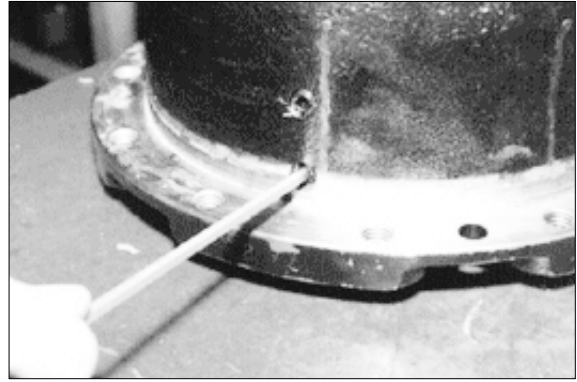
R55NM7TM130

(9) Remove the holder flange(101) from the housing(105).



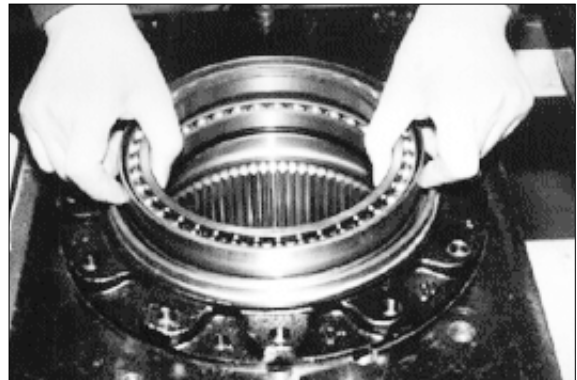
R55NM7TM116

(10) Remove the plug(104) and steel ball(106)
(104ea).



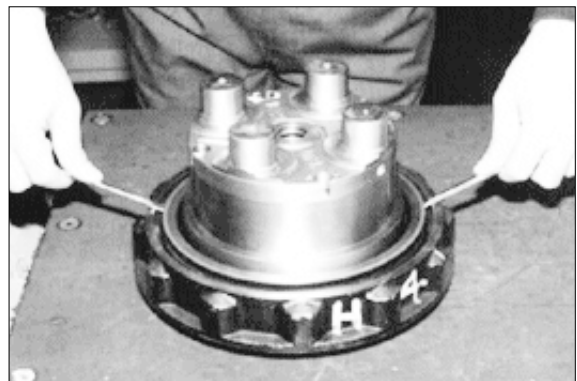
R55NM7TM113

(11) Remove the floating seal(102) and
angular bearing(125).



R55NM7TM109

(12) Remove the floating seal(102) from the
holder flange(1).



R55NM7TM134

(13) Remove the snap ring(76).
(14) Remove the oil seal(32).



R55NM7TM135

2. REASSEMBLY

1) GENERAL PRECAUTIONS

- (1) Reassemble in a work area that is clean and free from dust and grit.
- (2) Handle parts with bare hands to keep them free of linty contaminants.
- (3) Repair or replace the damaged parts.
Each part must be free of burrs at its corners.
- (4) Do not reuse O-rings, oil seal and floating seal that were removed in disassembly.
Provide the new parts.
- (5) Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air
Do not use the cloths.
- (6) When reassembling oil motor components of TM motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above).
- (7) Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

2) TIGHTENING TORQUE TABLE

Item No	Parts name	Size	Tightening torque	
			kgf · cm	lbf · in
21	Plug	PF 3/8	600	520.8
24	Plug	M30 P1.5	3600	3125
26	Plug	M24 P1.5	1300	1128
43	Hex. socket bolt	M10 P1.5	590	512
44, 107	Hex. socket plug	PT 1/8	125	108.5
52	Hex. socket plug	PF 1/4	300	260
54	Hex. socket plug	NPTF 1/16	100	86.8
70	Hex. socket bolt	M8	300	260
91	Hex. socket plug	PT 1/4	300	260
103	Nut ring	M165 x P2	1800	1562
104	Hex. socket plug	PT 3/8	350	304
110	Screw	M6	83	72
124	Hex. socket bolt	M8	300	260

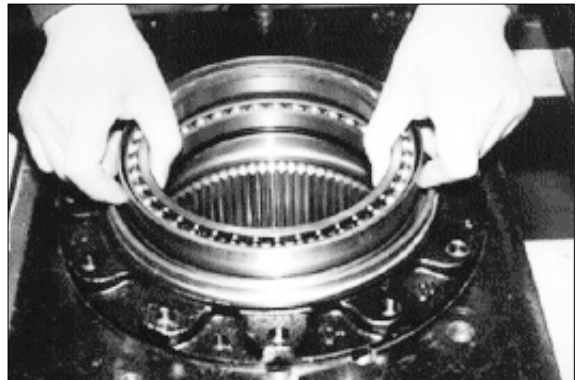
3) REDUCTION GEAR

- (1) Mount end of the floating seal(102) in the holder flange(101).



R55NM7TM107

- (2) Press angular bearing(125) into the housing(105).



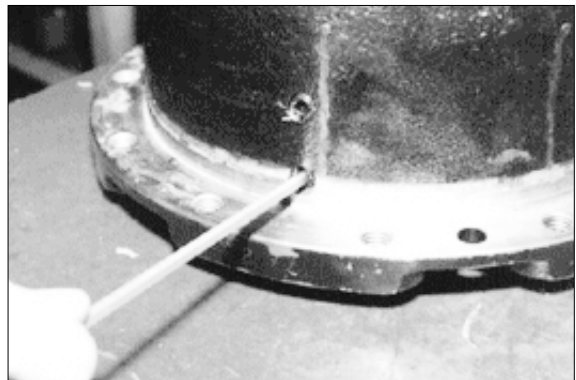
R55NM7TM109

- (3) Insert the steel balls(106)(104ea) into the housing(105).



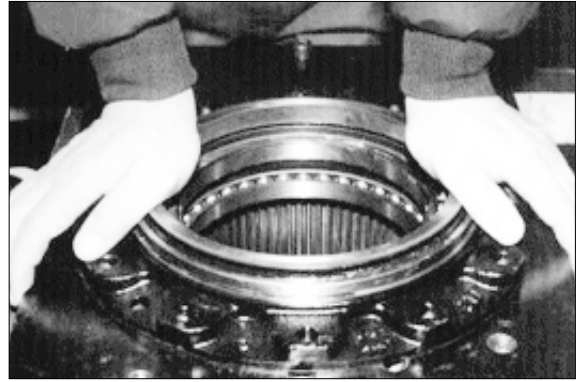
R55NM7TM111

- (4) Place seal taper around plug(104) and tighten it up.



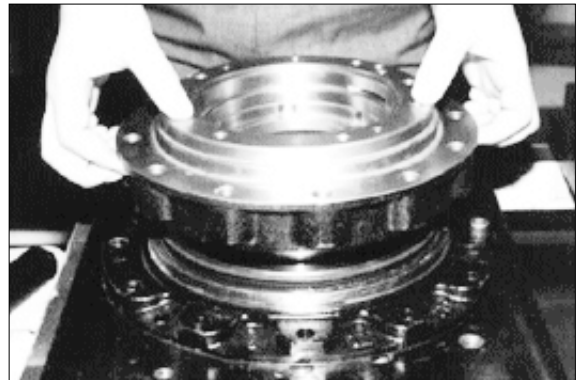
R55NM7TM113

- (5) Mount another end of floating seal(102) into the housing(105).



R55NM7TM115

- (6) Fit the holder flange(101) into the housing(105).



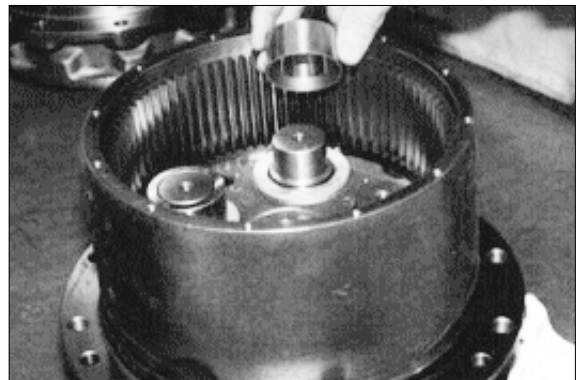
R55NM7TM116

- (7) Tighten the nut ring(103) and the plugs(104) to the required torque using a torque wrench.
Tightening torque : 350kgf · cm(2531lbf · ft)



R55NM7TM130

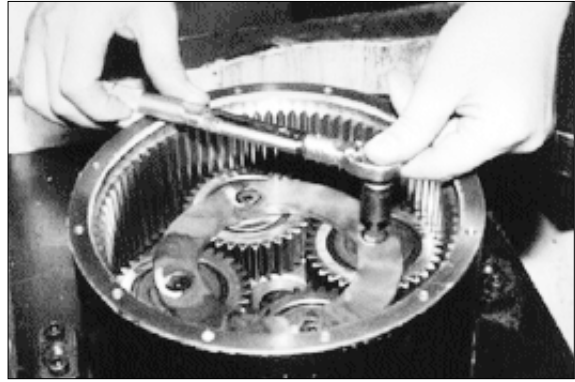
- (8) Mount the thrust washer(109) and the collar(112).



R55NM7TM126

- (9) Fit the needle bearing(111) and place the thrust plate(F)(113). Tighten the screw (110) to required torque using torque wrench.

Tightening torque : 83kgf · cm(72lbf · in)



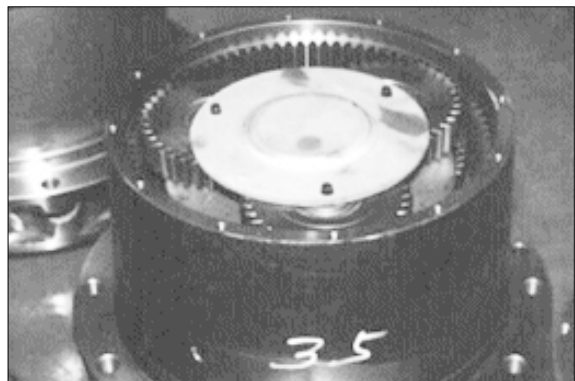
R55NM7TM125

- (10) Fit holder ass'y sun gear(114), needle bearing(118) and planetary gear(R)(117).



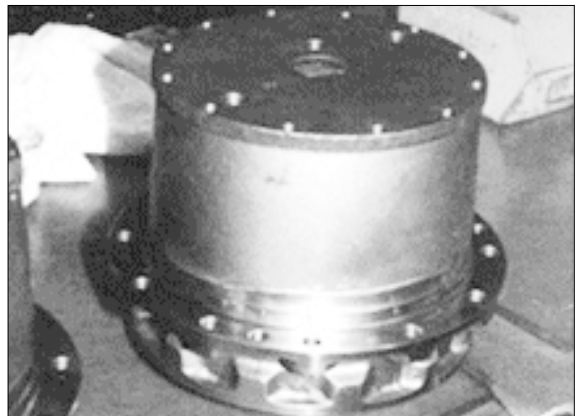
R55NM7TM138

- (11) Attach the drive gear(121) and place thrust plate(R)(122).



R55NM7TM103

- (12) Fit the cover(123) to the housing(105).
(13) Tighten socket bolts(124) to the required torque using a torque wrench.
Tightening torque : 125kgf · m(904lbf · ft)



R55NM7TM140

4) BRAKE VALVE

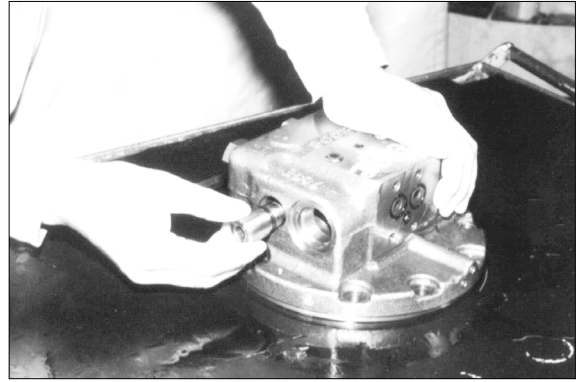
(1) To remount the check valve

Fit the O-ring(37) on the plug(26).
Insert the spring(30) and the valve(27)
into the plug(26), and then grease the
spring(30) and the valve(30) and hand-
lock the former.

Tightening torque : $26 \pm 4\text{kgf} \cdot \text{m}$
($188 \pm 28.9\text{lb} \cdot \text{ft}$)

Insert the plug(26) in conjunction with the
spring(30) and the valve(30) into the rear
flange(1), and tighten the plug to the
required torque.

Tightening torque : $26 \pm 4\text{kgf} \cdot \text{m}$
($188 \pm 28.9\text{lb} \cdot \text{ft}$)



R55NM7TM136

(2) To remount the spool

Insert the spool(23) into the rear
flange(1).



R55NM7TM108

Attach the O-ring(36) to the plug(24).
Install spring retainer(25) and the
spring(28) into both plugs(24), and
tighten the plugs(24) into the rear
flange(1) at the required torque.

Required torque : $45 \pm 9\text{kgf} \cdot \text{m}$
($32.5 \pm 65\text{lb} \cdot \text{ft}$)

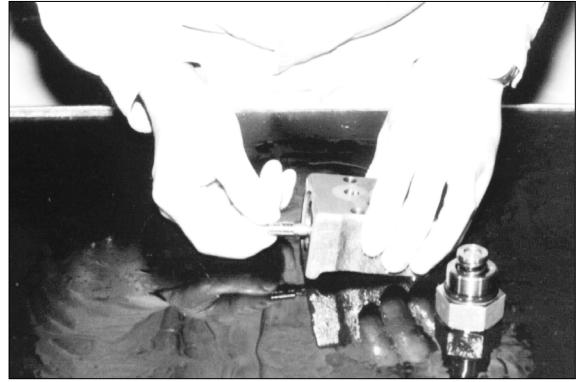


R55NM7TM110

(3) To reassemble the surge cut off valve

Apply a working fluid to the spool(56), and insert it into the body(55).

Damage to the hole section of the body or the outer surface of the spool may cause internal leakage to occur after reassembling, and TM motor performance to deteriorate.



R55NM7TM112

Fit the O-ring(36) to the plug(24).

Install the spring retainer(25) and the springs(58), (59) into the plug(24).

Tighten the plug(24) into the body(55) at the required torque.

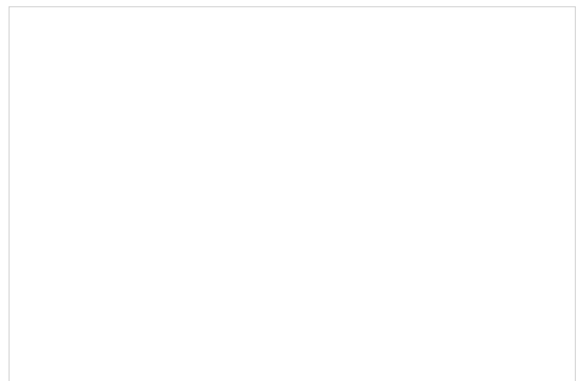


R55NM7TM114

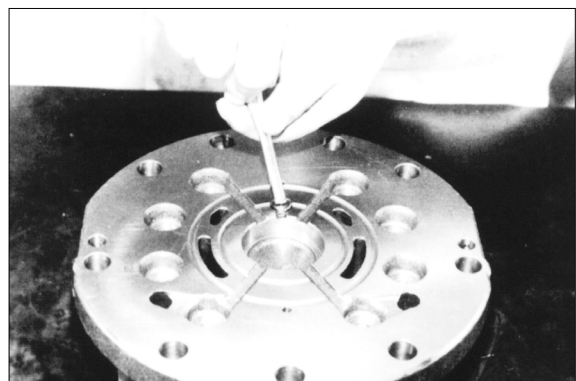
(4) To remount the parking brake valve

Mount the O-ring(33) on the valve seat(18).

Insert the valve(19), the spring(20), and the valve seat(18), in that order, into the rear flange(1).



Slightly bend a new ring and place it in the new ring into the ring groove of the rear flange.



R55NM7TM117

(5) To remount the valve(63)

Holding the rear flange(1) with its surface contacting the holder flange(101) upward, place the rear flange on a working bench.

Insert the valve(63) into the rear flange(1). Fit the spring(66) into the valve(63), and mount the stopper(64) on it.



R55NM7TM143

Slightly bench a new ring(65) and insert it into the rear flange(1) from the top of the stopper(64).

Then, fit the new ring into the ring groove of the rear flange.



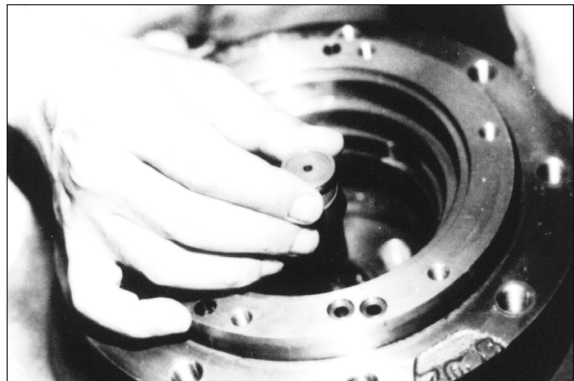
R55NM7TM142

5) HYDRAULIC MOTOR

(1) To remount the shaft(2)

Fit the oil seal(32), the snap ring(45) and roller bearing(49) in that order, into the holder flange(101).

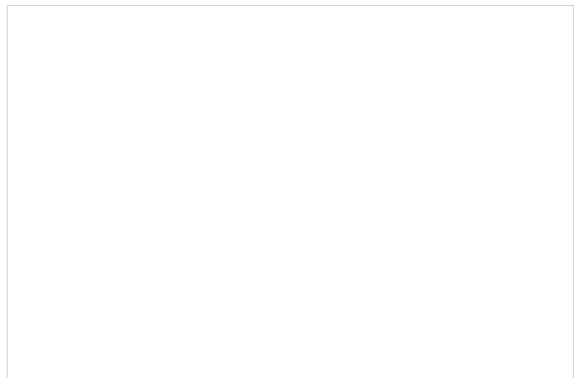
Insert the shaft(2) into the roller bearing(49).



R55NM7TM118

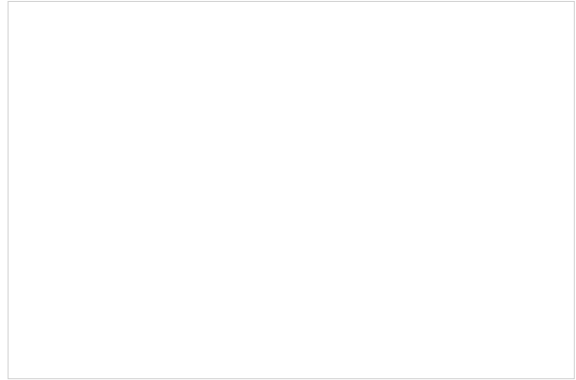
(2) To reassemble the piston ass'y(61), (62)

Mount the piston ass'y(61), (62) in the piston hole of the holder flange(101).



(3) To reassemble the steel balls(67)

Mount the two steel balls(67) in the steel ball hole of the holder flange(101).



(4) To reassemble cylinder block section

Insert washer(10), spring(14), washer(10) and the snap ring(45) in that order, into the shaft bore of cylinder block(4).



R55NM7TM137

Set cylinder block in the press in order to compress the spring(14).

Place retainer(I) on the washer(10) and push down this tool with the press until the snap ring groove becomes cleared.

Fit snap ring(45) into the groove.



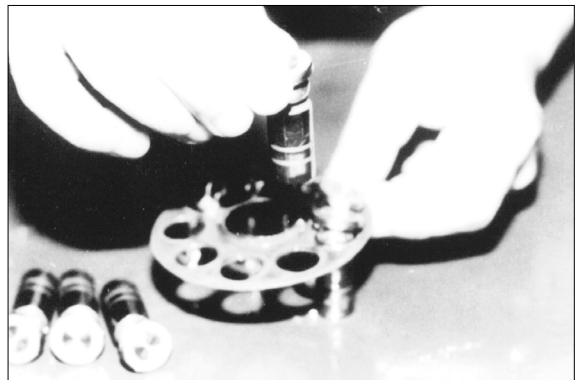
R55NM7TM133

(5) Piston motor sub-assembly

Fit 3-rollers(51) into the pin holes of cylinder block(4), and then, put thrust ball(8) on it.

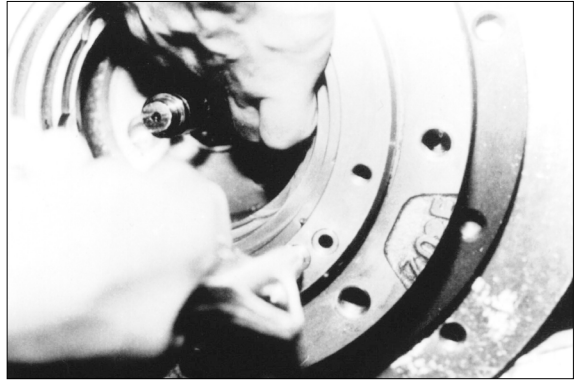
Insert piston assembly into retainer plate(7).

Mount the piston assembly into the cylinder block(4). After mounting, immerse the entire them in a working fluid.



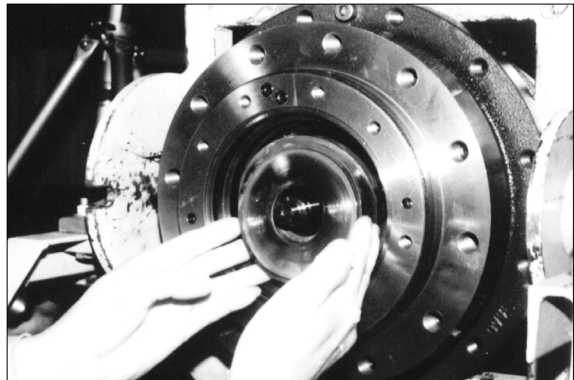
R55NM7TM144

Fit the spring(60) into the piston(62).
Insert the piston(62) and steel balls(68)
into the hole of the holder flange(101).



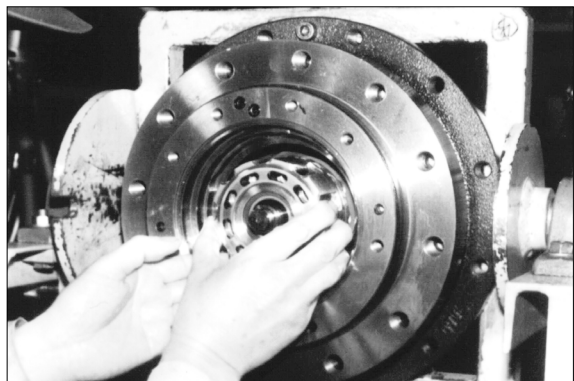
R55NM7TM139

Mount the swash plate(3) on the steel
balls(68).



R55NM7TM145

Fit the cylinder block & piston into the
shaft(5).

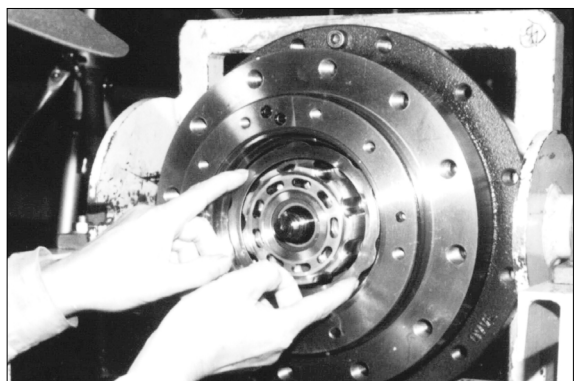


R55NM7TM131

(6) To reassemble the parking brake section

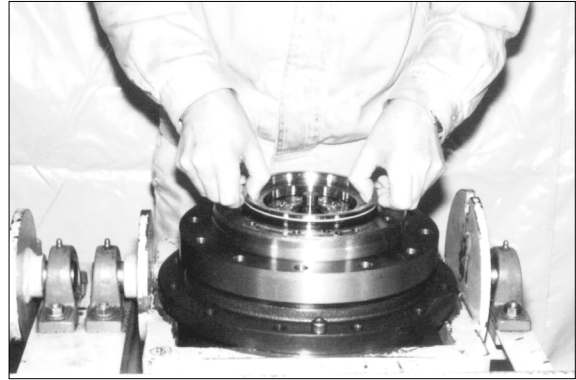
Fit the mating plate(16) first and then the
friction plate(15), one by one, into the
grooves of the outer surface of the
cylinder block(4).

This order of fitting must be strictly
observed.



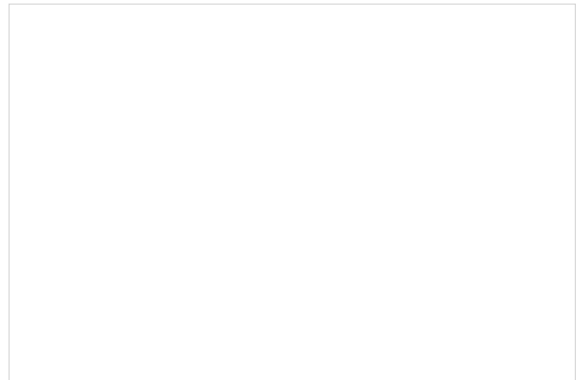
R55NM7TM141

Fit the O-rings(39), (35) in the O-ring grooves of the piston(12).
Mount the piston(12) in the holder flange(101).



R55NM7TM129

Fit the O-ring(75) and the O-ring(126) in the O-ring groove of the holder flange(101).
Fill the holder flange(101) with a working fluid quantity required : 1.2 liters



(7) To mount the rear flange(1) back in the holder flange(101)

Mount the ball bearing(50) in the rear flange(1).

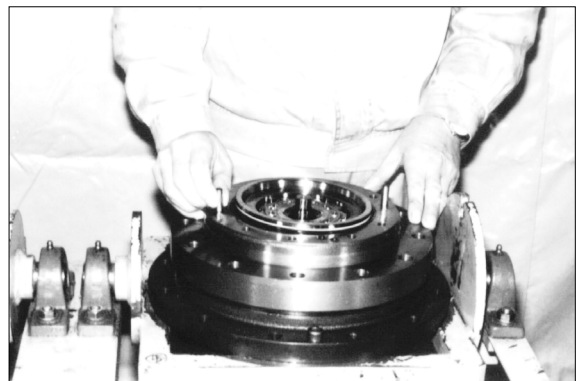
Fit the two dowel pins(41) into the pin holes of the rear flange(1).

Using the dowel pins(41) as a guide, mount the timing plate(9) in the rear flange(1).

At this time, apply grease to the contact surface of the timing plate(9) and the rear flange(1).

Arrange the eight springs(113) correctly in the spring mounting hole of the rear flange(1).

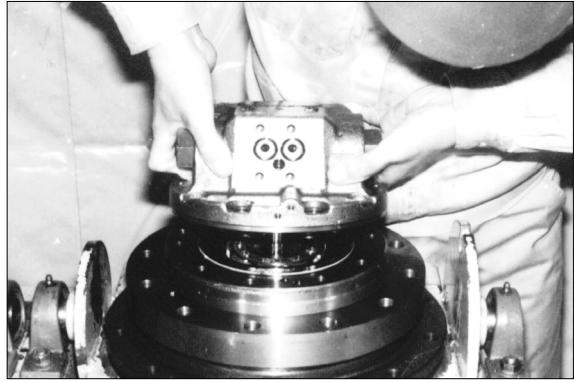
Fit the two dowel pins(42) into the holder flange(101).



R55NM7TM122

Mount the rear flange(1) on the holder flange(101).

At this time, the two dowel pins that have been fitted into the holder flange(101) must be aligned with the pin holes.



R55NM7TM121

Tighten the eight hex. socket head bolts into the holder flange(101) at the required torque.

- Tightening torque : $25.7 \pm 4 \text{kgf} \cdot \text{m}$
($185.9 \pm 29 \text{lbf} \cdot \text{ft}$)



R55NM7TM119

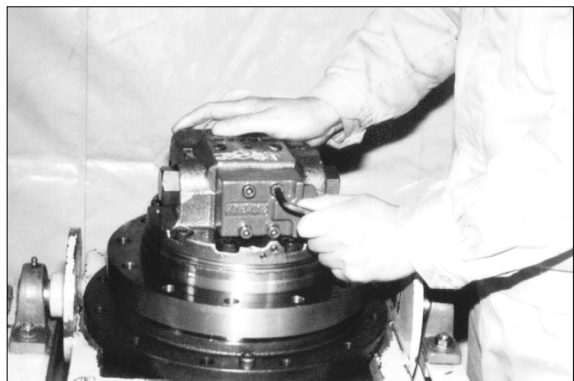
(8) To mount the surge cut off valve ass'y back in the rear flange(1)

Fit the two O-rings(40), (46) in the rear flange(1).

Assemble the body(55) of the surge cut off valve, which was mounted previously in procedure 4), into the rear flange(1).

Then, tighten the four hex. socket bolts(70) into the rear flange(1) at the required torque.

- Tightening torque : $3 \pm 0.5 \text{kgf} \cdot \text{m}$
($21.7 \pm 3.6 \text{lbf} \cdot \text{ft}$)



R55NM7TM120

3. TESTING

The motor case must be filled up with a working fluid before starting performance verification tests. After completion of TM motor servicing, the performance verification tests listed below must be performed.

1) WHEN A TESTING APPARATUS IS AVAILABLE :

If internal parts have been replaced, carry out running in operation, followed by performance tests.

(1) Conditions for running-in operation

- 10 rpm, no-load pressure, one minute, clockwise/counterclockwise rotation.
- 20 rpm, no-load pressure, one minute, clockwise/counterclockwise rotation.
- 20 rpm, 100kgf/cm², two minutes, clockwise/counterclockwise rotation.

(2) Condition for performance tests

- Working fluid : ISO VG #46 wear-resistant type.
- Lubricating oil : Gear oil.
- Temperatures : Ambient temperature ---- Room temperature.
 - Working fluid temperature ---- 50 ± 5 °C
 - Casing temperature of ---- 40 to 80 °C
 - reducer section
 - Drainage pressure : 0.8kgf/cm² or less

(3) Efficiency tests (for the first speed)

Volume efficiency	Machine efficiency	External drainage amount (Referential data)	Remarks
90% or more	83% or more	83% or more	

(4) Second speed volume efficiency verification tests

Second speed selection	Volume efficiency
Differential pressure : 100kgf/cm ² Revolutions : 20 rpm	96% or more

(5) Second speed operation tests

During the no-load tests under the running-in operating conditions for (3) and (4) above, make sure that the motor will change from the low speed over to the high speed when fluid pressures of 20kgf/cm² or more are applied from the second-speed selector pilot port (D-port).

Also, ensure that the motor changes over to the low speed at fluid pressures of 10kgf/cm² or less.

2) WHEN FIELD PERFORMANCE VERIFICATION TESTS ARE TO BE CONDUCTED WITHOUT USING A TESTING APPARATUS

Install the TM motor in the vehicle and provide piping, and then without mounting a crawler, carry out running-in operation, followed by performance tests.

(1) Condition for running-in operation

10 rpm, no-load pressure, one minute, clockwise/counterclockwise rotation.

20 rpm, no-load pressure, one minute, clockwise/counterclockwise rotation.

(2) Condition for performance tests

Temperature : Working fluid temperature ---- 50 ± 5 °C

Casing temperature of the ---- 40 to 80 °C

reducer section

(3) No load driving pressure (Differential pressure)

First speed	10 rpm	20kgf/cm ²
Second speed	20 rpm	30kgf/cm ²

(4) Motor drainage amount measurement

Both first and second speeds	10 rpm	0.8 /min below
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