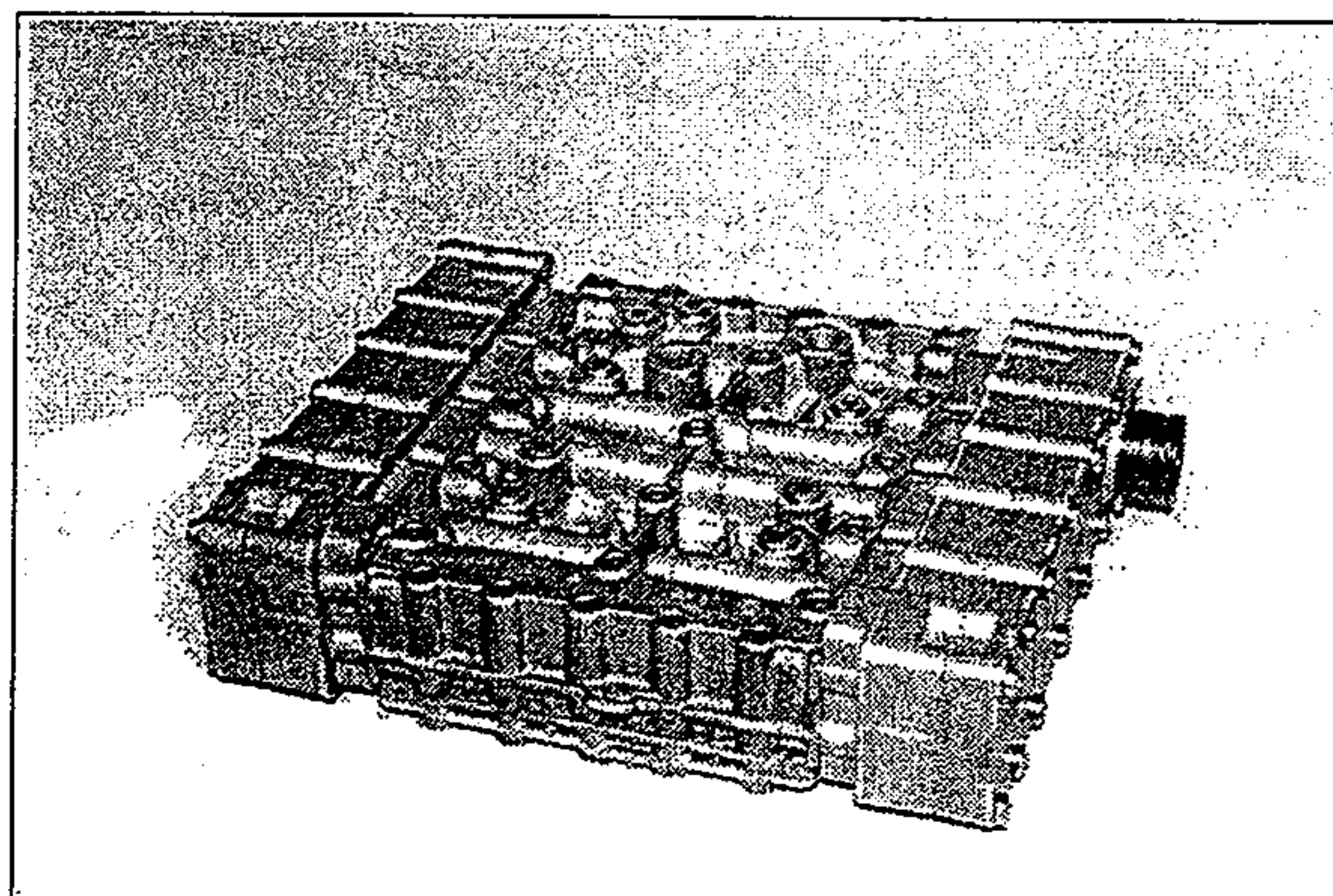


GROUP 4 DISASSEMBLY AND ASSEMBLY

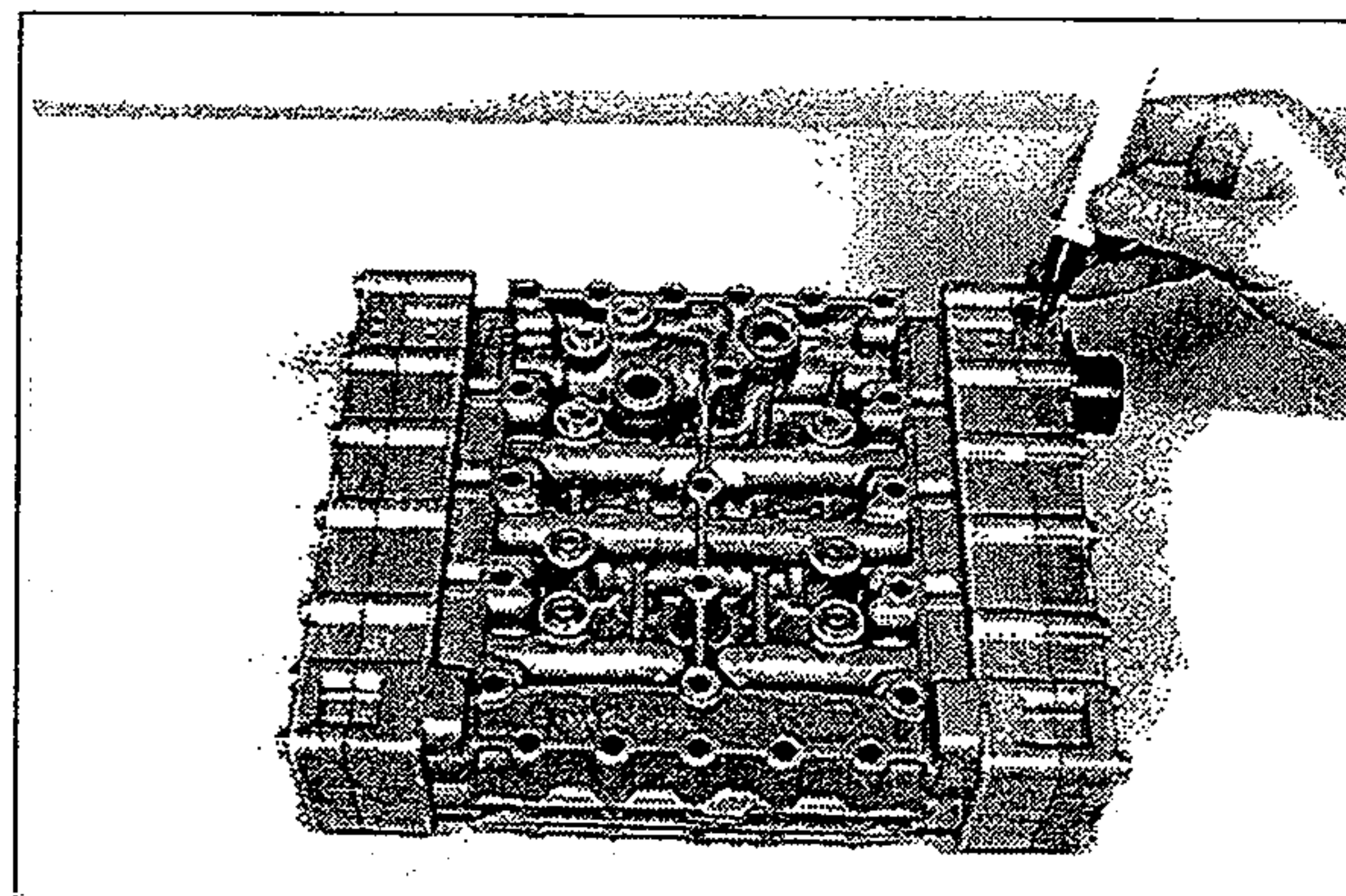
1. CONTROL VALVE

1) DISASSEMBLY

- (1) Illustration on the right shows the complete control unit.



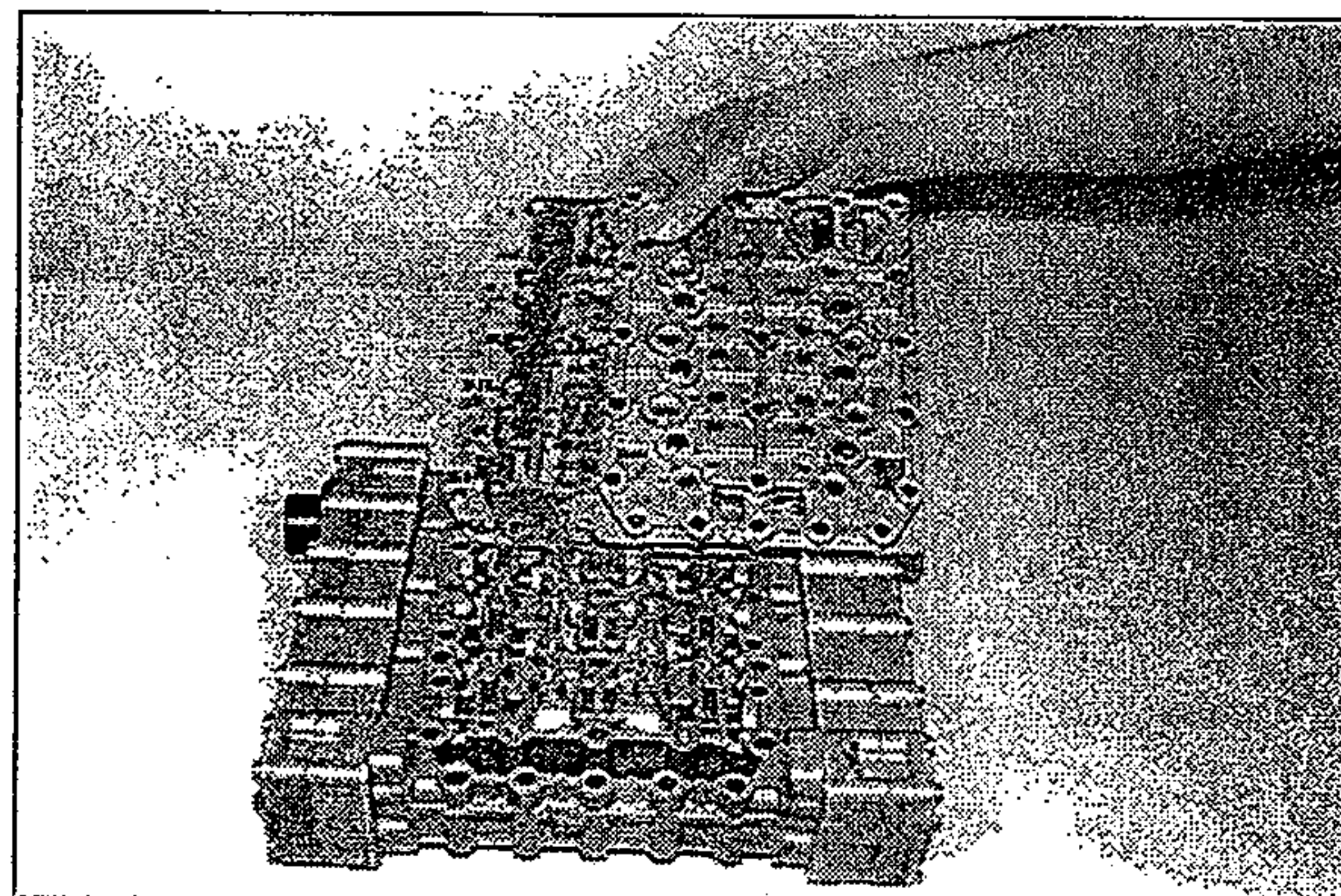
- (2) Mark the installation position of the different covers, the housing and cable harness with the valve housing.



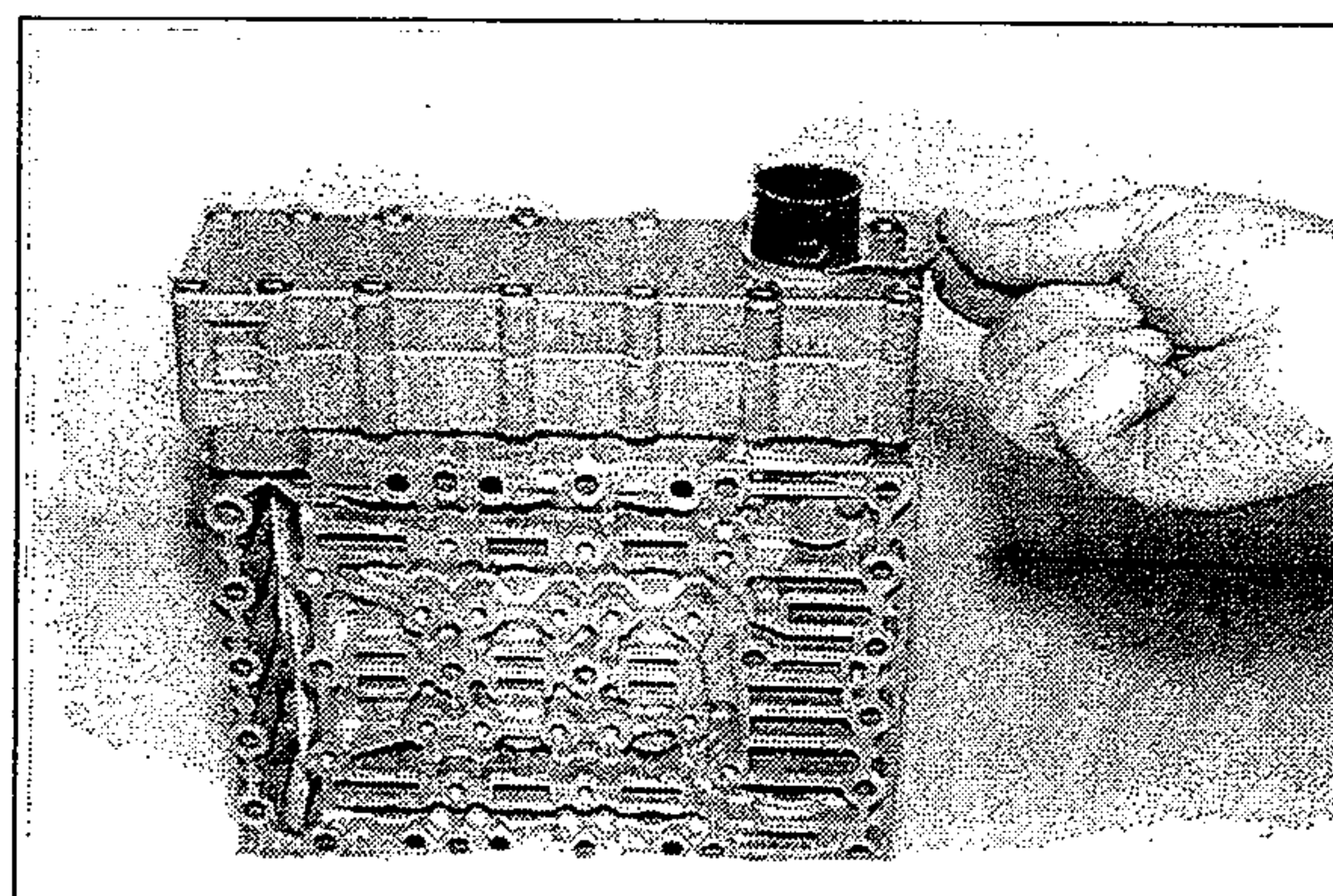
- (3) Loosen socket head screws.
Separate duct plate, 1st gasket, intermediate plate and 2nd gasket from the valve housing.

Box spanner

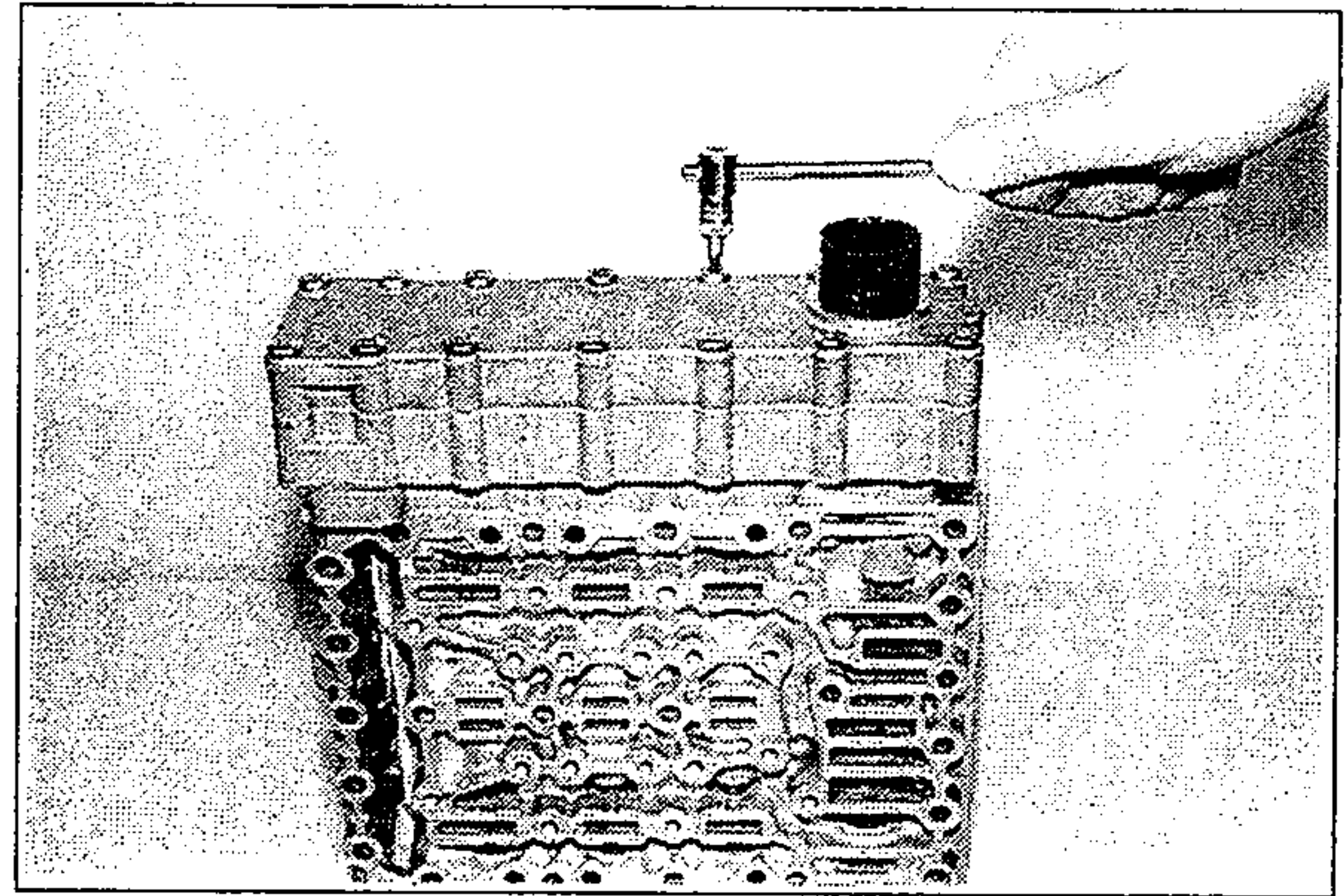
5873 042 002



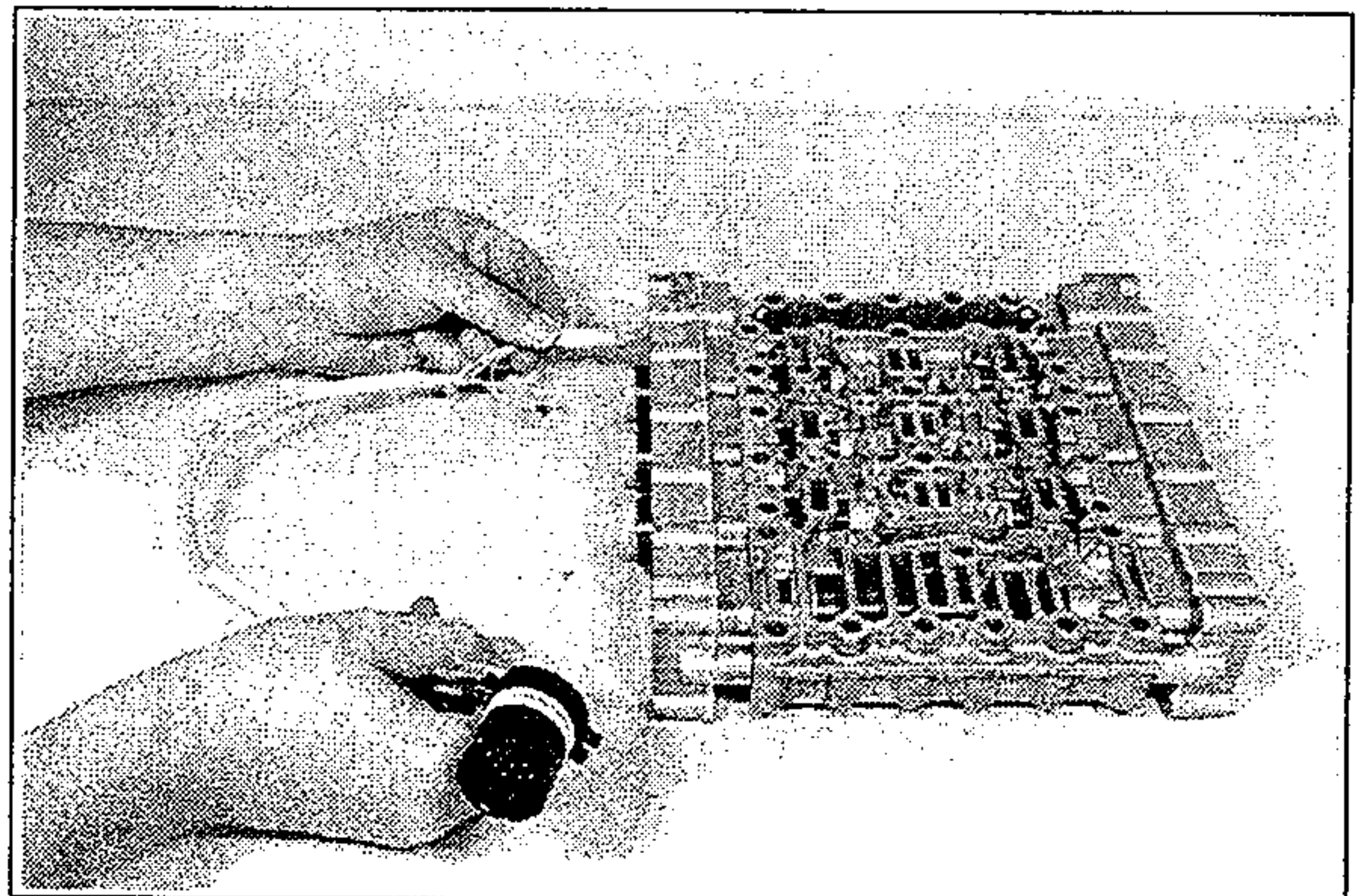
- (4) Remove retaining clip.



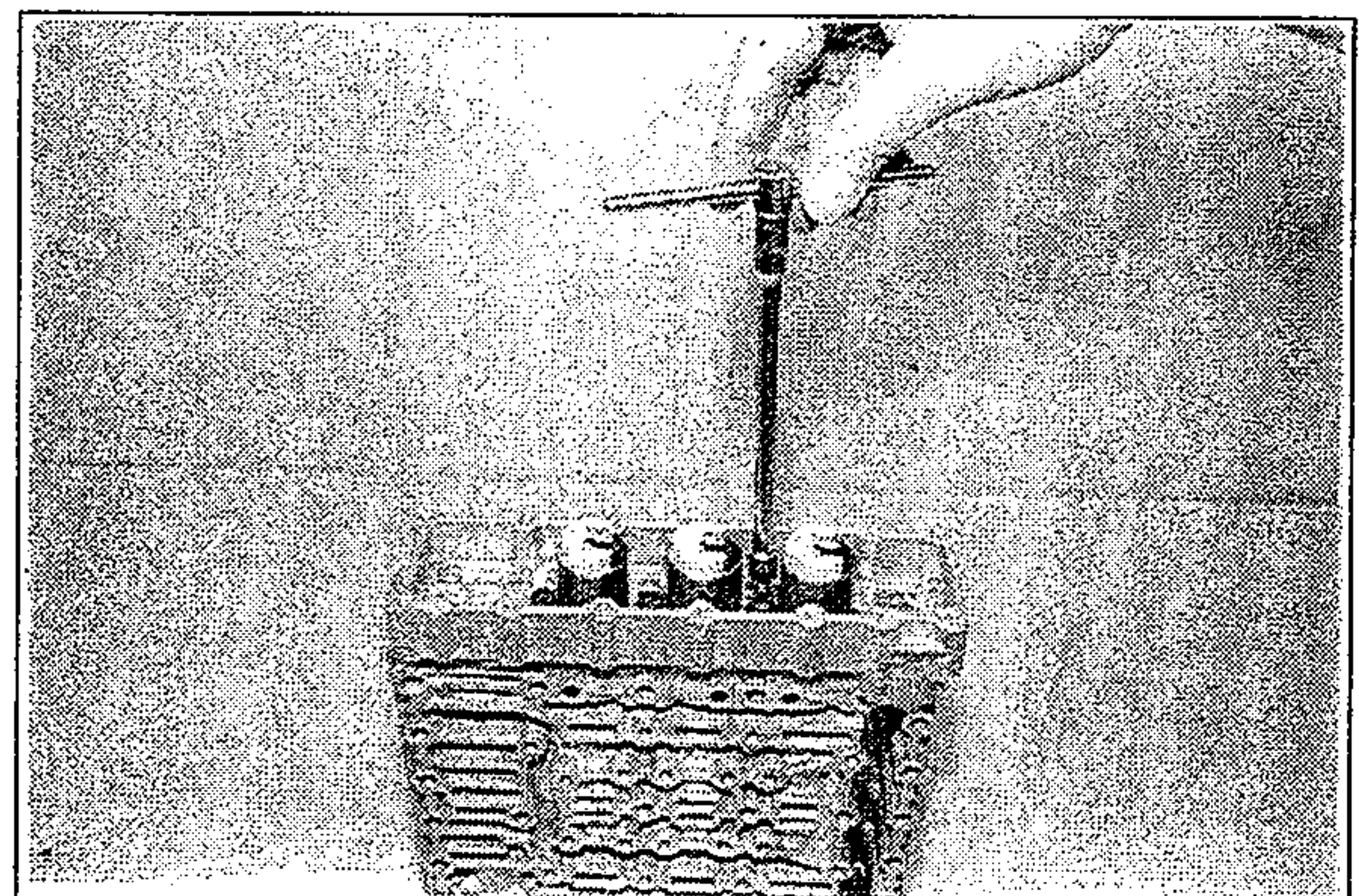
- (5) Loosen socket head screws.
Separate cover from housing and cable harness.
Box spanner 5873 042 002



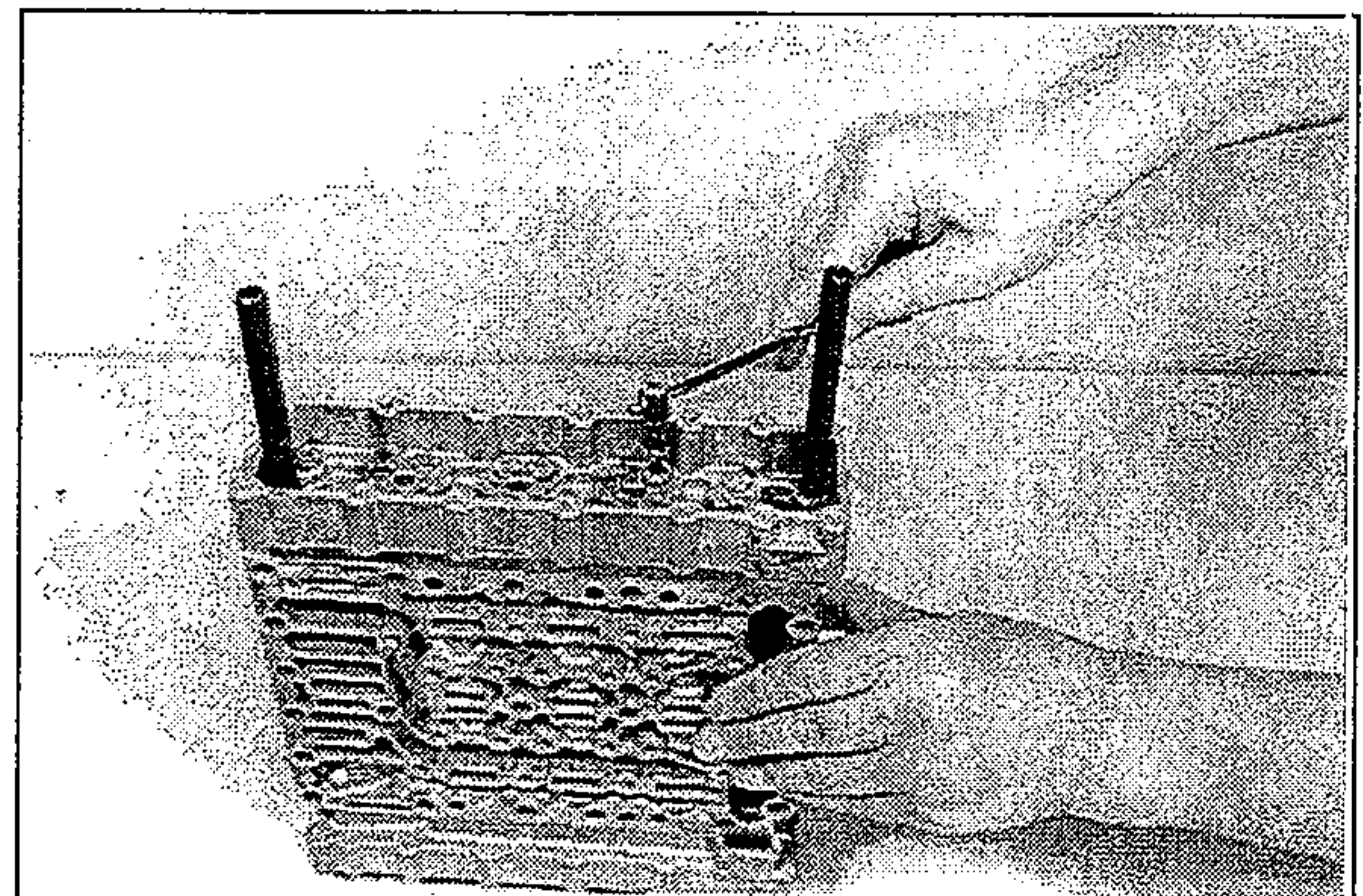
- (6) Disassemble opposite cover.
Disconnect pressure regulator and remove cable harness.



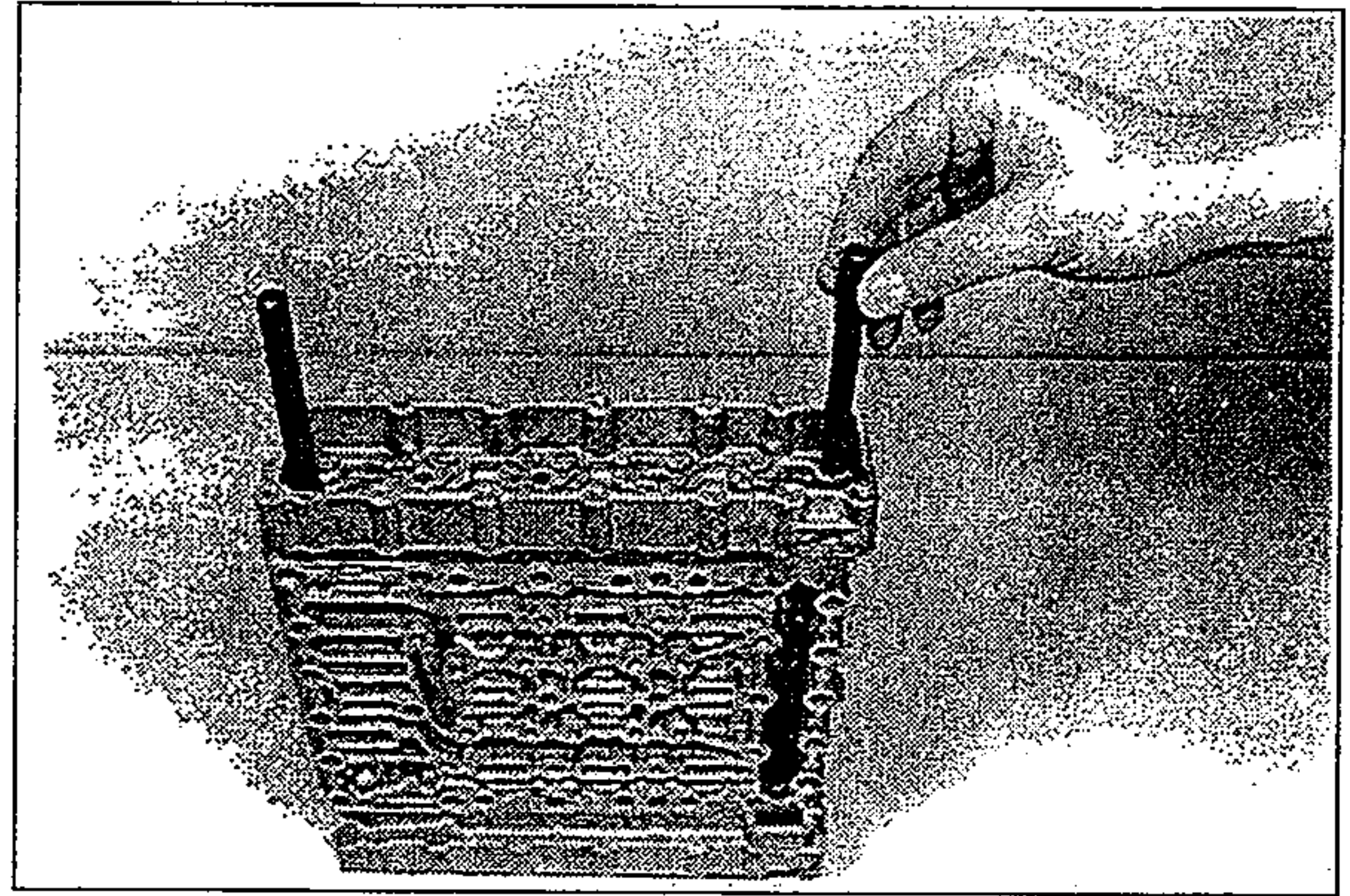
- (7) Loosen socket head screws, remove fixing plate and pressure regulators(3EA).
Box spanner 5873 042 002



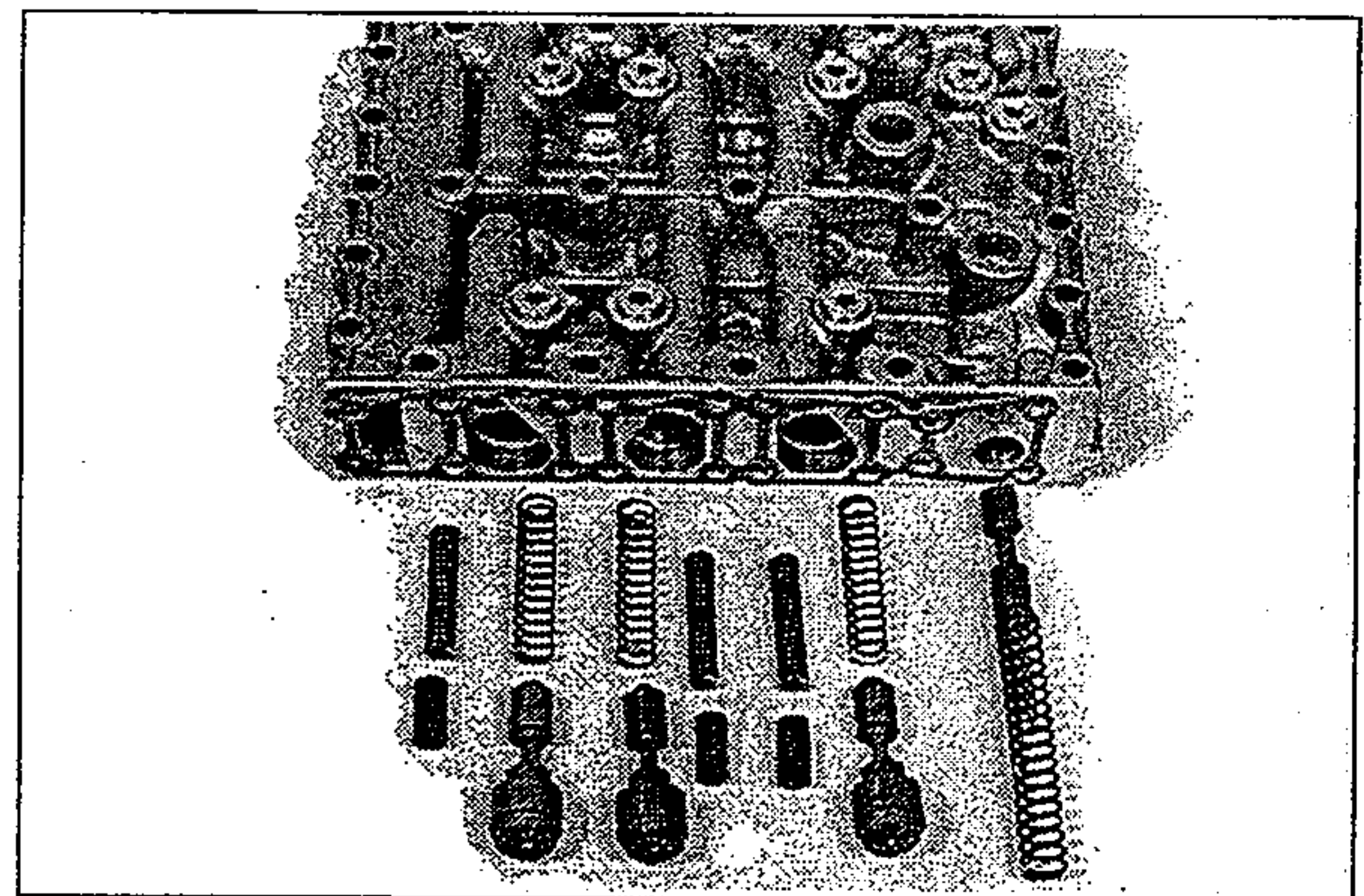
- (8) Loosen two socket head screws and locate housing provisionally, using adjusting screws(Housing is under spring preload).
Now, loosen remaining socket head screws.
Box spanner 5873 042 002
Adjusting screws 5870 204 036



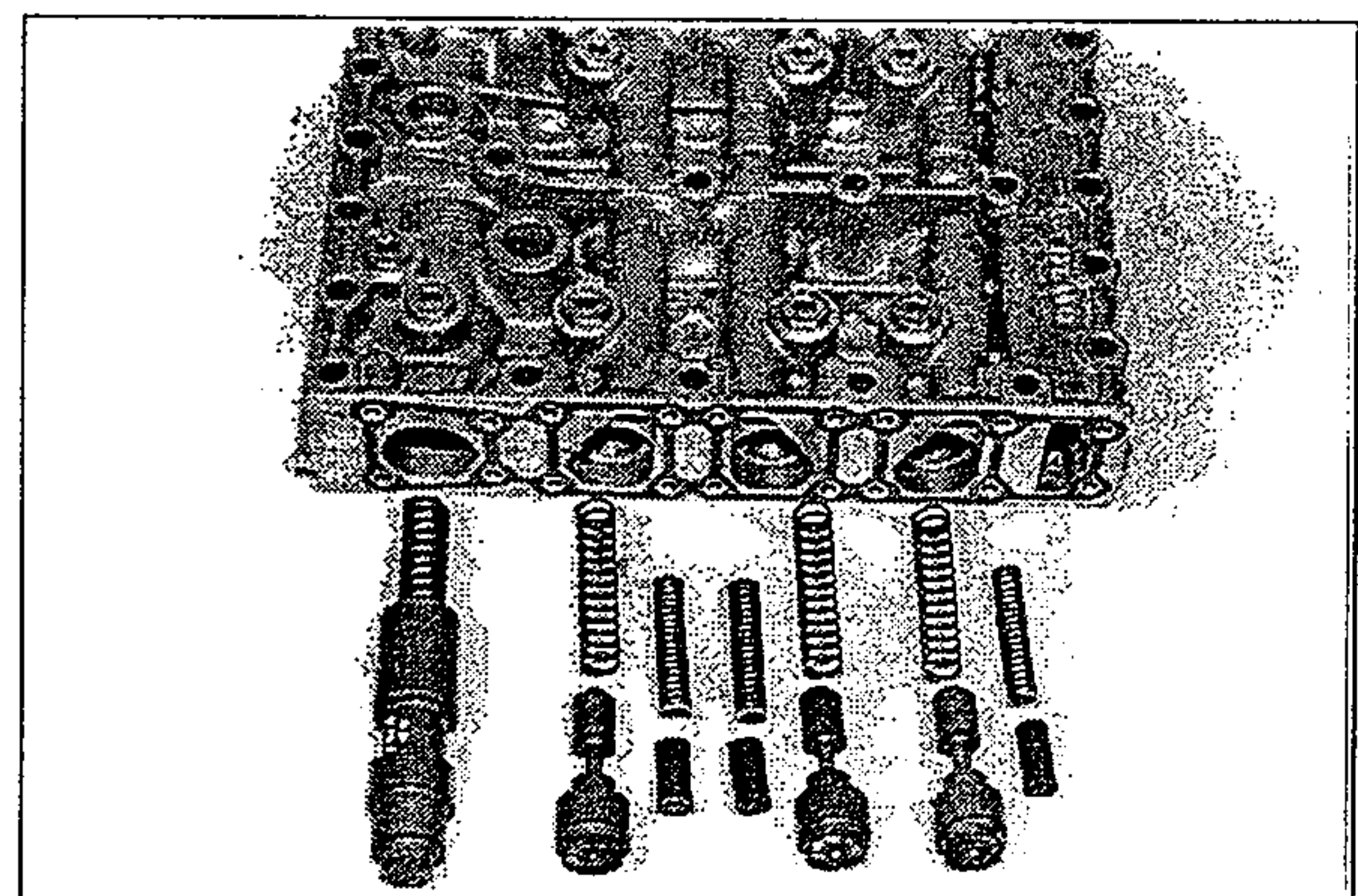
- (9) Separate housing from valve housing by loosening the adjusting screws uniformly.
Adjusting screws 5870 204 036



- (10) Remove components.



- (11) Remove opposite pressure regulators, housing as well as components accordingly.



2) ASSEMBLY

※ Check all components for damage and renew if necessary.

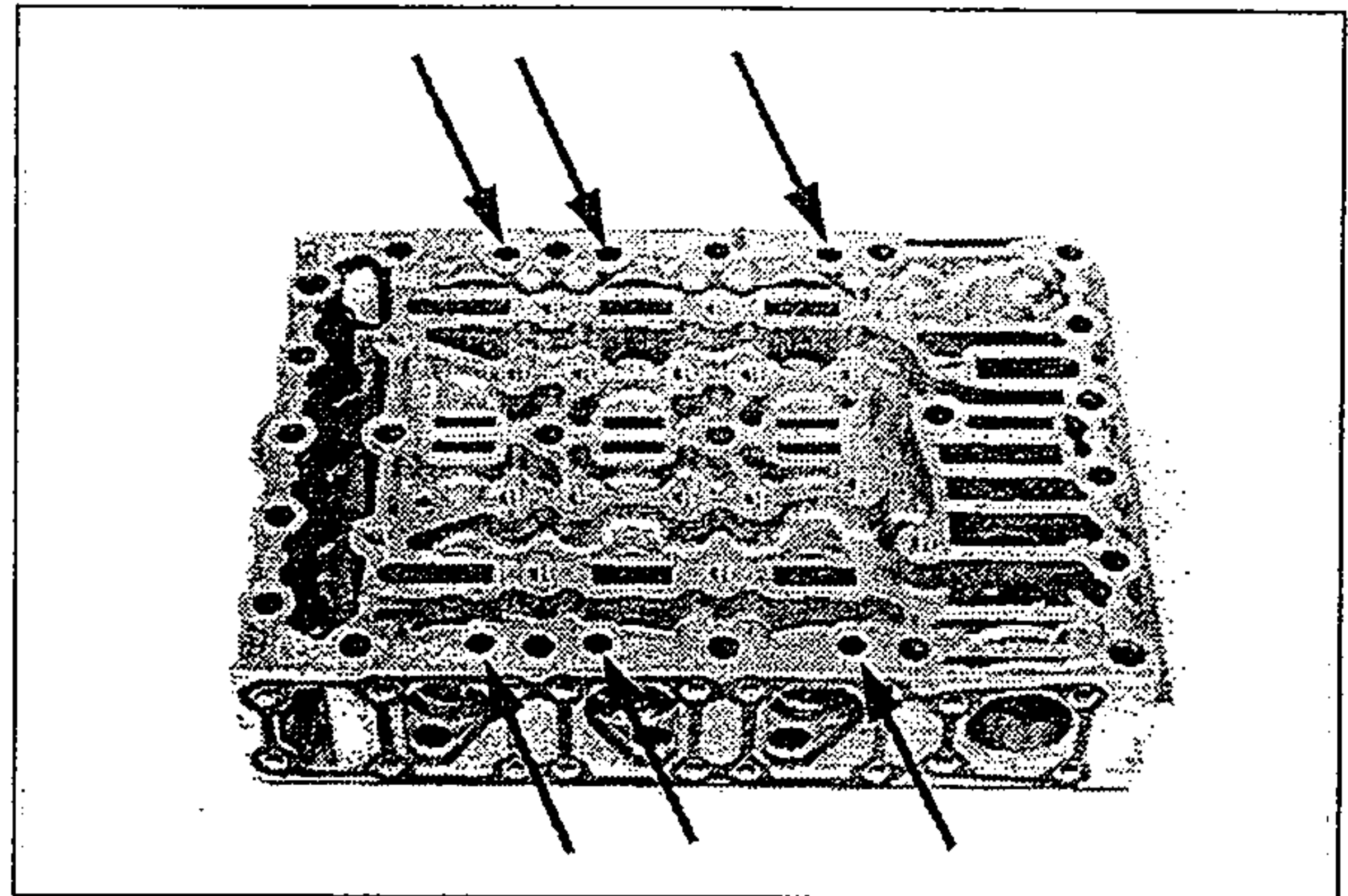
Prior to the installation, check free travel of all moving parts in the housing.

Spools can be exchanged individually.

Oil the components prior to the assembly.

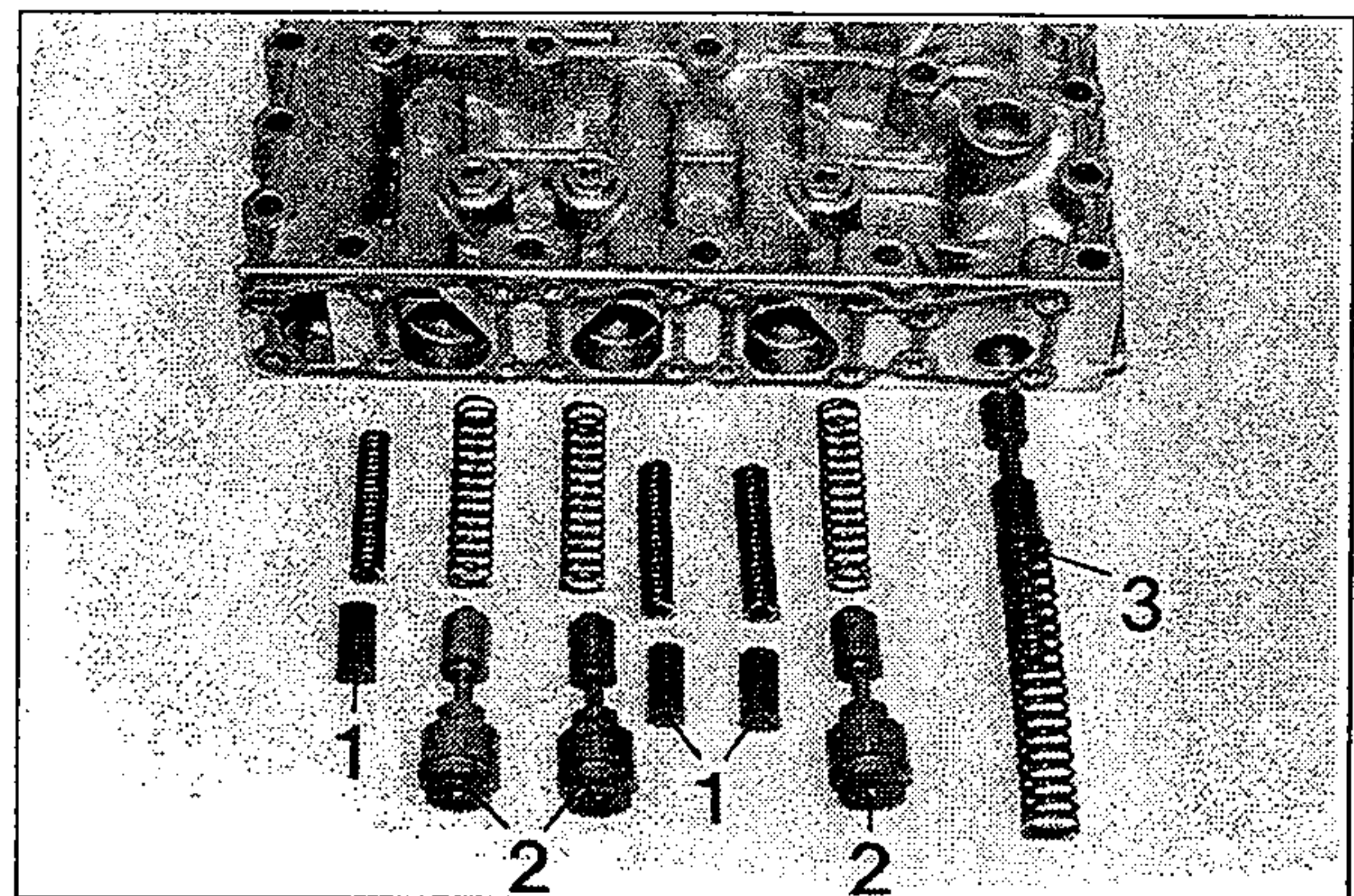
Insert diaphragms with the concave side showing upward until contact is obtained.

※ Installation position, see arrows.



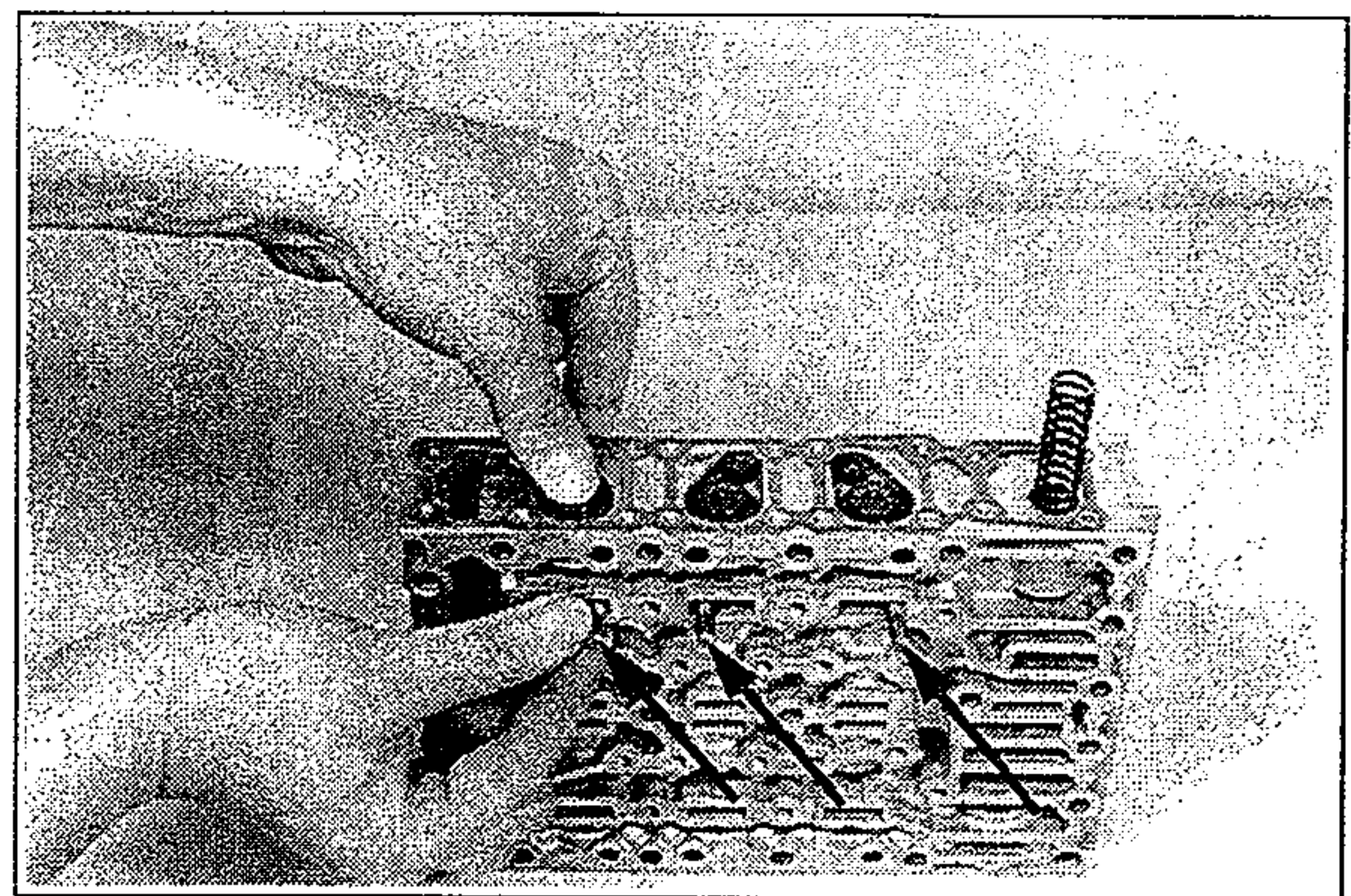
(1) Illustration on the right shows the following components.

- 1 Vibration damper
- 2 Follow-on slide
- 3 Pressure reducing valve



(2) Install components according to figure (1).

※ Preload compression spring of the follow-on slides and locate spool provisionally by means of cylindrical pins $\varnothing 5.0\text{mm}$ (Assembly aid), see arrows.

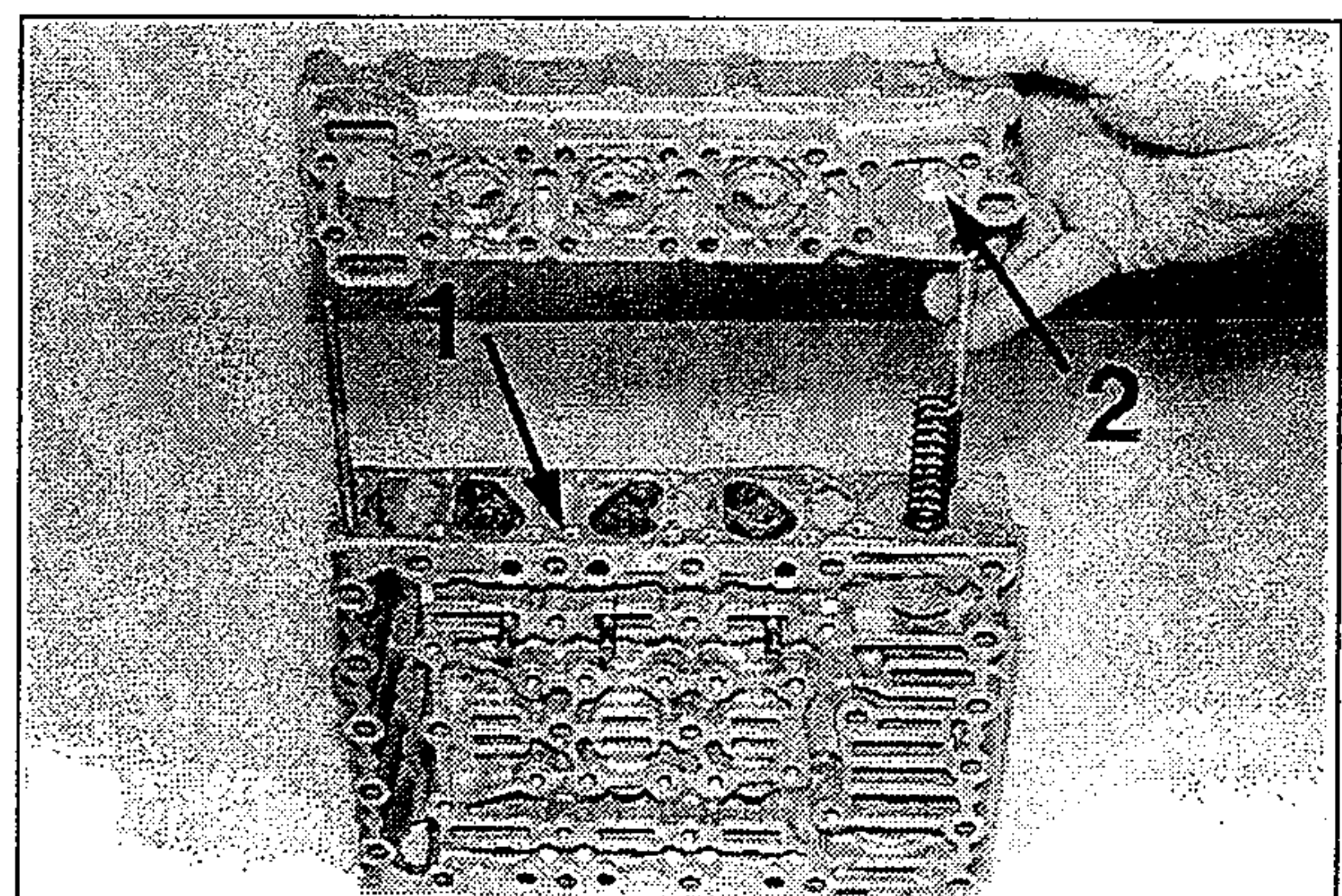


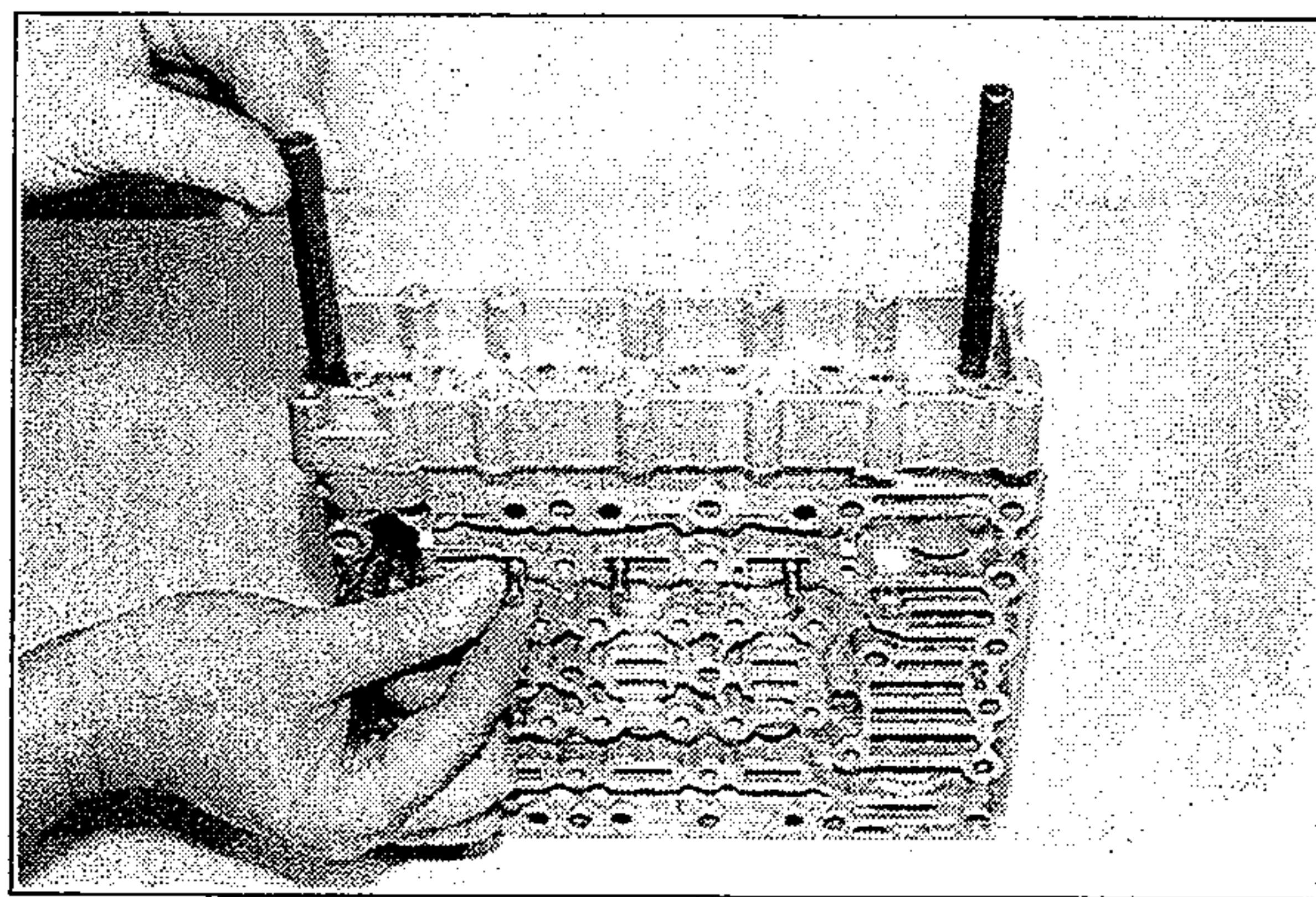
(3) Install two adjusting screws.

Assemble gasket (Arrow 1) and housing cover. Now, position the housing cover uniformly, using adjusting screws, until contact is obtained and remove cylindrical pins (Assembly aid) again (See the next figure).

※ Pay attention to the different housing covers. Install recess $\varnothing 15\text{mm}$ (Arrow 2), facing the spring of the pressure reducing valve.

Adjusting screws 5870 204 036

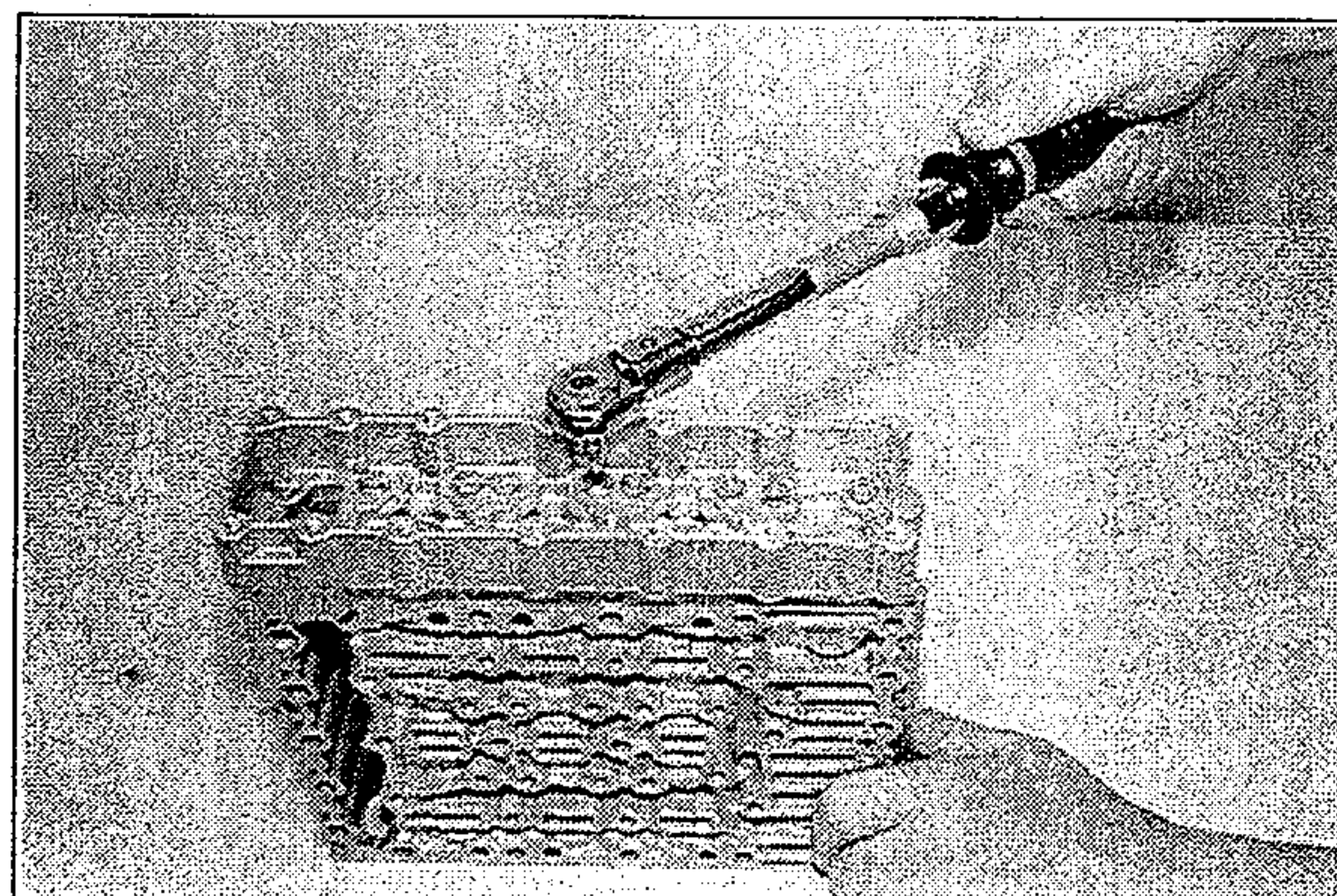




(4) Fasten housing cover by means of socket head screws.

• Torque limit : 0.56kgf · m(4.06lbf · ft)

Box spanner 5873 042 002



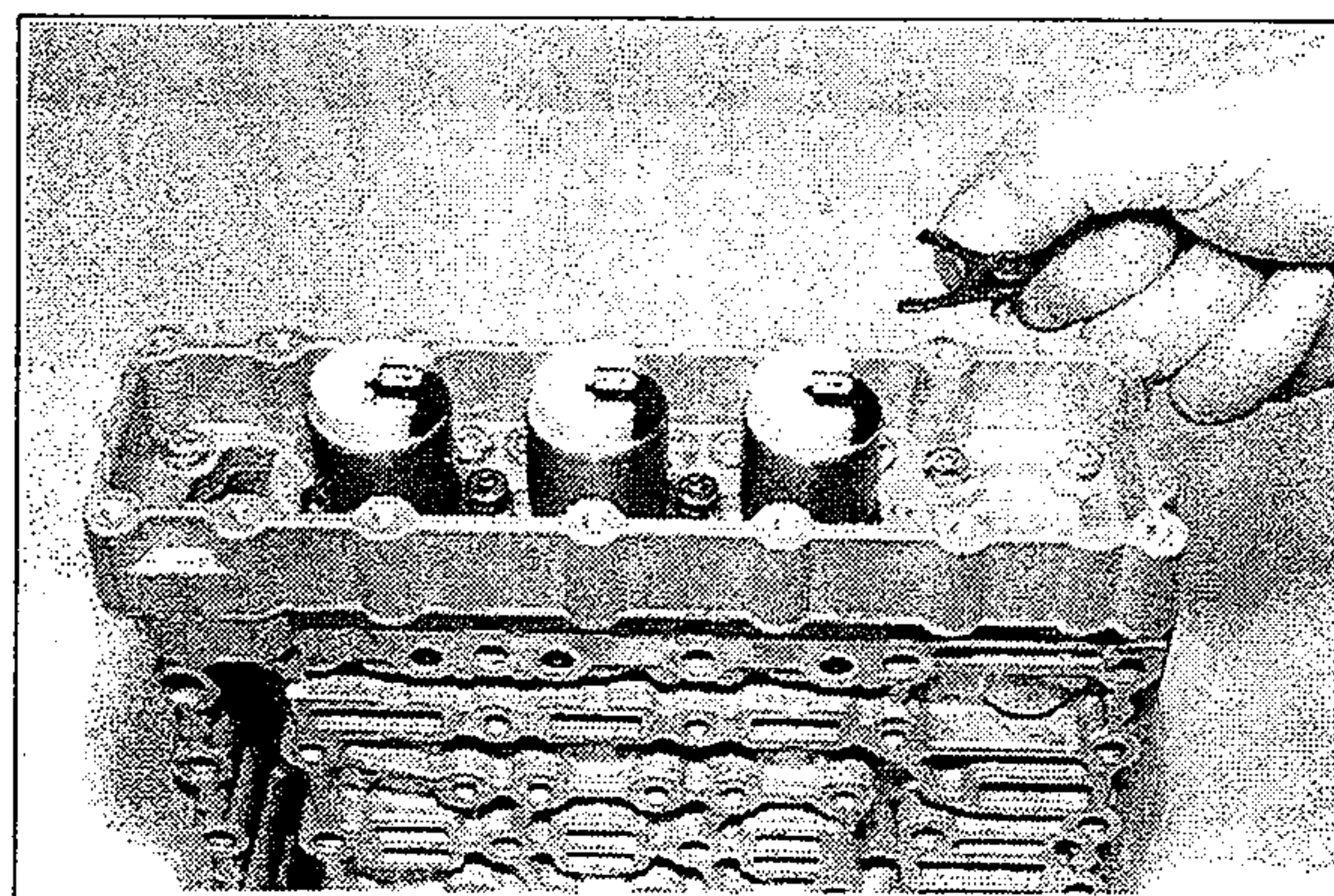
(5) Introduce pressure regulators and fix by means of fixing plates and socket head screws.

※ Install fixing plate, with the claw showing downward.

Pay attention to the radial installation position of the pressure regulators, see figure.

• Torque limit : 0.56kgf · m(4.06lbf · ft)

Box spanner 5873 042 002



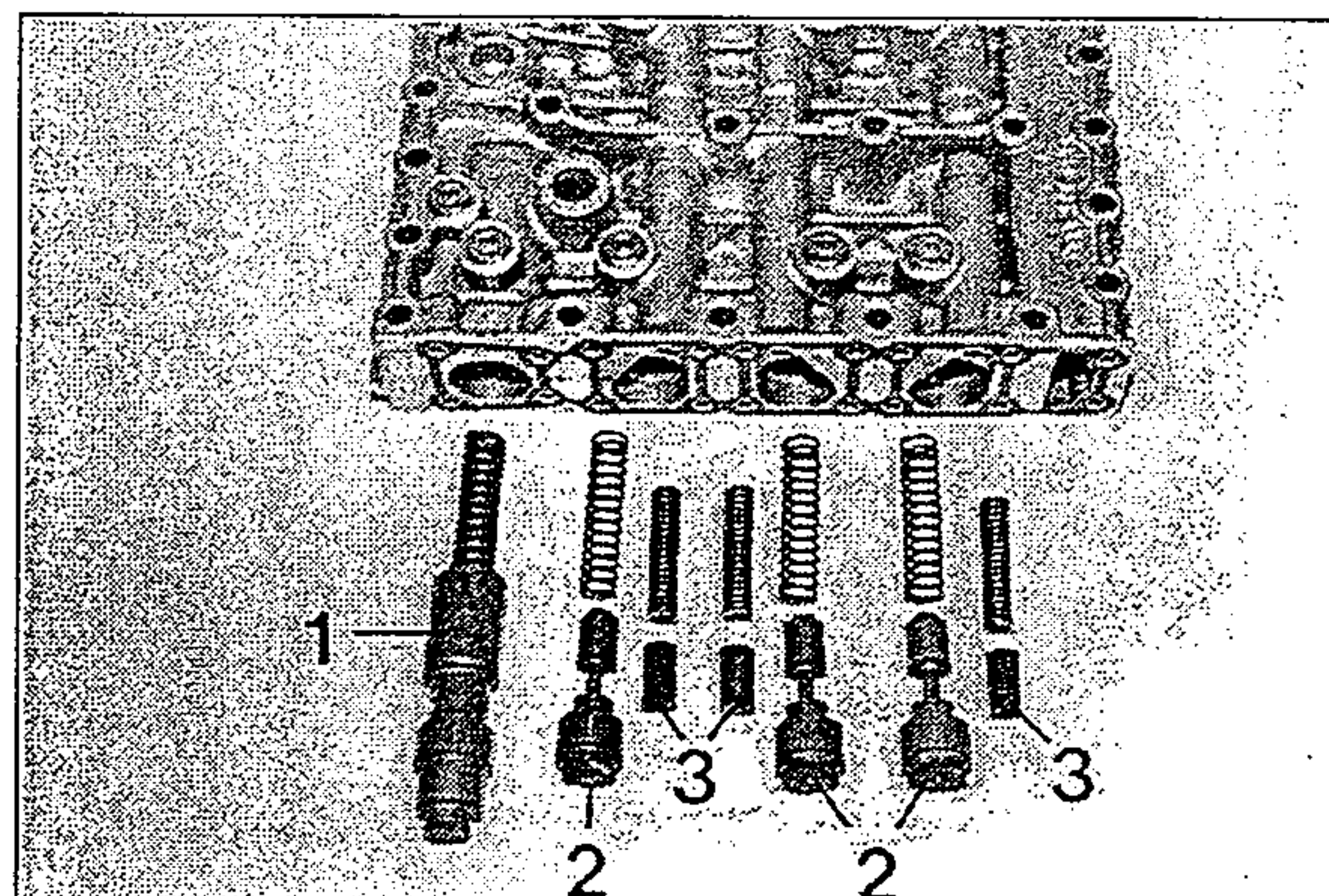
Pre assemble opposite side

(6) Illustration on the right shows the following components.

1 Main pressure valve

2 Follow on slide

3 Vibration damper



(7) Install components according to figure (6).

Preload compression springs of the follow-on slides and locate spool provisionally by means of cylindrical pins $\varnothing 5.0\text{mm}$ (Assembly aid), see arrows.

Install two adjusting screws.

Assemble gasket (Arrow 1) and housing cover, and position them uniformly against shoulder, using adjusting screws.

※ Pay attention to the different housing covers—install the recess $\varnothing 19\text{mm}$ (Arrow 2), facing the main pressure valve.

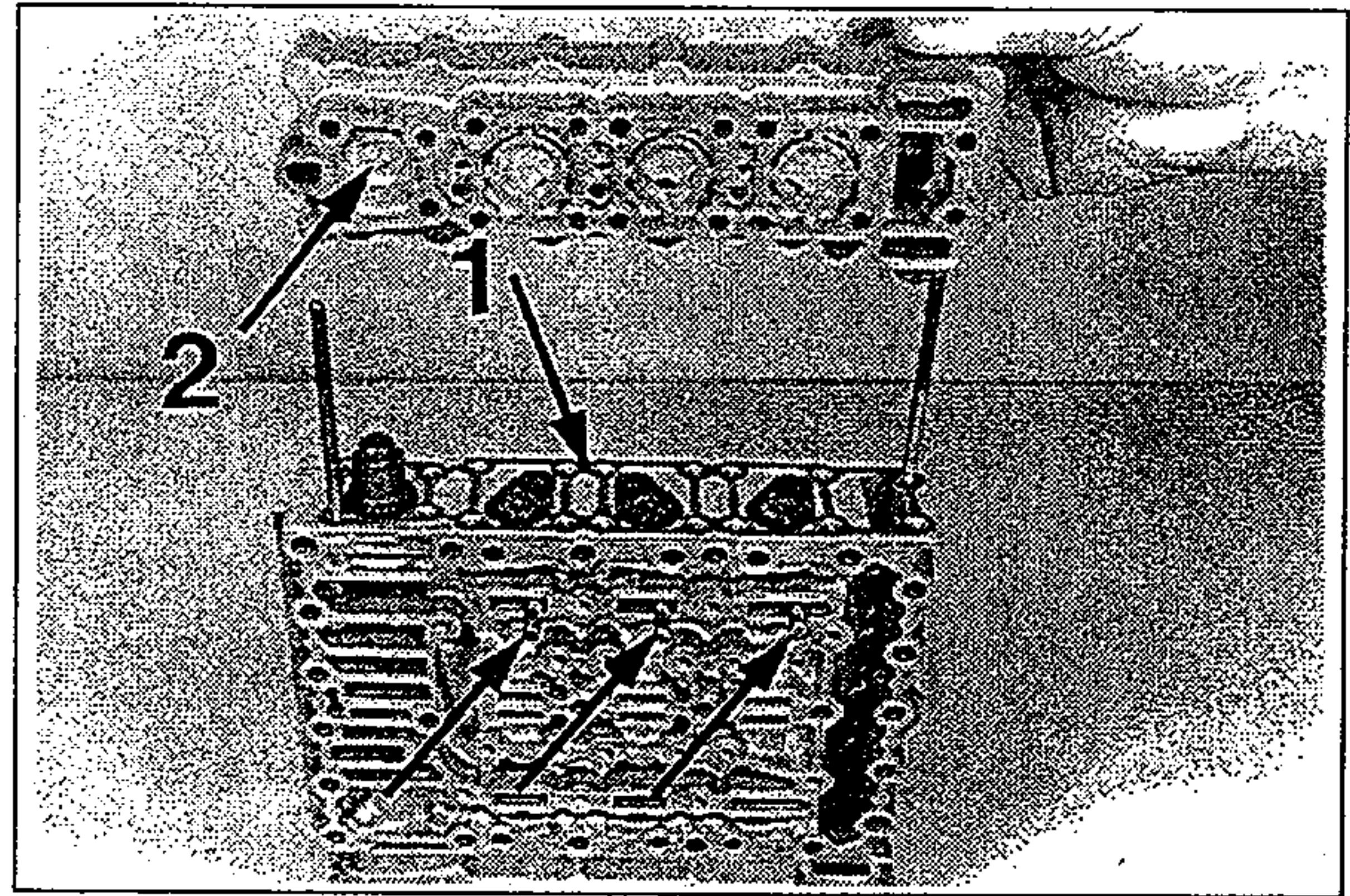
Now, fasten housing cover by means of socket head screws.

• Torque limit : $0.56\text{kgf} \cdot \text{m}$ ($4.06\text{lbf} \cdot \text{ft}$)

Remove cylindrical pins (Assembly aid) again.

Adjusting screws 5870 204 036

Box spanner 5873 042 002



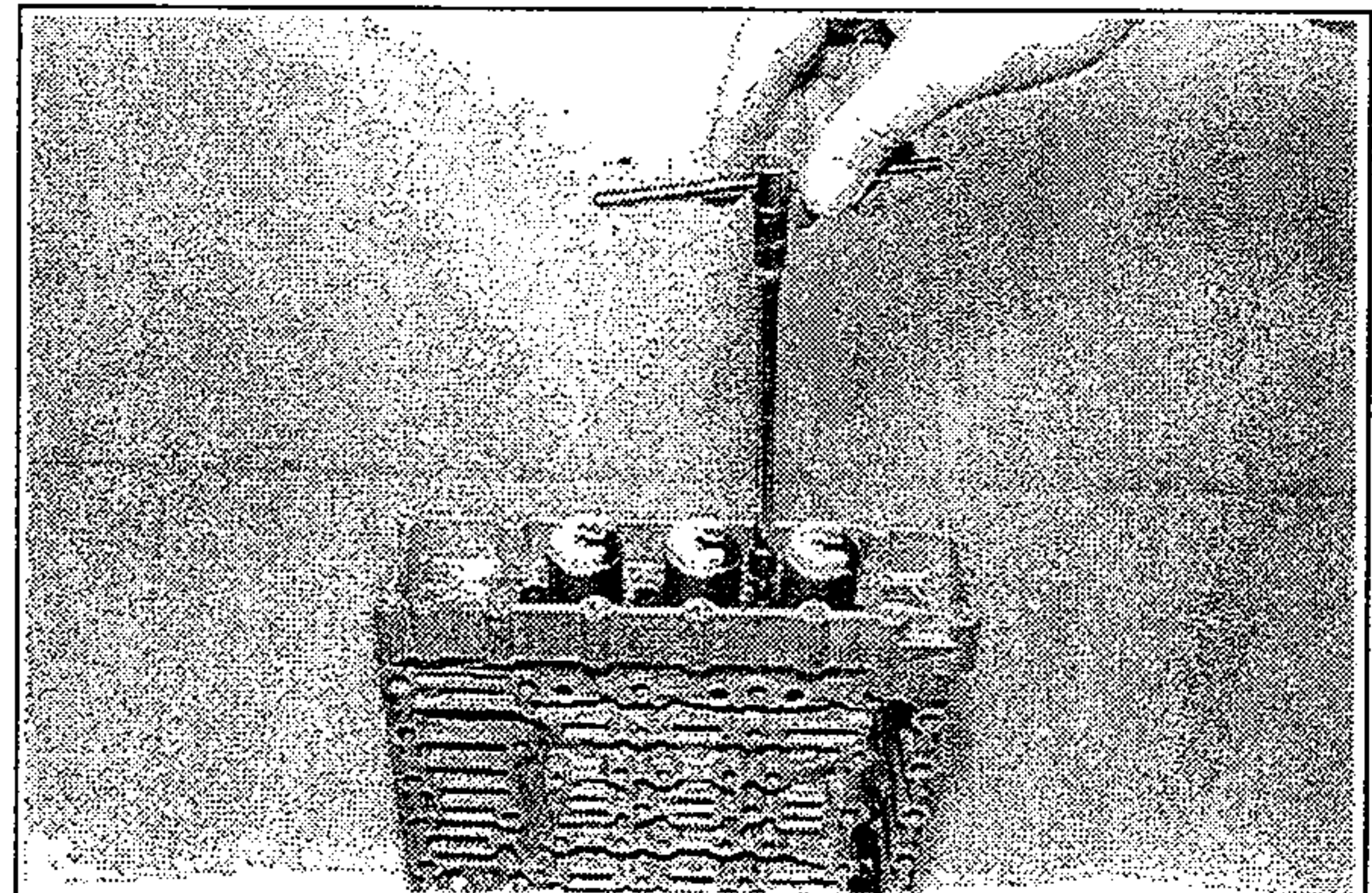
(8) Introduce pressure regulators and fix by means of fixing plates and socket head screws.

※ Install fixing plates, with the claw showing downward.

Pay attention to the radial installation position of the pressure regulators, see figure.

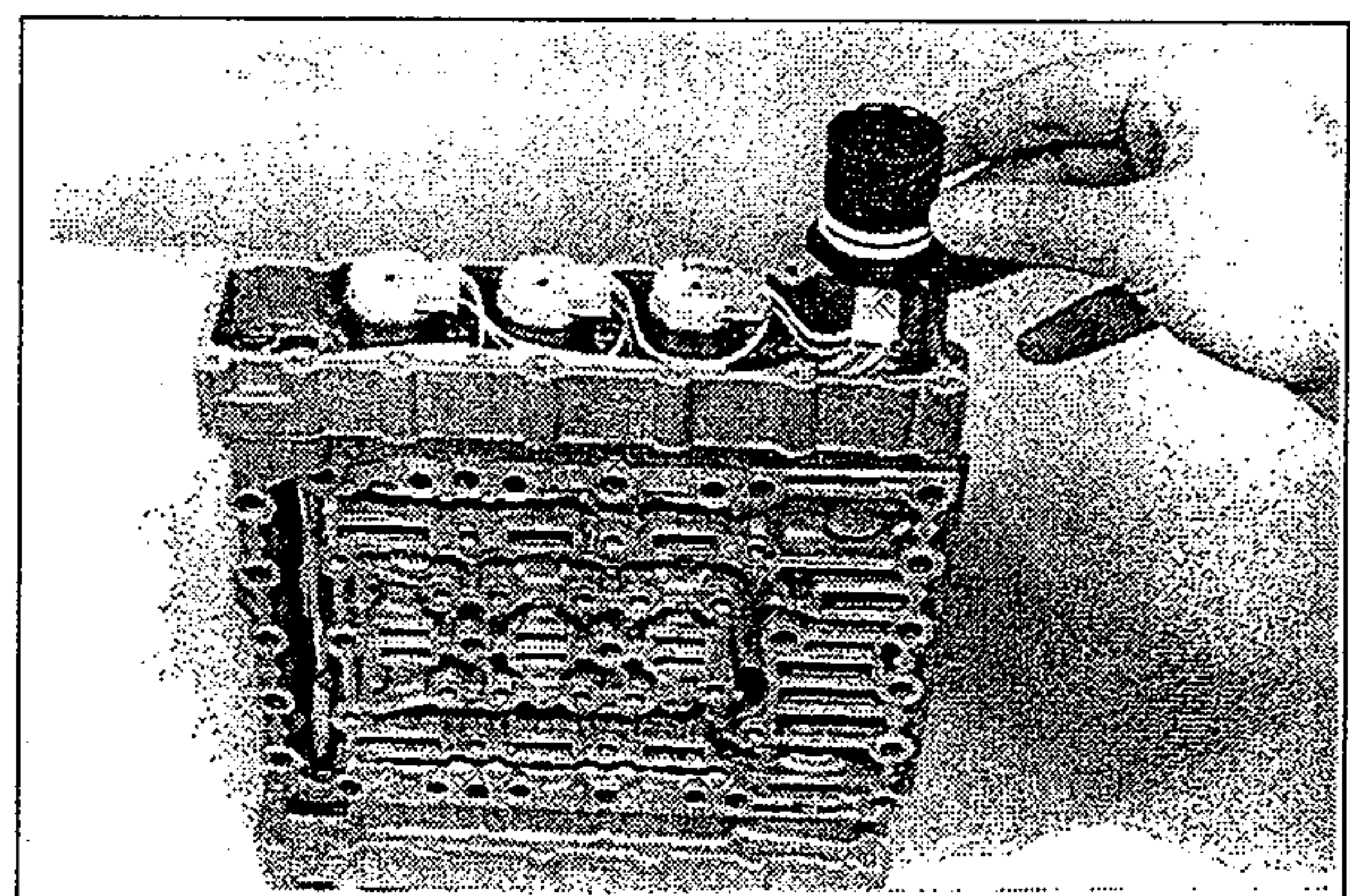
• Torque limit : $0.56\text{kgf} \cdot \text{m}$ ($4.06\text{lbf} \cdot \text{ft}$)

Box spanner 5873 042 002



(9) Introduce cable harness and connect pressure regulators (6EA).

※ Pay attention to the installation position of the cable harness, also markings (See figure(2), page 3-74).

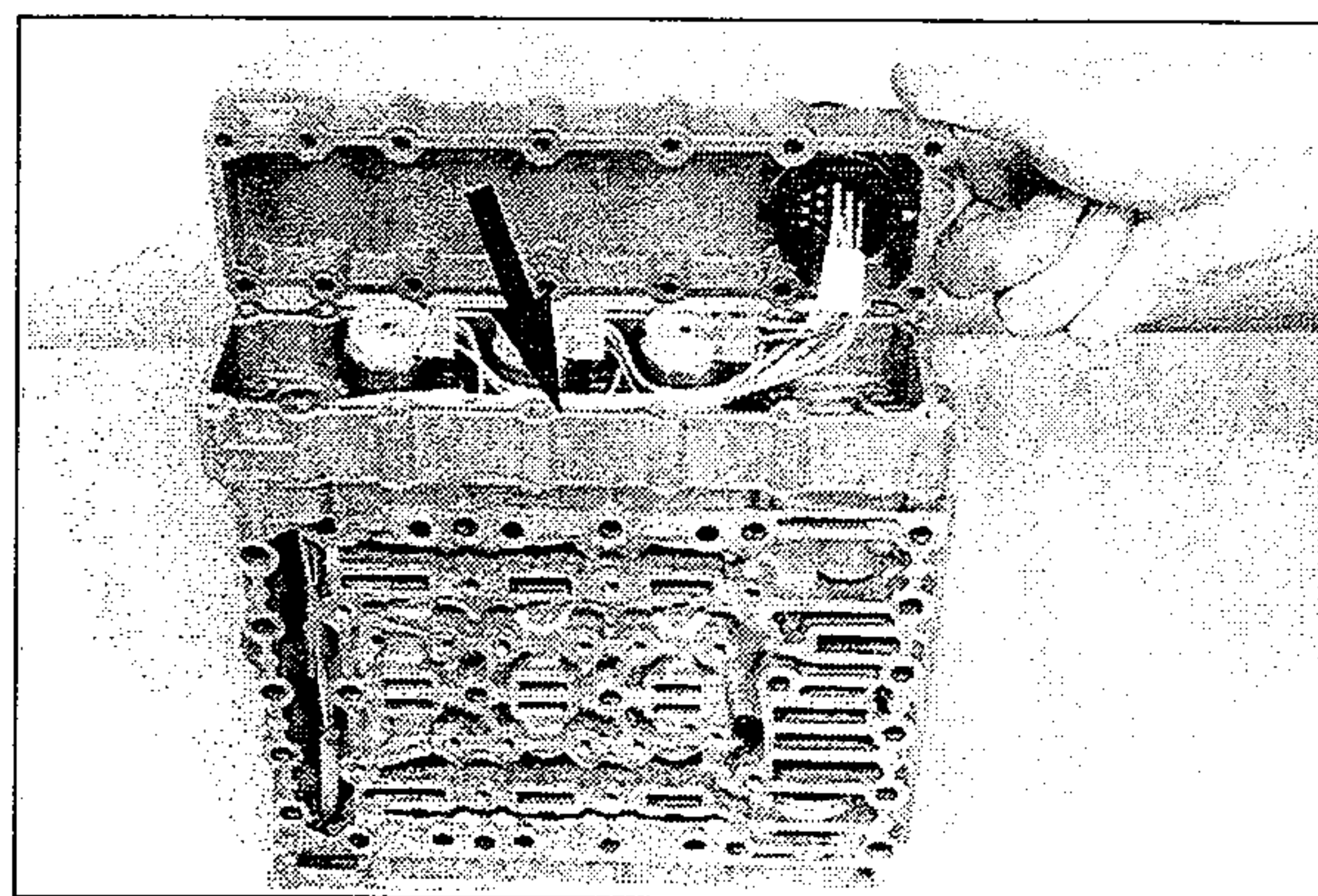


(10) Introduce female connector against shoulder, with the groove facing the guide nose of the cover.

Install gasket (Arrow) and fasten cover by means of socket head screws.

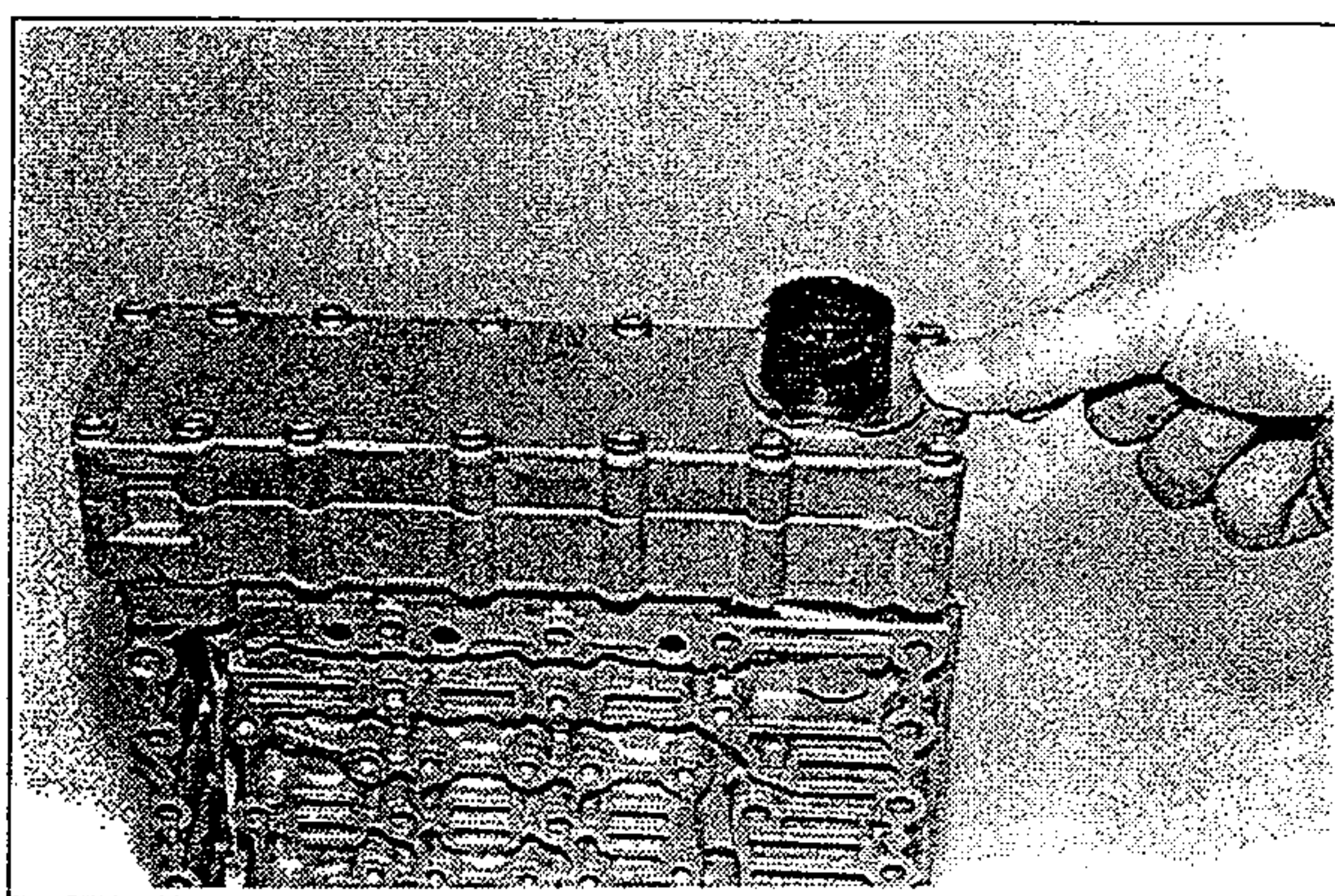
• Torque limit : 0.56kgf · m (4.06lbf · ft)

Box spanner 5873 042 002



(11) Fix female connector by means of retaining clamp, see figure.

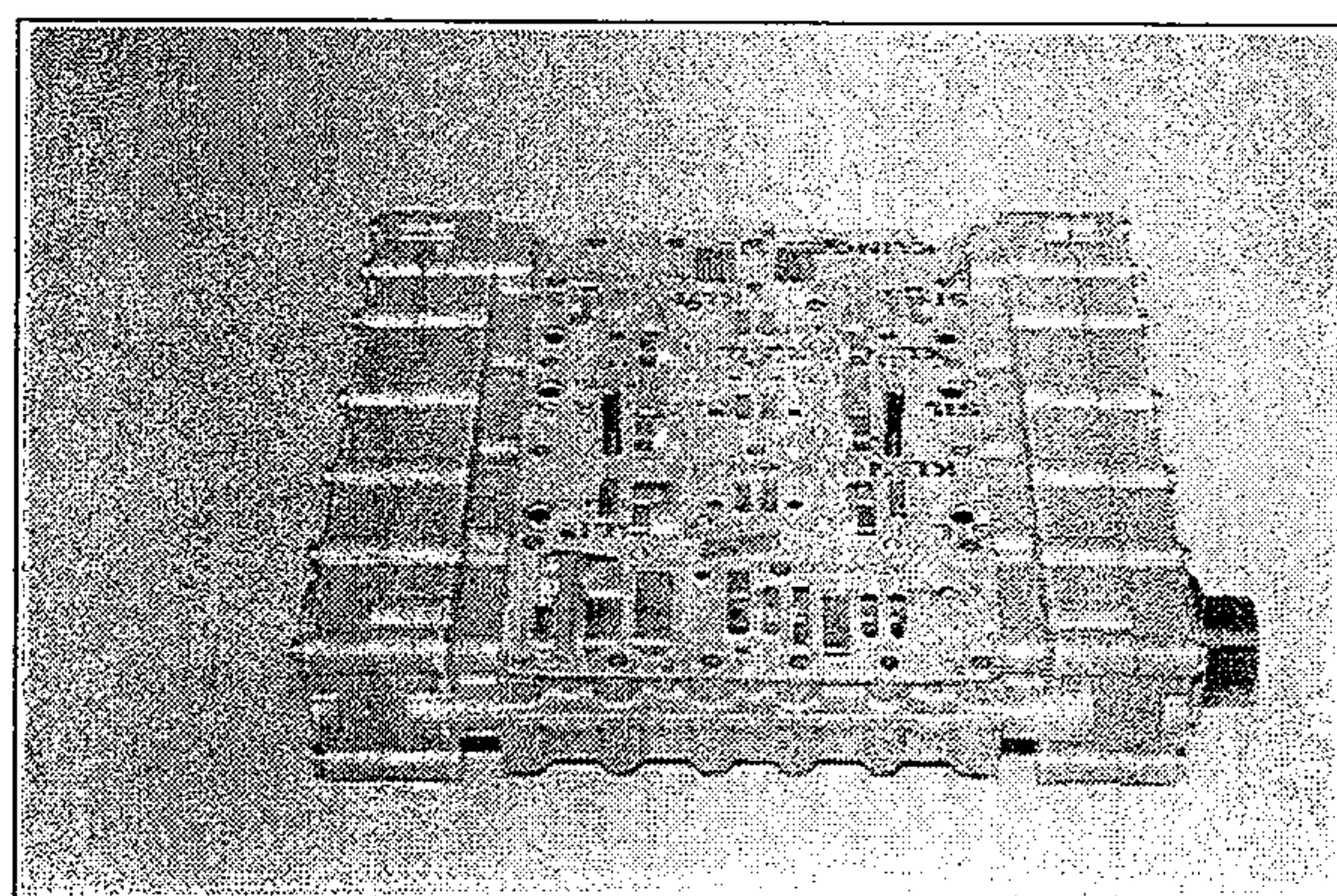
Install opposite cover.



(12) Install two adjusting screws and mount gasket I.

※ Pay attention to the different gaskets, see on the right figure and (15).

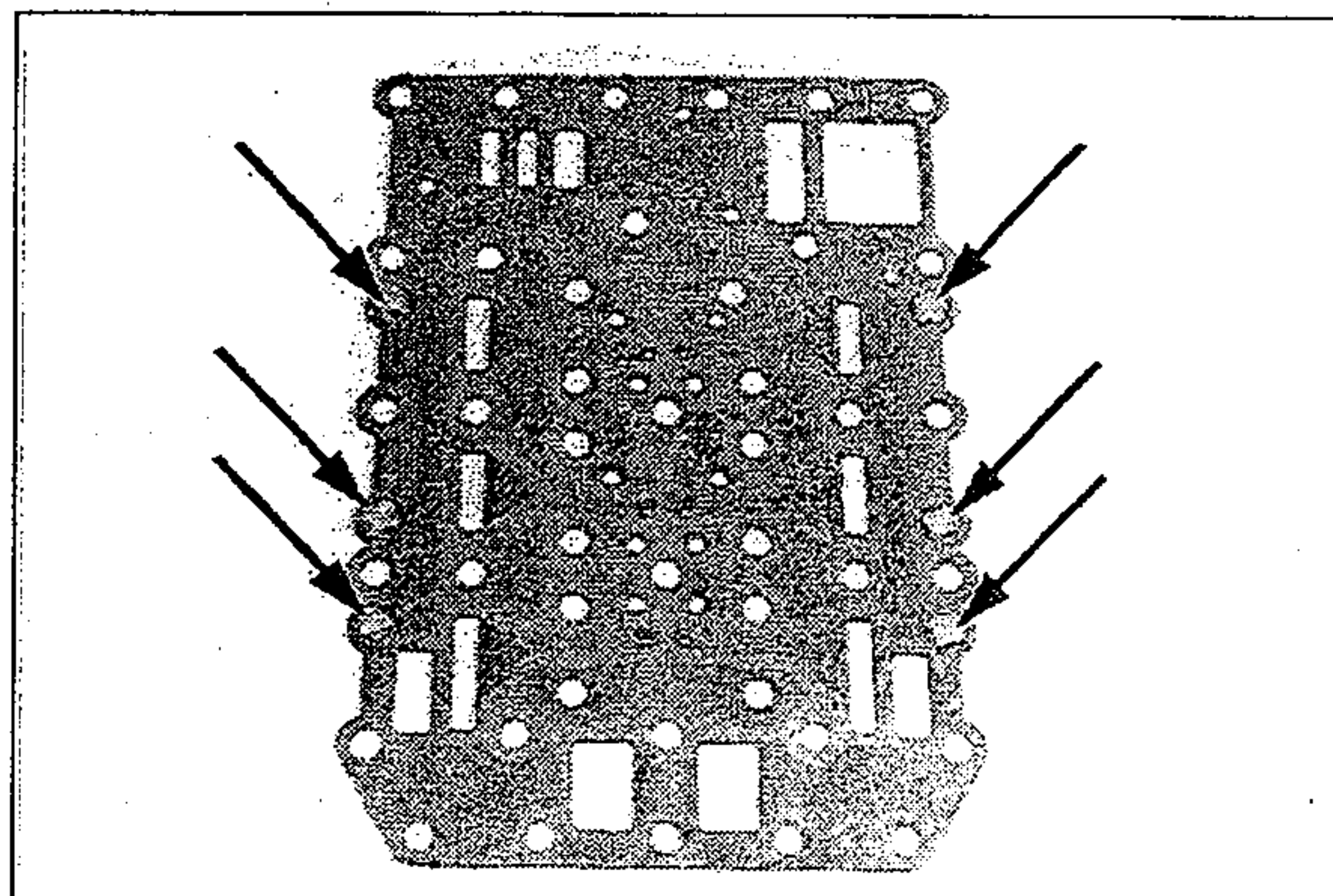
Adjusting screws 5870 204 063



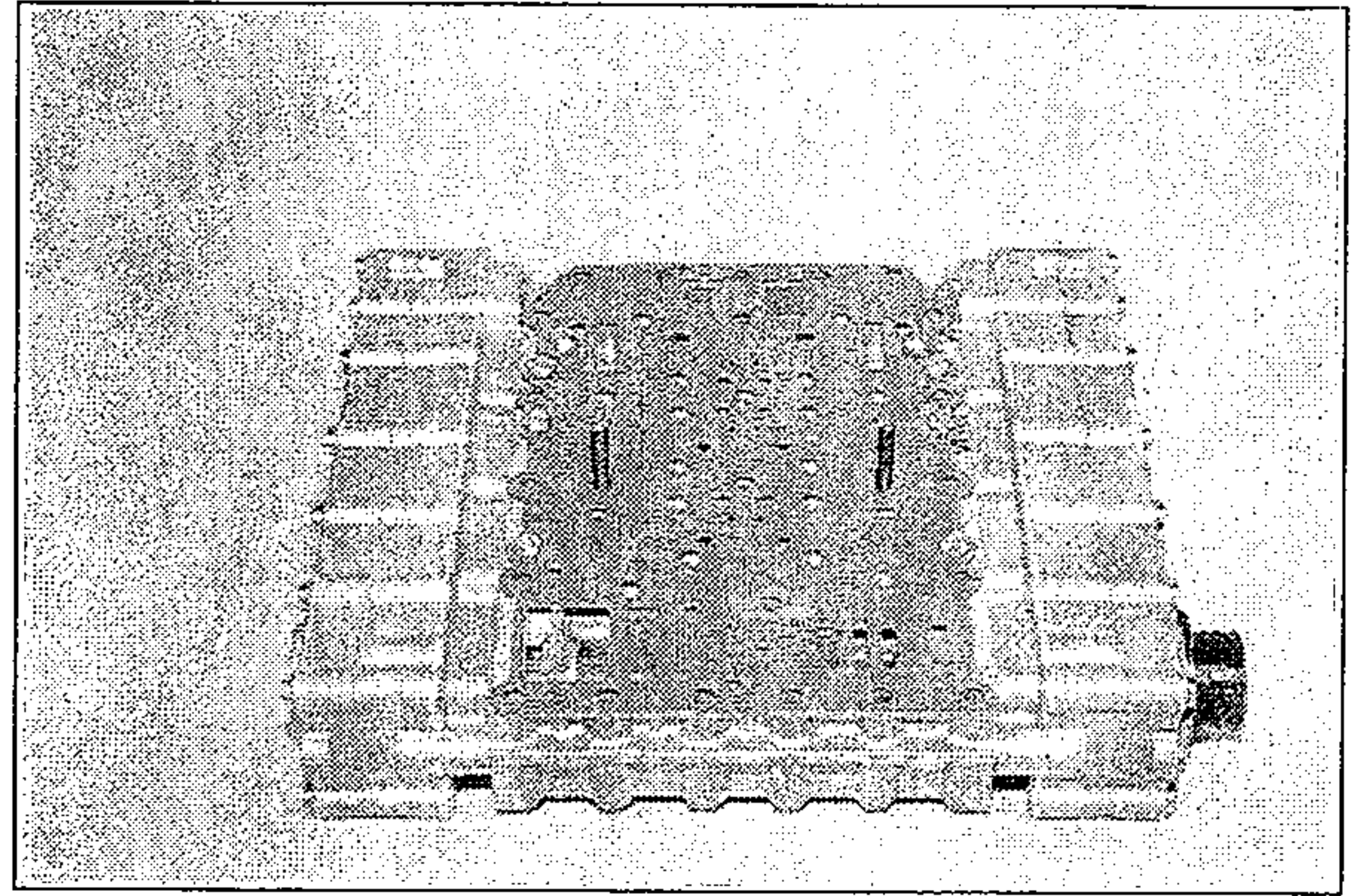
Intermediate plate-Version with screens

(13) Insert screws (6EA) flush mounted into the bore of the intermediate plate, see arrow.

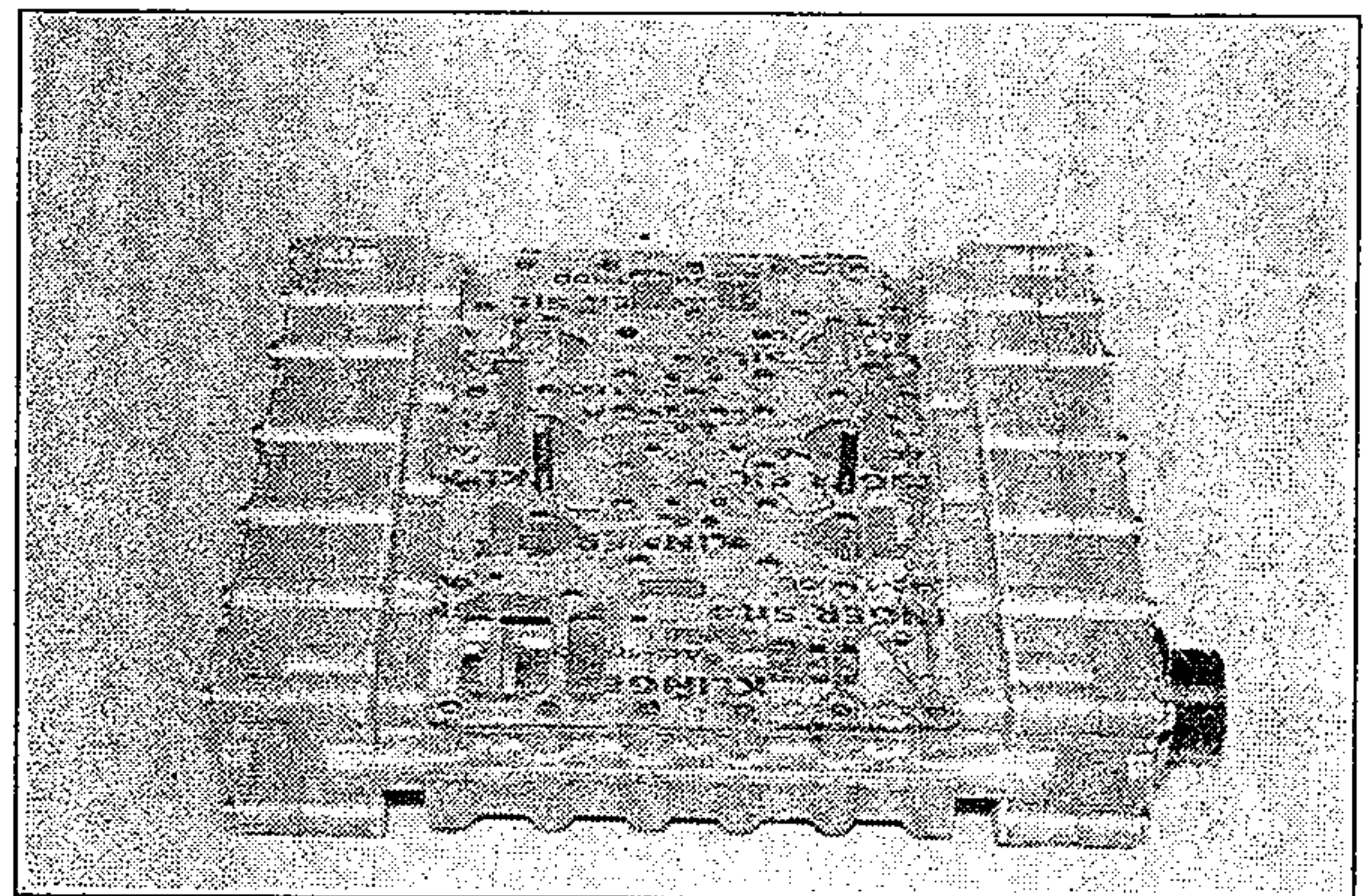
※ Pay attention to the installation position- screws are showing upward (Facing the duct plate).



(14) Mount intermediate plate, with the screens showing upward.



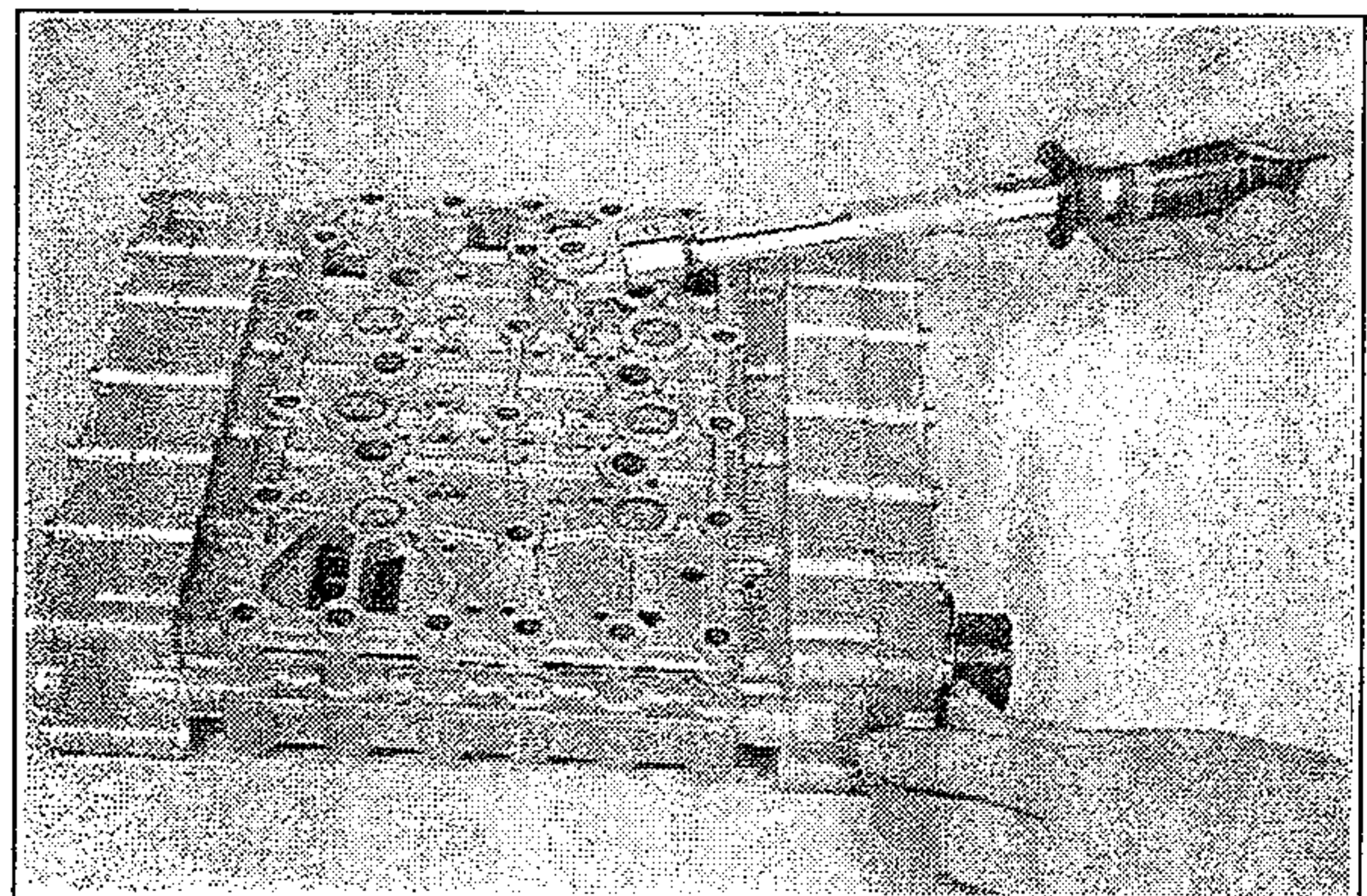
(15) Mount gasket II.



(16) Mount duct plate and fasten it uniformly by means of socket head screws.

• Torque limit : 0.97kgf · m(7.0lbf · ft)

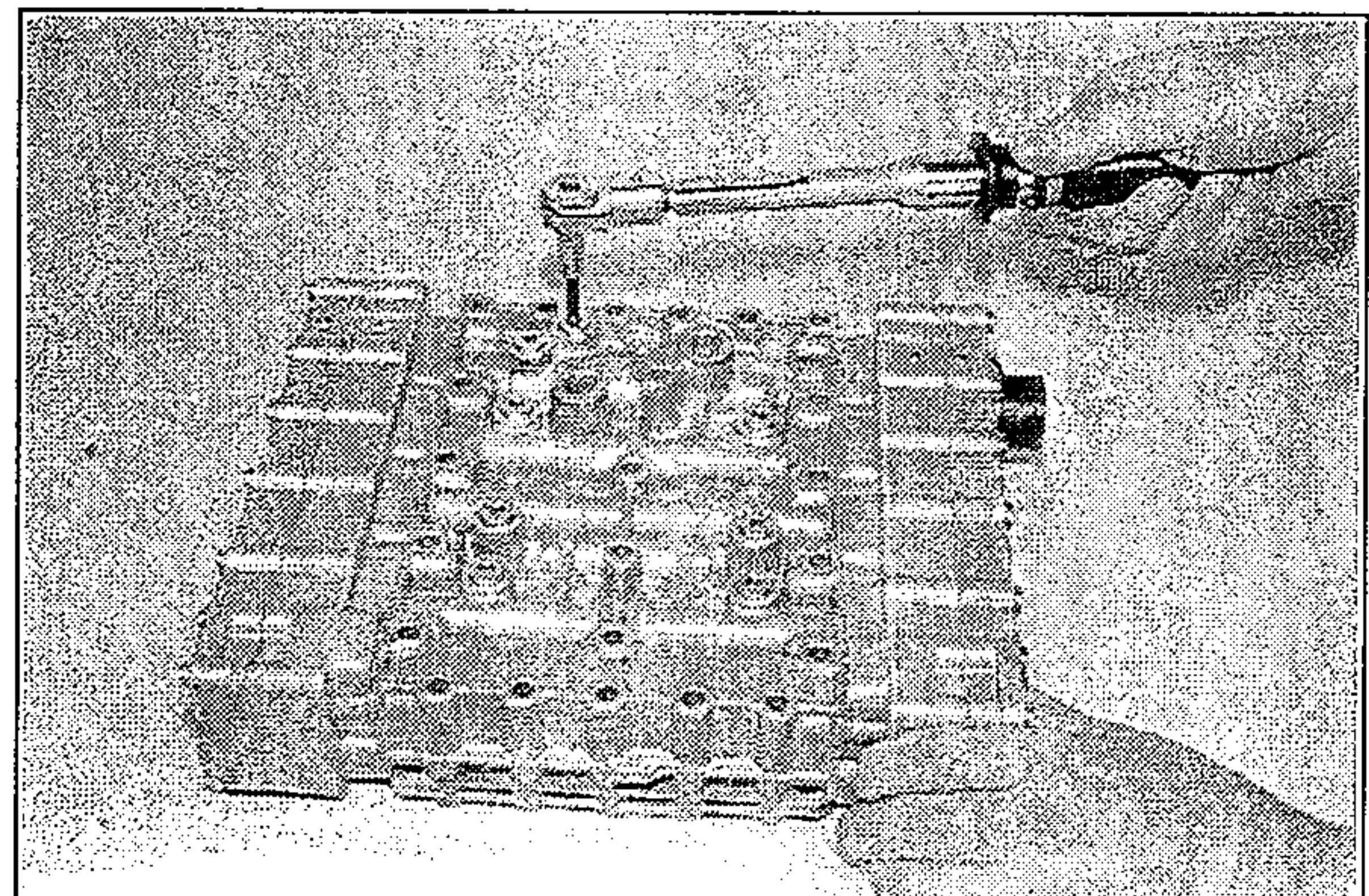
Box spanner 5873 042 002



(17) Equip screw plug(8EA) with new O-rings and install them.

• Torque limit : 0.56kgf · m(4.06lbf · ft)

※ The installation of the hydraulic control unit is described, starting from page 3-131.



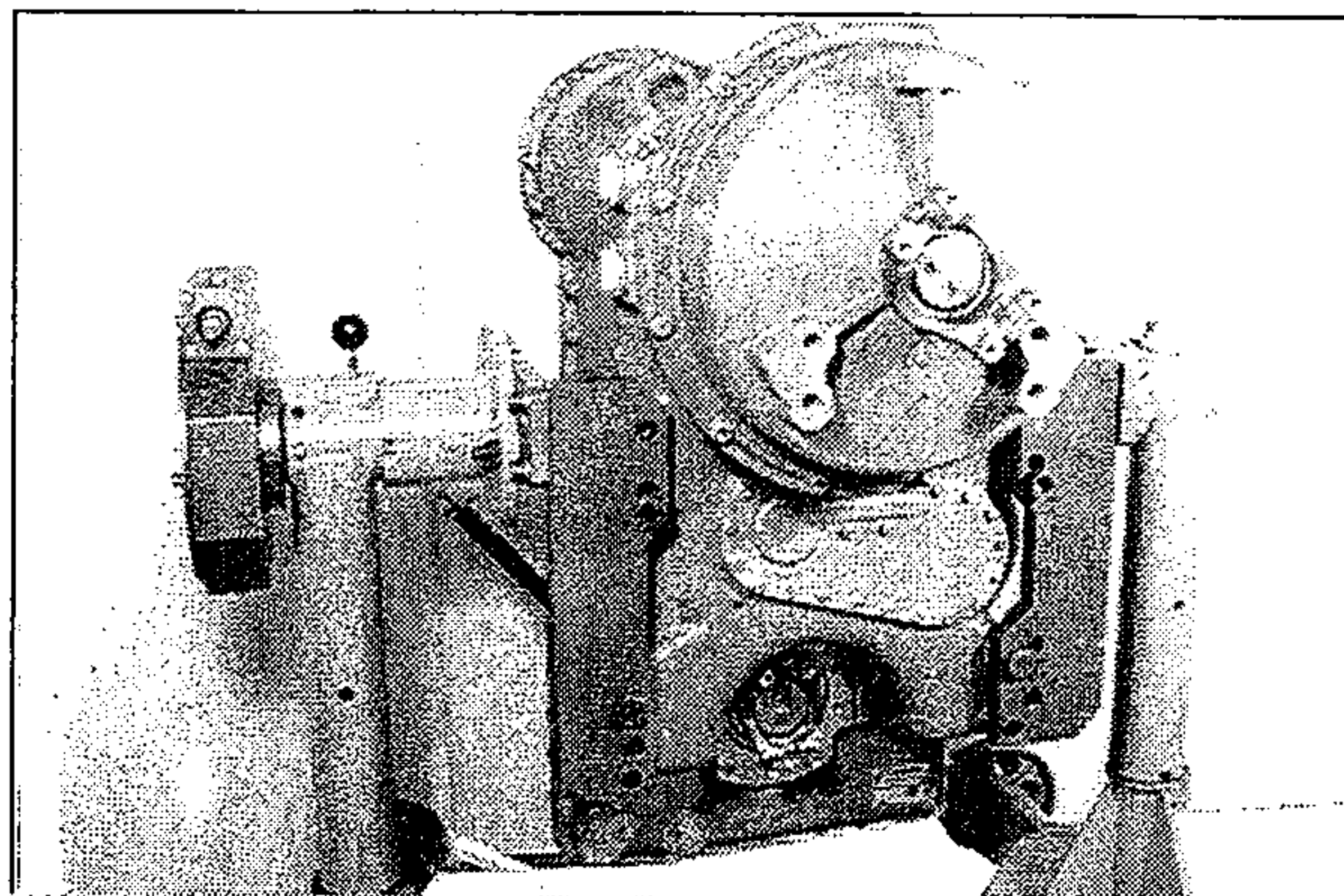
2. POWERSHIFT TRANSMISSION

Fasten transmission of the assembly car.

Assembly car 5870 350 000

Strips 5870 350 063

Support 5870 350 090



1) DISASSEMBLY

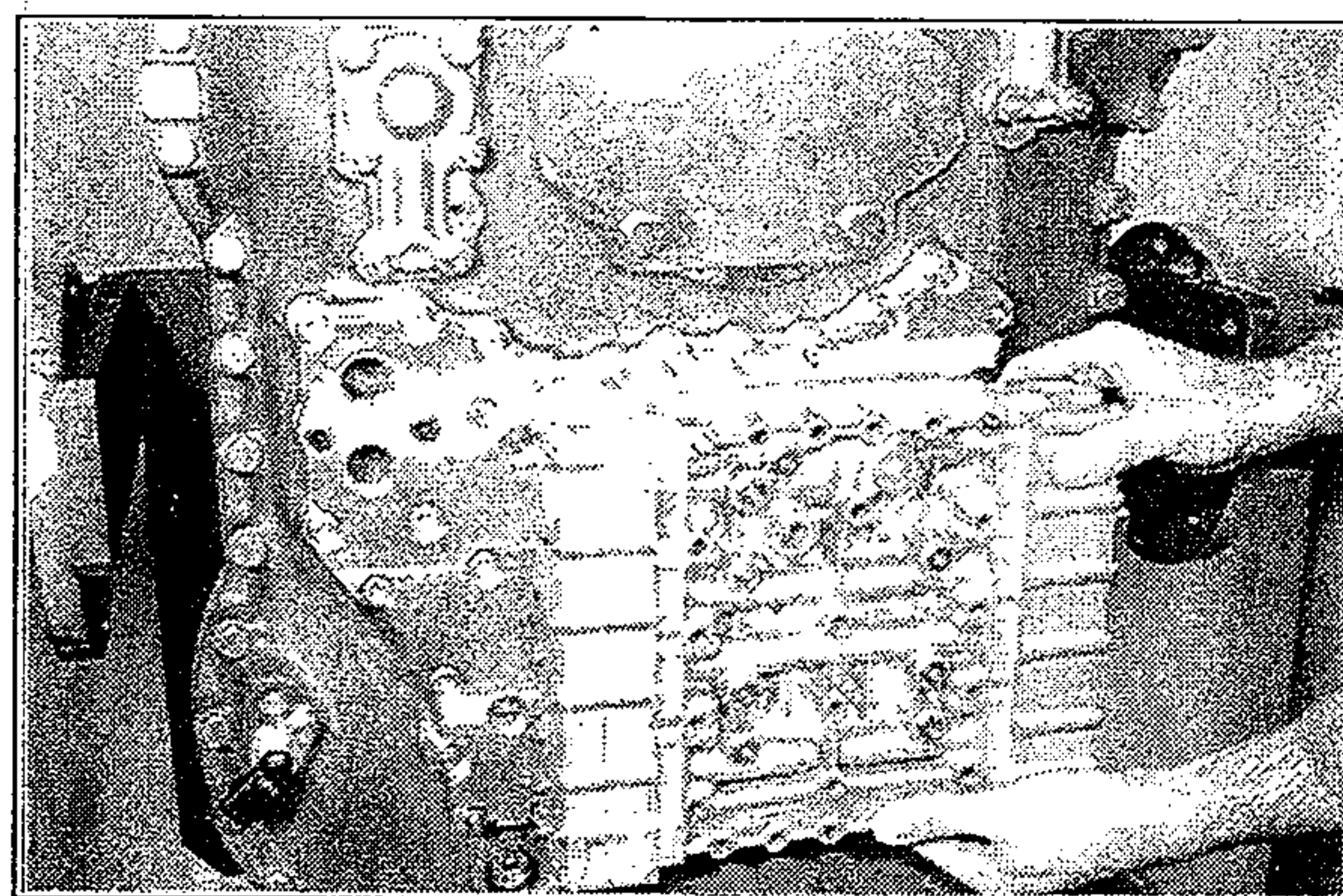
(1) Separate hydraulic control unit and duct plate from gearbox housing

- ① Loosen two socket head screws and install adjusting screws.

Now, loosen remaining socket head screws and separate valve housing from duct plate.

Adjusting screws(M6) 5870 204 063

Box spanner 5873 042 002

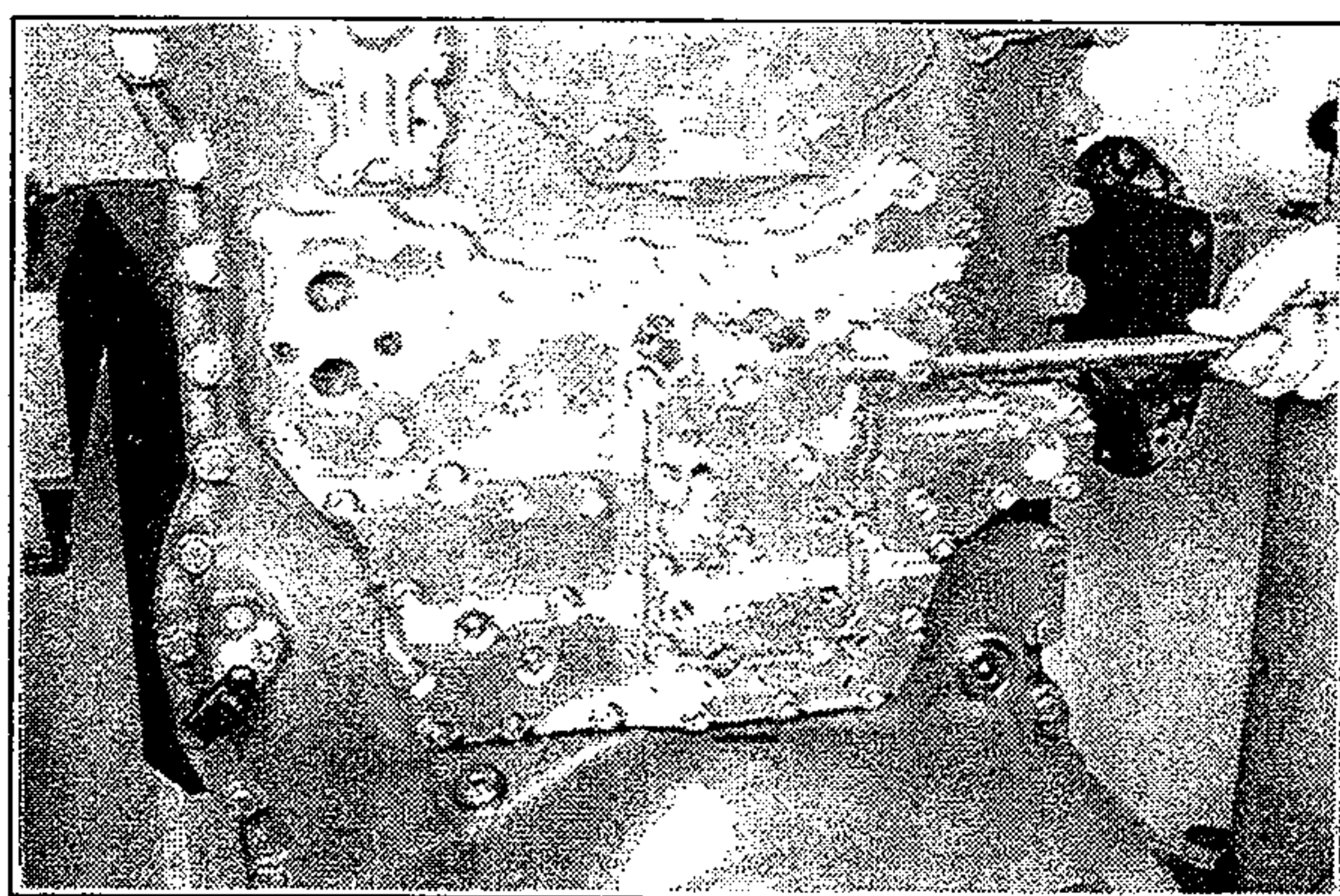


- ② Remove both gaskets and intermediate plate.

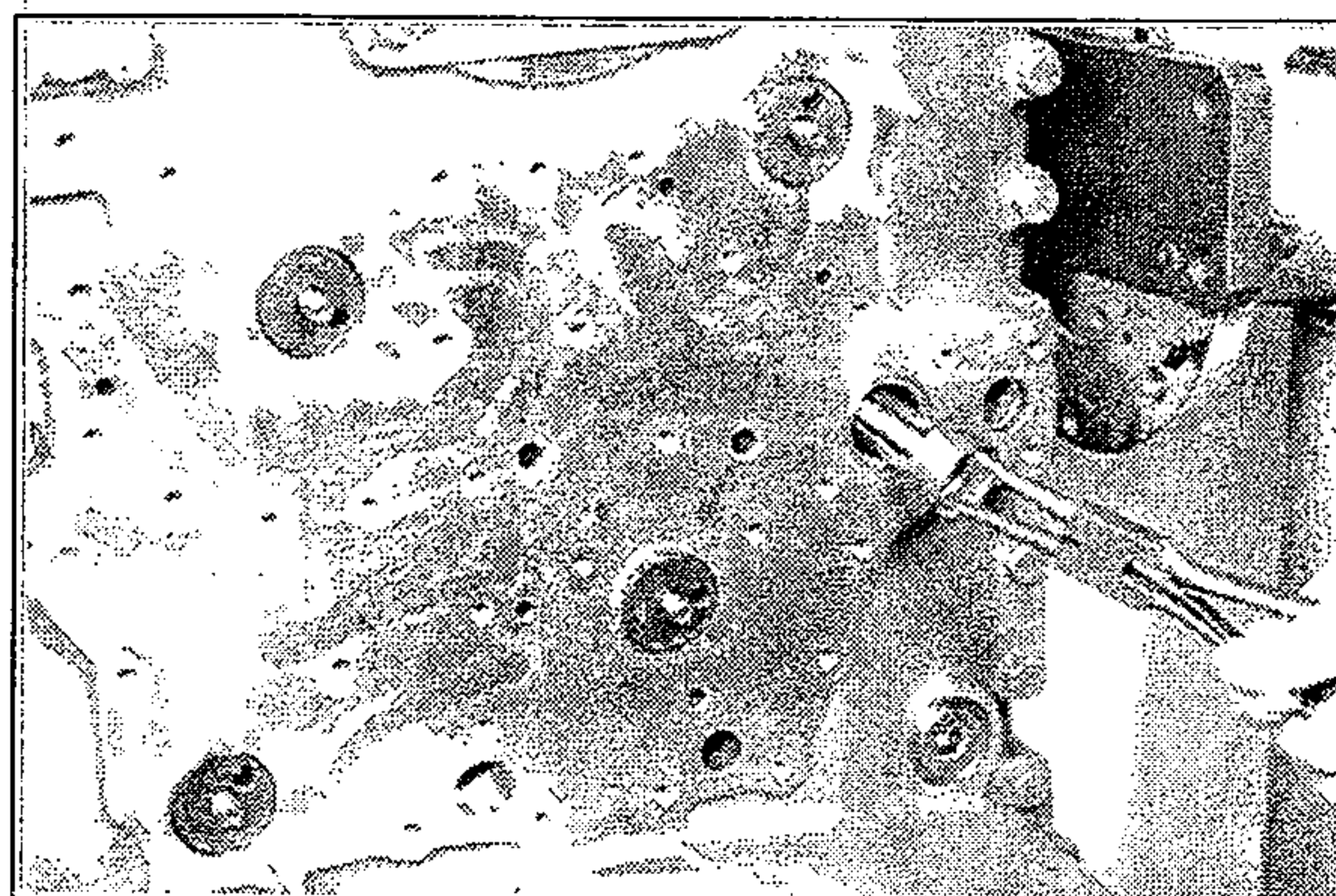
Loosen socket head screws as well as hexagon nuts and separate duct plate from gearbox housing.

Now, remove gasket.

Box spanner 5873 042 004

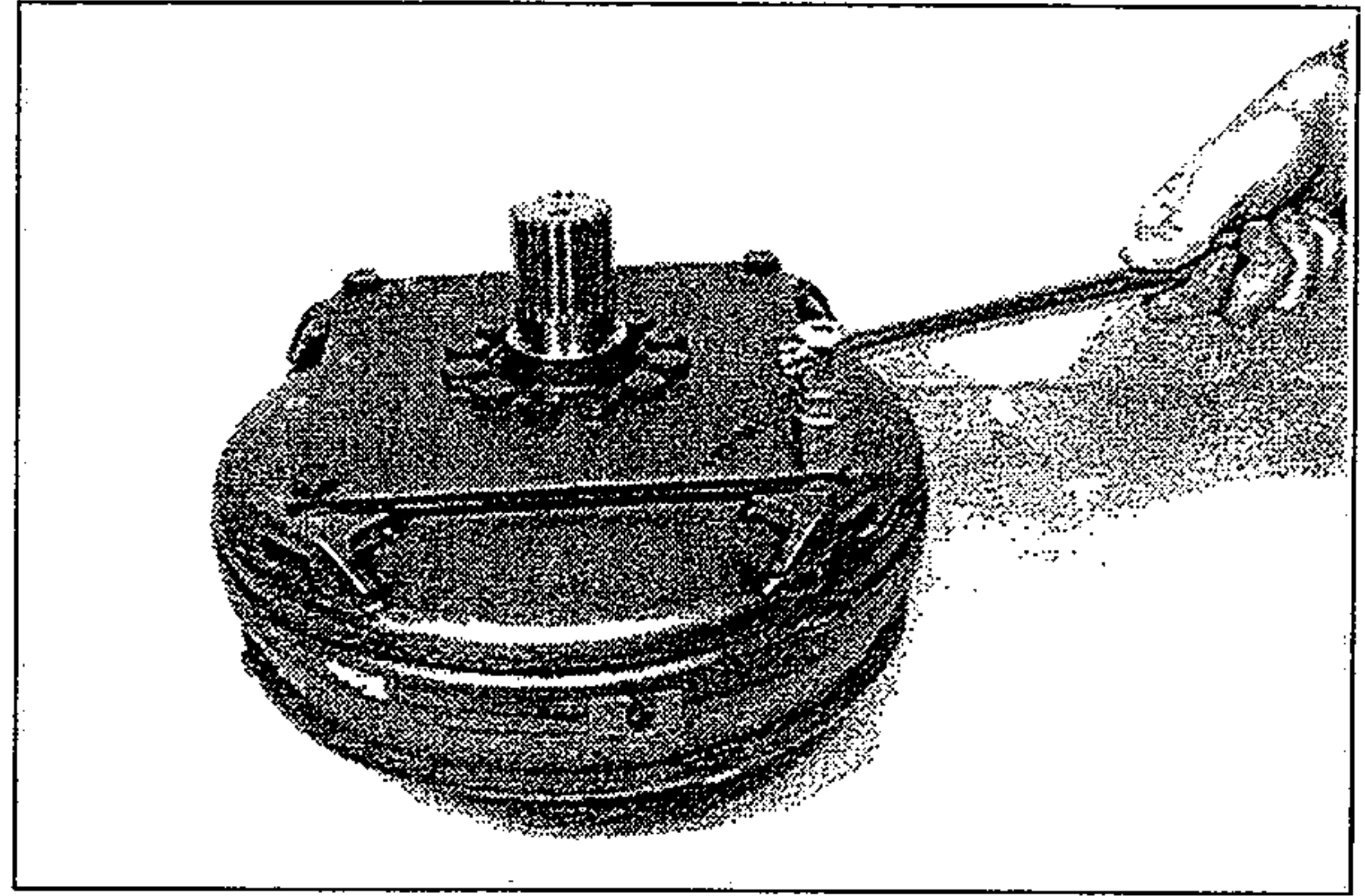


- ③ Pull converter safety valve out of the housing bore.

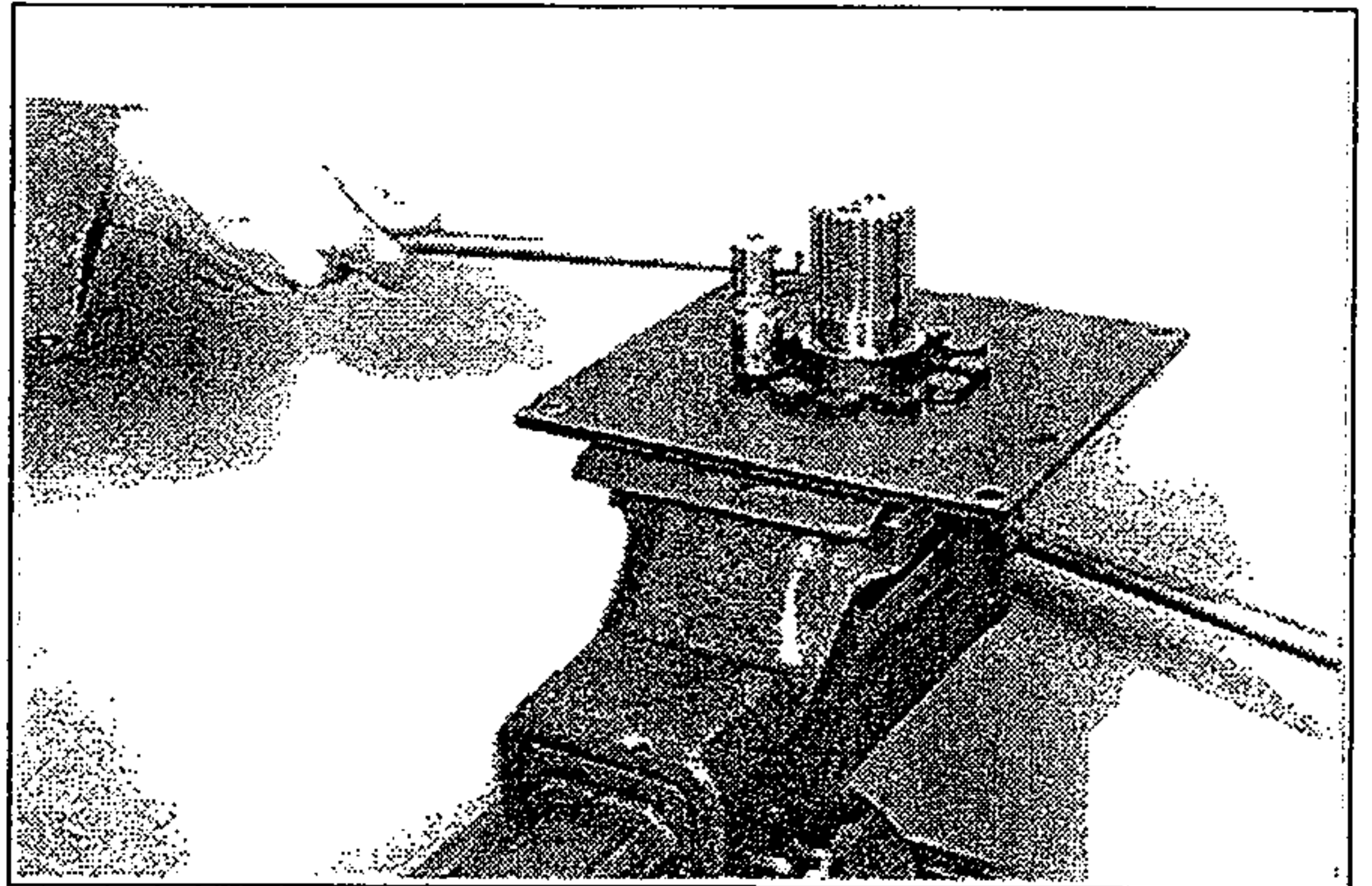


(2) Converter

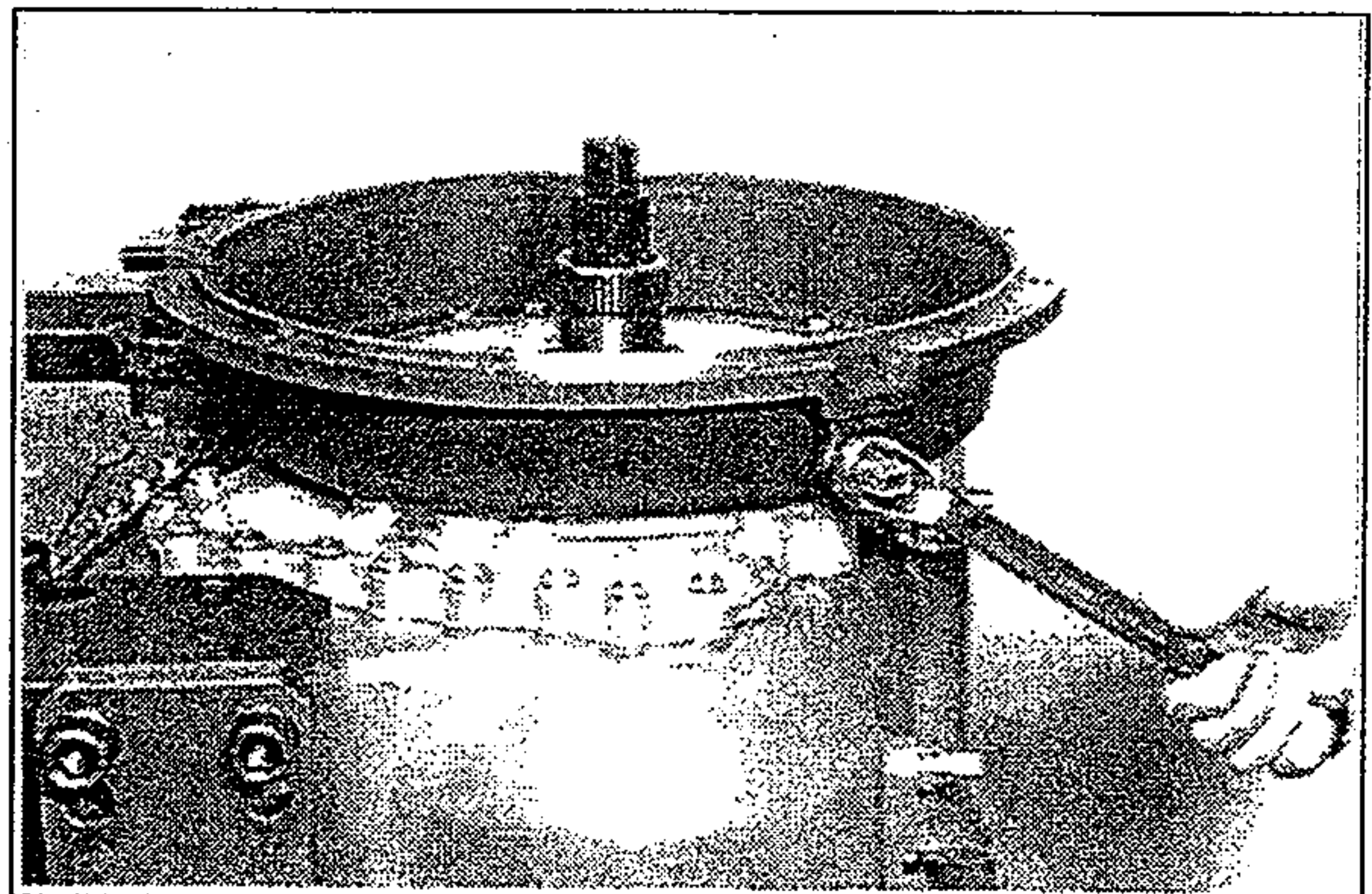
- ① Loosen hexagon head screws and separate diaphragm from the converter.



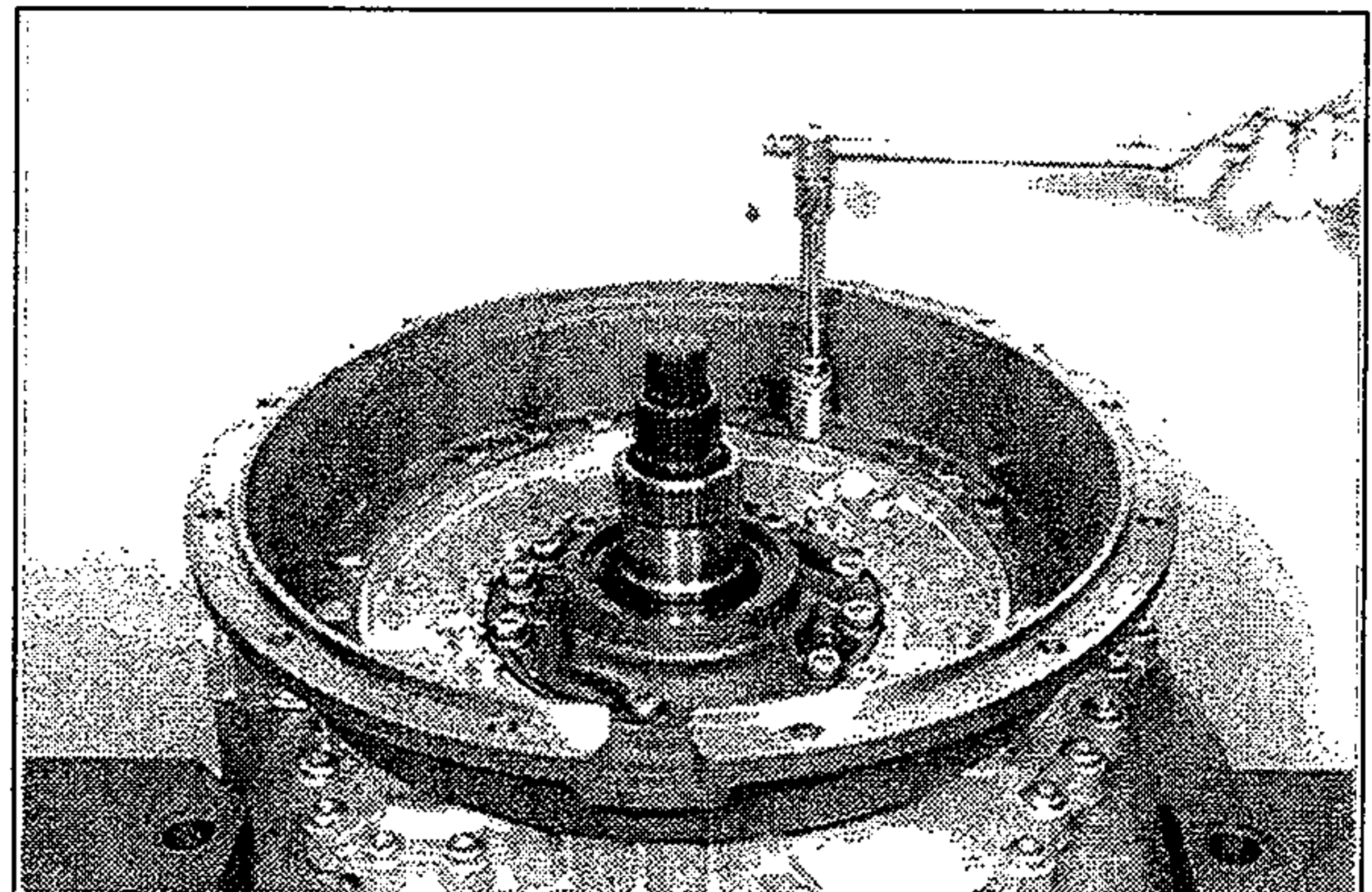
- ② Loosen hexagon head screws and separate drive shaft from the diaphragm.



- ③ Remove inductive transmitter(Engine).

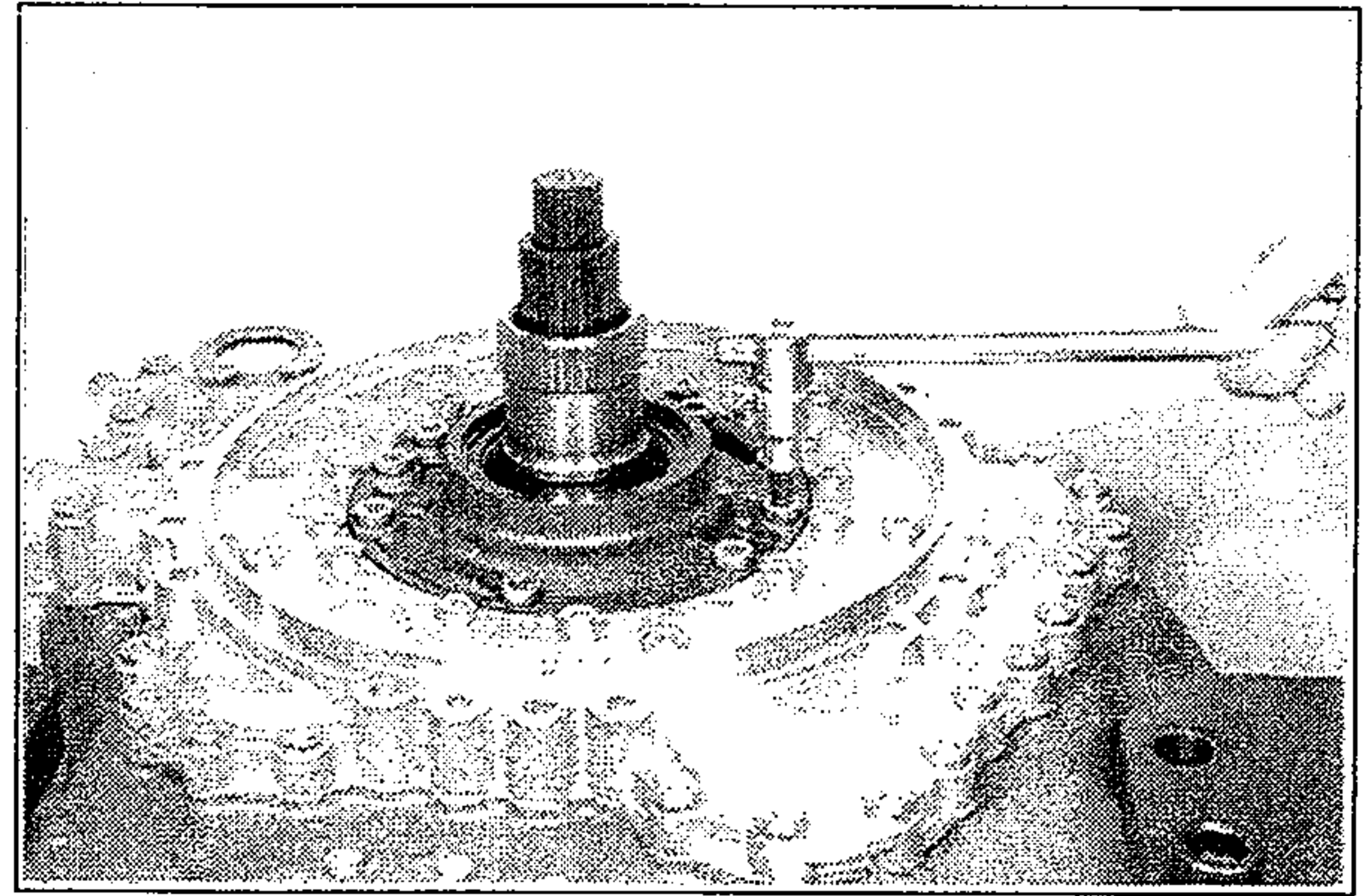


- ④ Loosen hexagon head screws and remove converter bell.



(3) Hydraulic pump

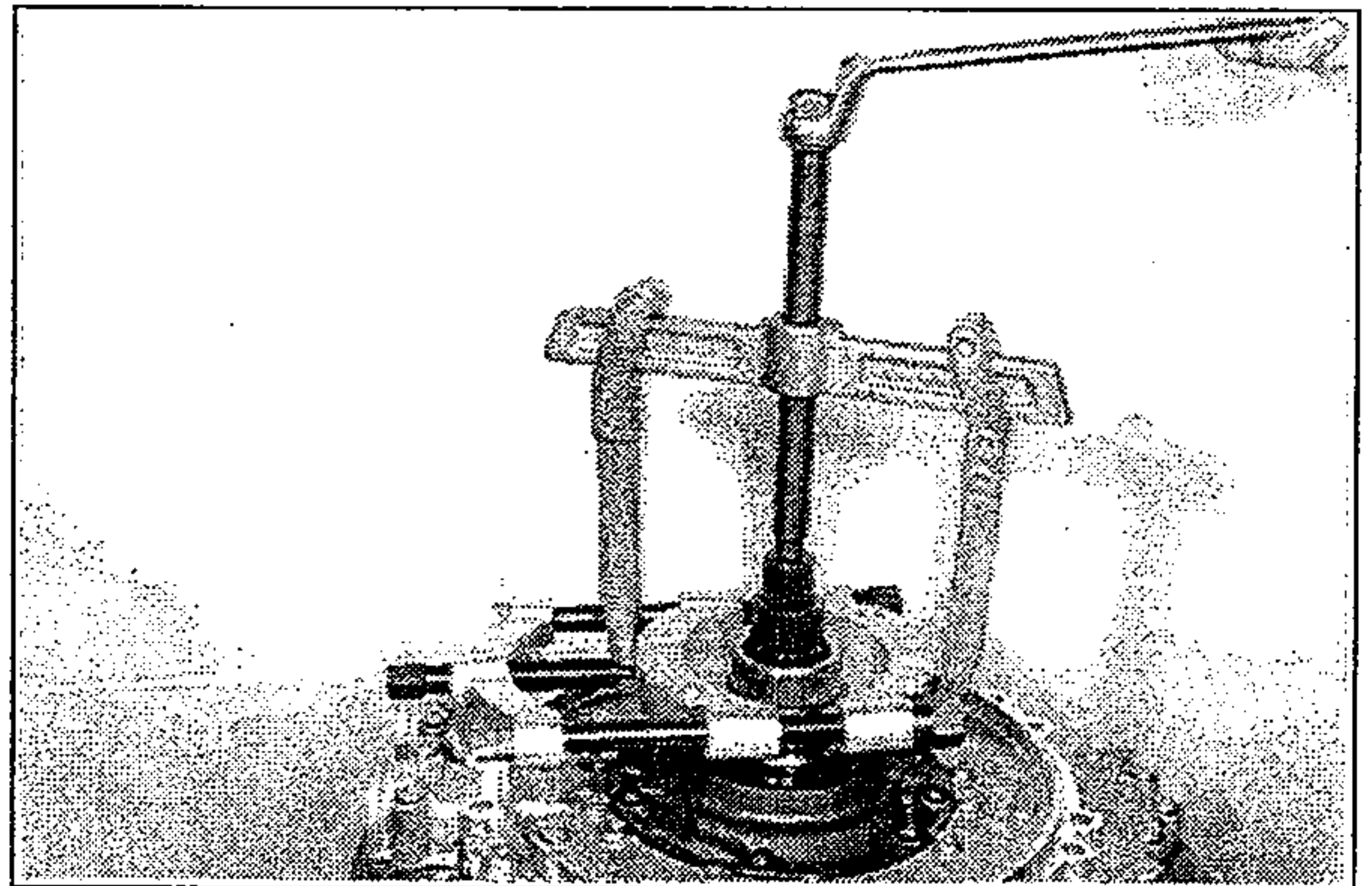
- ① Loosen socket head screws.



- ② Apply separating device on the gear teeth runout of the stator shaft and pull pump(Compl.) by means of two leg puller carefully out of the housing bores.

Separating device 5870 300 024

Two leg puller 5870 970 004

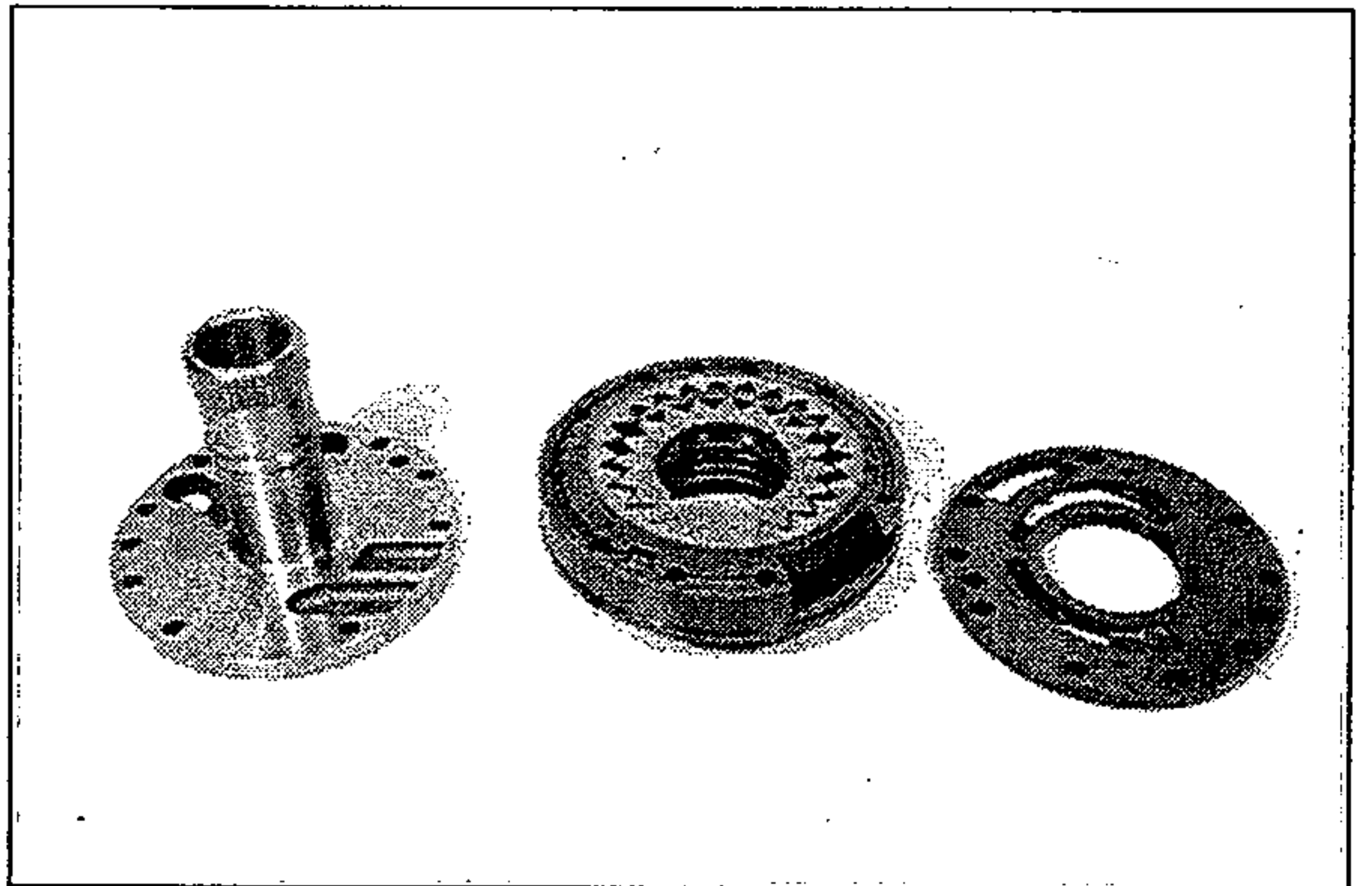


- ③ Separate hydraulic pump from stator shaft.

Separate control disk from pump.

- ※ If traces due to running in should be encountered in the pump housing or on the control disk, the complete pump has to be renewed.

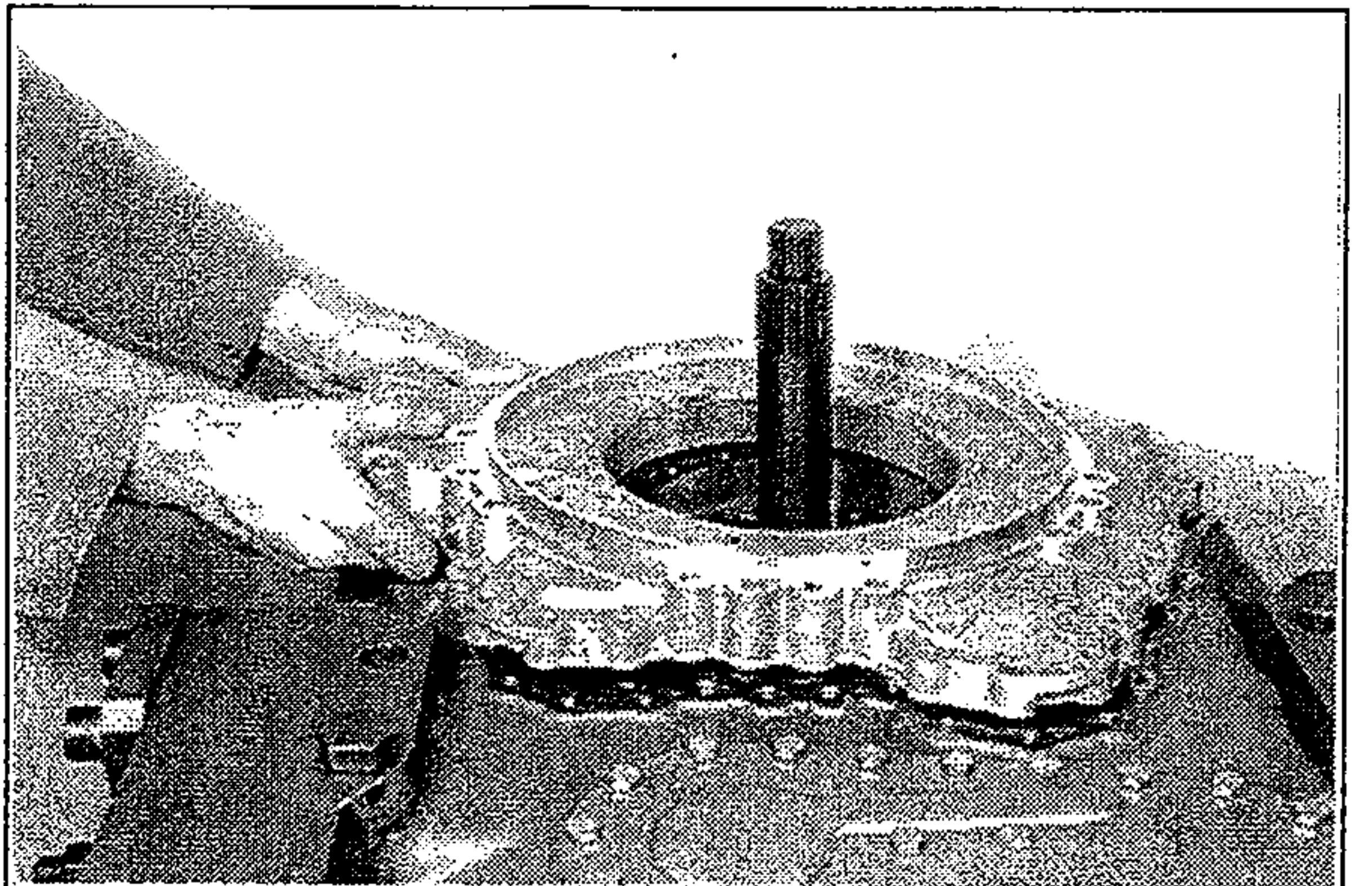
Now, lay on control disk again and fix it by means of grooved pins(2EA).



- ④ Loosen socket head screws as well as two hexagon head screws and remove oil feed housing.

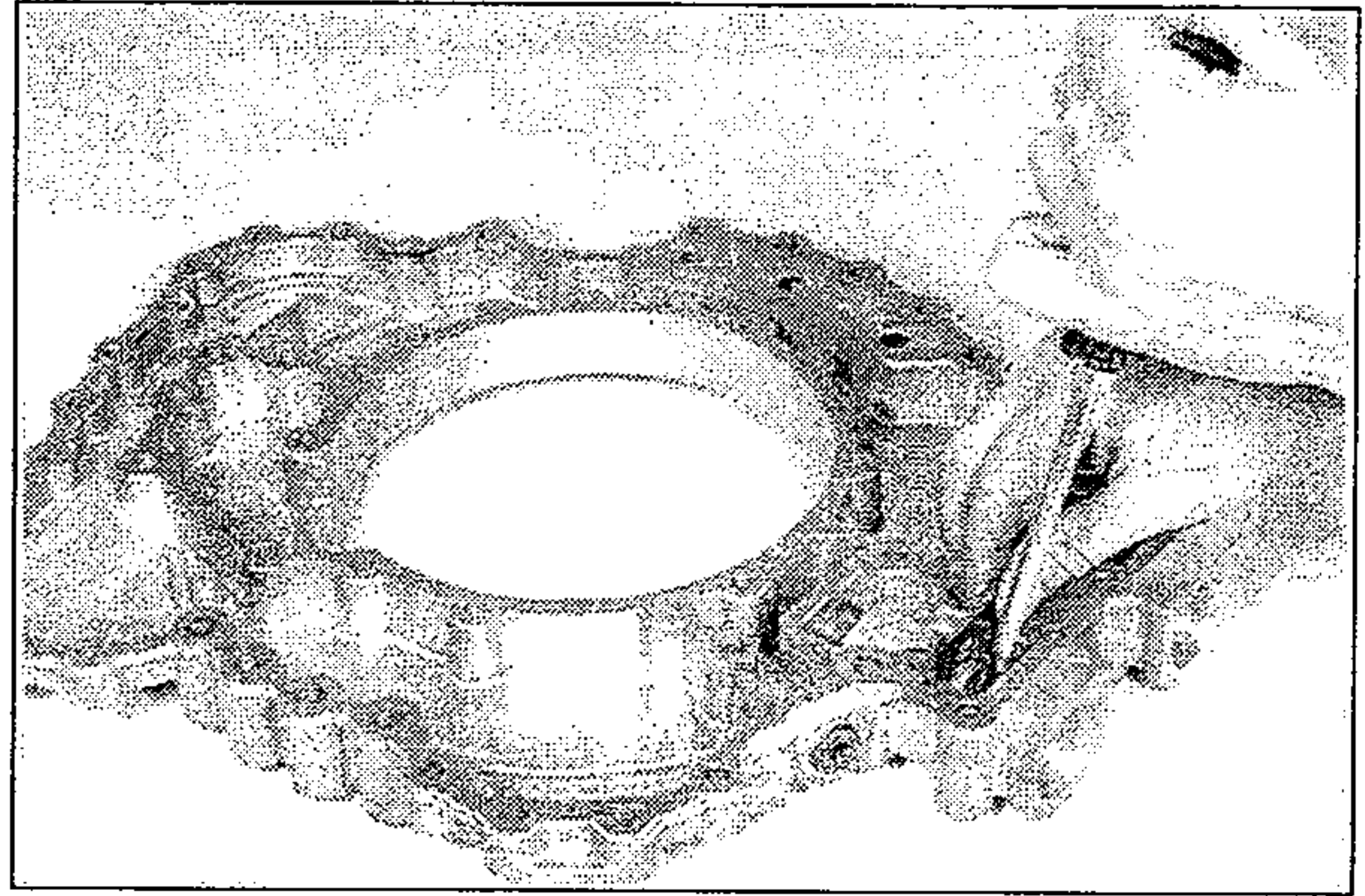
Now, remove gasket.

Box spanner 5873 024 004

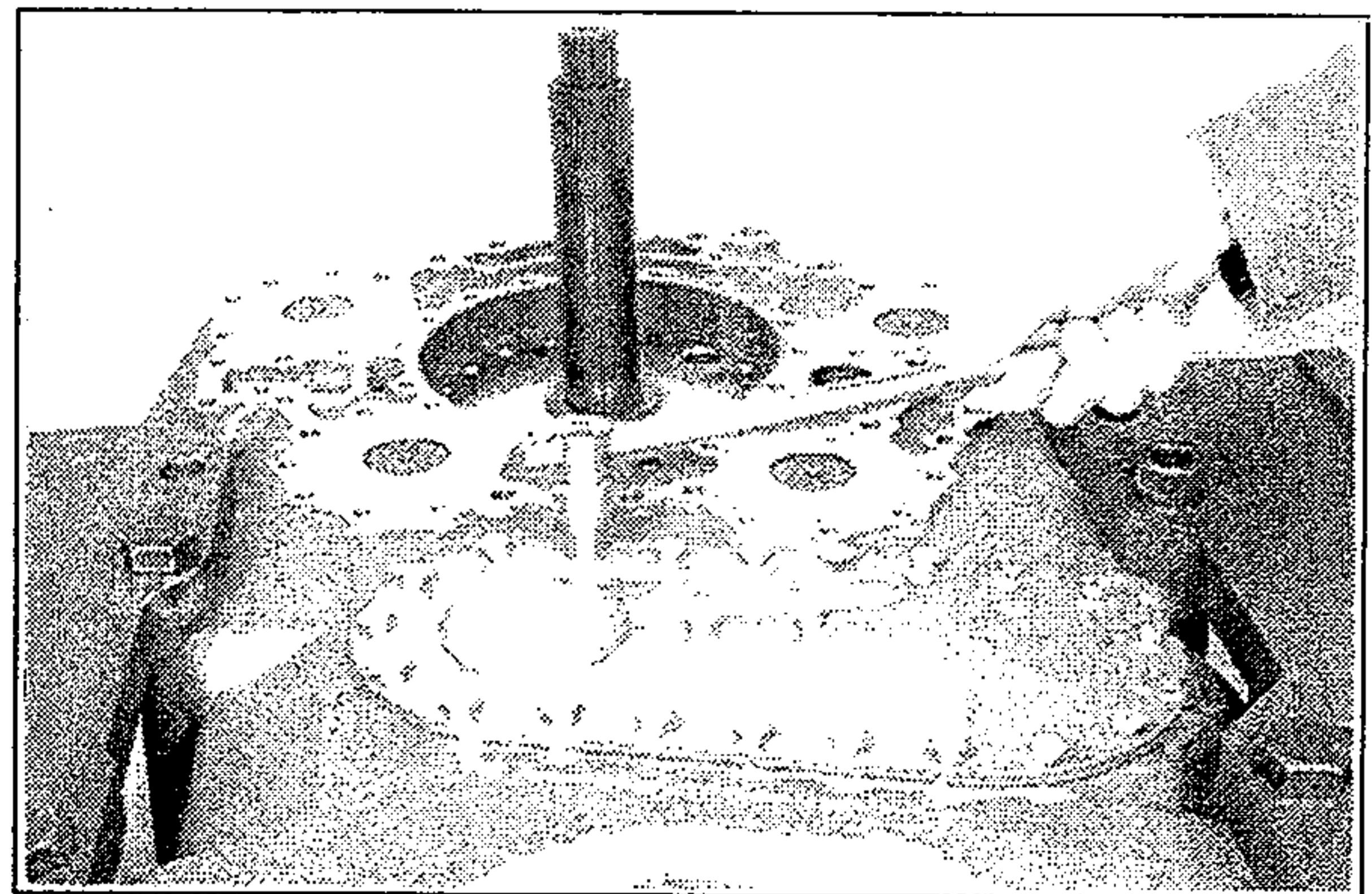


(4) Converter back pressure valve

- ① Preload compression spring and remove lock plate.
Remove released components.

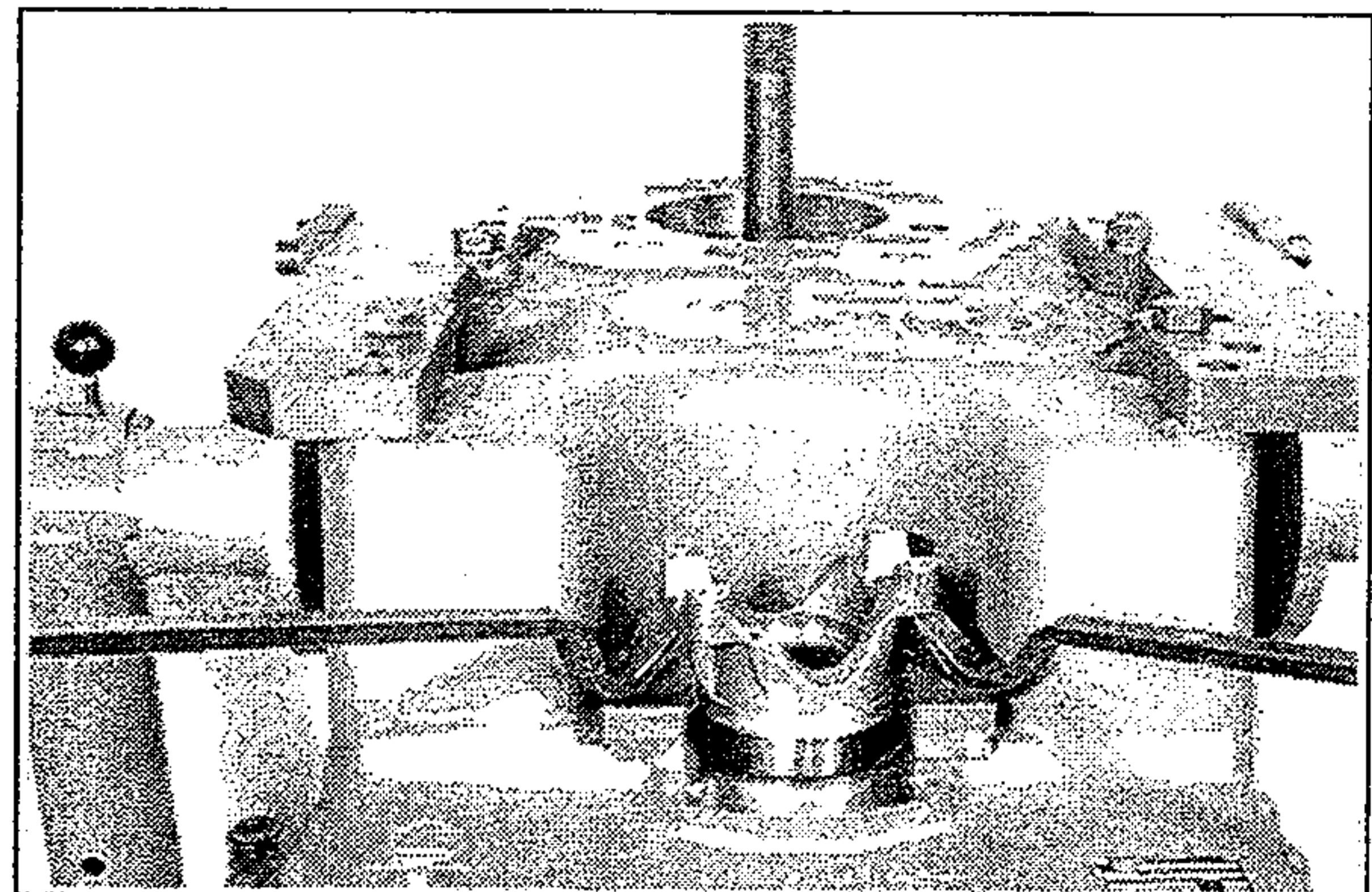


- ② Loosen hexagon head screws.
Remove cover and gasket.

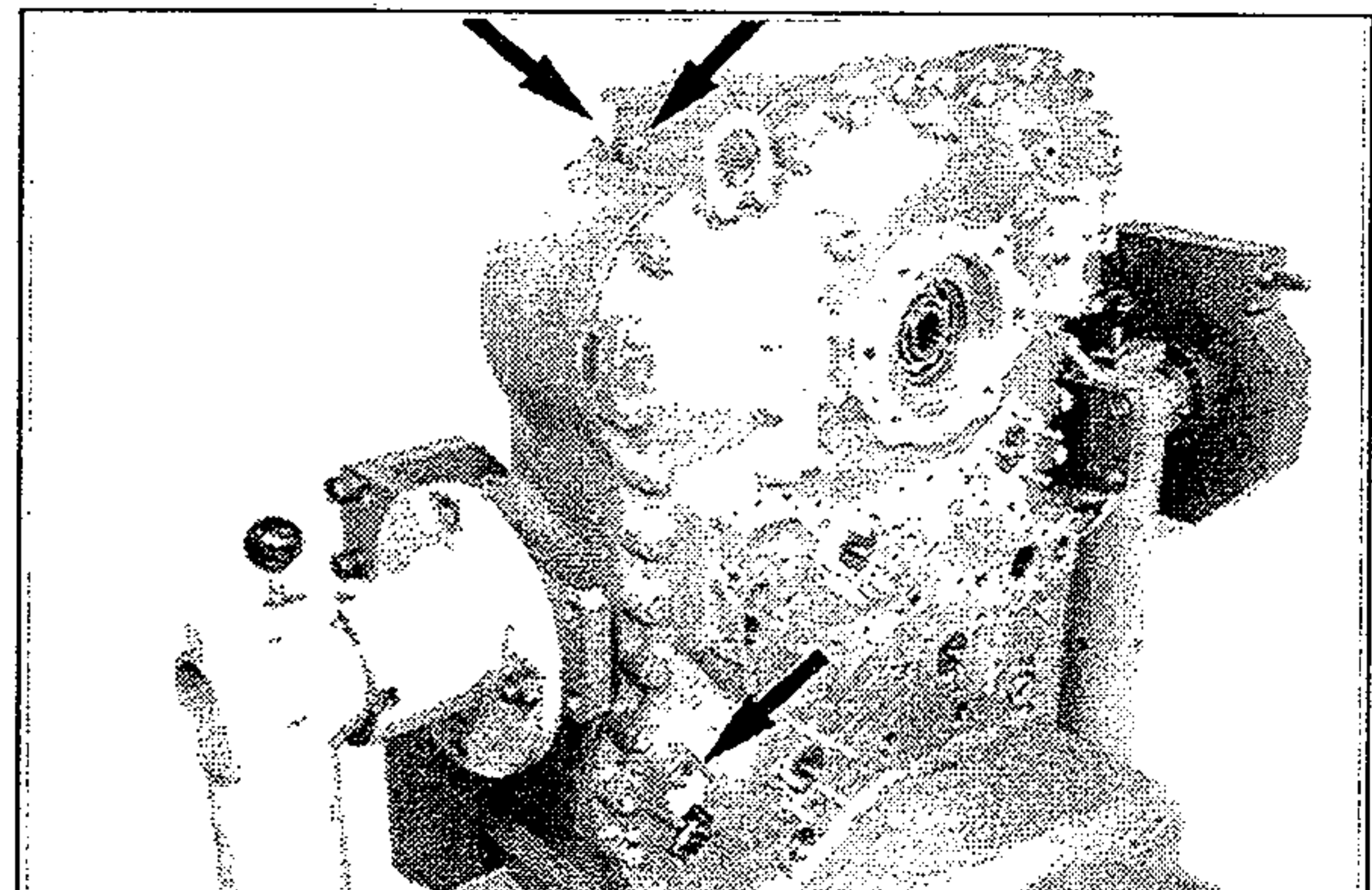


(5) Remove output, input and clutches

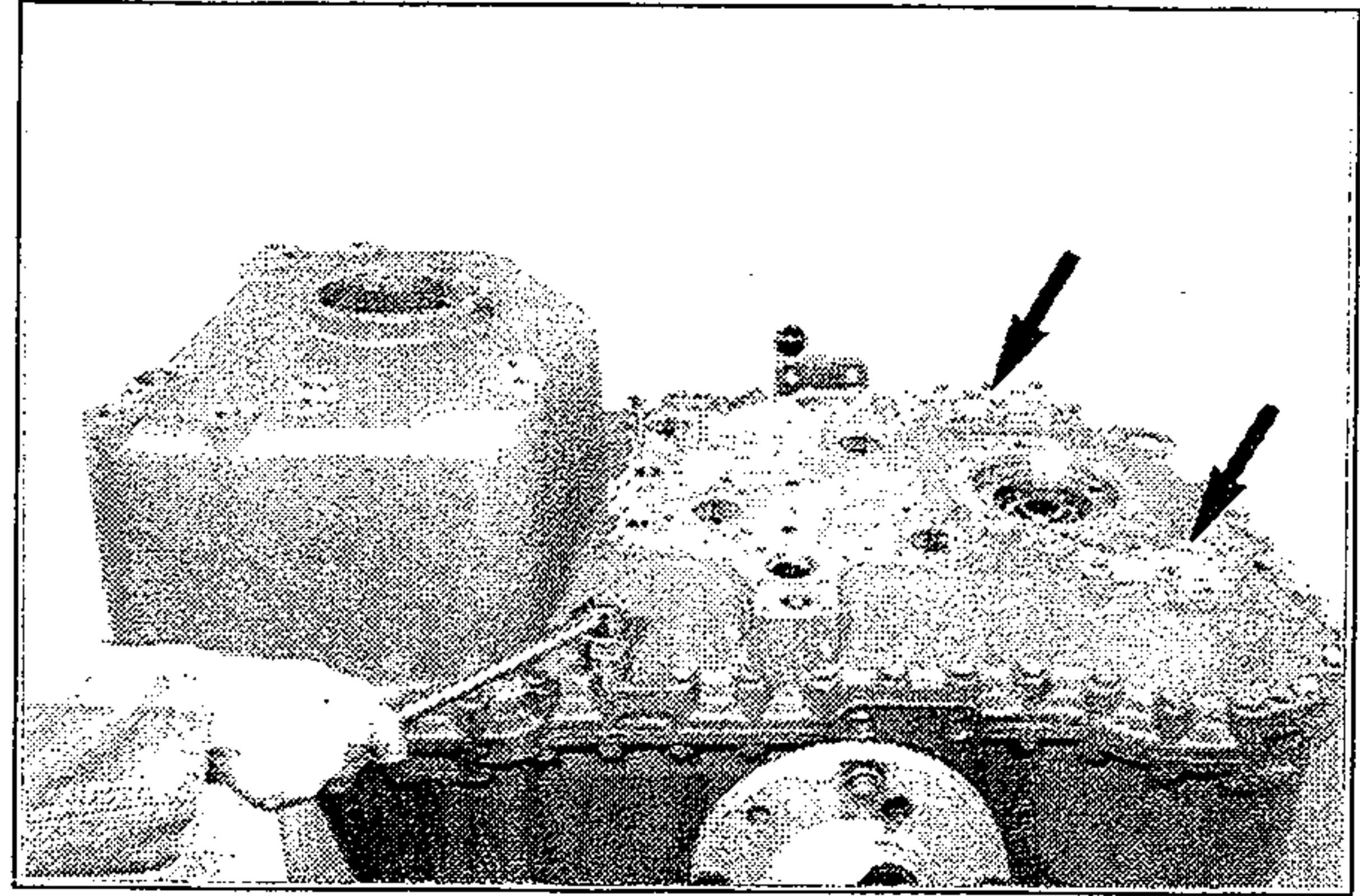
- ① Remove lock plate, loosen hexagon head screws and pry converter side output flange off the shaft.
Now, pry shaft seal out of the housing bore.
Tilt transmission 180° and remove rear side output flange accordingly.
Pry bar 5870 345 065



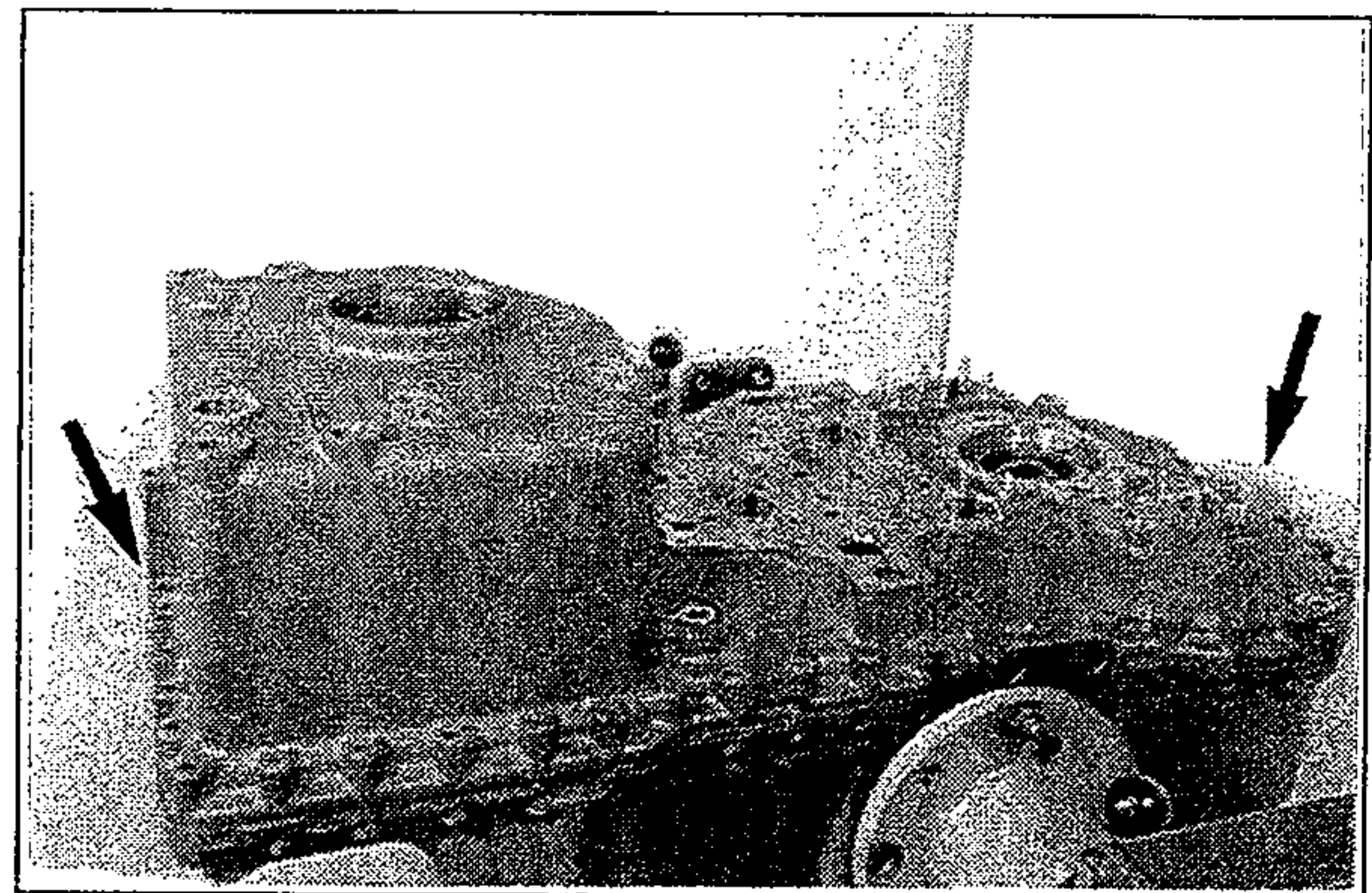
- ② Remove speed sensor as well as both inductive transmitters(Arrows).



- ③ Loosen hexagon nuts and remove both covers(Arrows).
Loosen screw connection(Housing/
Housing cover).



- ④ Drive both cylindrical pins out(Arrows).



※ The following figures show the common removal of all clutches.

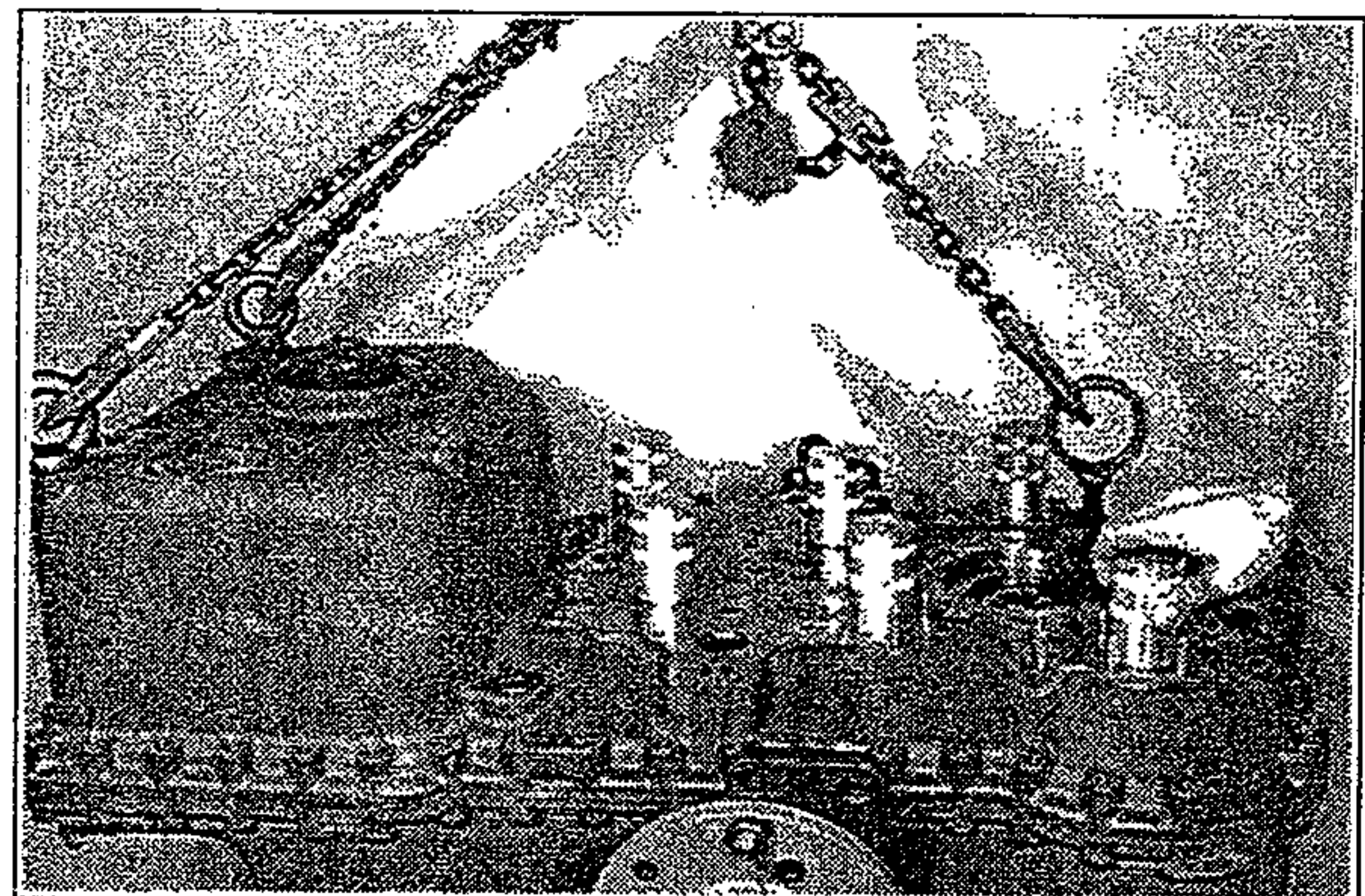
The removal of single clutches without use of the special tool(Handles 5870 260 010) is due to the installation conditions extremely difficult.

Besides there is the danger of injuries.

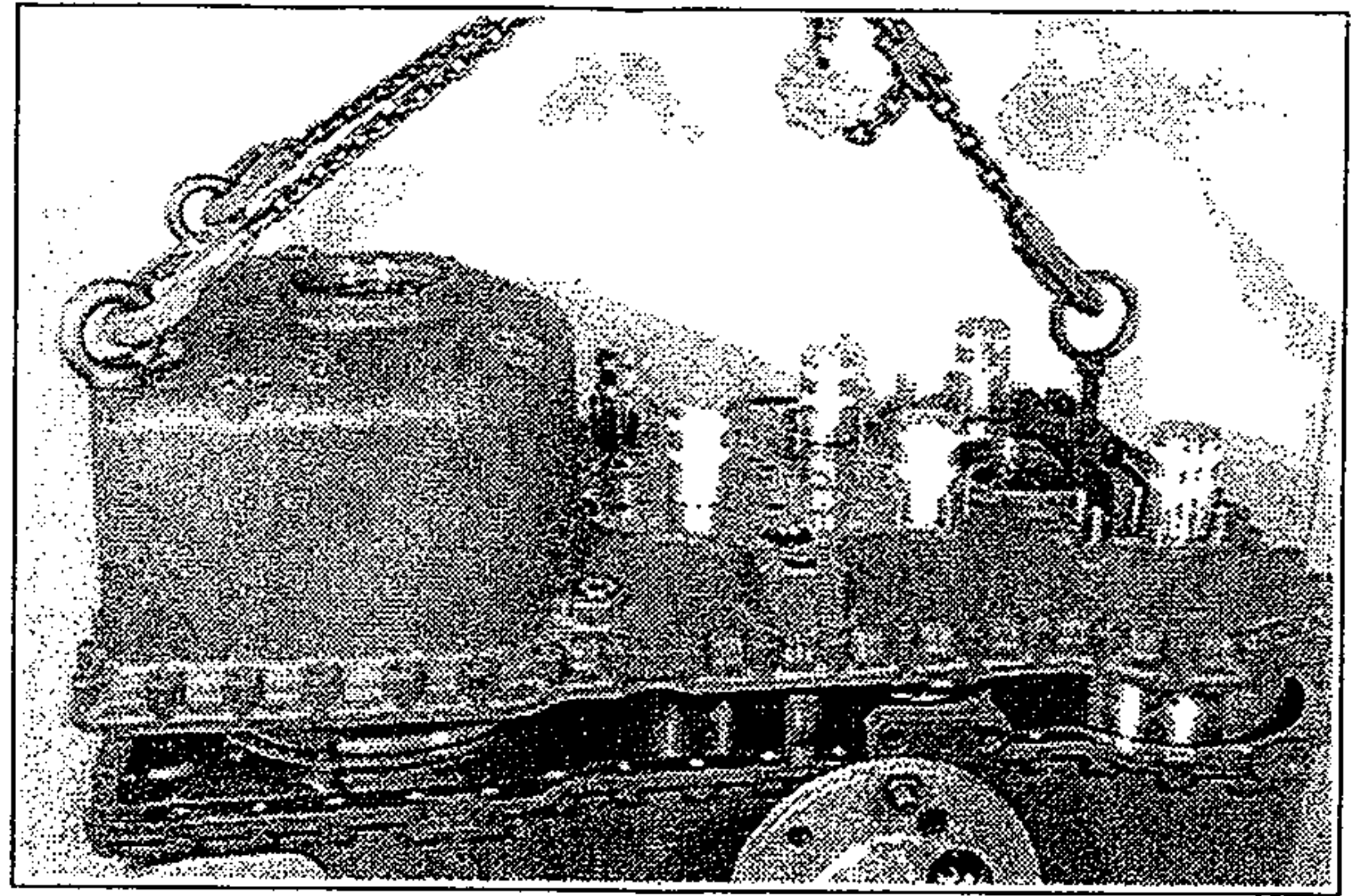
- ⑤ Locate all clutches by means of handles in the housing cover.

Install eye bolts and hang in the lifting device.

Handle(6 pieces needed)	5870 260 010
Eye bolt(M20, 2EA)	0636 804 003
Eye bolt(M16, 1EA)	0636 804 001
Puller device	5870 000 017
Lifting chain	5870 281 047

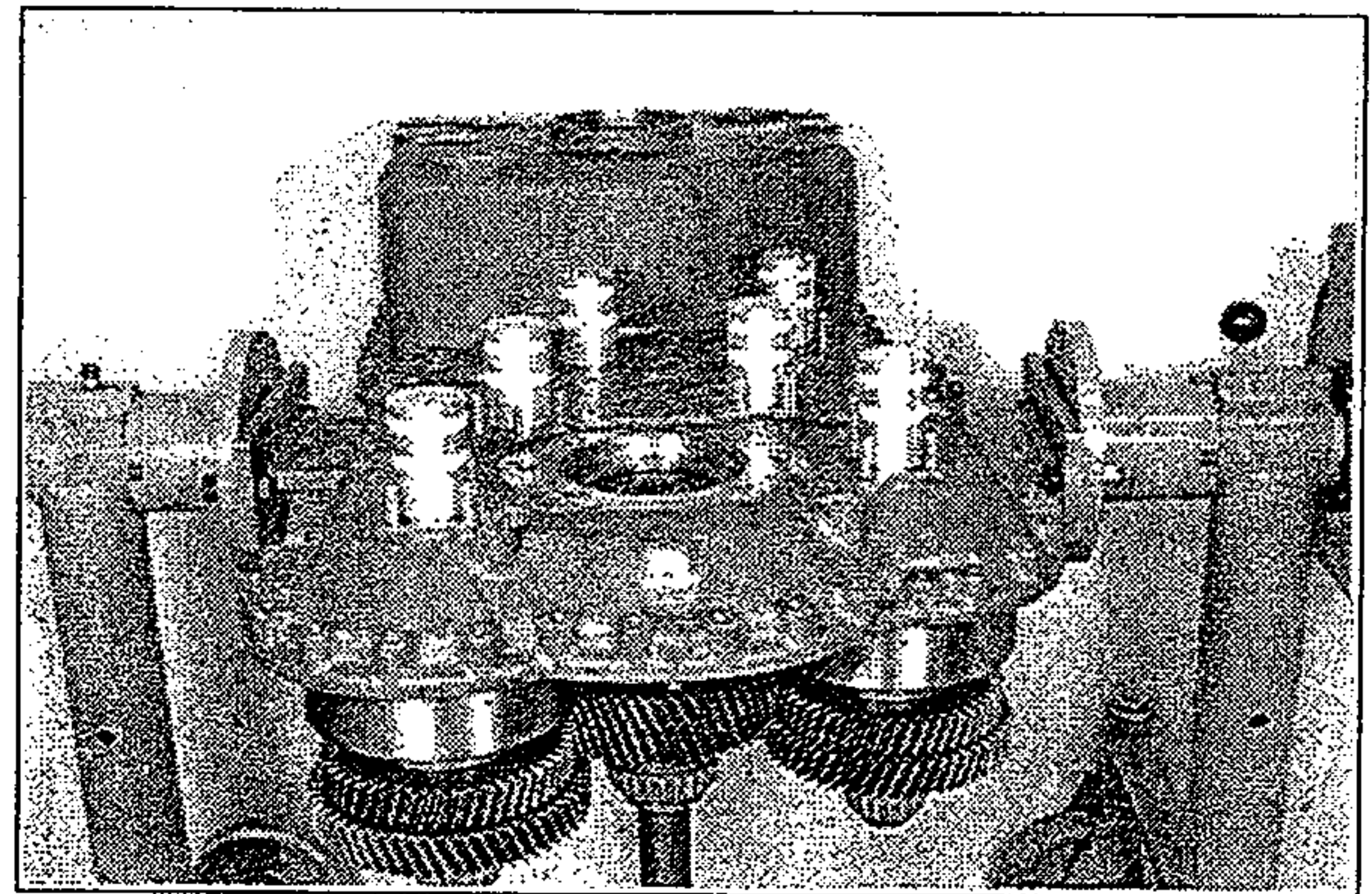


- ⑥ Separate housing cover along with clutches from the gearbox housing, using lifting device.

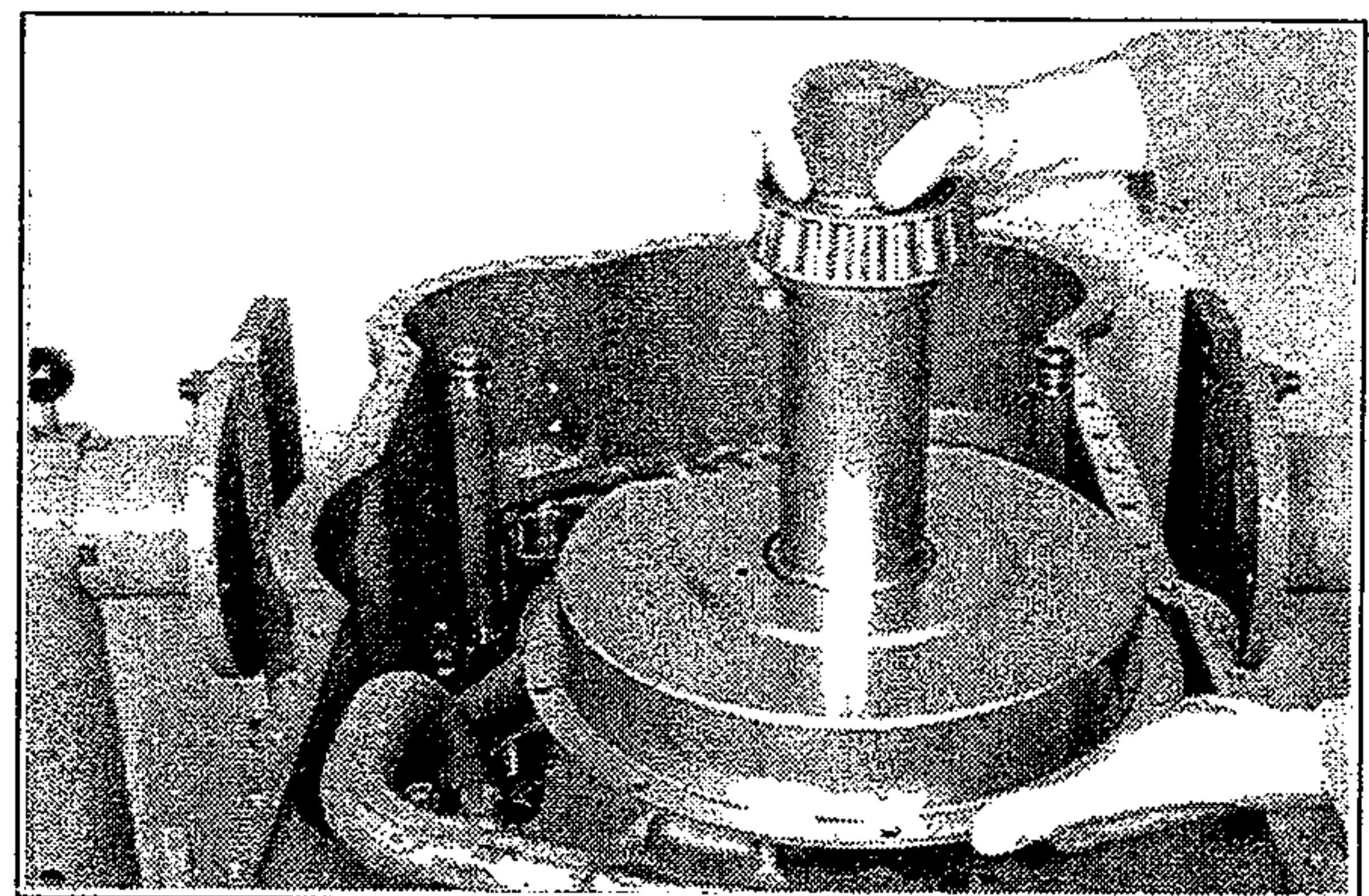


- ⑦ Fasten housing cover on the assembly car.

Assembly car	5870 350 000
Clamping bracket	5870 350 089

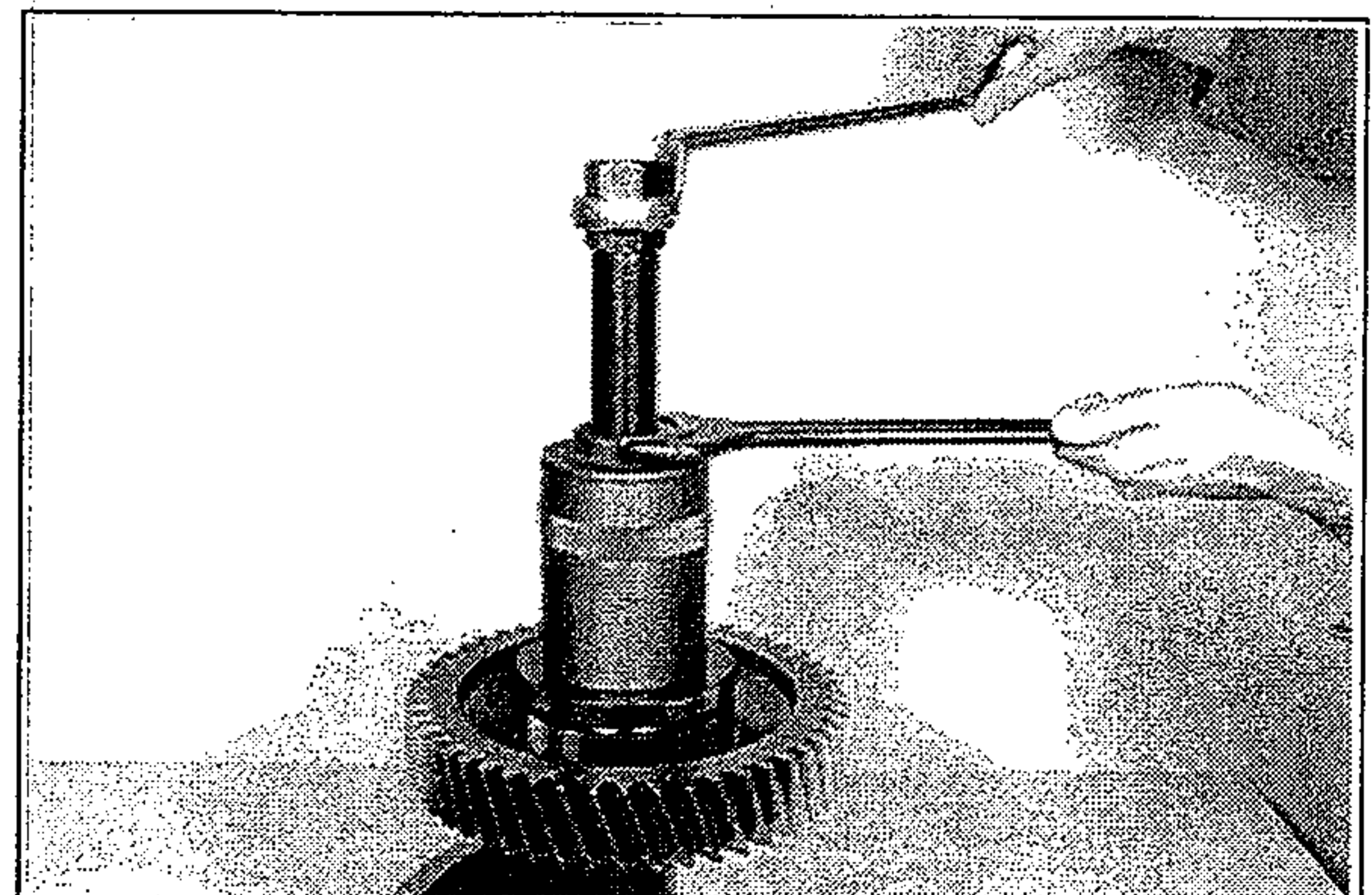


- ⑧ Loosen socket head screws and remove output shaft as well as the two oil collecting plate.



- ⑨ Pull off tapered roller bearing.
Remove opposite tapered roller bearing accordingly.

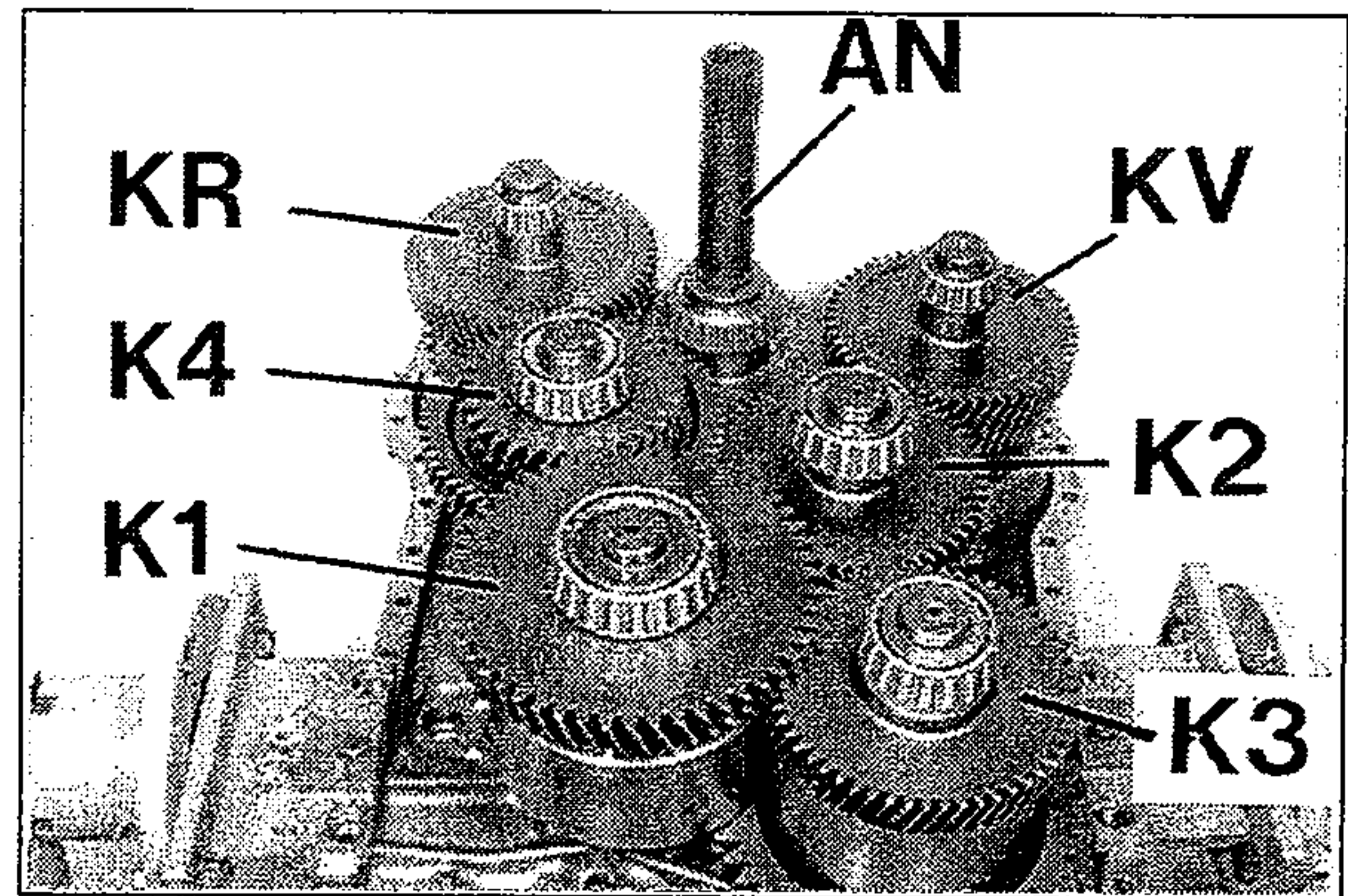
Grab sleeve	5873 002 038
Basic set	5873 002 001



⑩ Tilt housing cover 180°.

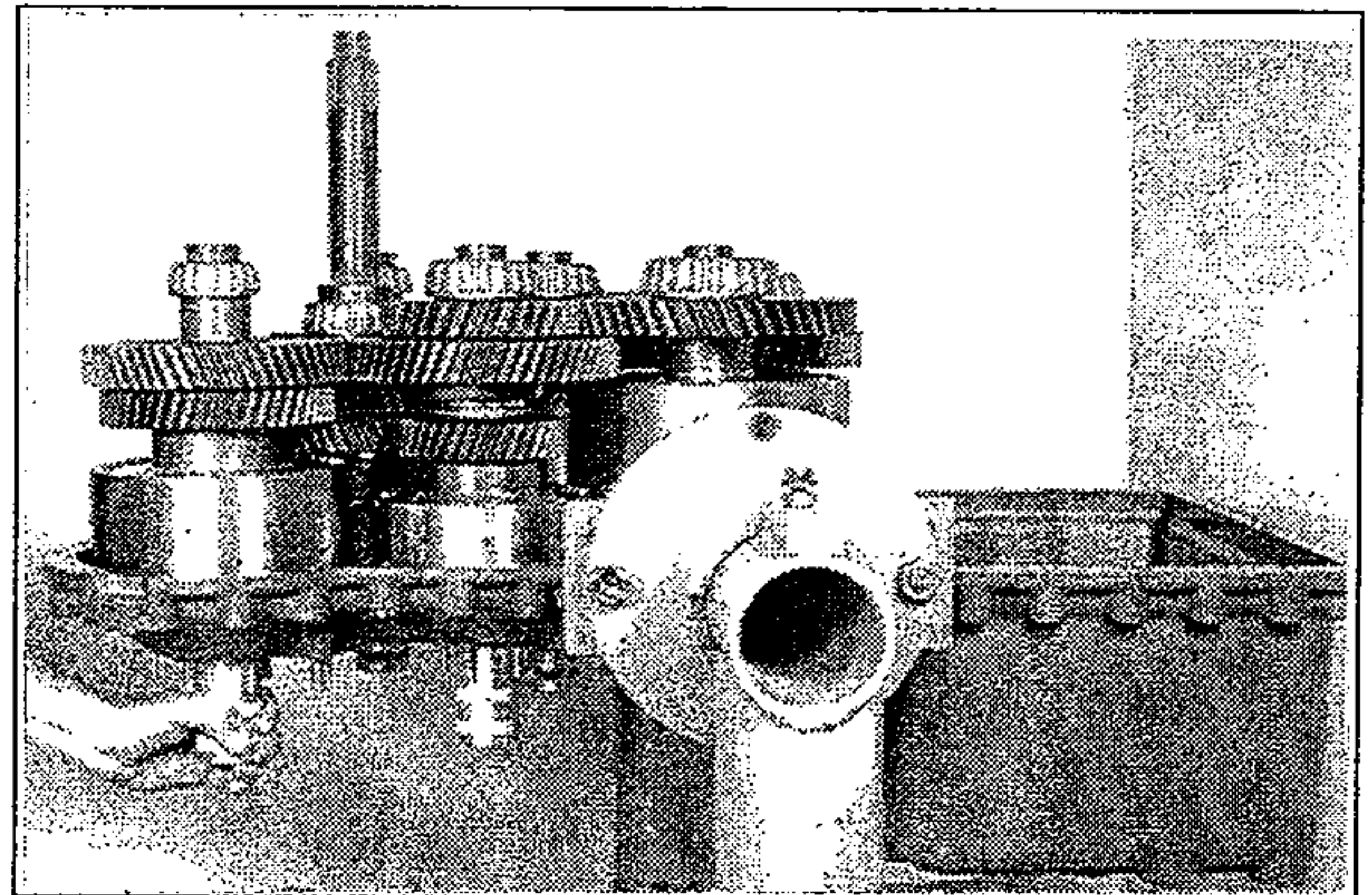
Illustration on the right shows the arrangement of the single clutches and the input in the housing cover.

AN	Input
KV	Clutch-Forward
KR	Clutch-Reverse
K1	Clutch-1st speed
K2	Clutch-2nd speed
K3	Clutch-3rd speed
K4	Clutch-4th speed

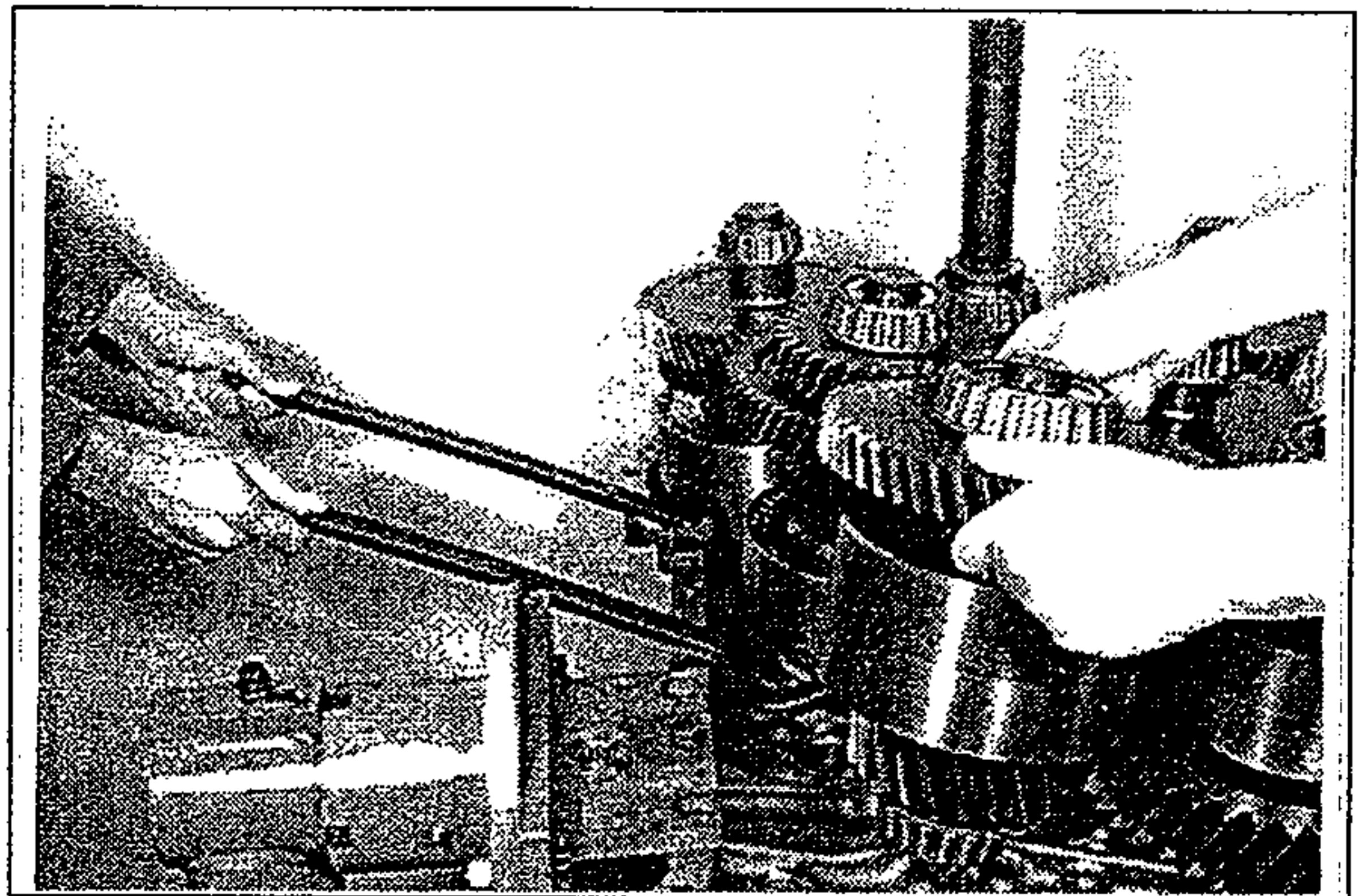


⑪ Remove handles(See figure).

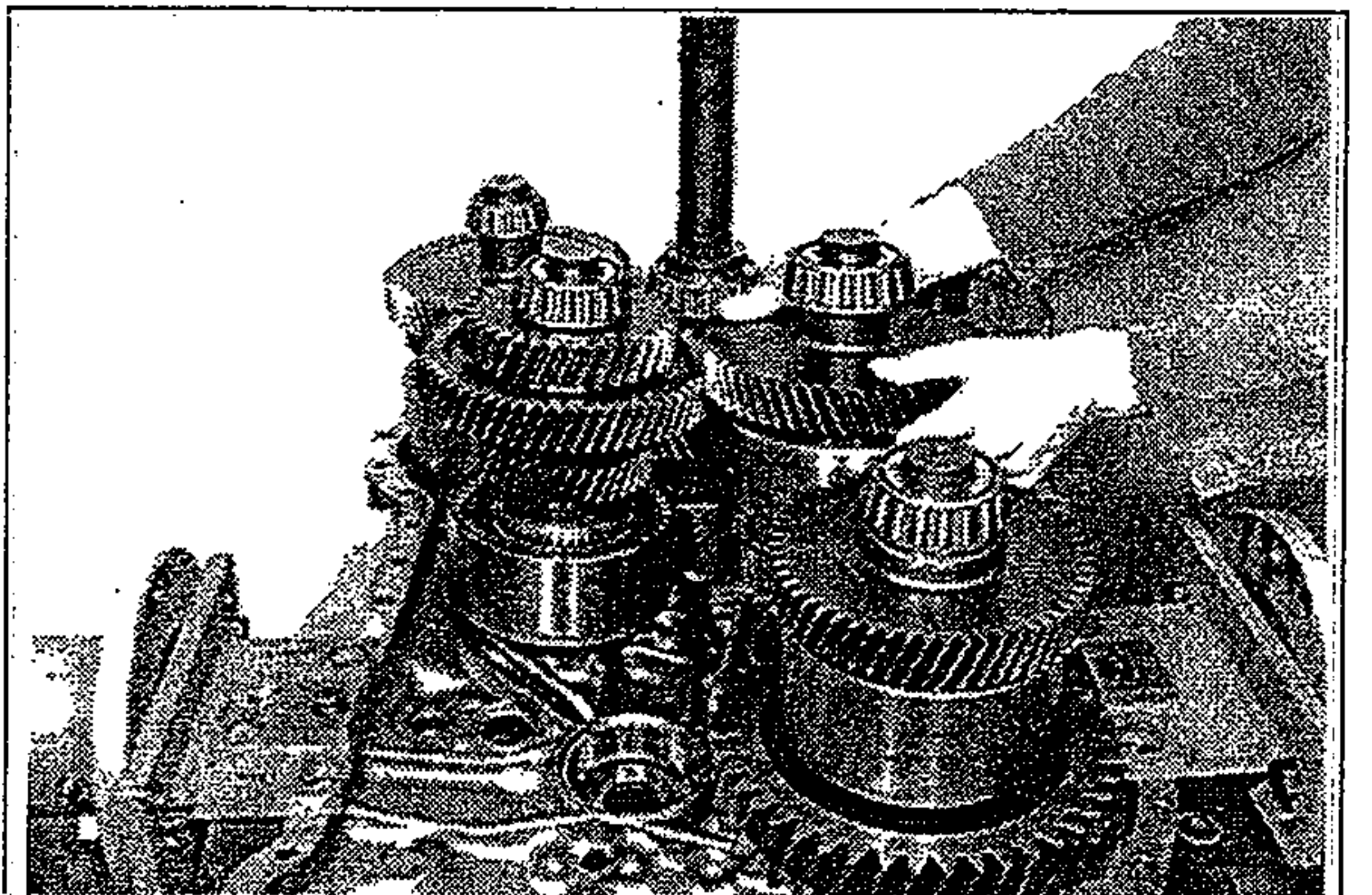
Handles	5870 260 010
---------	--------------



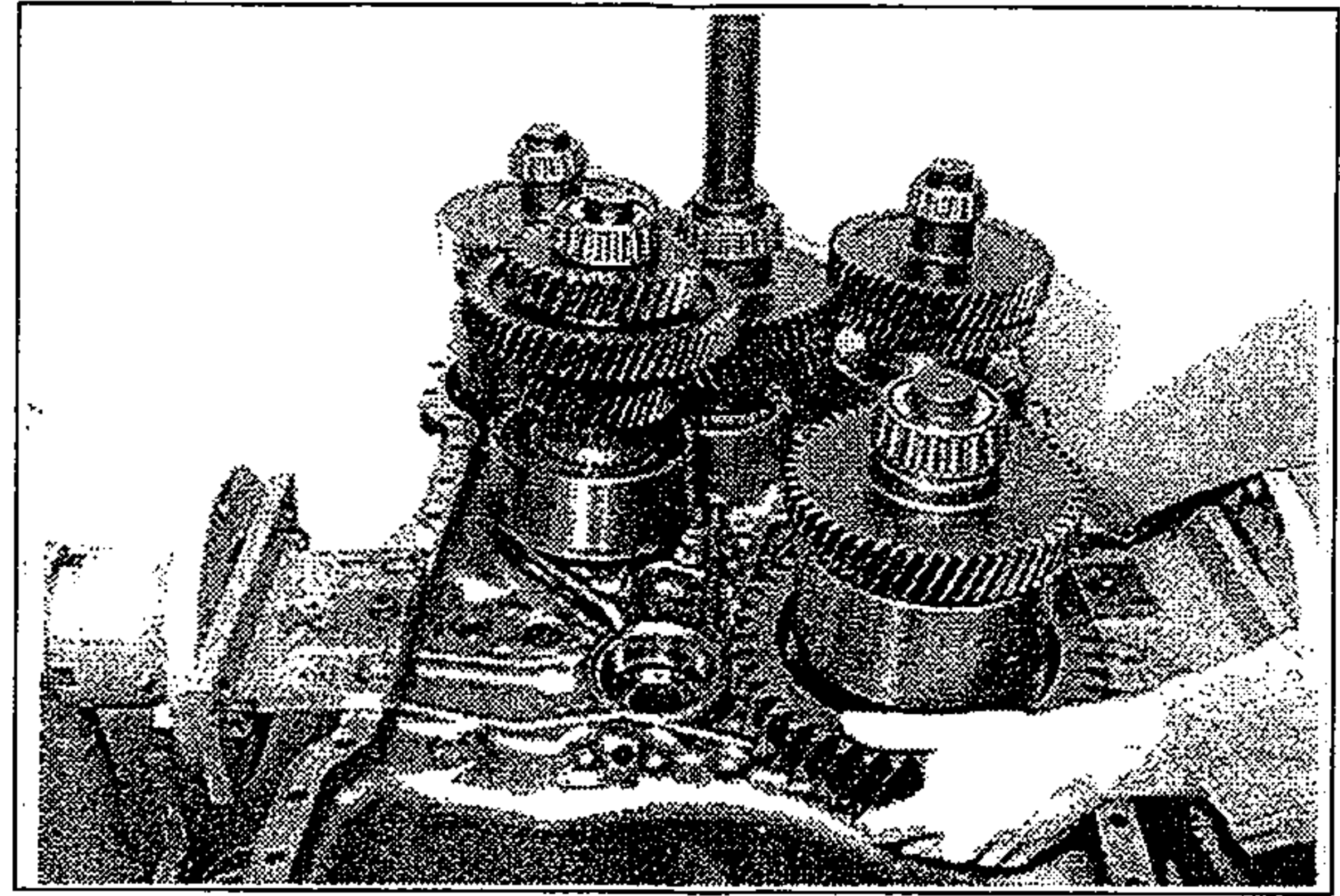
⑫ Lift clutch K4 a bit by means of pry bars and remove clutch K1.



⑬ Remove clutch K2.



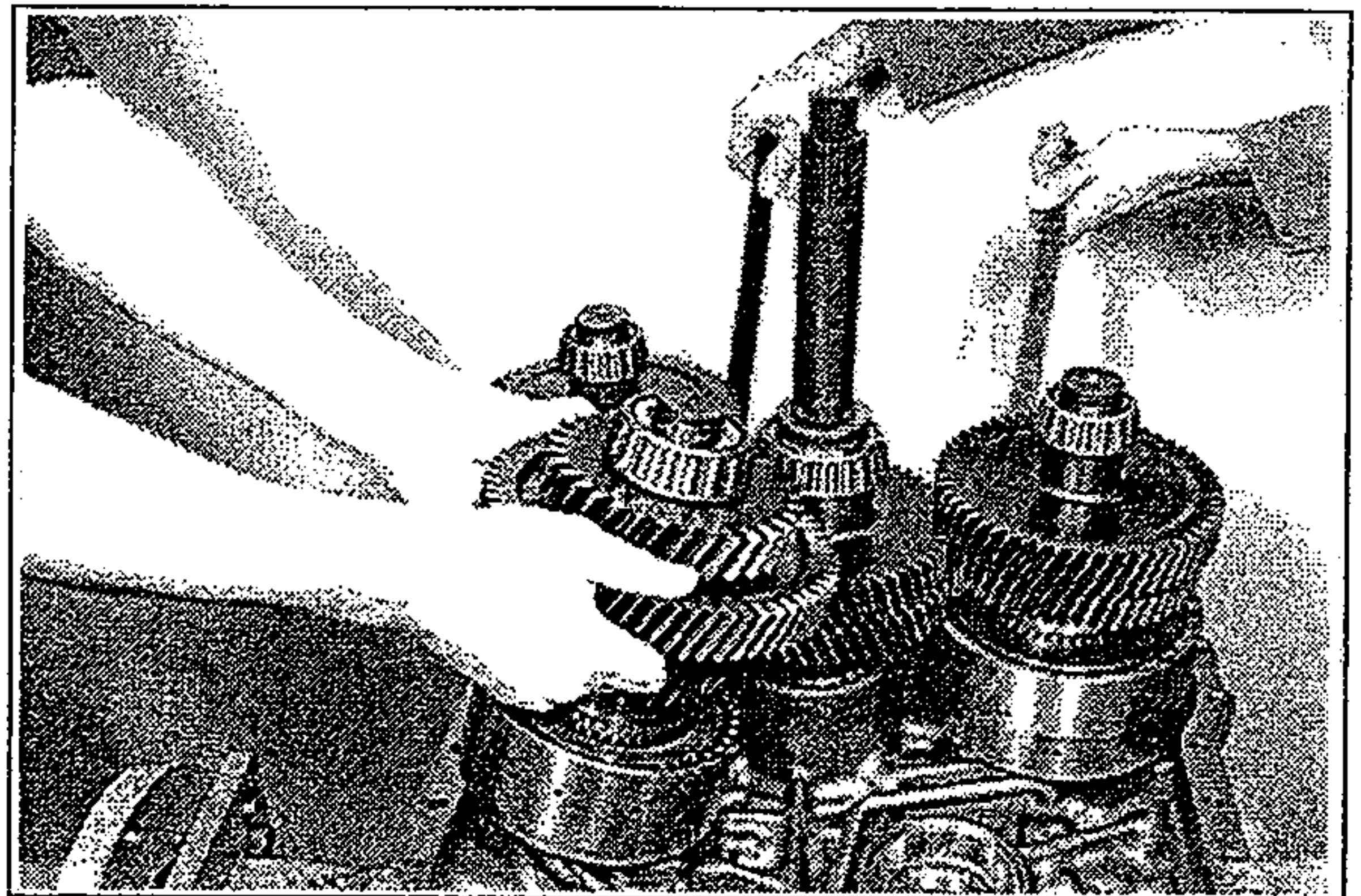
- ⑭ Remove clutch K3.



- ⑮ Lift clutch KV and KR by means of pry bars and remove clutch K4.

Pry bar

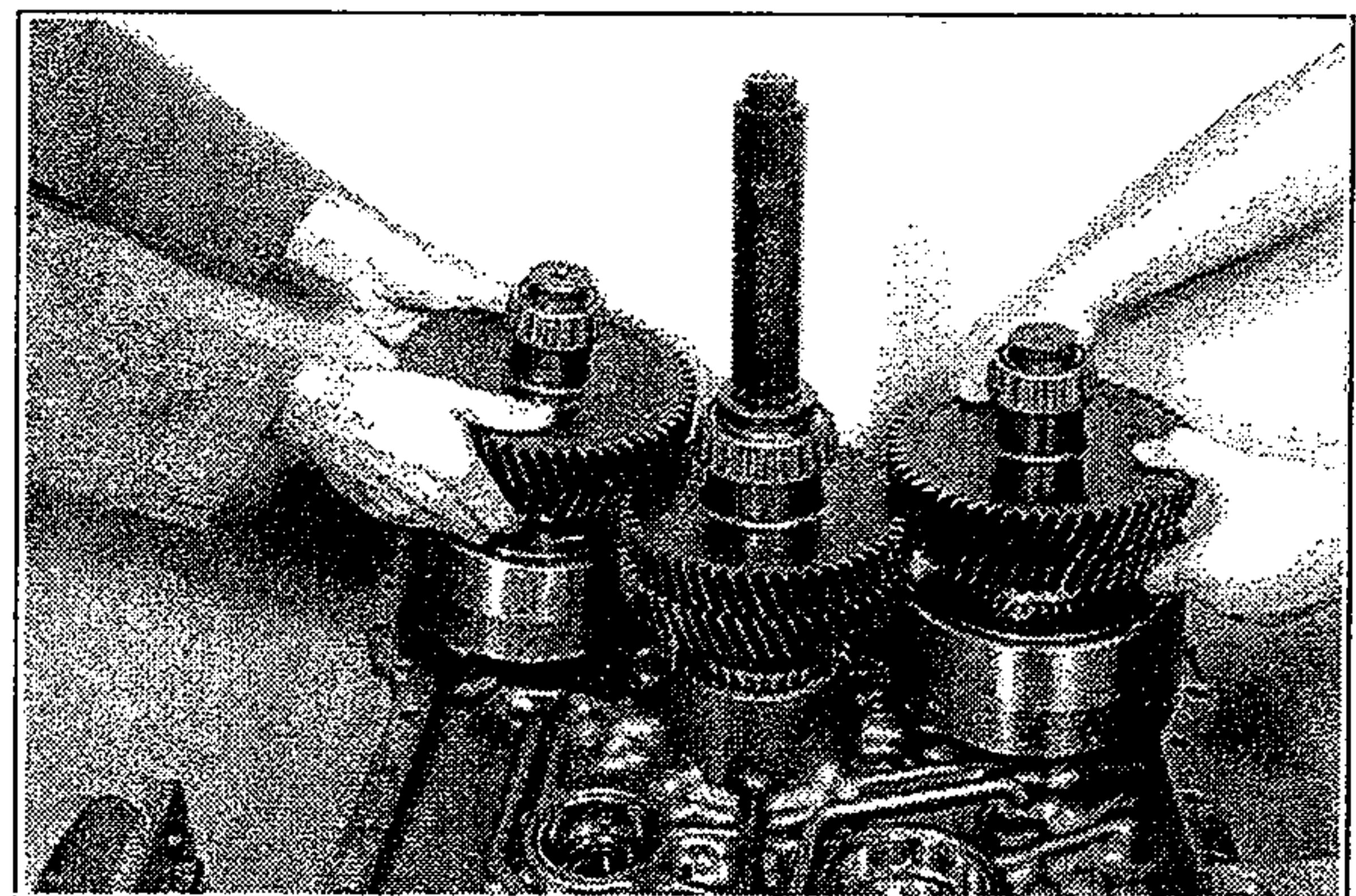
5870 345 065



- ⑯ Lift clutch KV and clutch KR as well as input together out of the housing cover. Remove bearing outer races out of the housing bores.

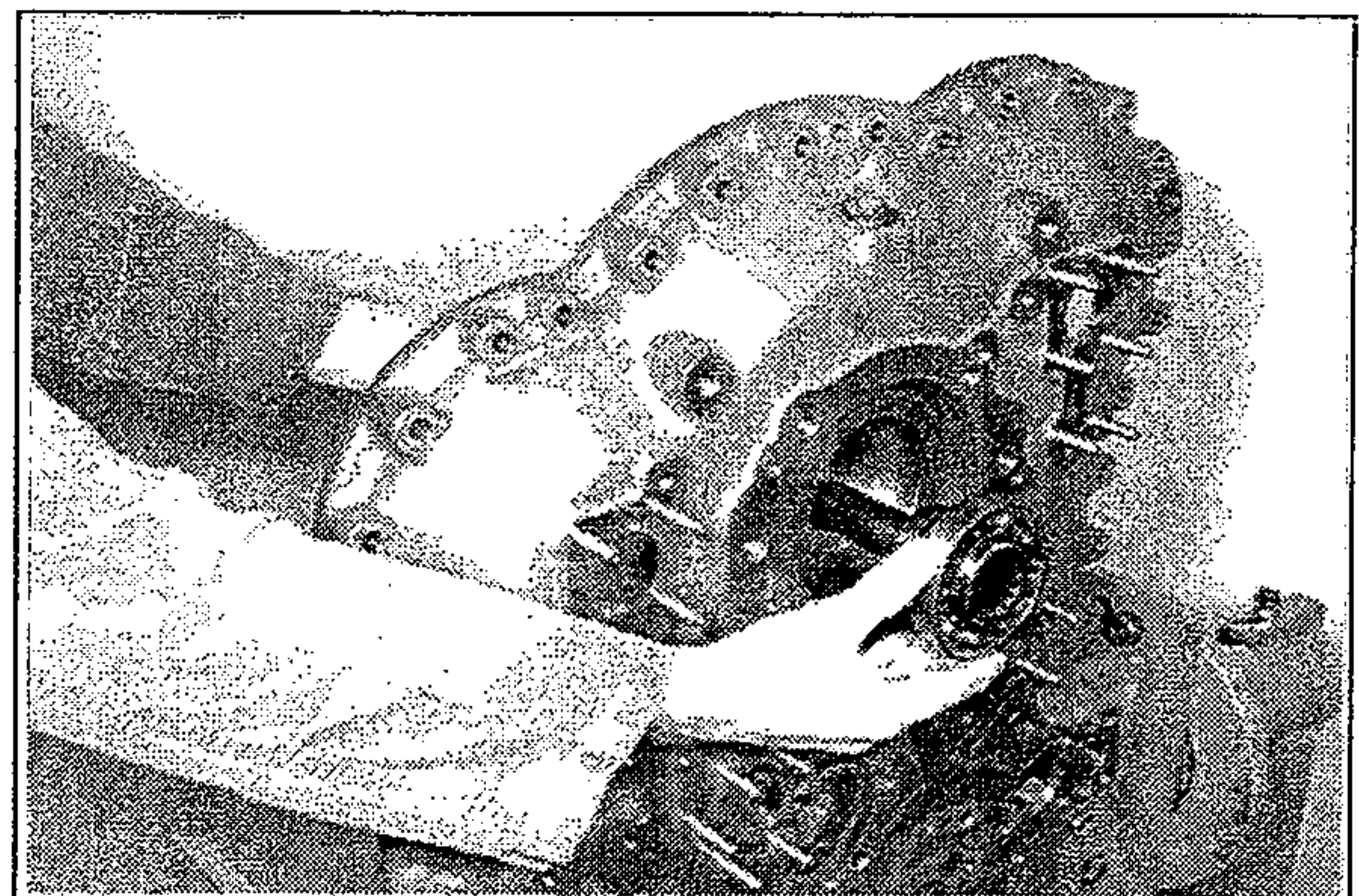
※ If contrary to the recommendation the tapered roller bearings of the clutches as well as of the input and output will not be renewed, the allocation (Bearing inner races to bearing outer races) must at least be maintained.

Mark bearing inner race and bearing outer race accordingly to each other.

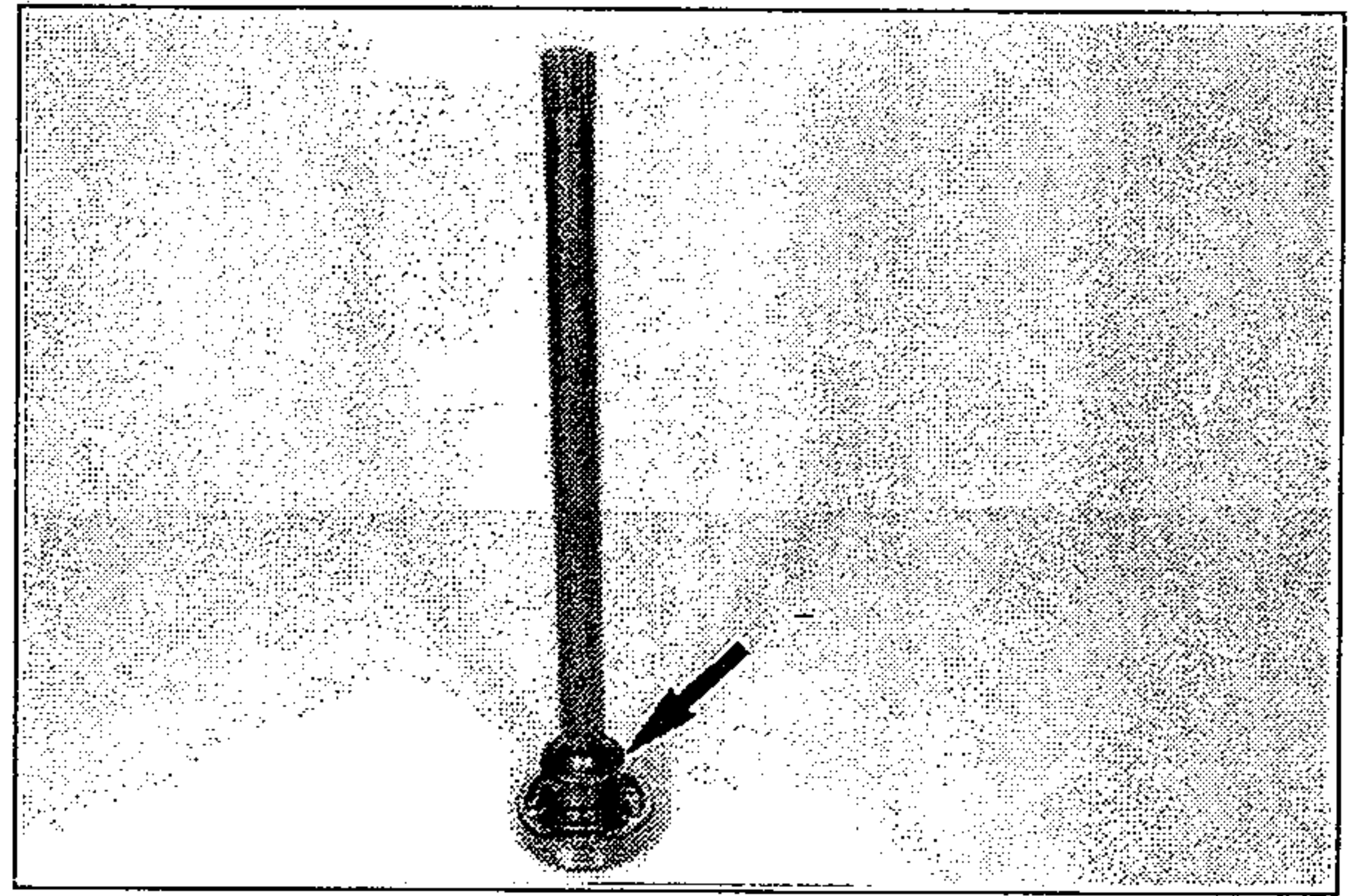


- ⑰ Tilt housing cover 90°.

Squeeze circlip out and separate pump shaft from housing cover.



- ⑱ Squeeze rectangular ring out(Arrow) and press ball bearing from the shaft.

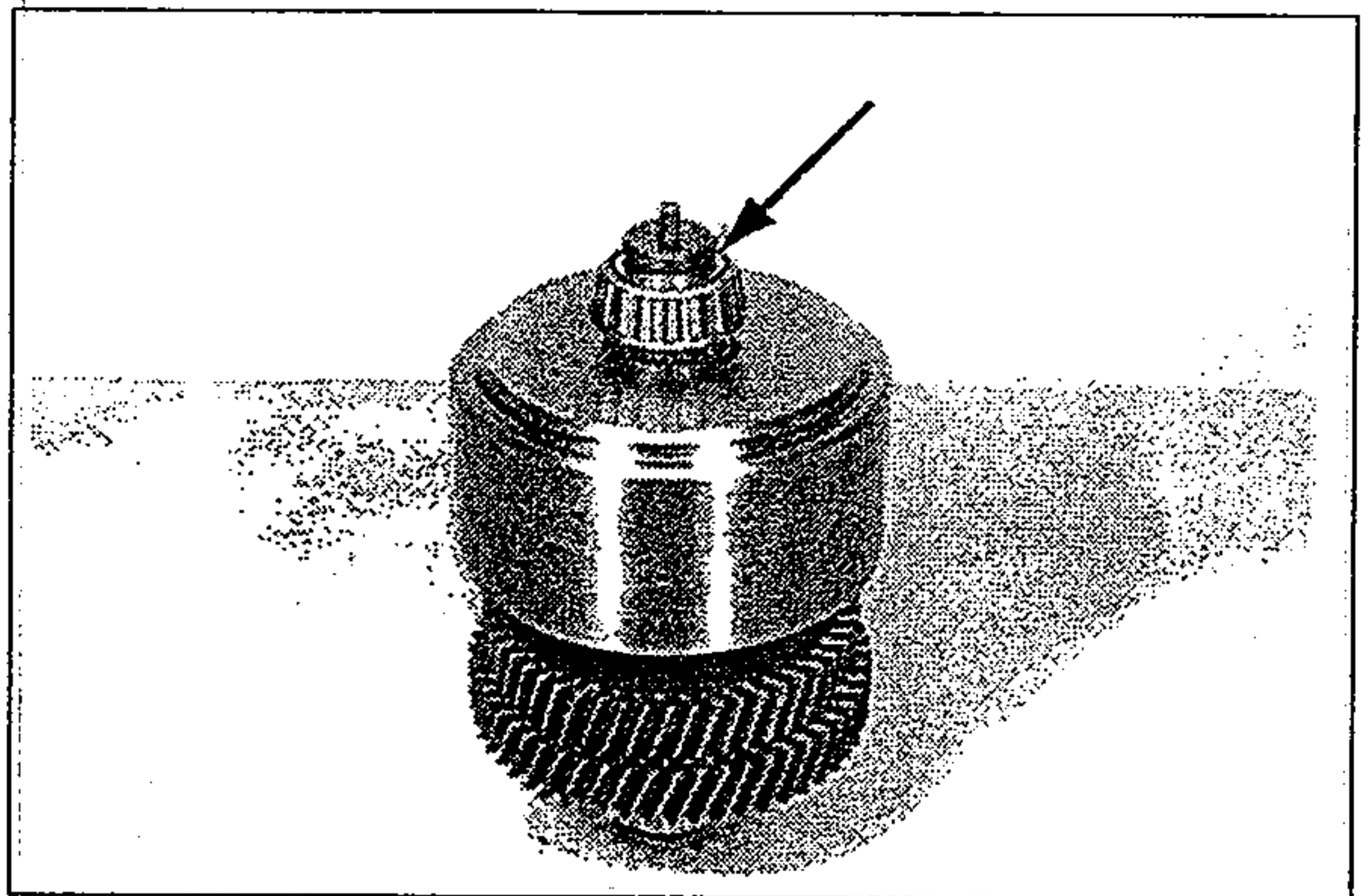


(6) Disassemble clutch KV and KR

※ The following figures show the disassembly of clutch KV.

The disassembly of clutch KR is similar.

- ① Squeeze rectangular ring out(Arrow).

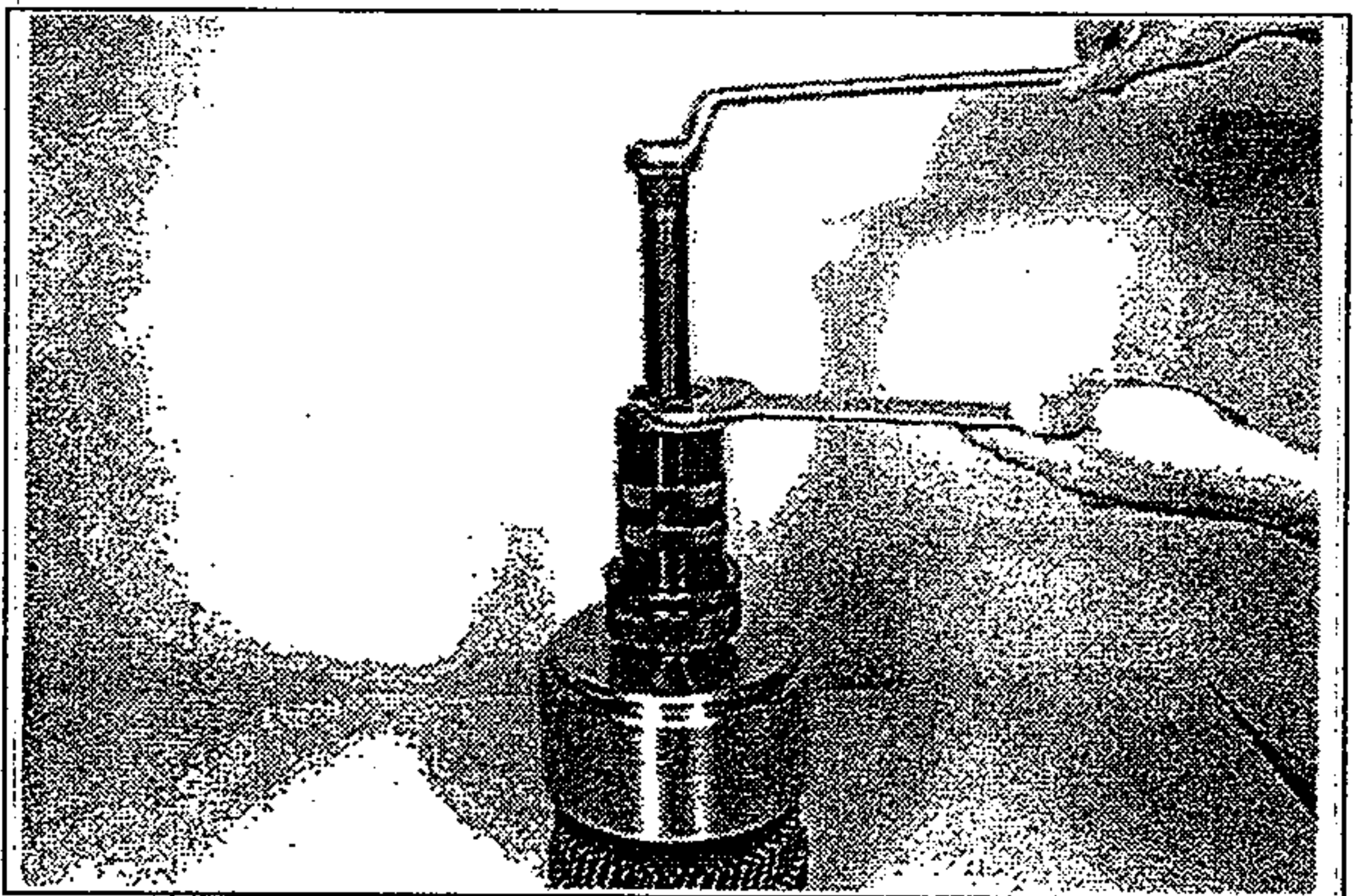


- ② Pull tapered roller bearing from the shaft.
Remove opposite tapered roller bearing accordingly.

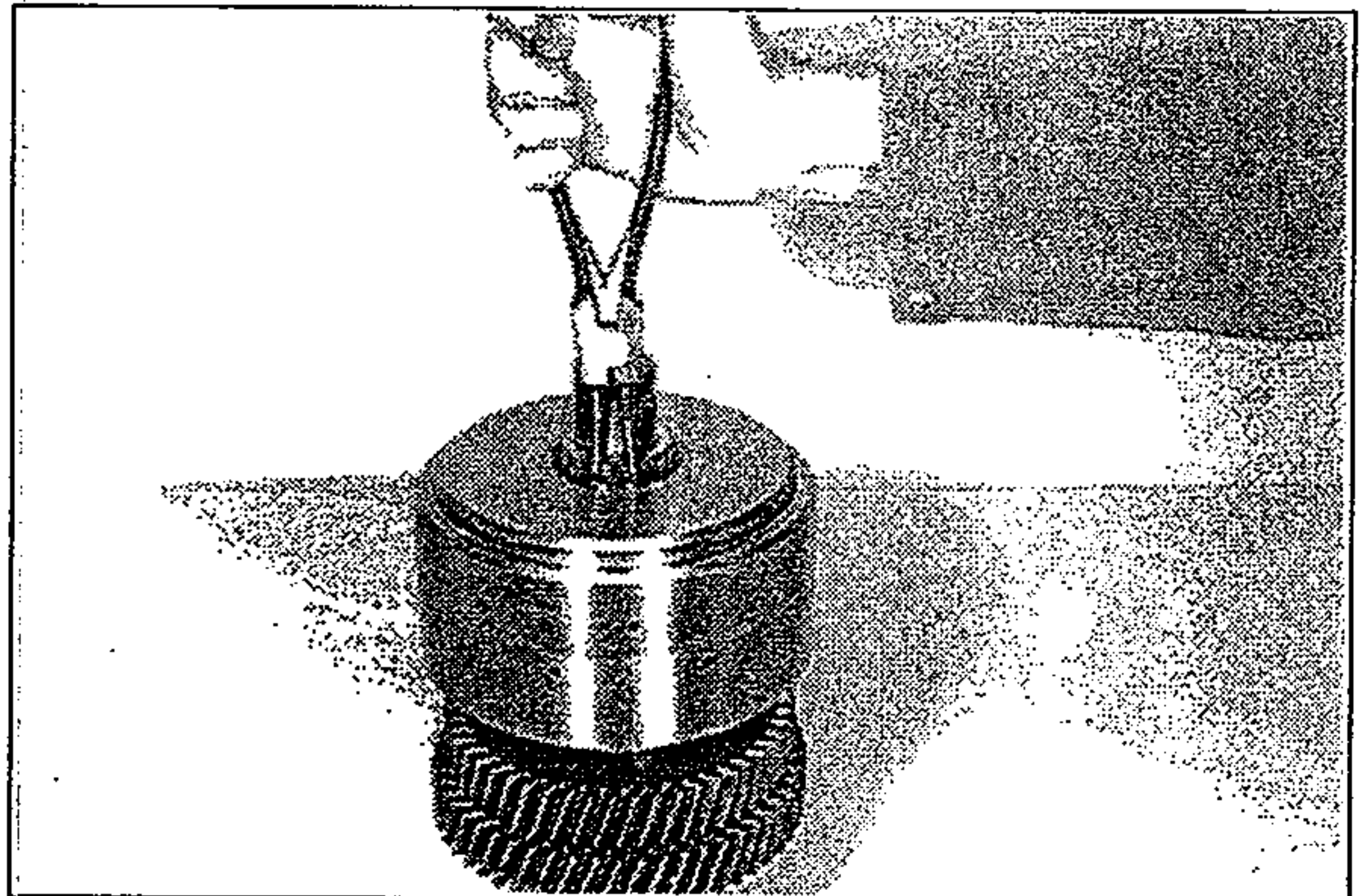
Grab sleeve 5873 001 057

Grab sleeve 5873 001 059

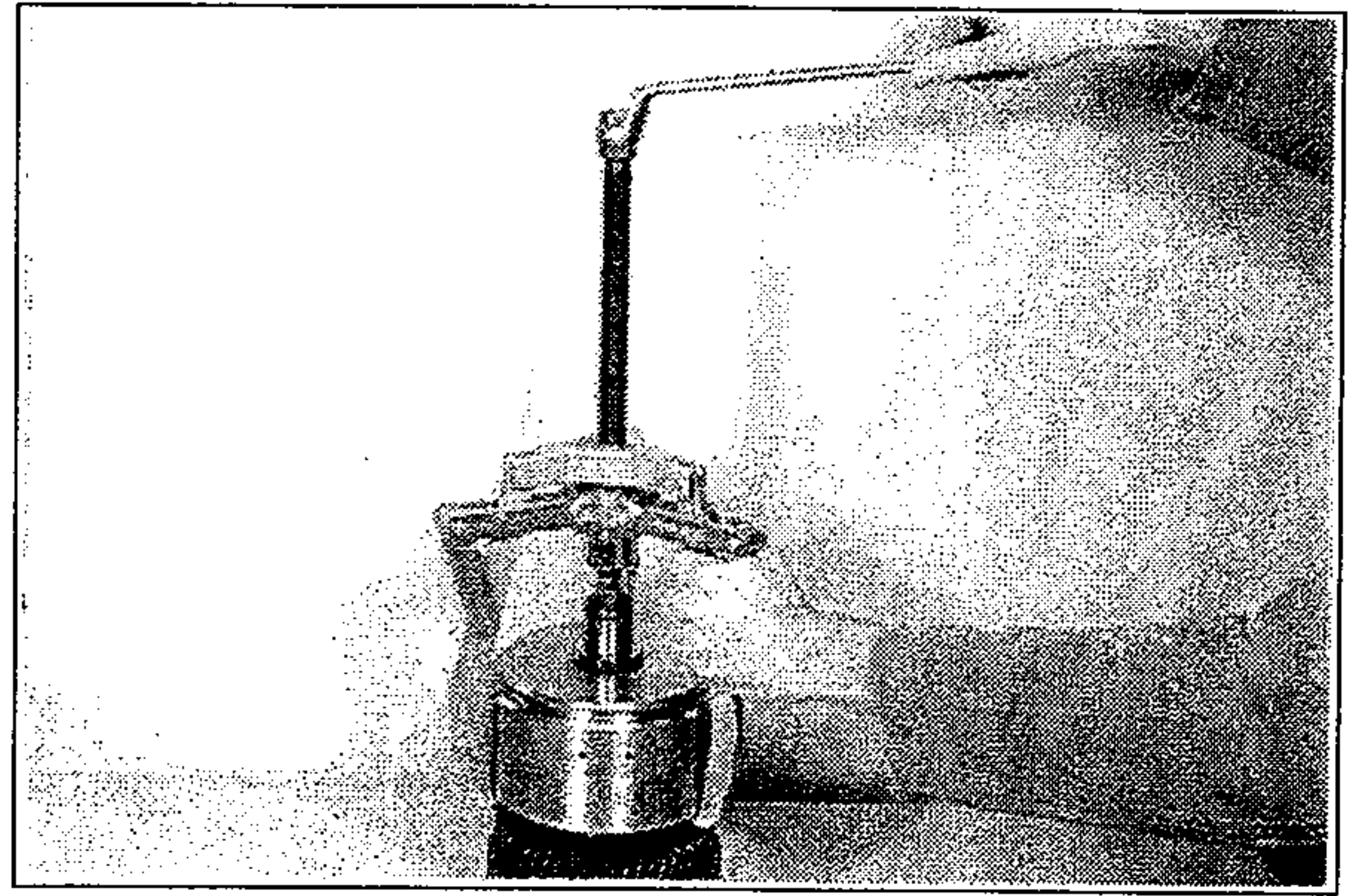
Basic set 5873 001 000



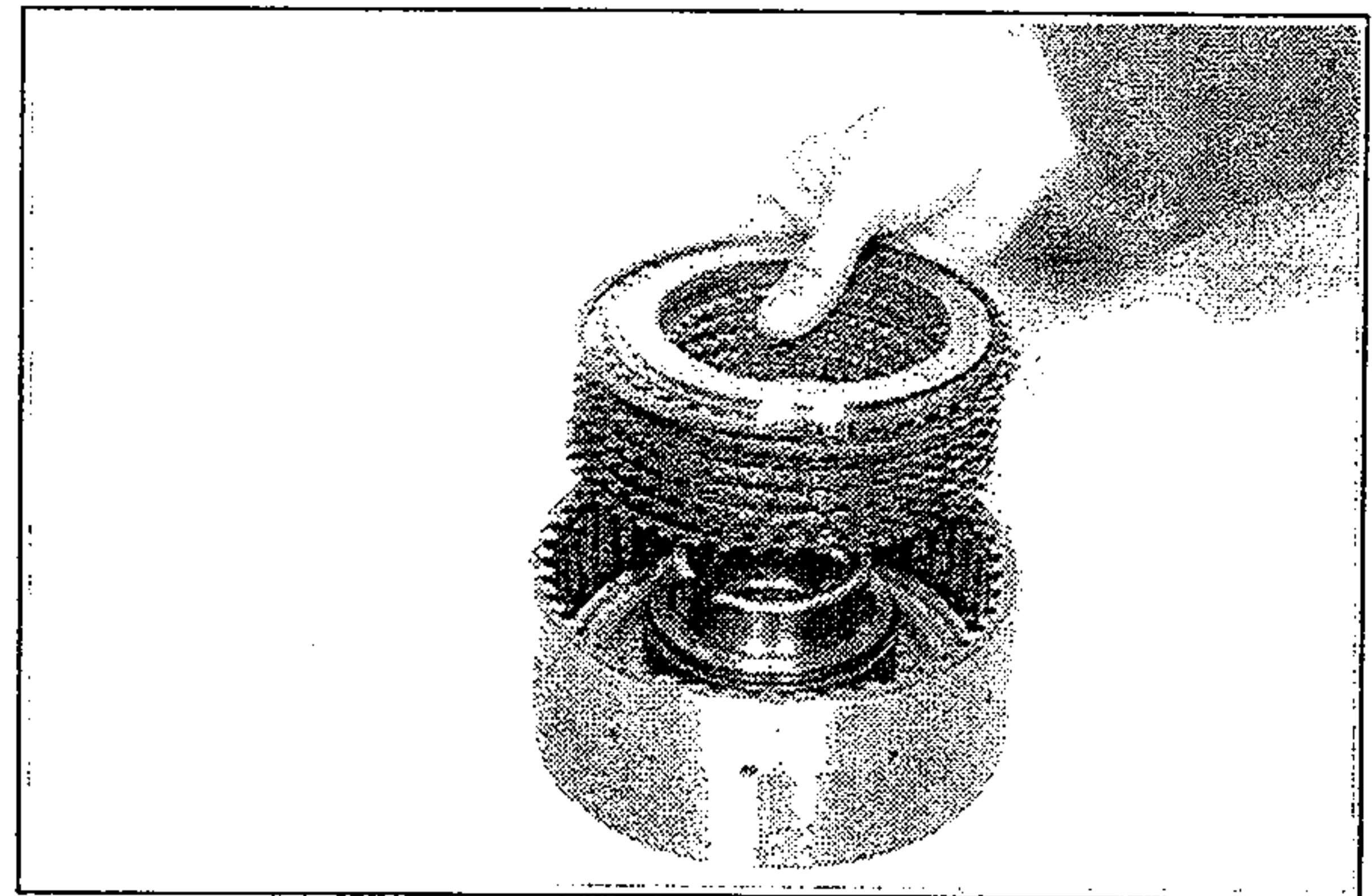
- ③ Squeeze circlip out.



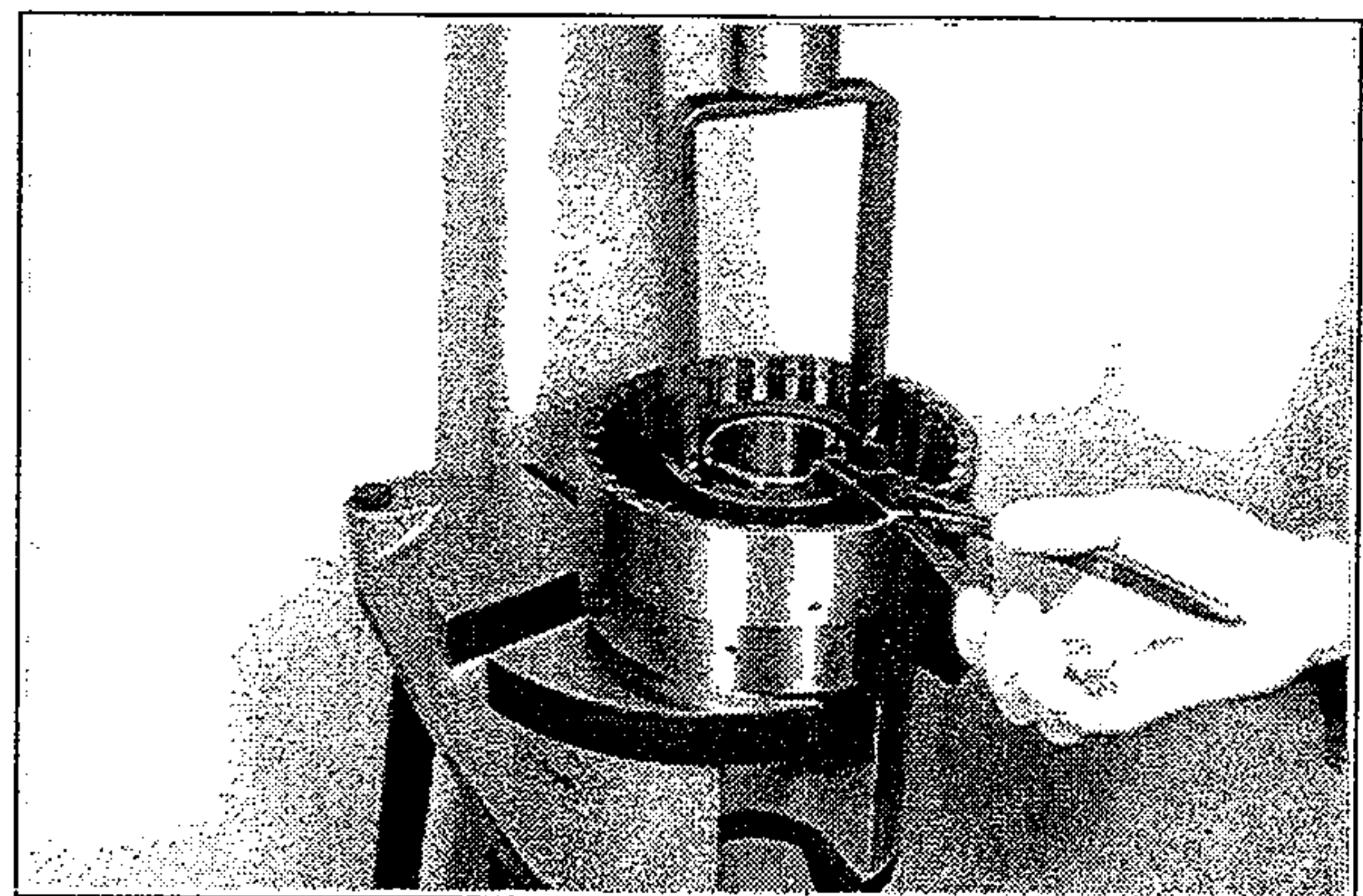
- ④ Separate plate carrier from the shaft.
Three leg puller 5870 971 003



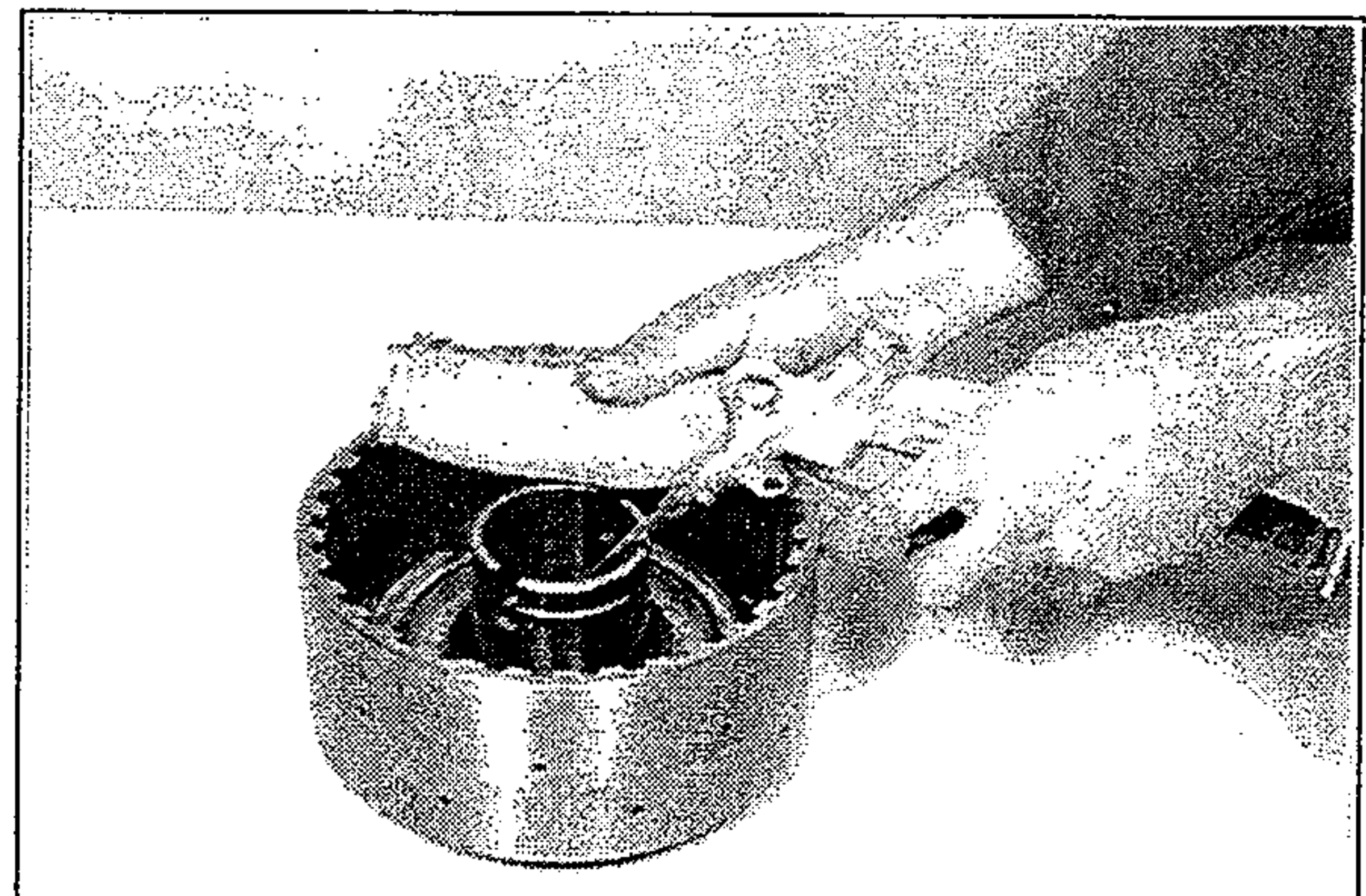
- ⑤ Squeeze snap ring out and remove plate pack.



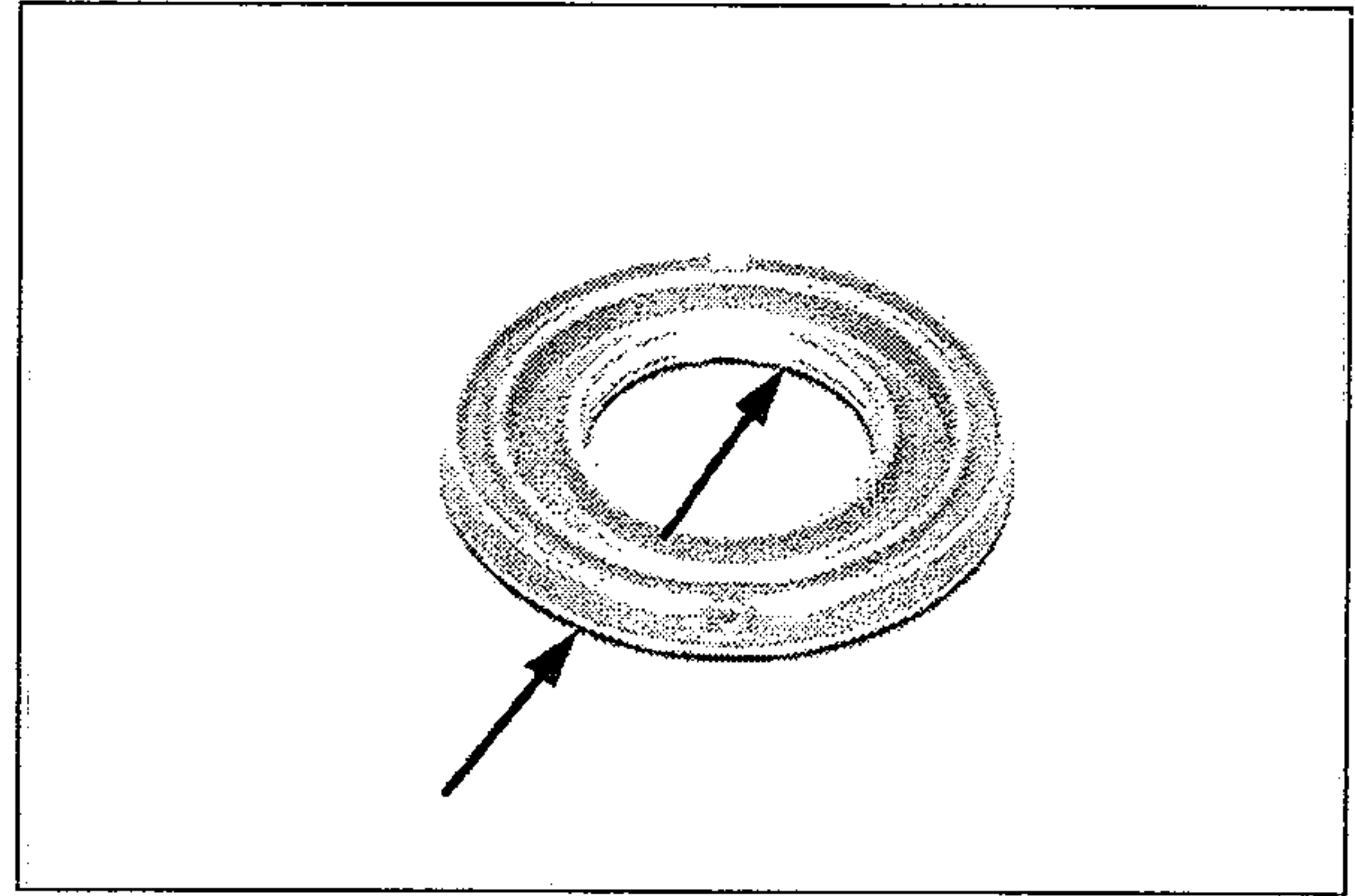
- ⑥ Preload compression spring, squeeze snap ring out and remove components.
Assembly aid 5870 345 088



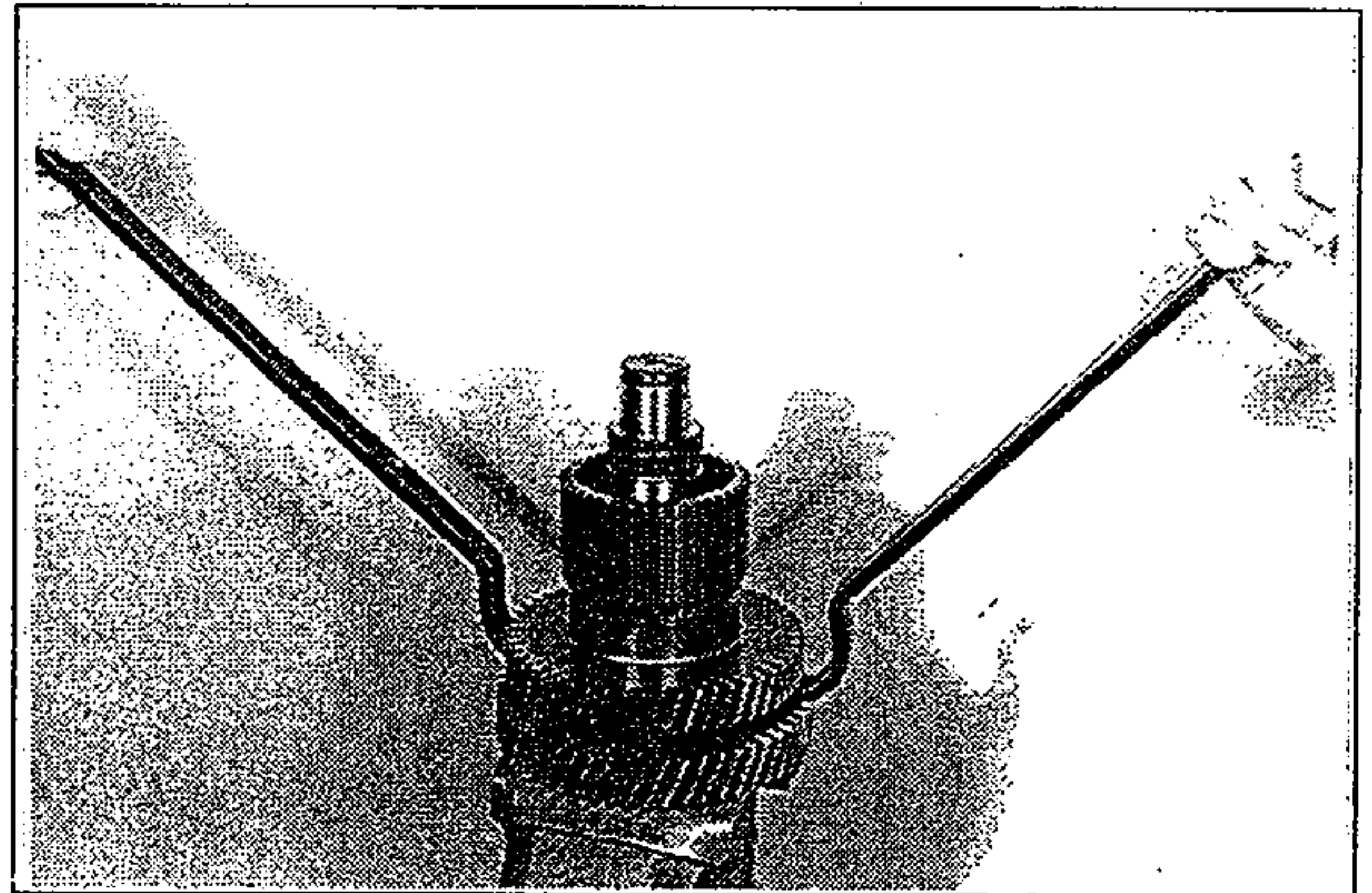
- ⑦ Lift piston by means of compressed air out of the cylinder bore and remove it.



⑧ Remove both O-rings(Arrows).



⑨ Lift idler gear a bit by means of pry bare.



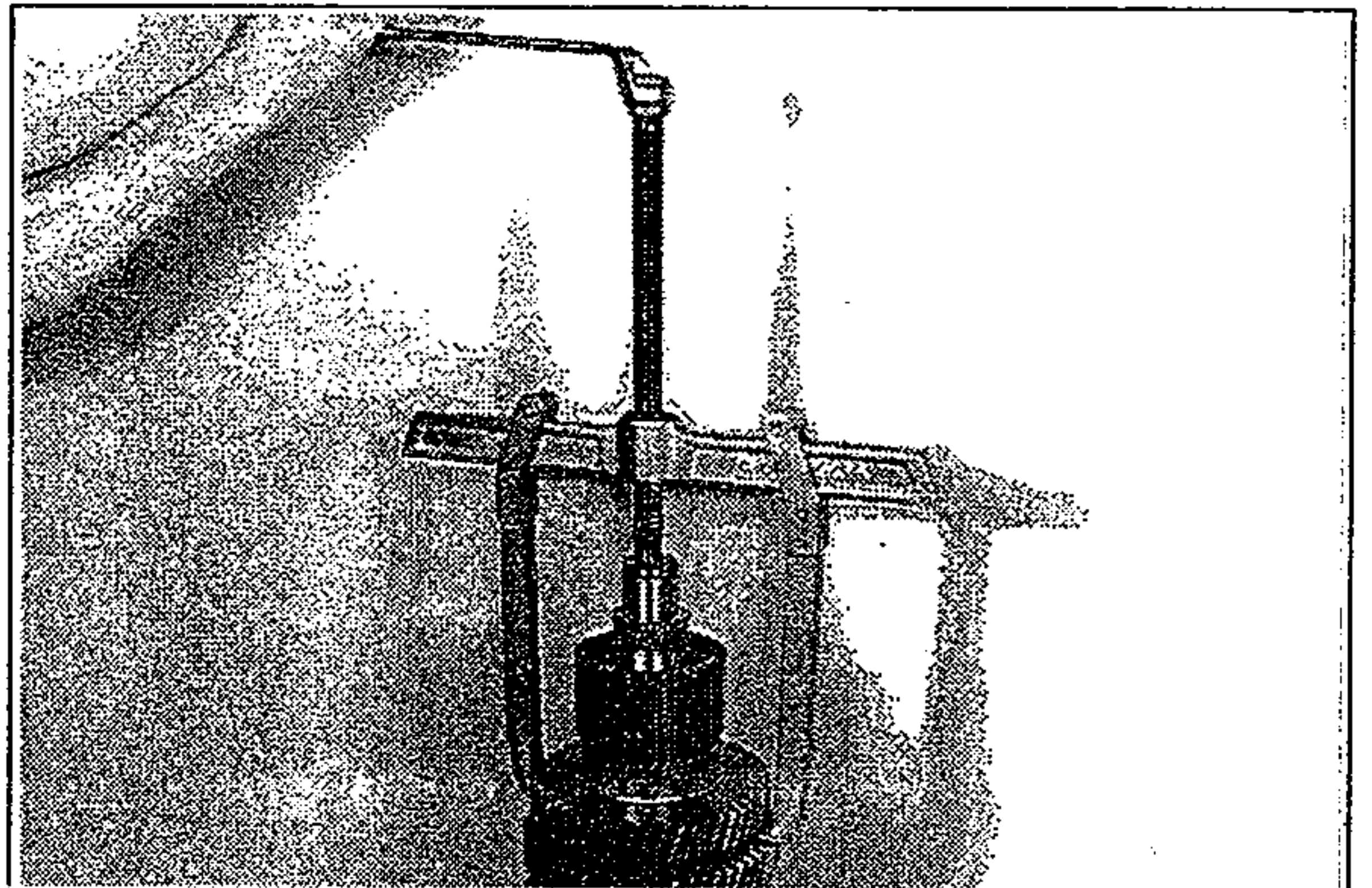
⑩ Apply puller and separate idler gear from the clutch shaft.

Pry bar

5870 345 065

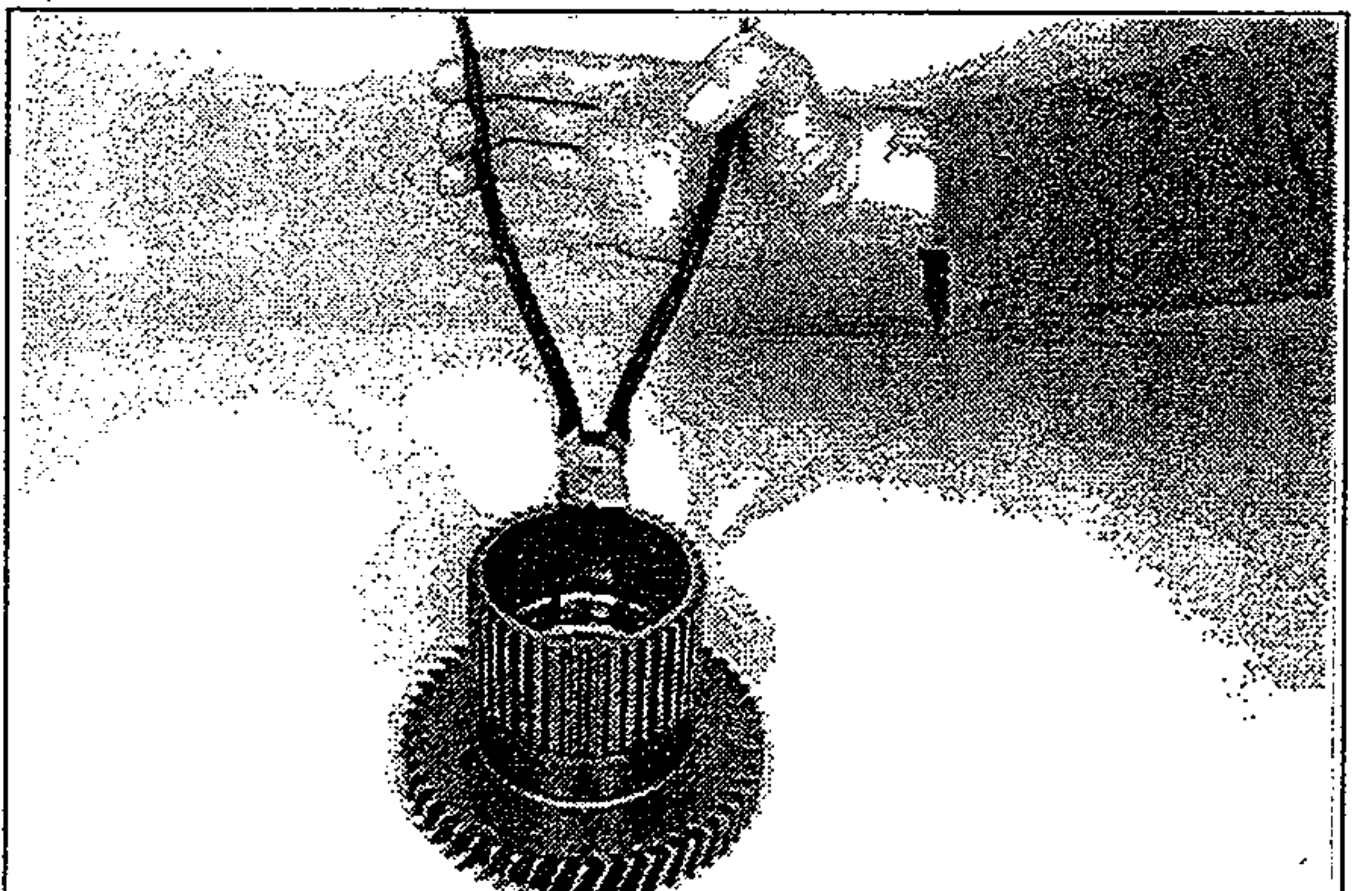
Puller

5870 971 003



⑪ Squeeze circlip out and remove ball bearing.

※ The disassembly of clutch KR has to be carried out accordingly.



(7) Disassemble clutch K1, K2 and K3

※ The following figures show the disassembly of clutch K3.

The disassembly of the clutches K1 and K2 is similar.

① Squeeze rectangular ring out.

Pull tapered roller bearing from the shaft.

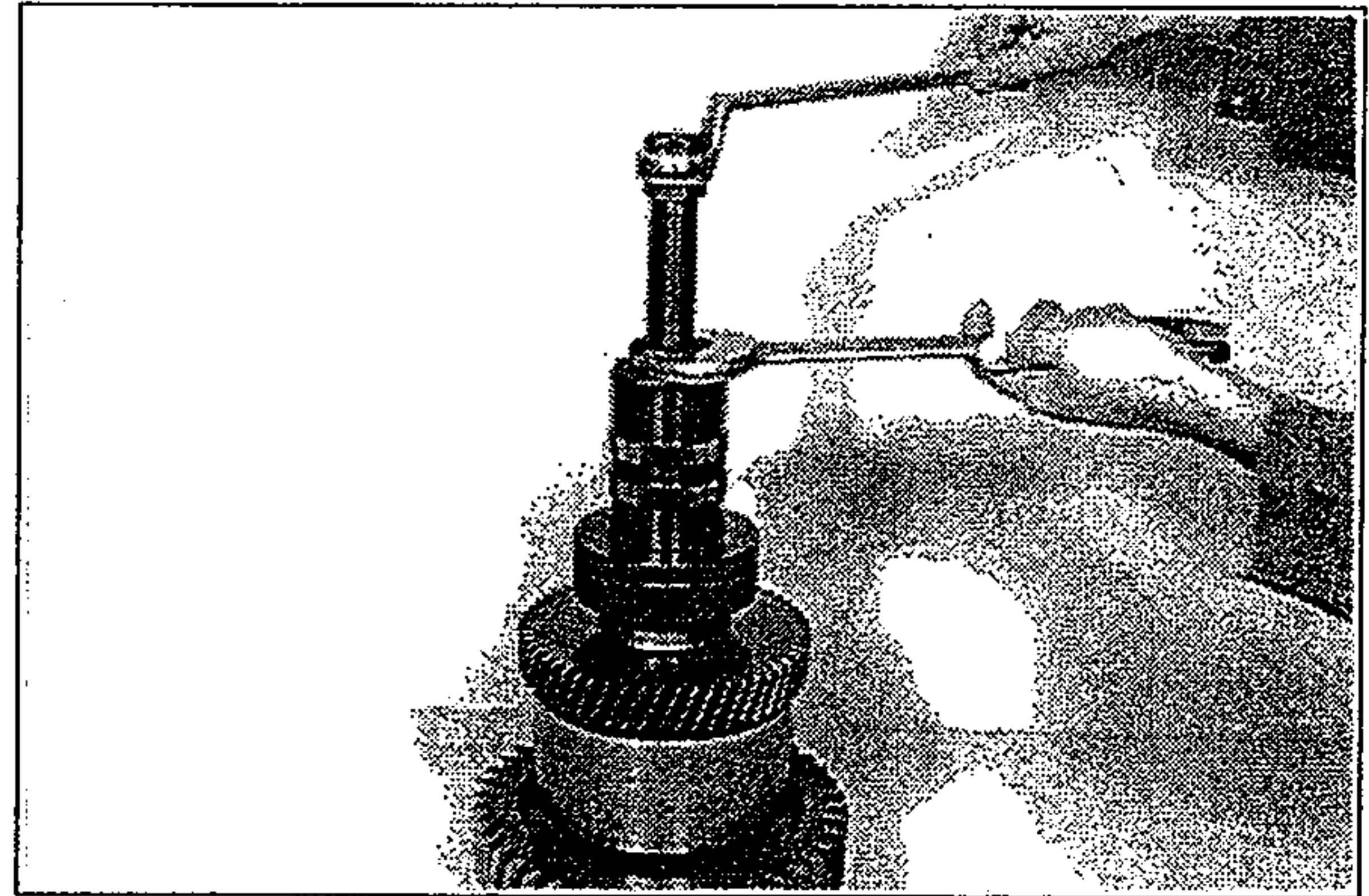
Remove the opposite tapered roller bearing accordingly.

Grab sleeve(Bearing 33800) 5873 001 059

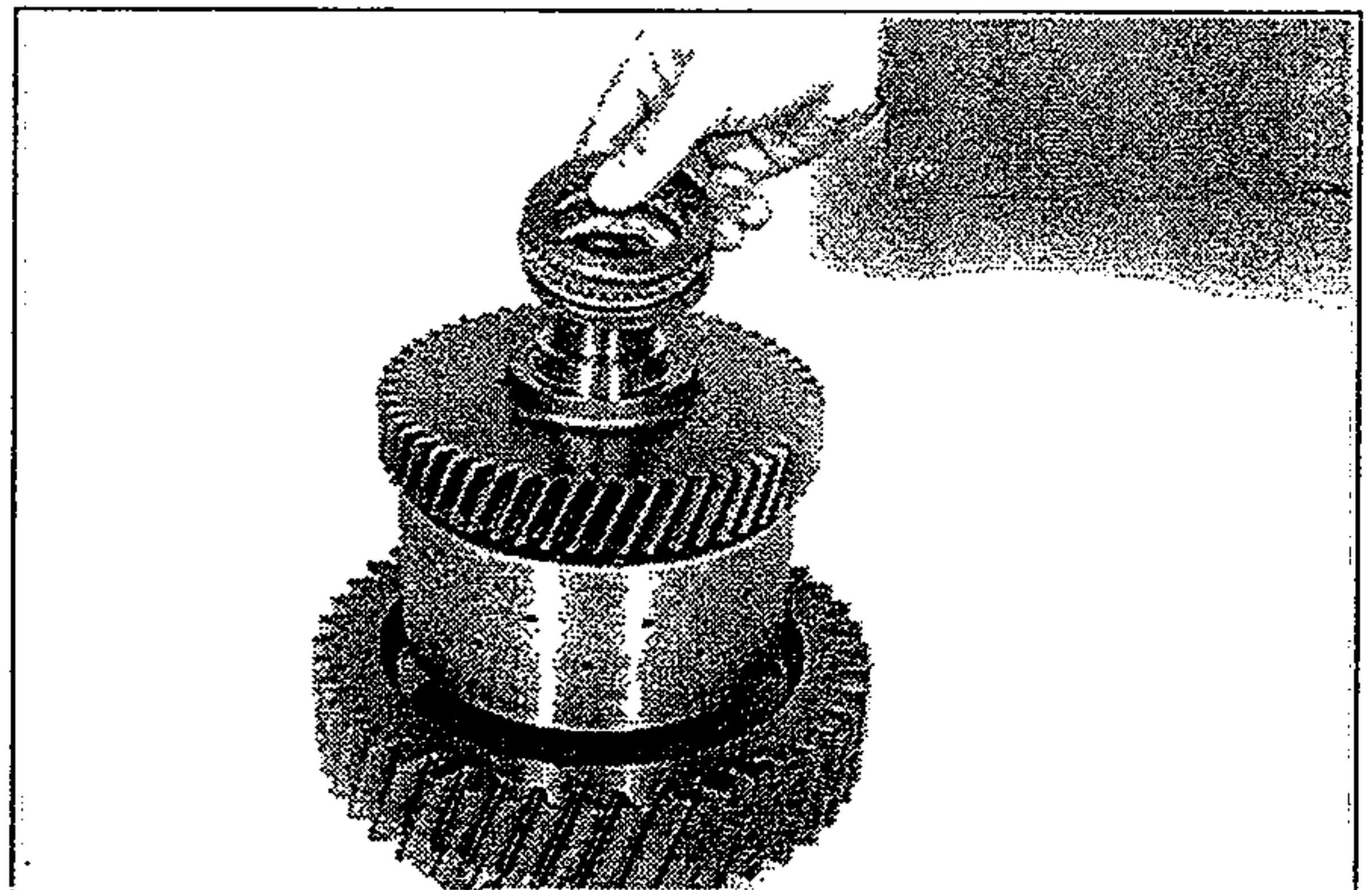
Grab sleeve(Bearing 39500) 5873 002 038

Basic set 5873 001 000

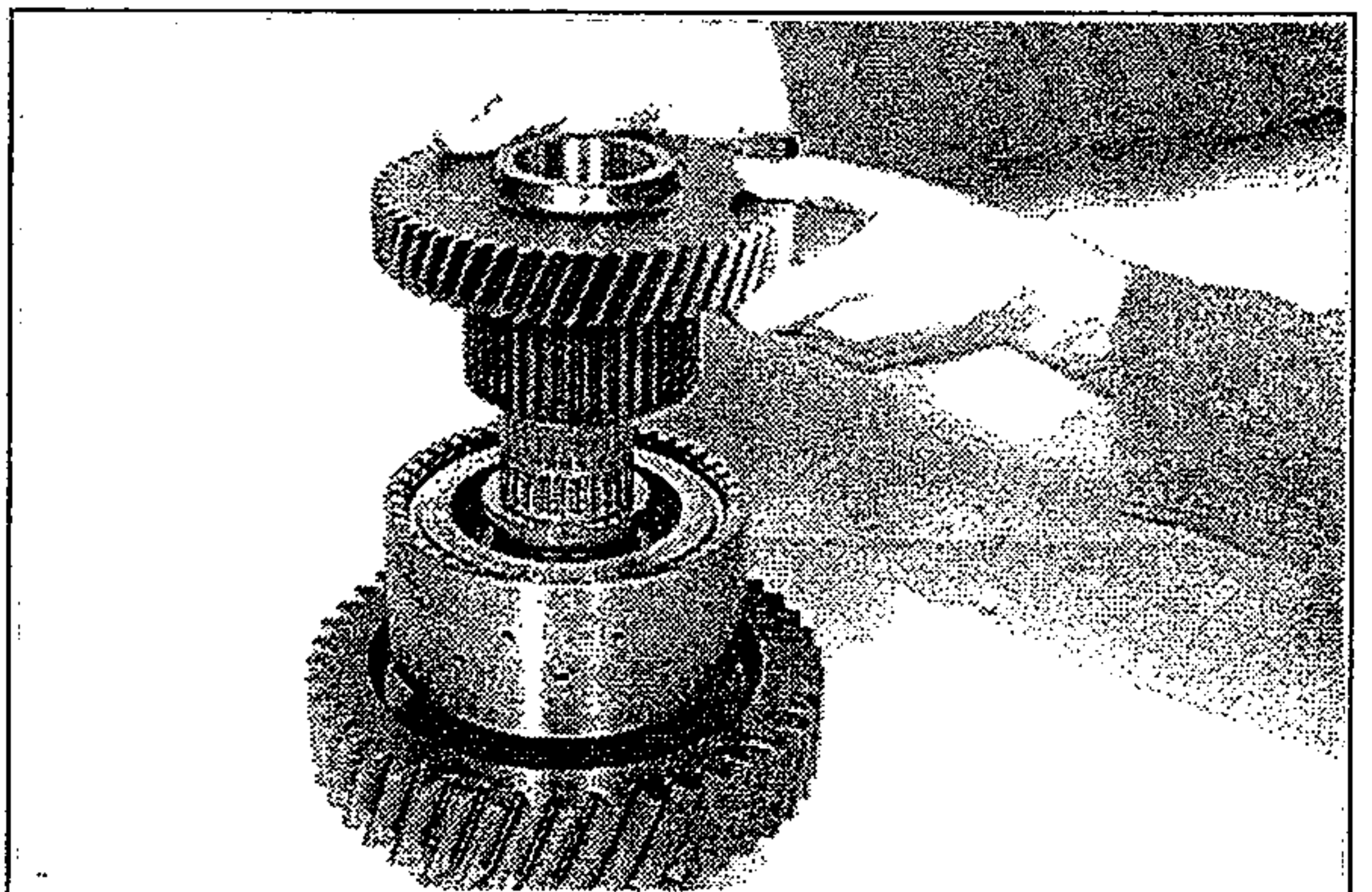
Basic set 5873 002 001



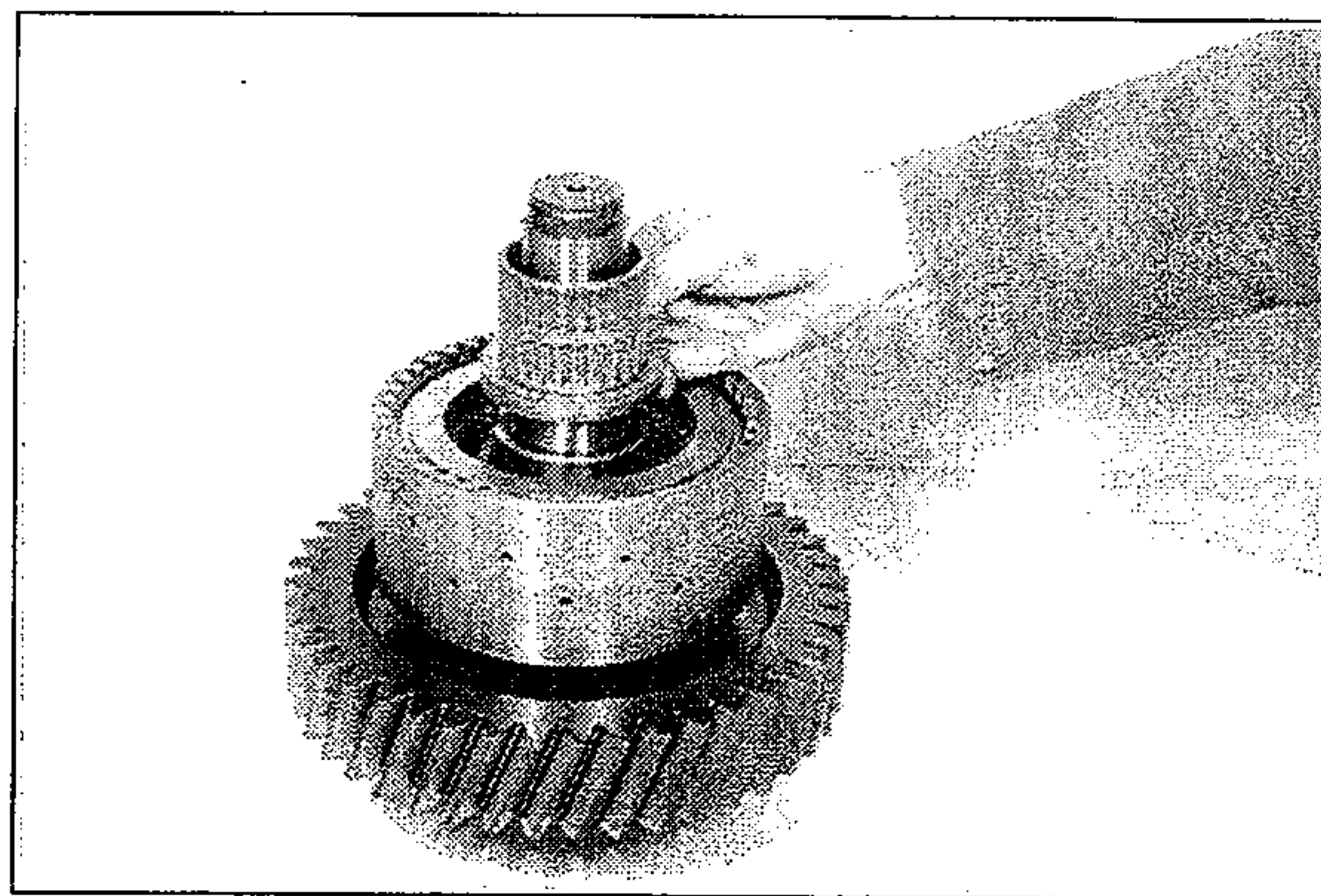
② Remove running disk, axial needle cage and axial washer.



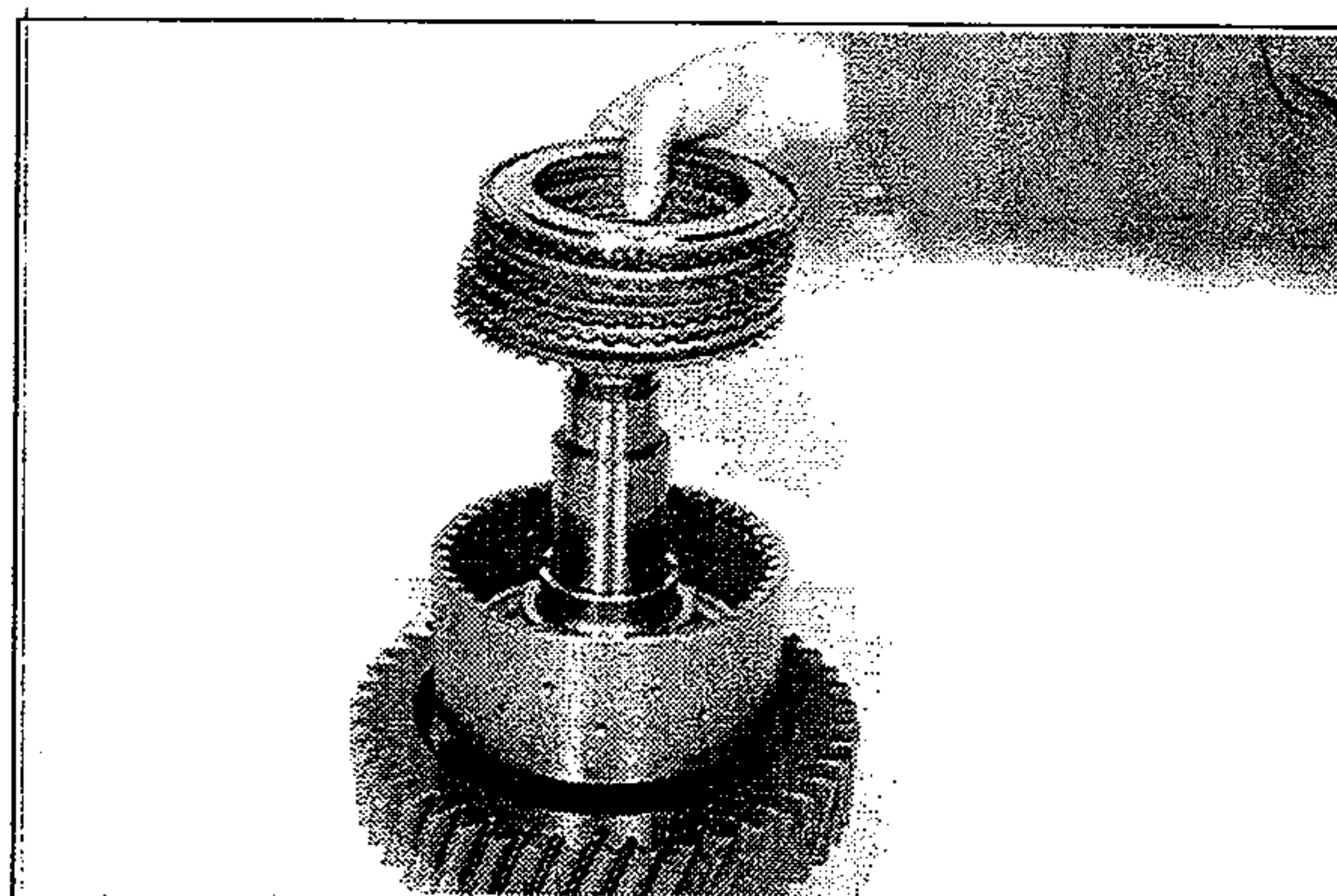
③ Remove idler gear.



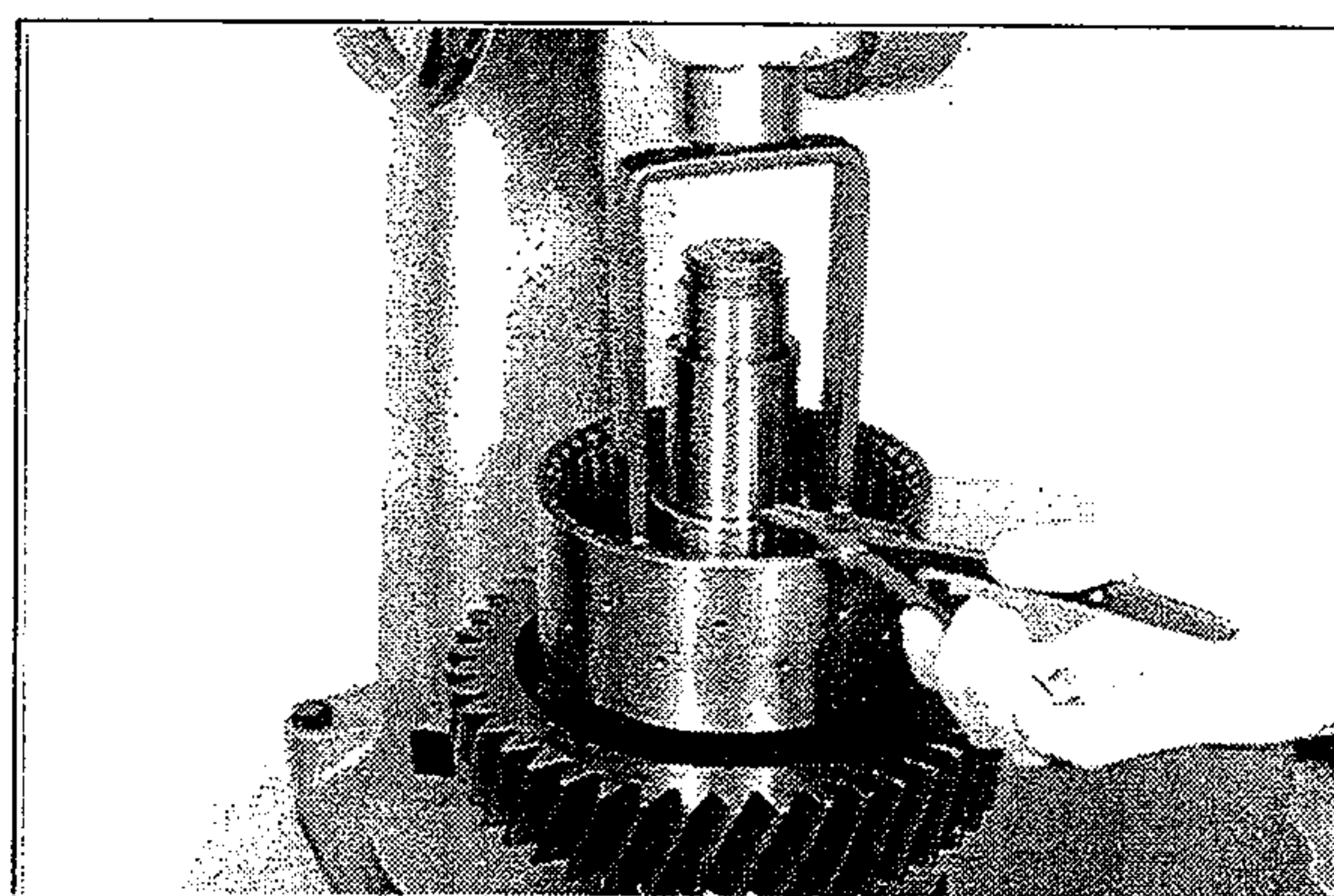
- ④ Remove both needle bearings as well as the axial bearing(Complete).



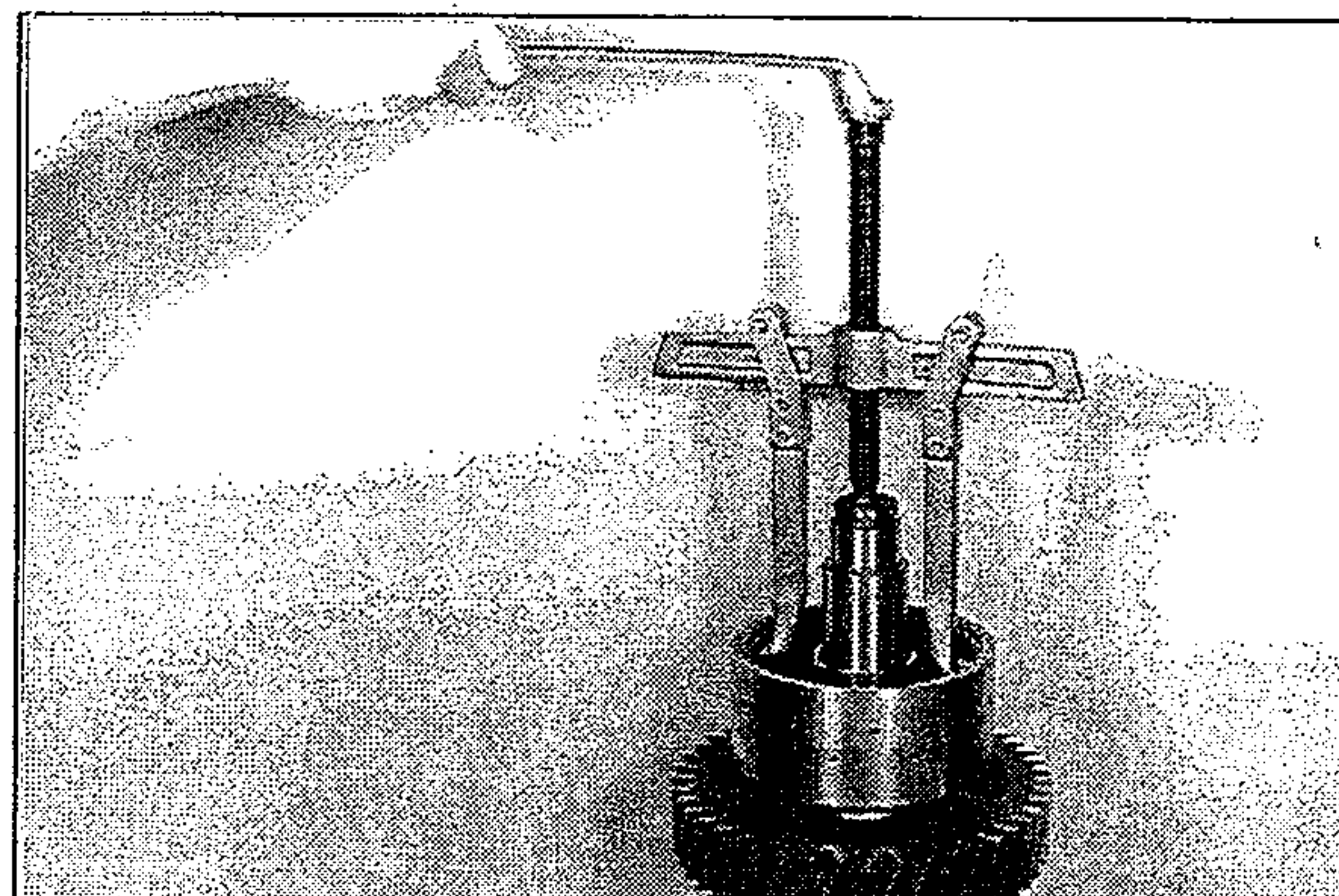
- ⑤ Squeeze snap ring out and remove plate pack.



- ⑥ Preload cup-spring pack and squeeze snap ring out.
Remove released components.
Assembly aid 5870 345 088

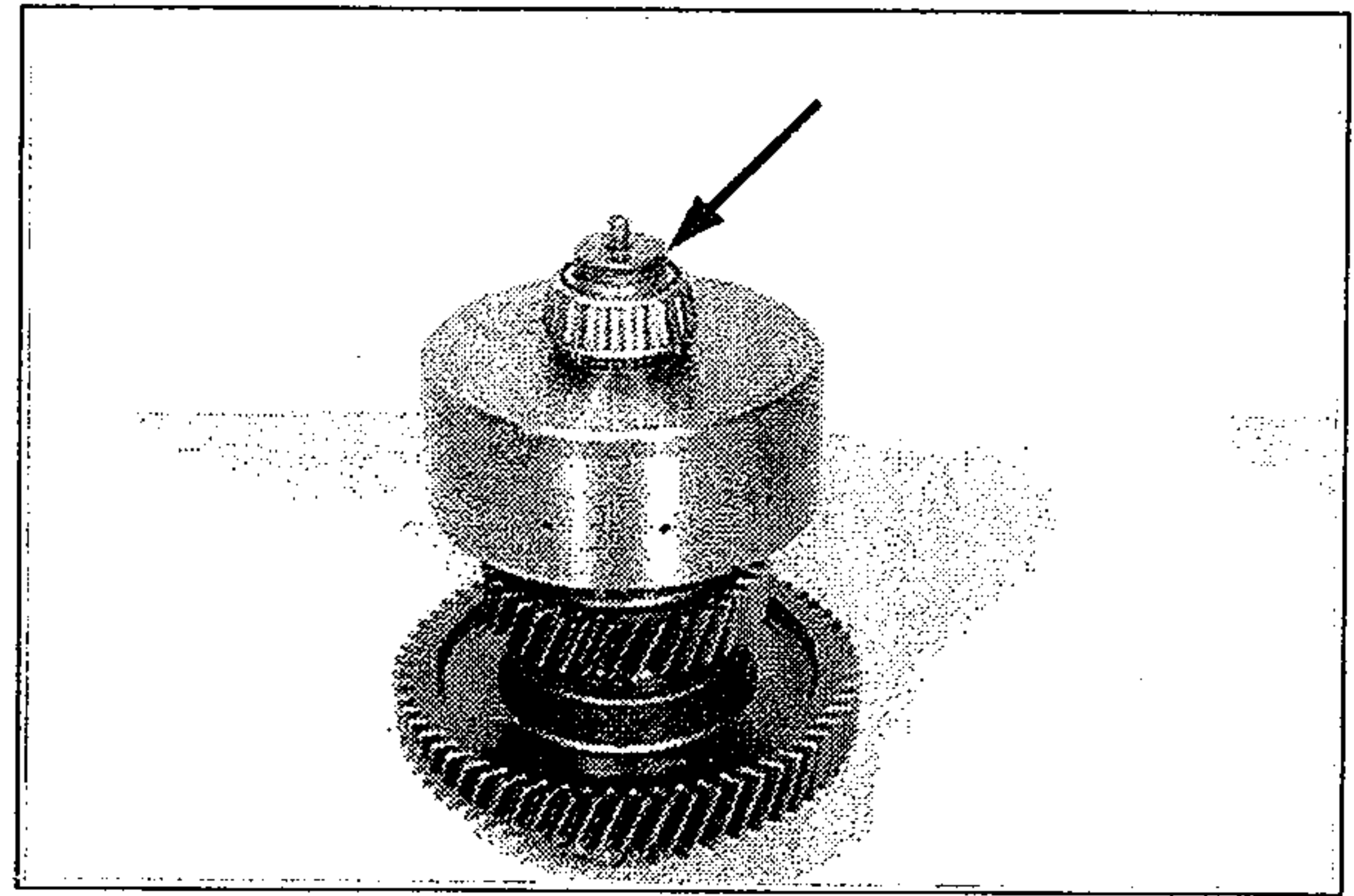


- ⑦ Squeeze circlip into the groove of the plate carrier.
Apply puller on the circlip and pull plate carrier from the clutch shaft.
Puller 5870 970 004
Circlip 0630 502 053



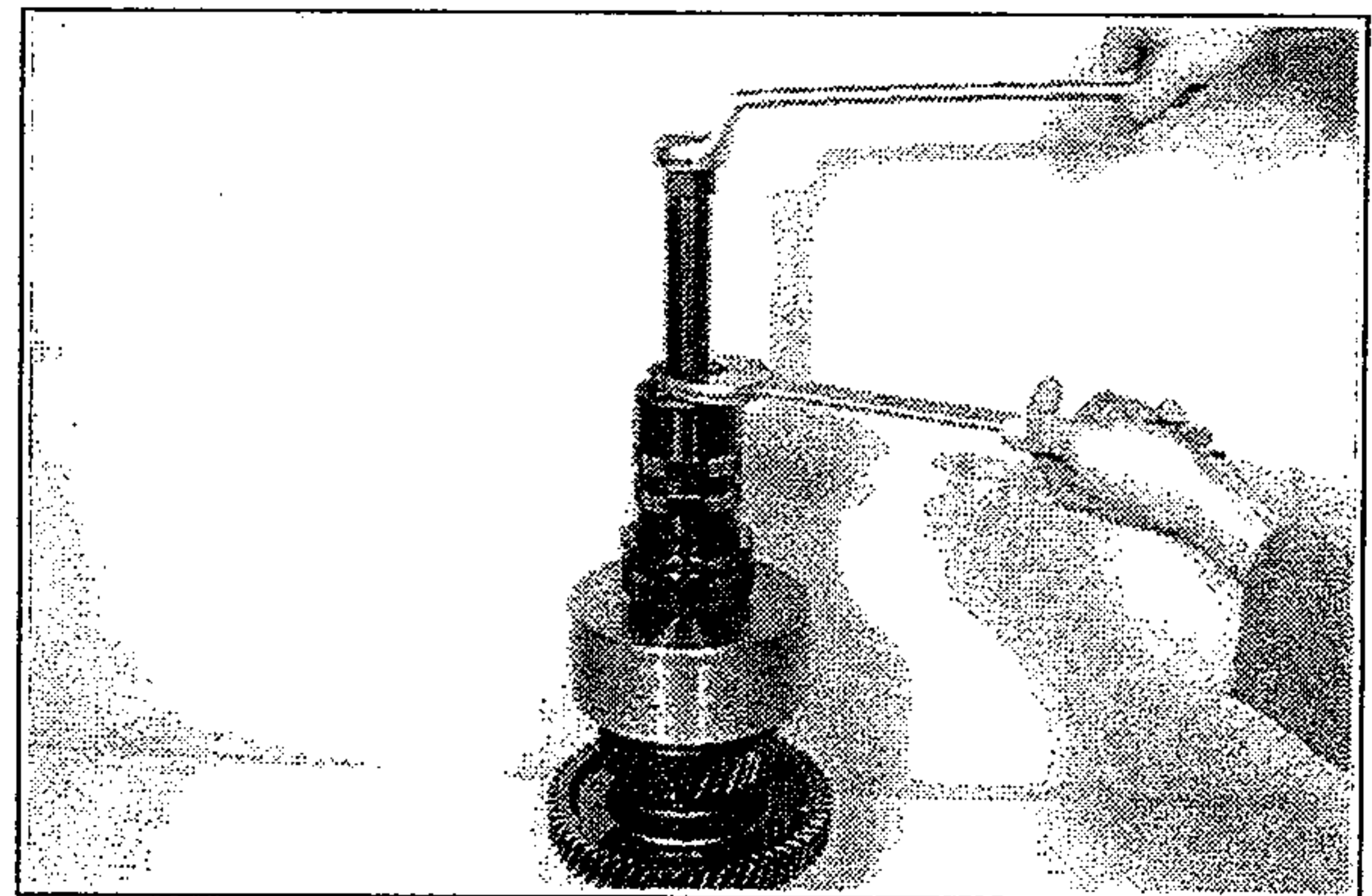
(8) Disassemble clutch K4

- ① Squeeze rectangular ring out (Arrow).



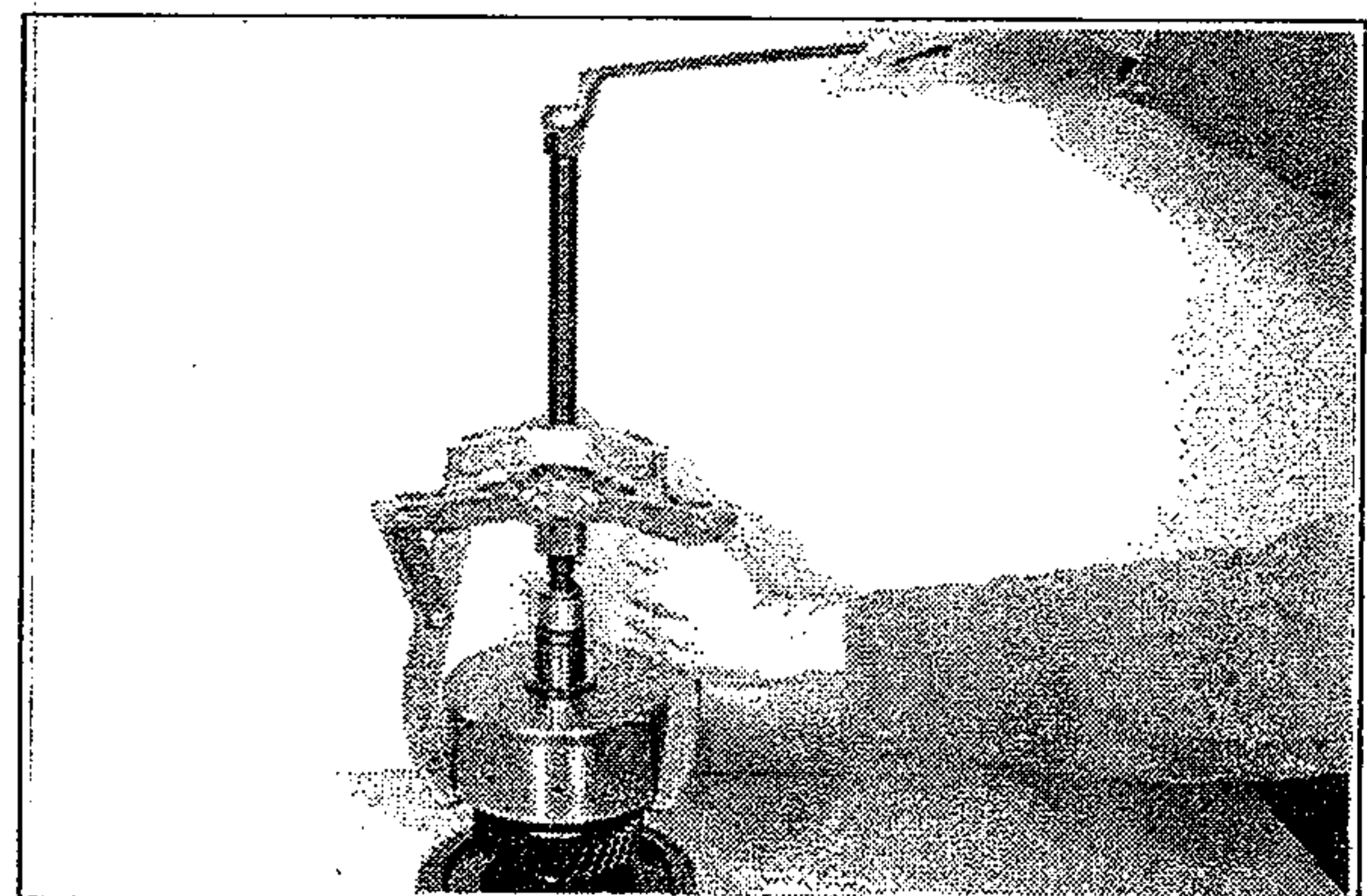
- ② Pull tapered roller bearing from the shaft.
Remove opposite tapered roller bearing accordingly.

Grab sleeve	5873 001 057
Grab sleeve	5873 001 059
Basic set	5873 001 000

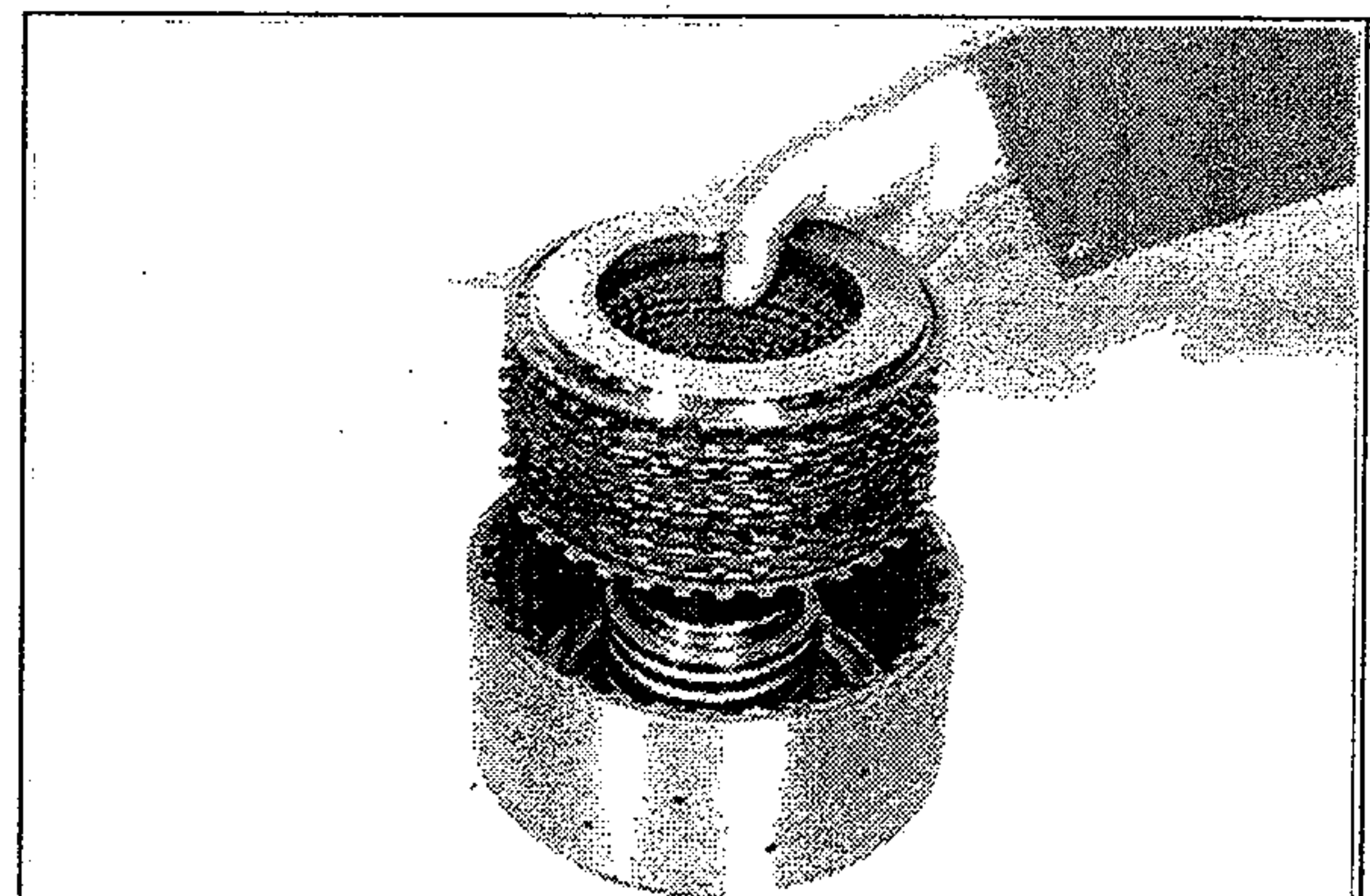


- ③ Squeeze circlip out and separate plate carrier from the shaft.

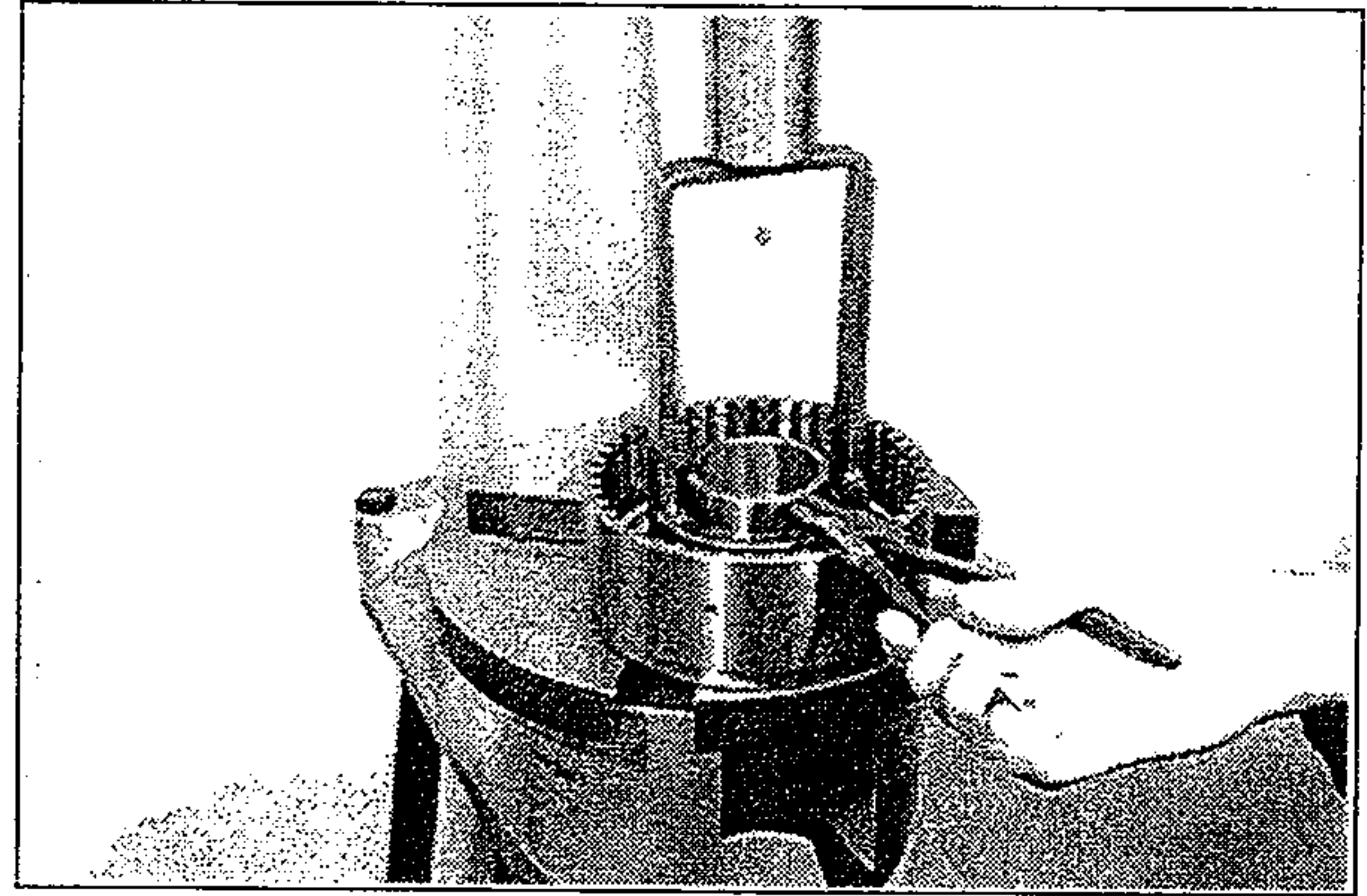
Three leg puller	5870 971 003
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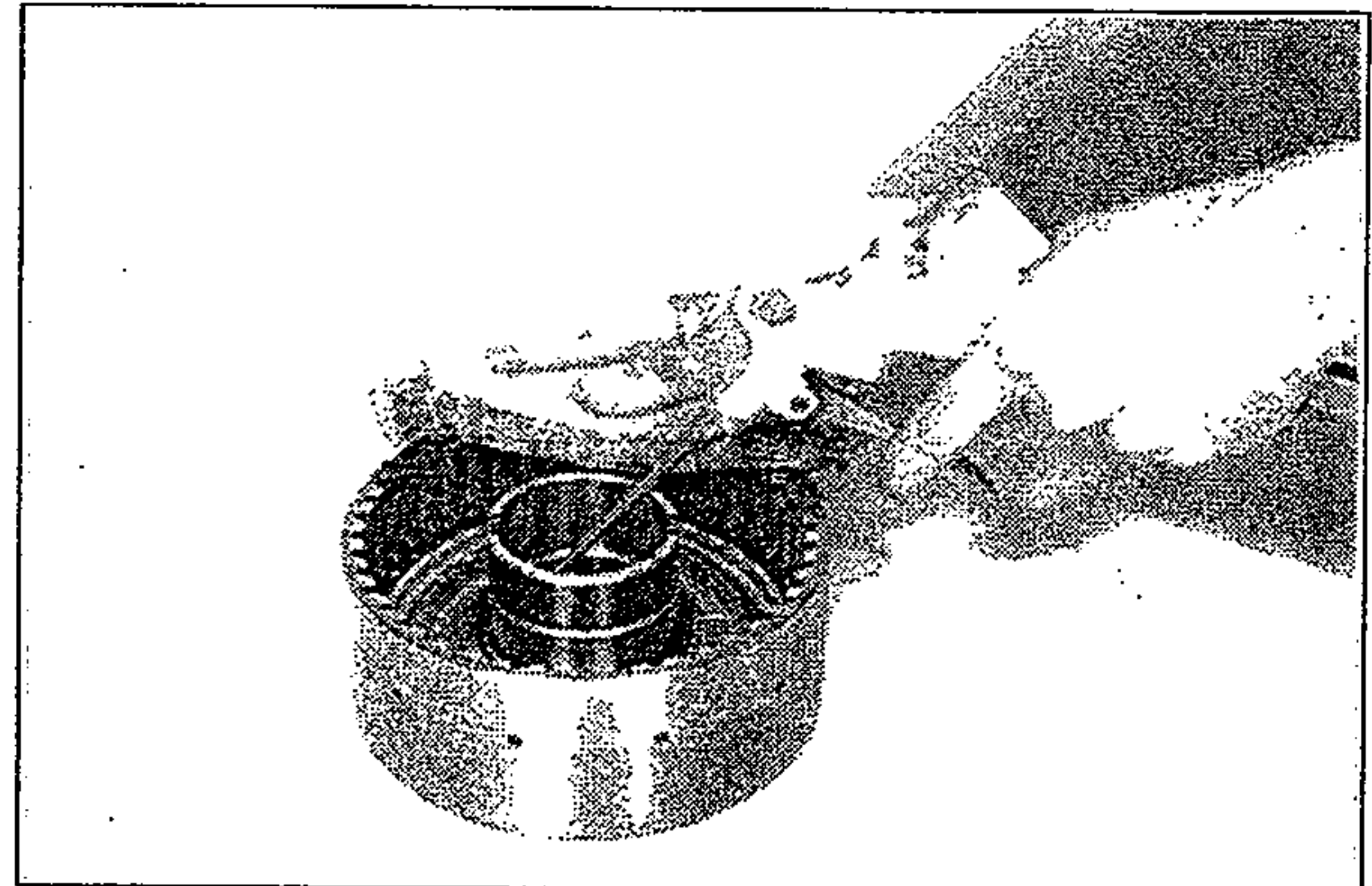
- ④ Squeeze snap ring out and remove plate pack.



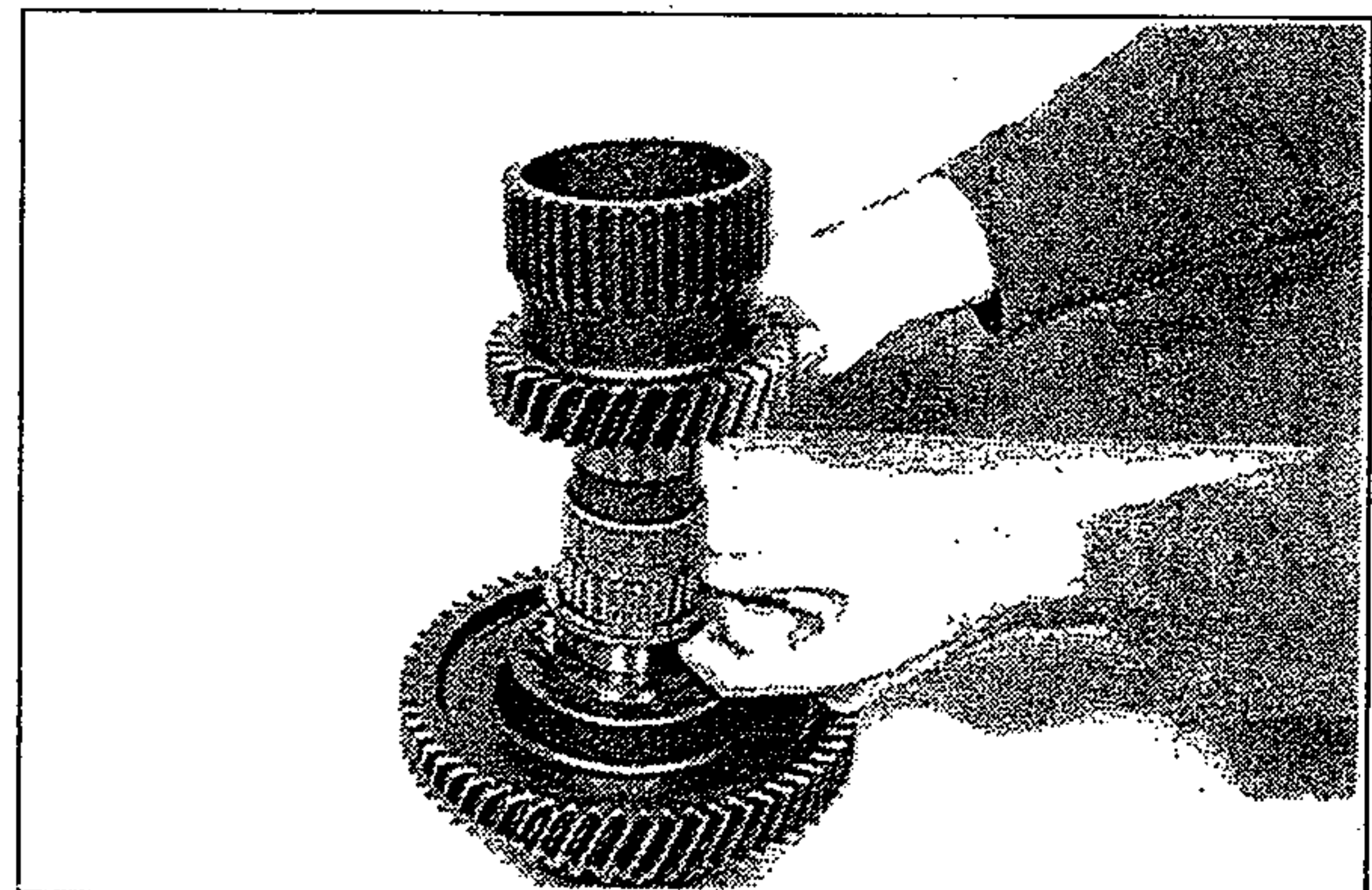
- ⑤ Preload cup-spring pack and squeeze snap ring out.
Remove released components.
Remove piston.
Assembly aid 5870 345 008



- ⑥ Lift piston by means of compressed air out of the cylinder bore and remove it.



- ⑦ Take off the idler gear and remove release components.
※ The separation of shaft and gear is not possible(Shrink fit).



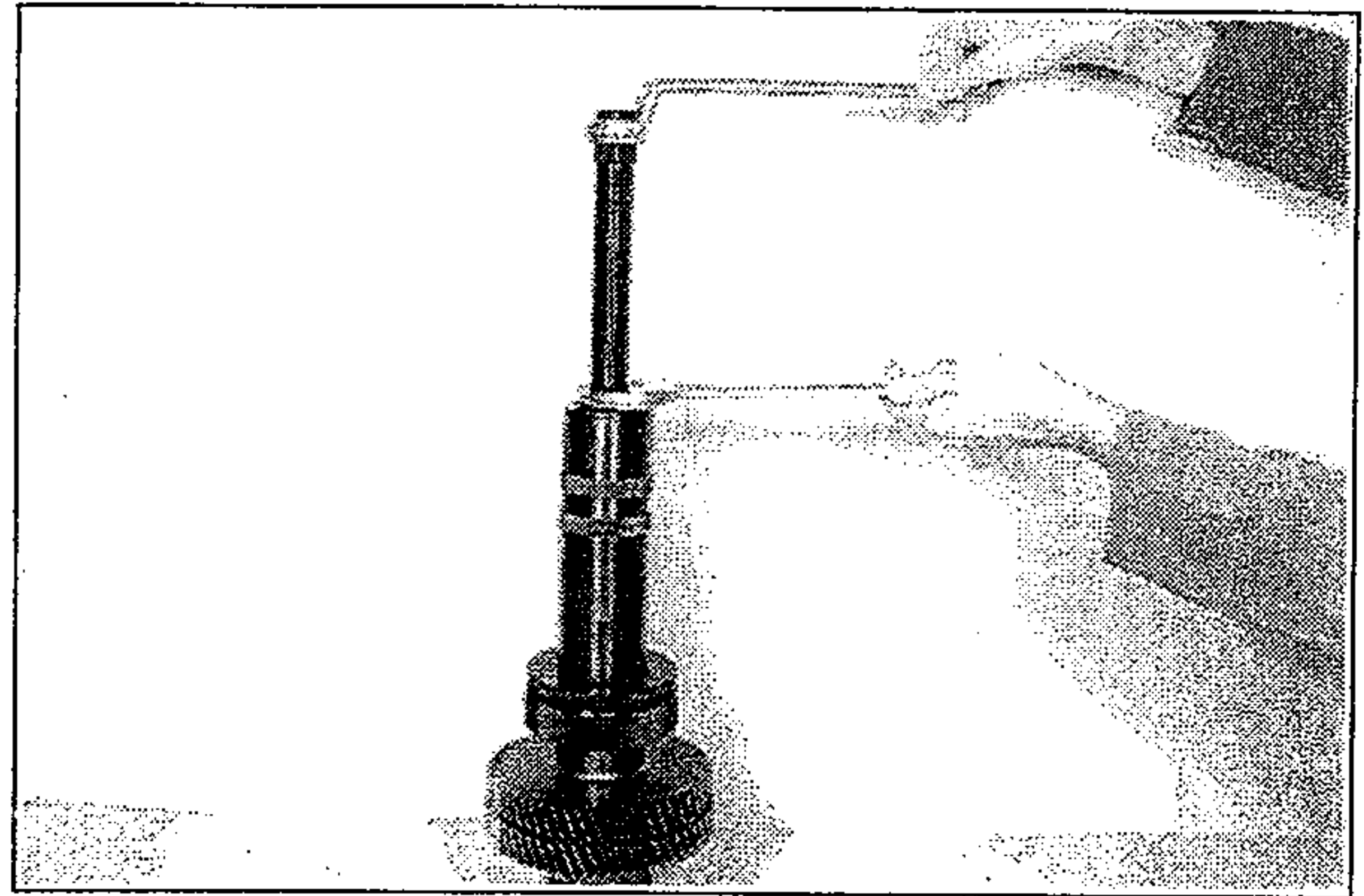
(9) Disassemble drive shaft

- ① Squeeze rectangular ring out.
Pull off tapered roller bearing.
Remove opposite tapered roller bearing accordingly.

Grab sleeve 5873 002 045

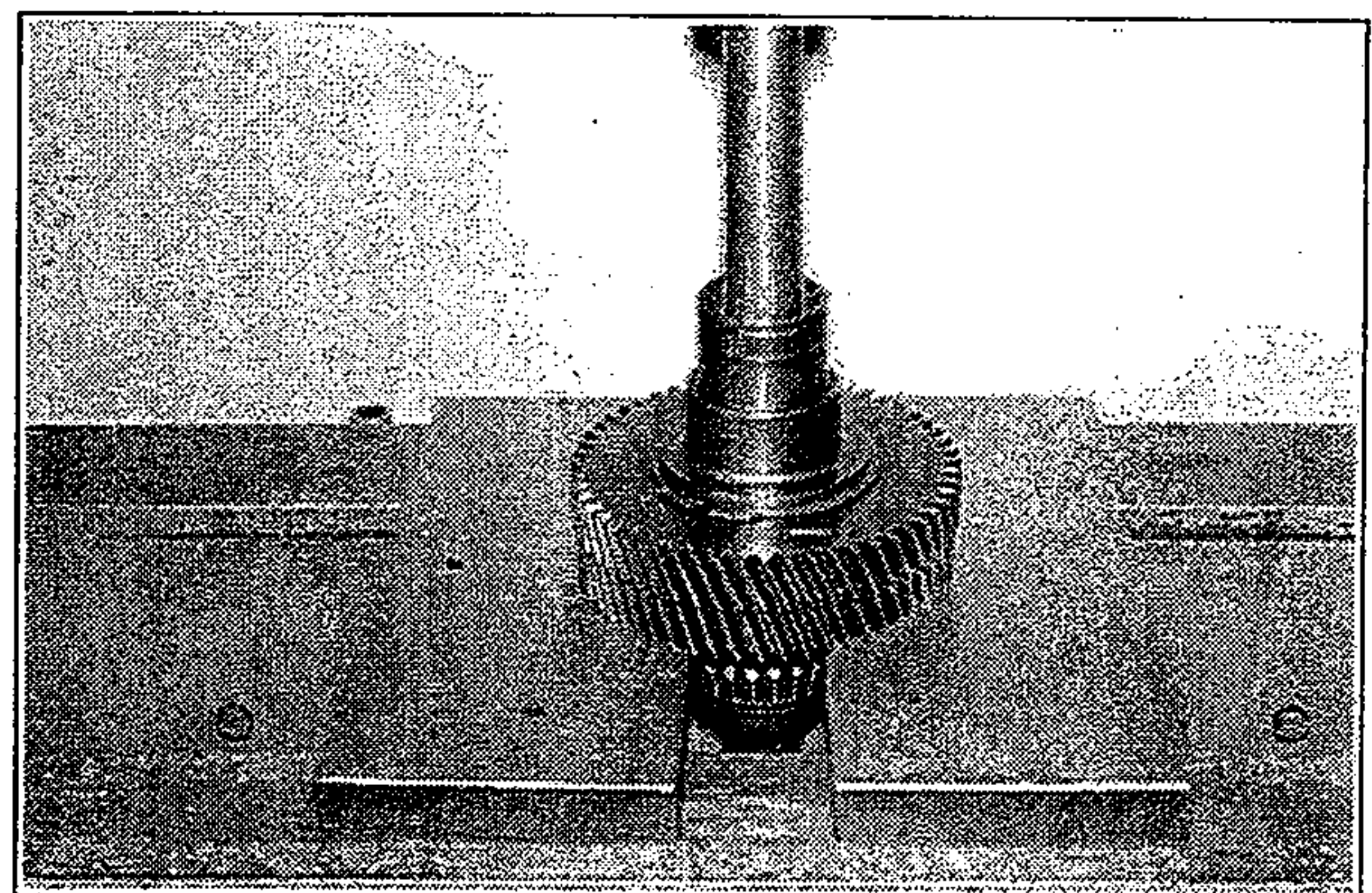
Basic set 5873 002 001

Basic set 5873 002 006



- ② If necessary, press turbine shaft out of the drive shaft.

※ The turbine shaft is axially fixed with a snap ring which will be destroyed at the pressing out.



2) REASSEMBLY

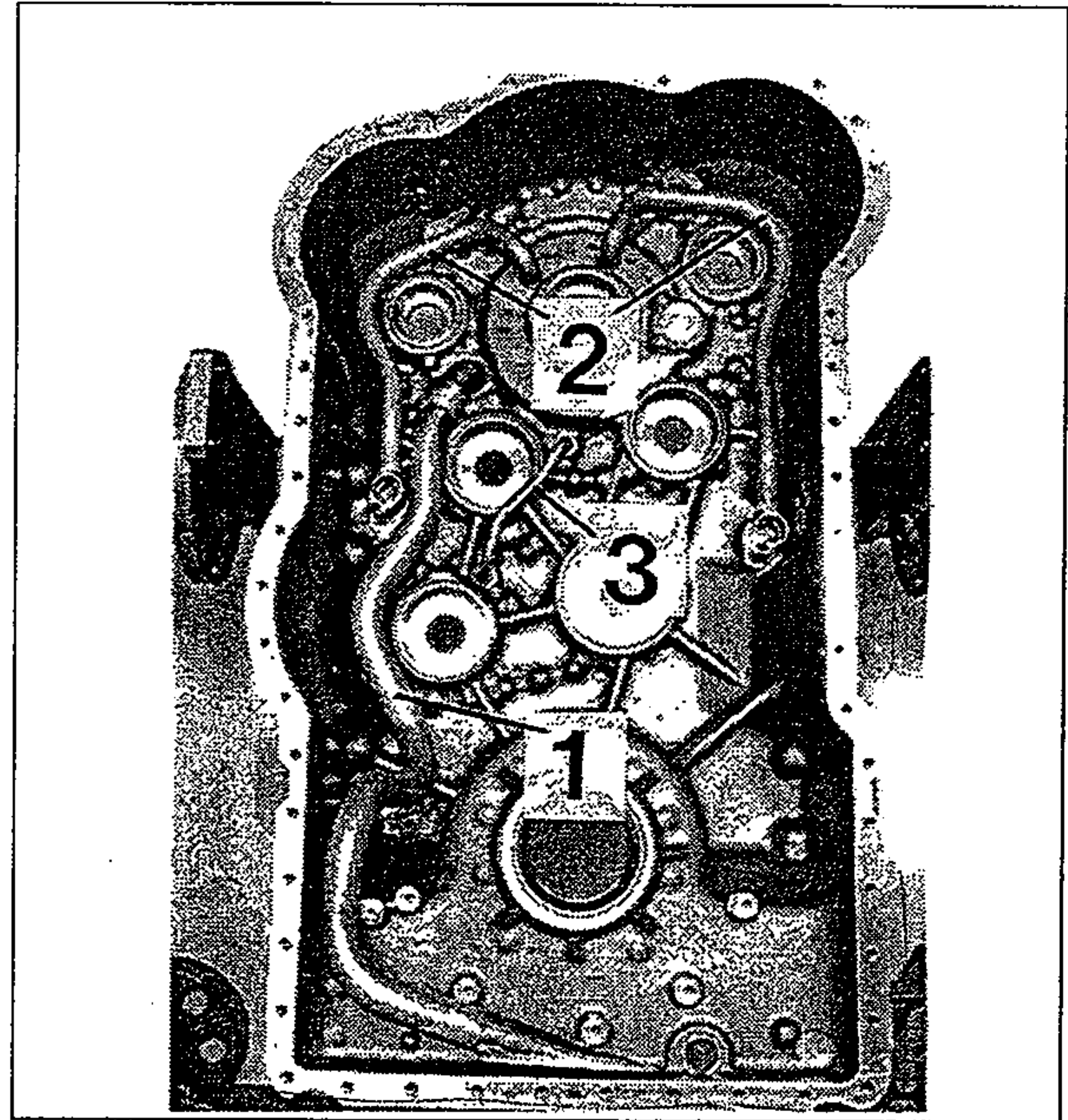
(1) Install oil tubes

※ To ensure the correct installation of the oil tubes, the use of the indicated special tool is imperative.

- ① Insert suction pipe(1), pressure pipes(2) and pressure pipelubrication(3) into the housing bores.

Fasten suction and pressure pipes by means of socket head screws.

• Torque limit : 2.3kgf · m(17.0lbf · ft)



- ② Tilt housing 180°.

Roll suction as well as pressure pipes(Arrows) into the housing bores, using special tool.

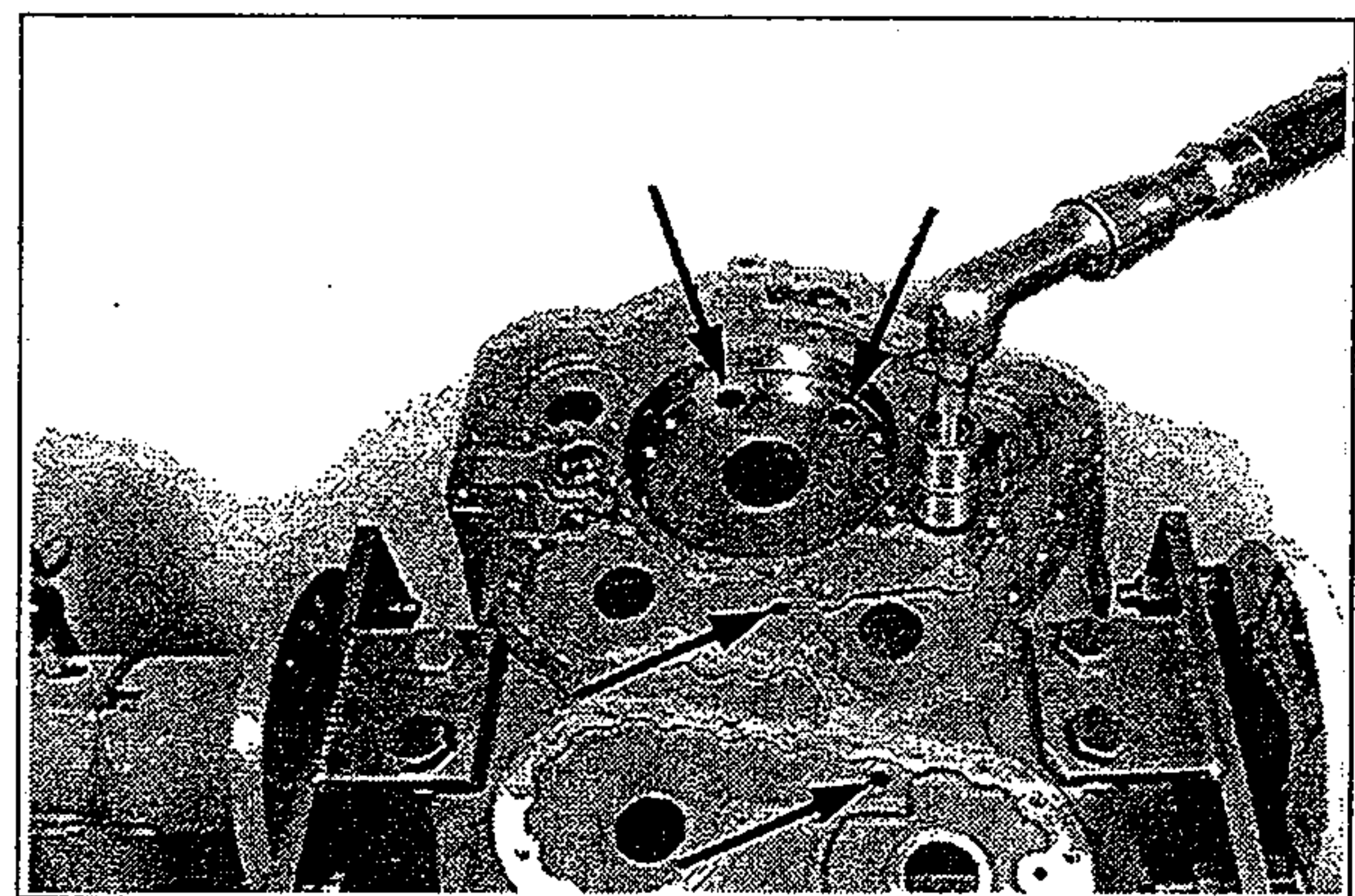
The pipe end must be maximally plane with the housing face.

If necessary, equalize projection of pipe.

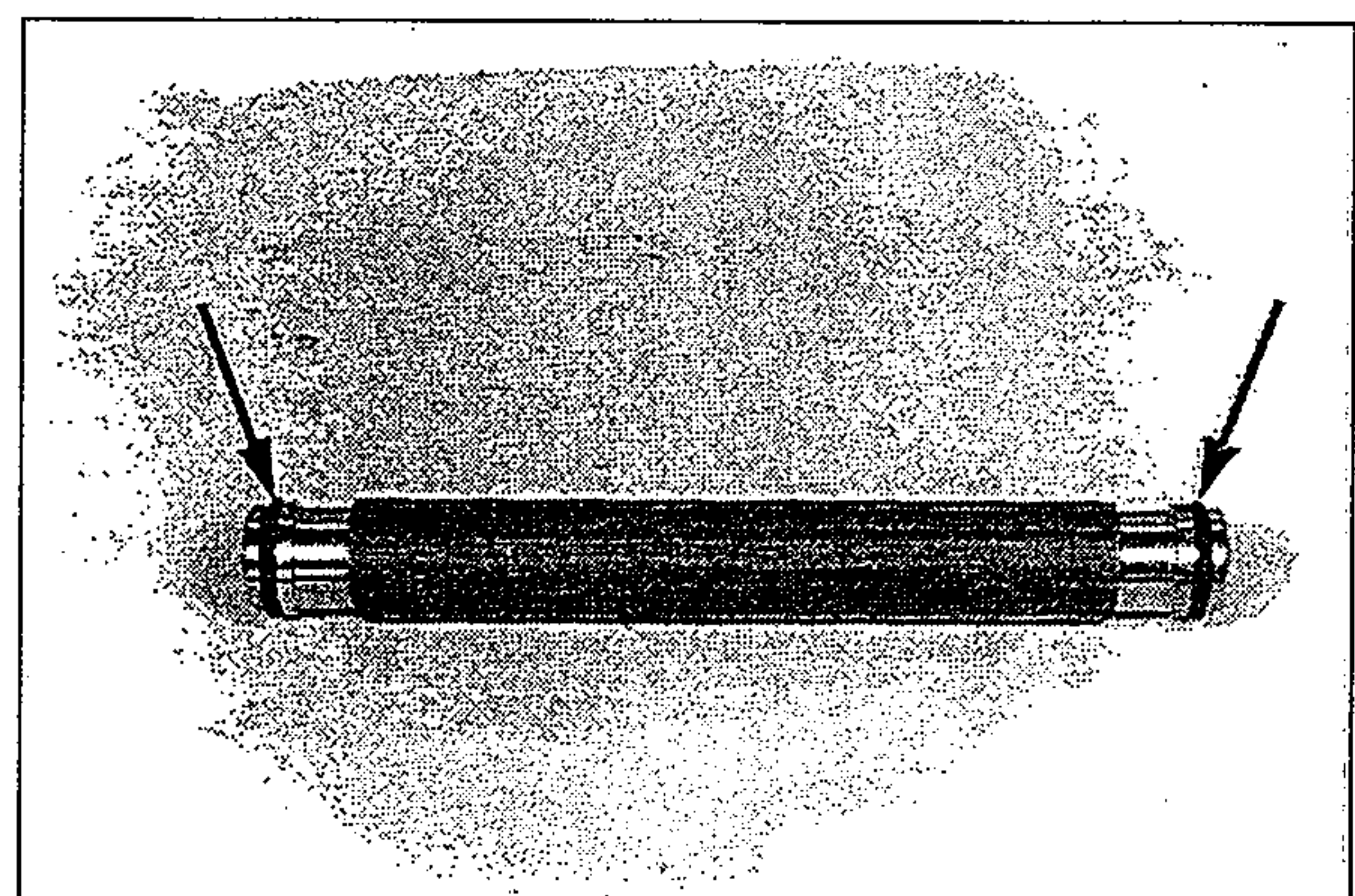
Rolling tool 5870 600 003

Rolling tool 5870 600 005

Rolling tool 5870 600 007



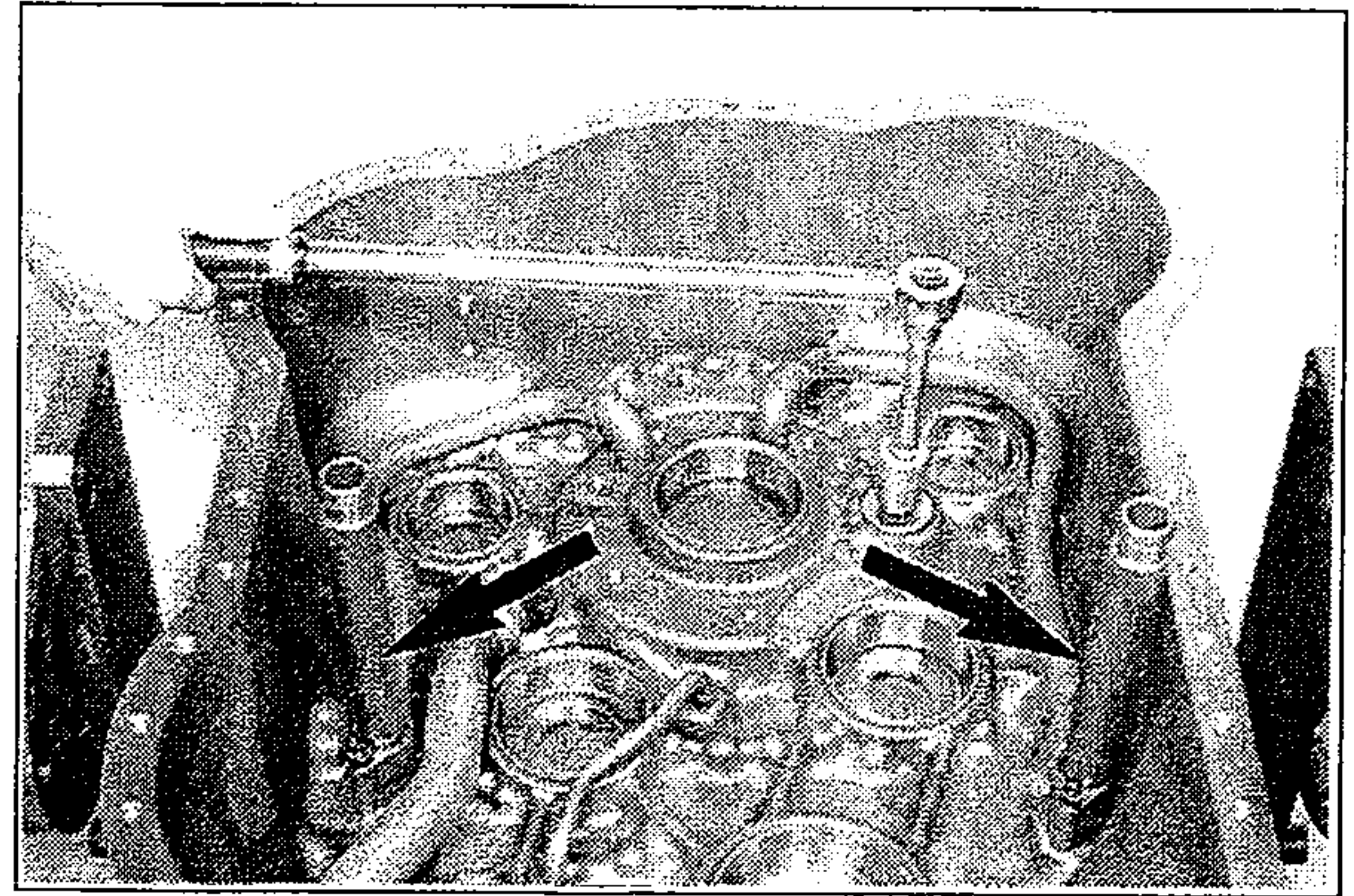
- ③ Insert O-rings(2EA/pipe) into the annular grooves of the two oil tubes and oil them.



- ④ Assemble both oil tubes(Arrows) until contact is obtained.

Equip screw plug with new O-ring and install it.

- Torque limit : 14.3kgf · m(103lbf · ft)



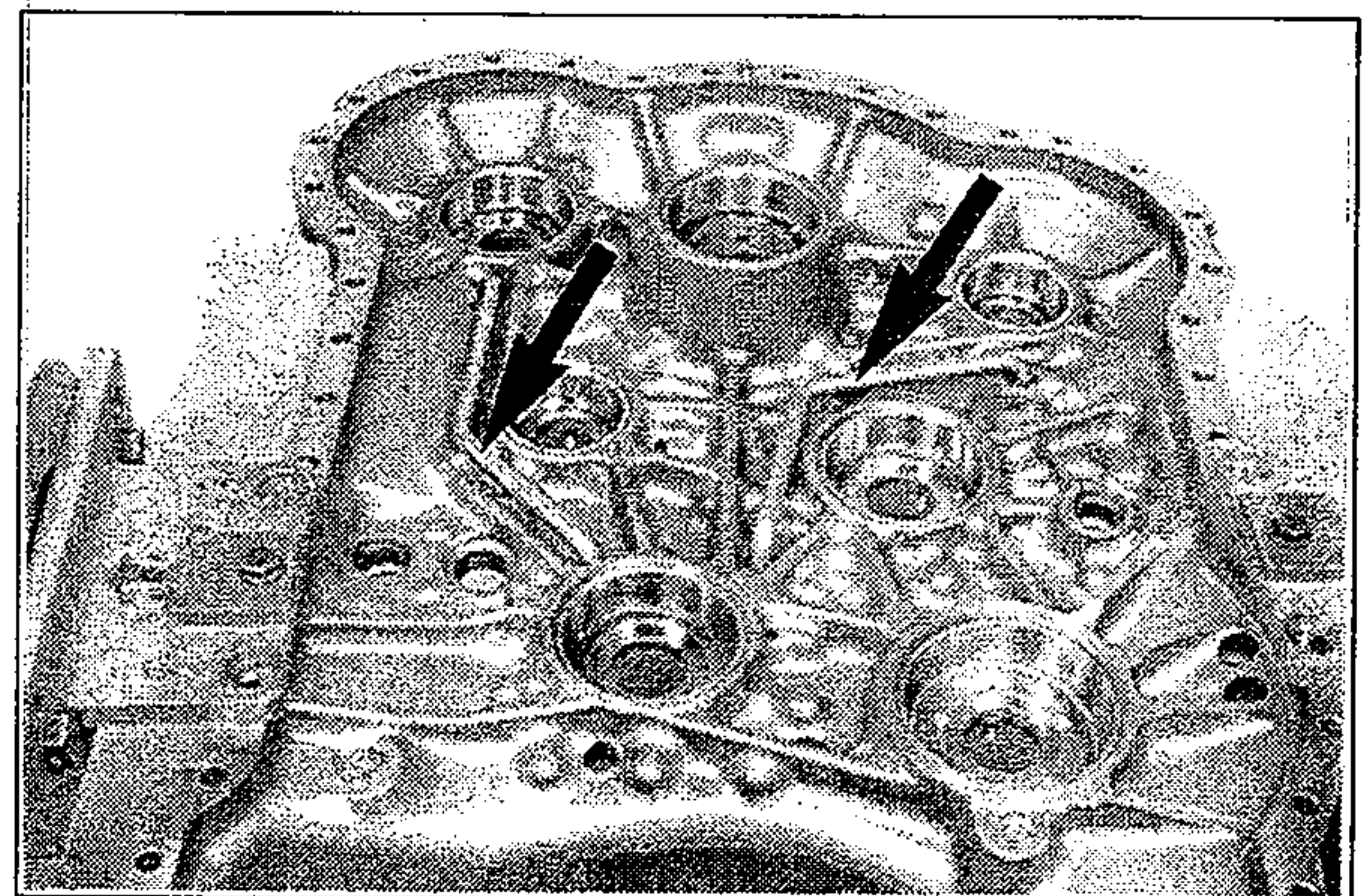
- ⑤ Insert both oil tubes(Arrows) into the housing cover, tilt housing cover 180° and roll oil tubes into the housing bores.

- ※ The tube end must be maximally plane with the housing face.

If necessary, equalize projection of the tube.

Rolling tool

5870 600 008



- ⑥ Mount studs(M8 × 25).

- Torque limit : 0.92kgf · m(6.64lbf · ft)

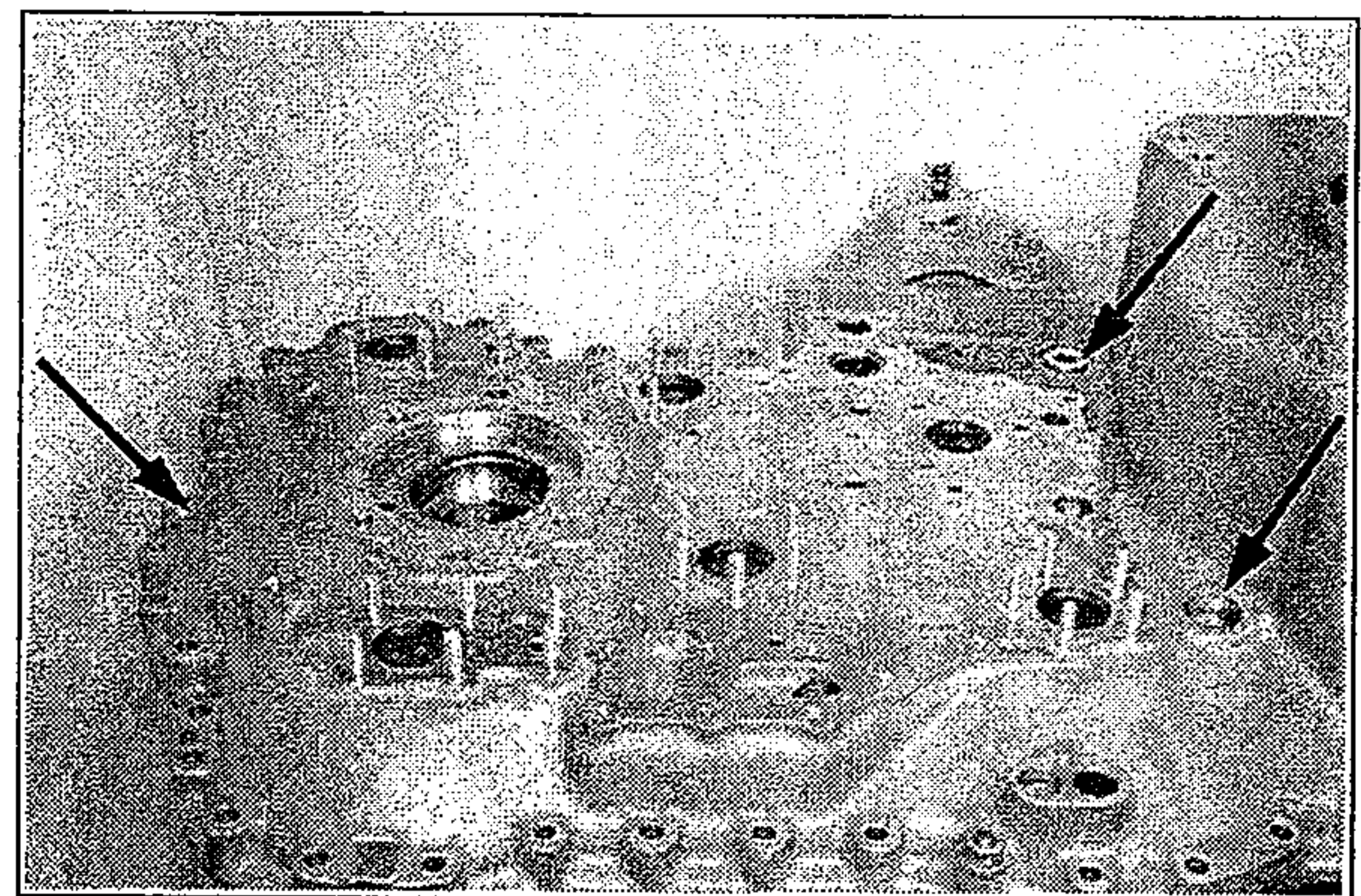
Wet screw in thread with loctite(Type No. 262).

Equip plugs(Arrows) with new O-rings and install them

- Torque limit(M16 × 1.5) : 4.1kgf · m
(29.5lbf · ft)

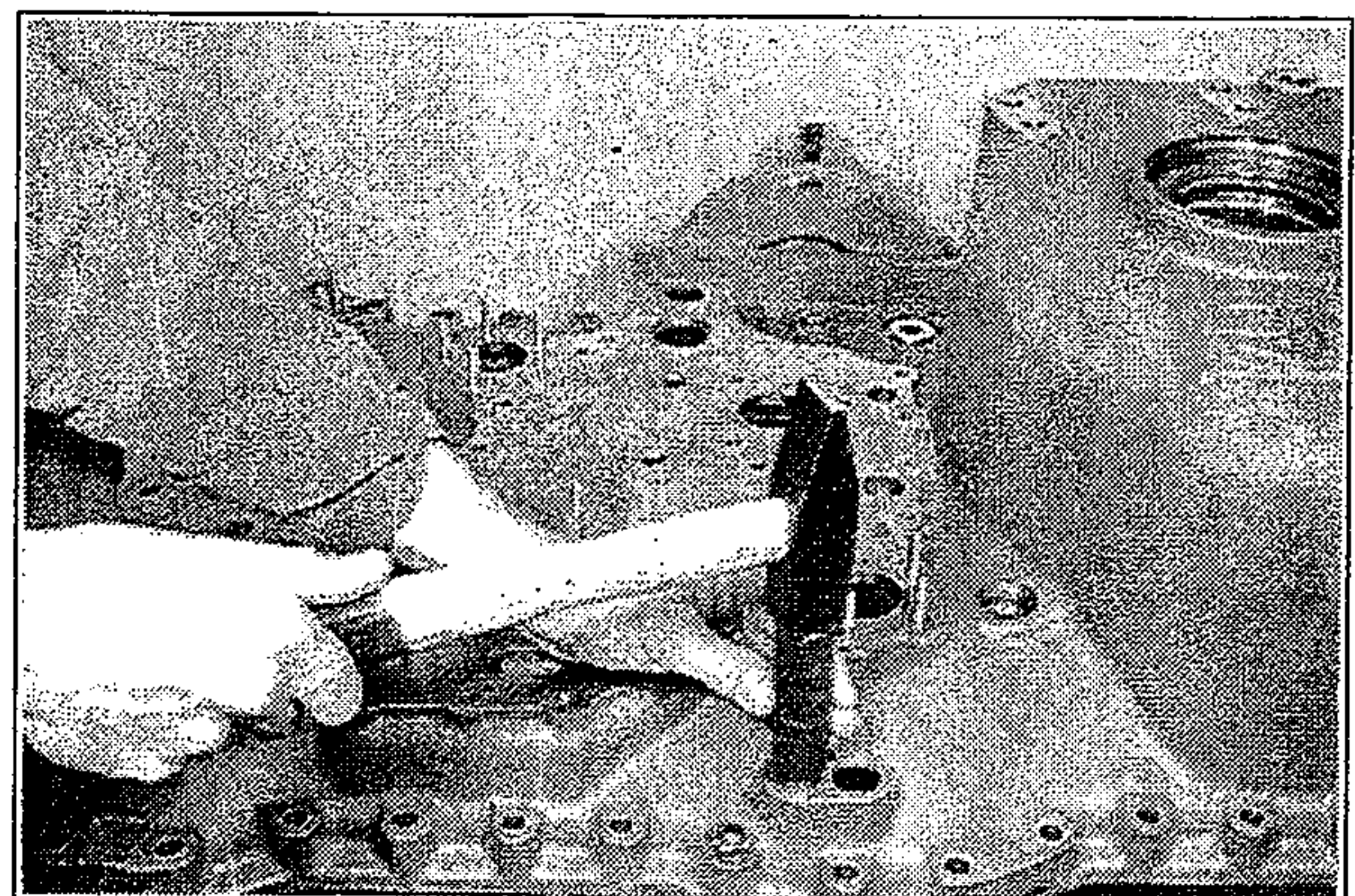
- Torque limit(M18 × 1.5) : 5.1kgf · m
(36.9lbf · ft)

- Torque limit(M26 × 1.5) : 8.2kgf · m
(59.0lbf · ft)



- ⑦ Insert sealing cover, with the recess showing upward.

- ※ Wet contact face with loctite(Type No. 262).

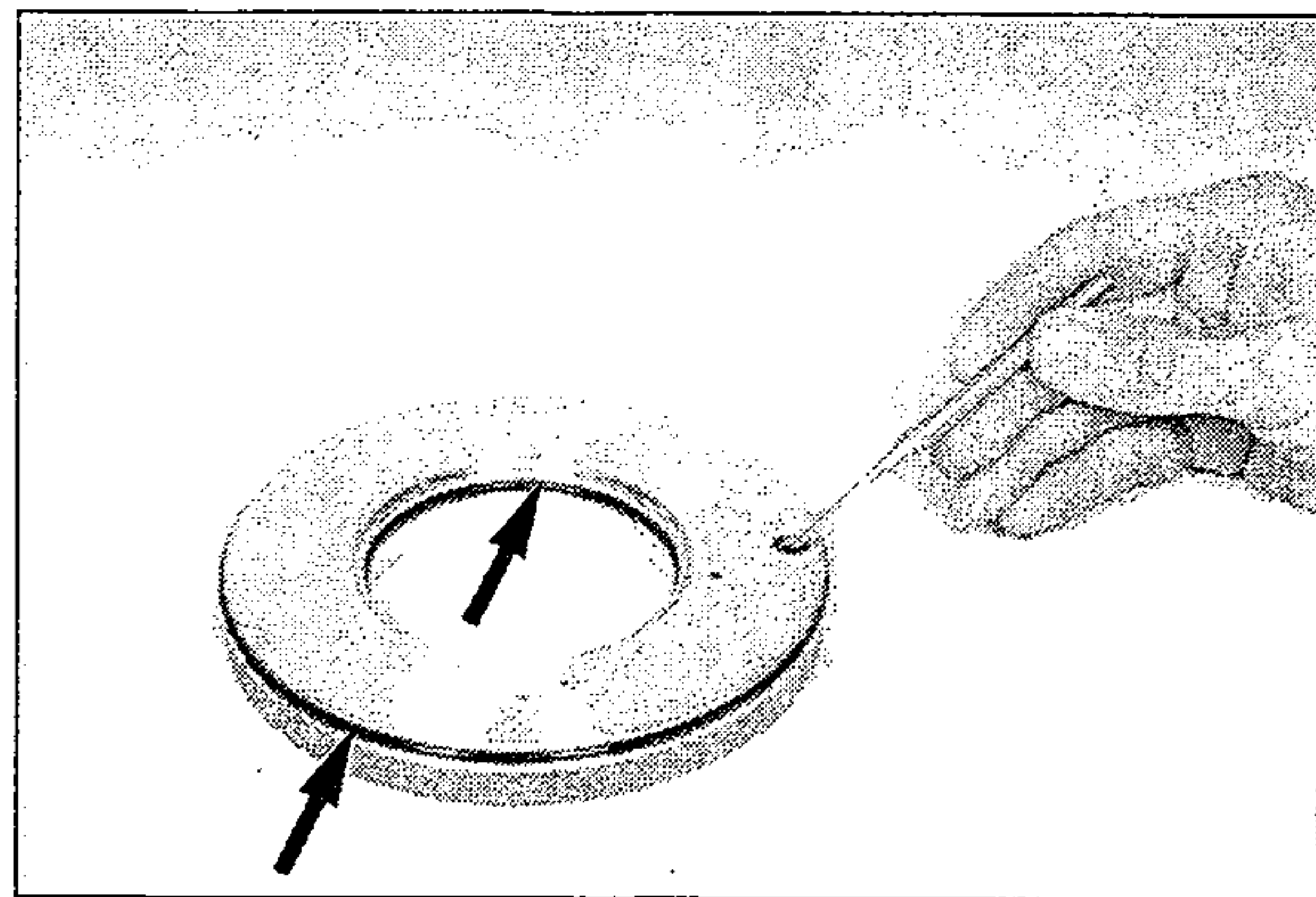


(2) Reassemble clutch KV and KR

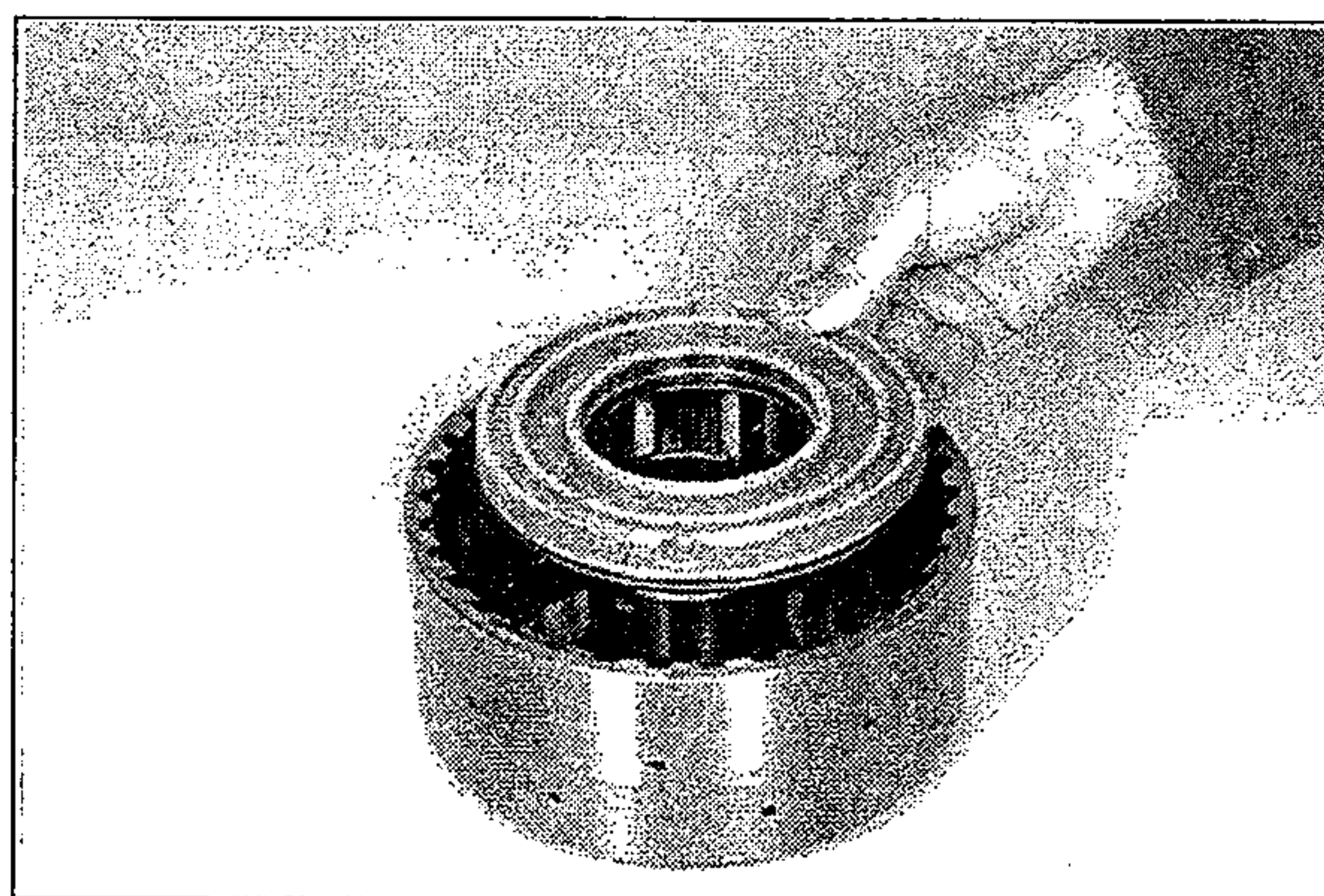
- ※ The following figure show the reassembly of the clutch KV. The reassembly of the clutch KR has to be carried out accordingly.

Preassemble plate carrier

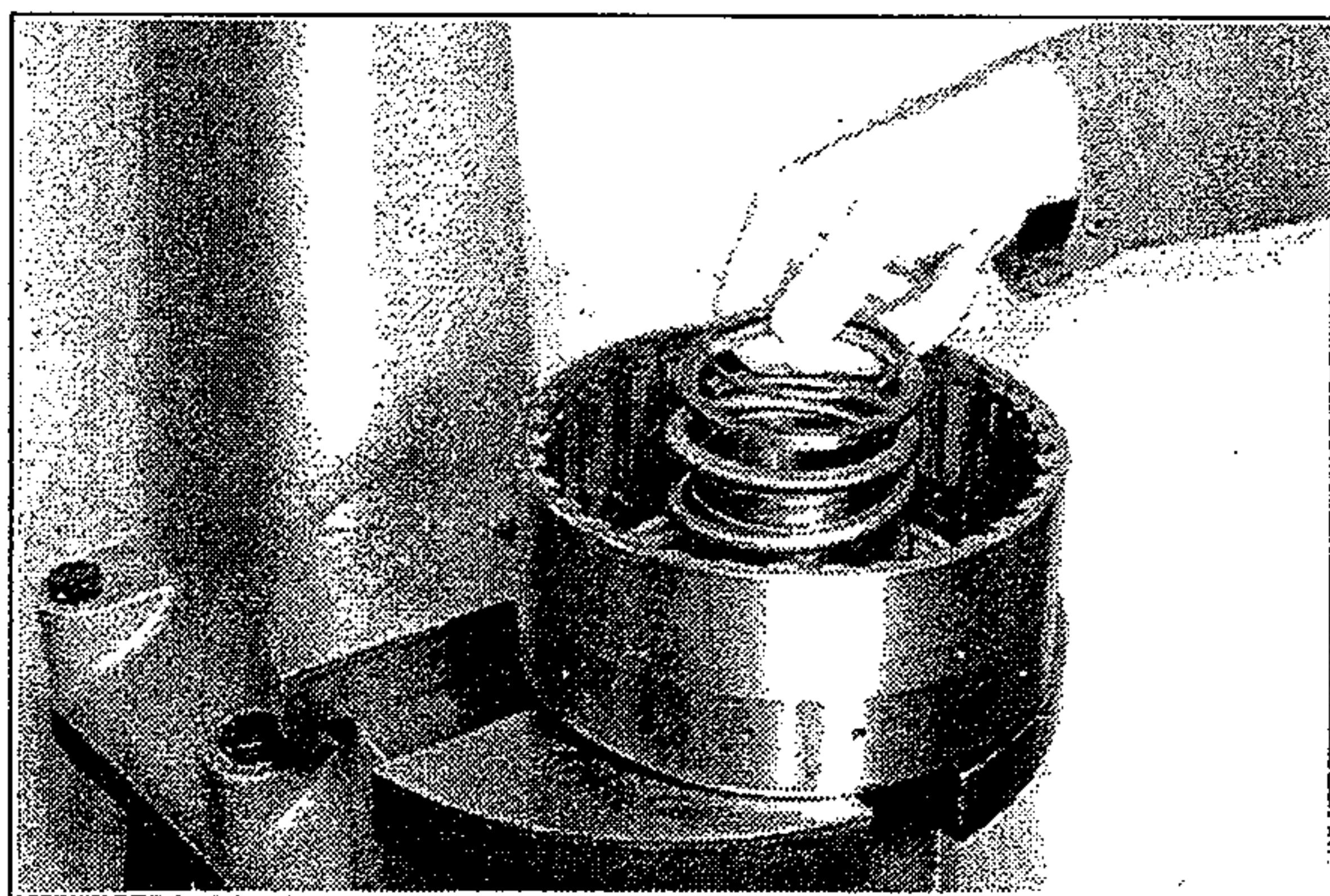
- ① Check function of the purge valve.
 - ※ Ball must not stick, if necessary, clean with compressed air.



- ② Insert both O-ring(Arrows) scrollfree into the grooves of the piston and oil. Introduce piston until contact is obtained.
 - ※ Pay attention to the installation position, see figure.



- ③ Install disk, compression spring and guide ring.



- ④ Preload compression spring and fix it by means of snap ring.

Assembly aid

5870 345 088

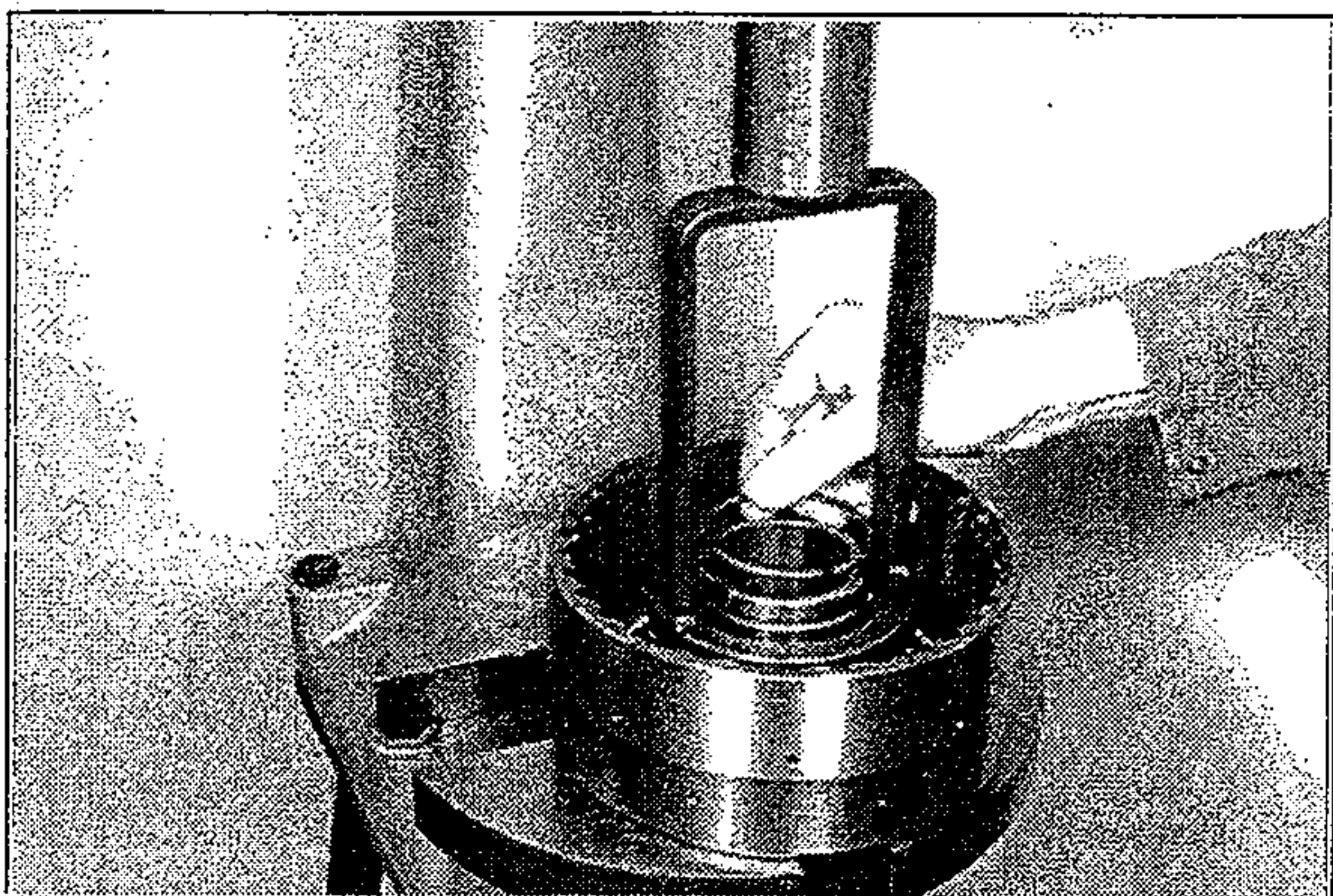


Plate pack KV, KR

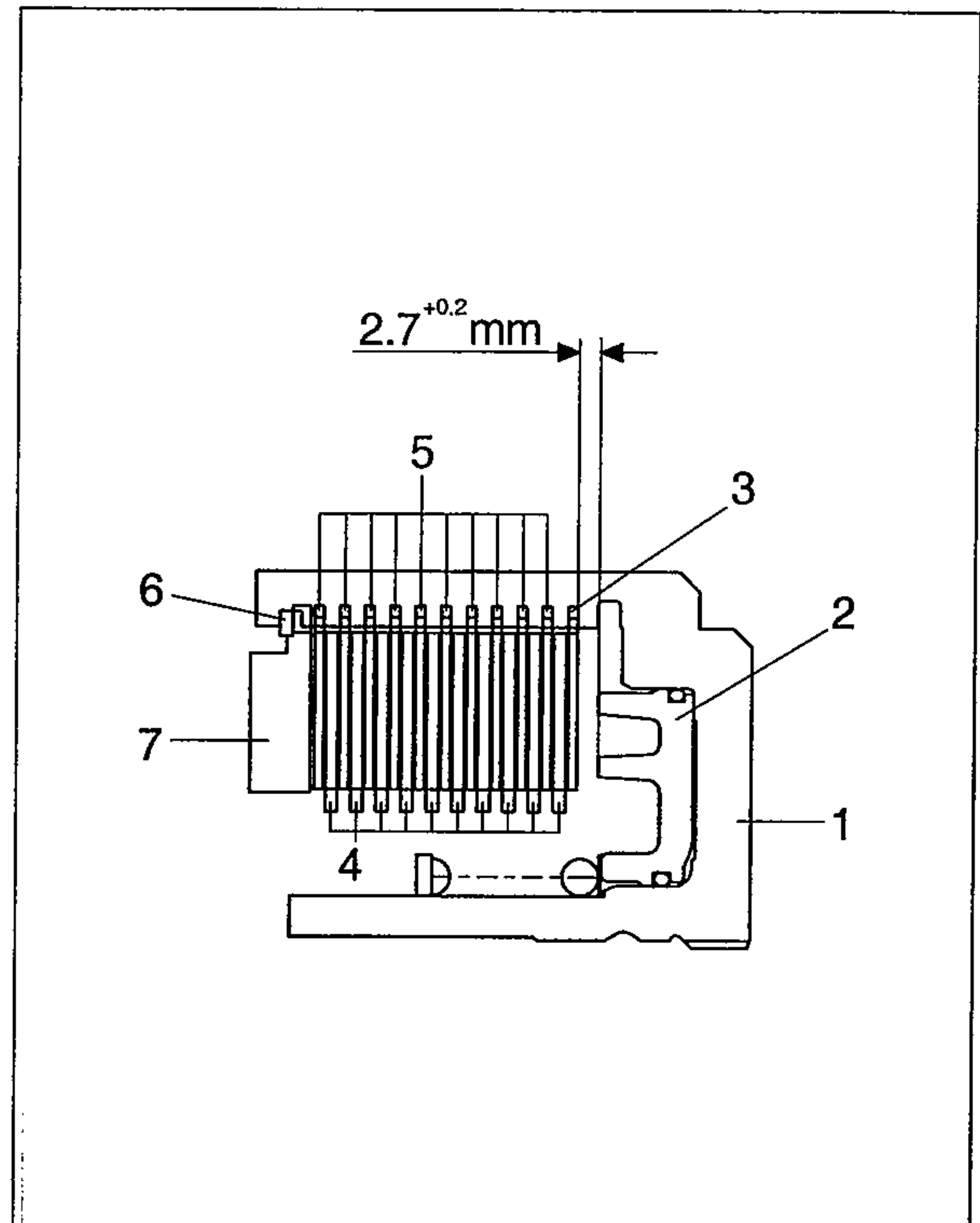
※ The plate arrangement respectively stacking of clutch KV and KR is identical.

⑤ The following draft shows the installation position of the components.

- 1 Plate carrier
- 2 Piston
- 3 Outer plate-one sided coated(1 piece)
- 4 Inner plates(10 pieces)
- 5 Outer plates-coated on both sides (10 pieces)
- 6 Snap ring(Optional s= 2.1~4.2mm)
- 7 End shim

Effective number of friction surfaces = 20

※ Install outer plate 3 with the uncoated side facing the piston.

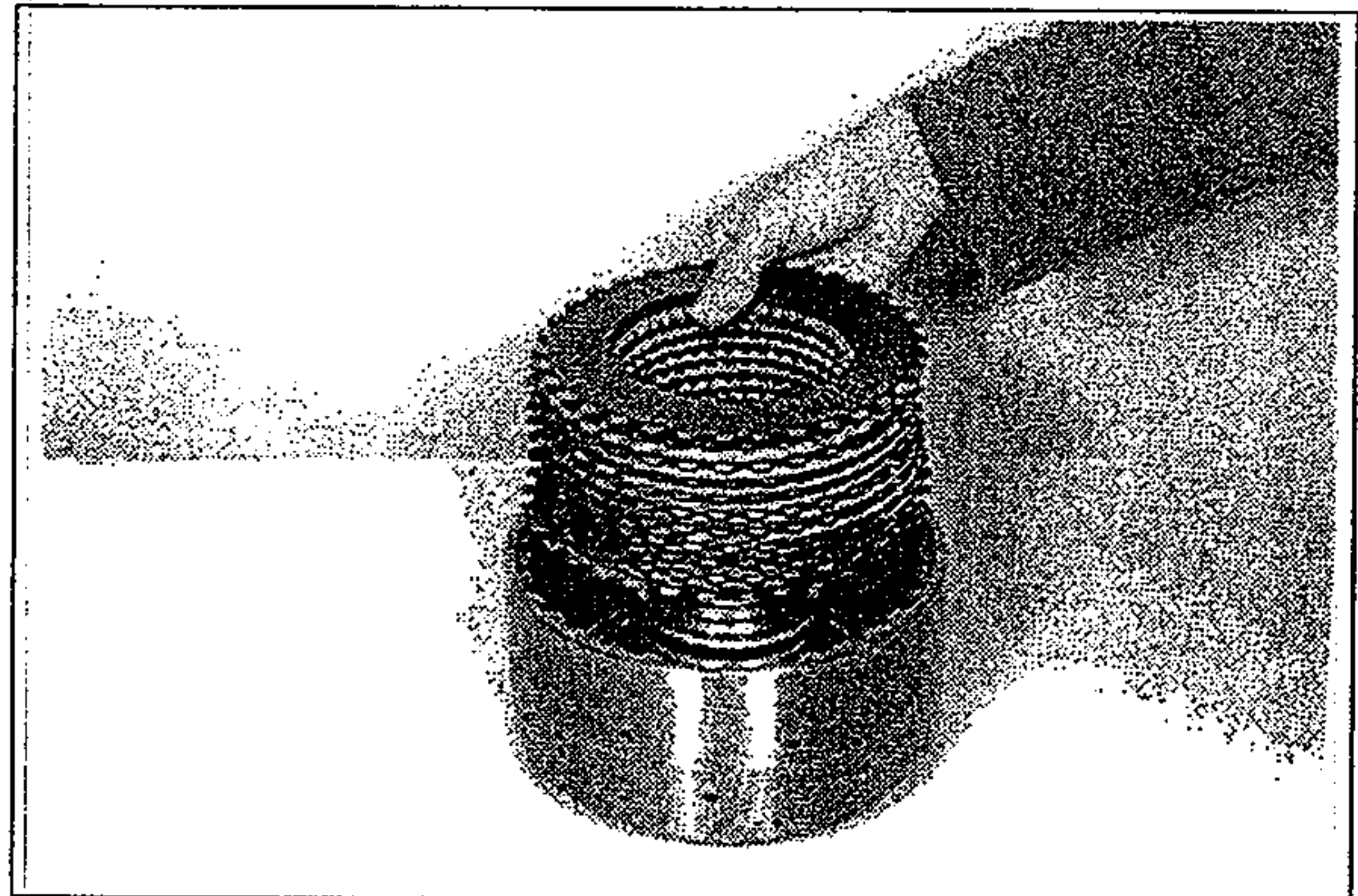


Adjust plate clearance : $2.7+0.2$ mm

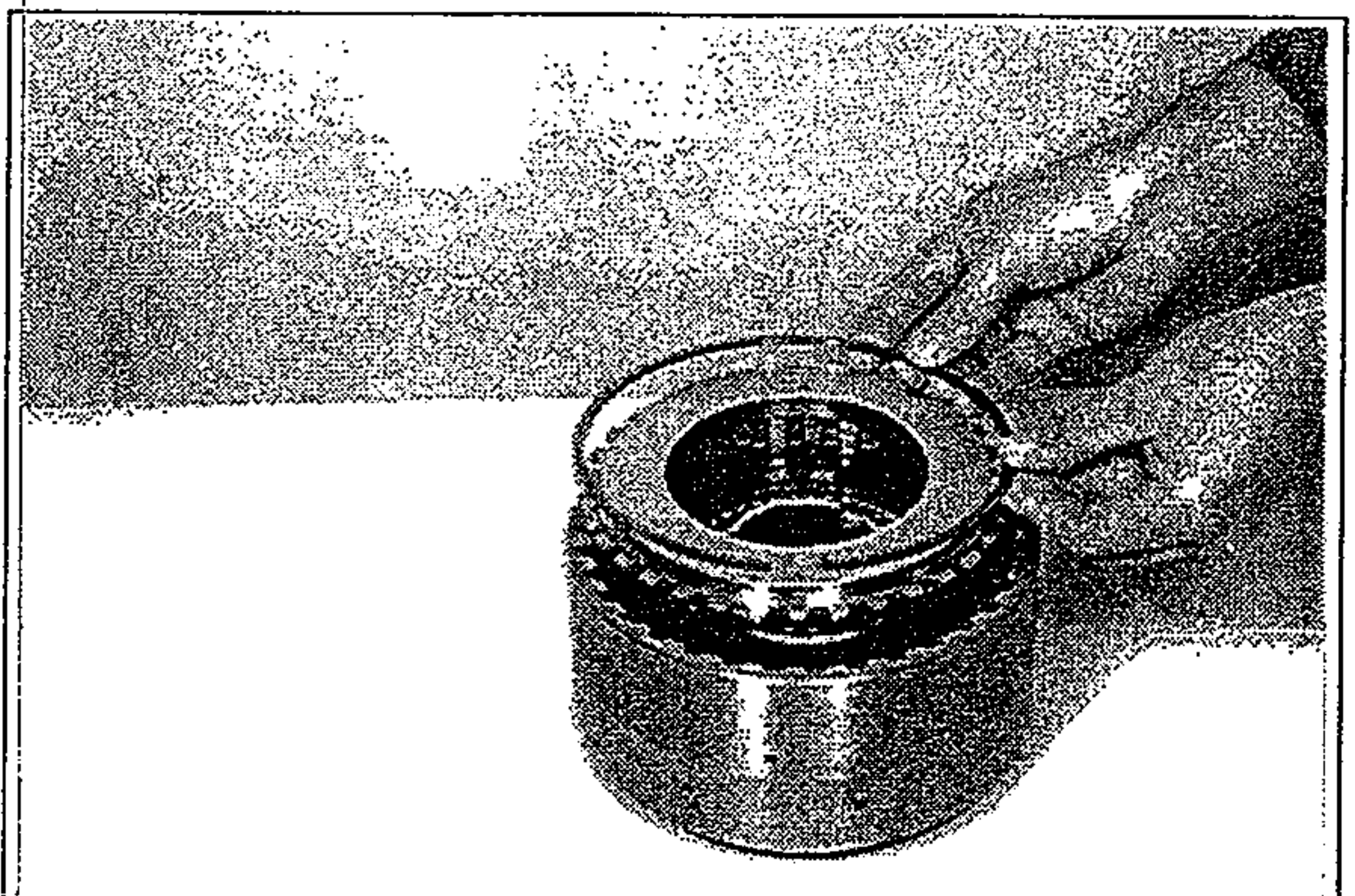
※ For the adjustment of the plate clearance are snap rings of different thickness available.

To ensure a faultless measuring result, install plates for the moment without oil.

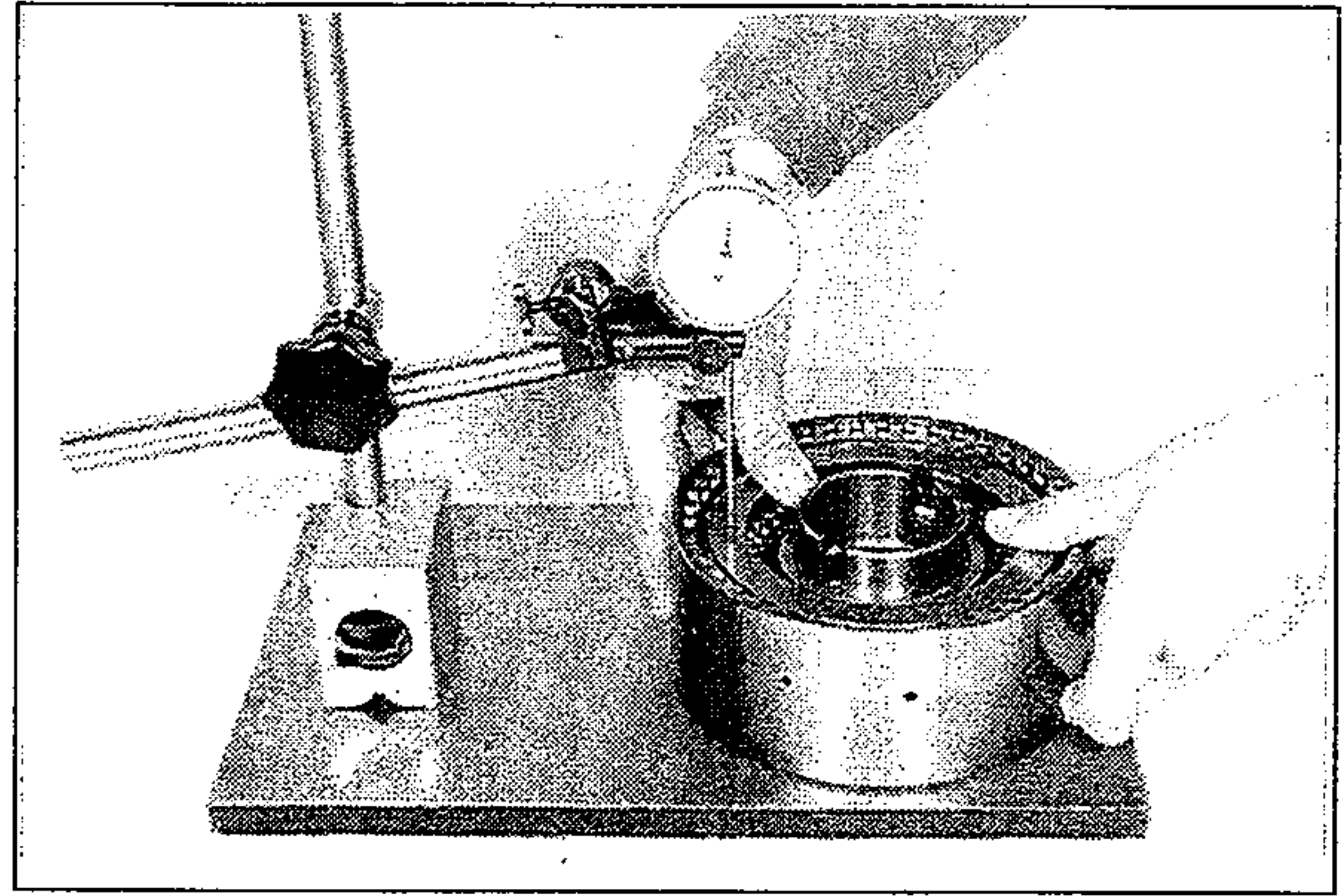
⑥ Introduce plate pack according to the upper draft.



⑦ Lay on the end shim and squeeze the snap ring in(e.g. s=2.55mm)



- ⑧ Press on end shim with about 100N (10kg), apply dial indicator and set it at zero.



- ⑨ Now, push the end shim by means of screw driver against snap ring until contact is obtained(Upward) and read plate clearance on the dial indicator.

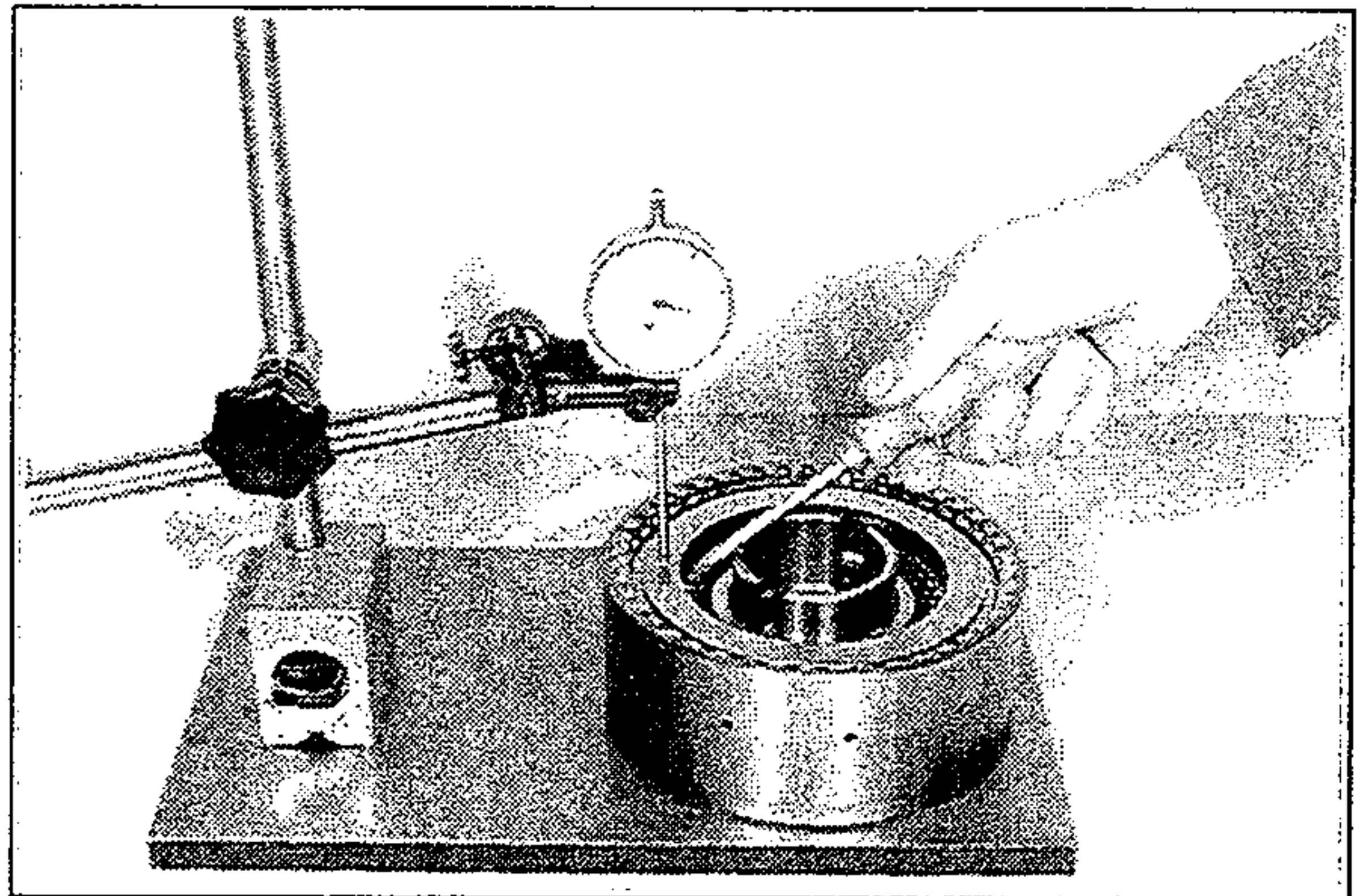
※ In case of a deviation from the required plate clearance, correct with corresponding snap ring(s=2.1~4.2mm).

After the adjustment of the plate clearance has been carried out, remove the plate pack, oil plates and install it again.

※ Use oil Dexron- II D, II /Mercon-M.

Magnetic stand 5870 200 055

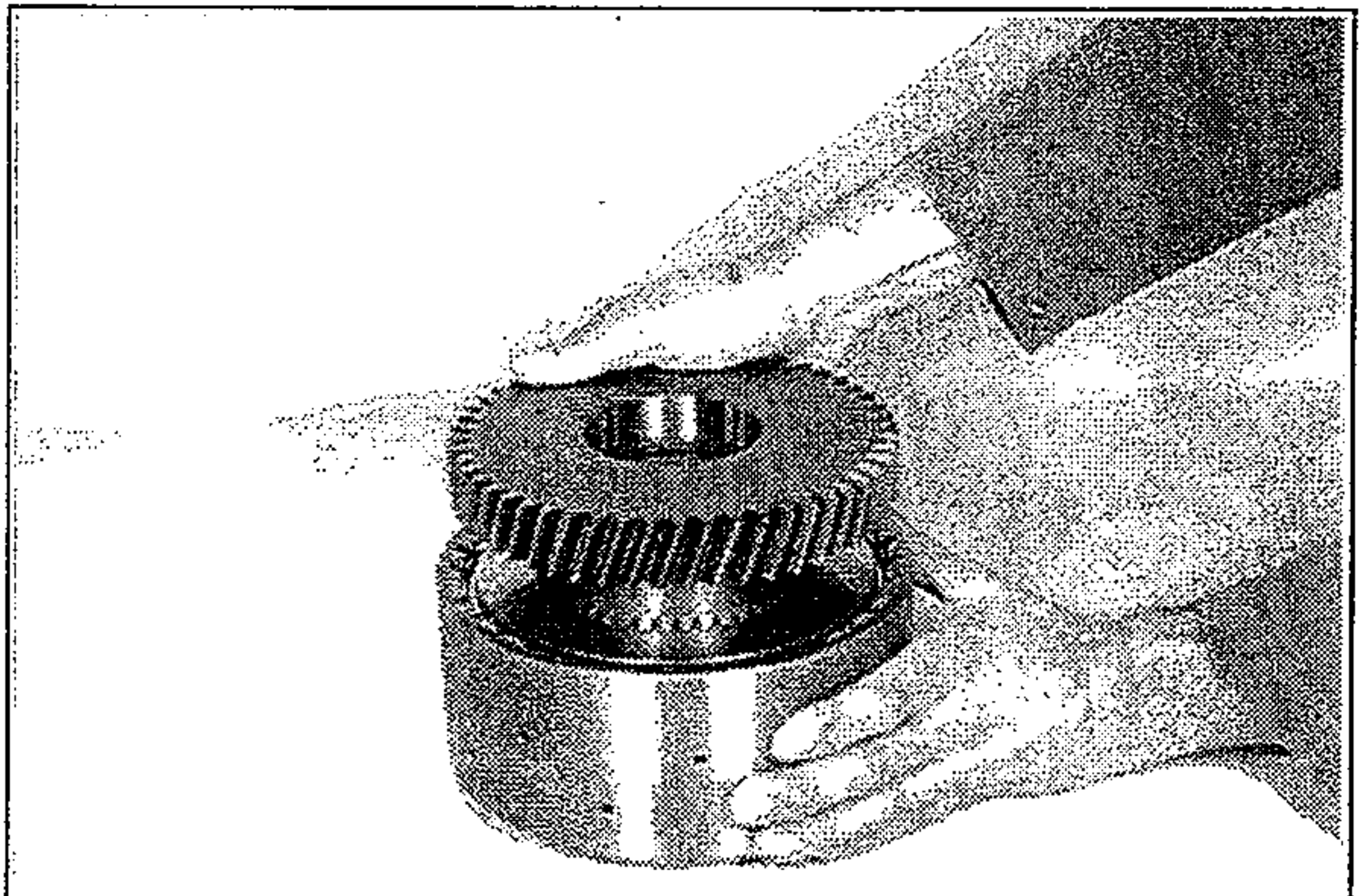
Dial indicator 5870 200 057



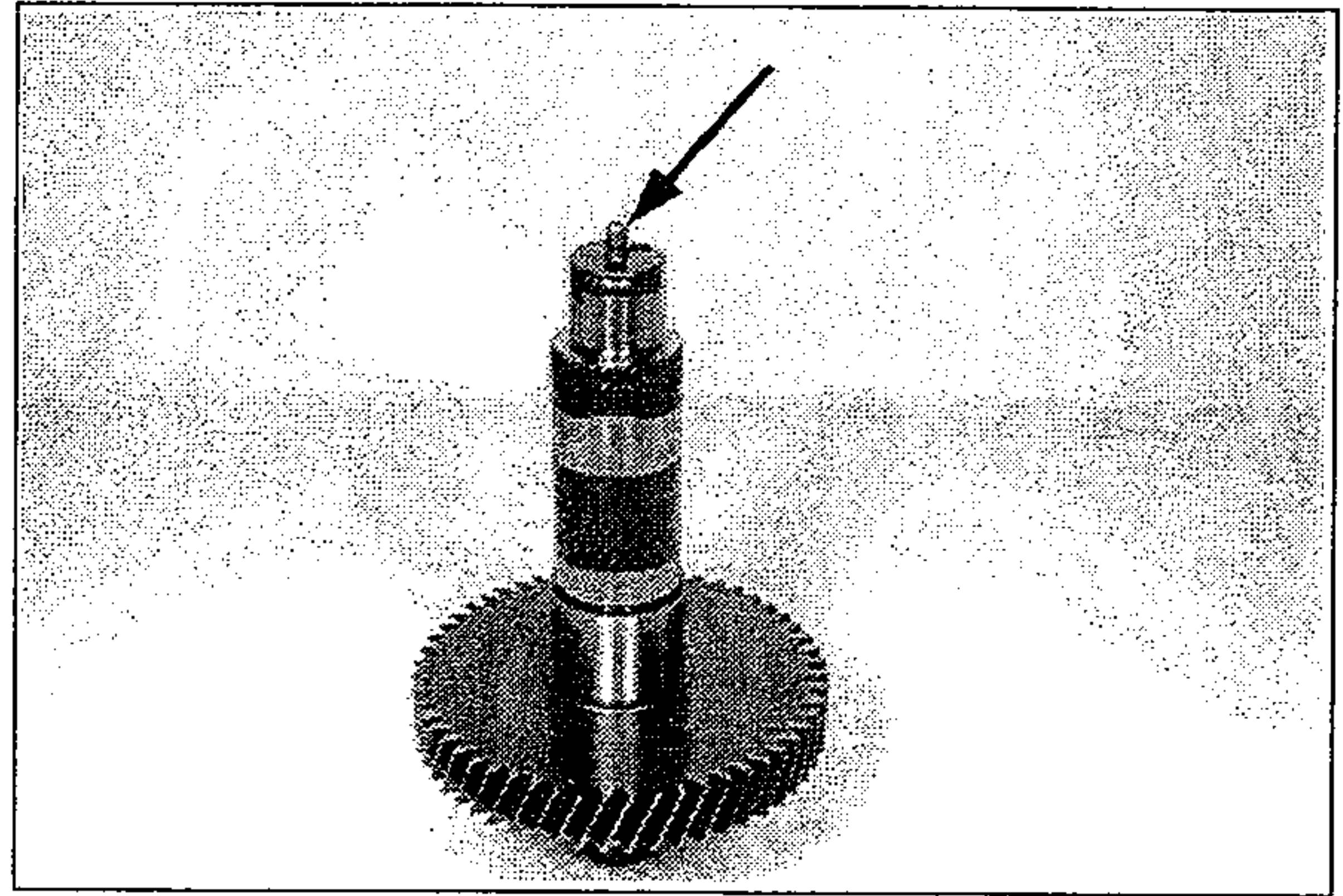
- ⑩ Introduce idler gear until all inner plates are accommodated.

※ This step makes the later assembly of the idler gear easier.

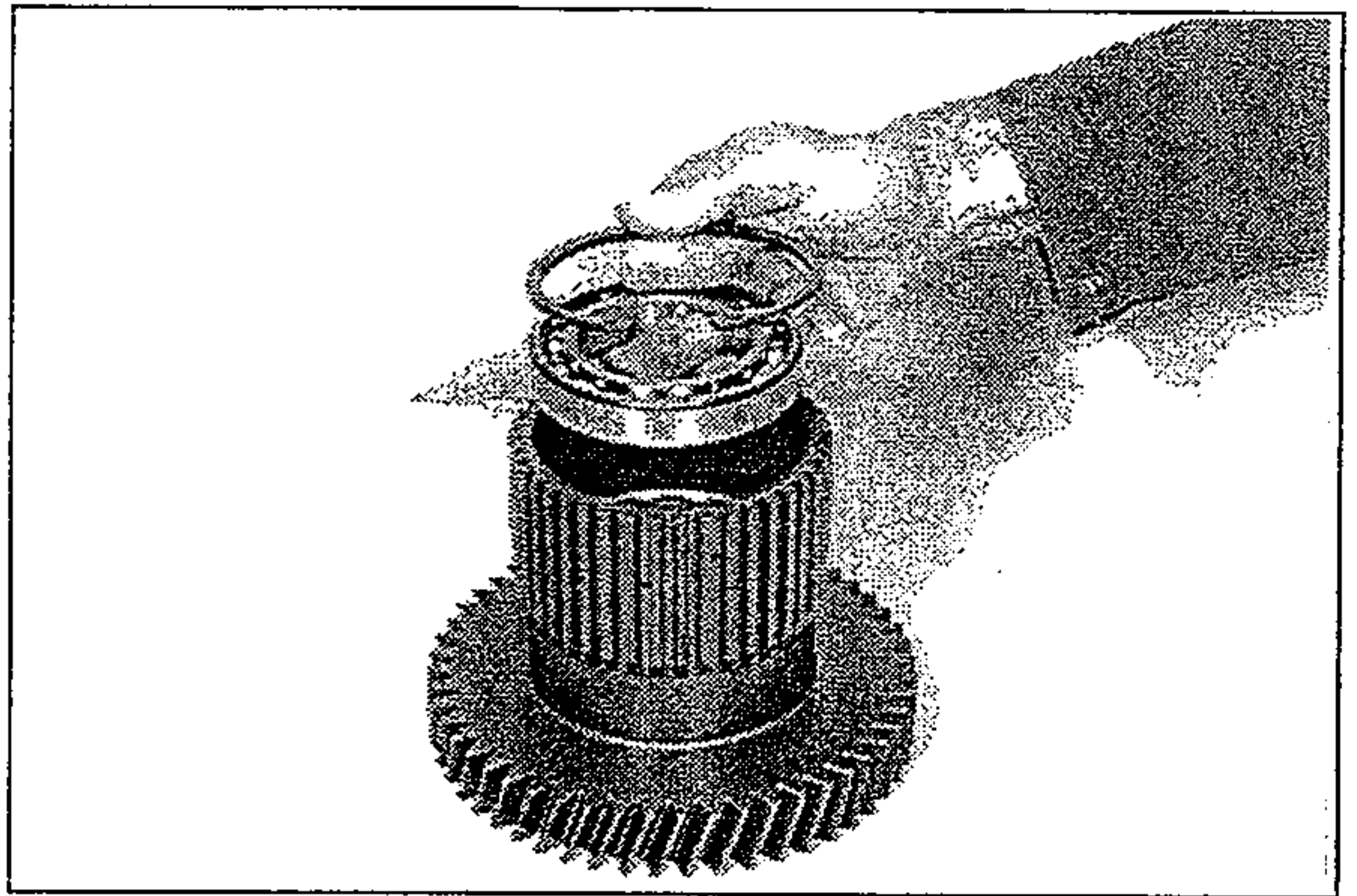
Now, remove the idler gear again.



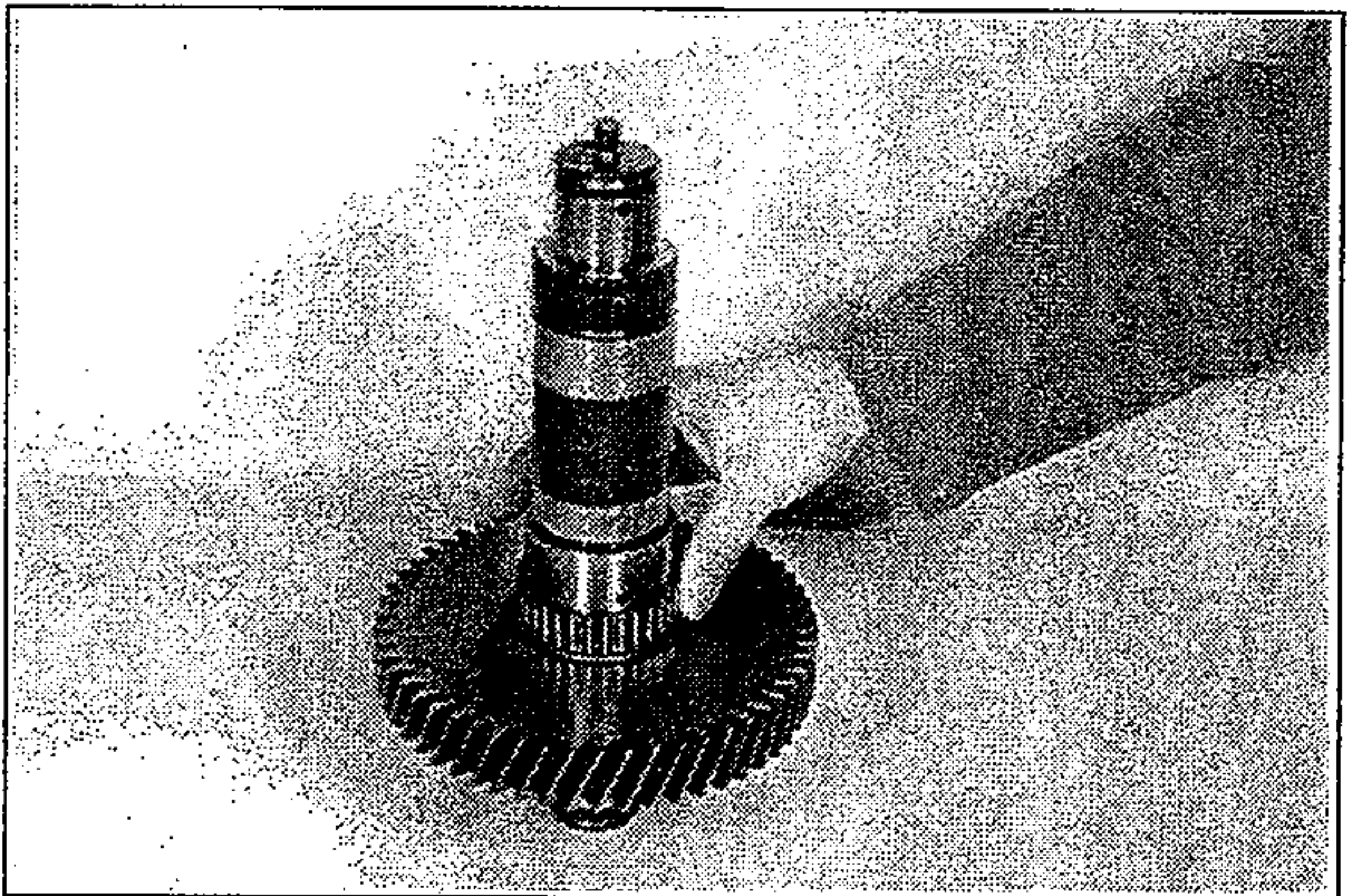
- ⑪ Mount stud(Arrow).
Wet screw-in thread with loctite(Type No.241).
• Torque limit(M10) : 1.7kgf · m(12.5lbf · ft)



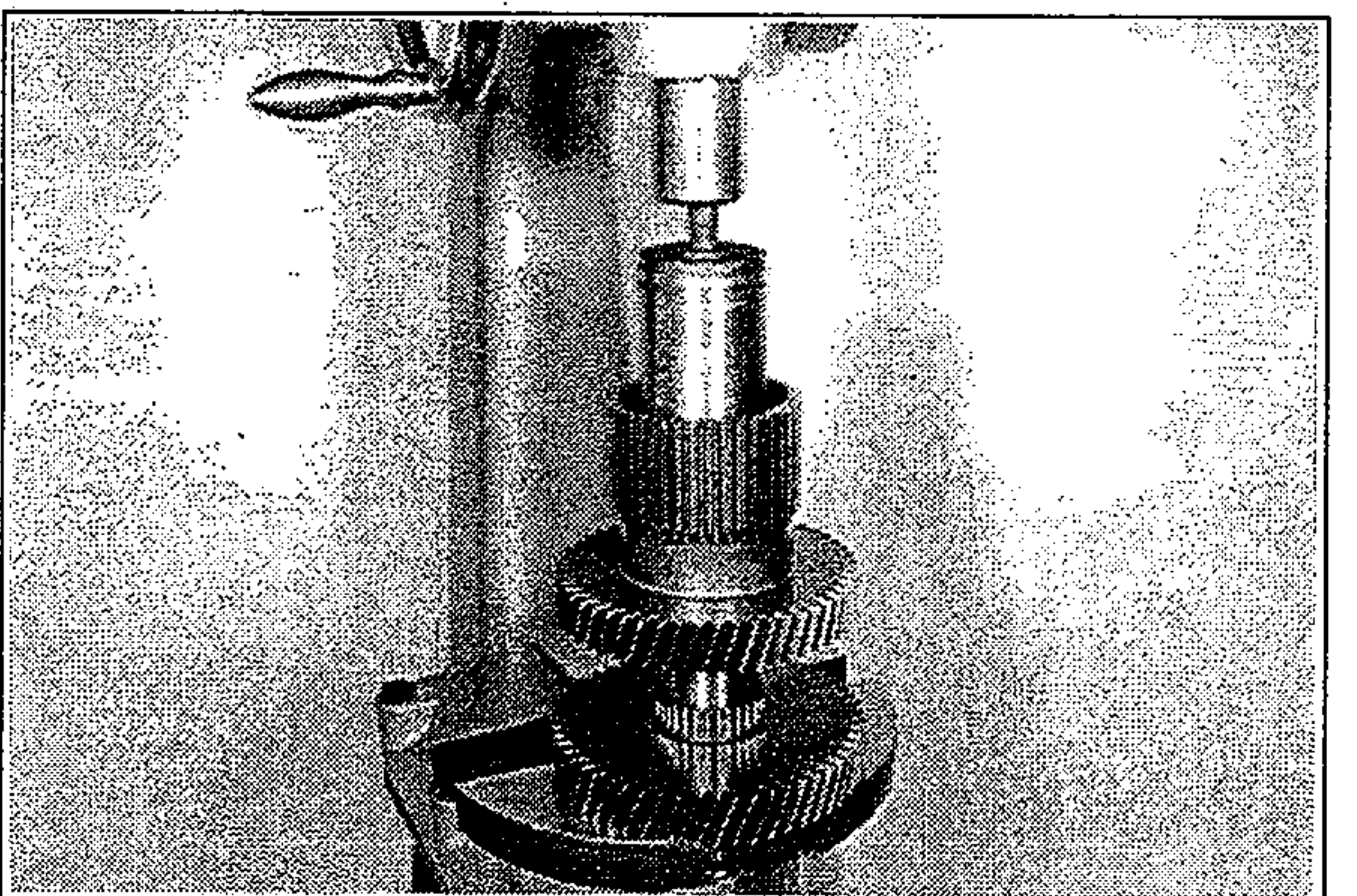
- ⑫ Insert ball bearing until contact is obtained and fix by means of circlip.



- ⑬ Assemble needle bearing.



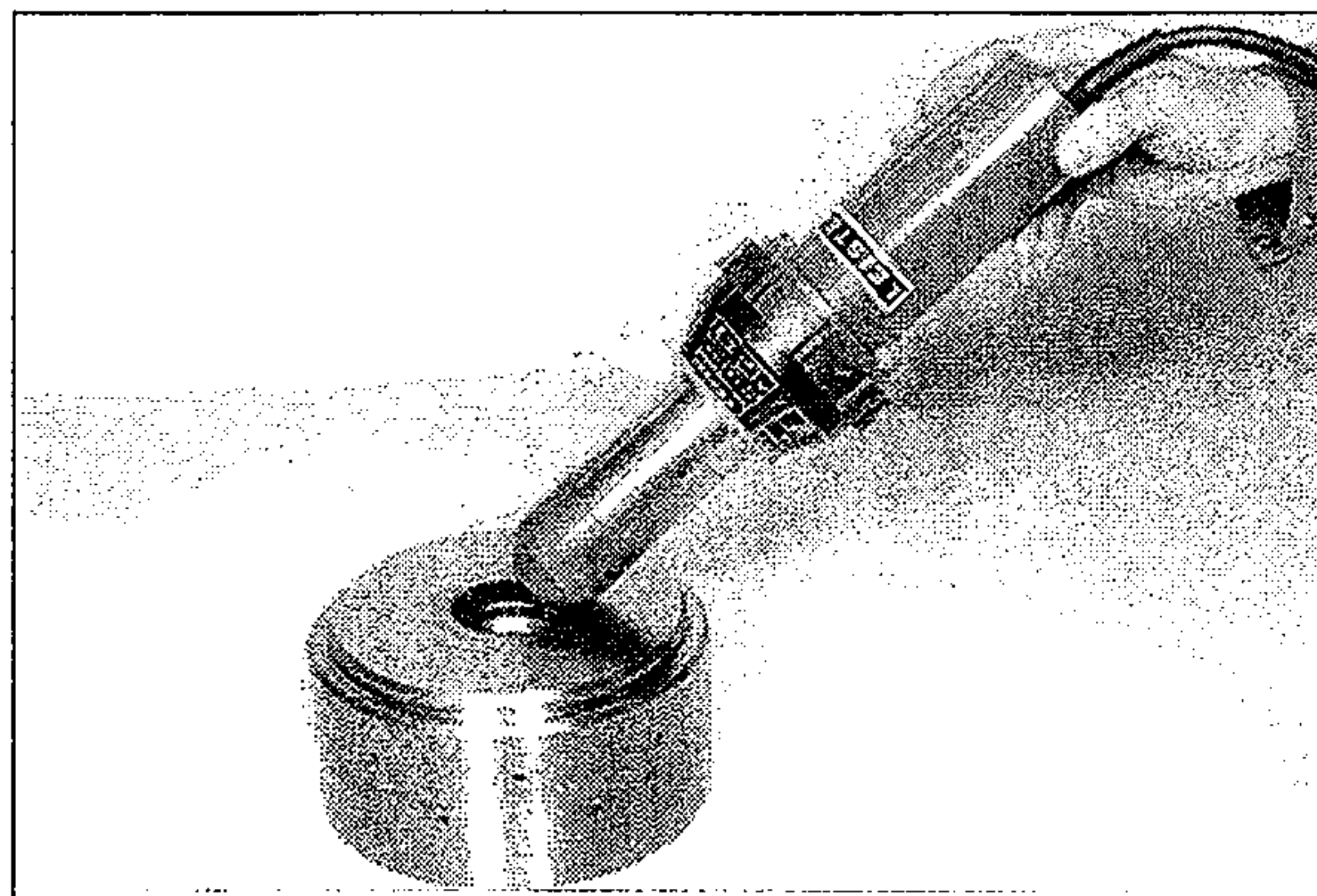
- ⑭ Press idler gear against shoulder.
※ Support it on the bearing inner race.



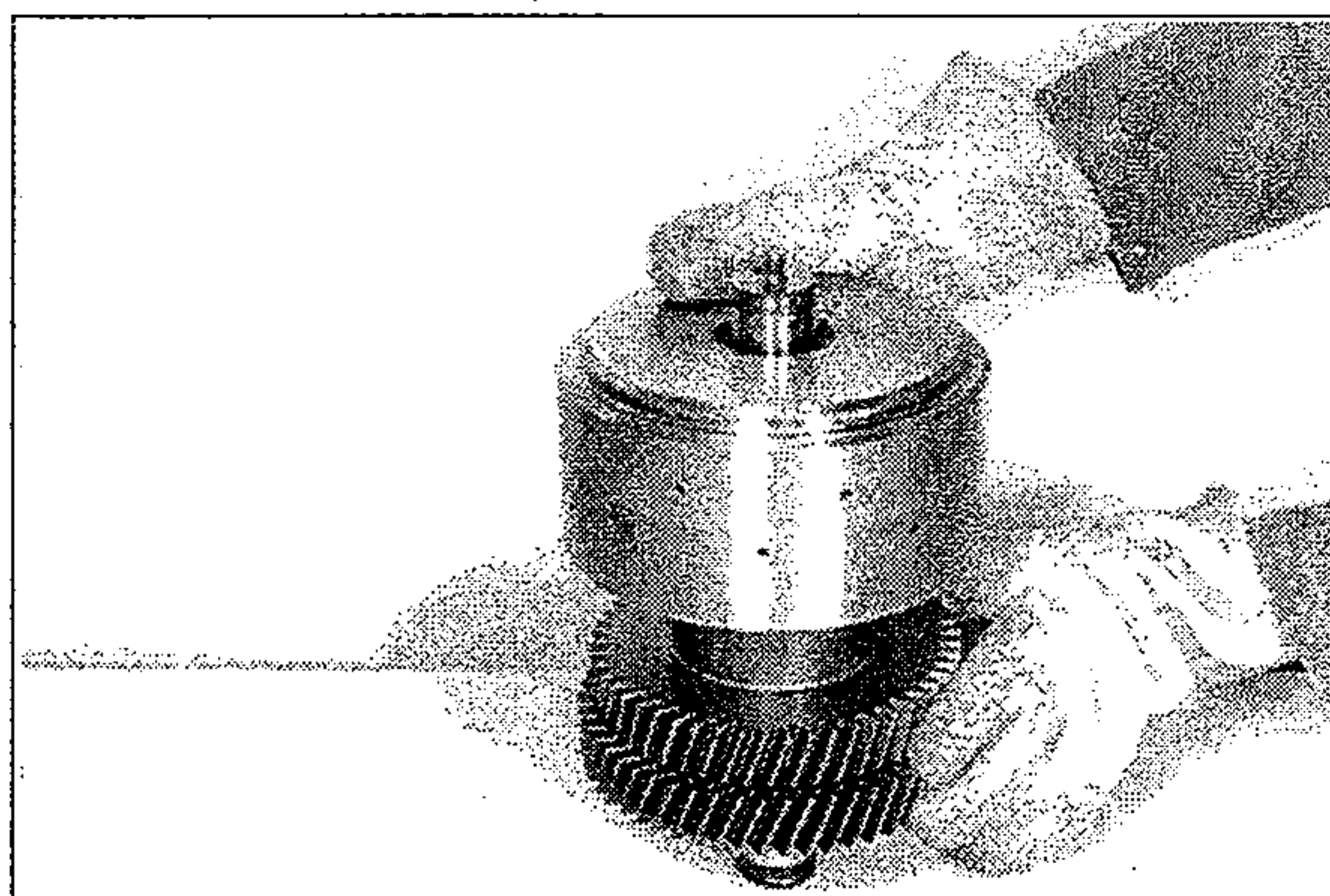
- ⑮ Heat inner diameter of plate carrier (About 120°C).

Hot air blower 220V 5870 221 500

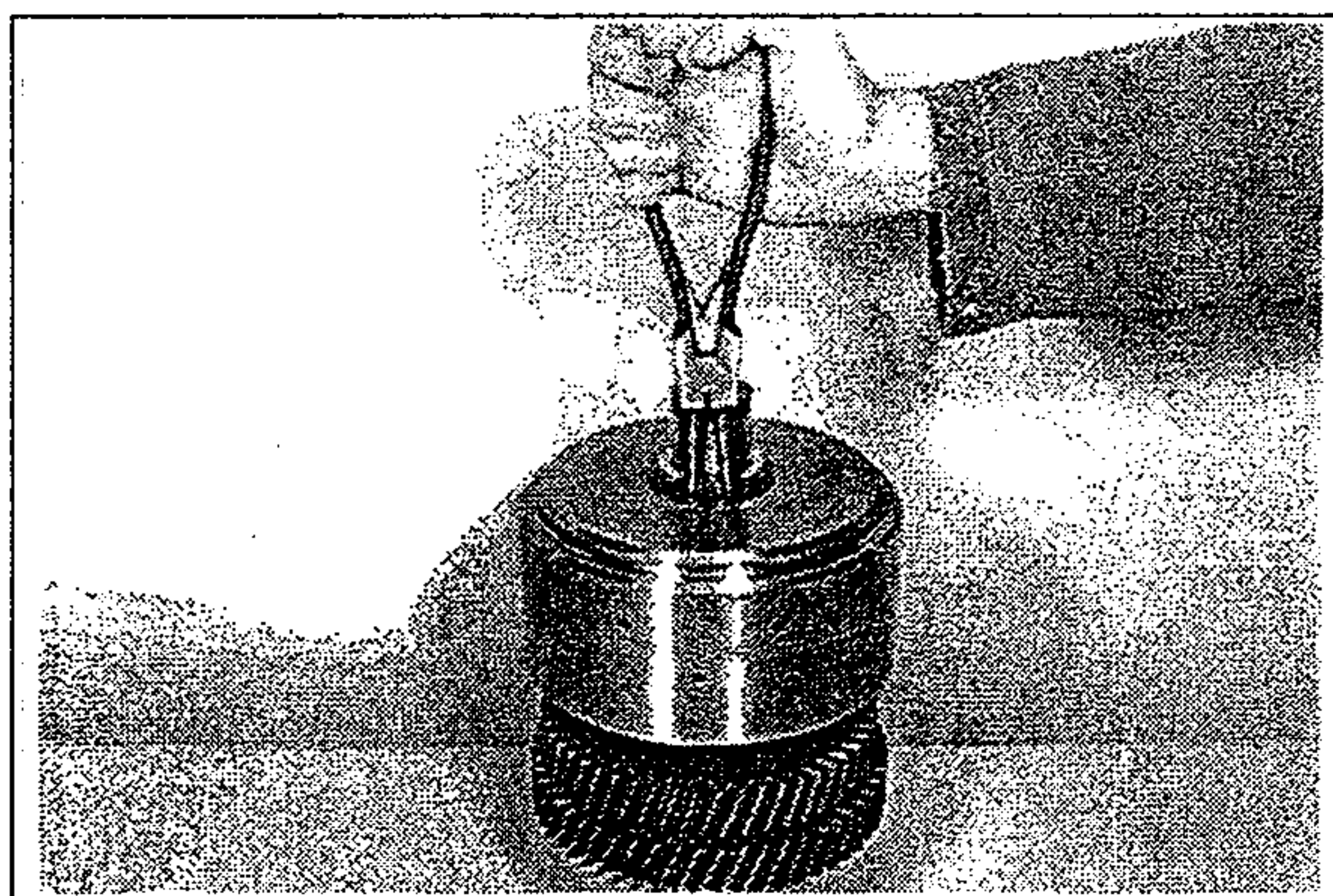
Hot air blower 110V 5870 221 501



- ⑯ Assemble preassembled plate carrier until contact is obtained.

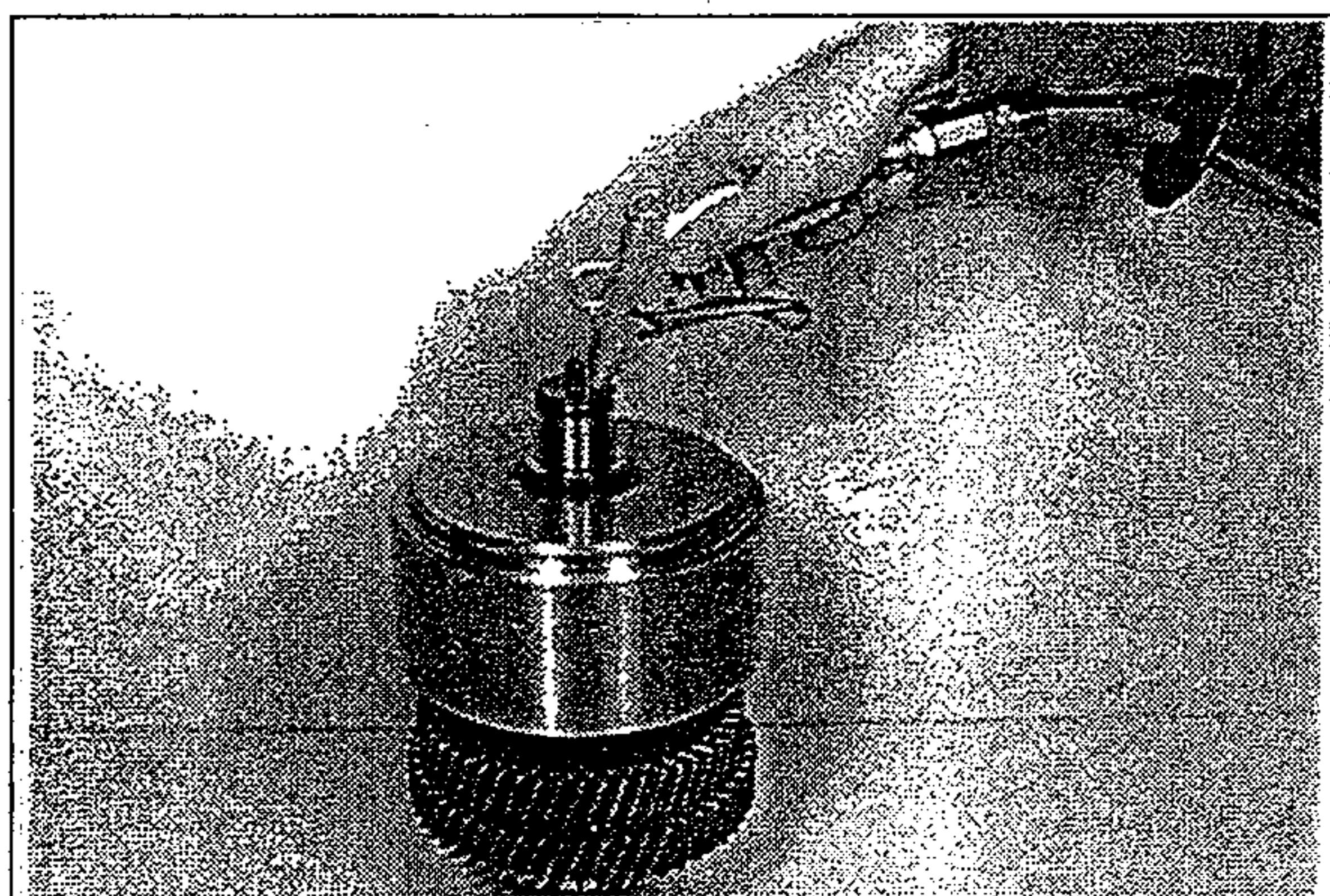


- ⑰ Locate plate carrier axially by means of circlip.

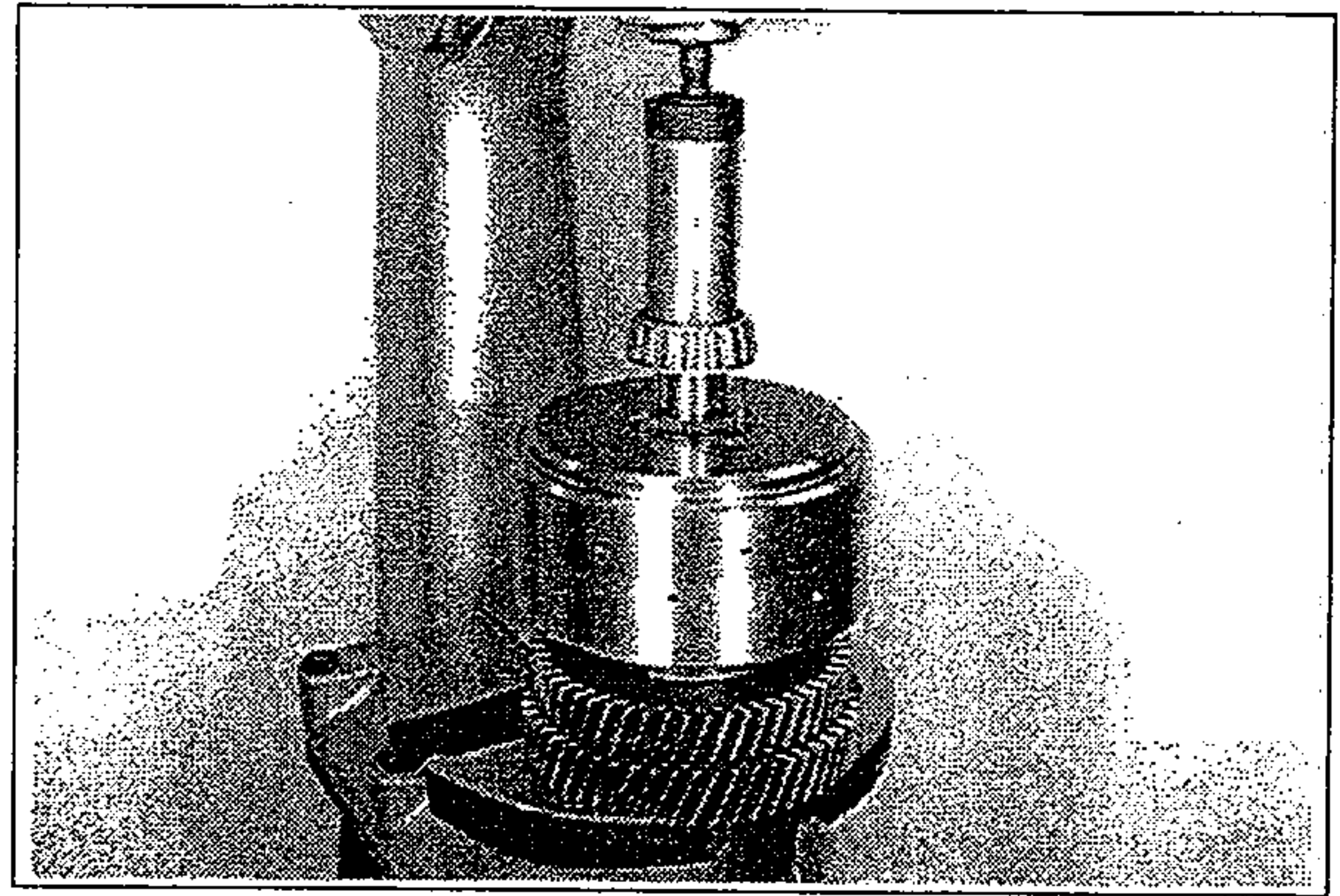


- ⑱ Check function of clutch by means of compressed air.

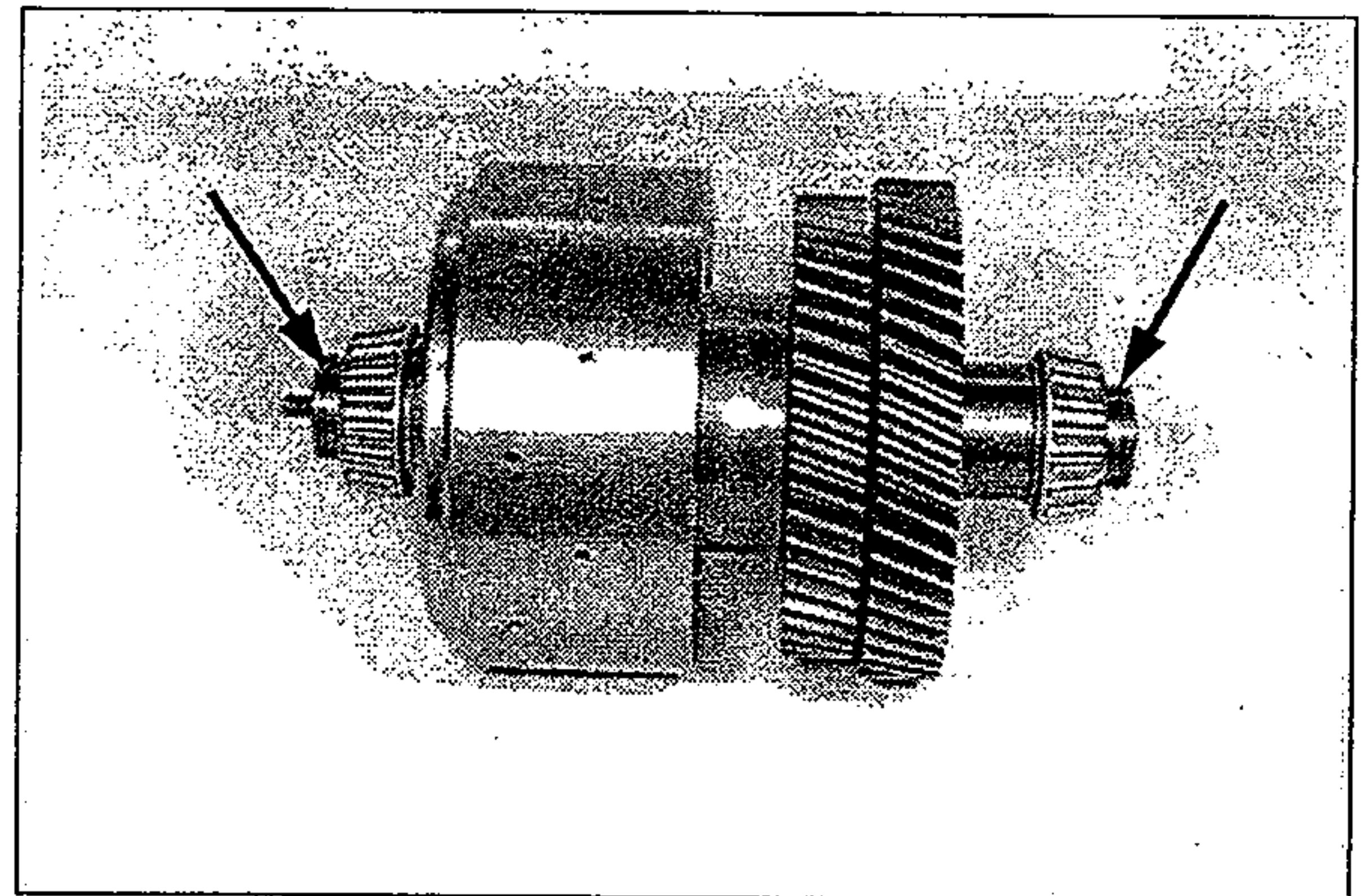
※ At correctly installed components, the closing resp. opening of the clutch is clear audible.



- ⑱ Press tapered roller bearing against shoulder.
Install opposite tapered roller bearing accordingly.



- ⑳ Squeeze rectangular rings in(Arrow) and let them snap in.

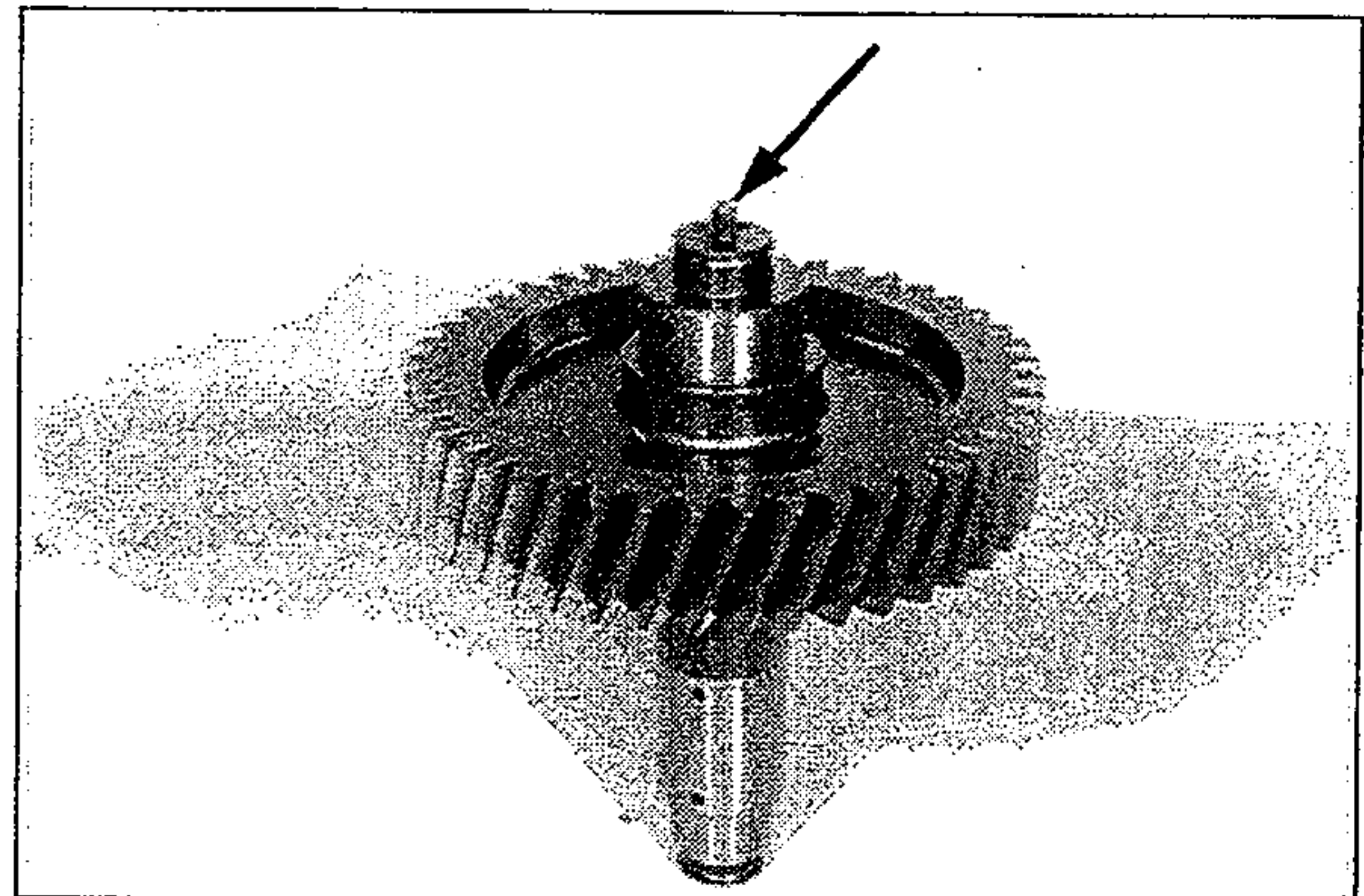


(3) Reassemble clutch K1, K2 and K3

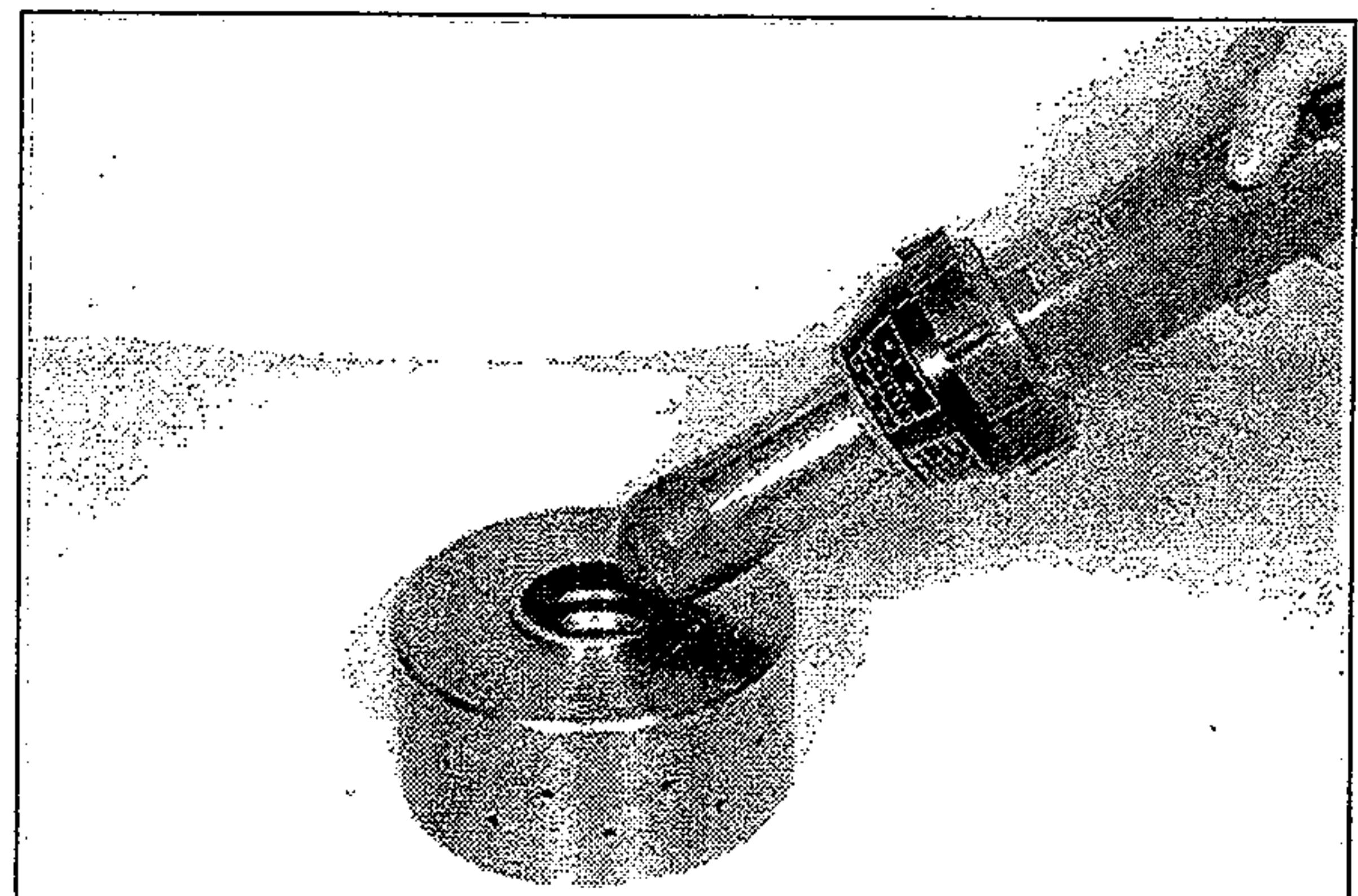
- ※ The following figures show the reassembly of clutch K3.

The reassembly of the clutches K1 and K2 has to be carried out accordingly.

- ① Install stud(Arrow).
※ Wet screw in thread with loctite(Type No. 241).
• Torque limit(M10) : 1.7kgf · m(12.5lbf · ft)



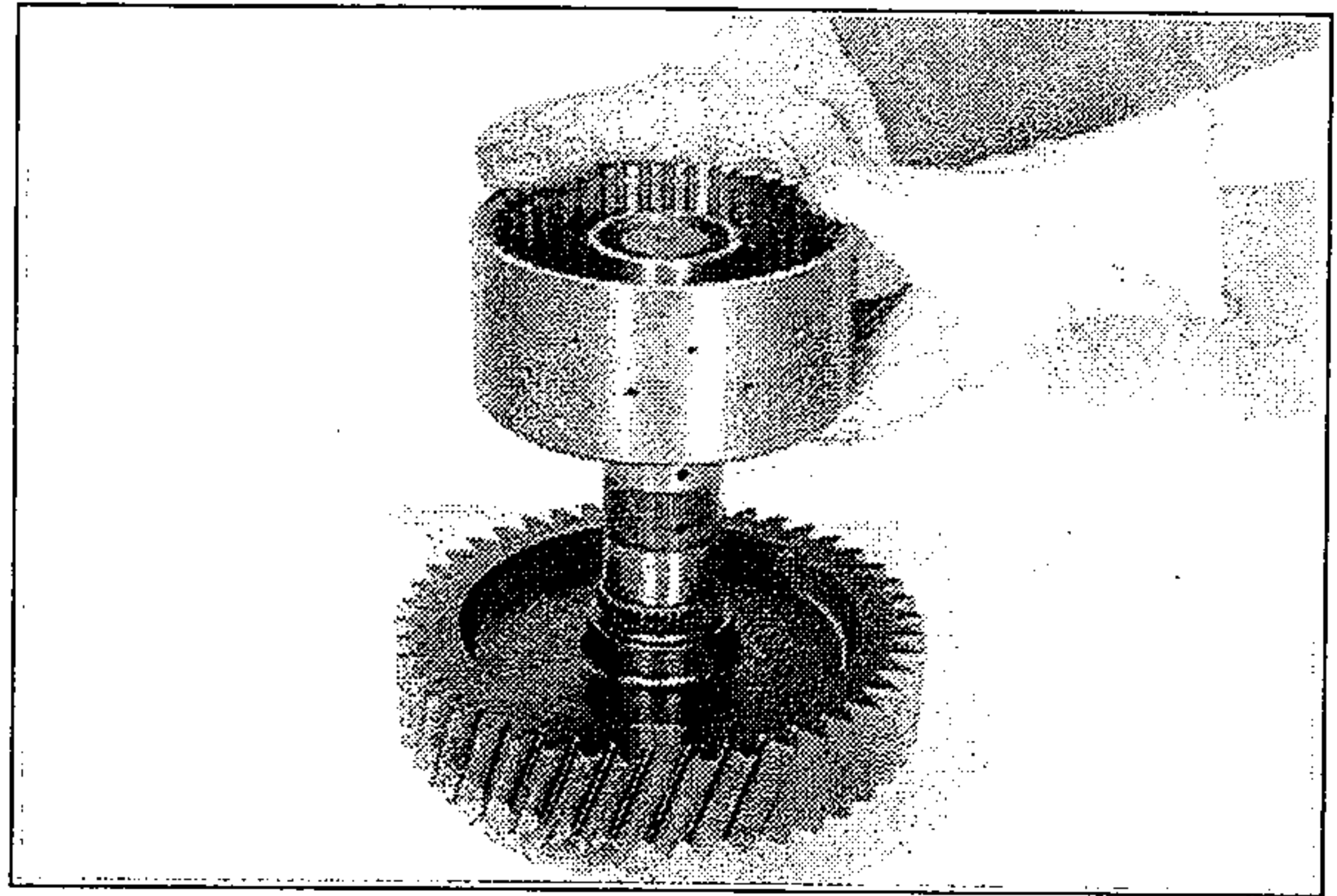
- ② Heat inner diameter of plate carrier.



- ③ Assemble plate carrier until contact is obtained.

Hot air blower 220V 5870 221 500

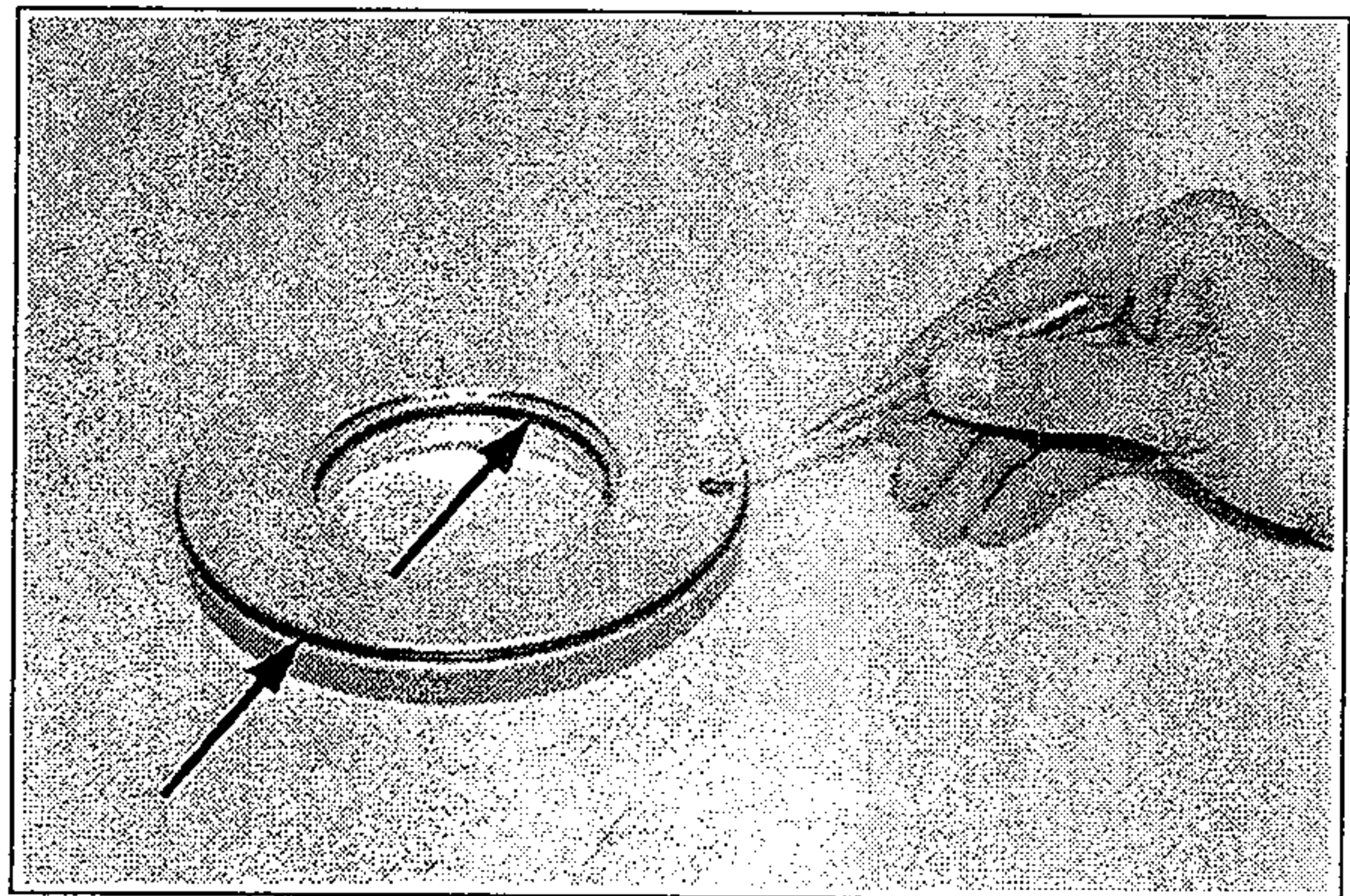
Hot air blower 110V 5870 221 501



- ④ Check function of the purge valve

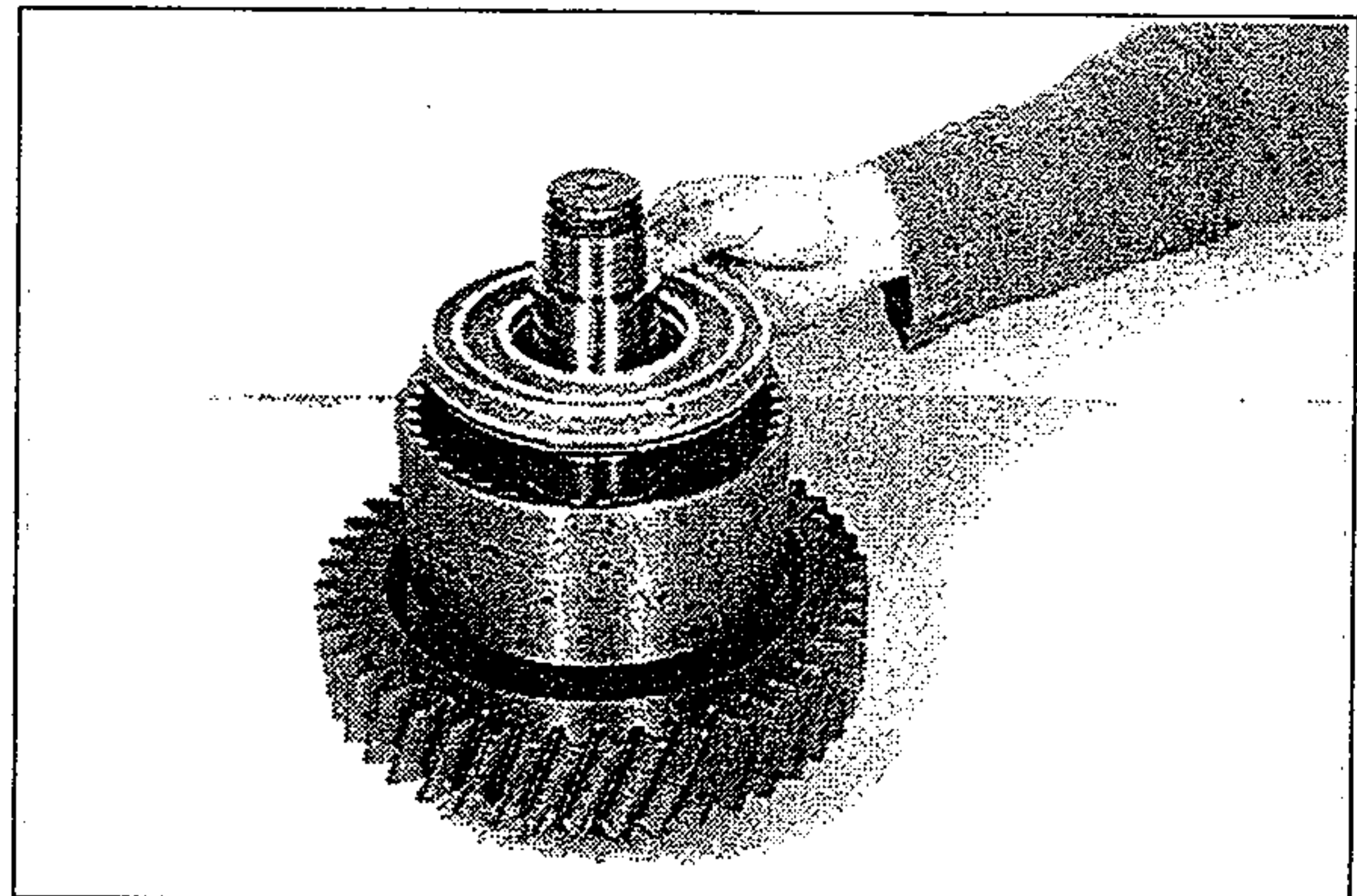
※ Ball must not stick, if necessary clean with compressed air.

Insert both O-rings(Arrows) scrollfree into the grooves of the piston and oil.



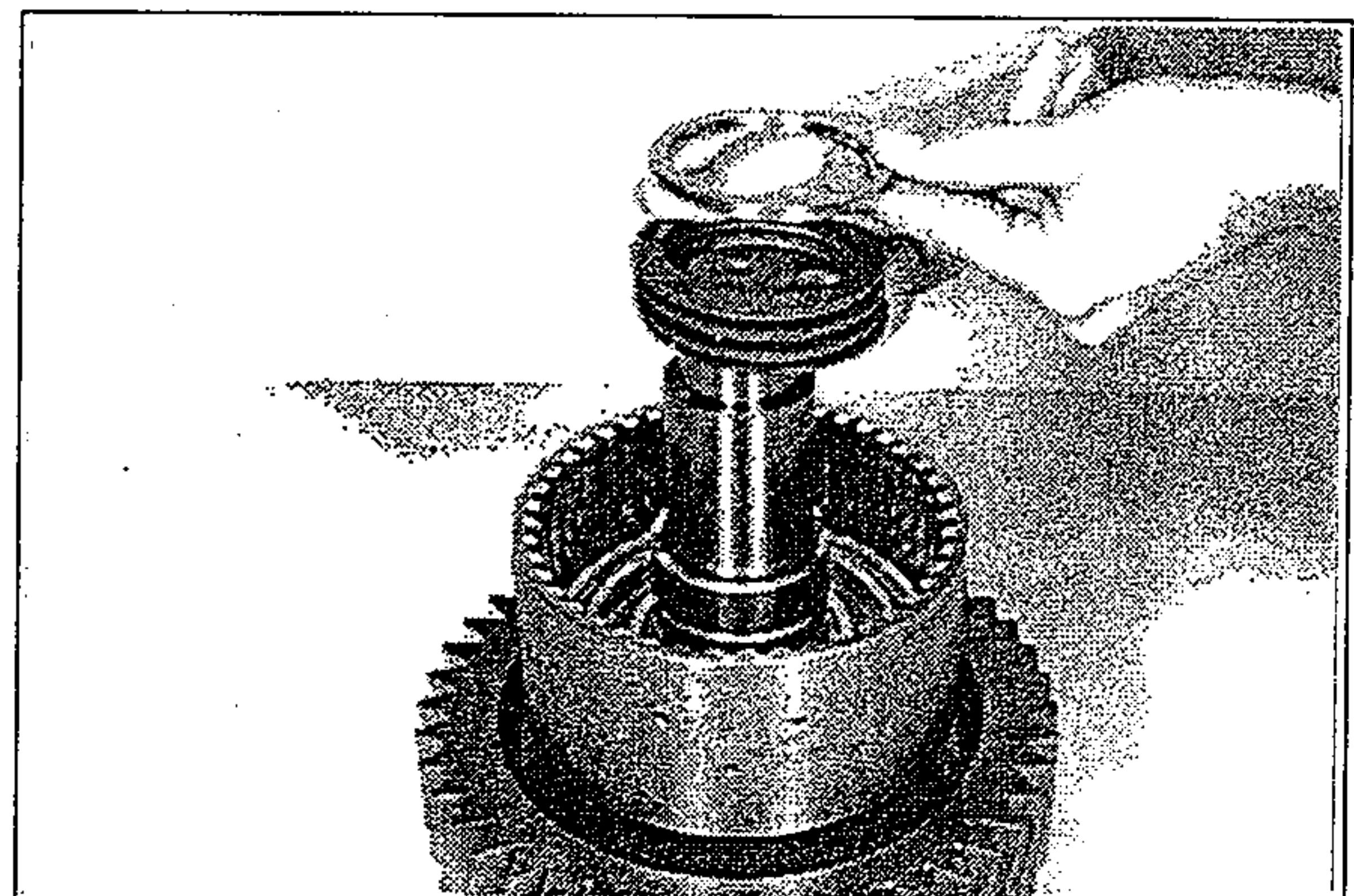
- ⑤ Introduce piston until contact is obtained.

※ Pay attention to the installation position, see figure.



- ⑥ Lay on cup spring pack and guide ring.

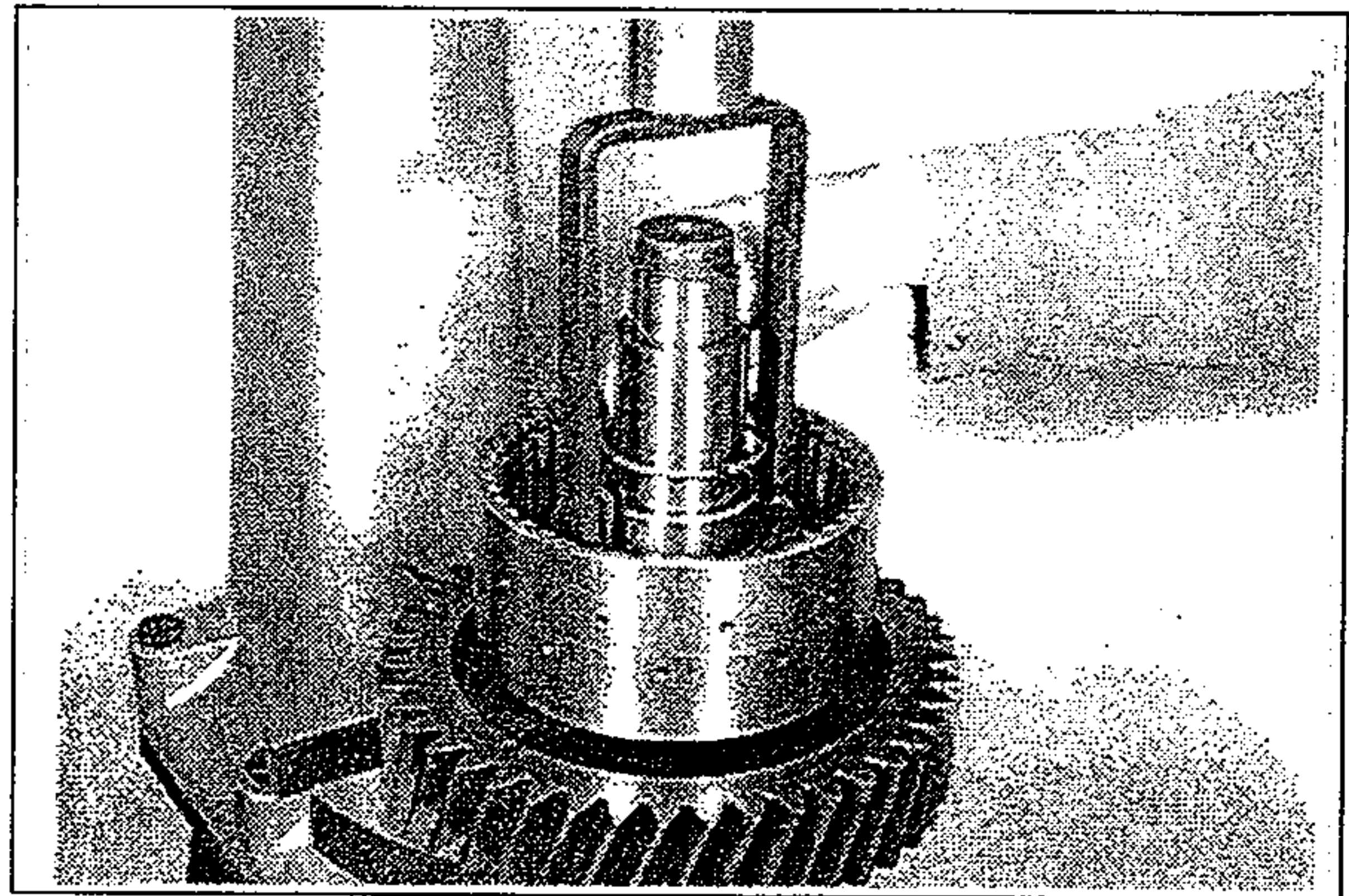
※ Pay attention to the stacking of the cup springs, see the next draft.



- ⑦ Preload cup spring pack and fix it by means of snap ring.

Assembly aid

5870 345 088



- ※ The plate arrangement of clutch K1 is identical with clutch K2 and K3.
In this connection see the following drafts.

Plate pack K1

- 1 Plate carrier
- 2 Piston
- 3 Outer plate-one side coated(1 piece)
- 4 Inner plates(9 pieces)
- 5 Outer plates-on both sides coated (9 pieces)
- 6 Snap ring(Optional s=2.1~4.2mm)
- 7 End shim

Effective number of friction surfaces = 18

- ※ Install outer plate 3 with the uncoated side facing the piston.

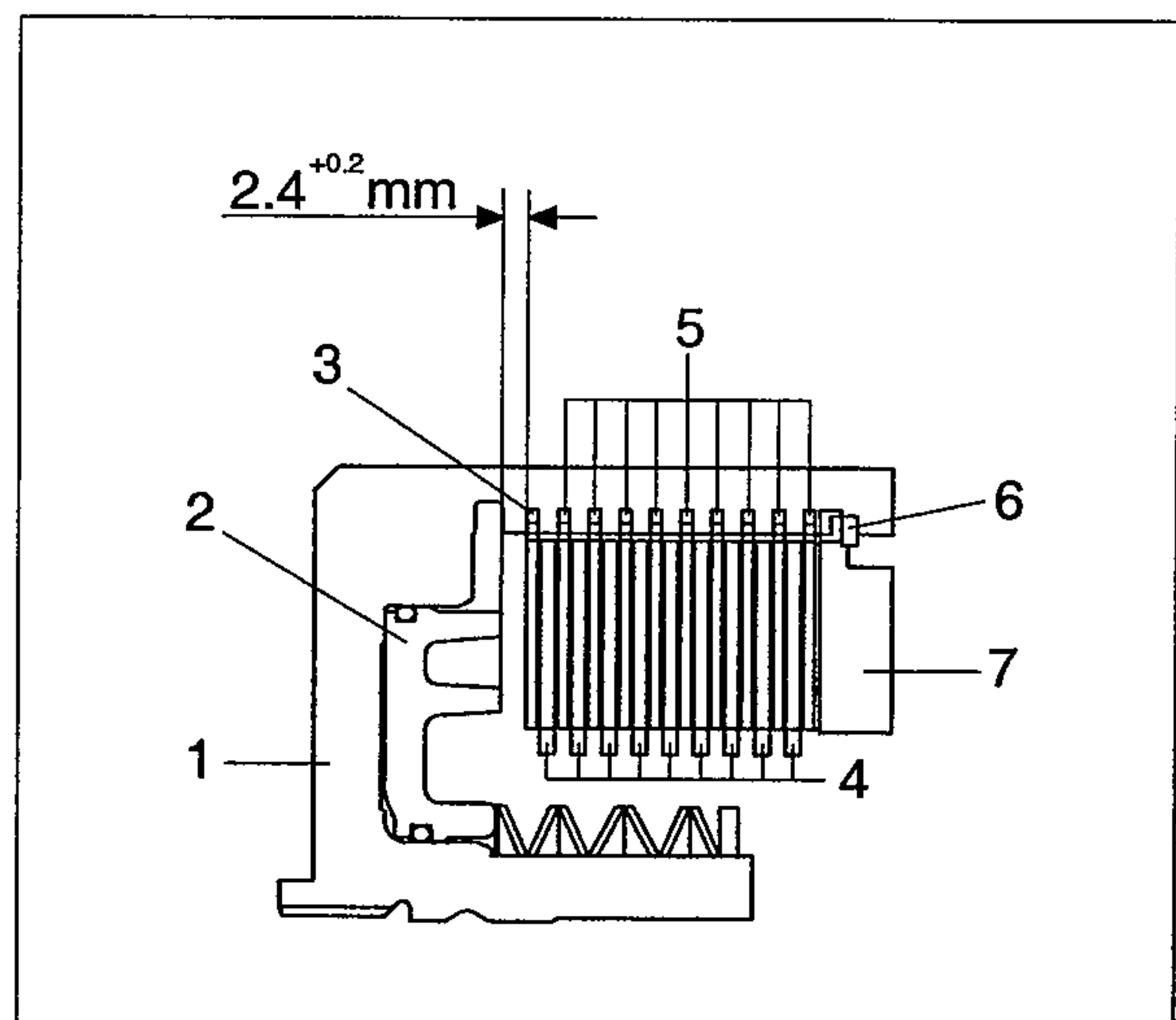
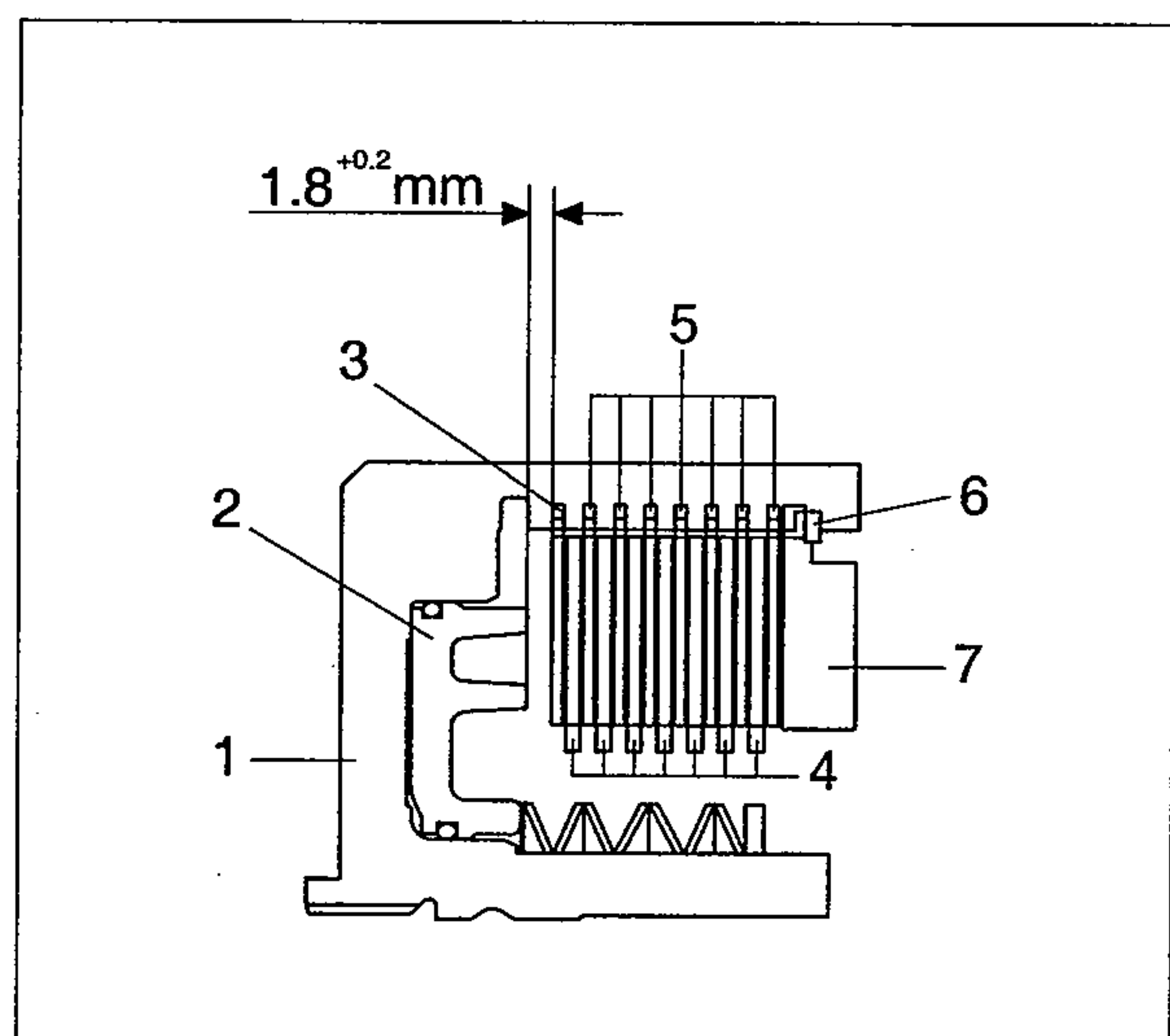


Plate pack K2 and K3

- 1 Plate carrier
- 2 Piston
- 3 Outer plate-one side coated(1 piece)
- 4 Inner plates(7 pieces)
- 5 Outer plates-on both side coated (7 pieces)
- 6 Snap ring(Optional s= 2.1~4.2mm)
- 7 End shim

Effective number of friction surfaces = 14

- ※ Install outer plate 3 with the uncoated side facing the piston.



Adjust plate clearance

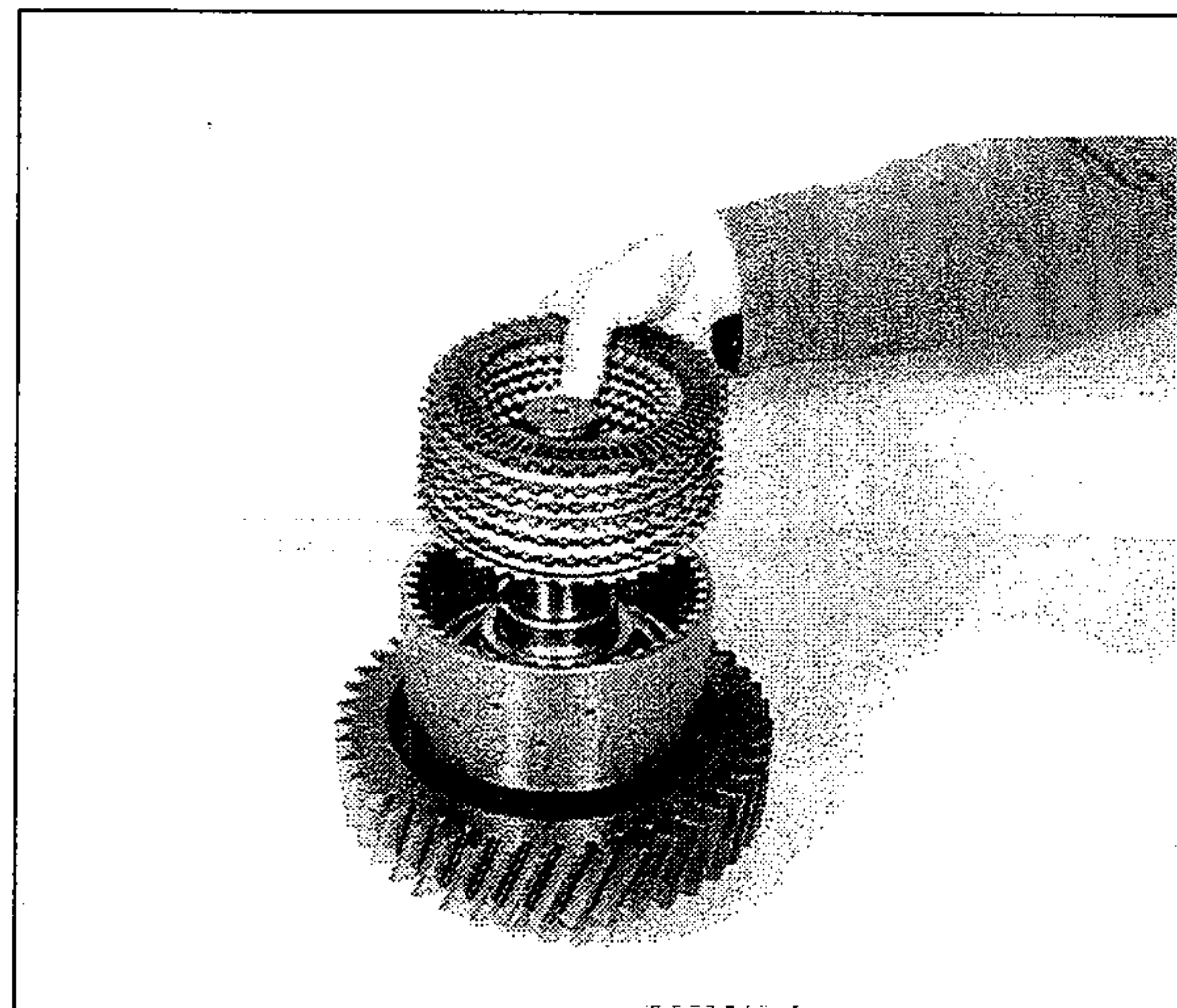
Plate clearance clutch K1 $2.4^{+0.2}\text{mm}$

Plate clearance clutch K2 and K3 $1.8^{+0.2}\text{mm}$

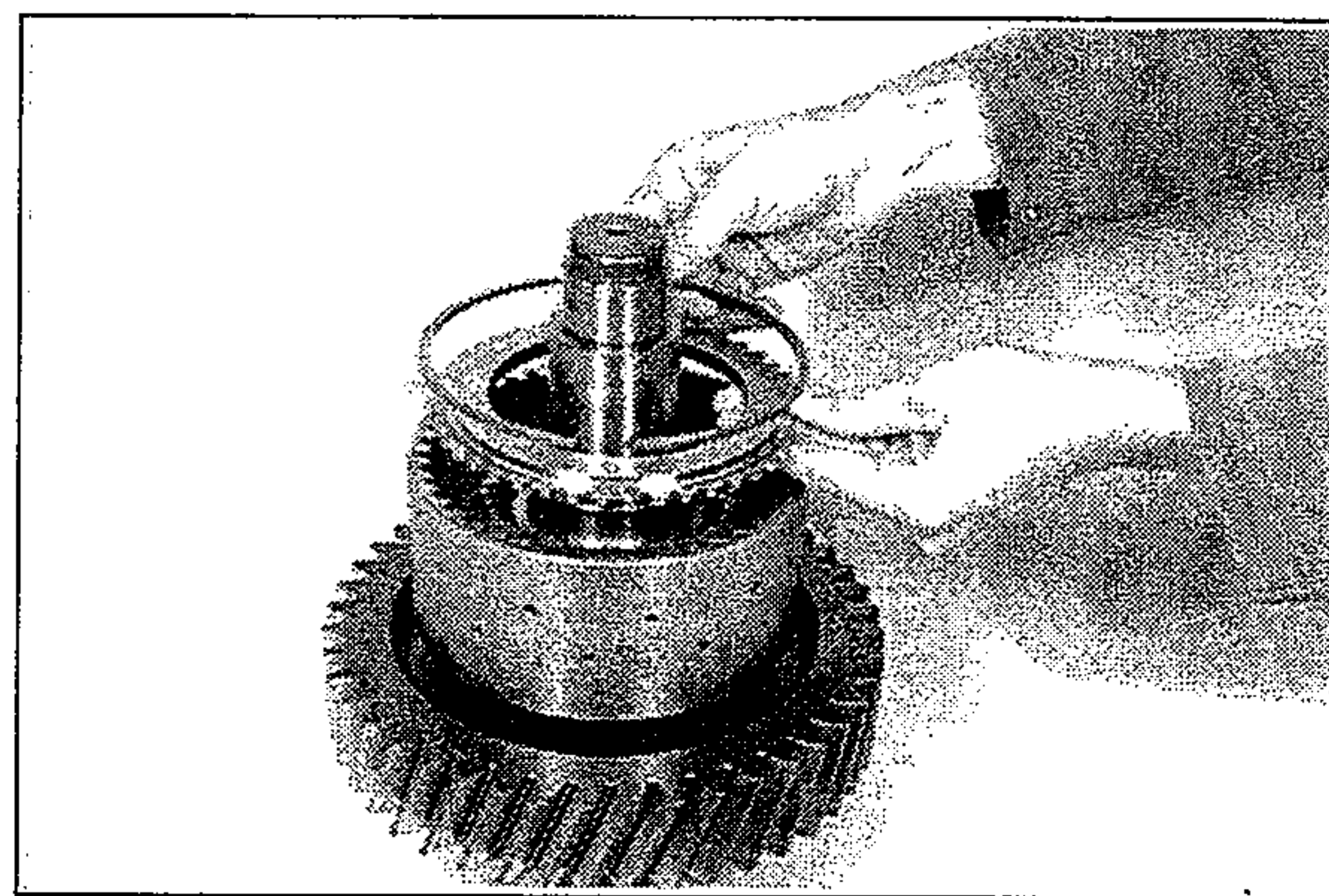
※ For the adjustment of the plate clearance are snap rings with different thickness available.

To ensure a faultless measuring result, install the plates for the moment without oil.

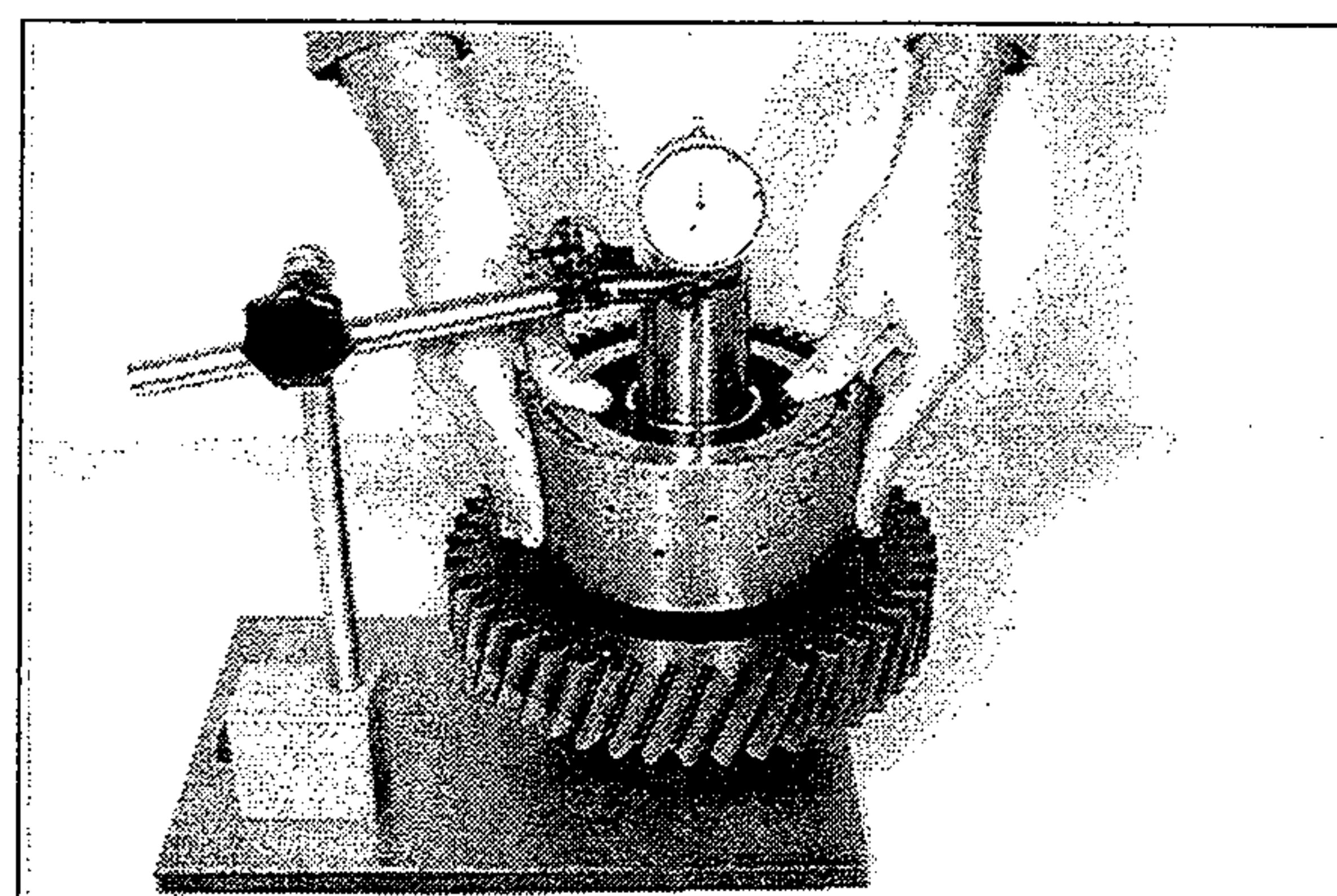
Introduce plate pack according to drafts / page 3-107.



⑧ Lay on the end shim and squeeze circlip in (e.g. $s=3.1\text{mm}$).



⑨ Press on the end shim with about 100N (10kg), apply dial indicator and set it at zero.



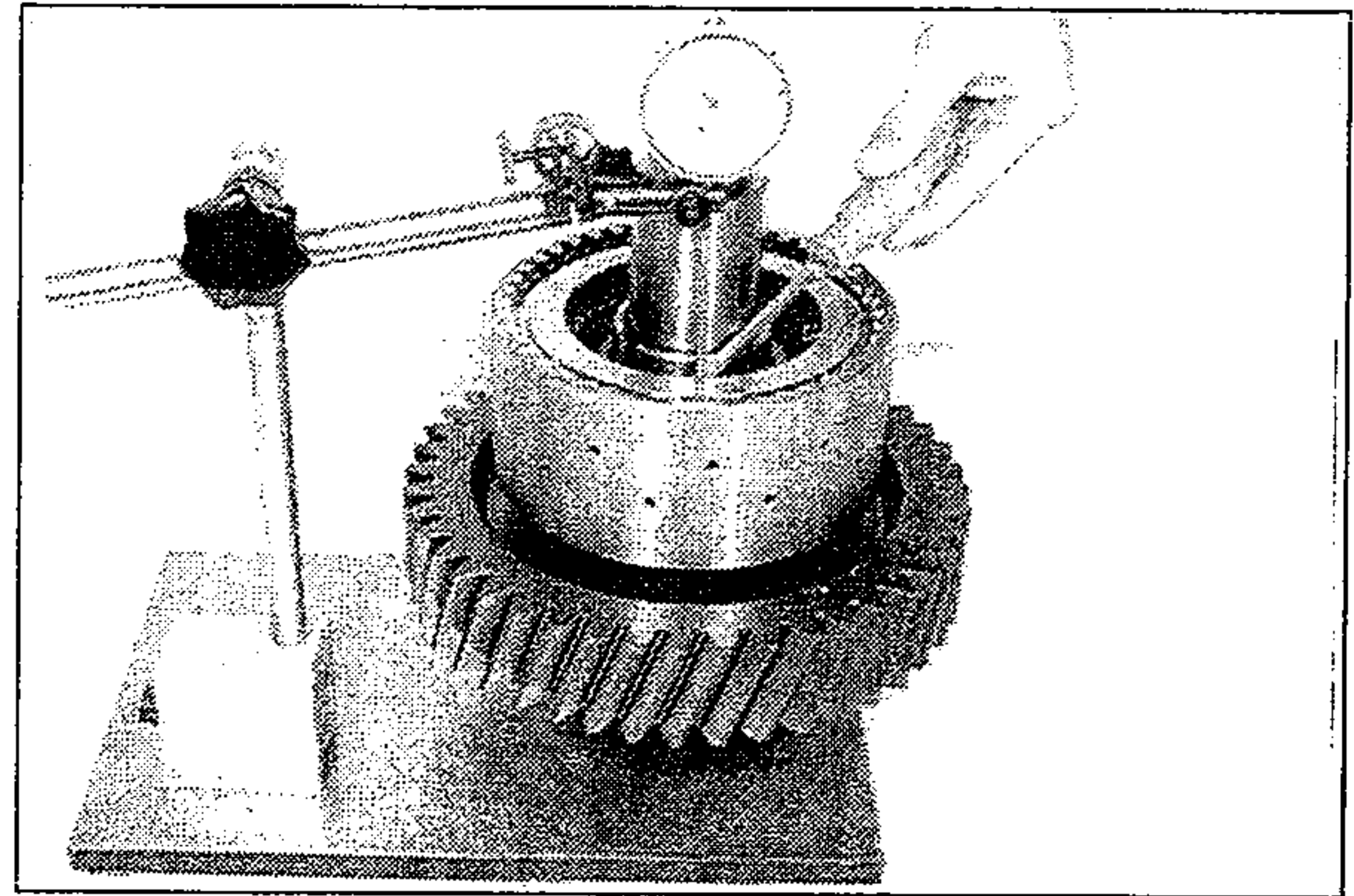
⑩ Now, push the end shim by means of screw driver against snap ring until contacts is obtained(Upward) and read plate clearance on the dial indicator.

※ In case of a deviation from the required plate clearance, correct with corresponding snap ring(s=2.1~4.2mm). After the adjustment of the plate clearance has been carried out, remove the plate pack, oil plates and install it again.

Use oil Dexron- II D, II /Mercon-M.

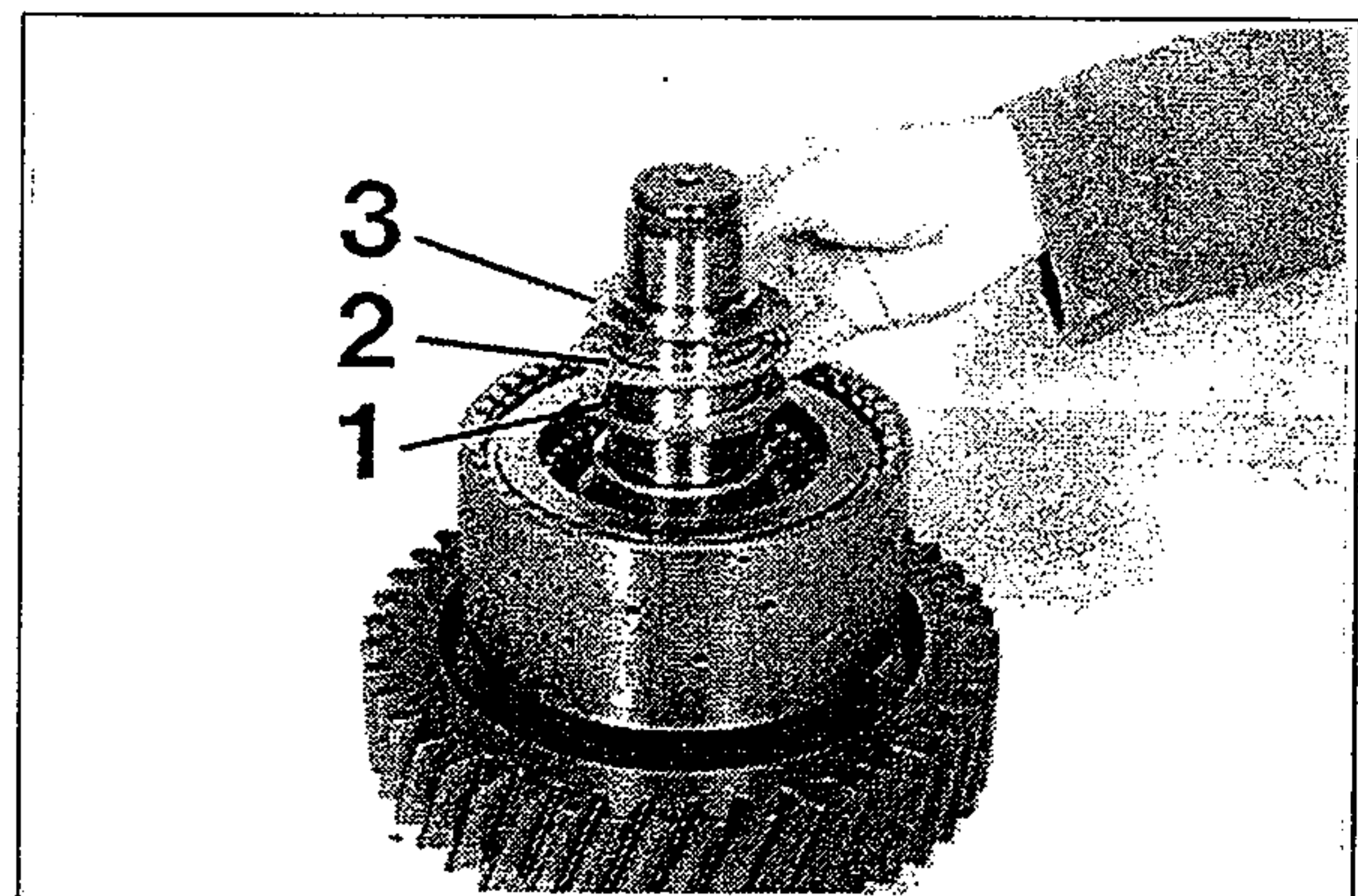
Magnetic stand 5870 200 055

Dial indicator 5870 200 057

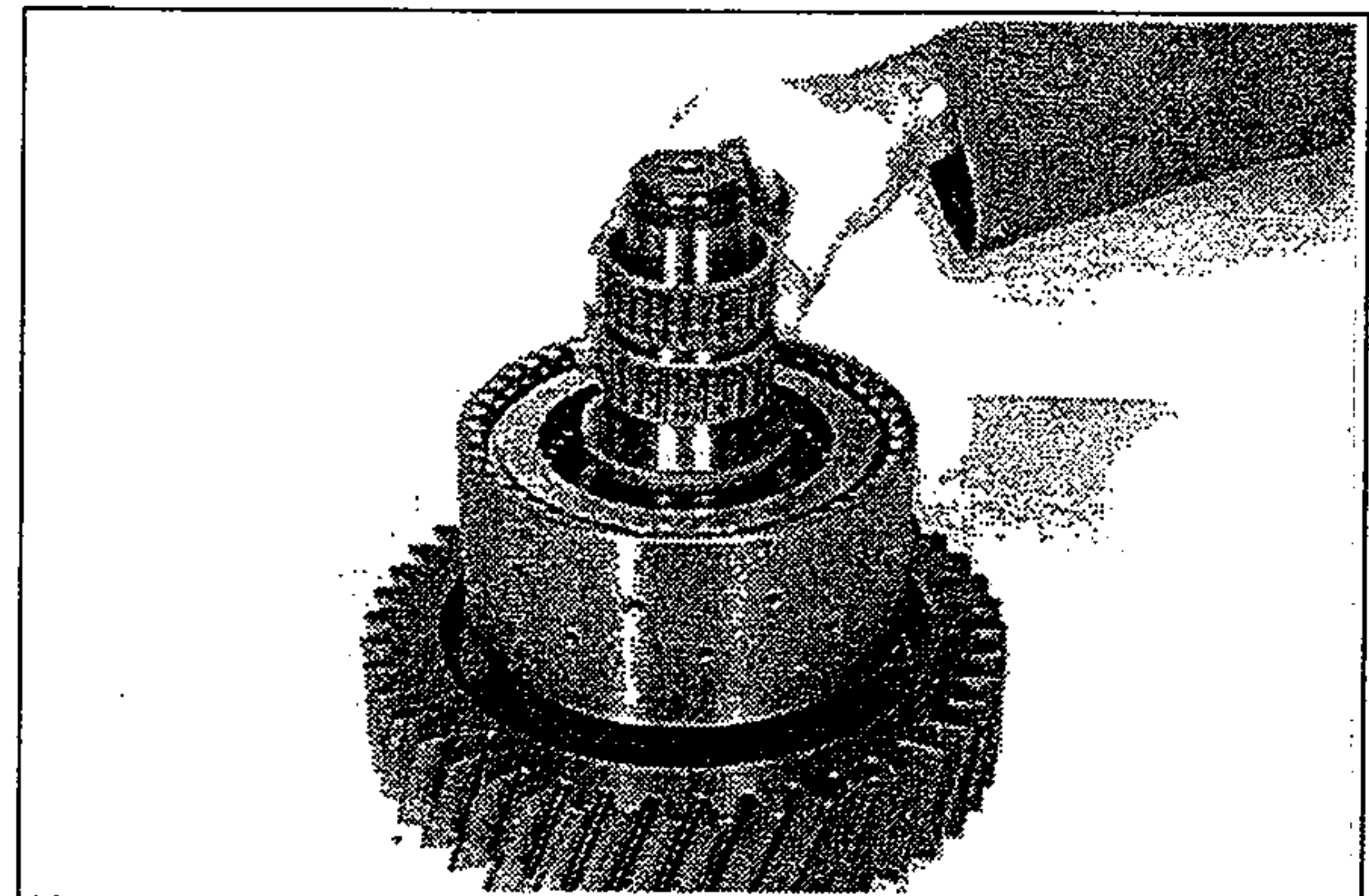


⑪ Assemble running disk 1 (55×78×5), axial needle cage 2 and axial washer 3 (55×78×1).

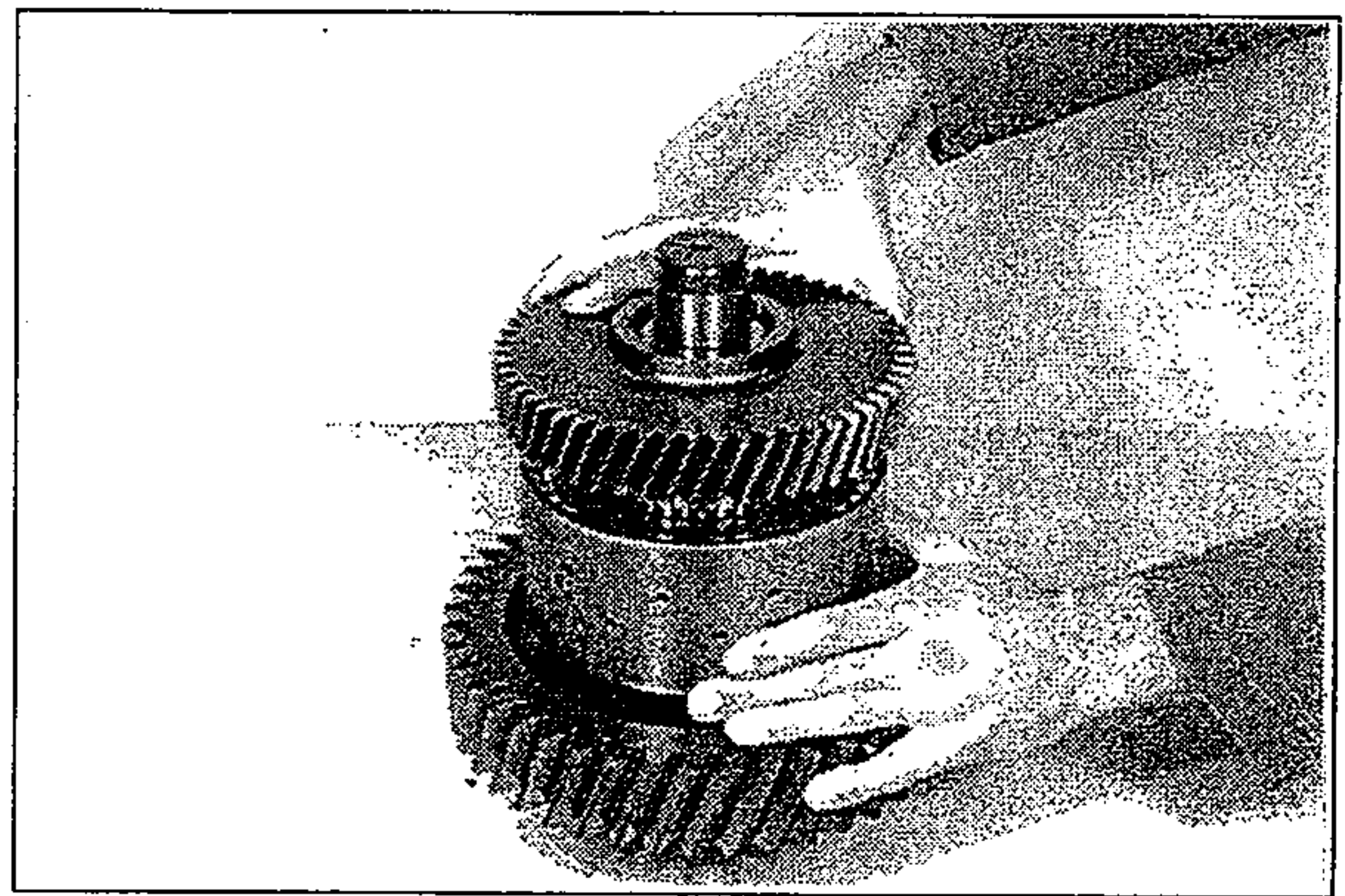
Install running disk 1, with the chamber facing the axial needle cage.



⑫ Assemble both needle bearings.

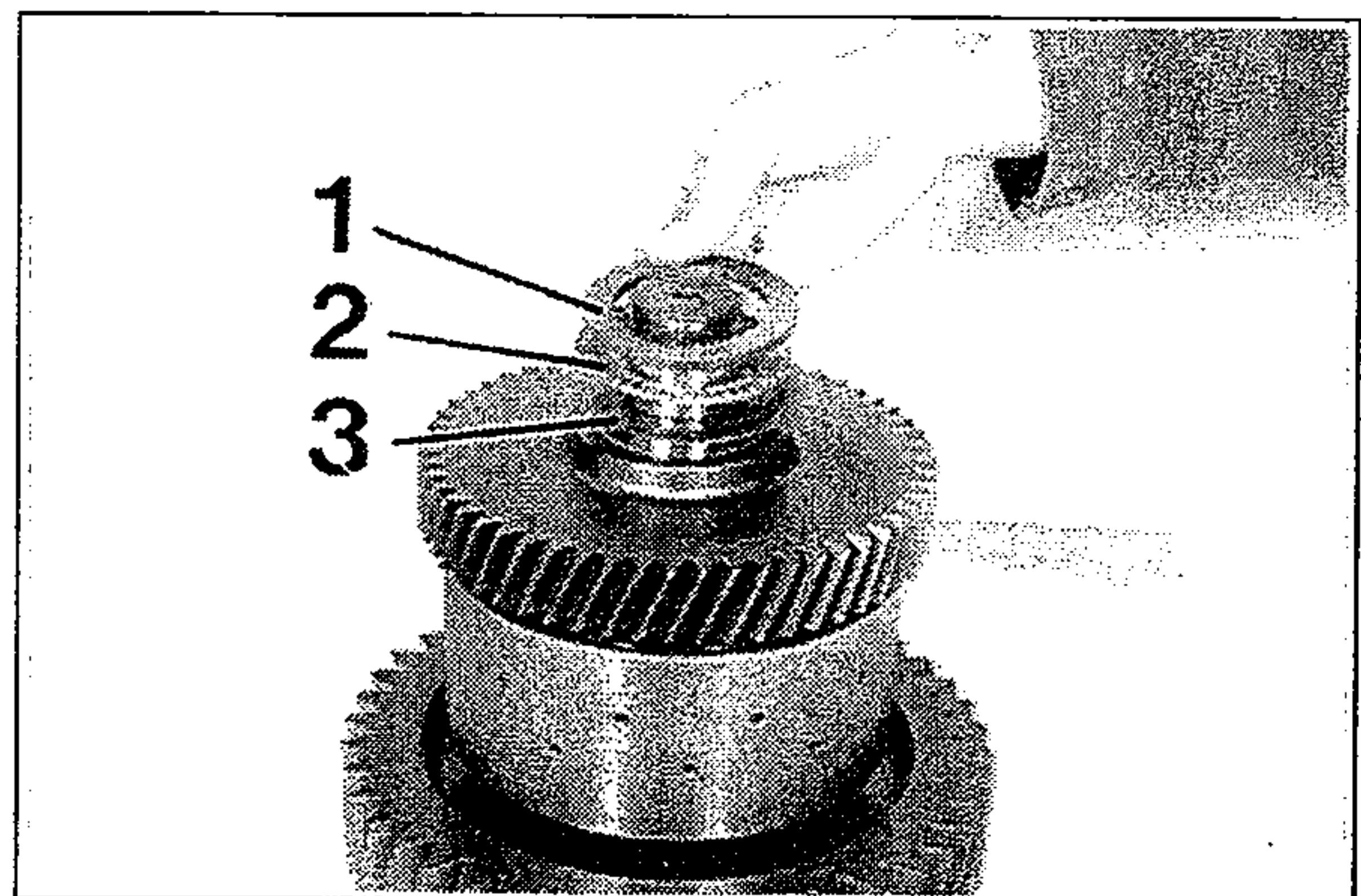


- ⑬ Introduce idler gear until all inner plates are accommodated.

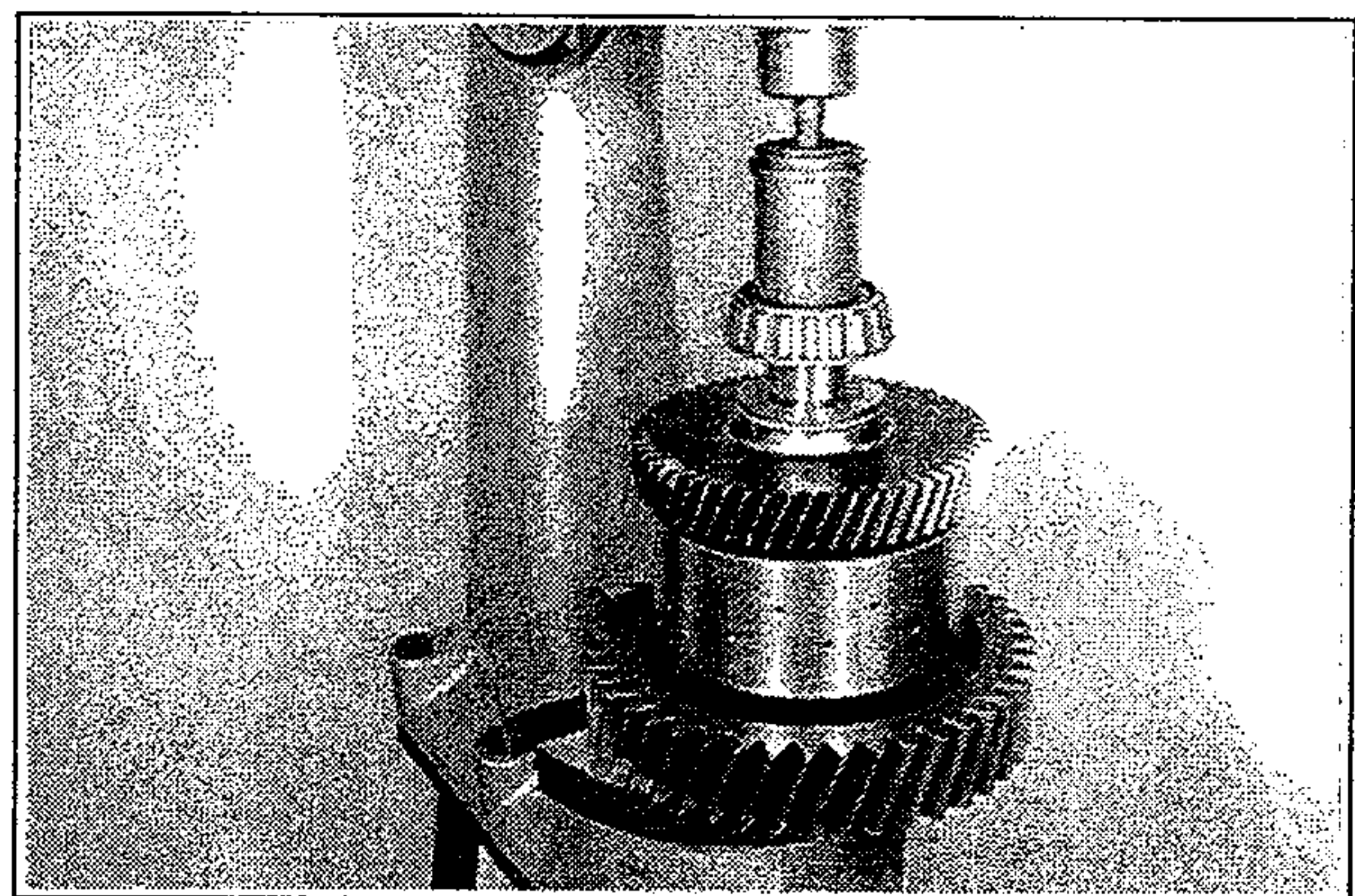


- ⑭ Assemble axial washer 3(55×78×1), axial needle cage 2 and running disk 1 (55×78×5).

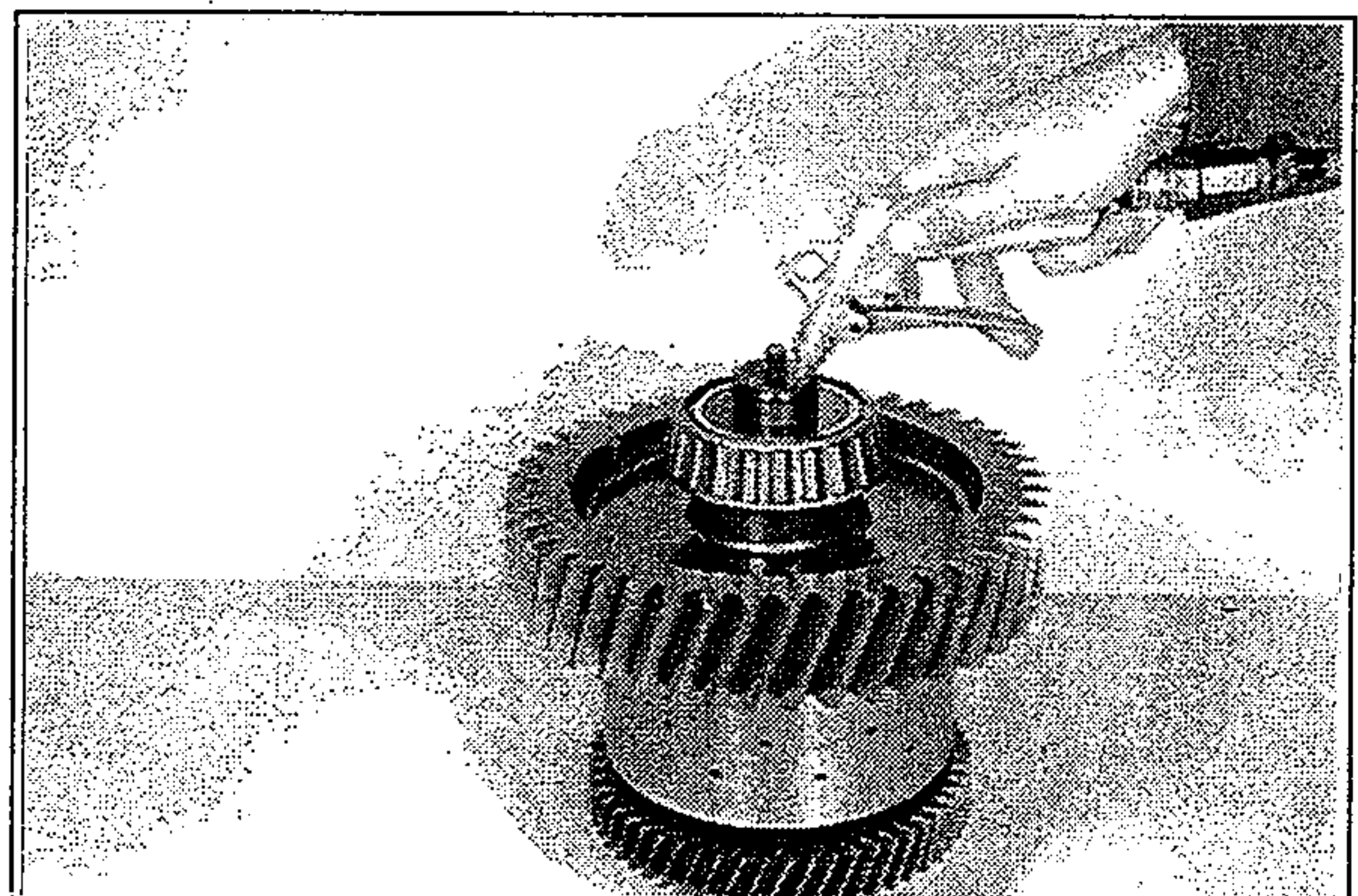
- ※ Install running disk 1, with the chamfer facing the axle needle cage.
- ※ Only if the running disk is overlapping with the shaft collar is ensured that all inner plates are accommodated.



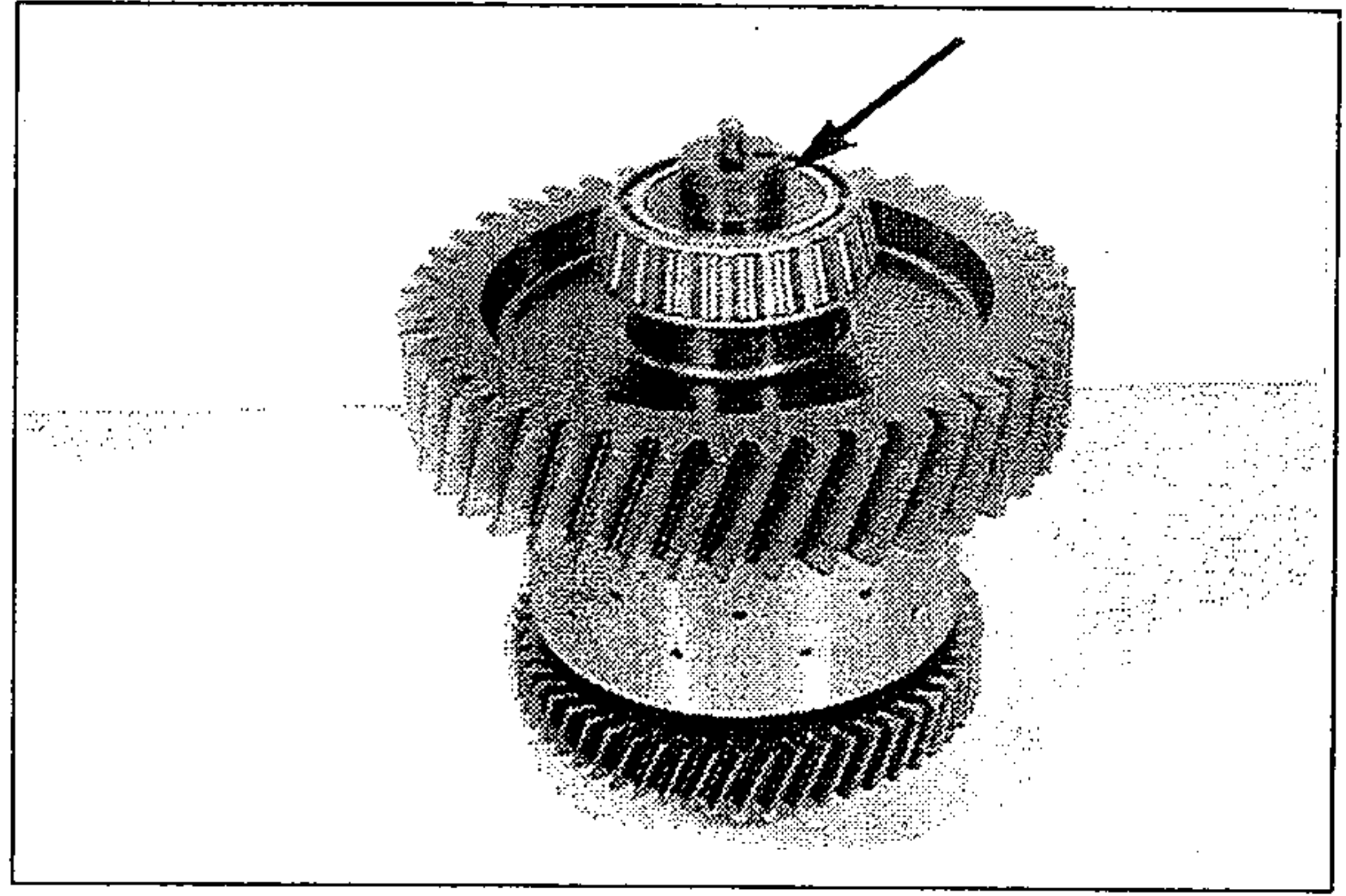
- ⑮ Press tapered roller bearing against shoulder.
Press opposite tapered roller bearing against shoulder.



- ⑯ Check function of the clutch by means of compressed air.
- ※ At correctly installed components, the closing respectively opening of the clutch is clearly audible.

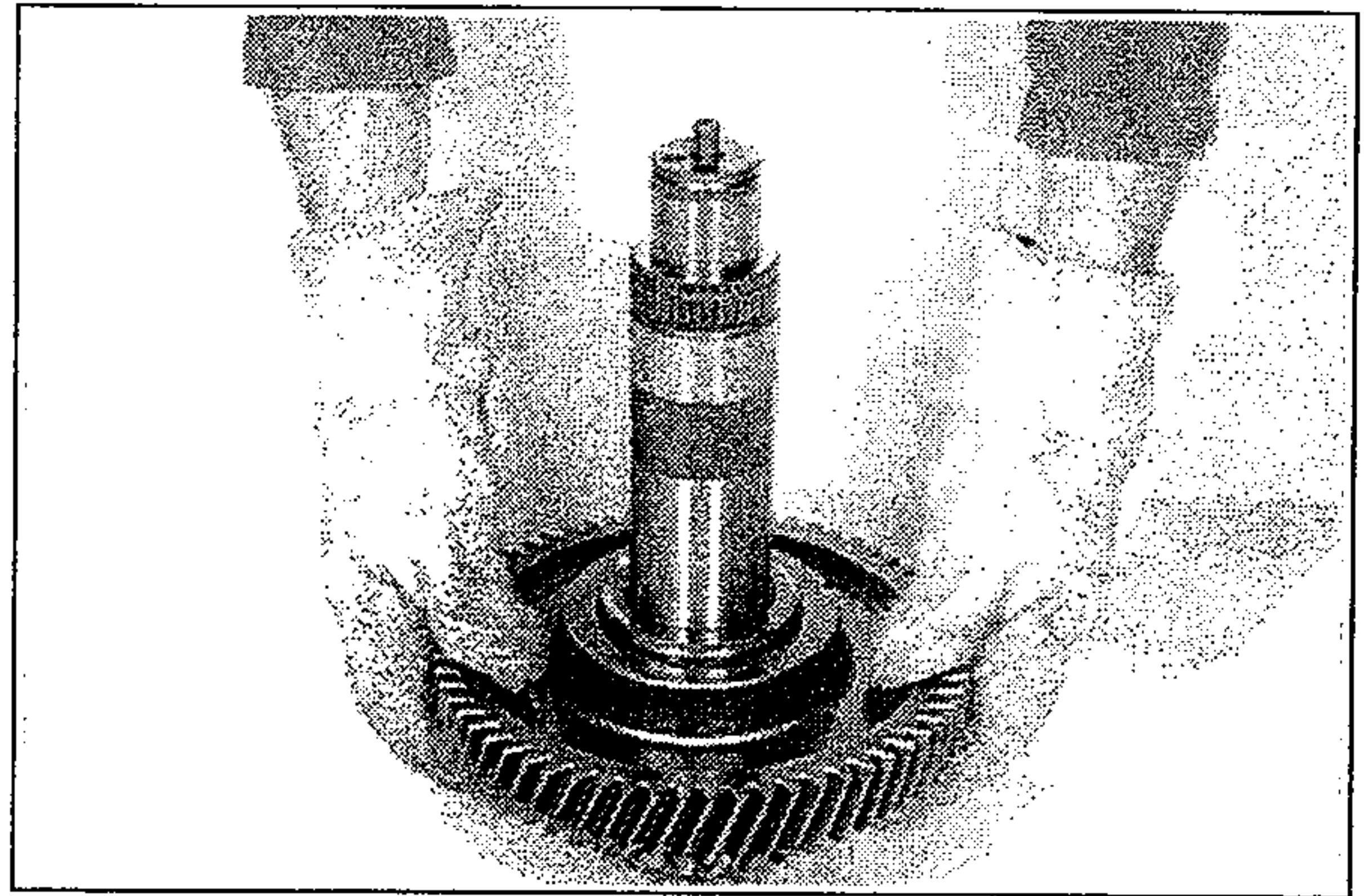


- ⑰ Squeeze rectangular ring in(Arrow) and let it snap in.
Install opposite rectangular ring accordingly.

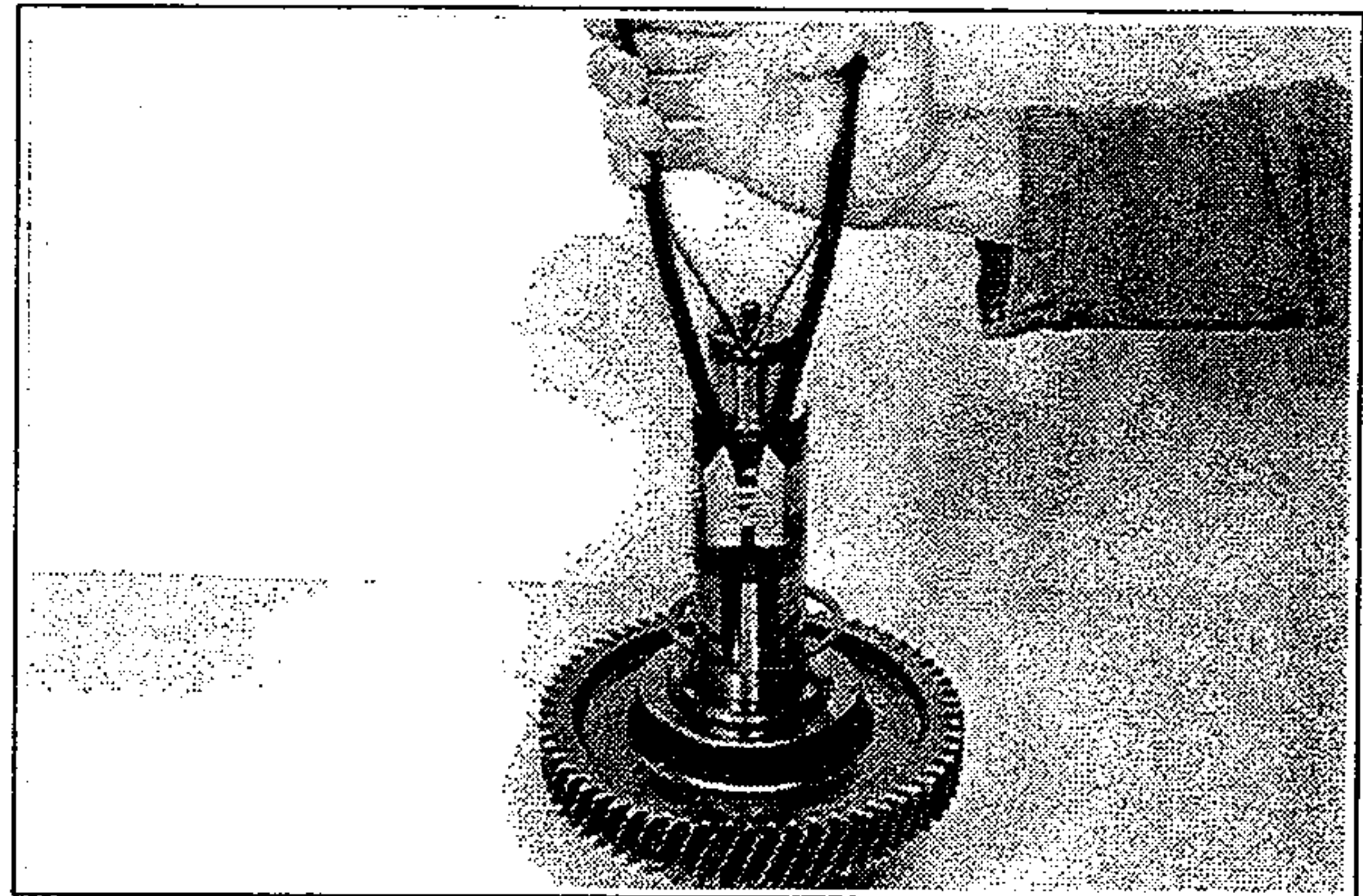


(4) Reassemble clutch K4

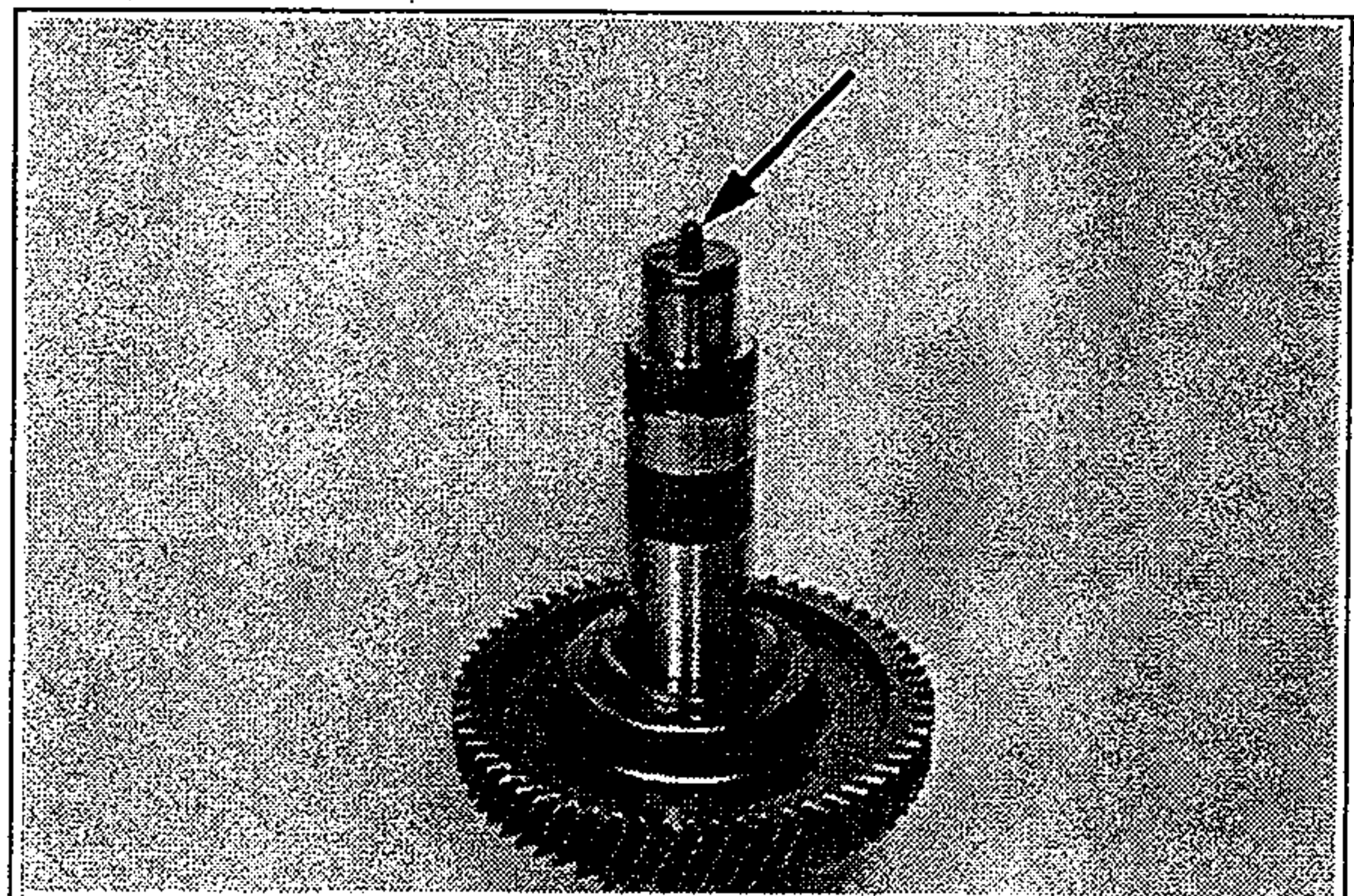
- ① Undercool shaft(About -80°C), heat gear (About $+120^{\circ}\text{C}$) and assemble it until contact is obtained.



- ② Fix gear axially by means of circlip.
Set of external pliers 5870 900 015



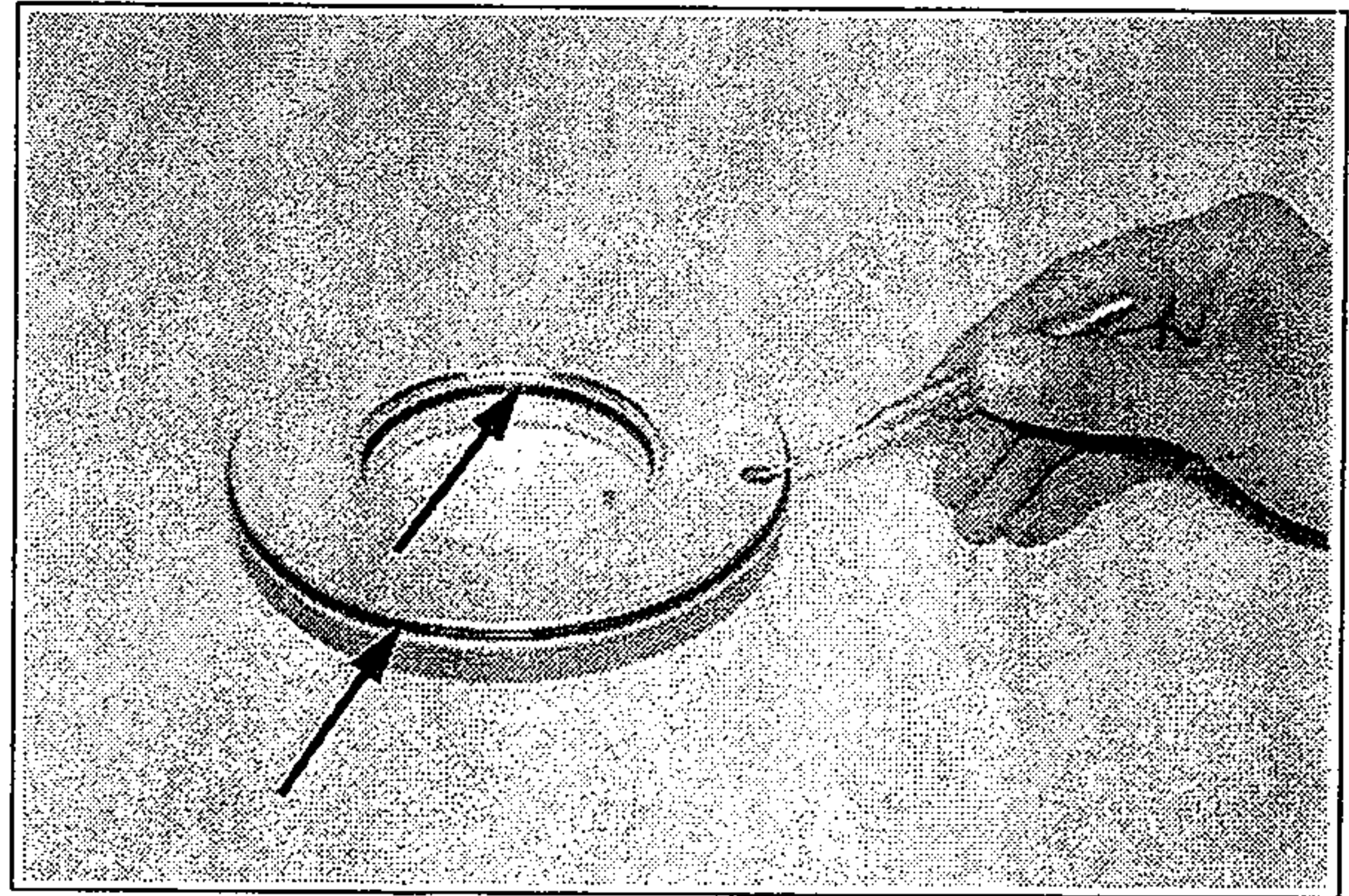
- ③ Install stud(Arrow).
※ Wet screw-in thread with loctite(Type No. 241).
• Torque limit(M10) : $1.7\text{kgf} \cdot \text{m}$ ($12.5\text{bf} \cdot \text{ft}$)



④ Check function of the purge valve.

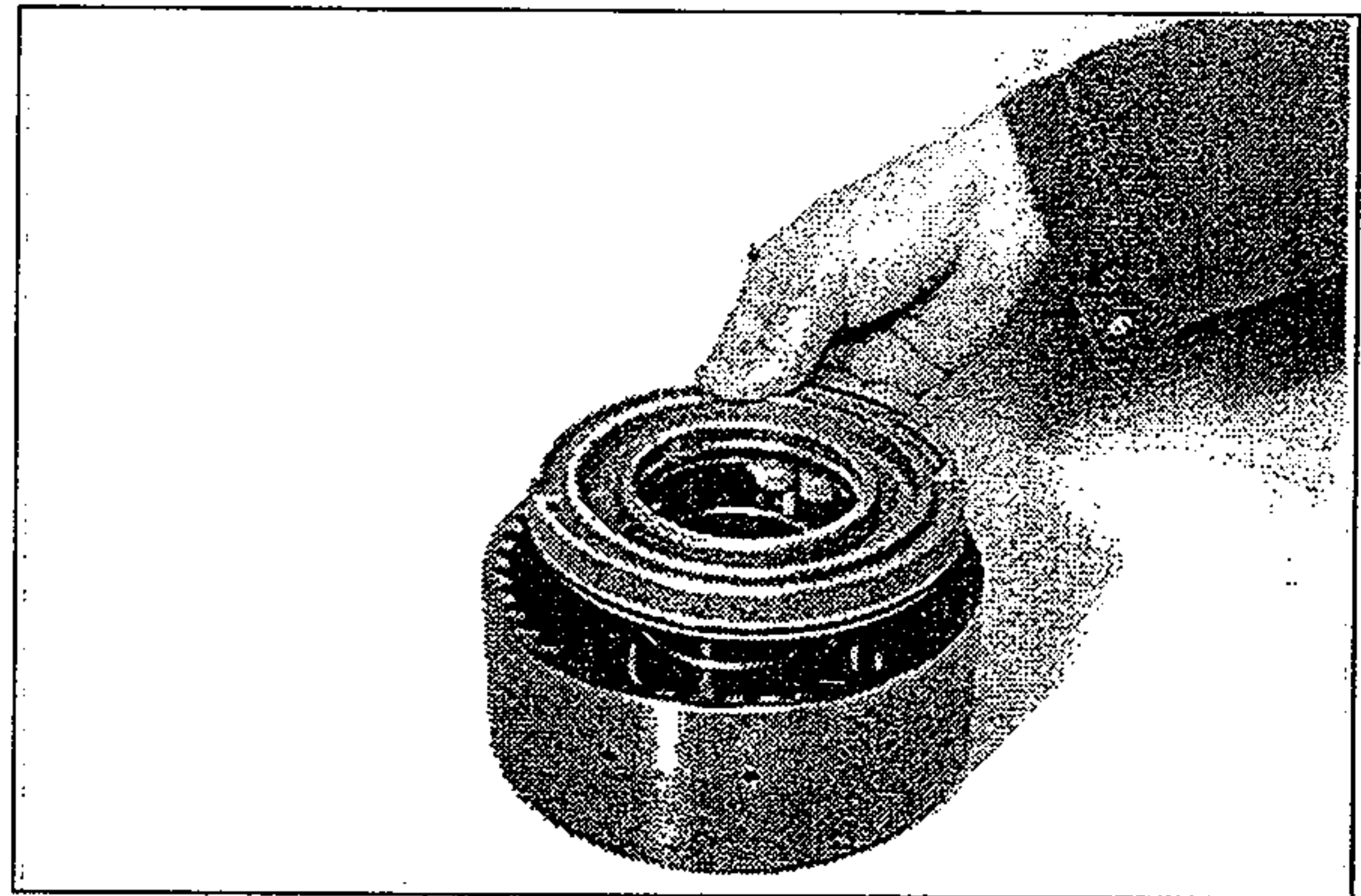
※ Ball must not stick, if necessary clean with compressed air.

Insert both O-ring(Arrow) scrollfree into the grooves of the piston and oil them.



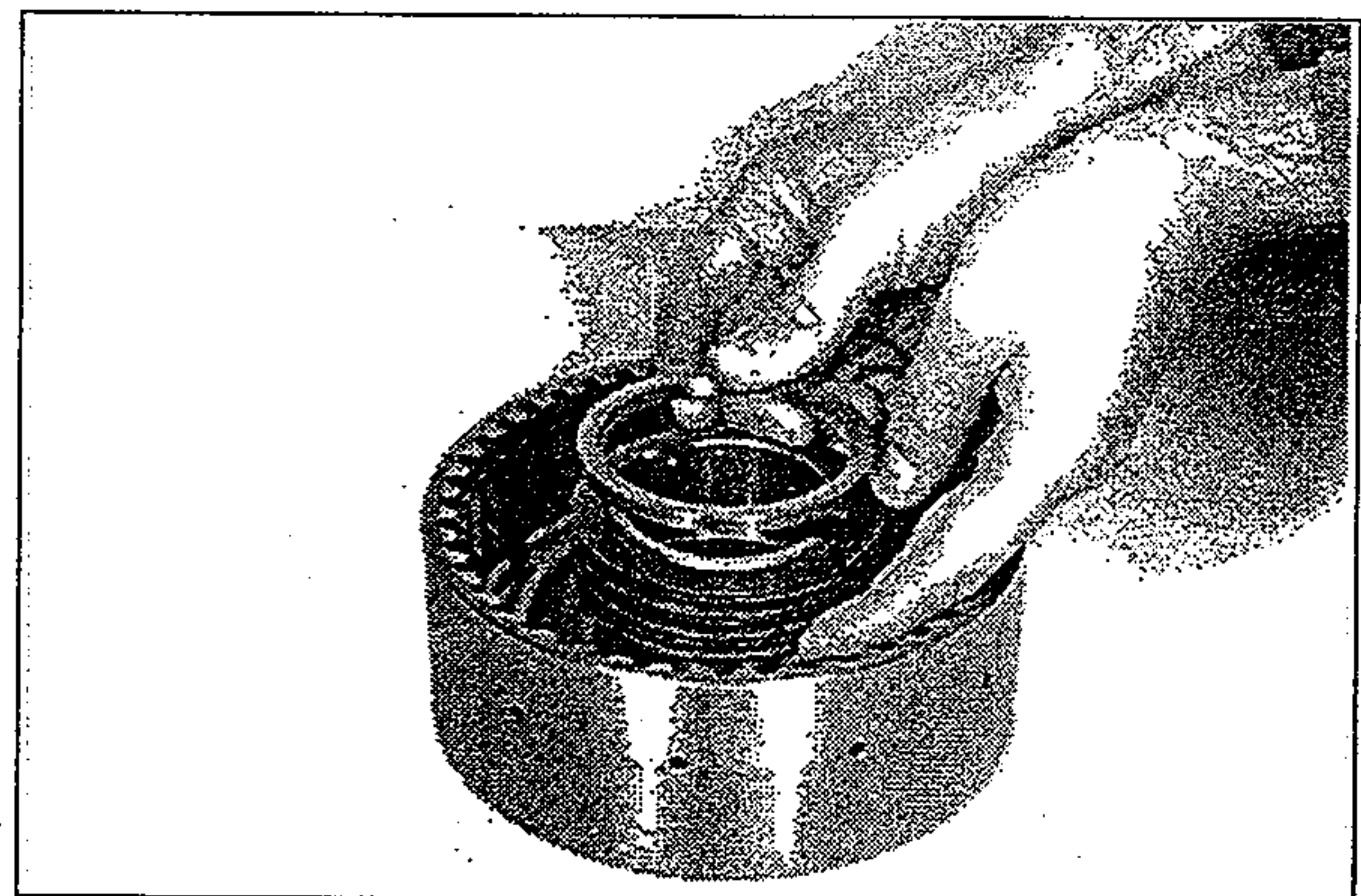
⑤ Introduce piston until contact is obtained.

※ Pay attention to the installation position, see figure.



⑥ Install cup-spring pack and guide ring.

※ Pay attention to the stacking of the cup springs, see the next draft.



⑦ Preload cup-spring pack and fix it by means of snap ring.

Assembly aid

5870 345 088

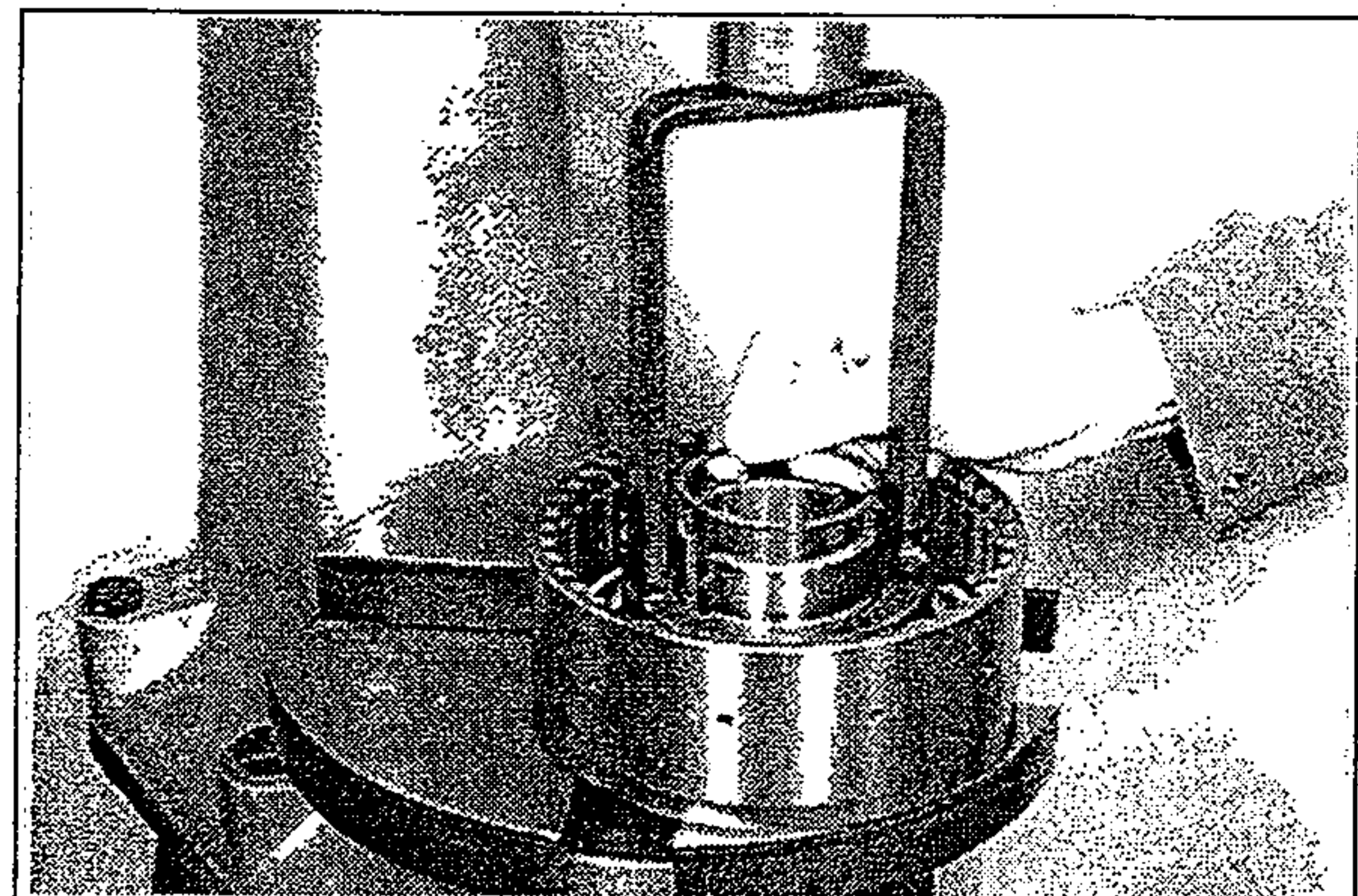


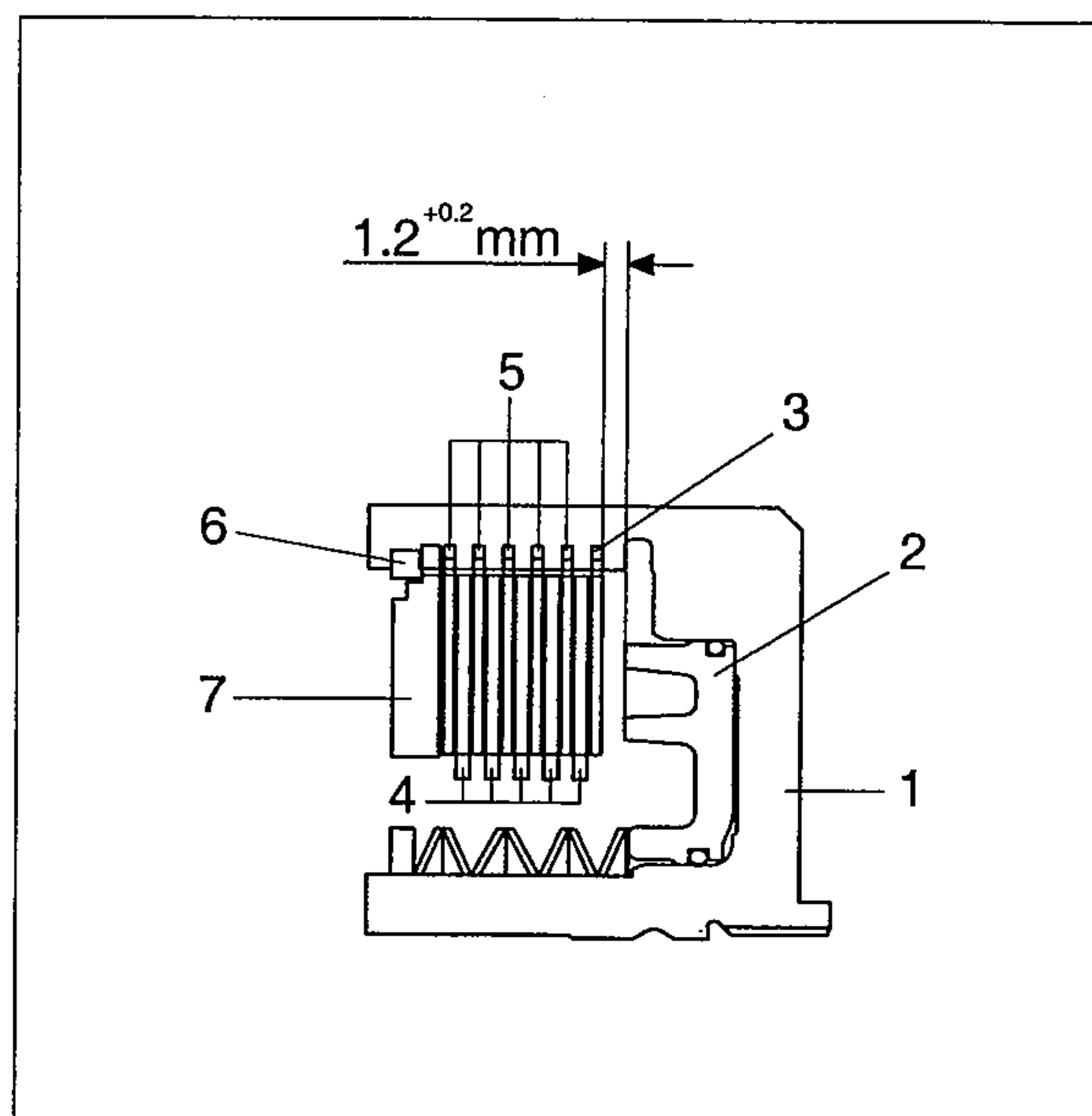
Plate pack K4

※ The following draft shows the installation position of the components.

- 1 Plate carrier
- 2 Piston
- 3 Outer plate-one side coated(1 piece)
- 4 Inner plates(5 pieces)
- 5 Outer plates-coated on both sides (5 pieces)
- 6 Snap ring(Optional s= 2.1~4.2mm)
- 7 End shim

Effective number of friction surfaces = 10

※ Install outer plate 3 with the uncoated side facing the piston.

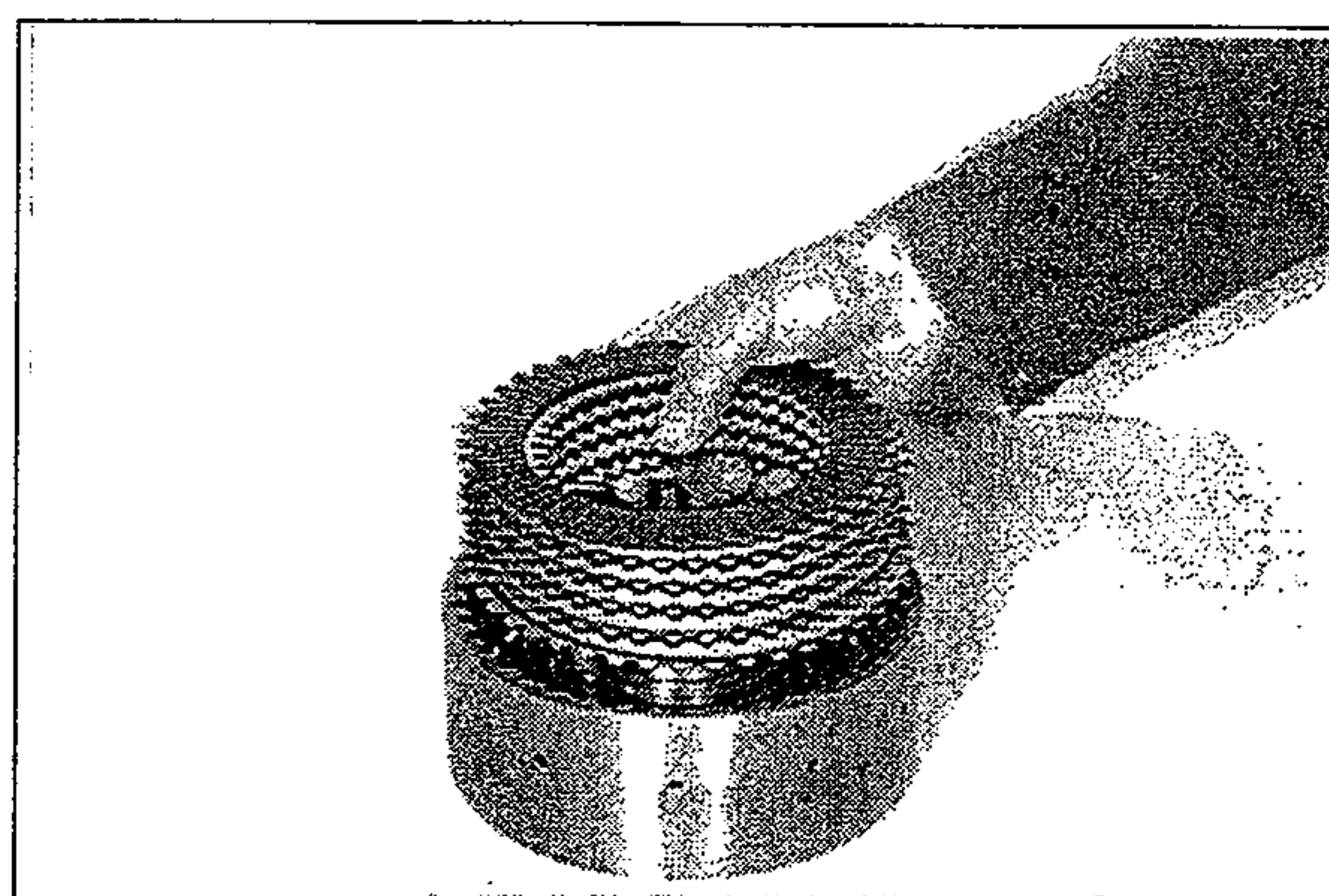


Adjust plate clearance = $1.2^{+0.2} \text{ mm}$

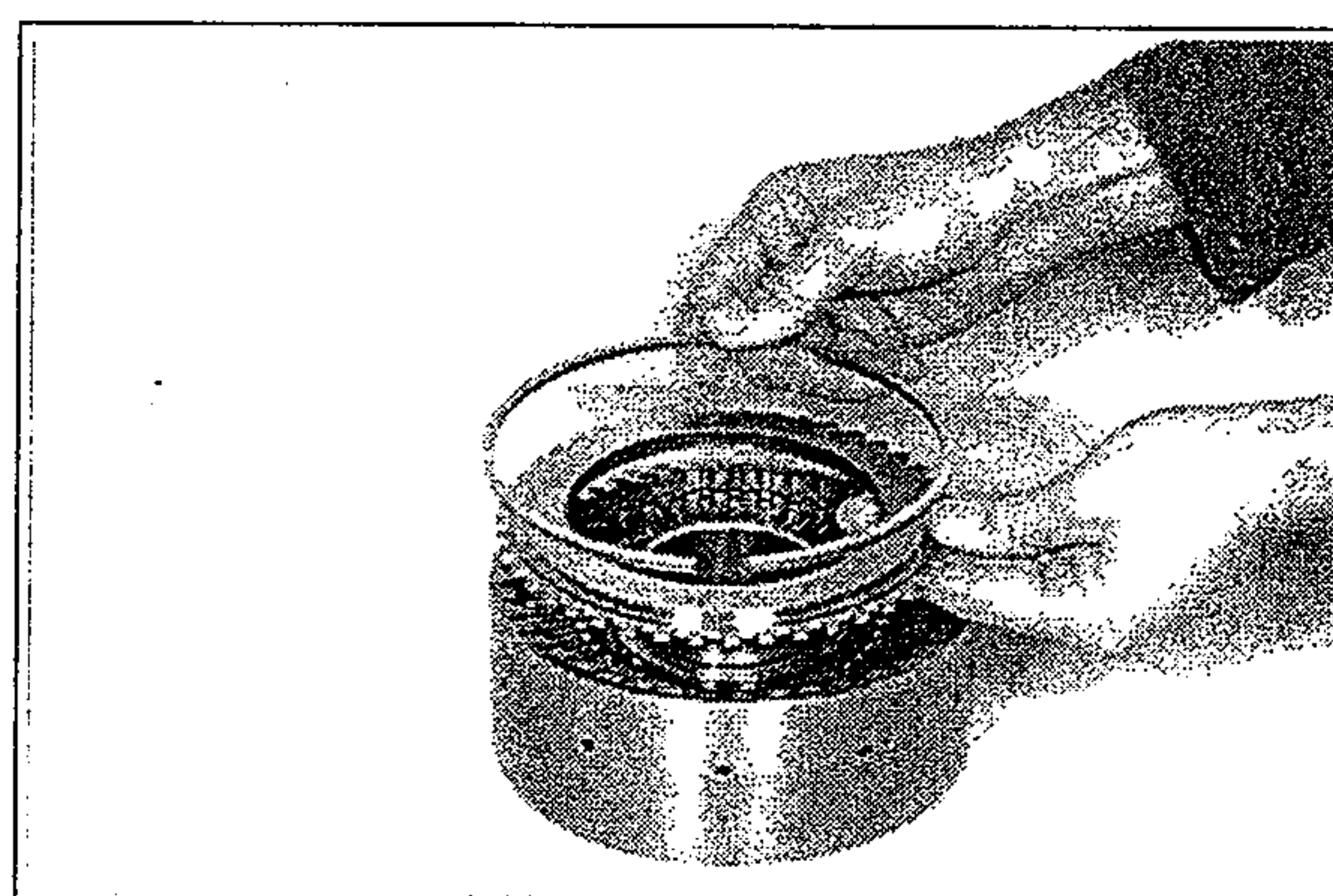
※ For the adjustment of the plate clearance are snap rings of different thickness available.

To ensure a faultless measuring result, install plates for the moment without oil.

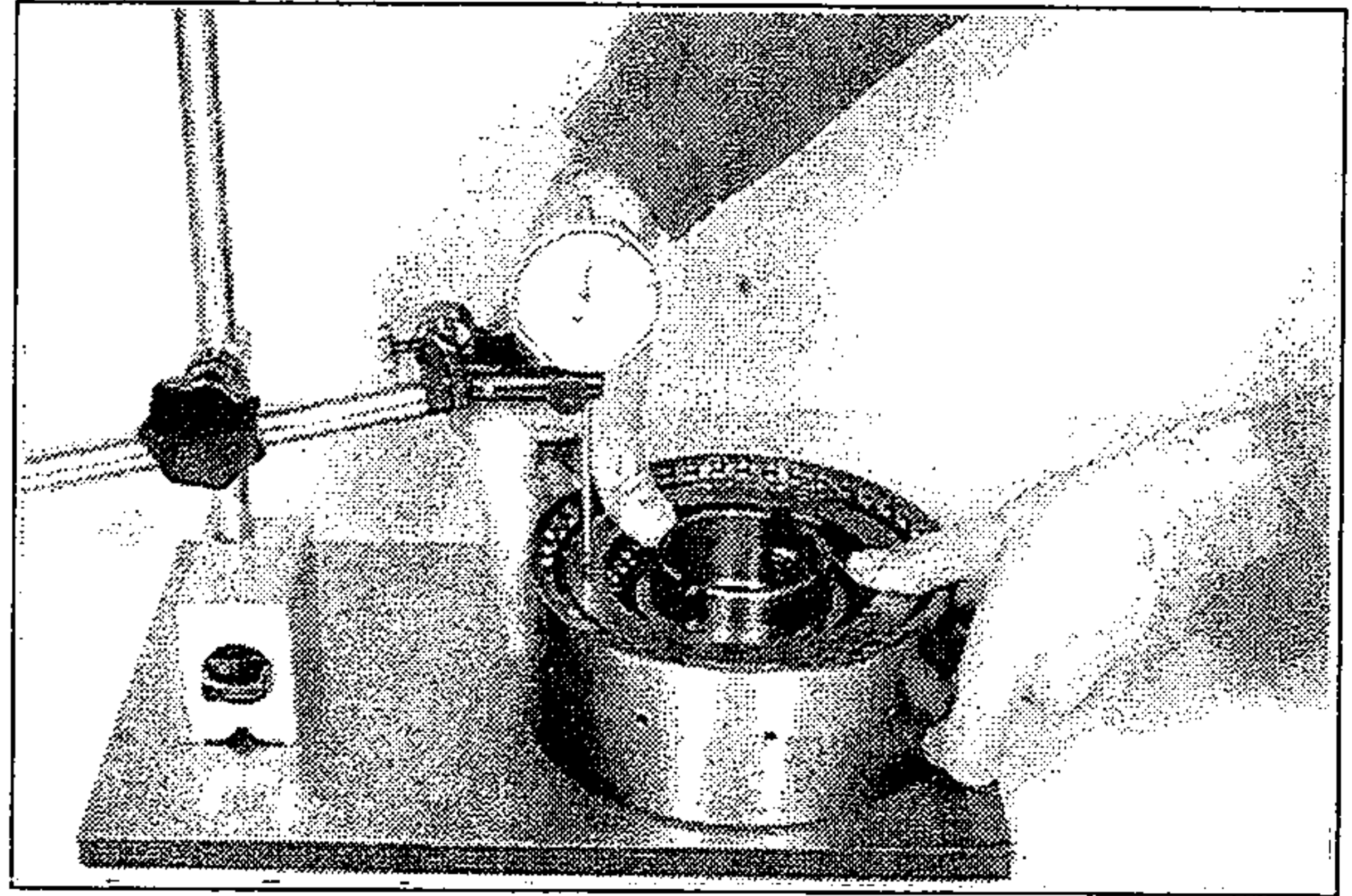
⑧ Introduce plate pack according to the draft.



⑨ Lay on end shim and squeeze snap ring in(e.g. s= 3.4mm).



- ⑩ Press on the end shim with about 100N (10kg), apply dial indicator and set it at zero.



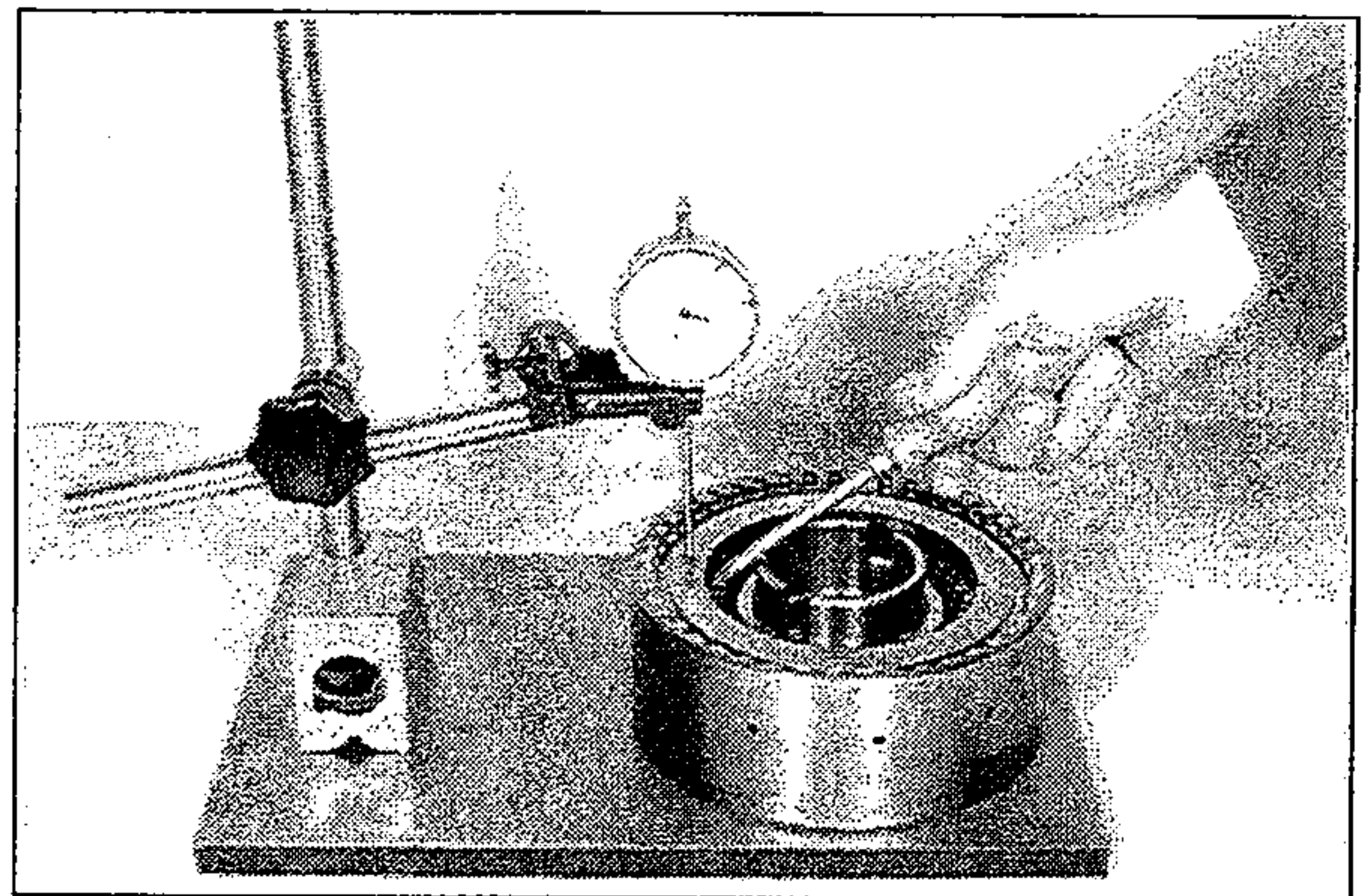
- ⑪ Now, push the end shim by means of screw driver against snap ring until contacts is obtained(Upward) and read plate clearance on the dial indicator.

※ In case of a deviation from the required plate clearance, correct with corresponding snap ring(s=2.1~4.2mm). After the adjustment of the plate clearance has been carried out, remove the plate pack, oil plates and install it again.

※ Use oil Dexron- II D, II /Mercon-M.

Magnetic stand 5870 200 055

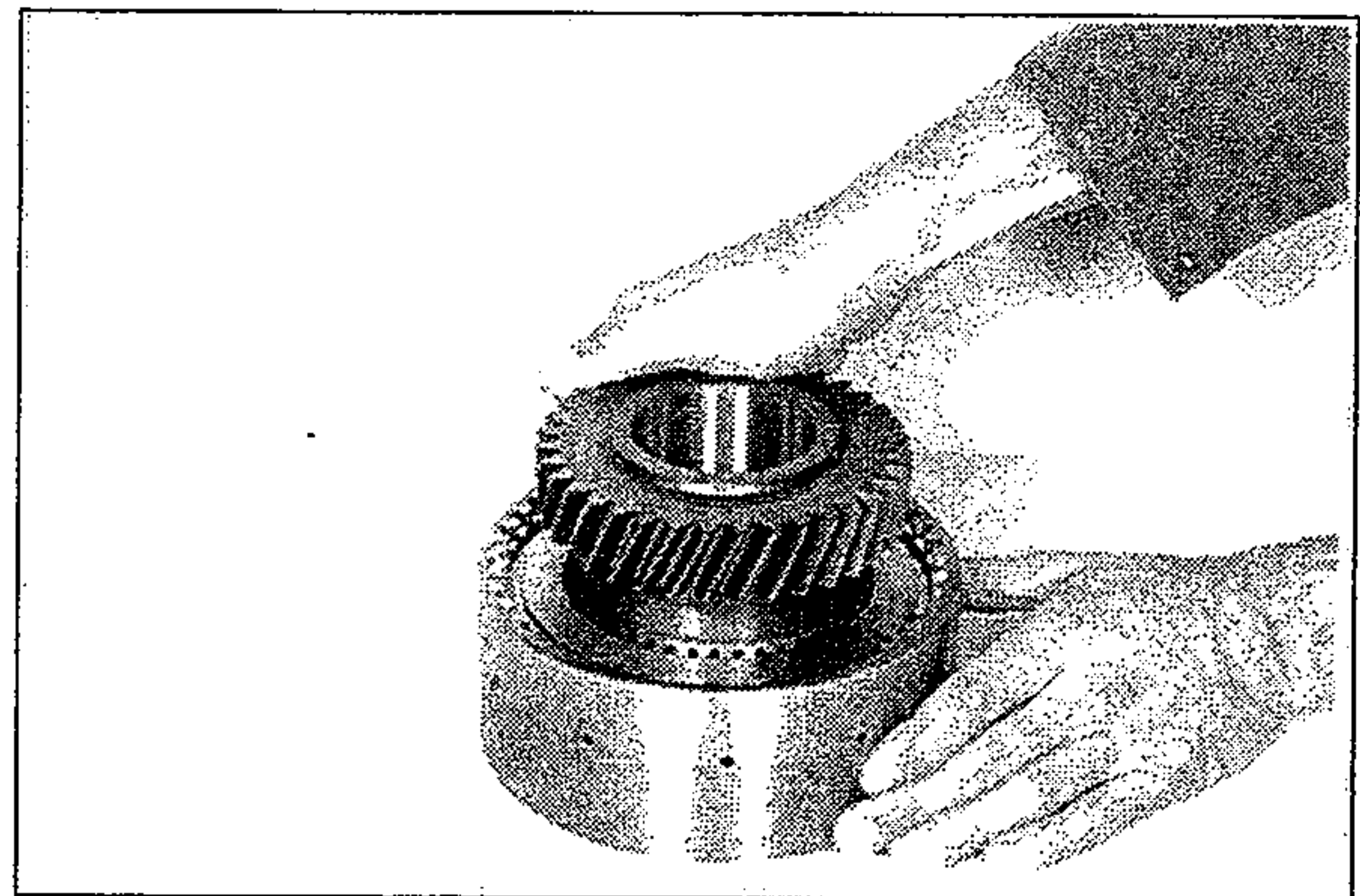
Dial indicator 5870 200 057



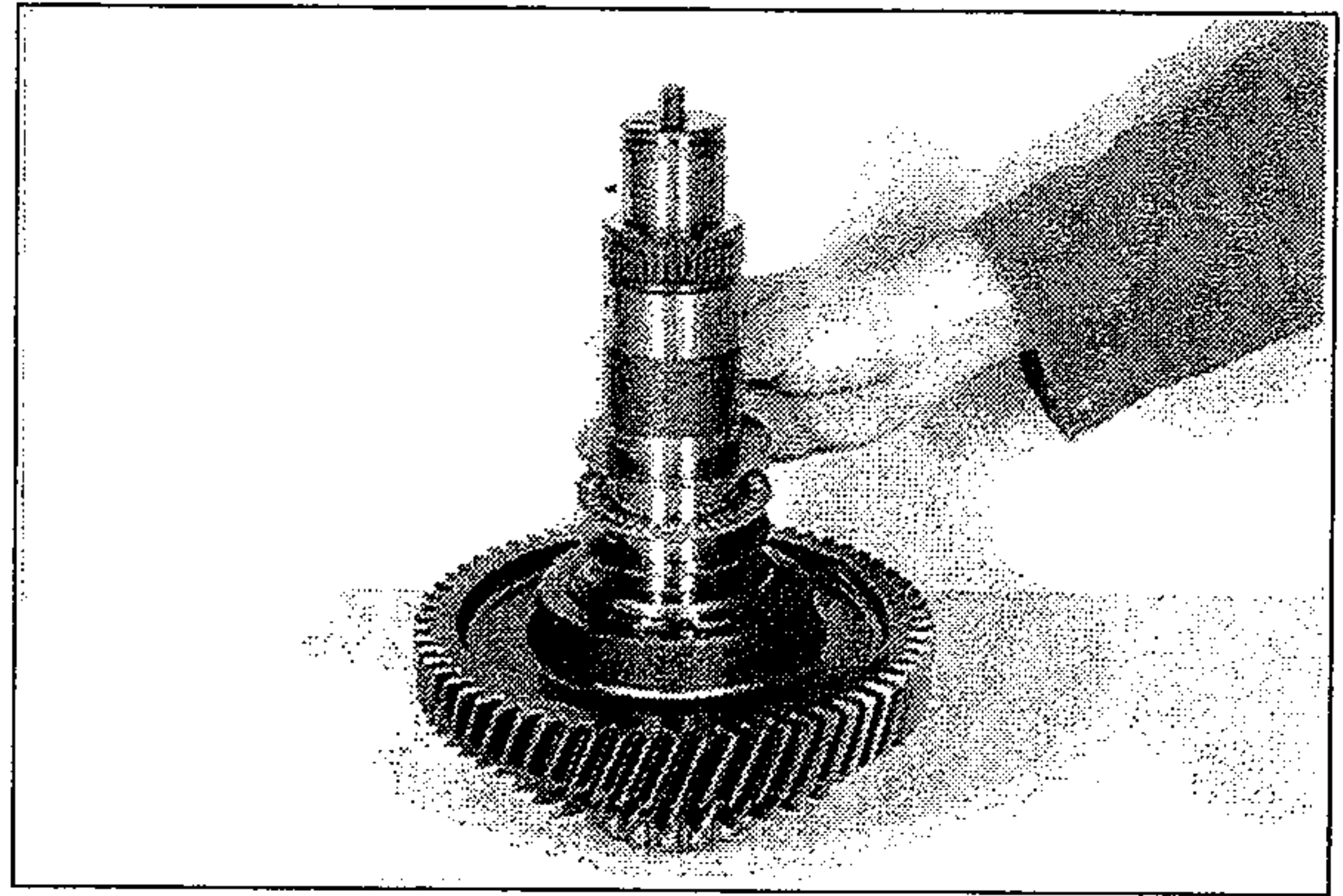
- ⑫ Introduce idler gear until all inner plates are accommodated.

※ This step makes the later assembling of the idler gear easier.

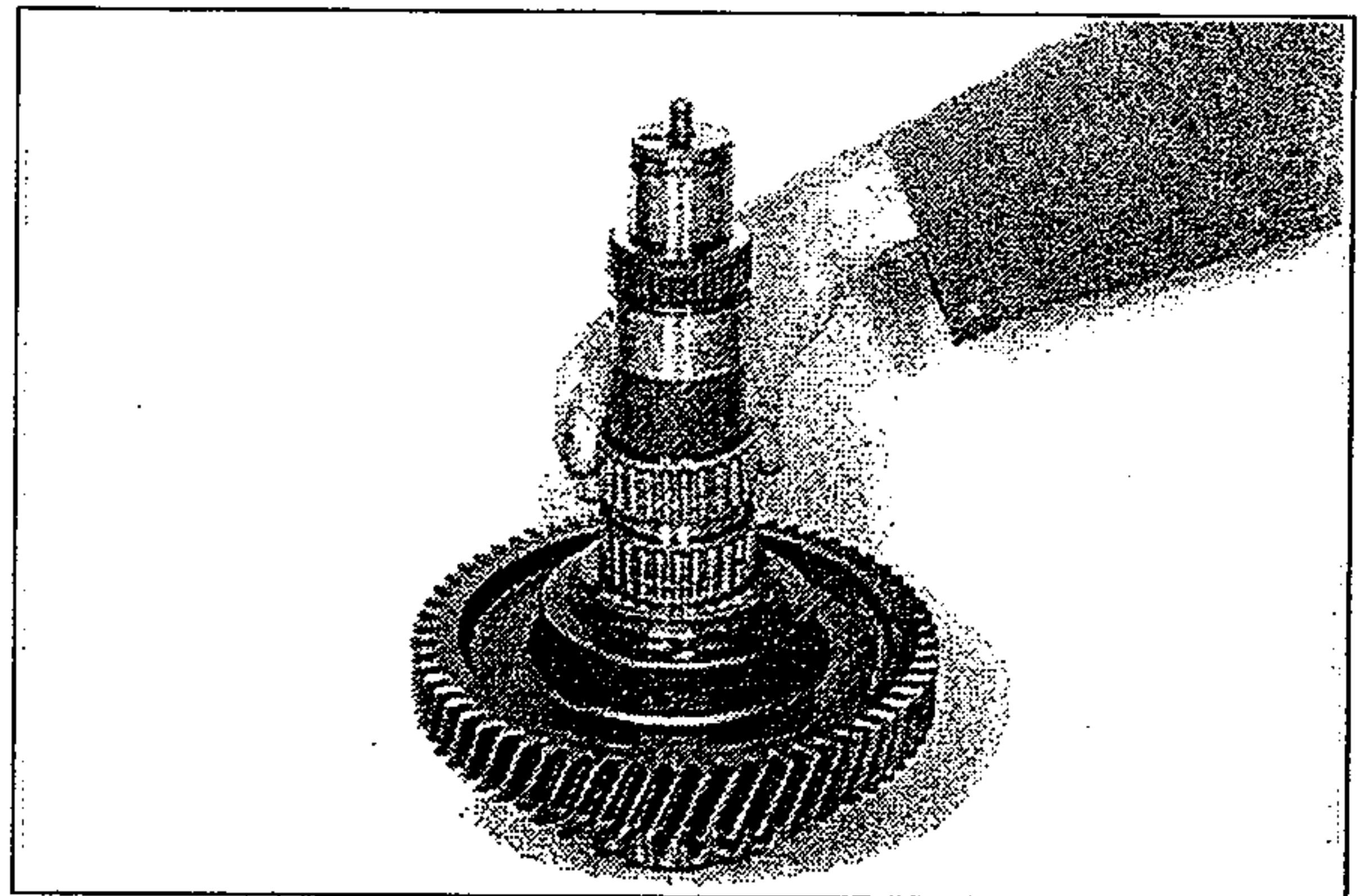
Now, remove idler gear again.



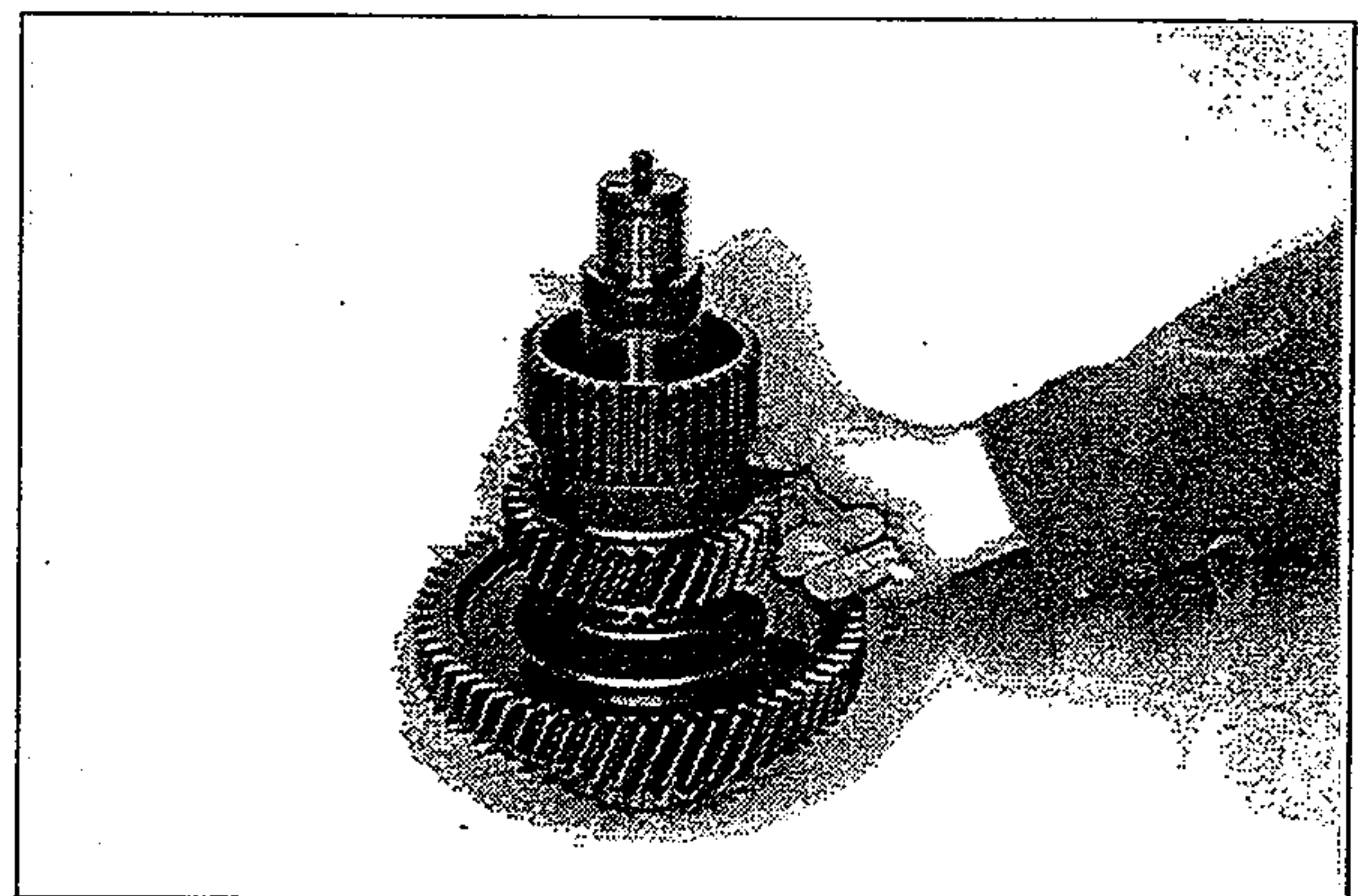
- ⑬ Assemble both axial washers as well as needle case.
- ※ Upper and lower axial washer have the same thickness($55 \times 78 \times 1$).



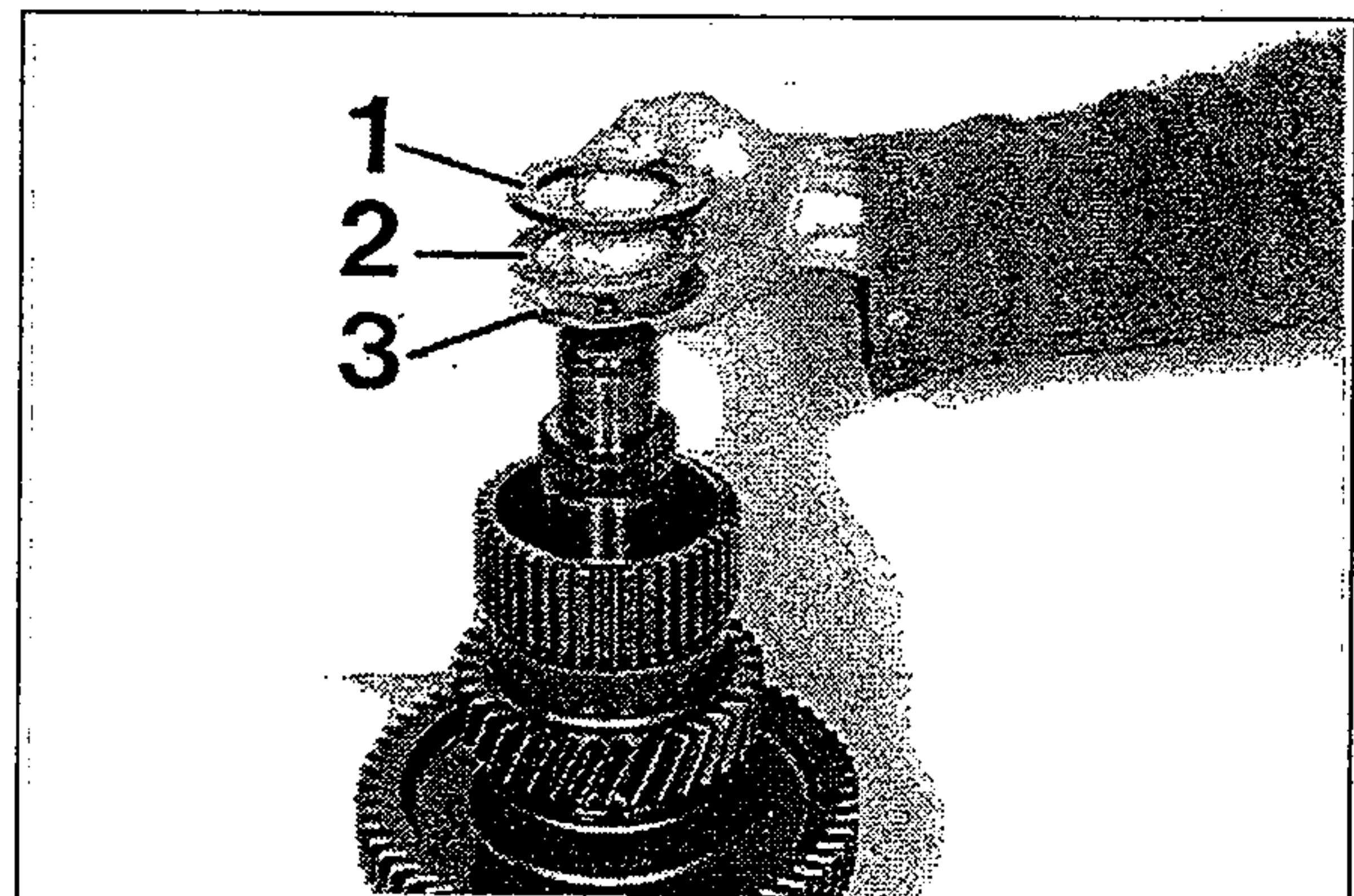
- ⑭ Assemble both needle bearings.



- ⑮ Assemble idler gear.



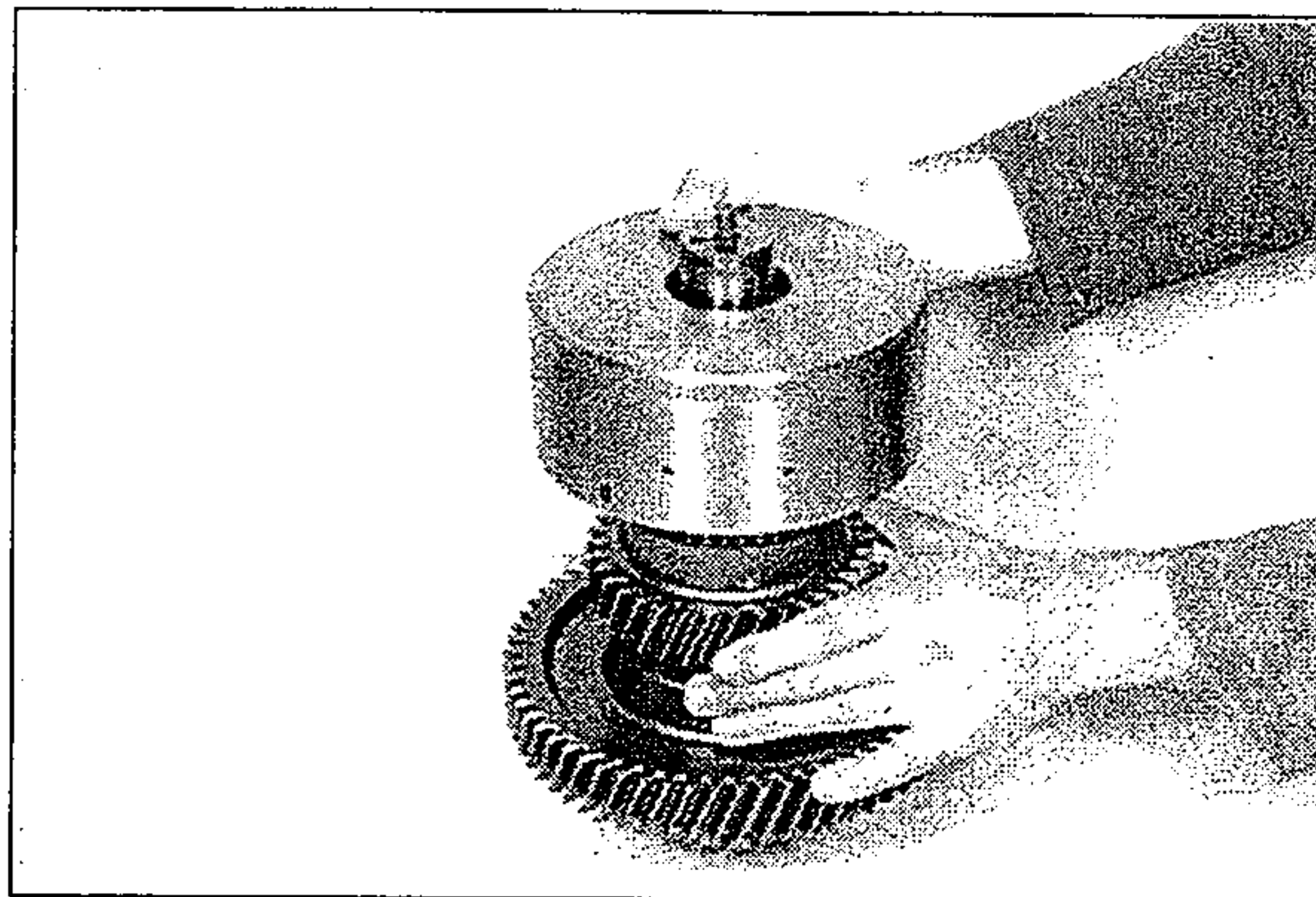
- ⑯ Assemble axial washer 3($55 \times 78 \times 1$), needle cage 2 and running disk 1($55 \times 78 \times 5$).
- ※ Install running disk 1, with the chamfer facing the needle cage.



- ⑰ Heat inner diameter of the plate carrier
(About 120°C).

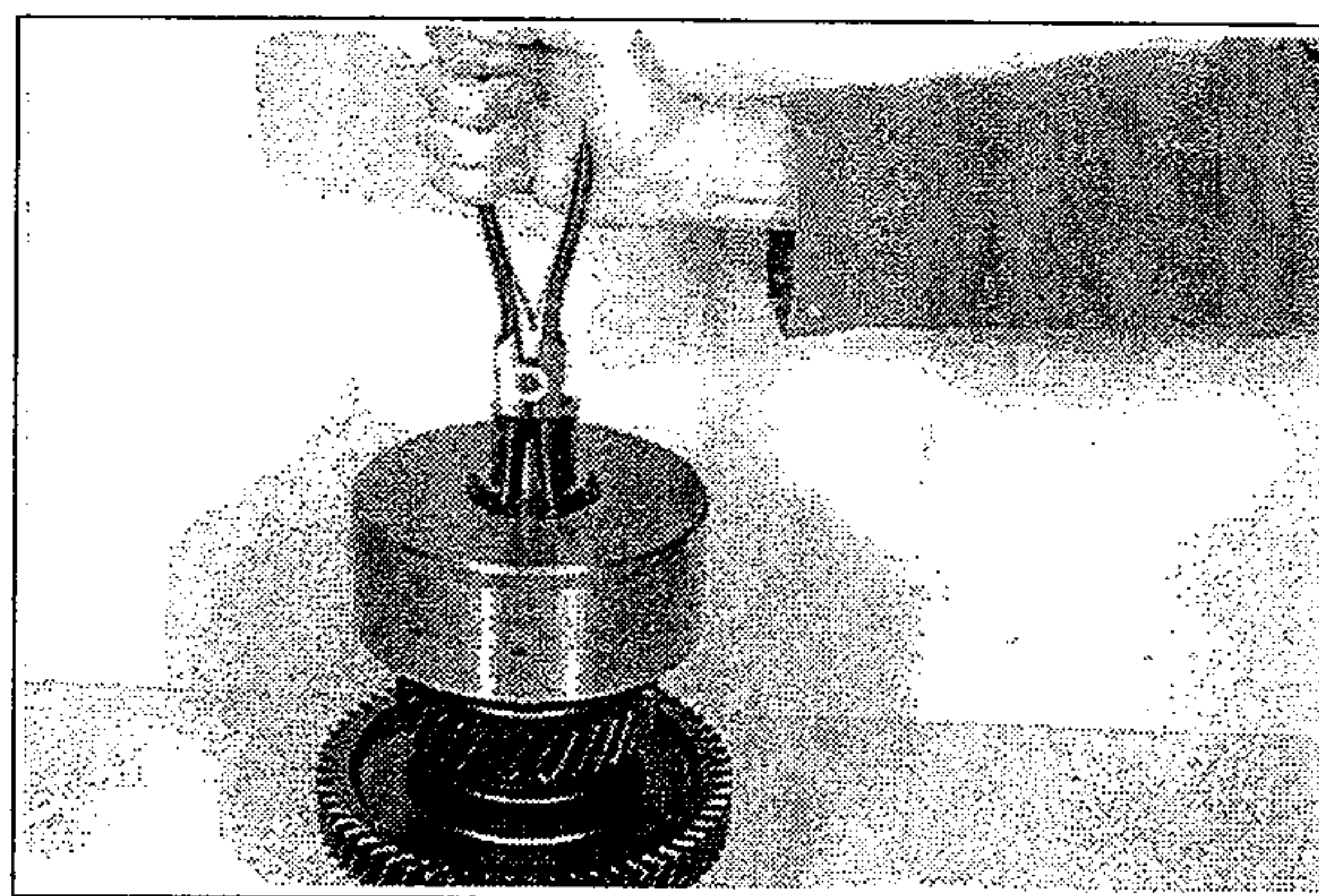
Assemble preassembled plate carrier
until all inner plates are accommodated.

※ Use safety gloves.



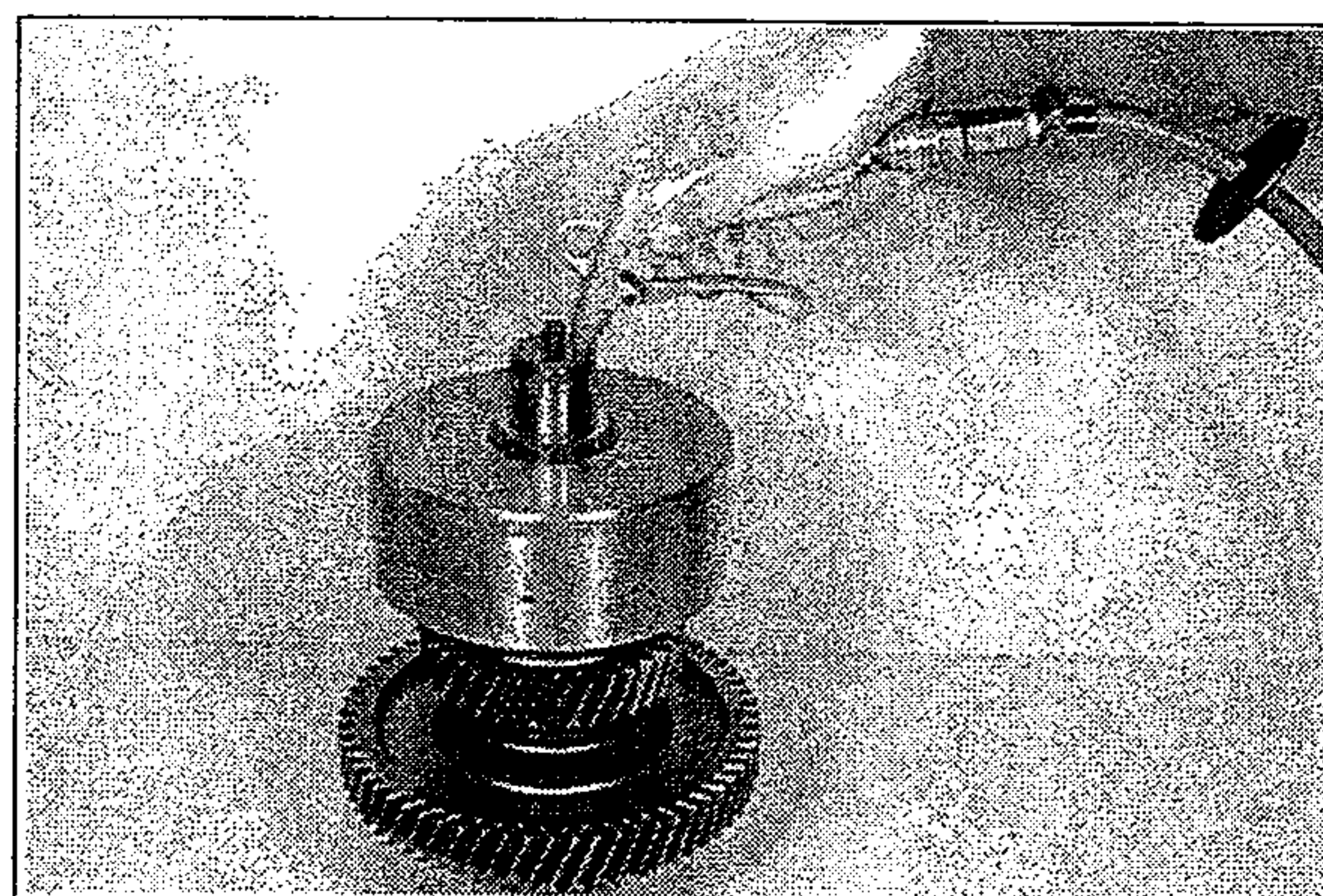
- ⑱ Fix plate carrier axially by means of
circlip.

Set of external pliers 5870 900 015



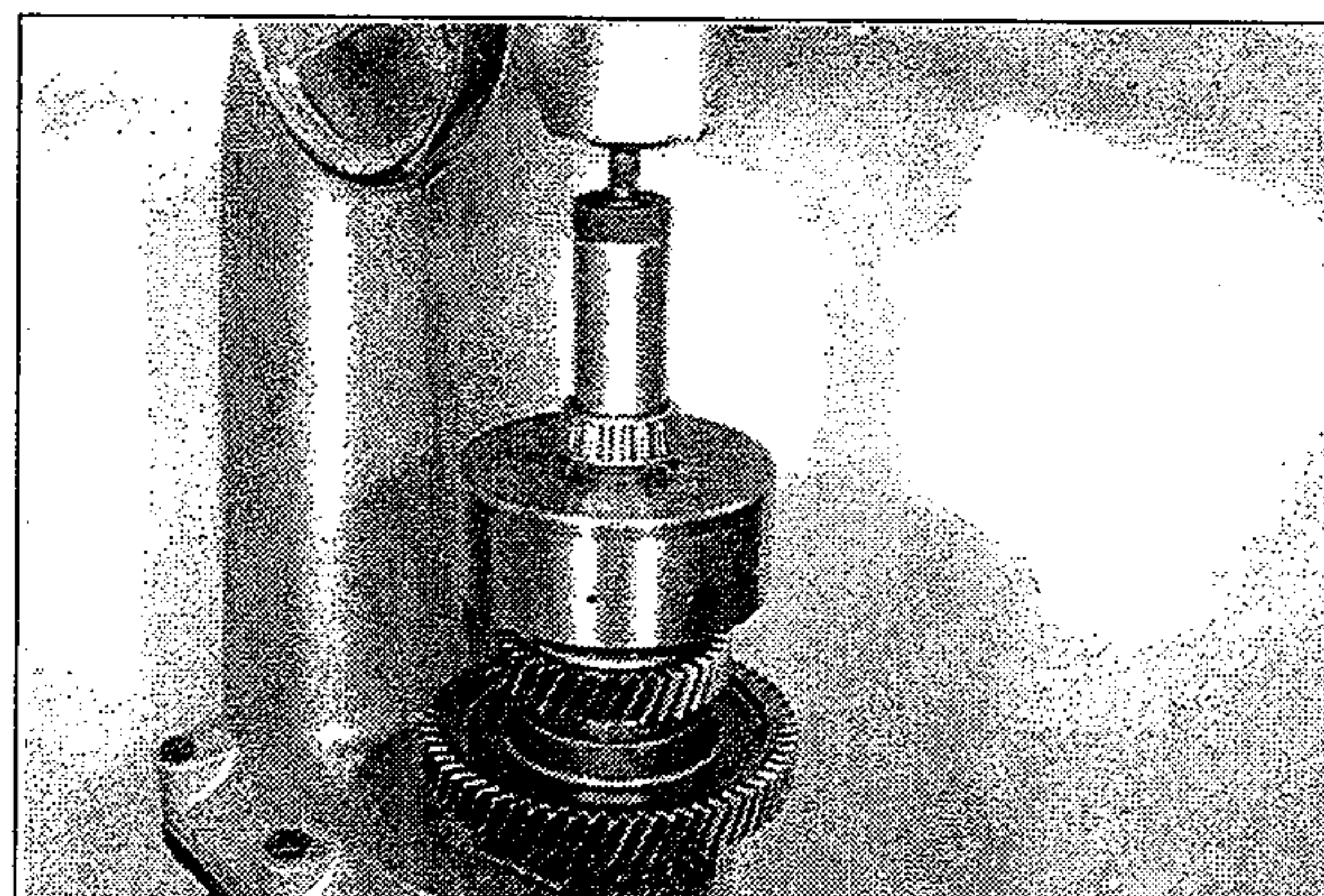
- ⑲ Check function of the clutch by means of
compressed air.

※ At correctly installed components, the
closing respectively opening of the clutch
is clearly audible.

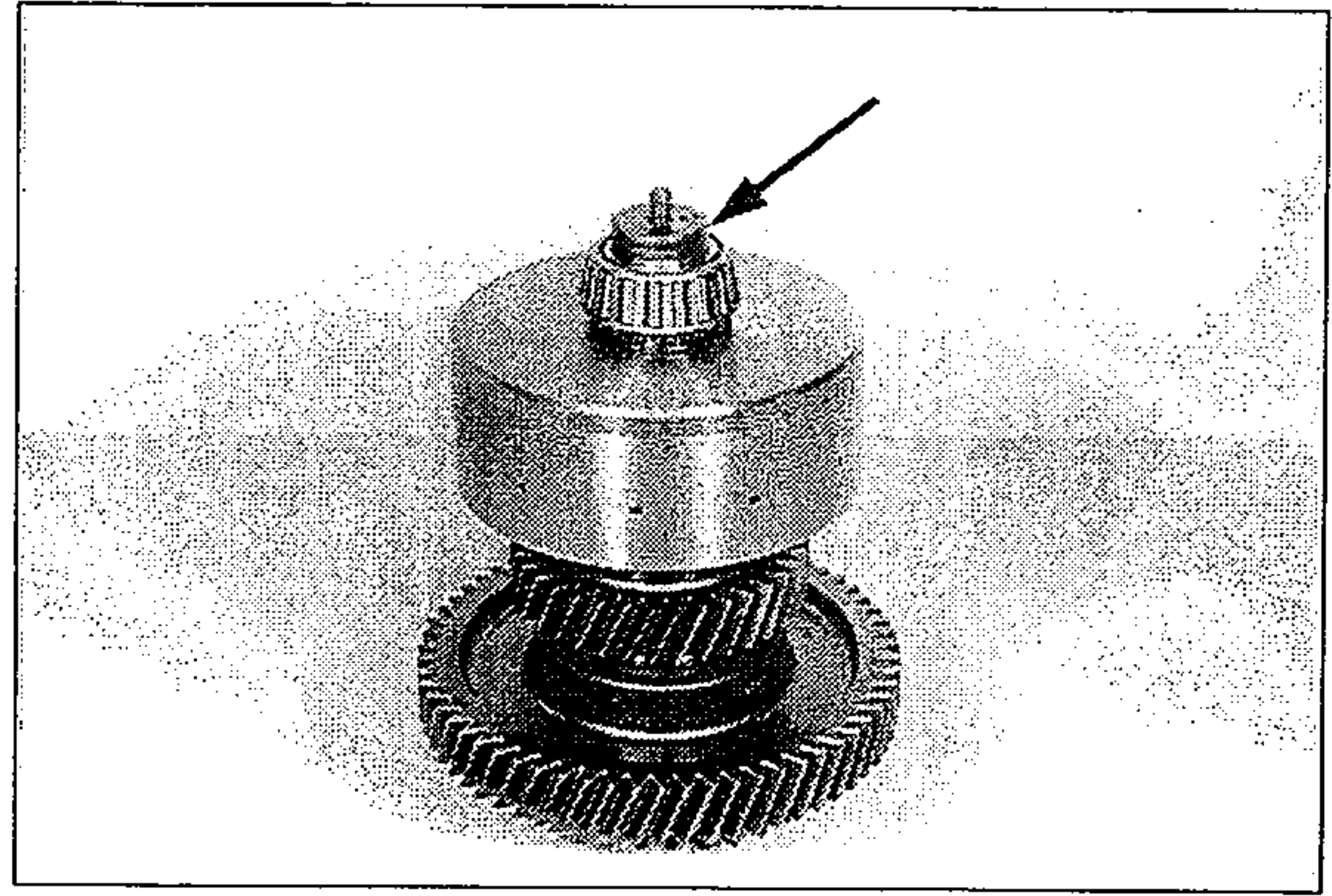


- ⑳ Press tapered roller bearing against
shoulder.

Install opposite tapered roller bearing.

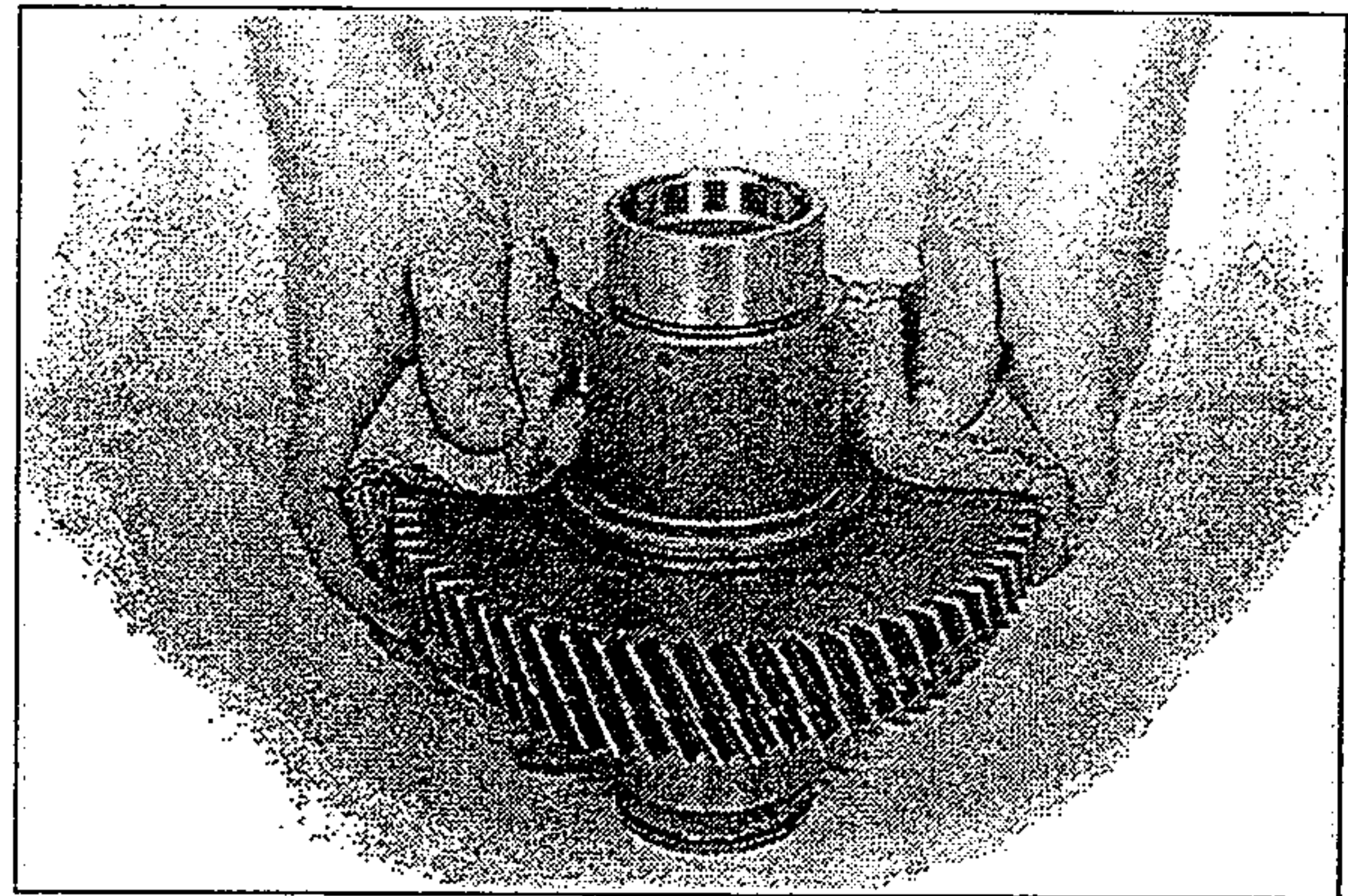


- ② Squeeze rectangular ring in(Arrow) and let it snap in.
Install opposite rectangular ring.

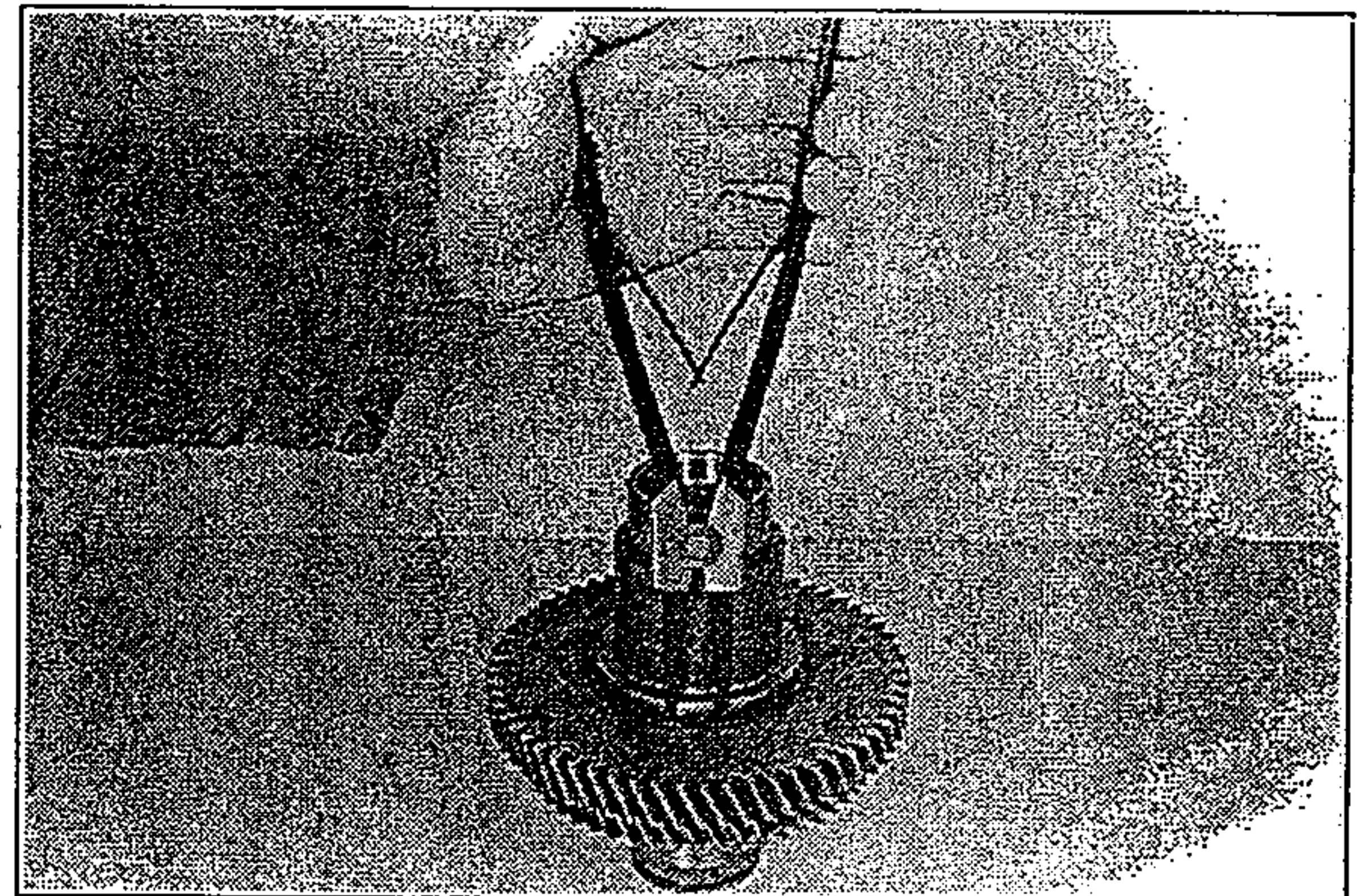


(5) Preassemble drive shaft

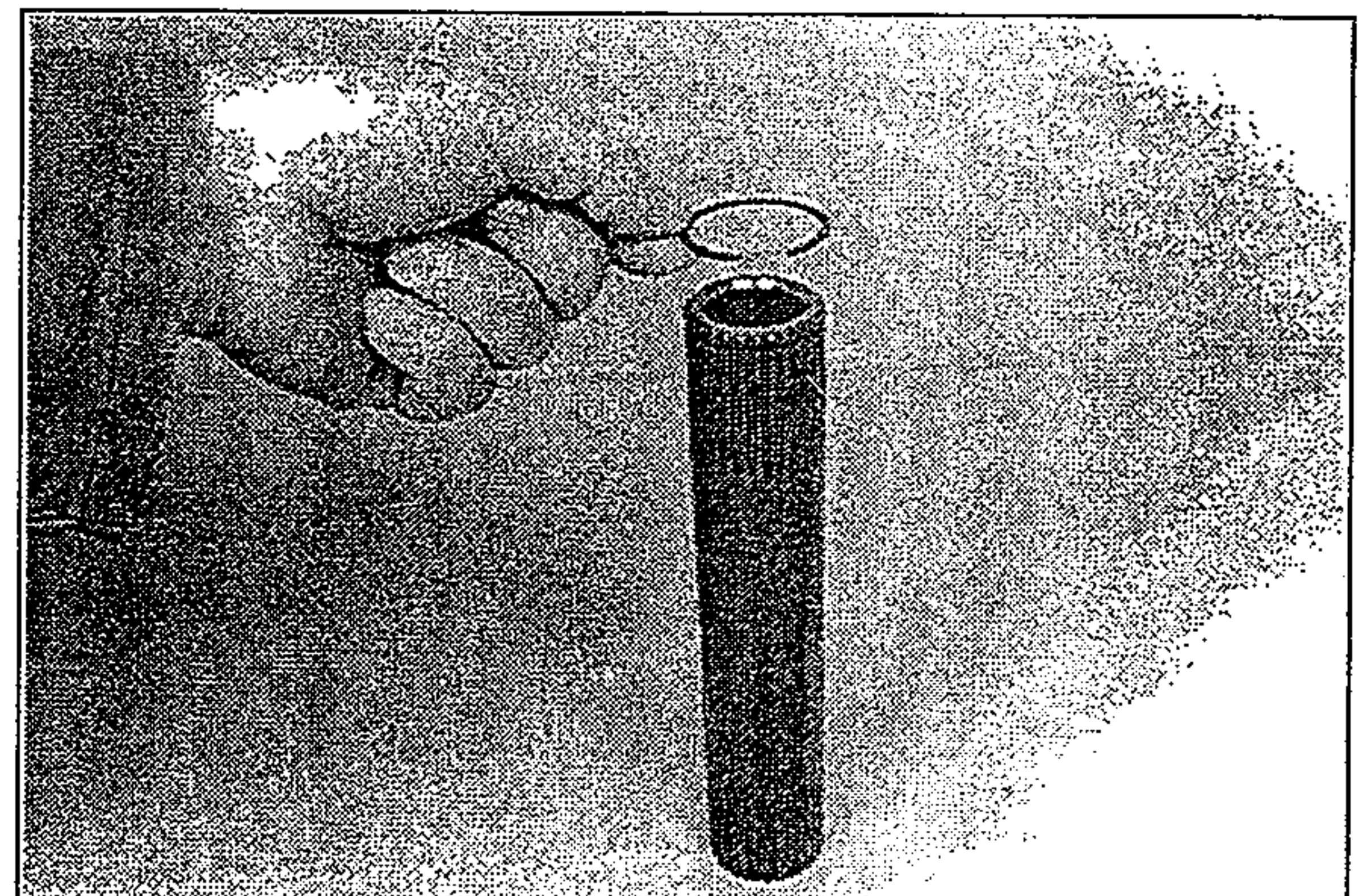
- ① Undercool the drive shaft(About -80°C), heat the gear(About $+120^{\circ}\text{C}$) and assemble it until contact is obtained.



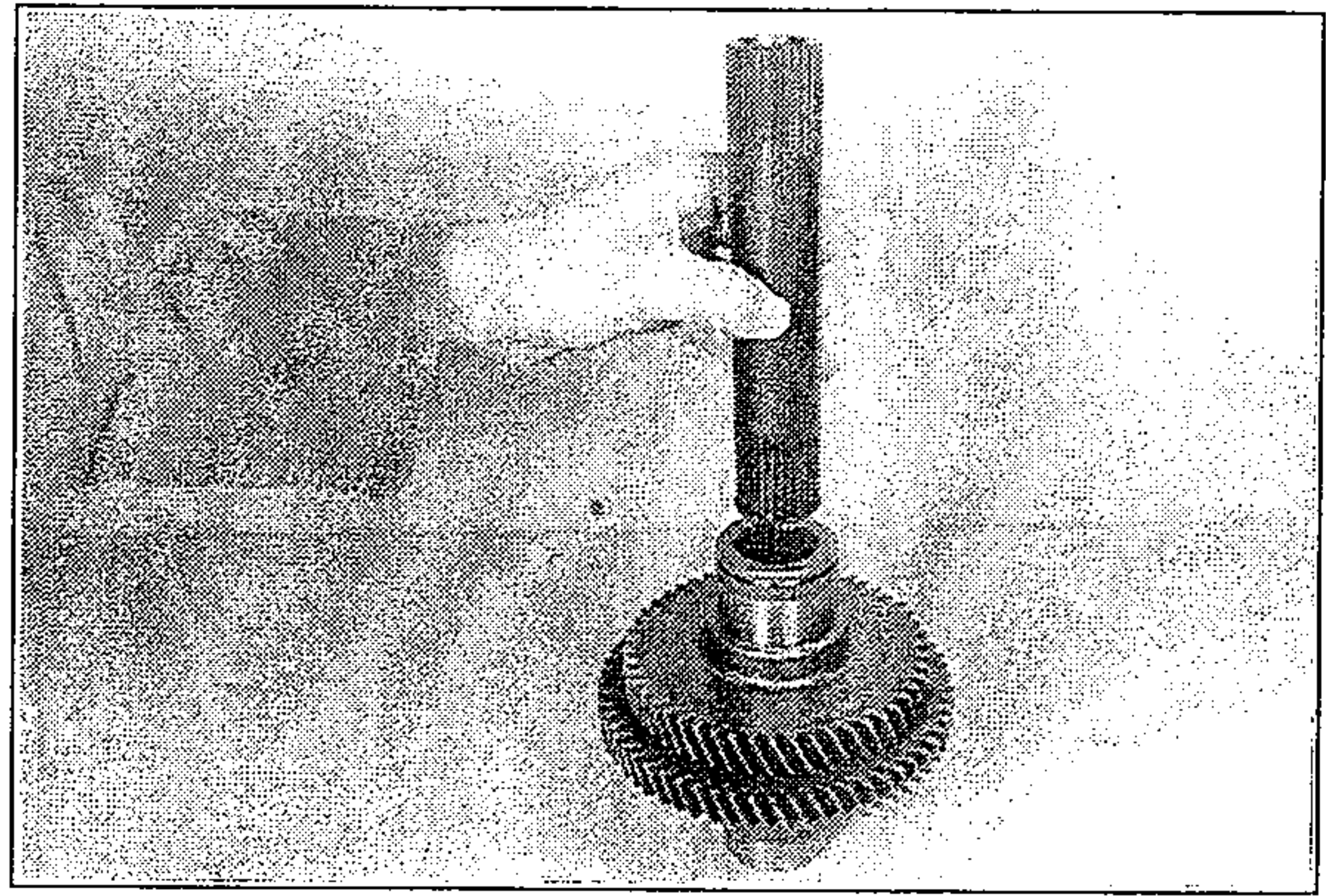
- ② Fix gear axially by means of circlip.



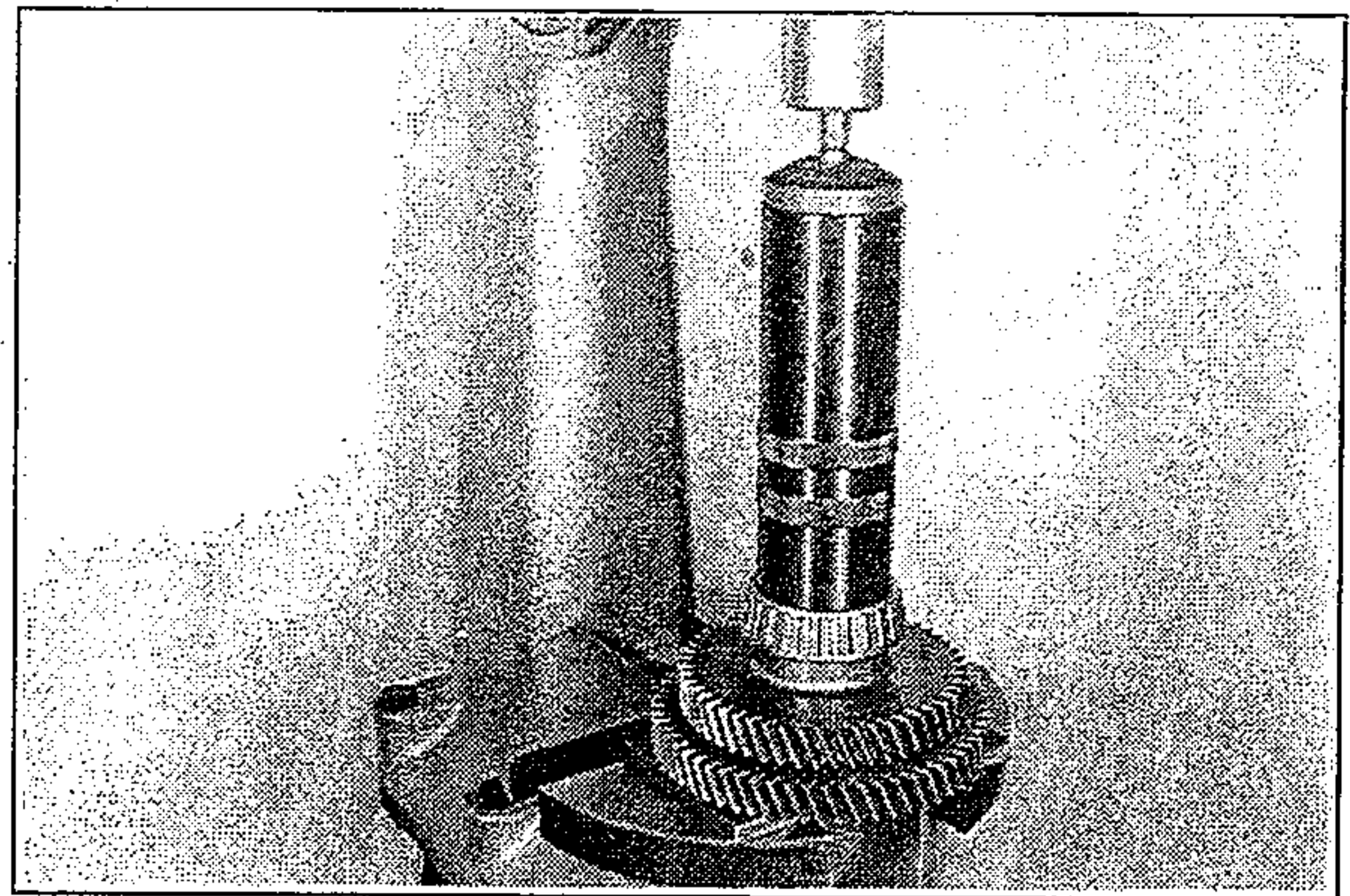
- ③ Squeeze snap ring into groove of the turbine shaft.



- ④ Introduce turbine shaft until the snap ring snaps into the groove of the drive shaft
turbine shaft is axially fixed.

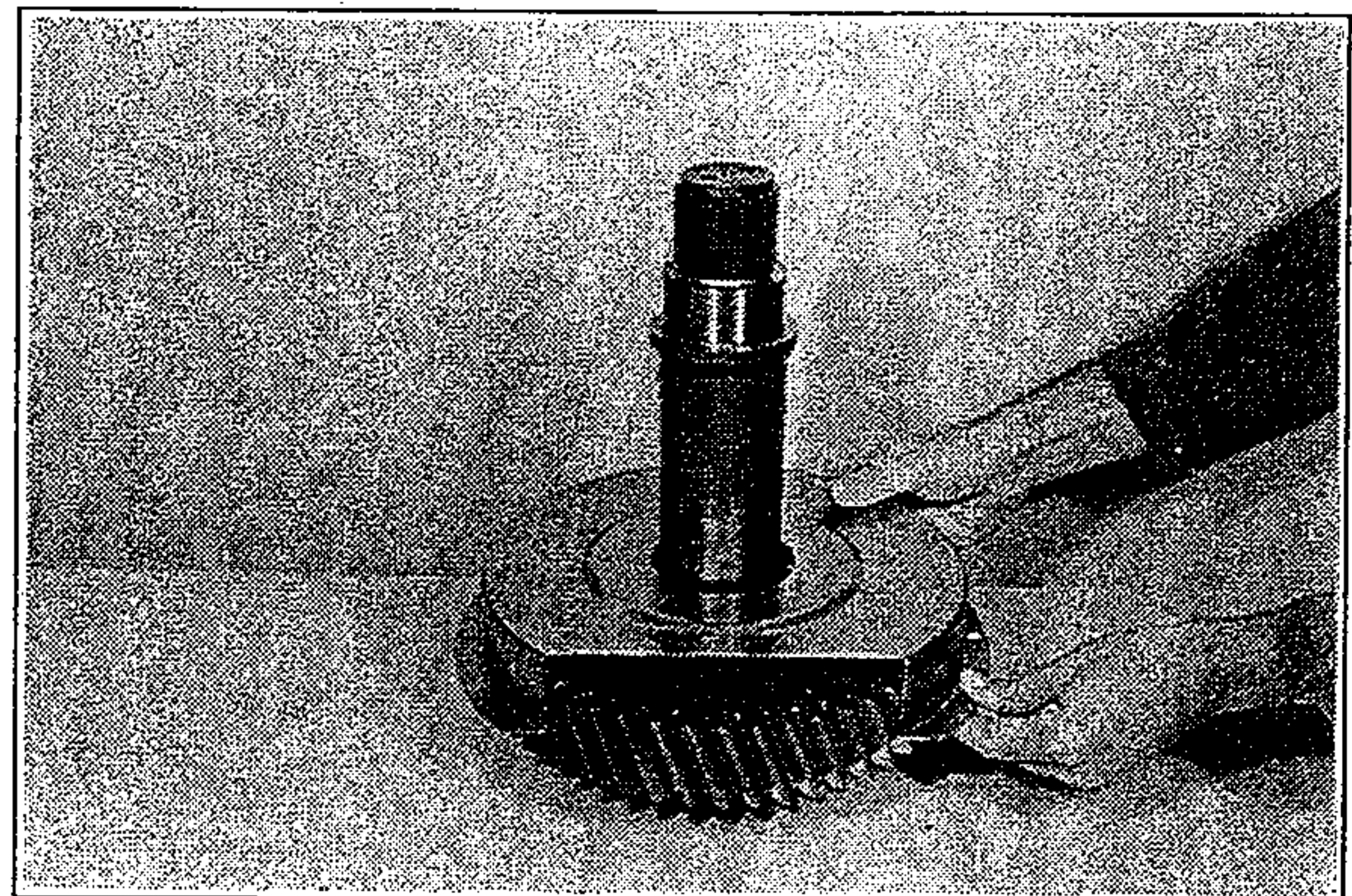


- ⑤ Press tapered roller bearing against shoulder.
Now, squeeze rectangular ring into the groove of the drive shaft and let it snap in.
Install opposite tapered roller bearing.

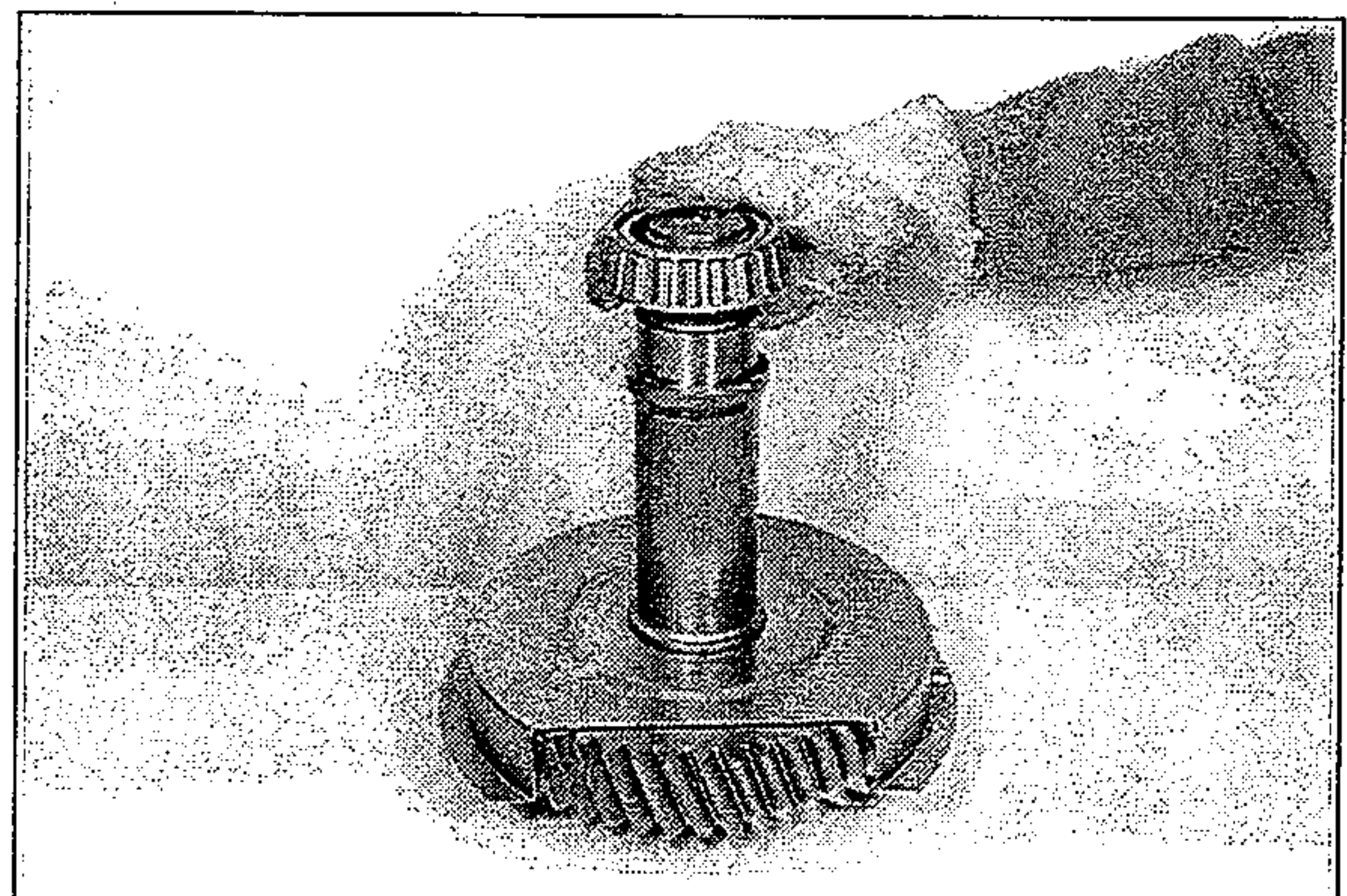


(6) Preassemble and install output

- ① Lay on screening plate



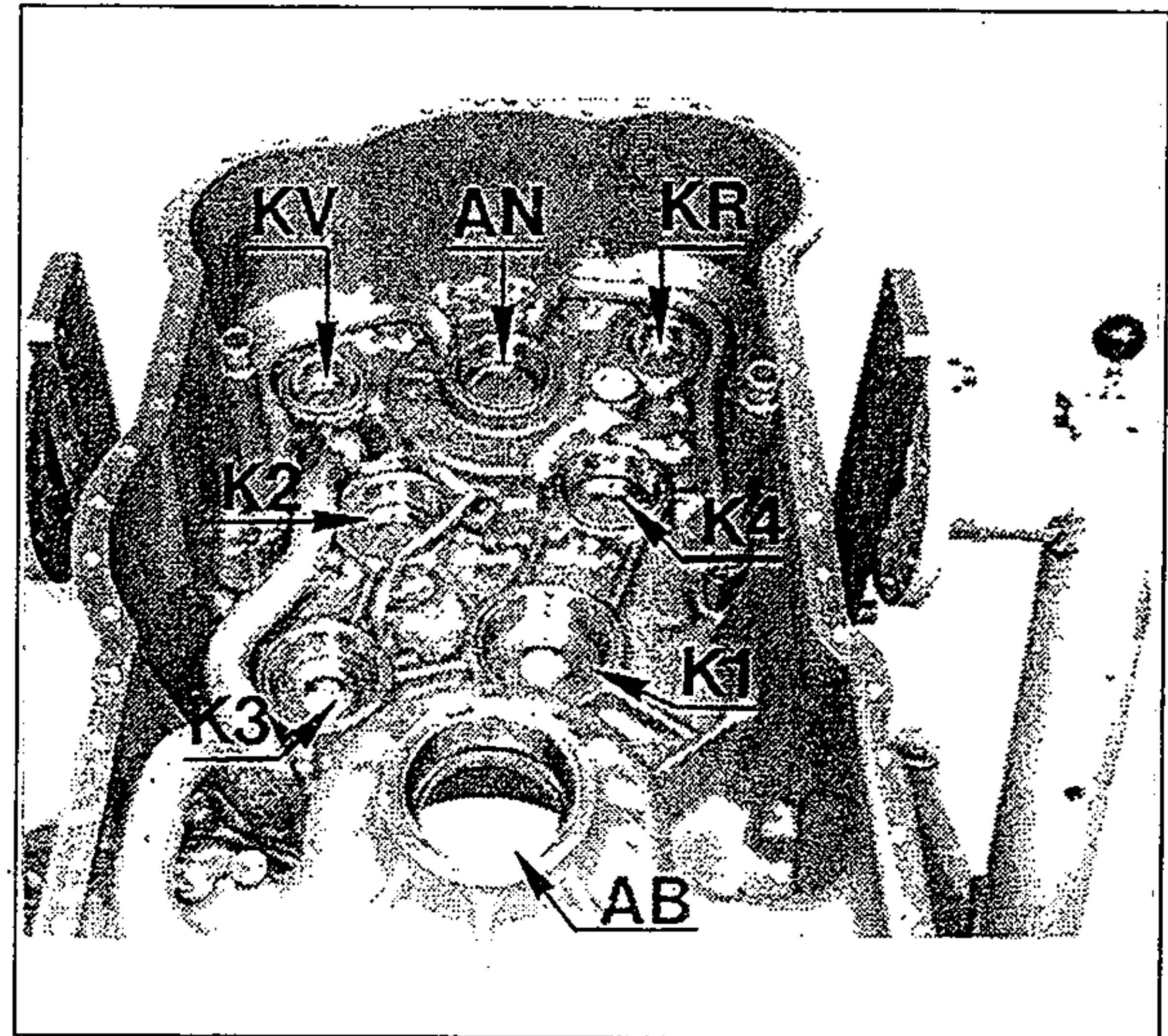
- ② Heat tapered roller bearing and assemble it until contact is obtained.
Install opposite tapered roller bearing accordingly.



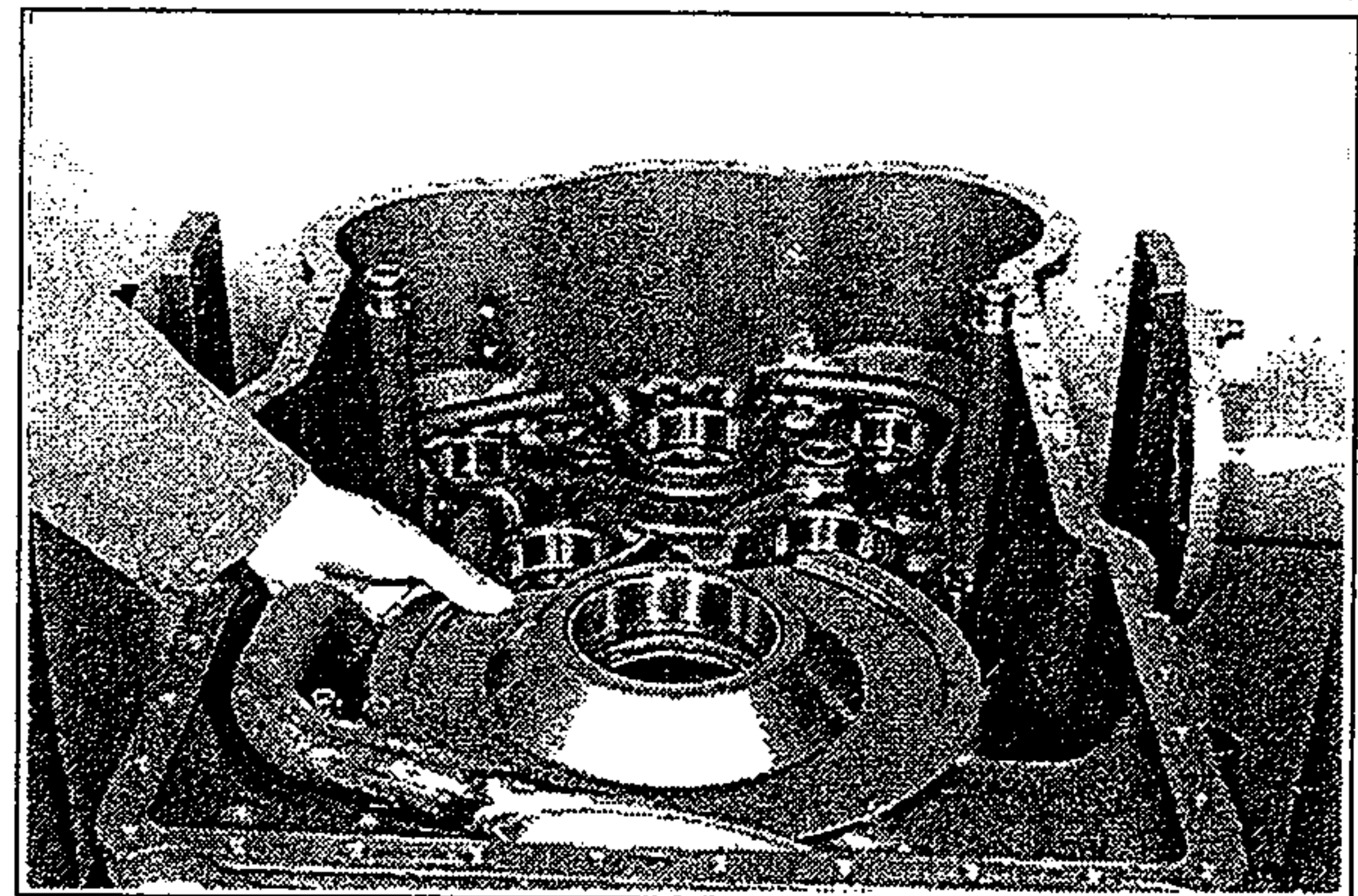
- ③ Insert all bearing outer races into the bearing bores of the housing.
Install O-ring(Arrows).

※ At the use of already run bearings, pay attention to the allocation of the bearing outer races, see also note/page 3-89.

AN Input
KV Clutch-Forward
KR Clutch-Reverse
K1 Clutch-1st speed
K2 Clutch-2nd speed
K3 Clutch-3rd speed
K4 Clutch-4th speed
AB Output

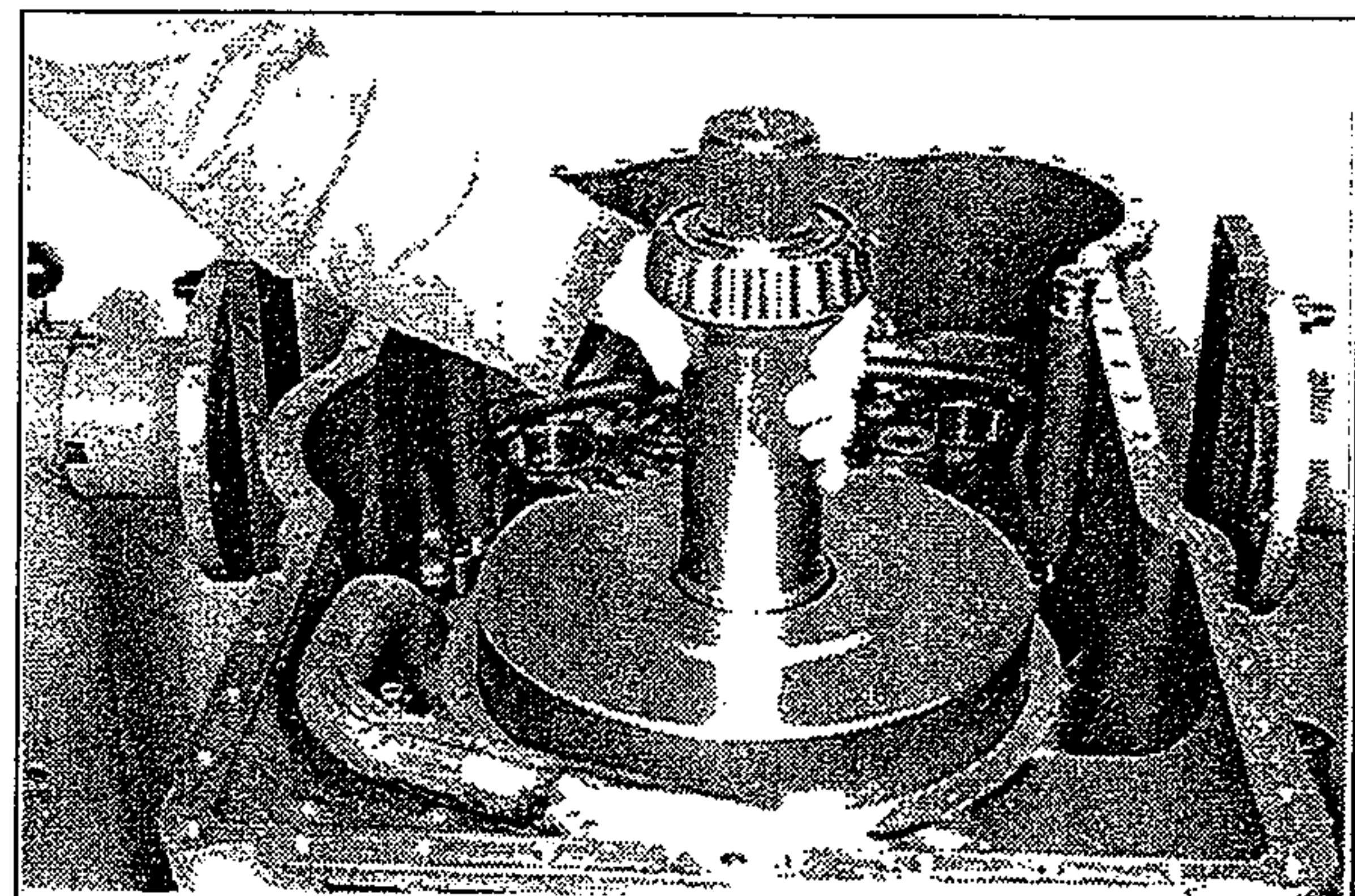


- ④ Lay on screening plate.



- ⑤ Insert preassembled output shaft.
Fix screening plates by means of socket head screws.

• Torque limit(M8/8.8) : 2.3kgf · m
(17.0lbf · ft)



(7) Install preassembled drive shaft and clutches

① Insert all bearing outer races into the bearing bores of the housing cover.

※ At the use of already run bearings, pay attention to the allocation of the bearing outer races, see also note/page 3-89.

AN Input

KV Clutch-Forward

KR Clutch-Reverse

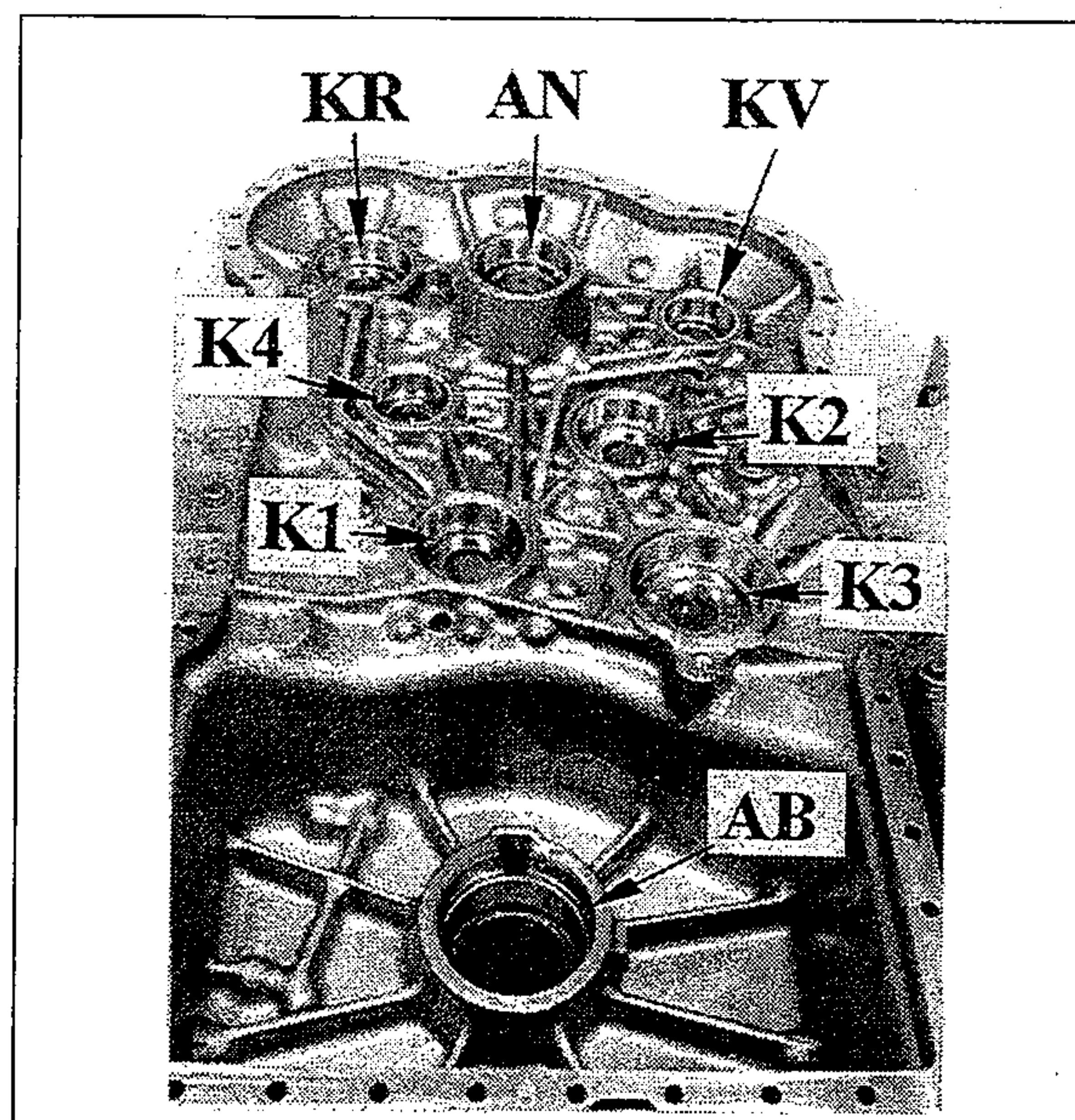
K1 Clutch-1st speed

K2 Clutch-2nd speed

K3 Clutch-3rd speed

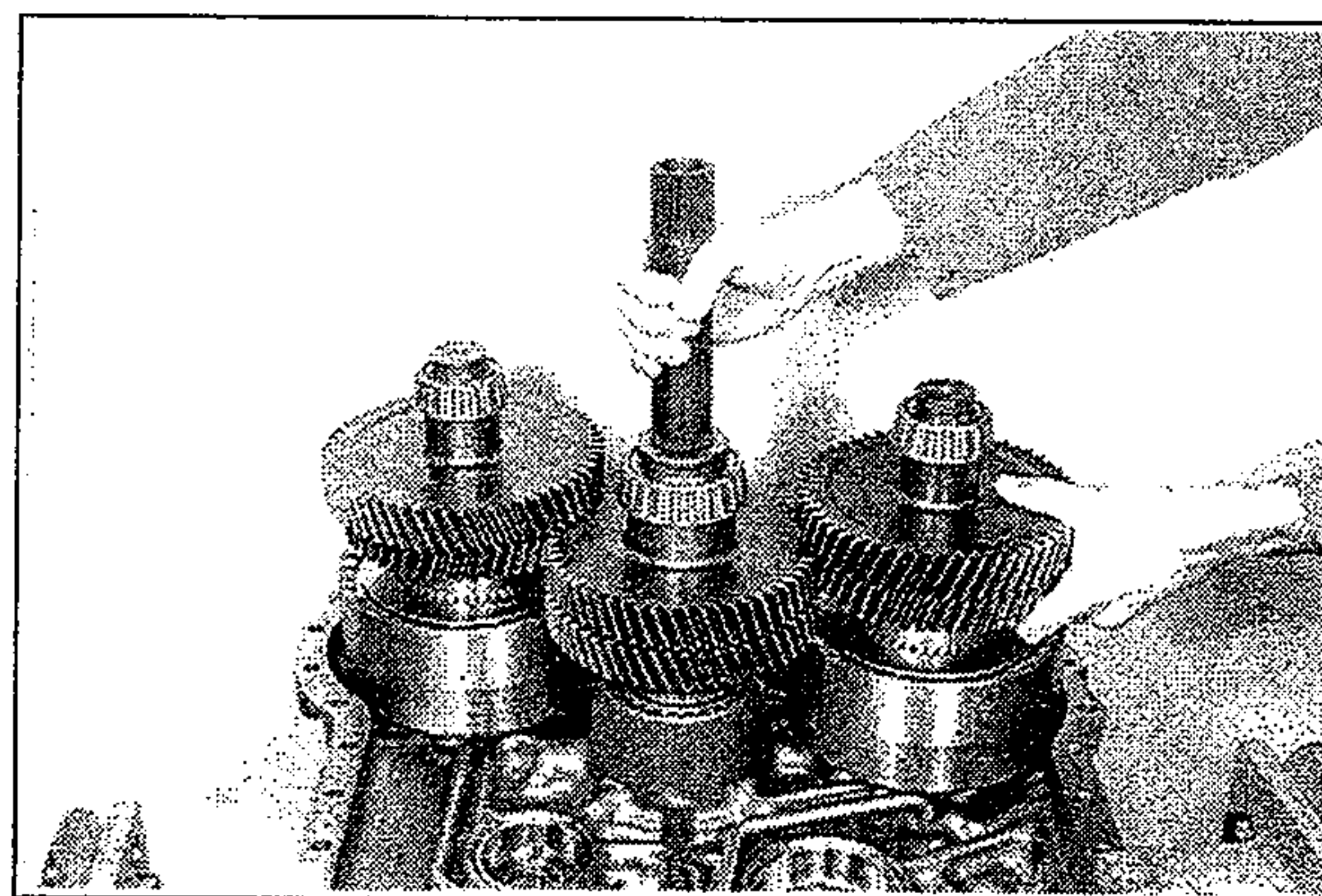
K4 Clutch-4th speed

AB Output

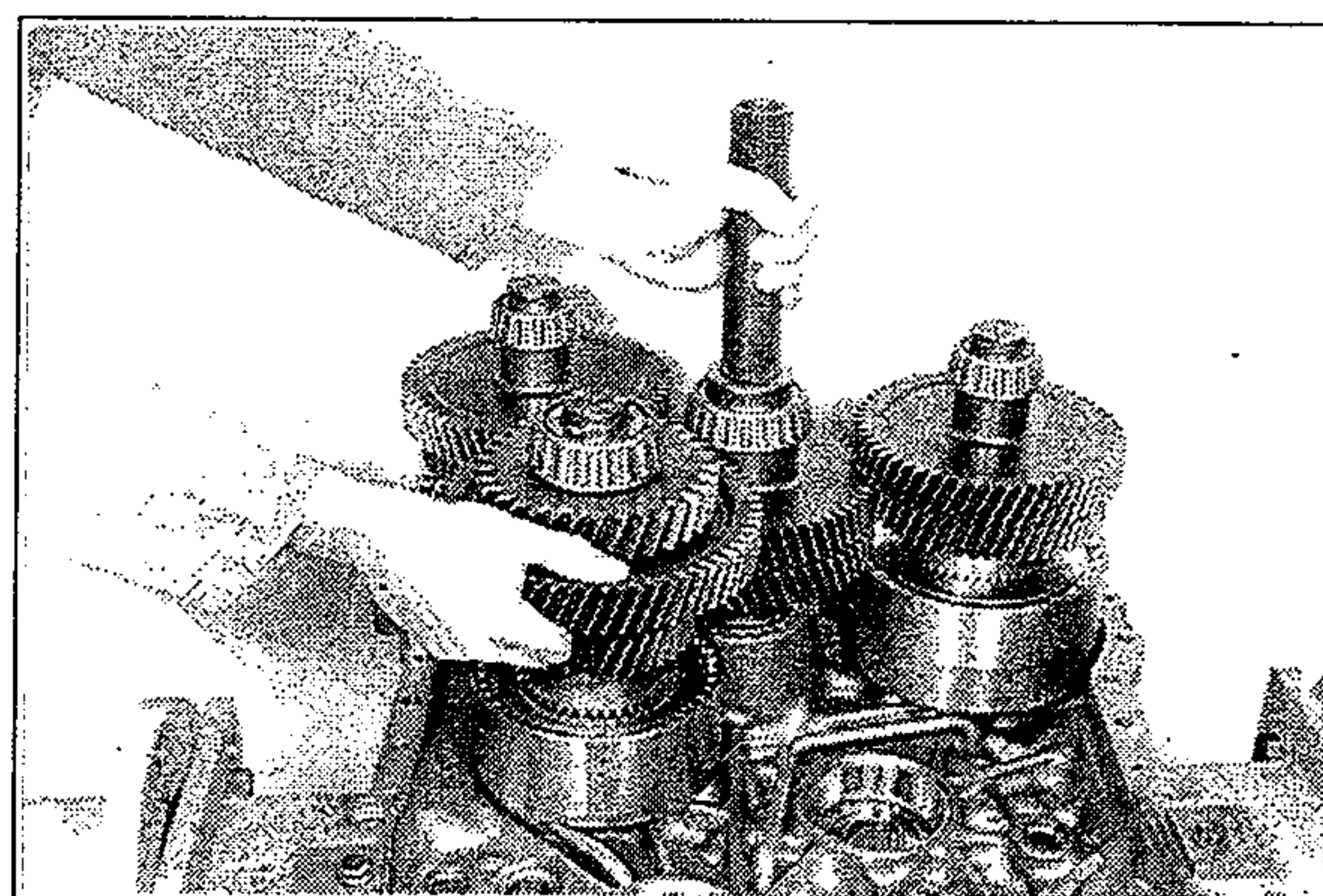


※ Prior to the installation of the clutches and the drive shaft, grease rectangular rings and align them centrally.

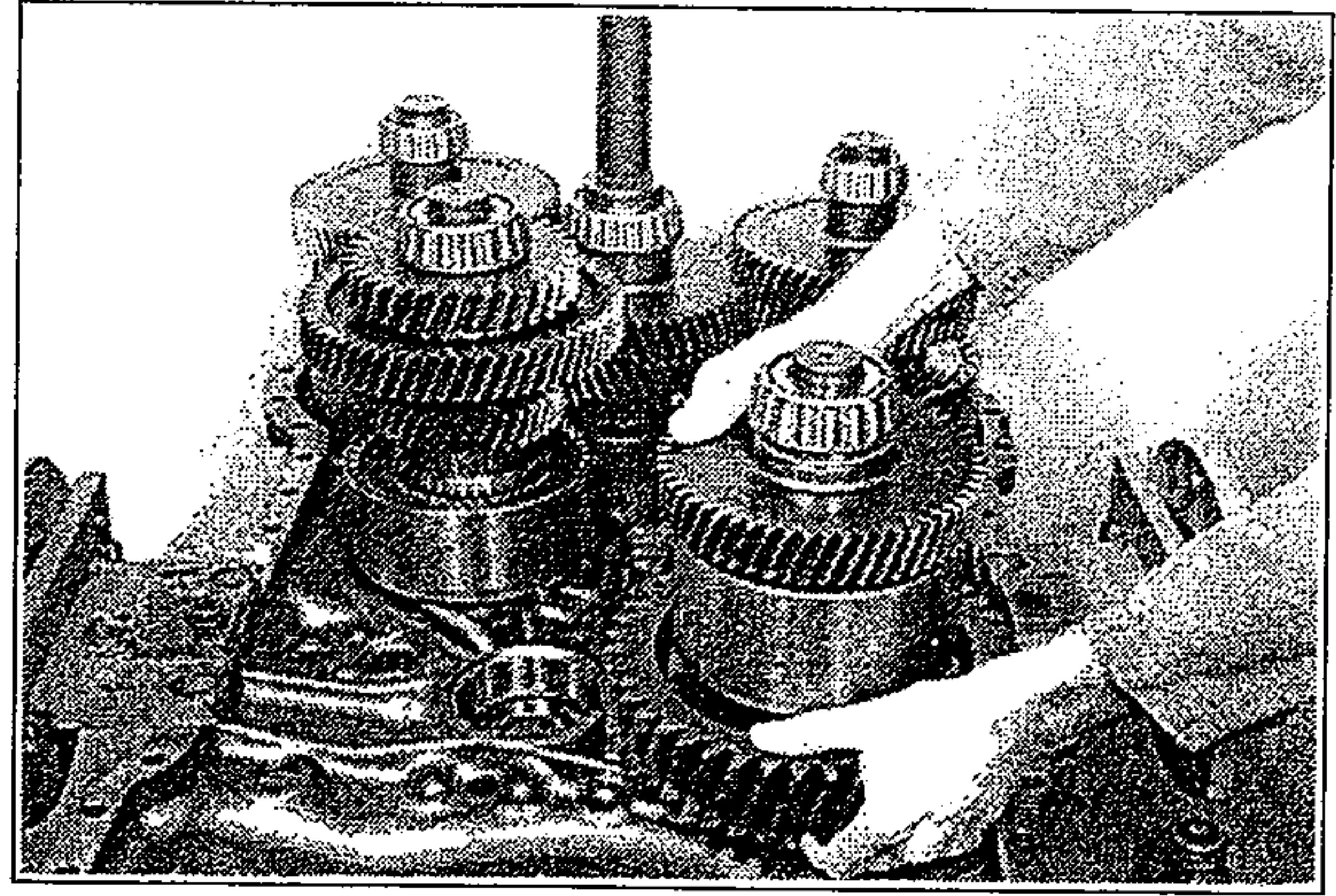
② Insert clutch KR, drive shaft and clutch KV together into the housing cover.



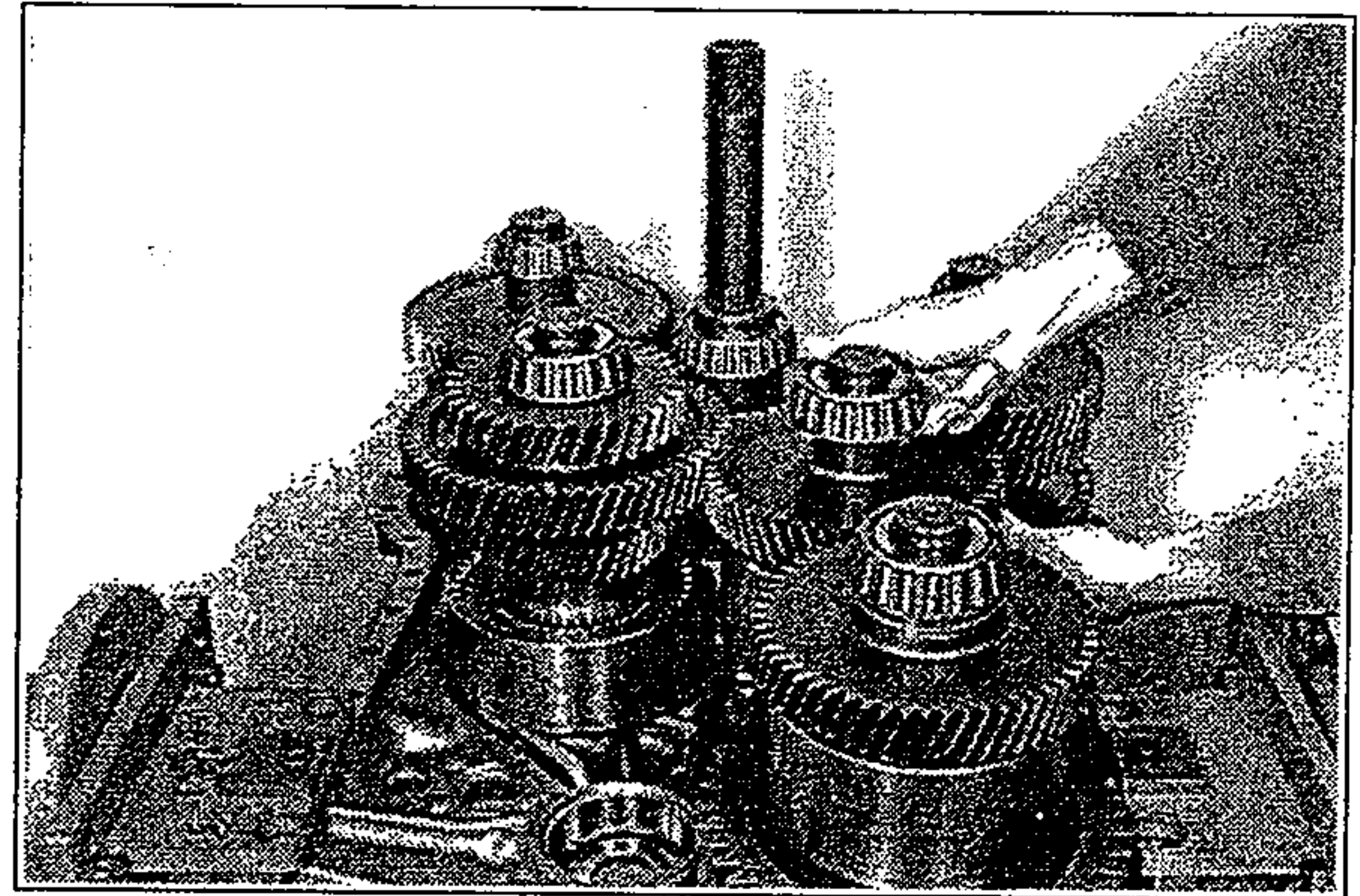
③ Lift drive gear and position clutch K4.



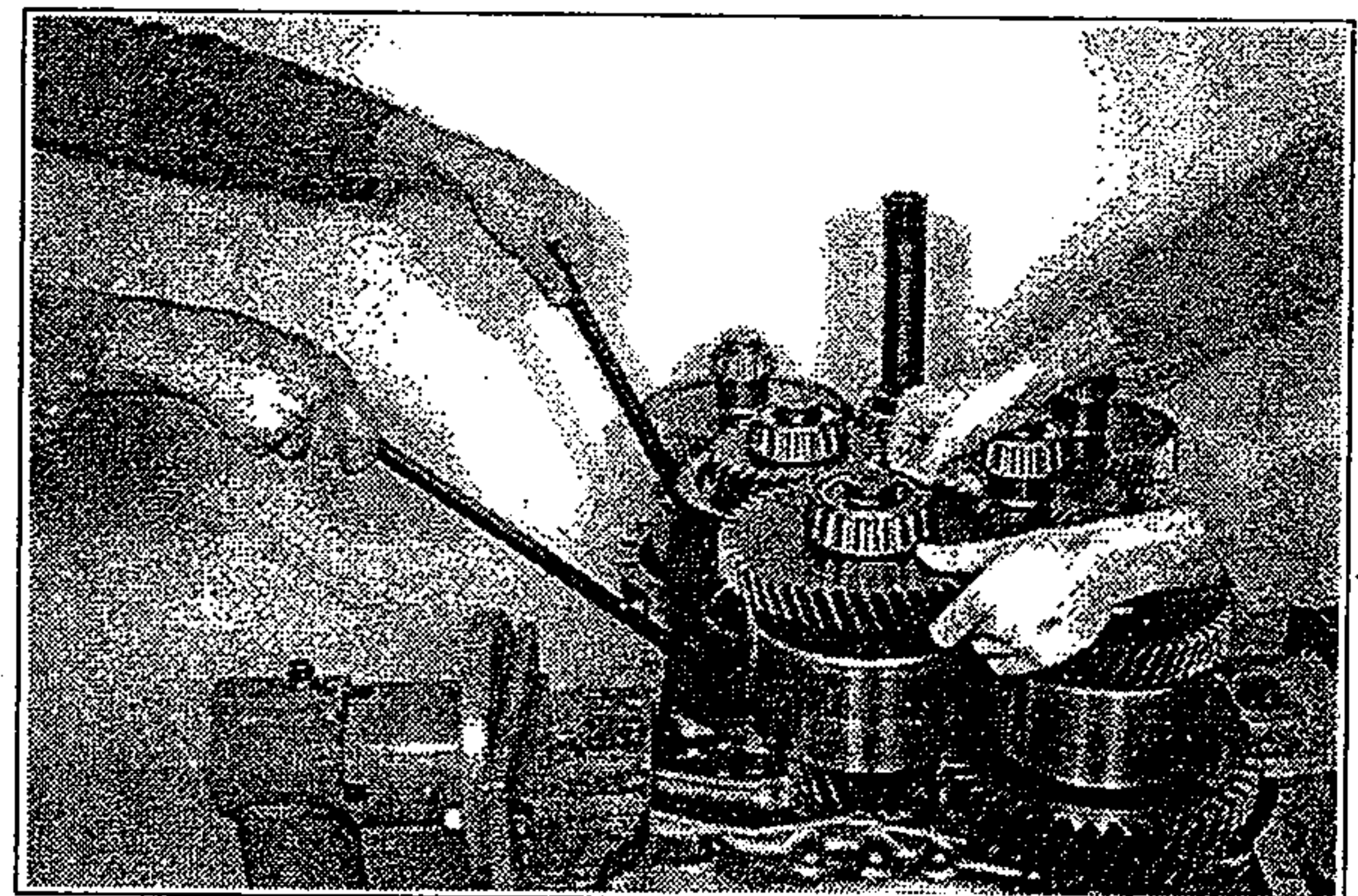
④ Install clutch K3.



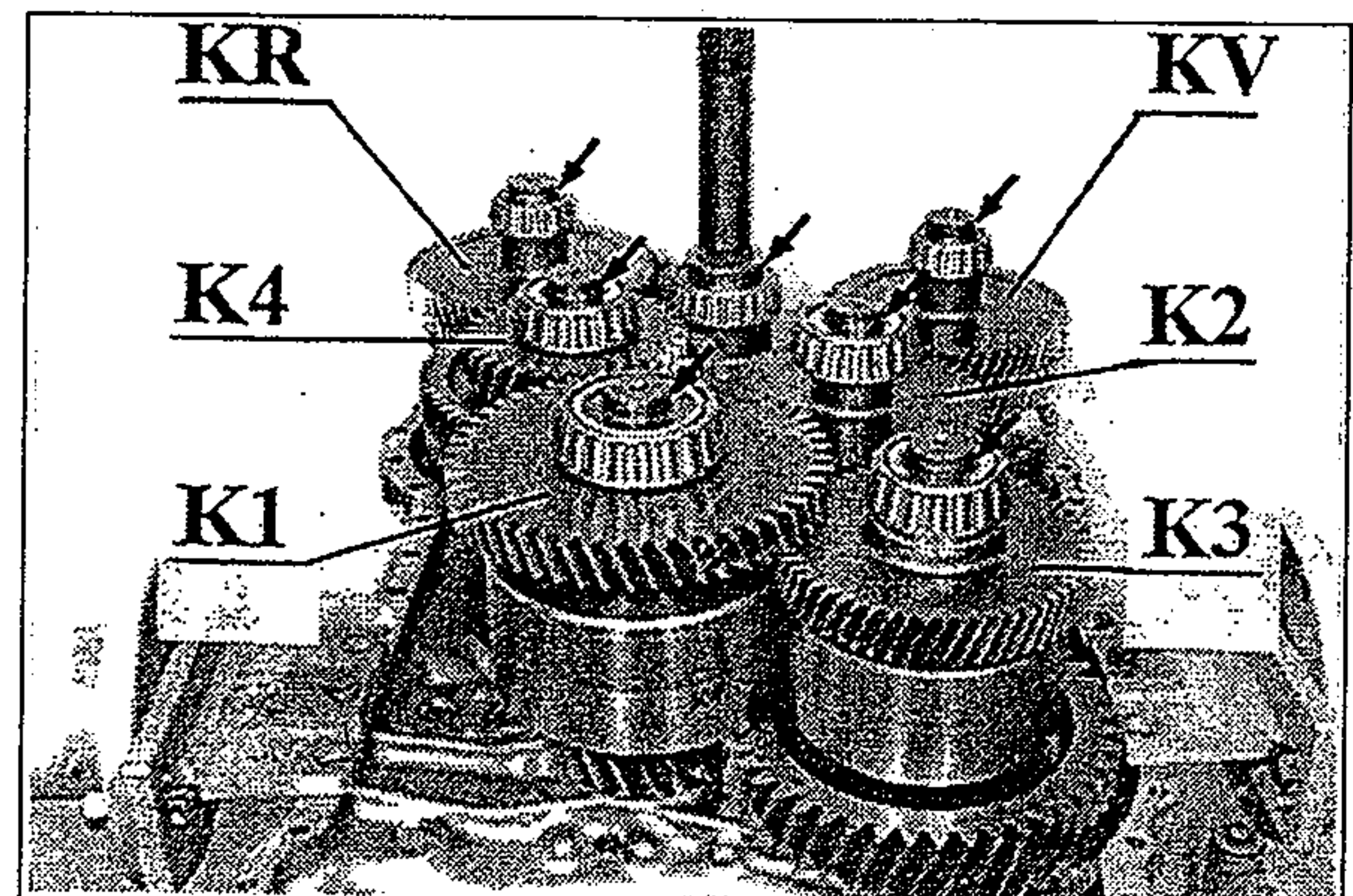
⑤ Position clutch K2.



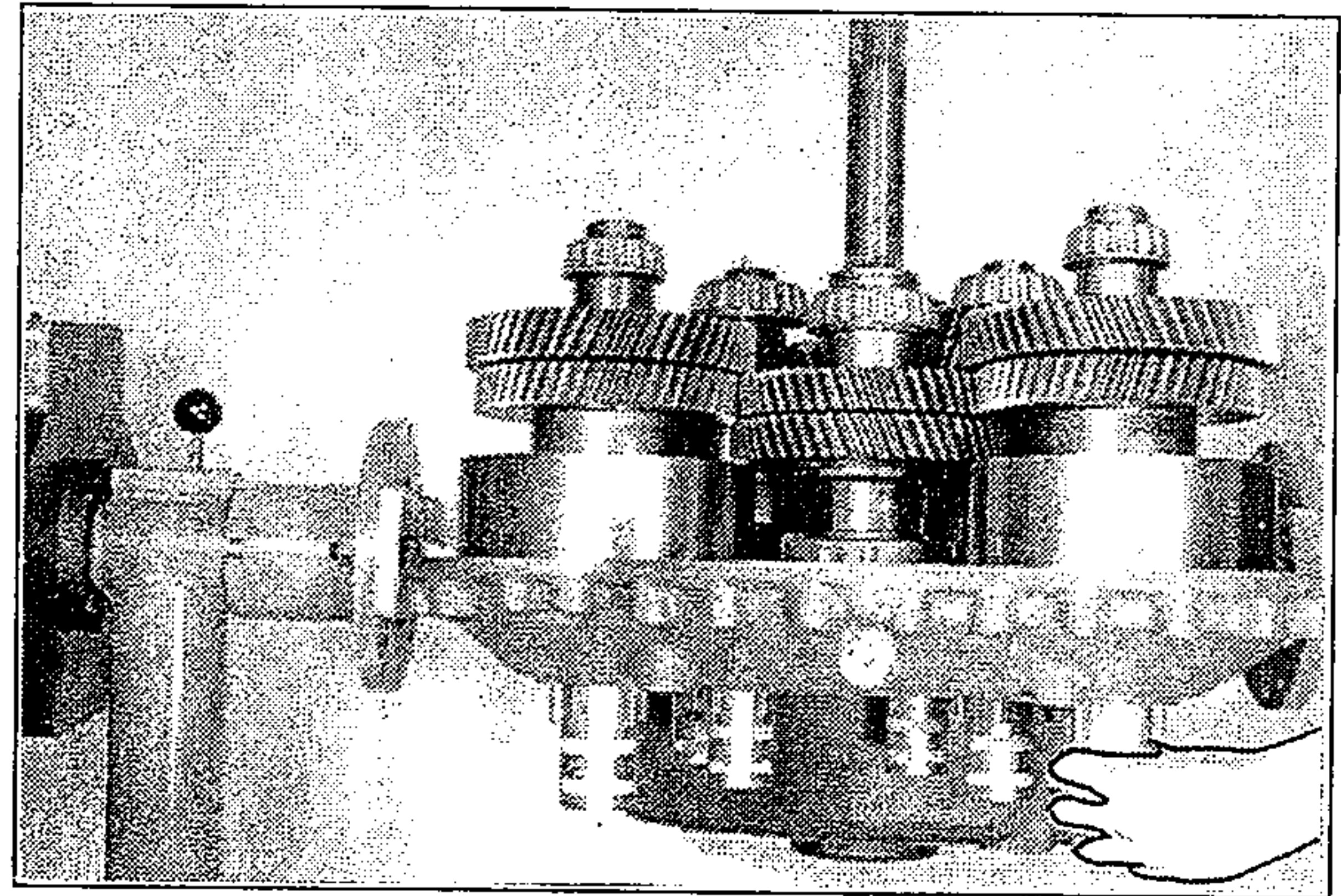
⑥ Lift clutch K4 and position clutch K1.



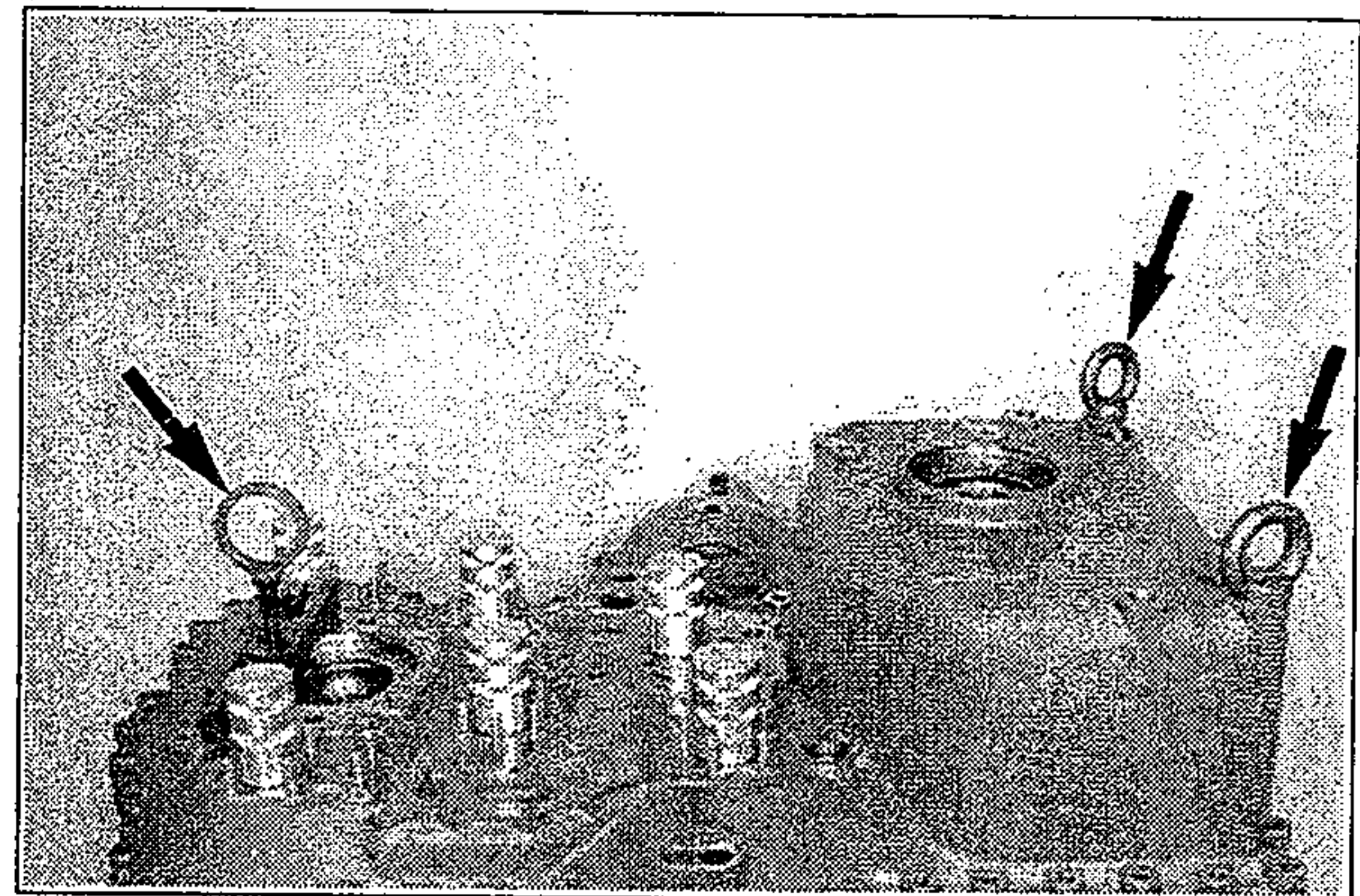
⑦ Illustration on the right shows the installation position of the single clutches in the housing cover.
Grease rectangular rings (Arrows) and align them centrally.



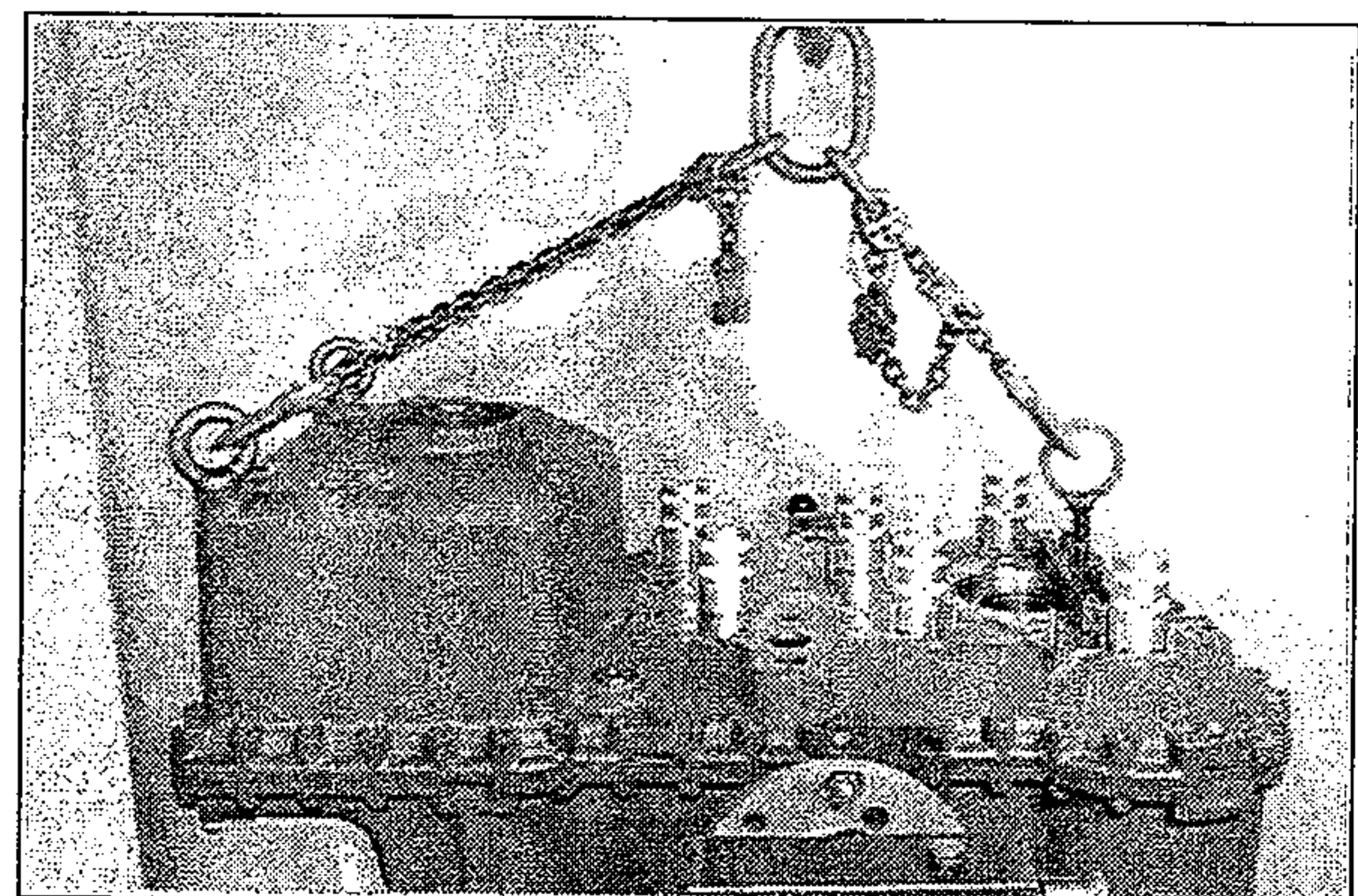
- ⑧ Fix all clutches by means of handles.
 Handle(6 pieces needed) 5870 260 010



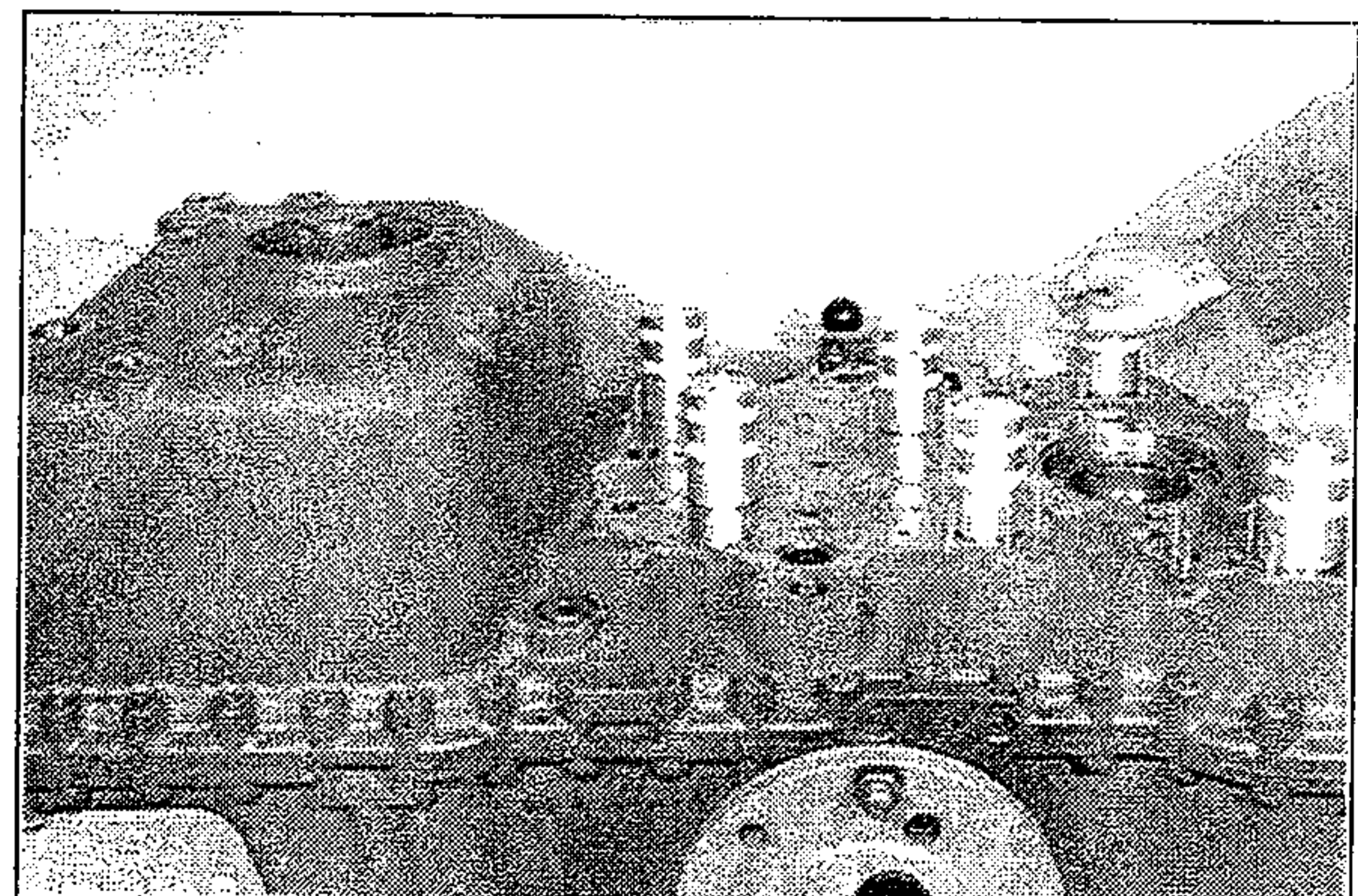
- ⑨ Tilt housing cover 180°.
 Install eye bolts(Arrows).
 Eye bolt(M20, 2EA) 0636 804 003
 Eye bolt(M16, 1EA) 0636 804 001
 Puller device 5870 000 017



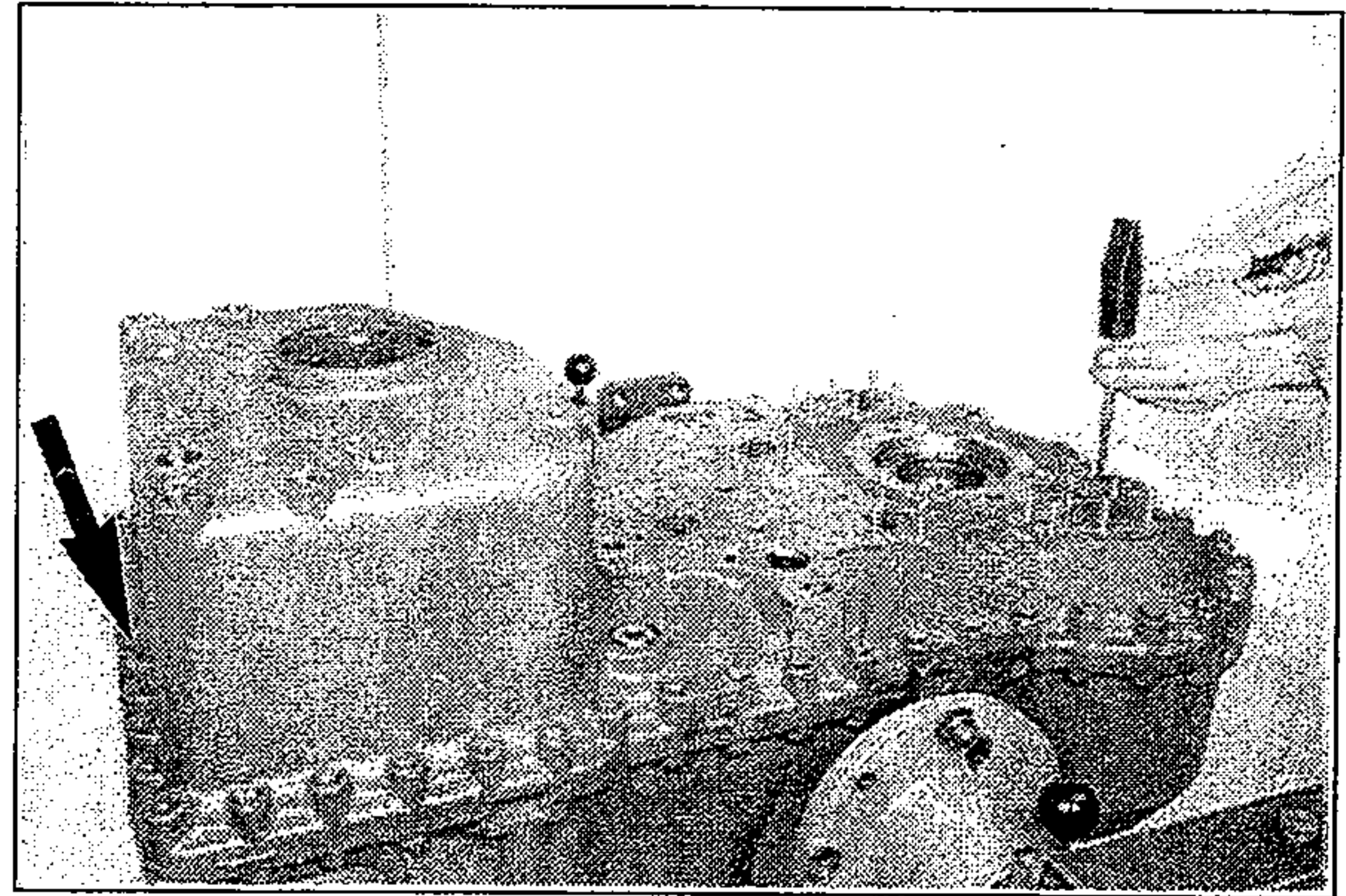
- ⑩ Grease O-rings of the two oil tubes.
 Wet mounting face with sealing compound loctite(Type No.574).
 Position preassembled housing cover by means of lifting device carefully on the gearbox housing until contact is obtained.
 ※ Pay attention to the overlapping of the oil tubes with the bores in the housing cover.
 Lifting chain 5870 281 047



- ⑪ Remove handles again.



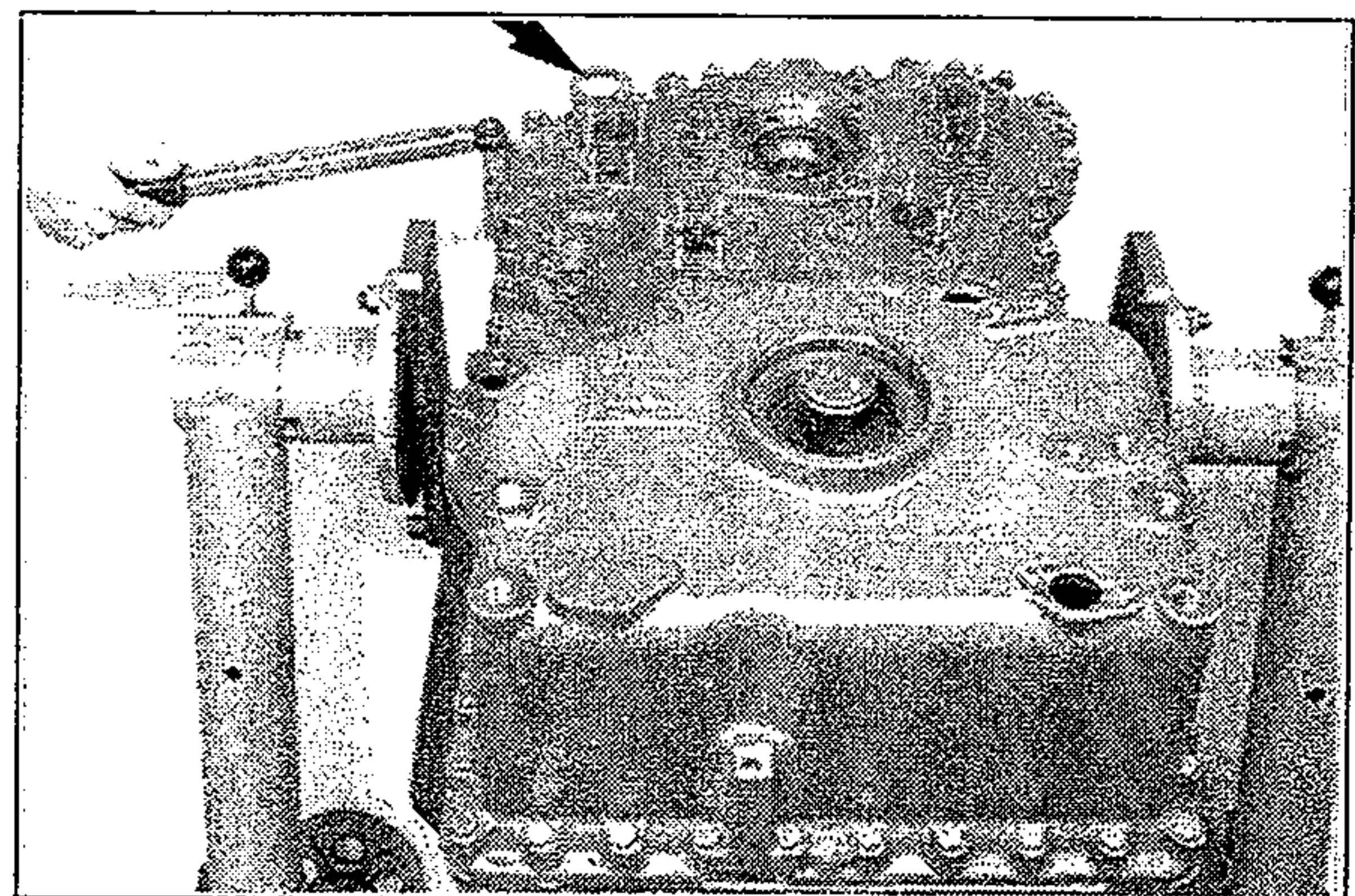
- ⑫ Install both cylindrical pins centrally to the housing face.



- ⑬ Fasten housing cover by means of hexagon head screws.

• Torque limit(M10/8.8) : 4.7kgf · m
(33.9lbf · ft)

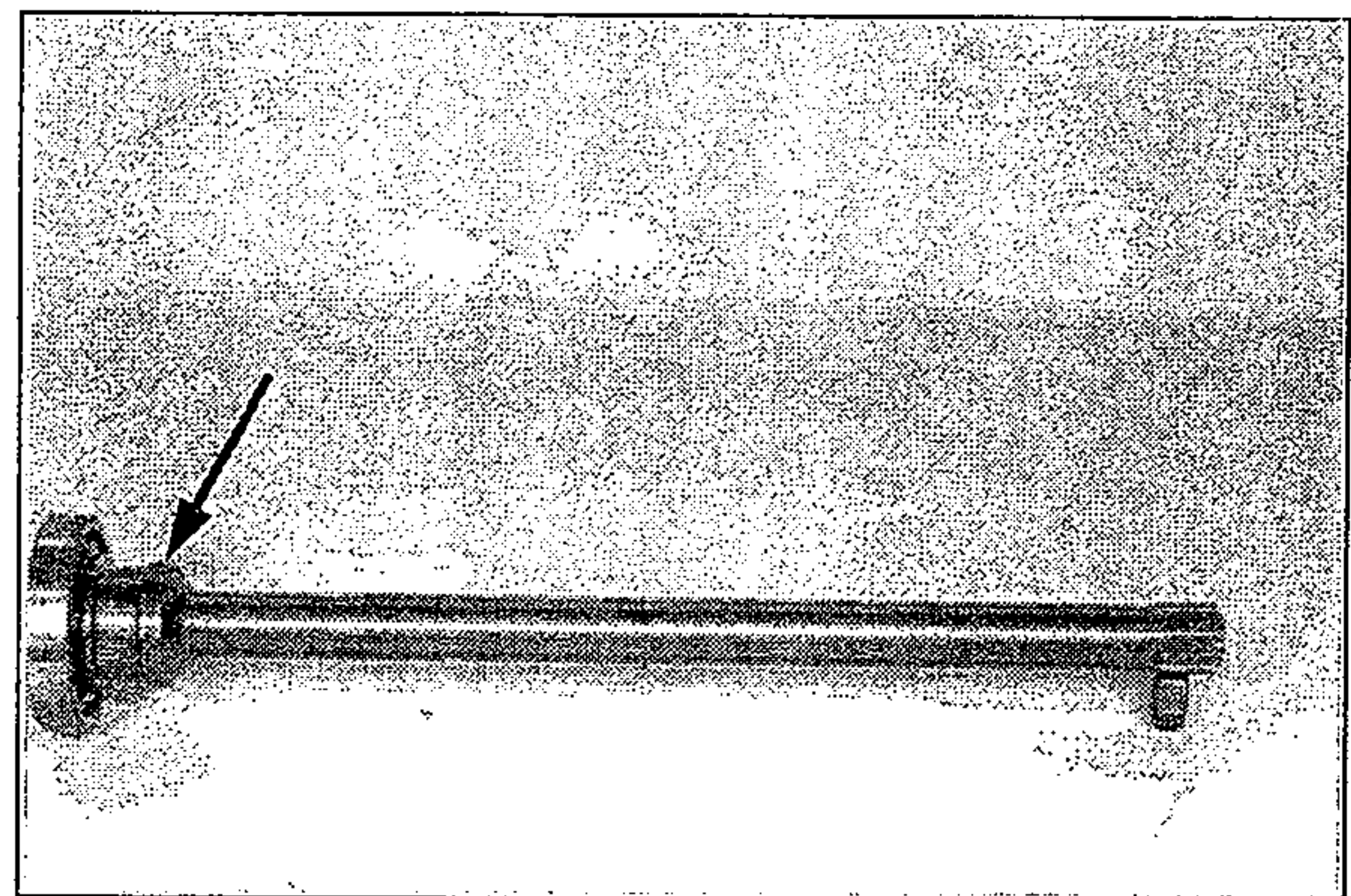
※ Pay attention to position of the fixing plate, see Arrow.



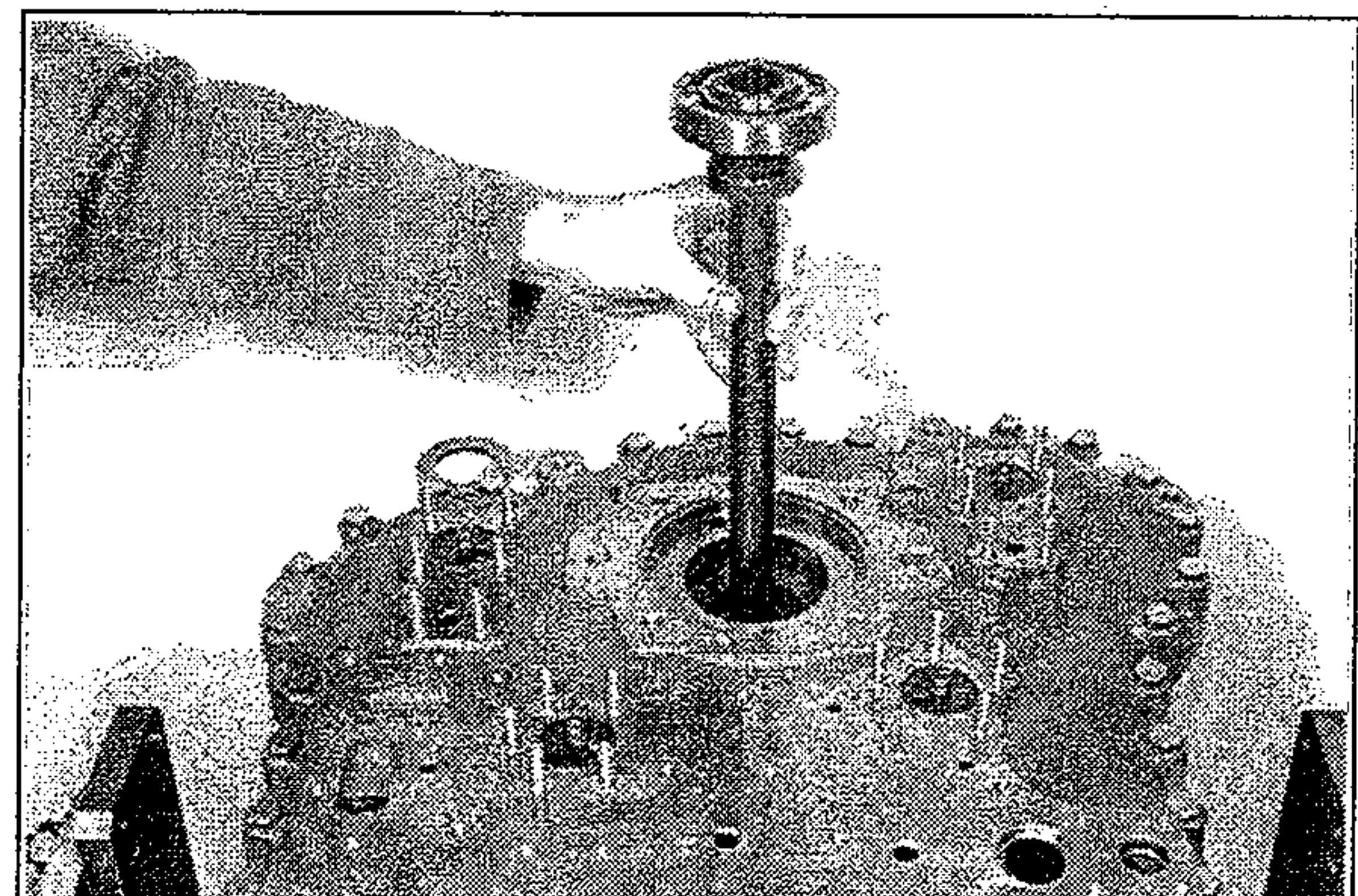
(8) Install pump shaft(Power take off)

- ① Install ball bearing.

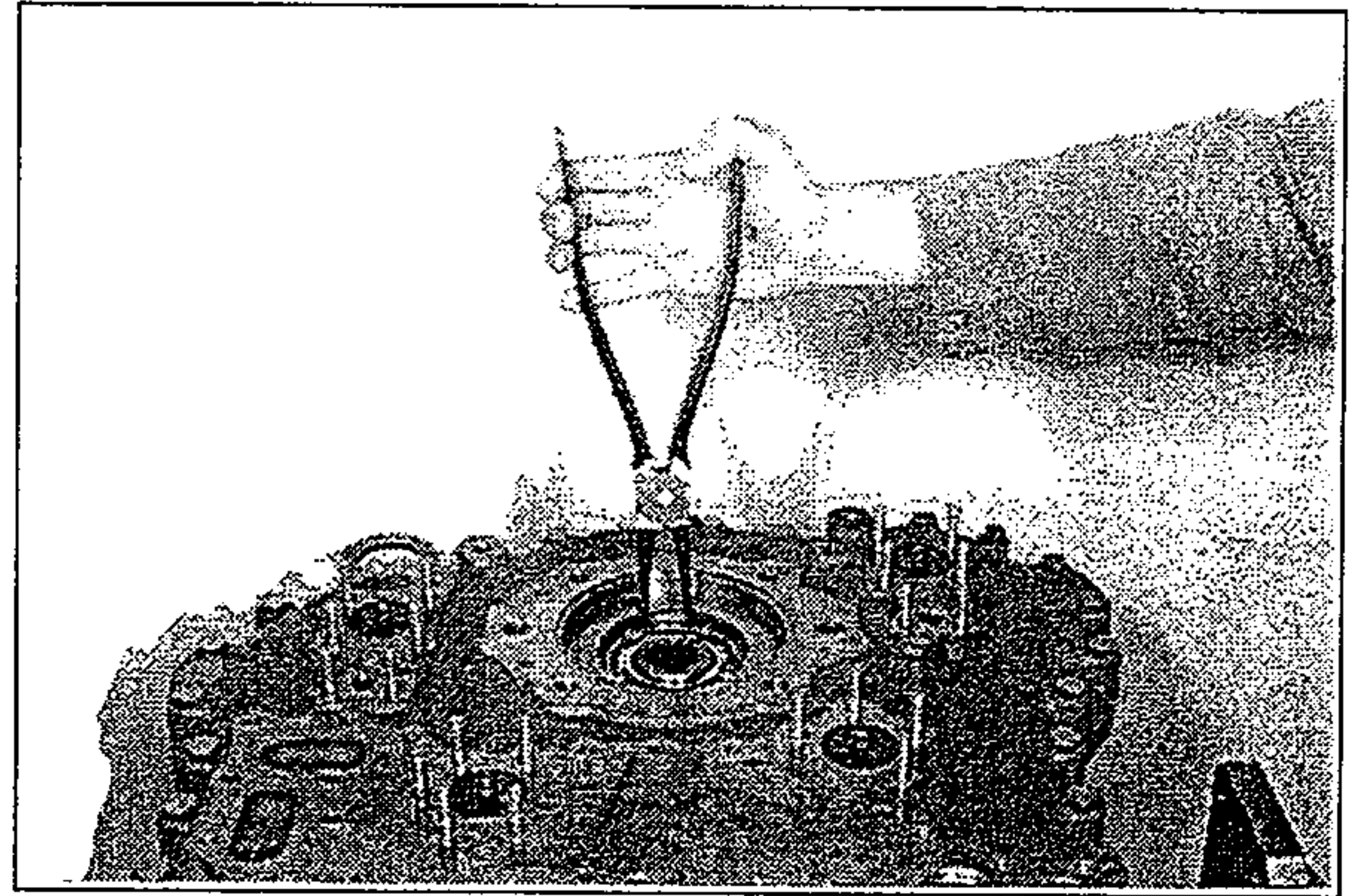
Squeeze rectangular ring in(Arrow) and let it snap in.



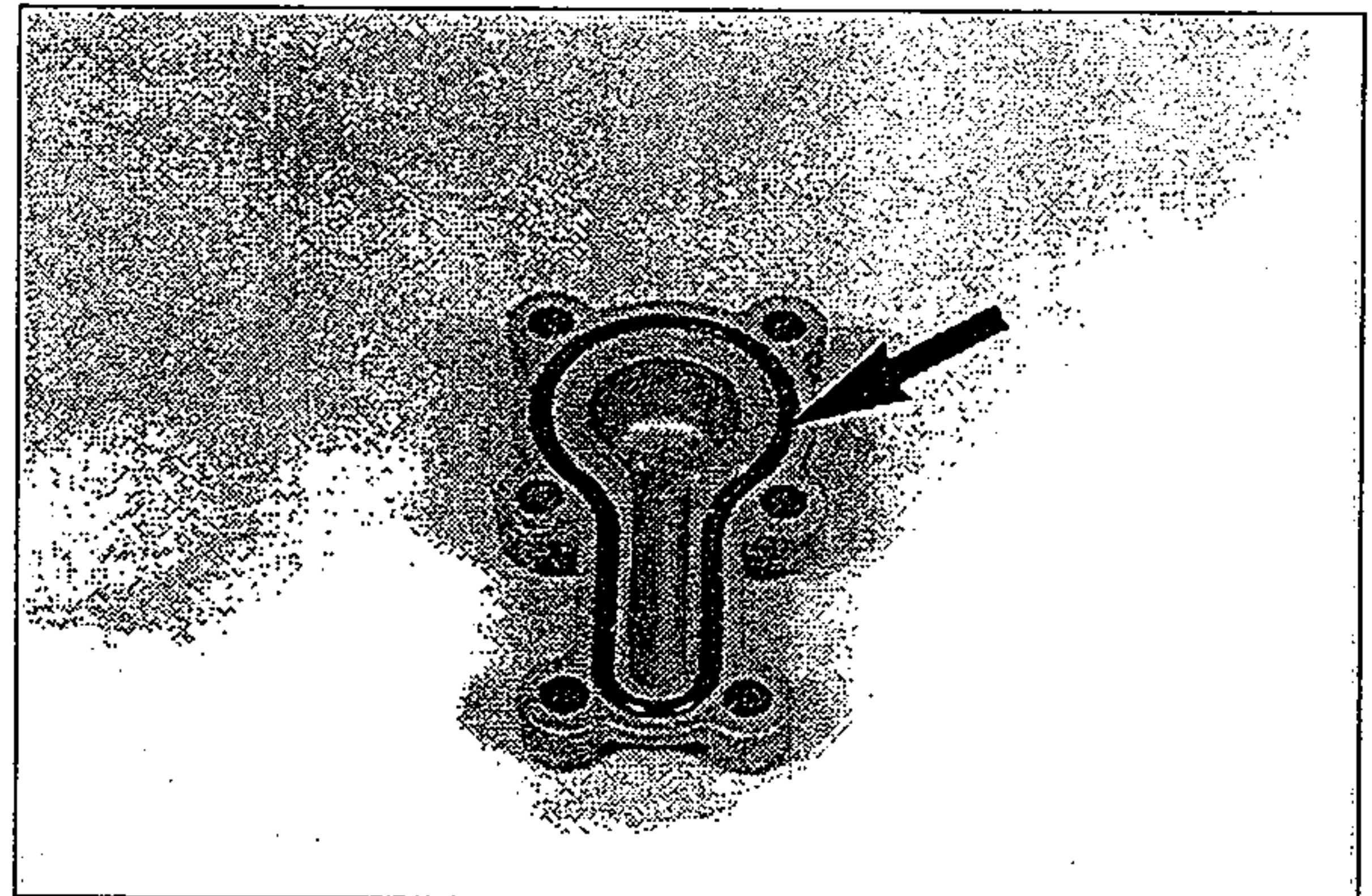
- ② Grease rectangular ring, align it centrally and introduce pump shaft until contact is obtained.



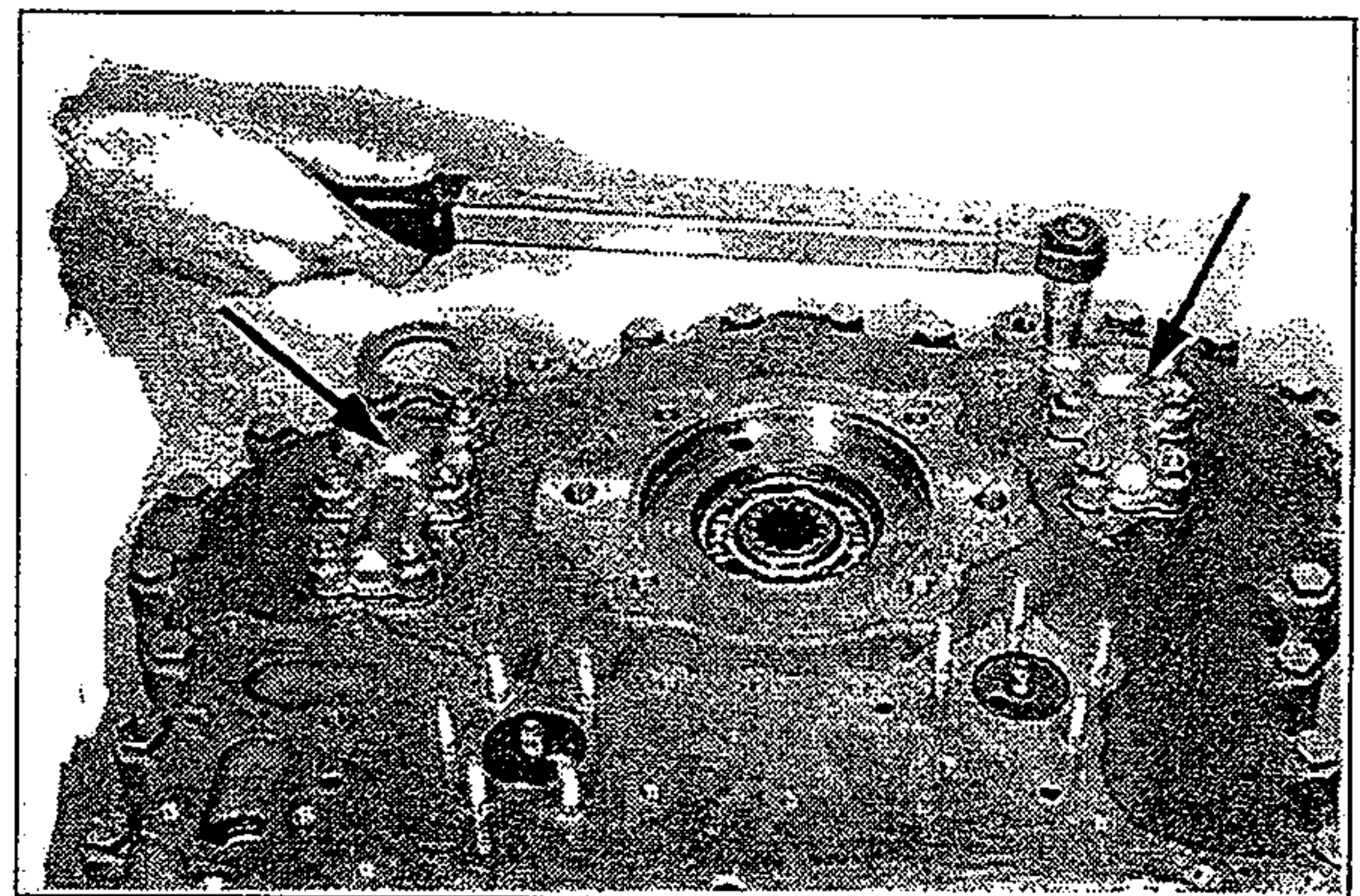
③ Fix pump shaft by means of circlip.



④ Insert O-ring(Arrow) into the annular groove of the oil feed covers.



⑤ Fasten both covers(Arrows) by means of hexagon nuts(Use plain washers).
• Torque limit : 2.3kgf · m(17.0lbf · ft)



(9) Install output flanges

① Install shaft seal with the sealing lip facing the oil chamber.

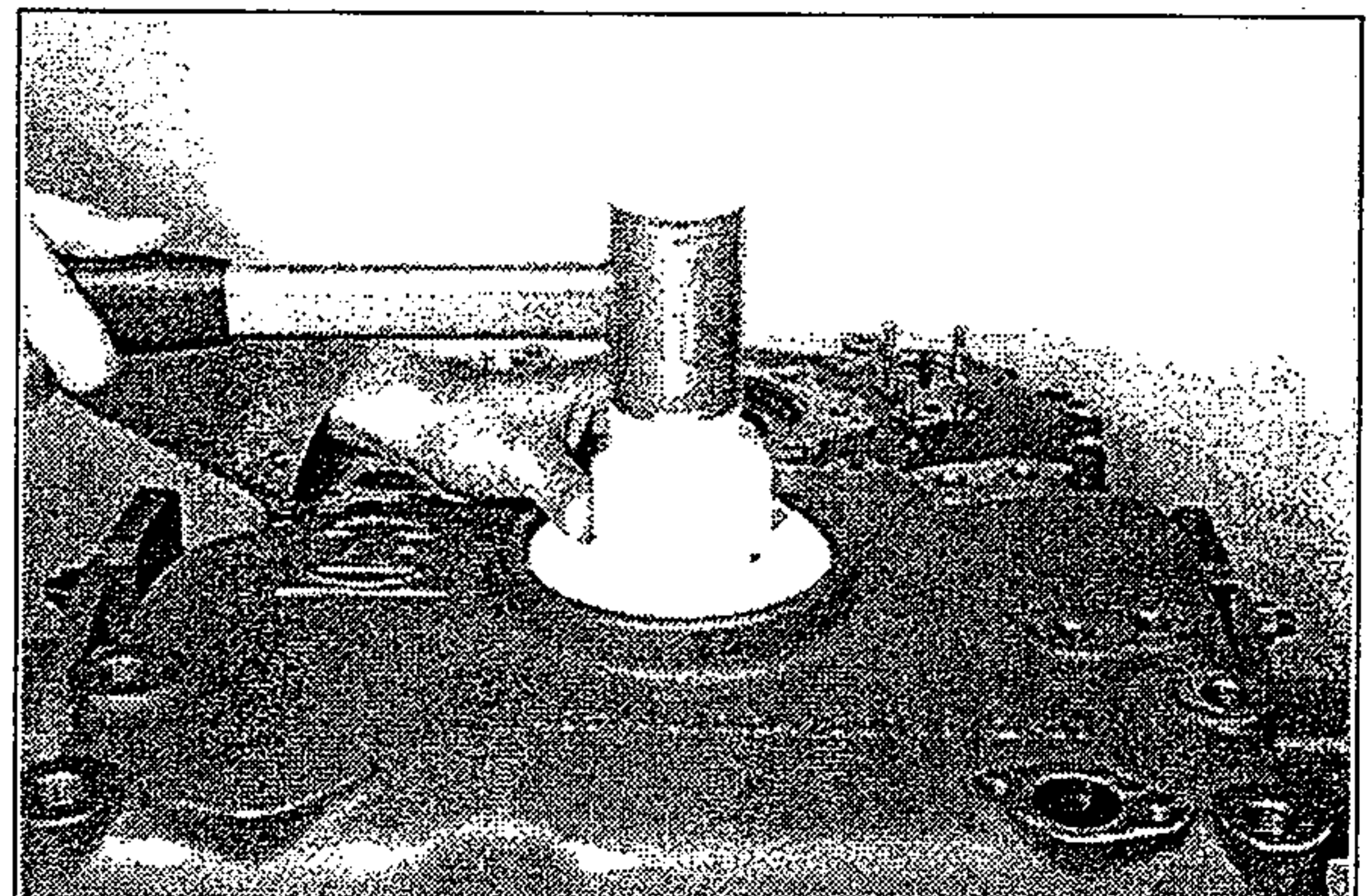
※ At the use of the prescribed driver, the exact installation position is obtained.

Wet rubber coated outer diameter with spirit.

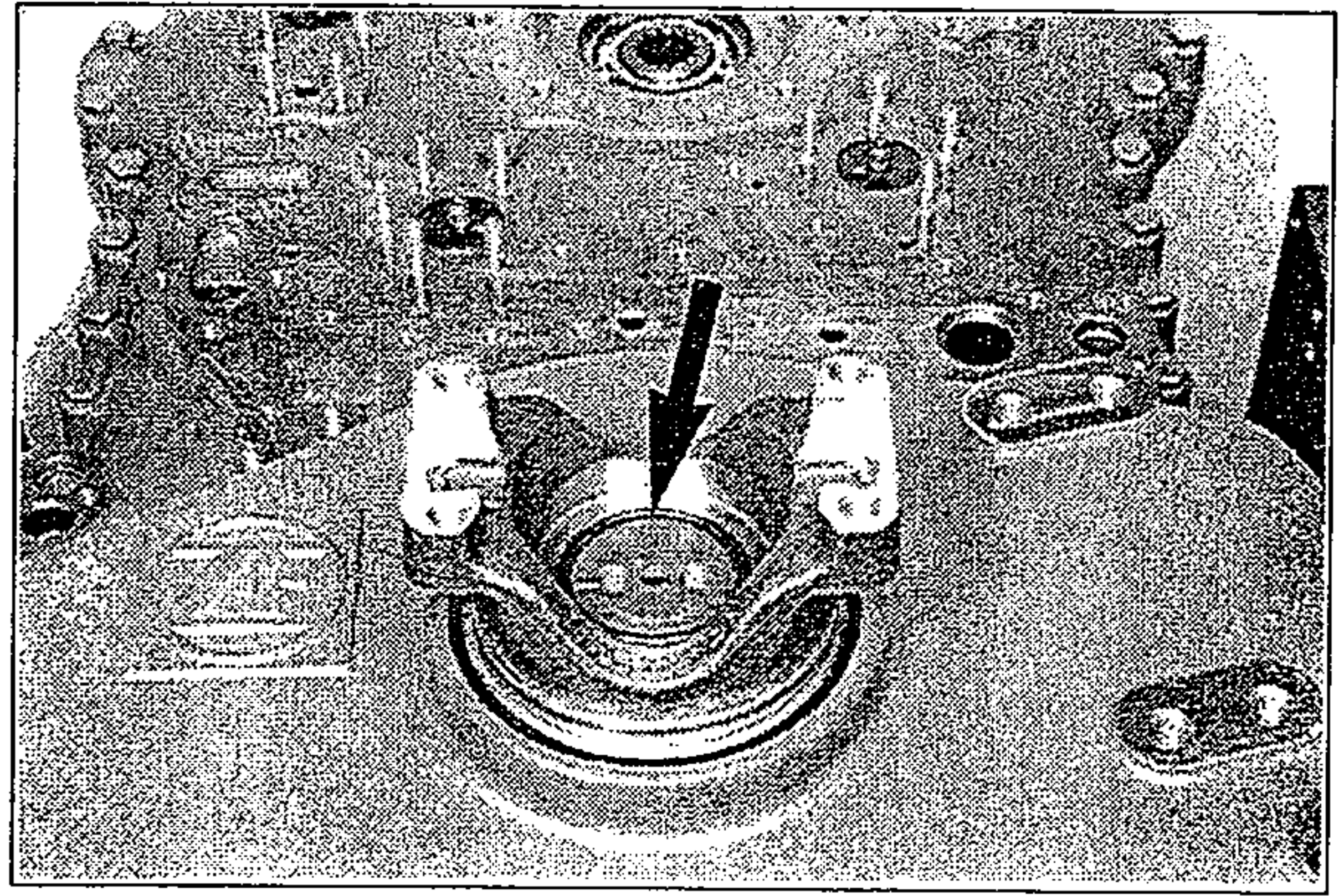
Grease sealing lip.

Driver

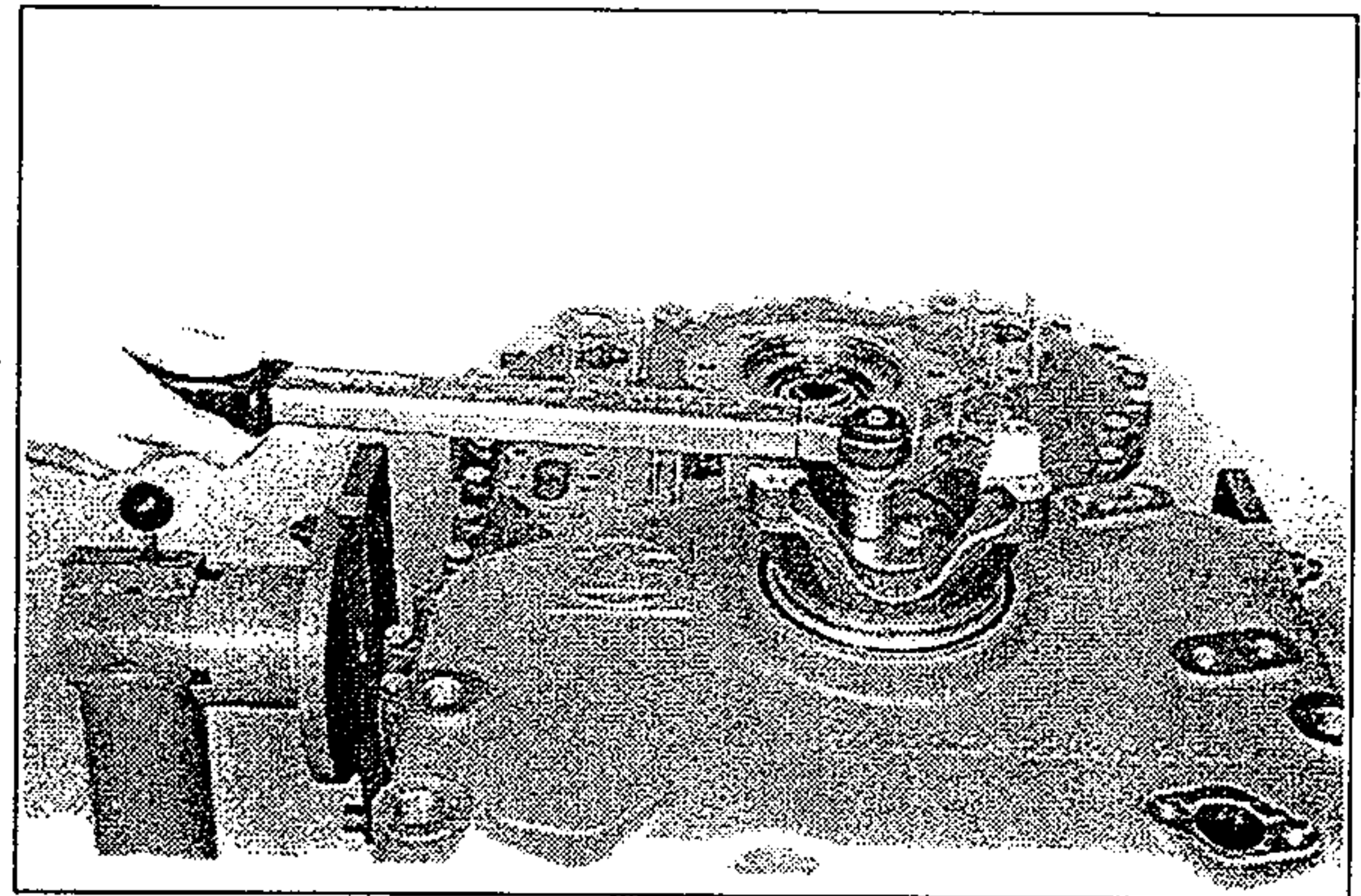
5870 048 213



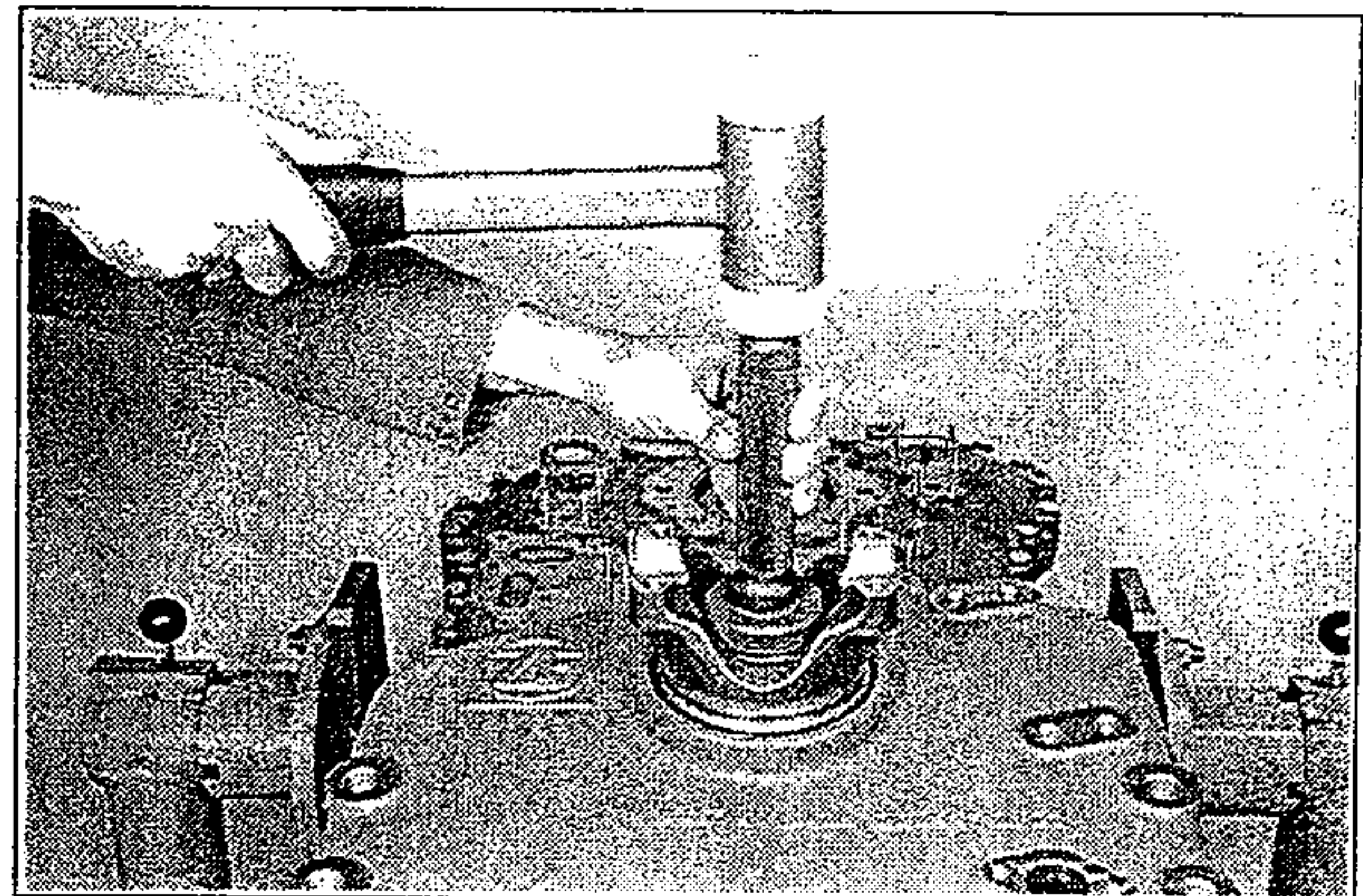
- ② Assemble output flange.
Insert O-ring(Arrow) into the gap of drive flange and shaft.



- ③ Fasten output flange by means of disk and hexagon head screws.
• Torque limit(M10/8.8) : 4.7kgf · m
(33.9lbf · ft)



- ④ Fix hexagon head screws by means of lock plate.
Driver 5870 057 009
Handle 5870 260 002
Install converter side output flange accordingly.

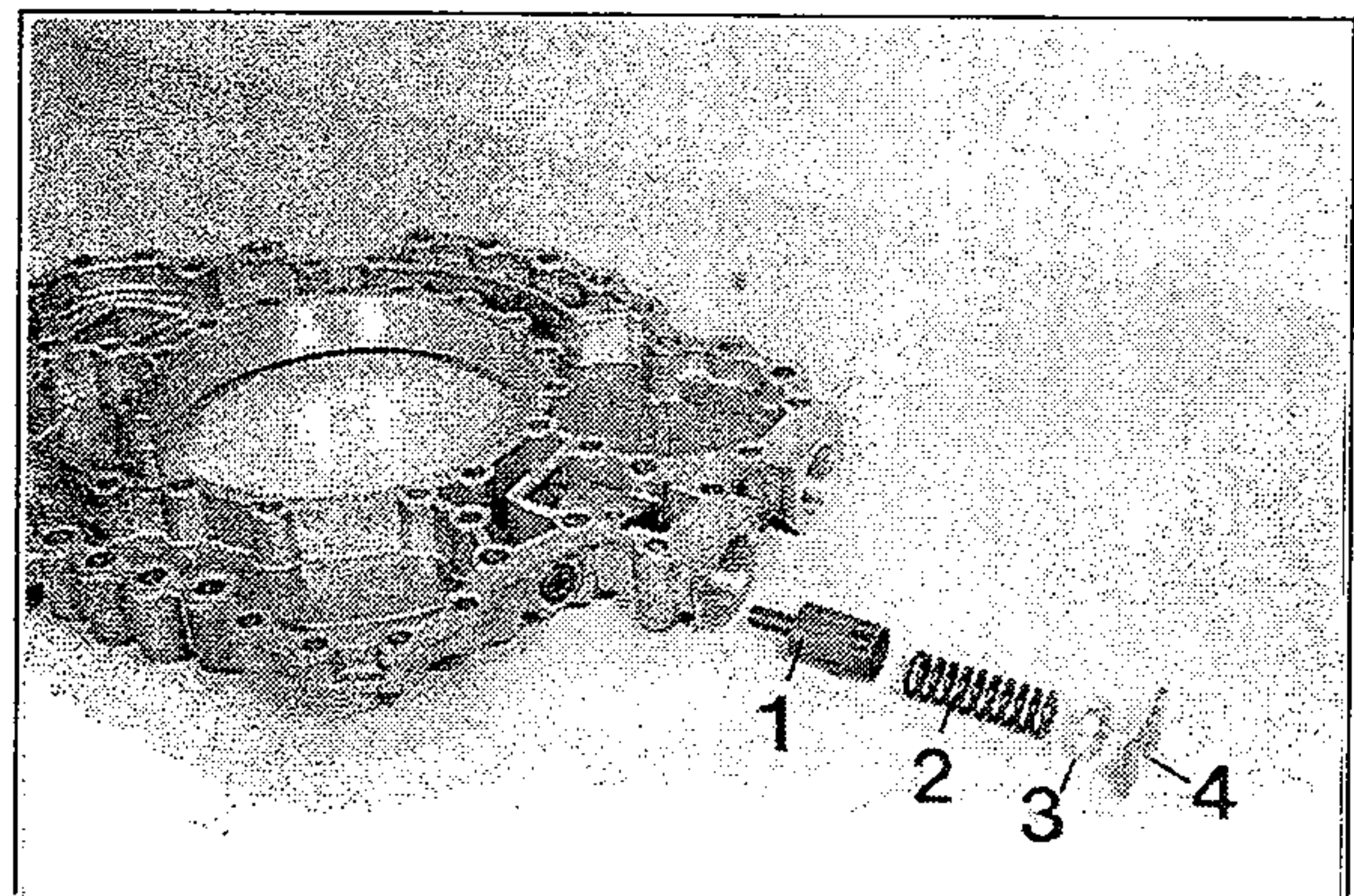


(10) Converter back pressure valve

- ① Illustration on the right shows the components of the converter back pressure valve.

- 1 Piston
- 2 Compression spring
- 3 Pressure plate
- 4 Lock plate

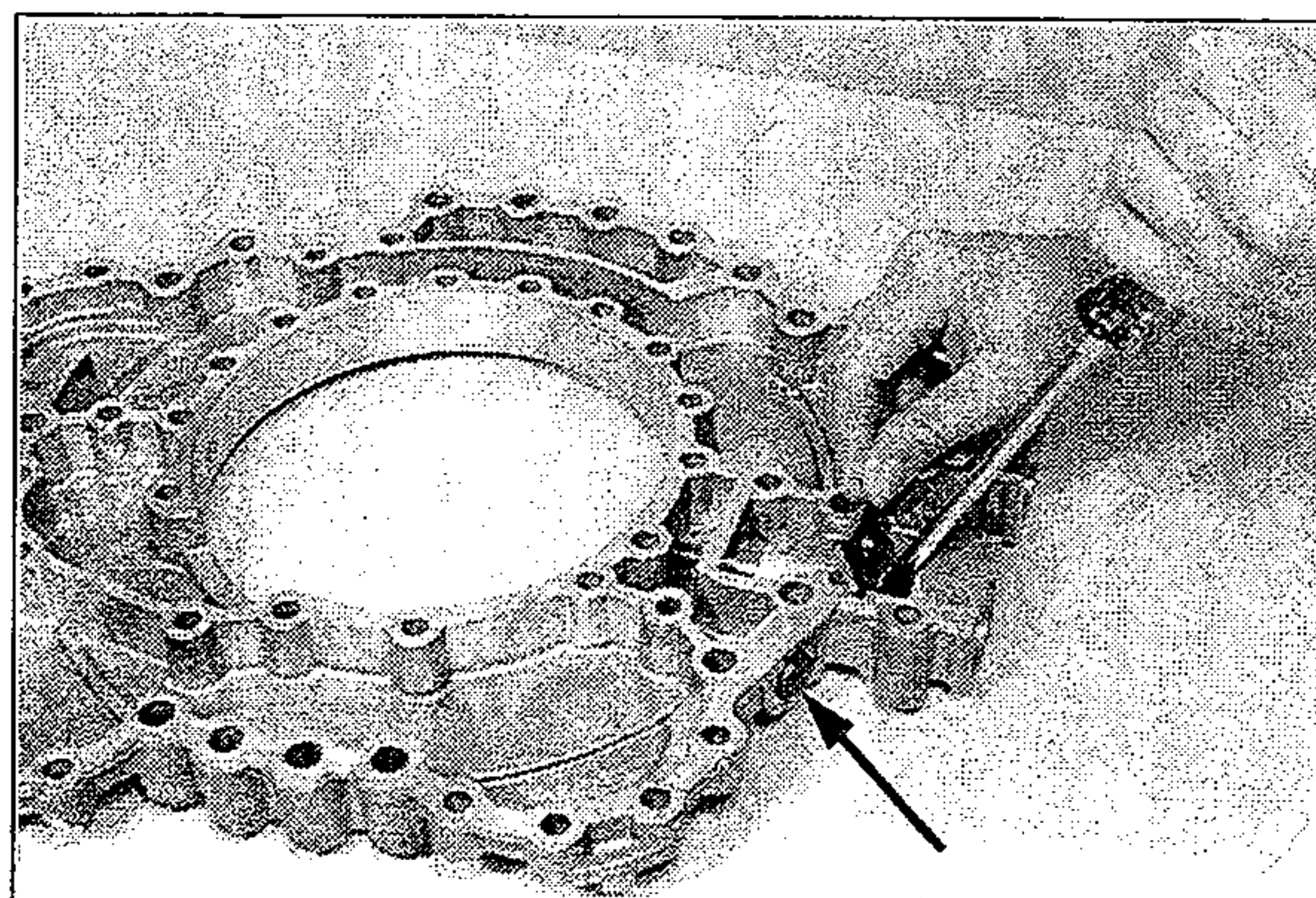
- ※ Install pressure plate with the spigot (ø 6mm) facing the lock plate.



- ② Introduce components according to figure (10) ①, preload and fix by means of lock plate.

Equip plug(Arrow) with new O-ring and install it.

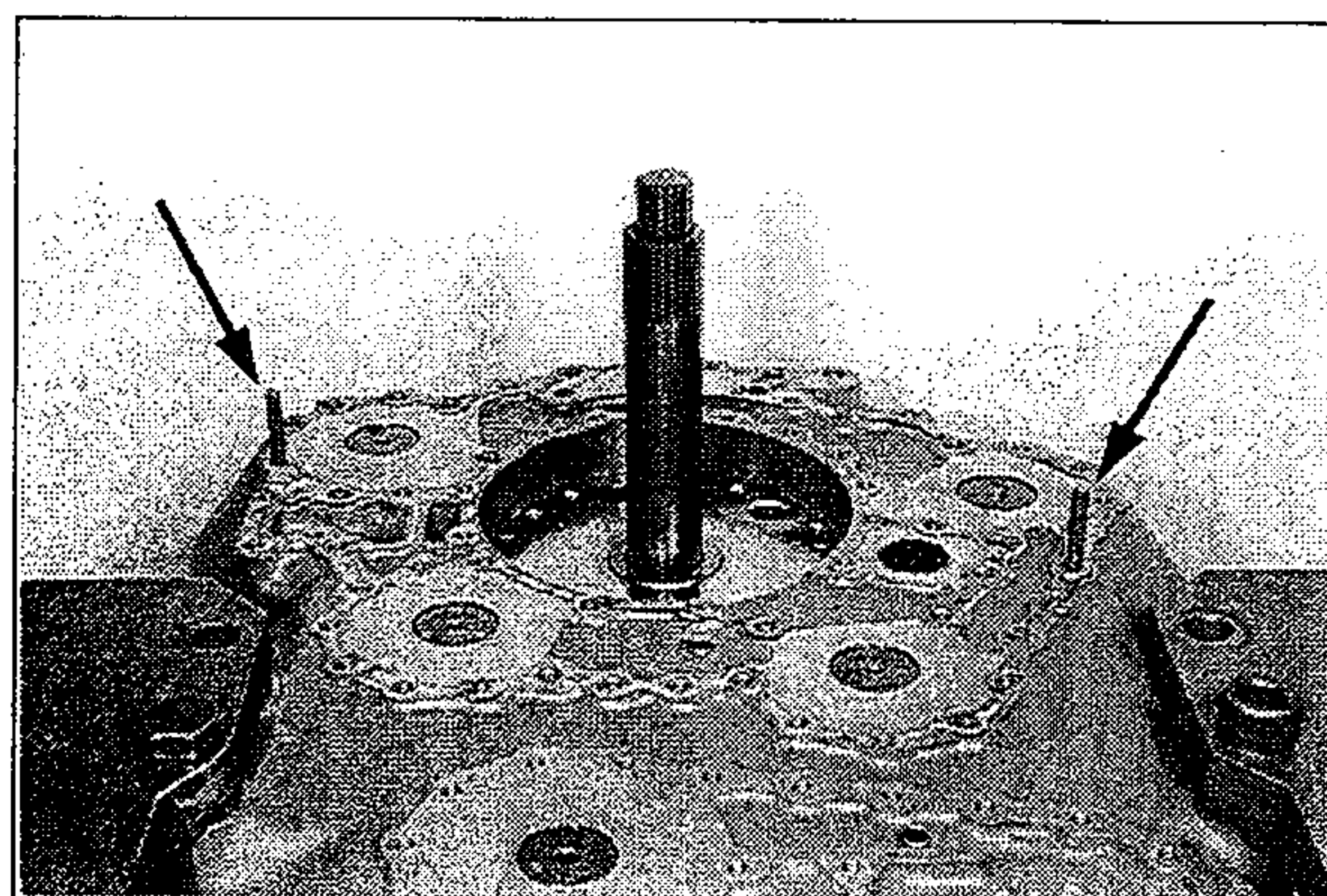
- Torque limit(M14 × 1.5) : 2.5kgf · m
(18.4bf · ft)



(11) Oil feed housing-Transmission pump

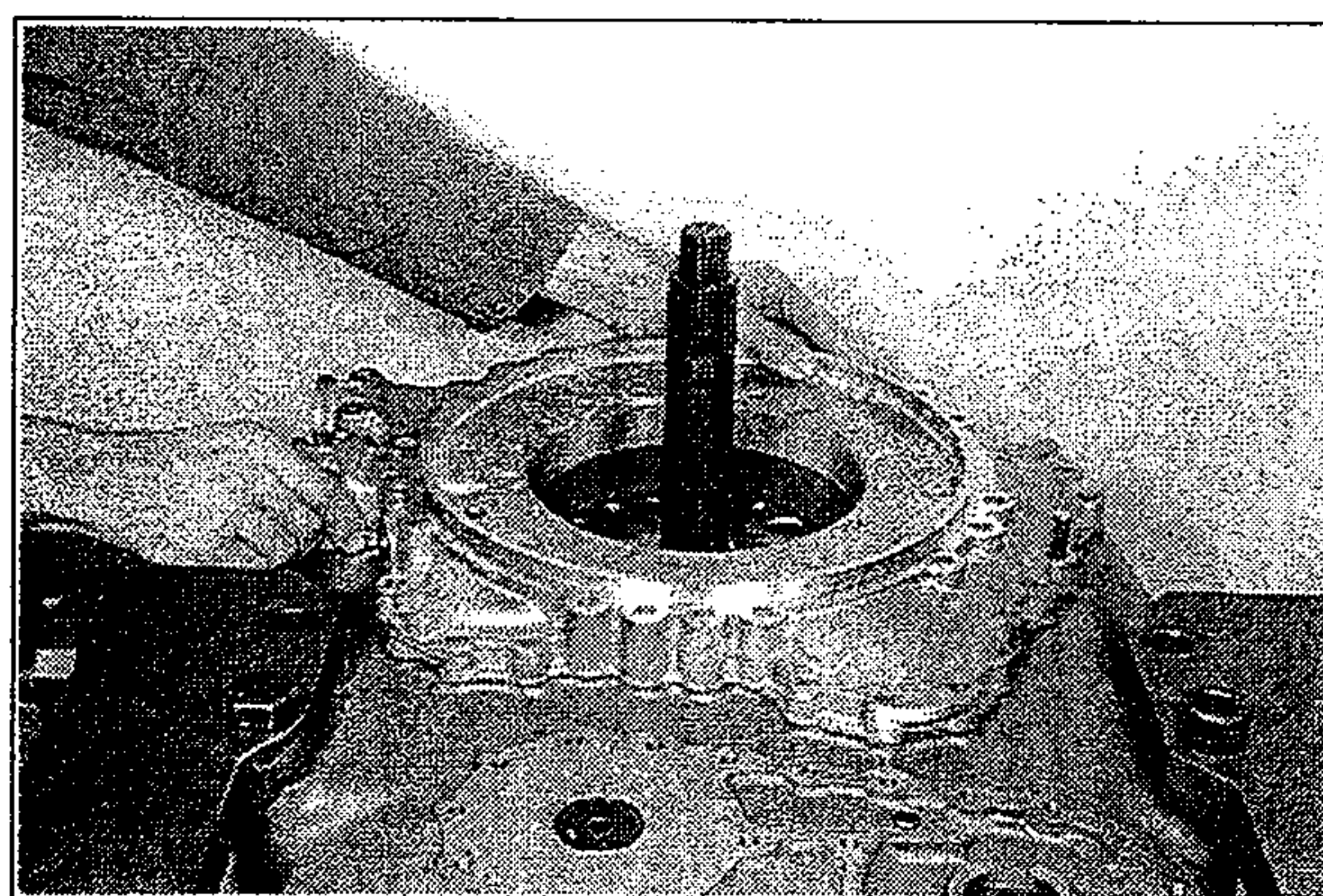
- ① Install two adjusting screws(Arrows) and lay on gasket.

Adjusting screws(M8) 5870 204 011



- ② Lay on oil feed housing and fix it provisionally by means of socket head screws.

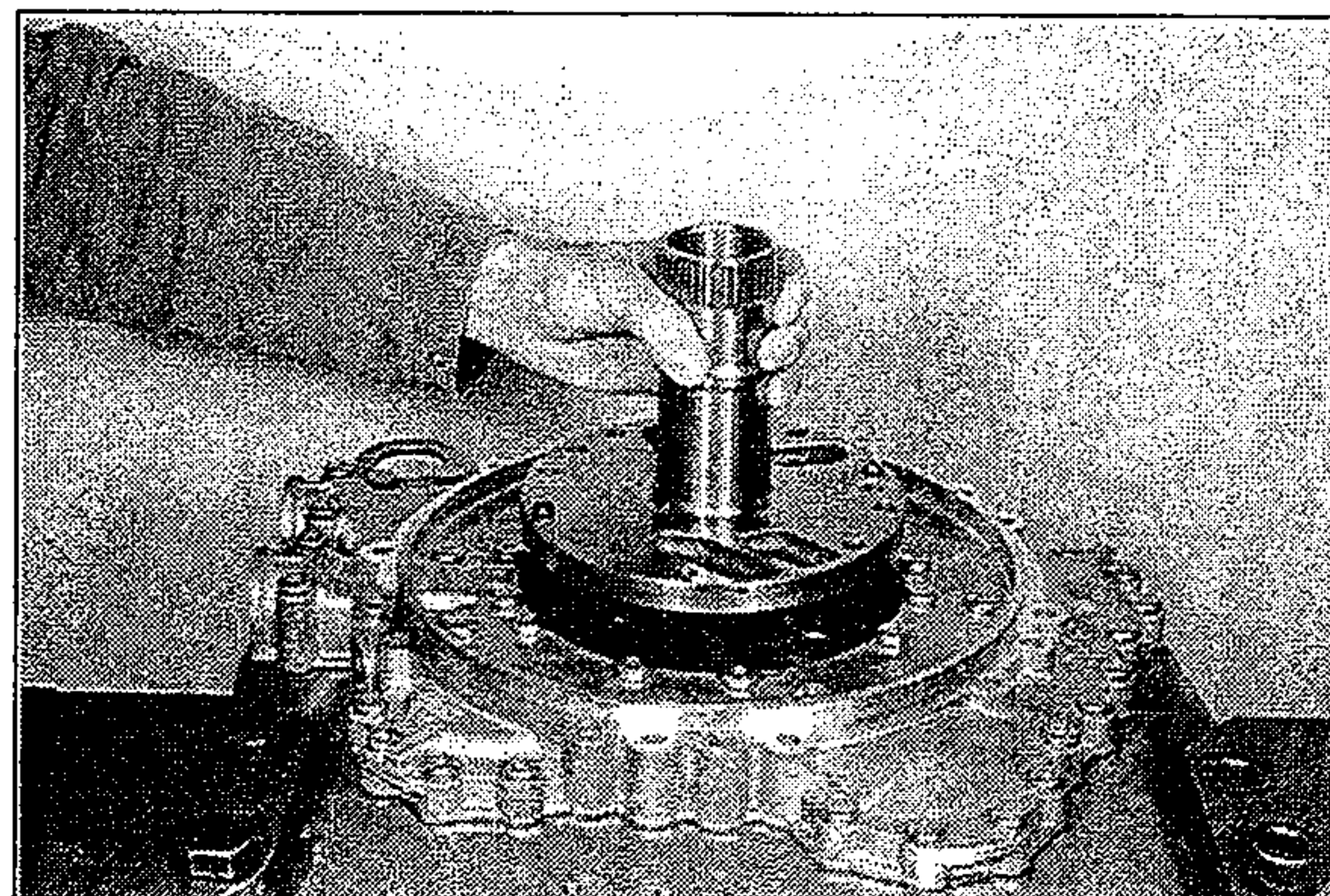
- ※ Screw socket head screws only in until contact is obtained **do not tighten**.



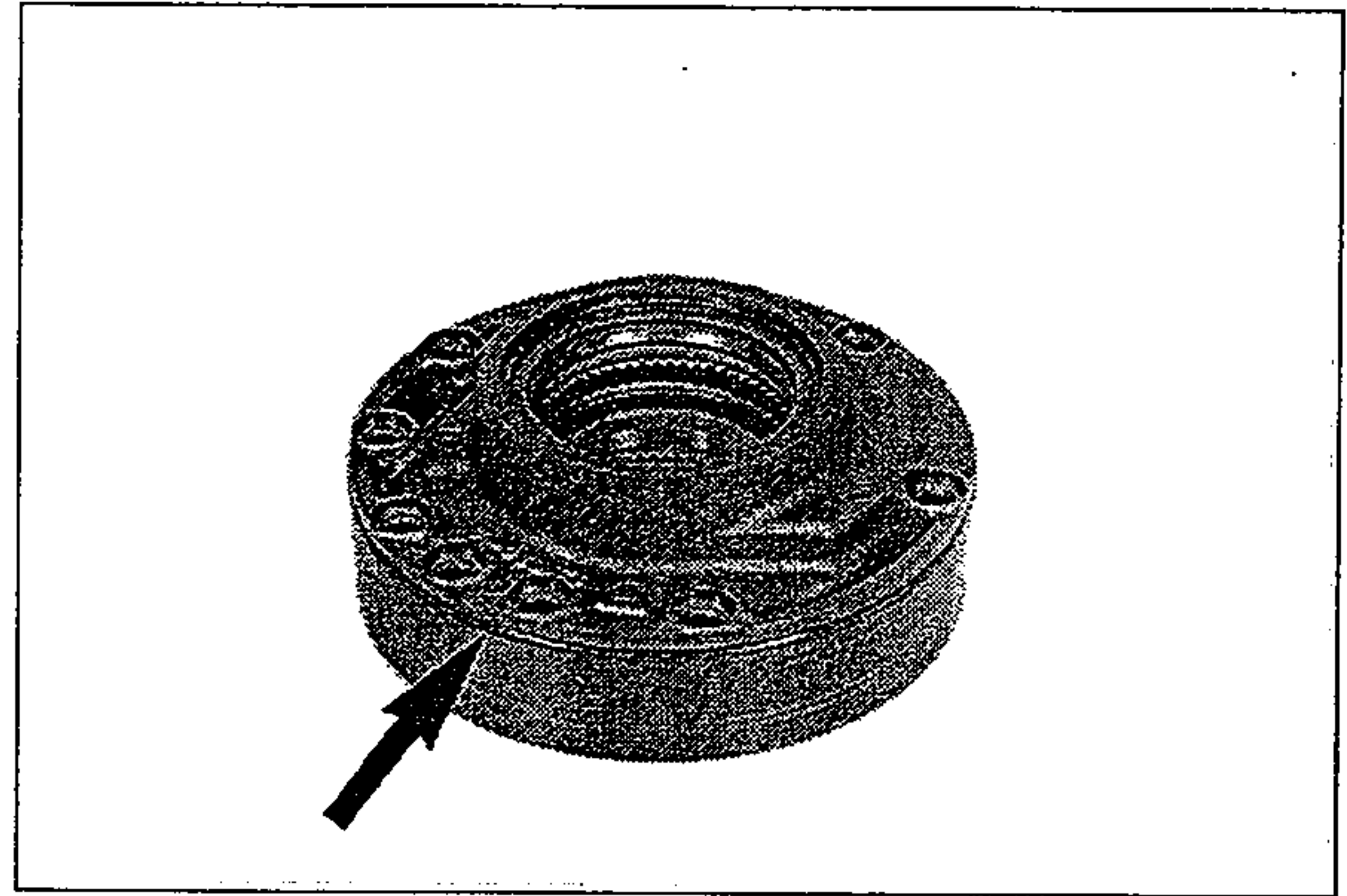
- ③ Install two adjusting screws and introduce stator shaft until contact is obtained.

- ※ Pay attention to the overlapping of the bores.

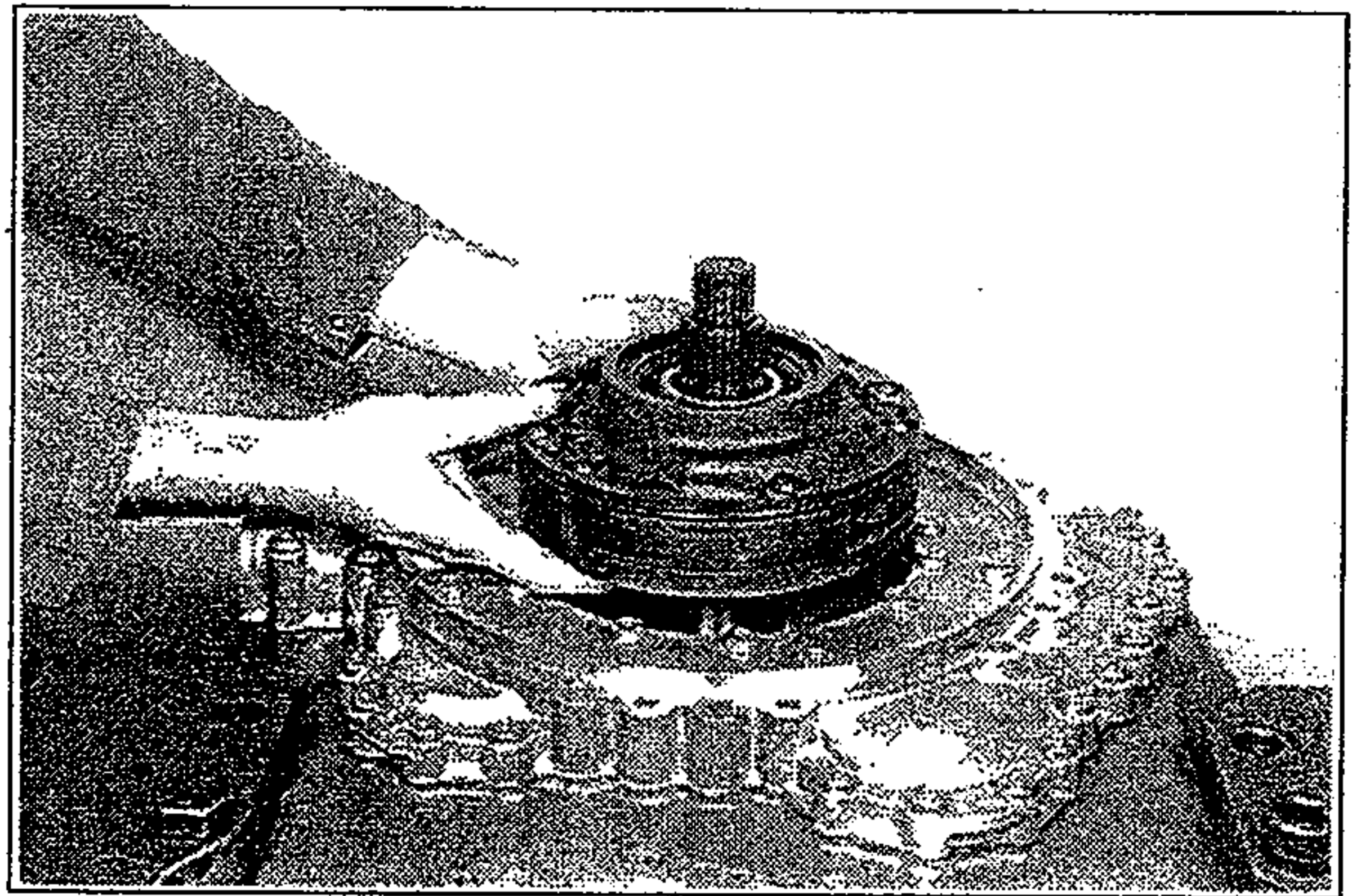
Adjusting screws(M10) 5870 204 007



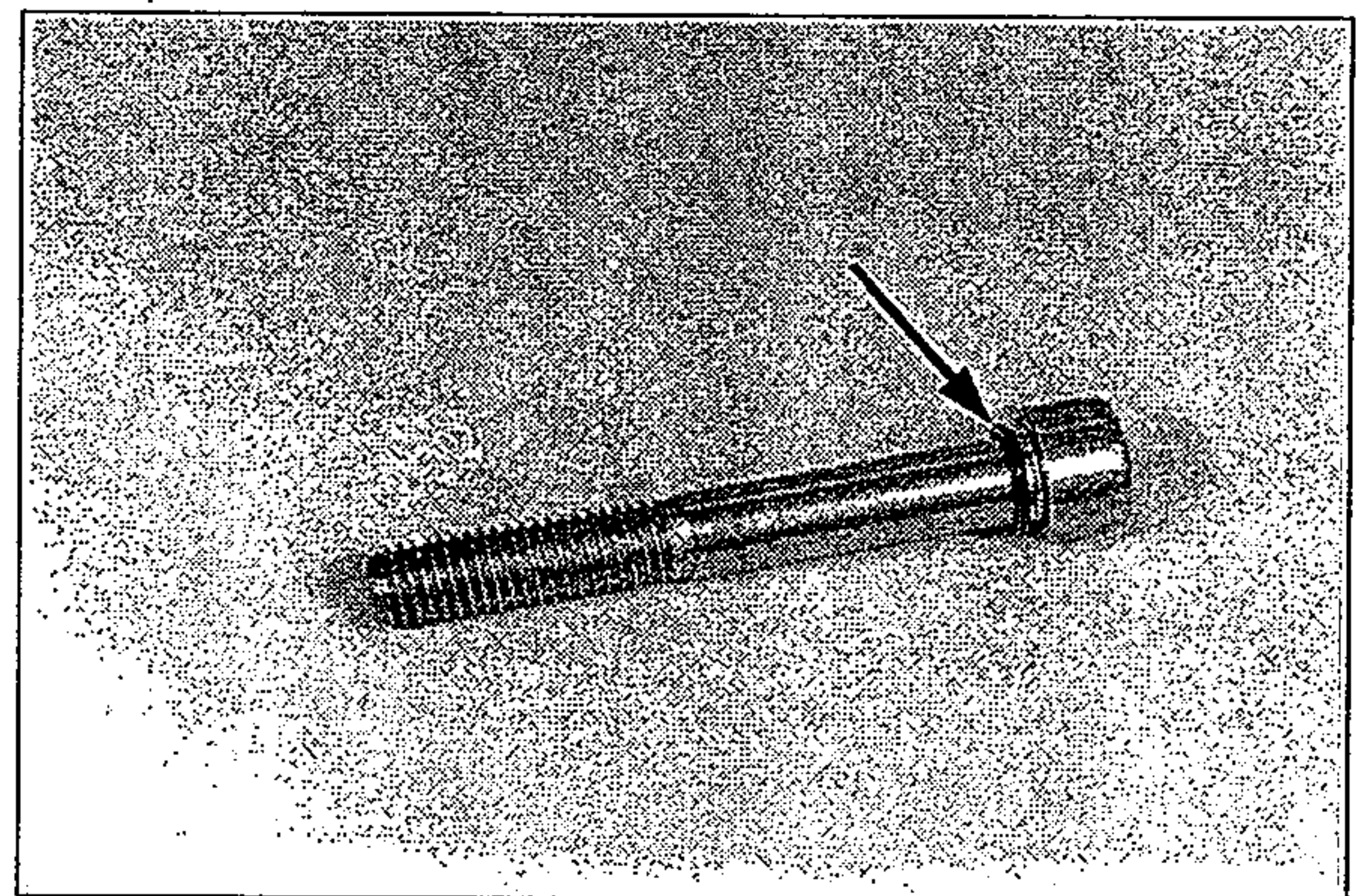
- ④ Insert O-ring(Arrow) into the annular groove and oil it.



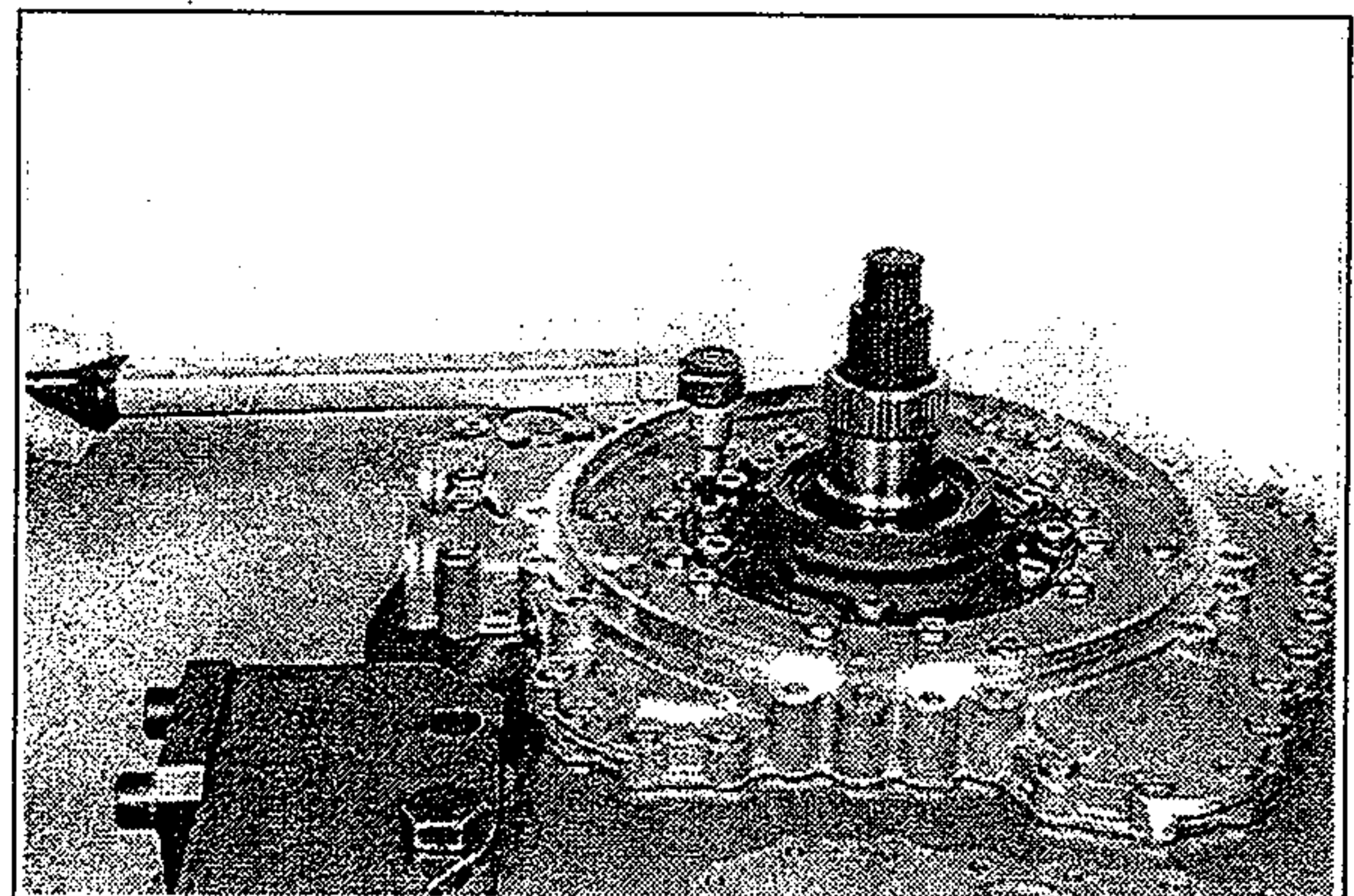
- ⑤ Introduce transmission pump(Complete) and put it by means of socket head screws(For the moment without O-rings) evenly against shoulder.
Now, remove socket head screws again.



- ⑥ Equip socket head screws with new O-ring(Arrow).
※ Grease O-rings.



- ⑦ Fasten transmission pump by means of socket head screws.
• Torque limit : 4.7kgf · m(33.9lbf · ft)



- ⑧ Fasten oil feed housing by means of socket head screws and hexagon head screws(2 pieces).

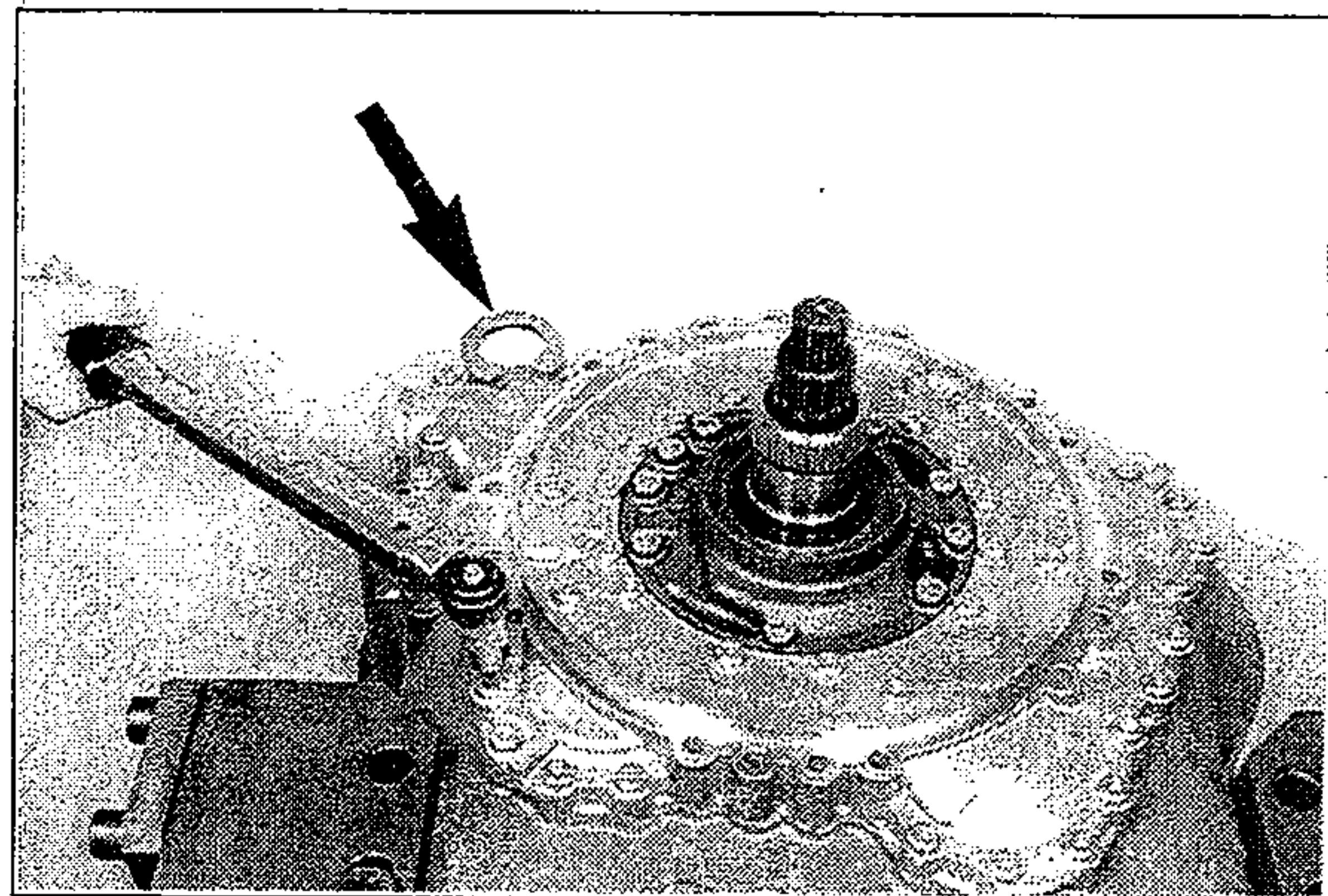
• Torque limit

- Socket head screw : 2.3kgf · m
(16.6bf · ft)

- Hexagon head screw : 4.7kgf · m
(33.9bf · ft)

※ Pay attention to the position of the fixing plate, see Arrow.

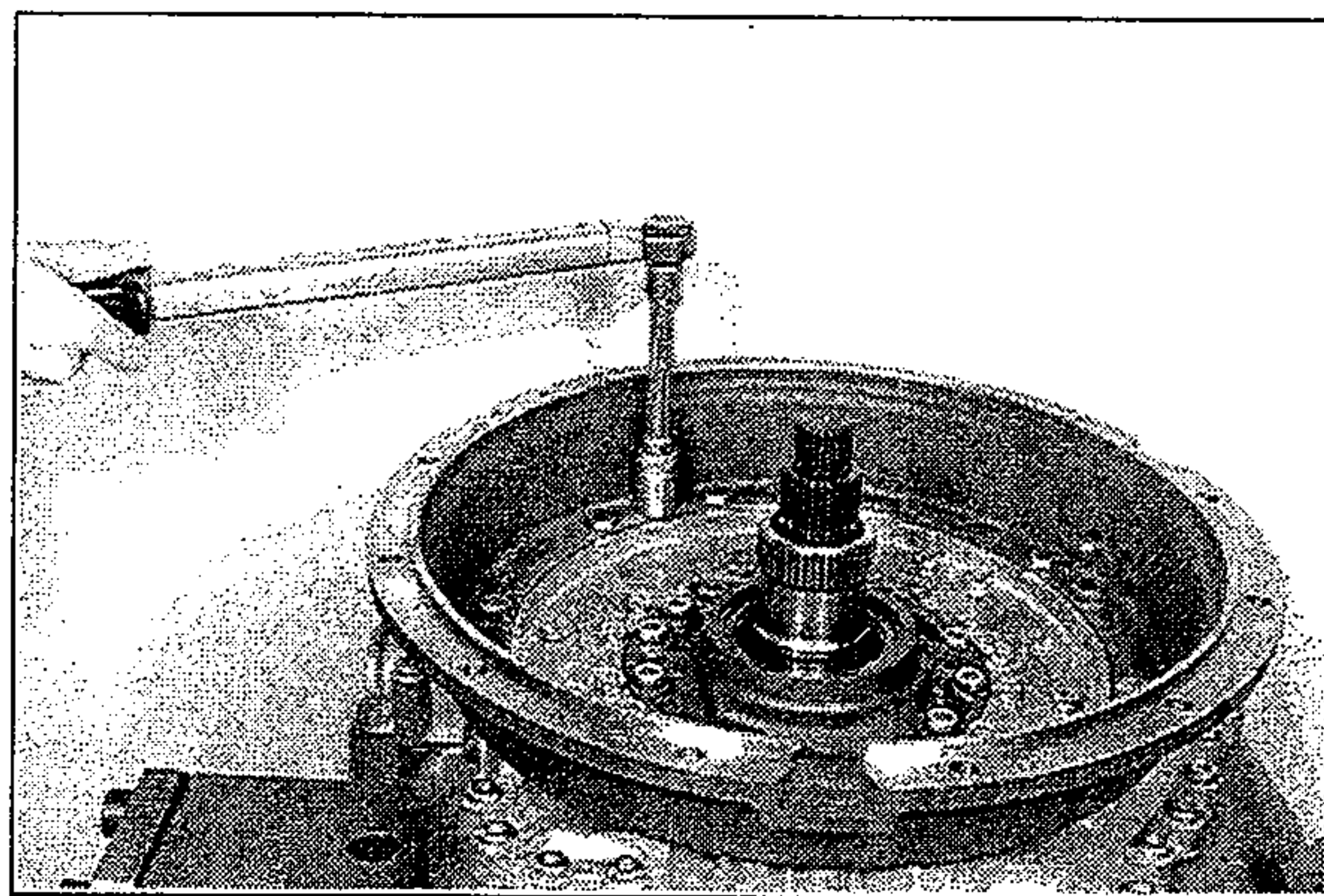
Box spanner(Torx, TX-40) 5873 042 004



(12) Engine connection-Converter

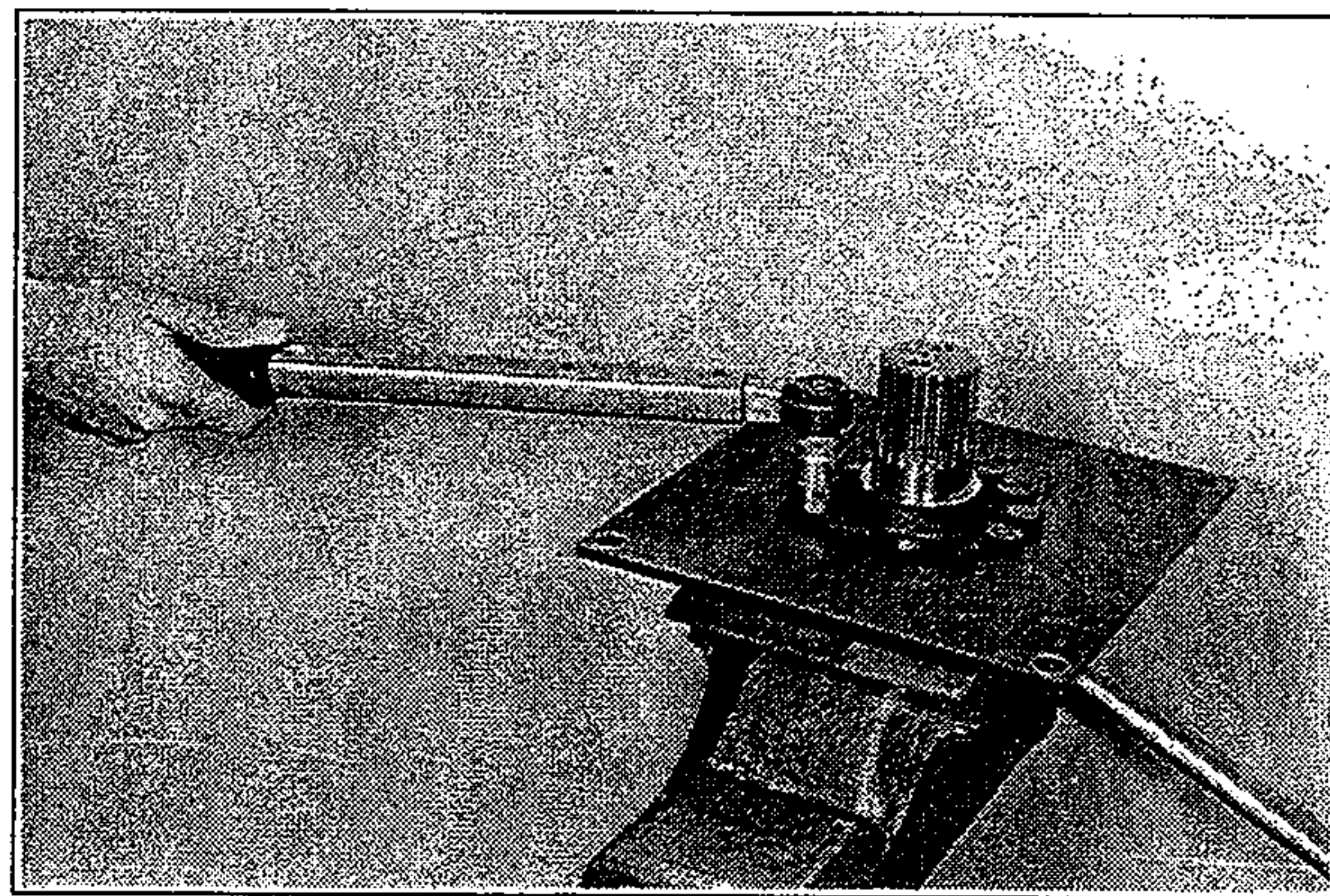
- ① Fasten converter bell by means of hexagon head screws.

• Torque limit(M10/10.9) : 6.9kgf · m
(50.1bf · ft)



- ② Screw drive shaft and diaphragm together.

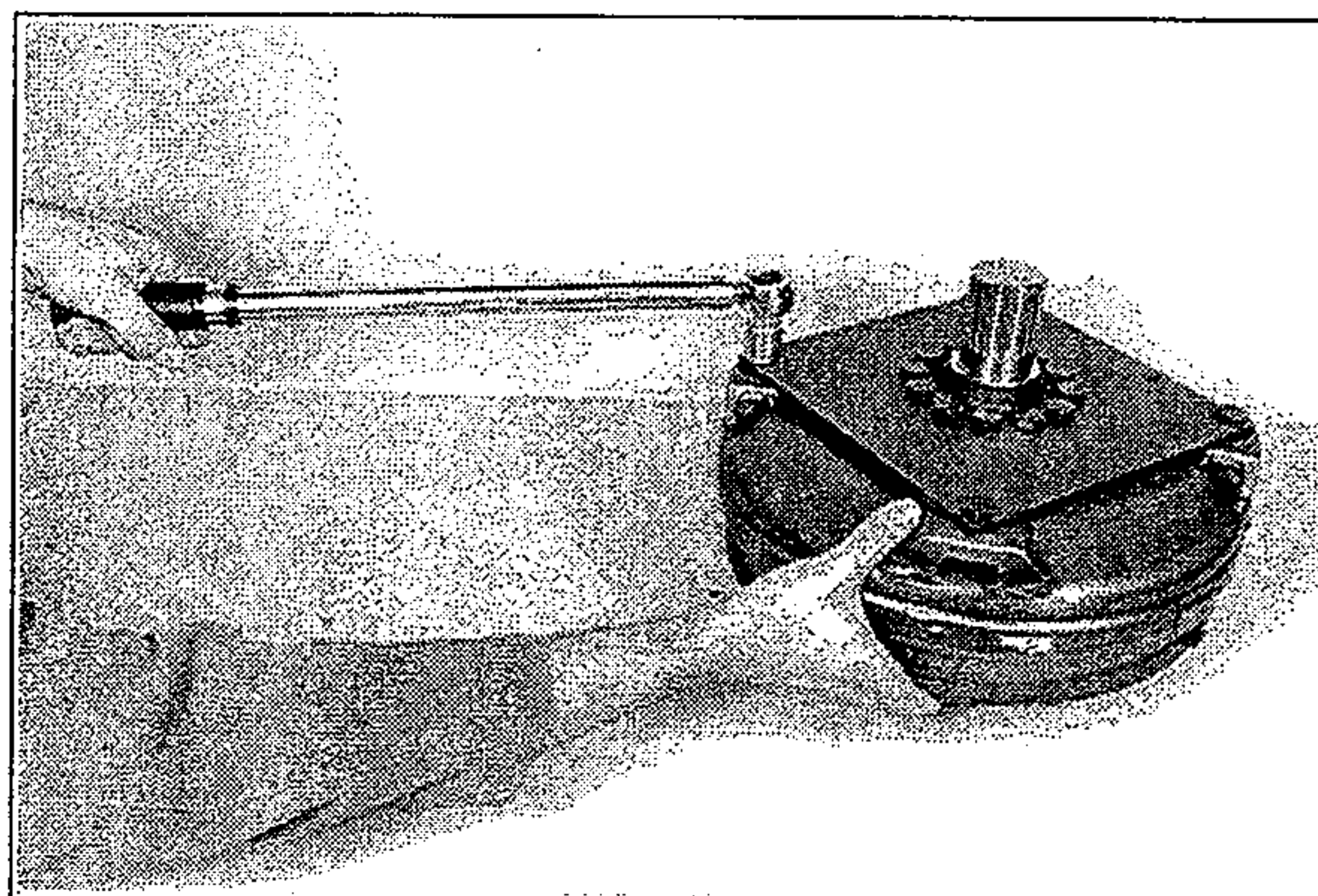
• Torque limit(M12/10.9) : 11.7kgf · m
(84.8bf · ft)



- ③ Fasten diaphragm by means of hexagon head screws on the converter.

• Torque limit(M12/10.9) : 11.7kgf · m
(84.8bf · ft)

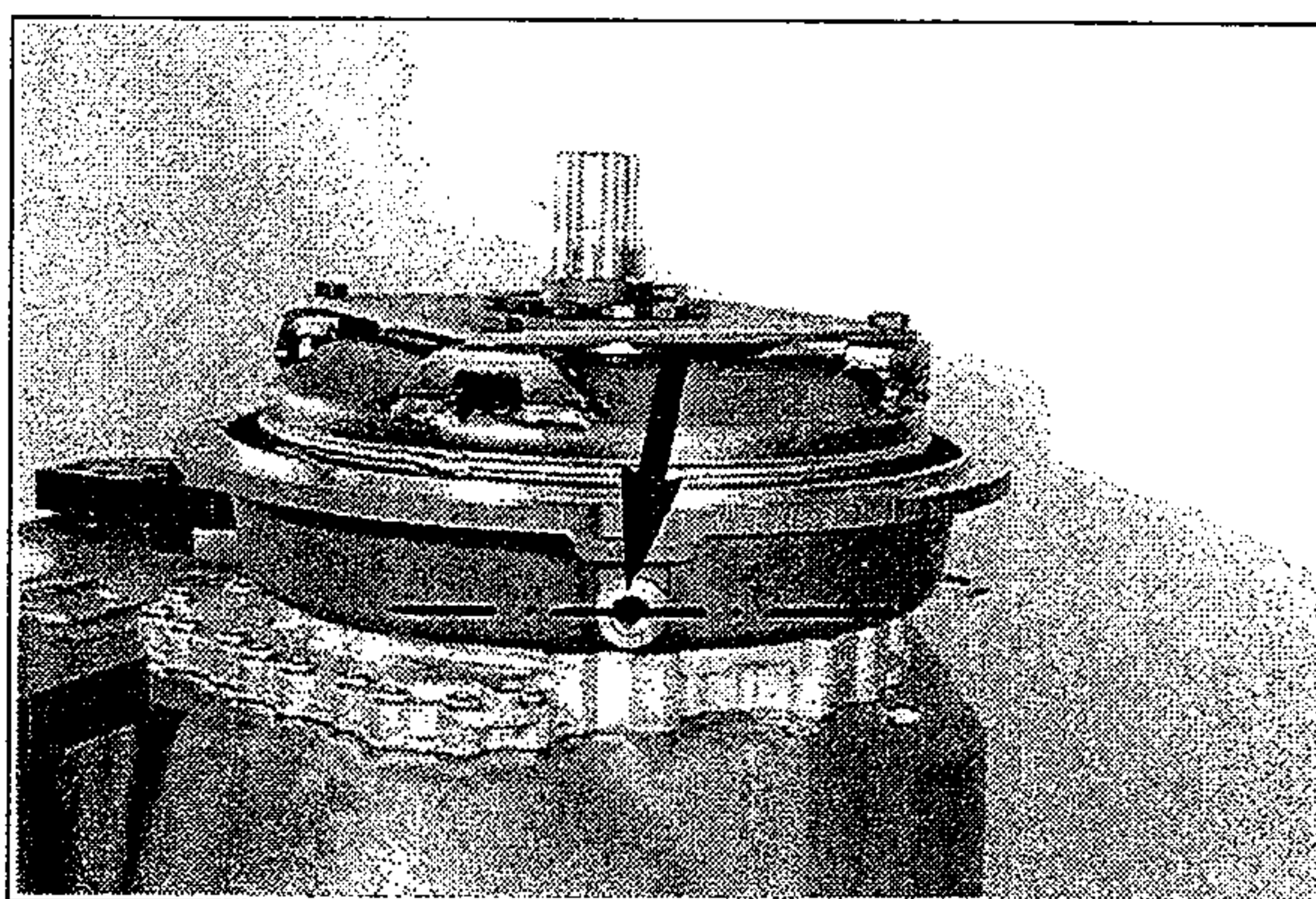
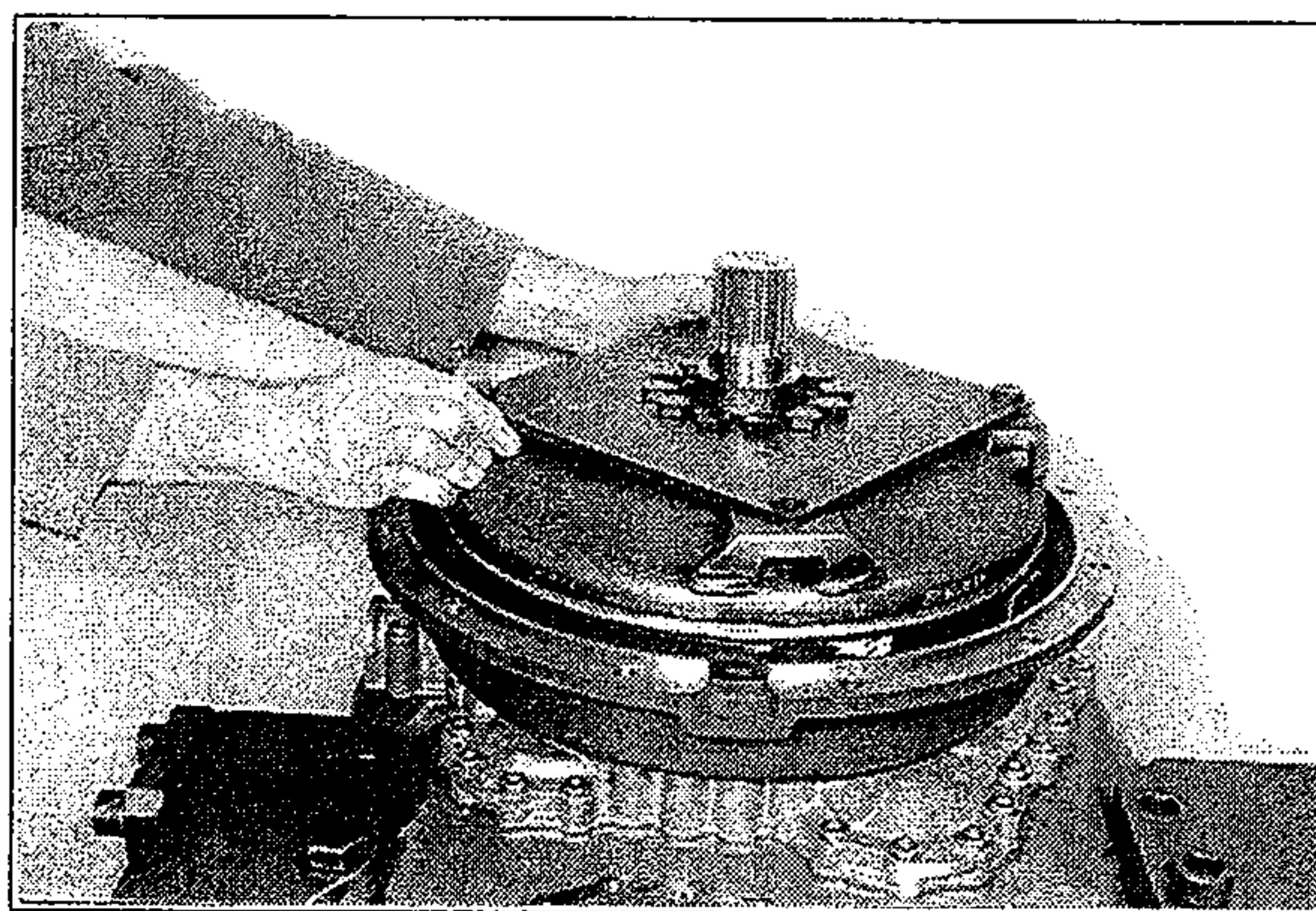
※ Insert hexagon head screws with loctite (Type No.262).



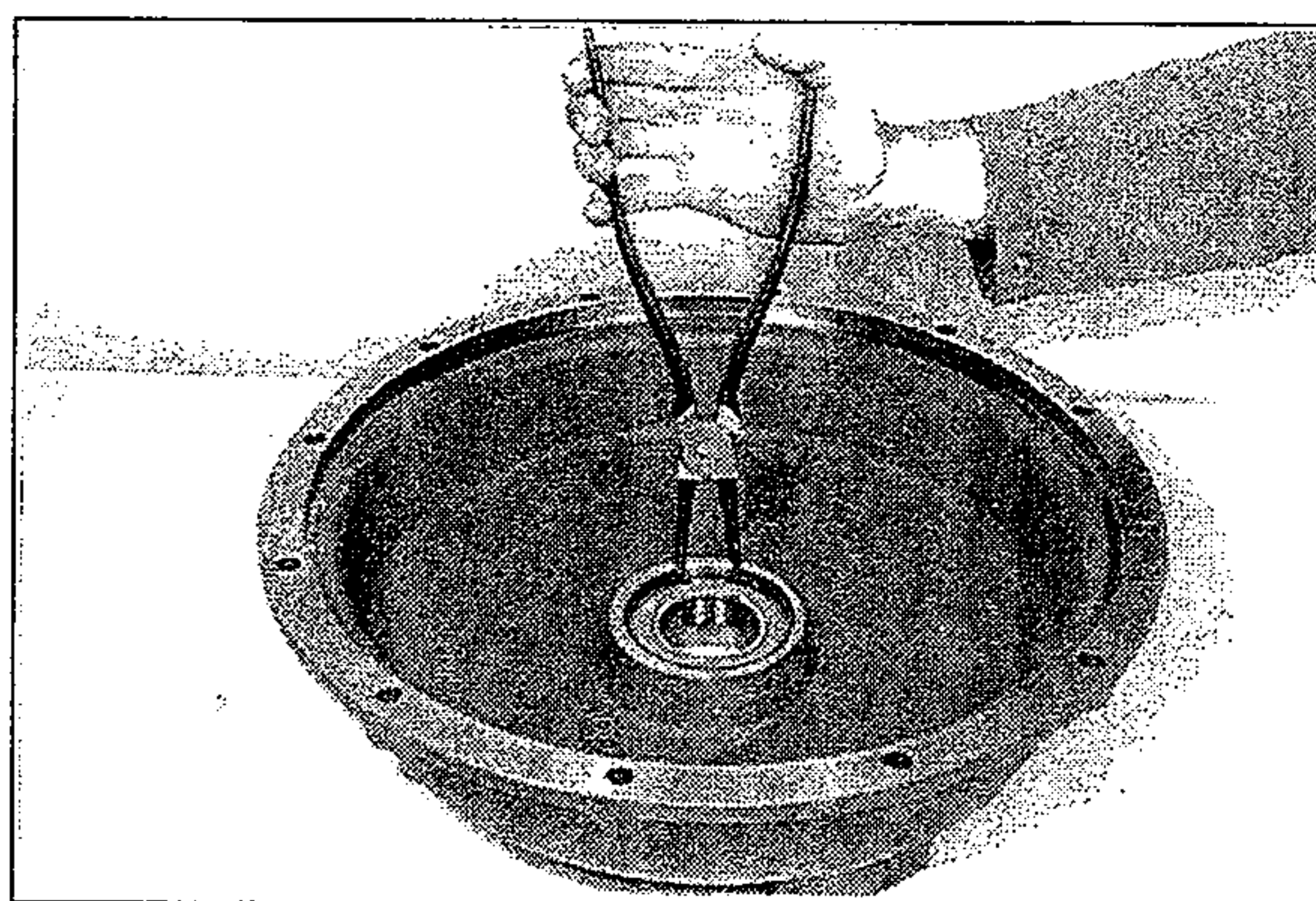
④ Introduce converter until contact is obtained.

※ Pulse disk of the converter must be positioned centrally to the bore of the inductive transmitter, see Arrow.

Only in this way will be ensured that the converter is perfectly introduced.



⑤ Insert ball bearing until contact is obtained and fix it by means of circlip.



⑥ Assemble housing cover.

Install drive flange, lay on disk and pull cover by means of hexagon head screws evenly against shoulder.

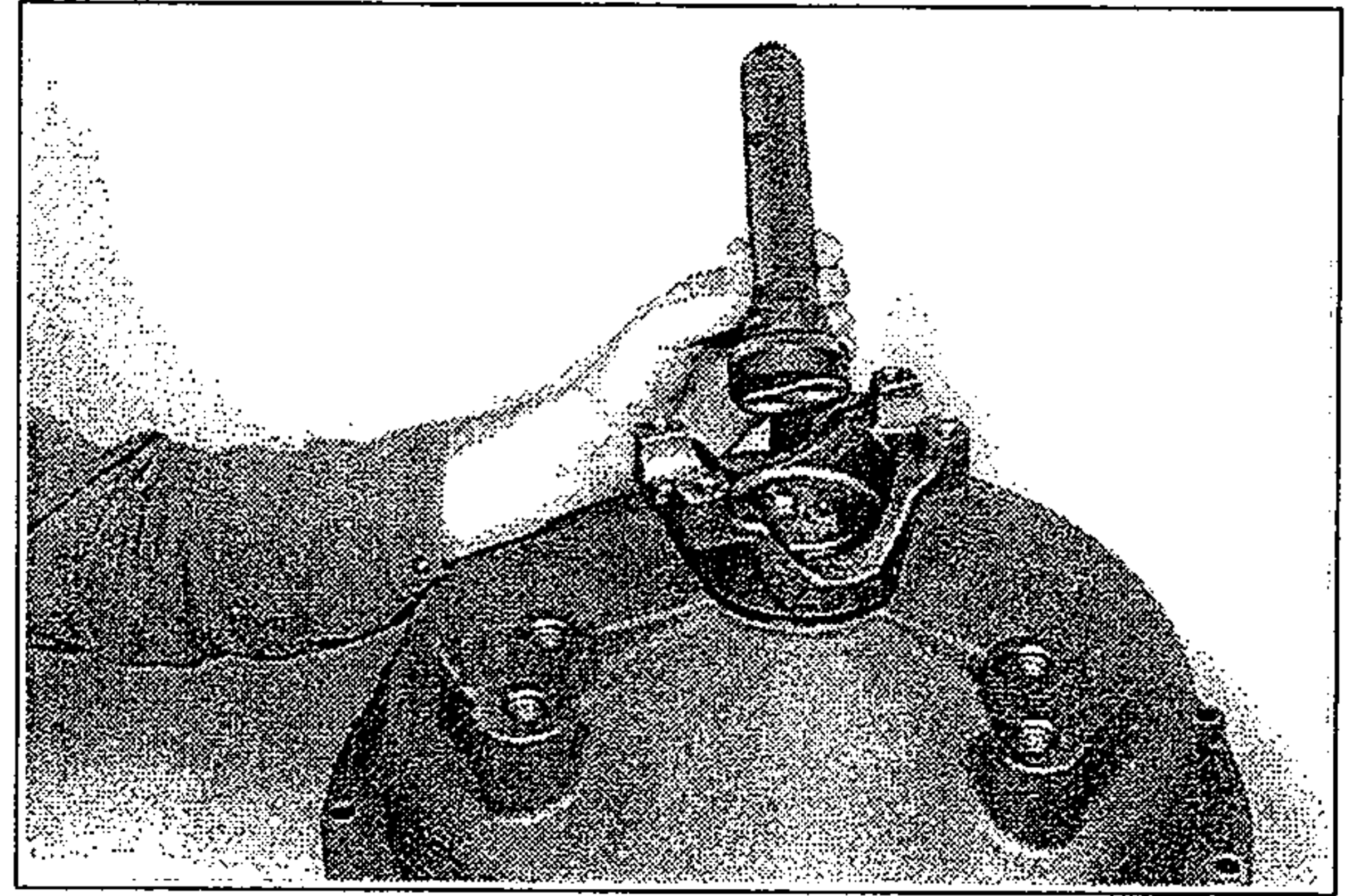
• Torque limit(M8/10.9) : 3.5kgf · m
(25.1bf · ft)

※ Pay attention to the radial installation position of the cover, see figure.



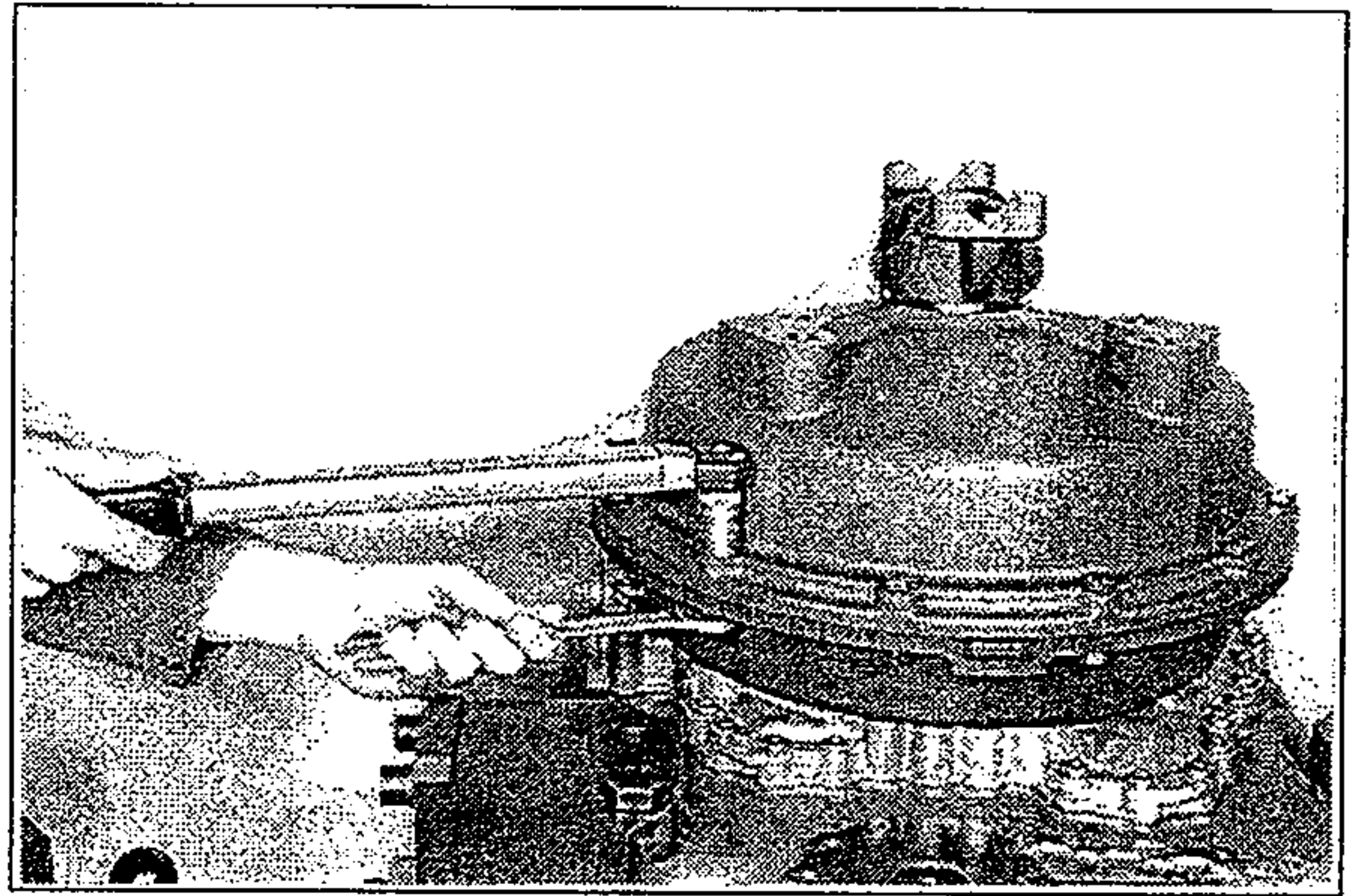
- ⑦ Fix hexagon head screws by means of lock plate.

Driver	5870 057 010
Handle	5870 260 002



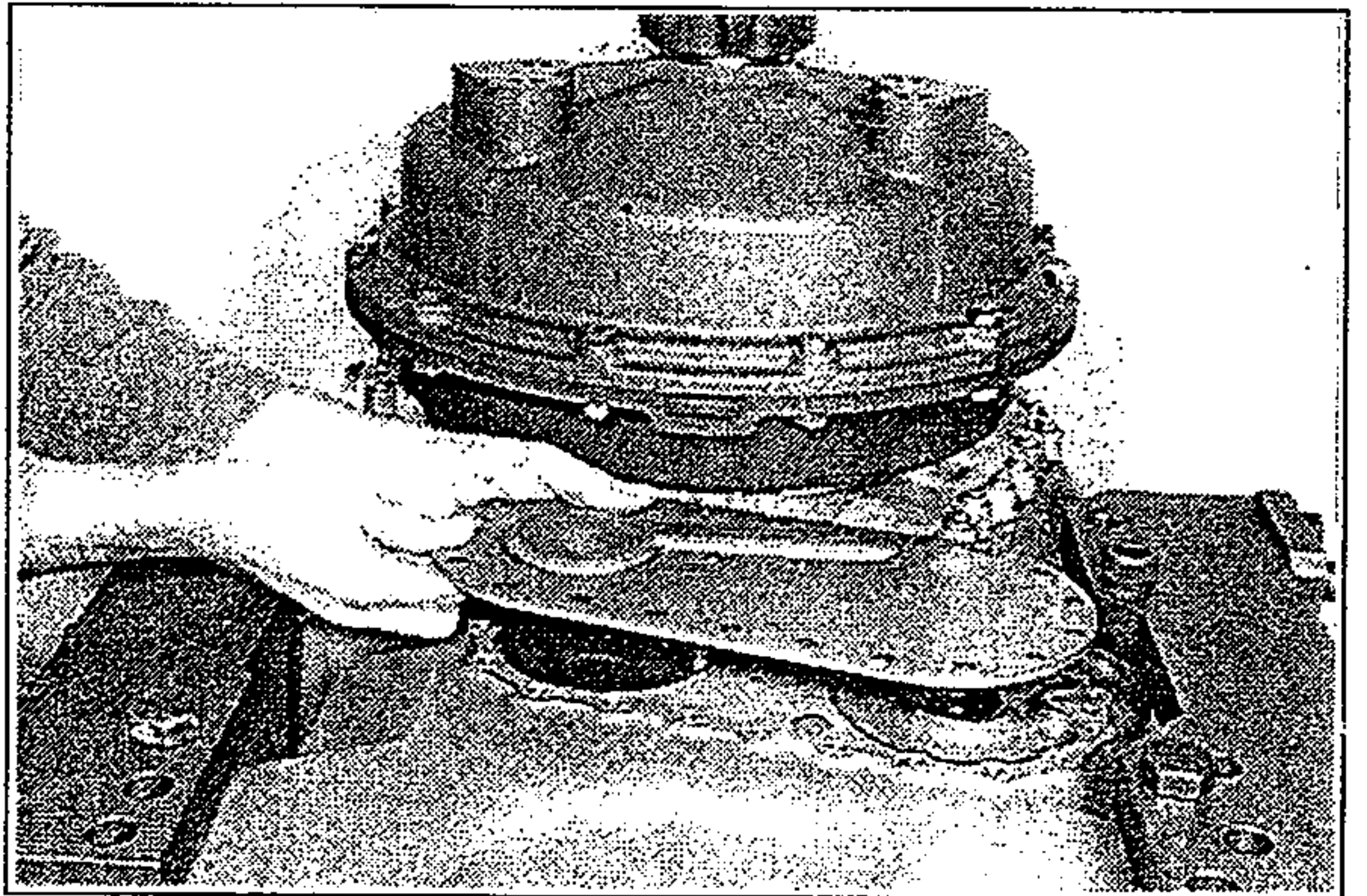
- ⑧ Fasten cover by means of hexagon head screws and nuts on the converter bell.

- Torque limit(M10/838) : 4.7kgf · m
(33.9lbf · ft)



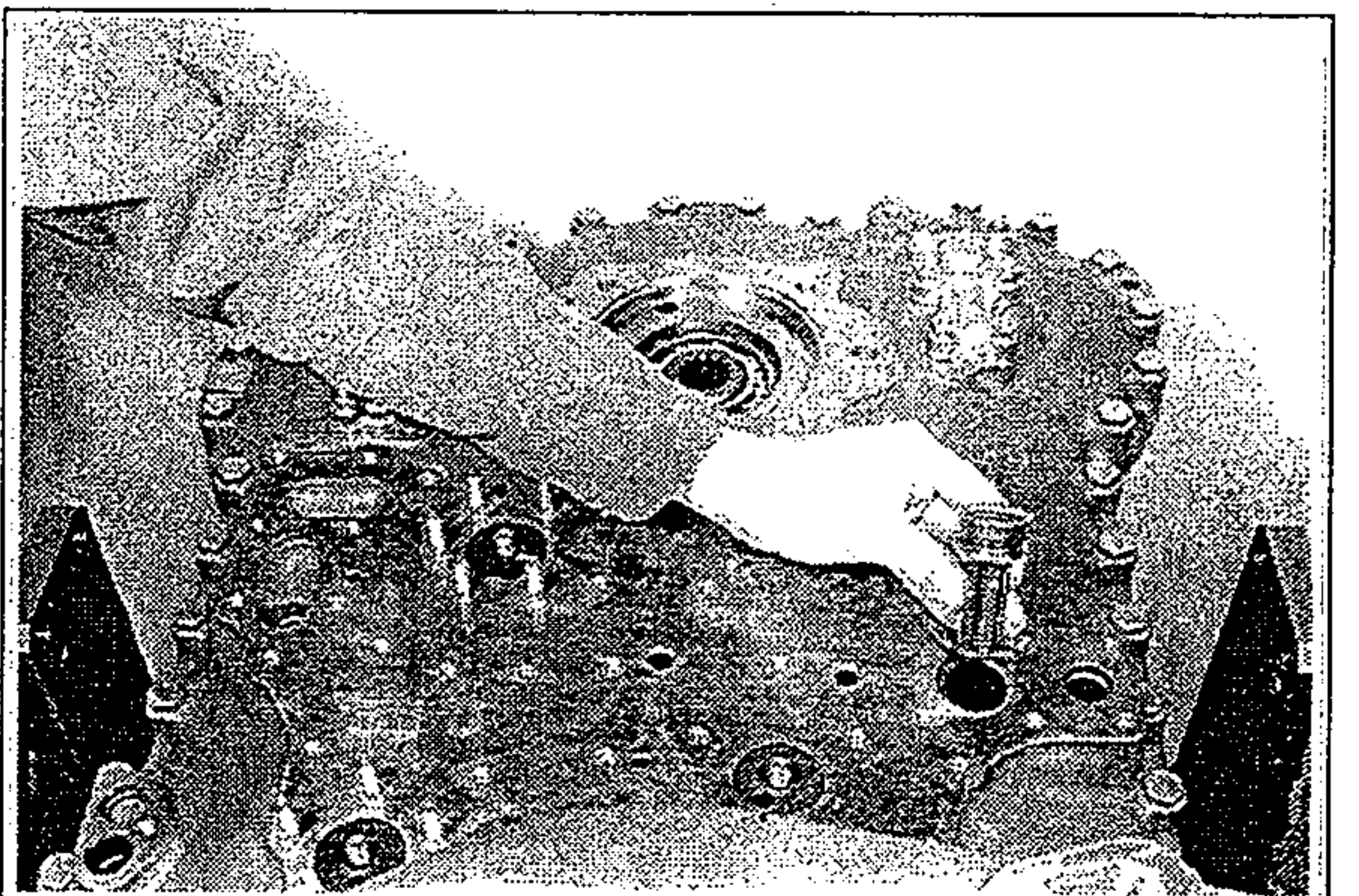
- ⑨ Mount gasket and fasten cover by means of hexagon head screws.

- Torque limit(M8/8.8) : 2.3kgf · m
(17.0lbf · ft)



(13) Converter safety valve

- ① Insert converter safety valve(Complete) into the housing hose.



(14) Mount duct plate and hydraulic control unit

① Install components according to the following draft.

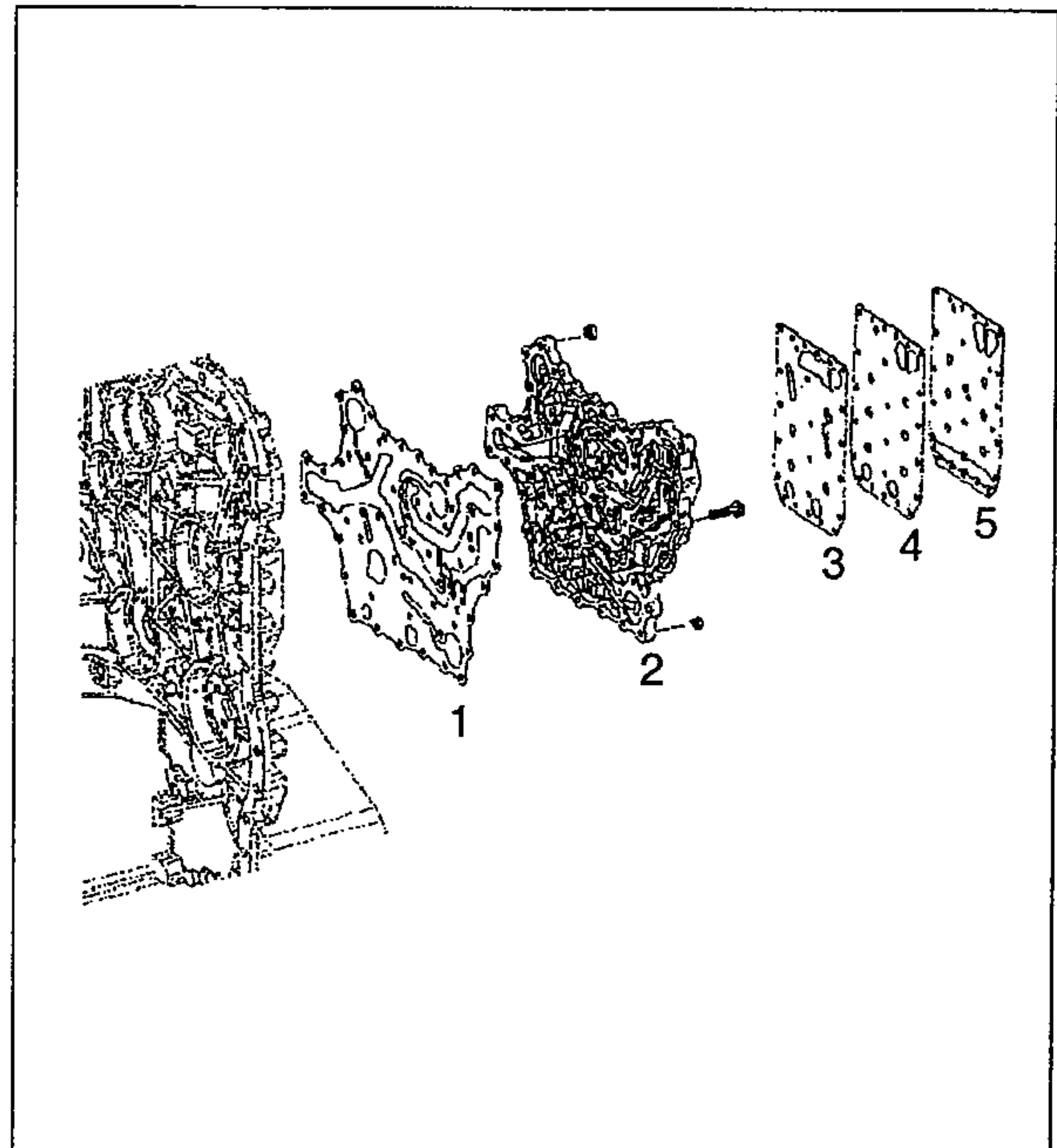
• Torque limit(M8) : 2.3kgf · m(17.0lbf · ft)

※ Pay attention to the installation position of the different gaskets, see draft.

- 1 Gasket
- 2 Duct plate
- 3 Gasket
- 4 Intermediate plate
- 5 Gasket

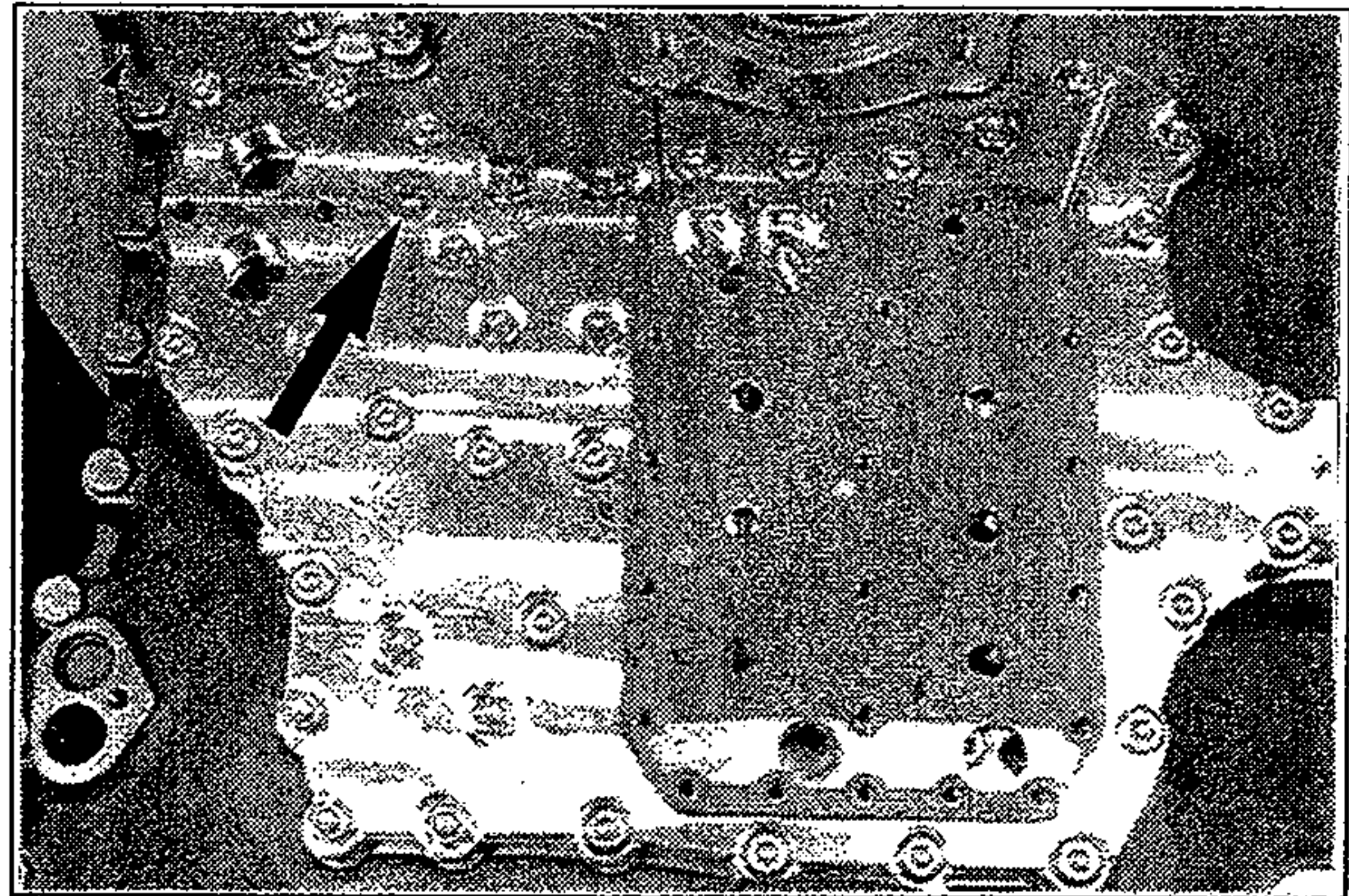
Adjusting screws 5870 204 063

Box spanne 5873 042 004



② Equip screw plug(Arrow) with new O-ring and install it.

• Torque limit(M16 × 1.5) : 3.0kgf · m
(21.7lbf · ft)

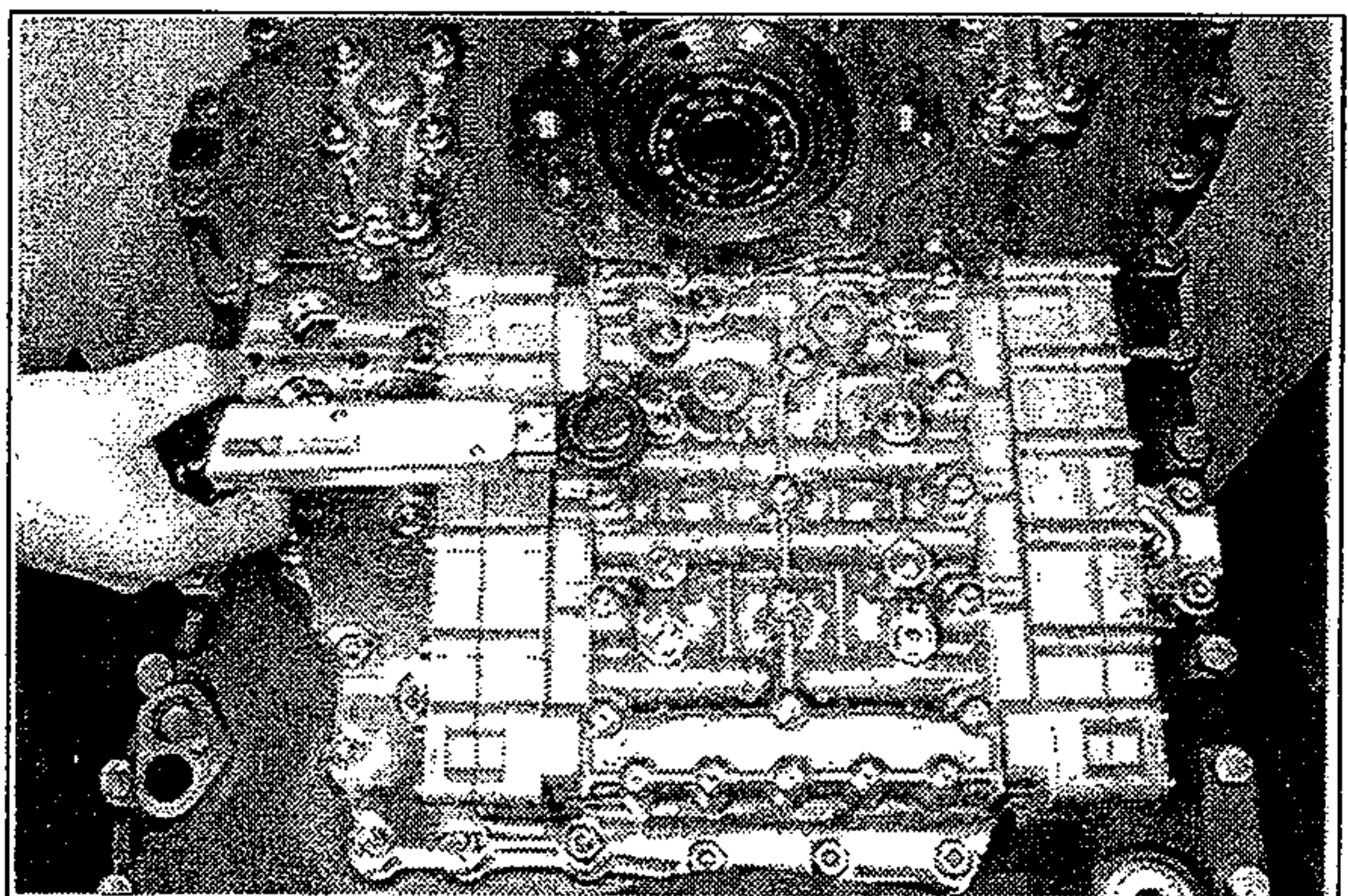


③ Fasten hydraulic control unit(HSG-94) by means of socket head screws.

• Torque limit(M6) : 0.97kgf · m(7.0lbf · ft)

Adjusting screws 5870 204 063

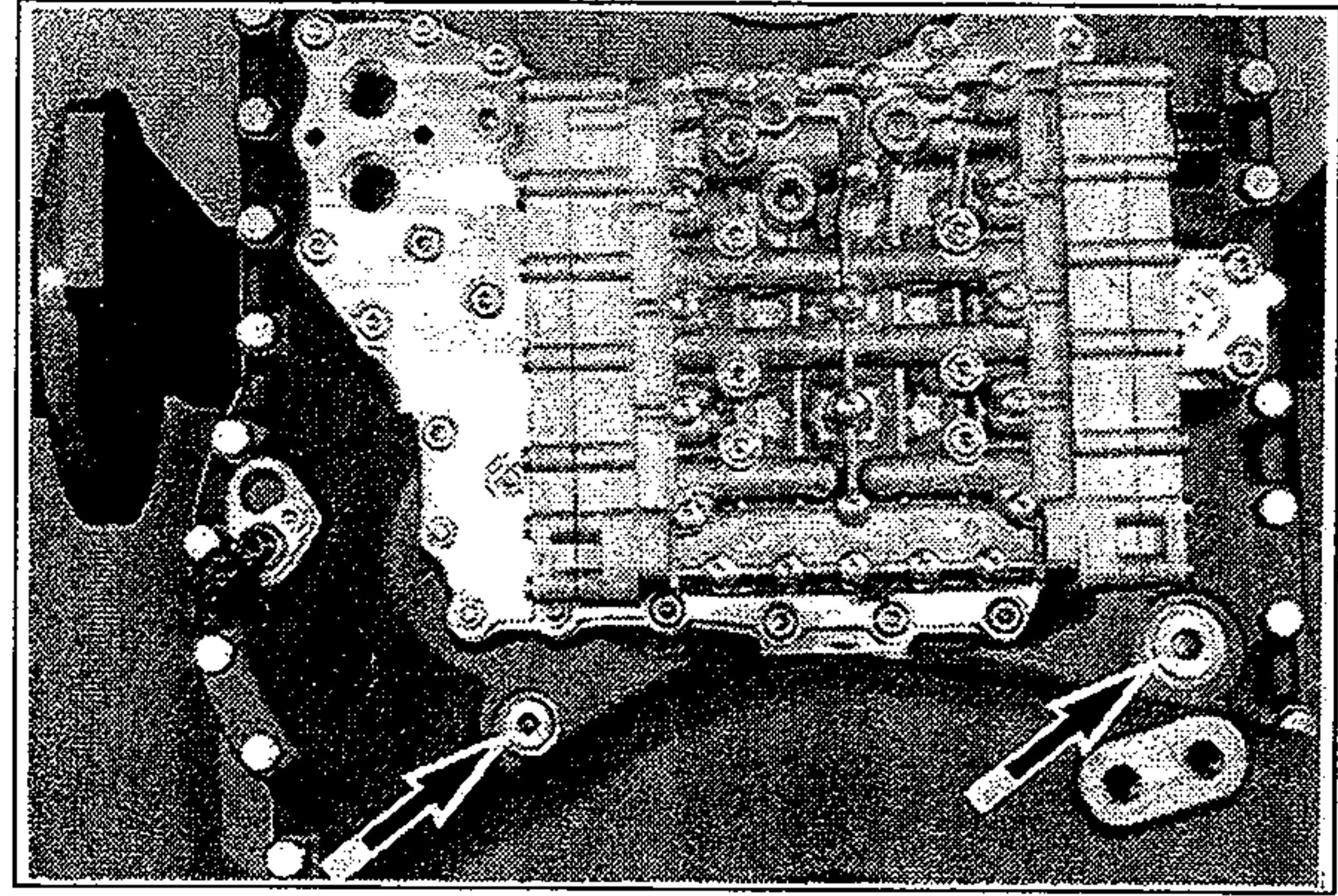
Box spanner(Torx Tx-27) 5873 042 002



(15) Install plugs and oil level tube

- ① Equip both plugs(Arrows) with new O-rings and install them.

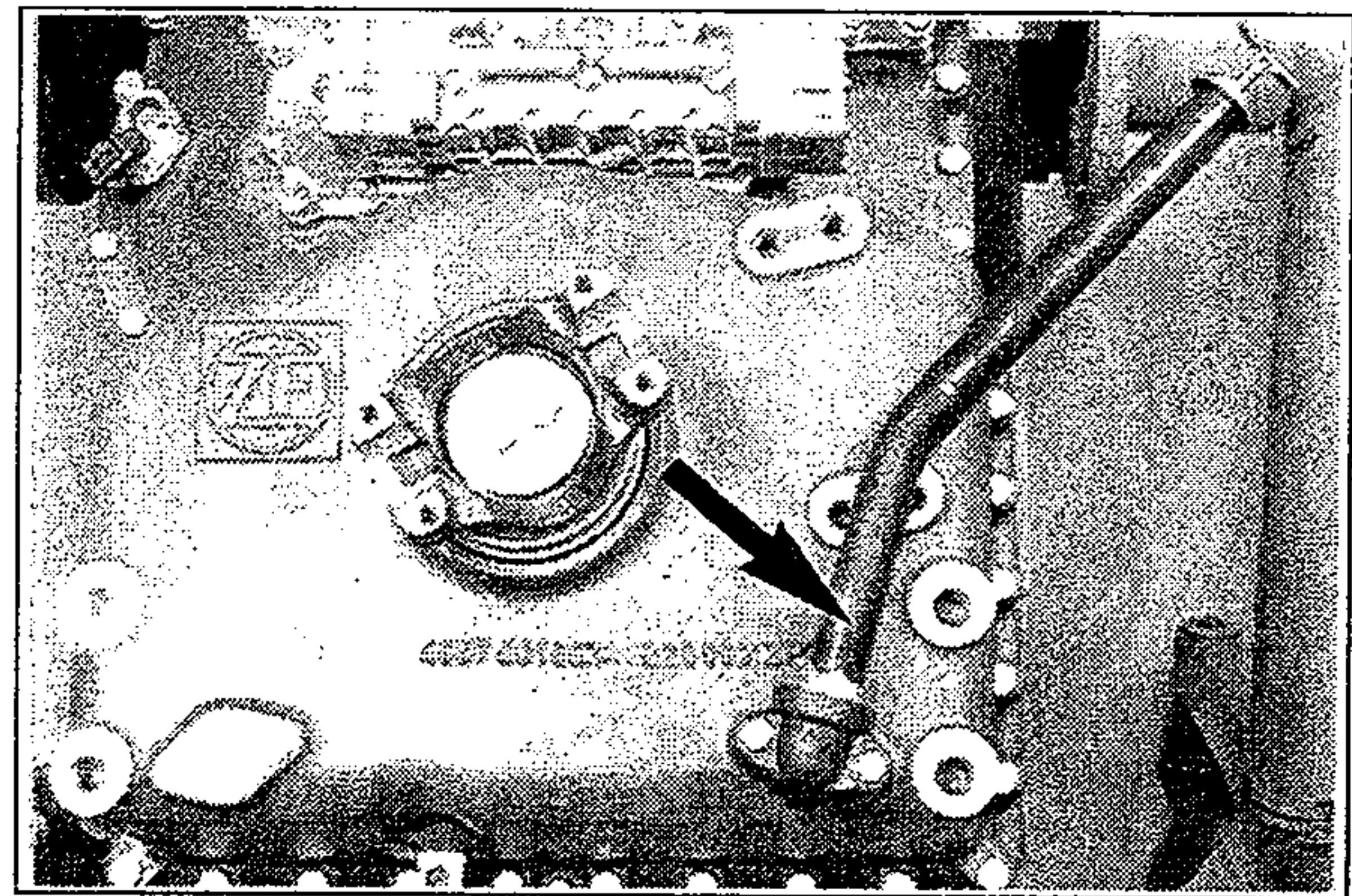
- Torque limit(M18 × 1.5) : 5.1kgf · m
(36.9lbf · ft)
- Torque limit(M26 × 1.5) : 8.2kgf · m
(59.0lbf · ft)



- ② Install oil level tube(Arrow).

※ Mount new gasket.

- Torque limit(M8/10.9) : 3.5kgf · m
(25.1lbf · ft)



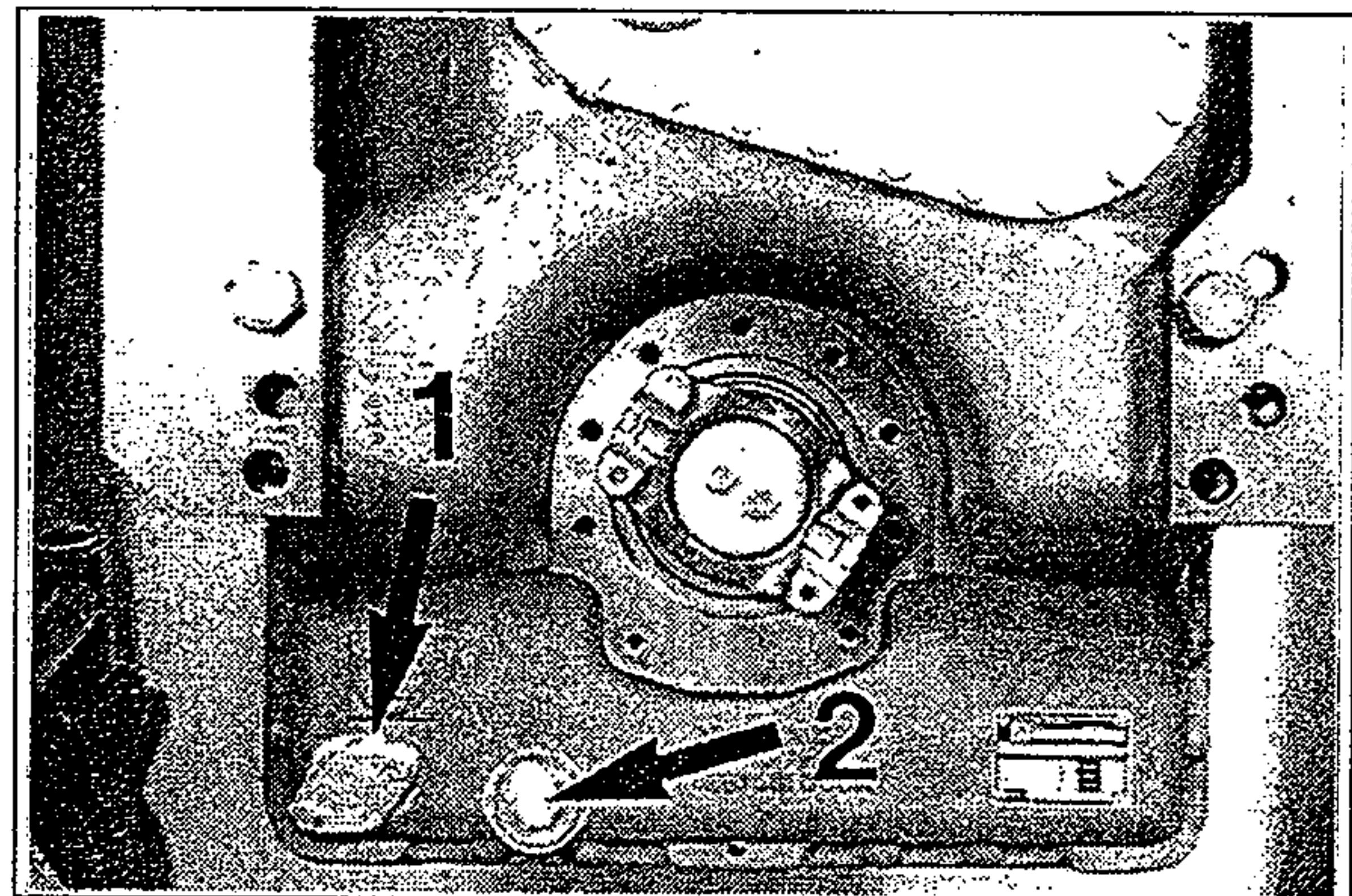
- ③ Install cover plate(Arrow 1).

※ Install new gasket.

- Torque limit(M8/8.8) : 2.3kgf · m
(17.0lbf · ft)

Equip screw plug(Arrow 2) with new O-ring and install it.

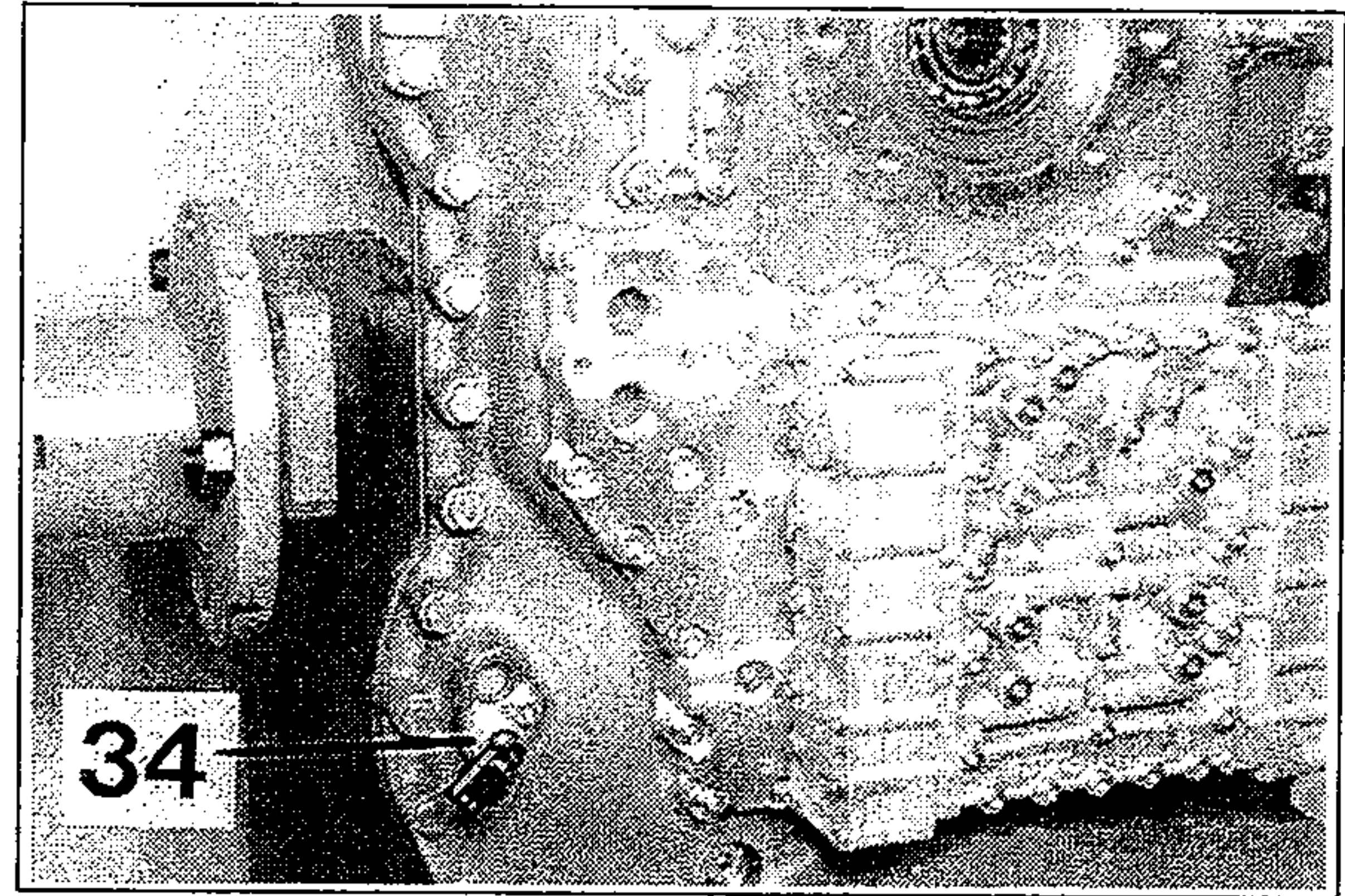
- Torque limit(M38 × 1.5) : 14.3kgf · m
(103lbf · ft)



(16) Speed sensor and inductive transmitters

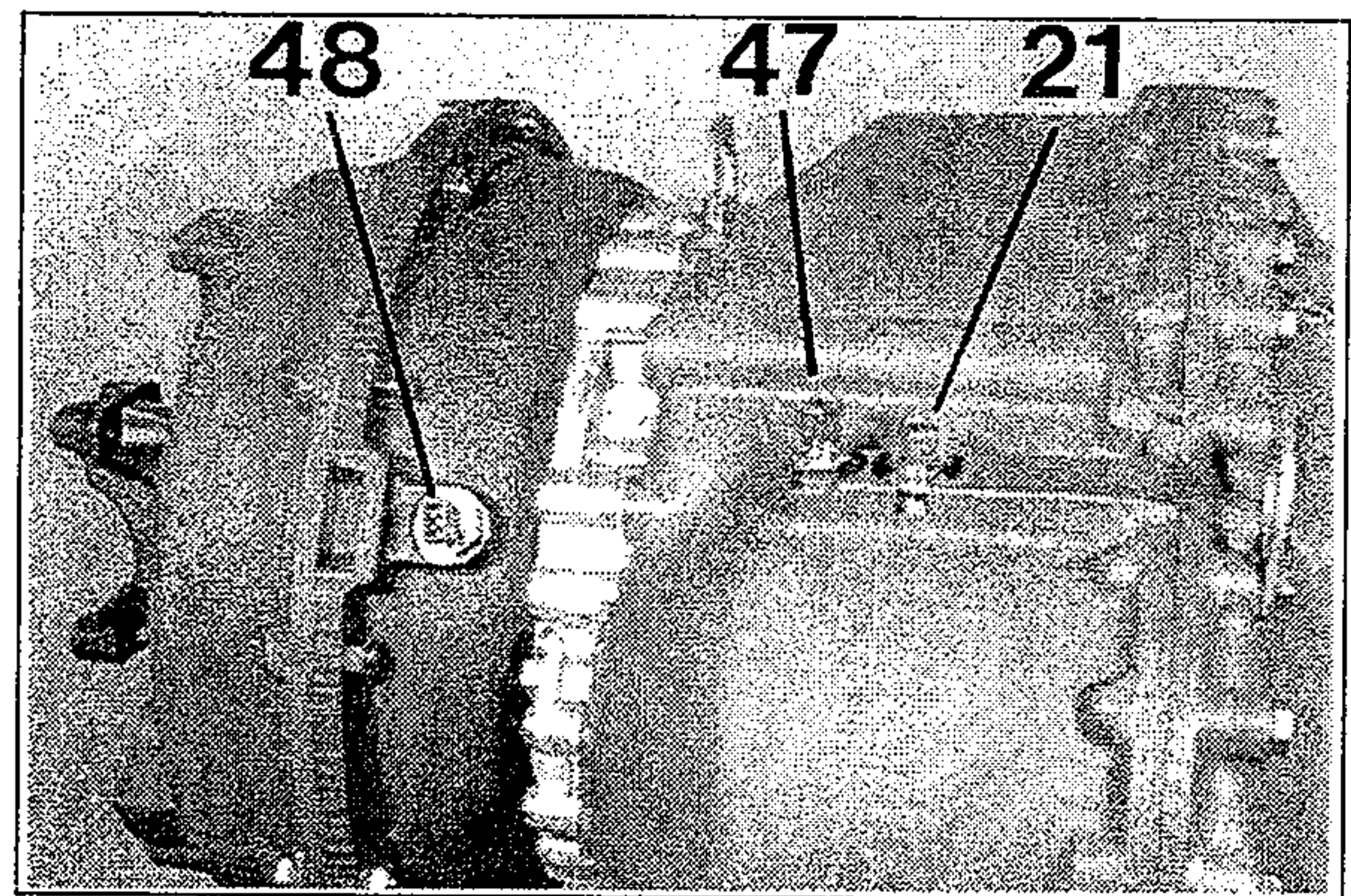
- ① The figures show the installation position of the single inductive transmitters and the speed sensor.

- 34 Speed sensor
n-Output and speedometer
- 21 Inductive transmitter
n-Turbine
- 47 Inductive transmitter
n-Central gear train
- 48 Inductive transmitter
n-Engine



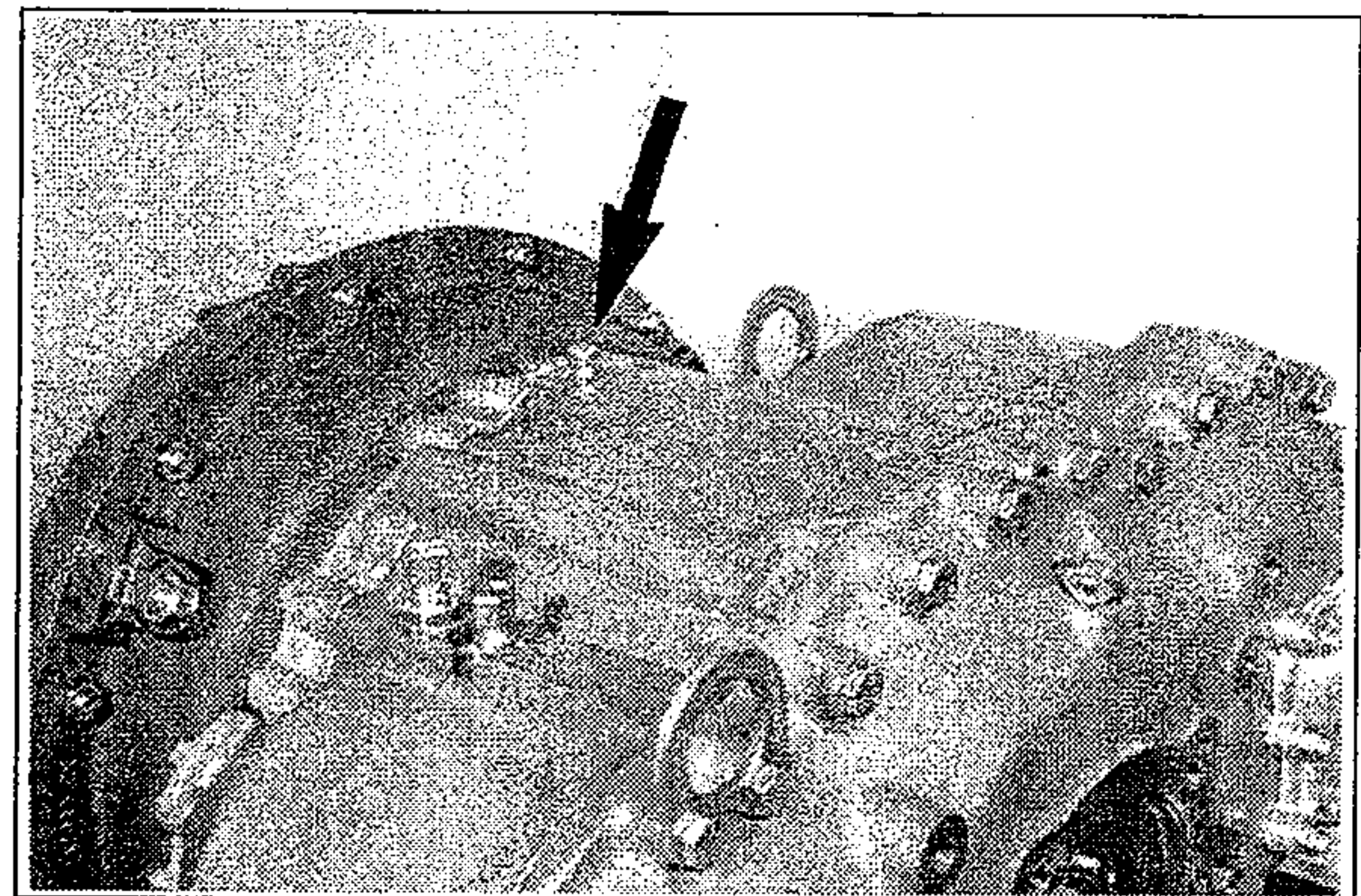
- ② Grease O-rings and install speed sensor as well as inductive transmitters.

- Torque limit : 2.3kgf · m(17.0lbf · ft)
(Socket head screw/Speed sensor)
- Torque limit : 3.1kgf · m(22.1lbf · ft)
(Inductive transmitter)



- ③ Install breather(Arrow).

- Torque limit : 1.2kgf · m(8.9lbf · ft)



3. AXLE

1) GENERAL INSTRUCTIONS

Before starting operations for disassembling, overhauling and reassembling the following points should be borne in mind.

(1) Cleaning components

△ **Never use gasoline, solvents or other inflammable fluids to clean components. Use approved commercial solvents that are unflammable and non-toxic.**

- ① Maximum cleanness is recommended when working on an assembly, consequently, all components should be thoroughly cleaned before reassembly.
- ② Ambient where operations are carried out should be dust free and as clean as possible.
- ③ Make sure that tools and equipment are at hand, particularly those listed and shown in this manual. Components that have been misplaced may be cause of failures on assembly operations as well as chips or foreign matters.
- ④ When overhauling the assembly we suggest to replace the following parts with new ones:
 - Seal rings
 - Gaskets
 - O-ring
 - Threaded rings with notched collar
 - Any component damaged during disassembly
- ⑤ In case of failure and breaking inside of assembly, all ducts and casings should be duly cleaned up so as to remove all material left to prevent further damage after assembling components.
- ⑥ In order to heat bearings use proper heating plates, pipings or suitable ovens.
Never heat parts by using a torch. Oil bath, heated by a torch, may be used to warm up components.
- ⑦ Lubricate all sections concerned when reassembling shafts, bearings, etc.
- ⑧ When mounting heat fitted components make sure of their proper position after they cooled off.
- ⑨ Lubricate O-ring seals before installing them in relevant seats to prevent kinking during assembly, such a position would impair proper sealing.

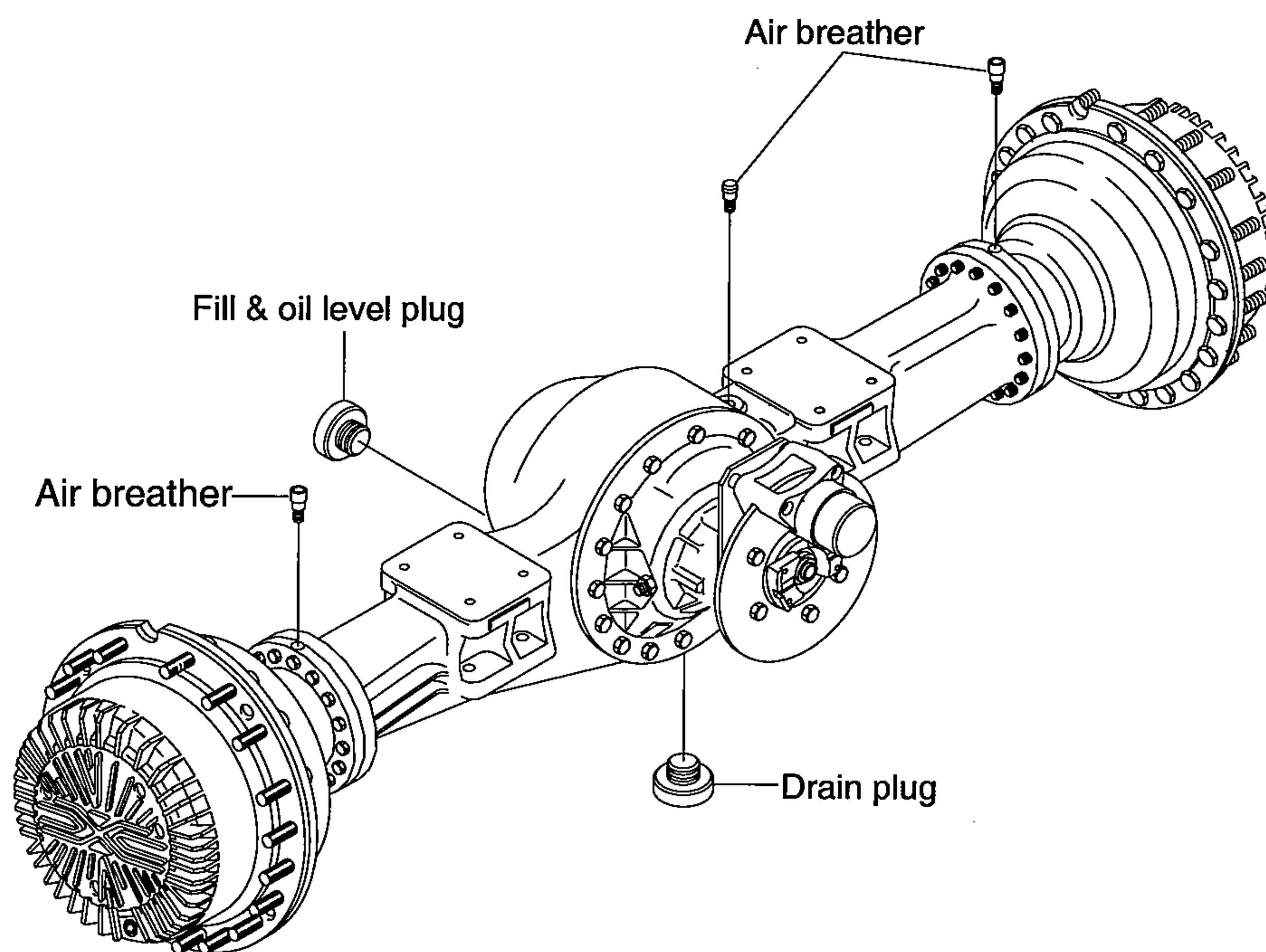
(2) Assembling leakproof components

Use of proper sealing compounds is recommended when assembling matched parts to be sealed against fluid leakages (Oil or water) and no sealing gasket is used.

Best results are reached, with said compounds, if matching surfaces are duly cleaned and degreased prior a uniform coat is spread all over the contact area.

We suggest the following sealing compounds:

- RHODORSIL CAF 1
- LOCTITE PLASTIC GASKET
- SILASTIC 732 RTV



- ※ Use only **genuine spare parts** to warrant proper operations and prevent interchangeability problems.

2) TIGHTENING TORQUES(Front and rear)

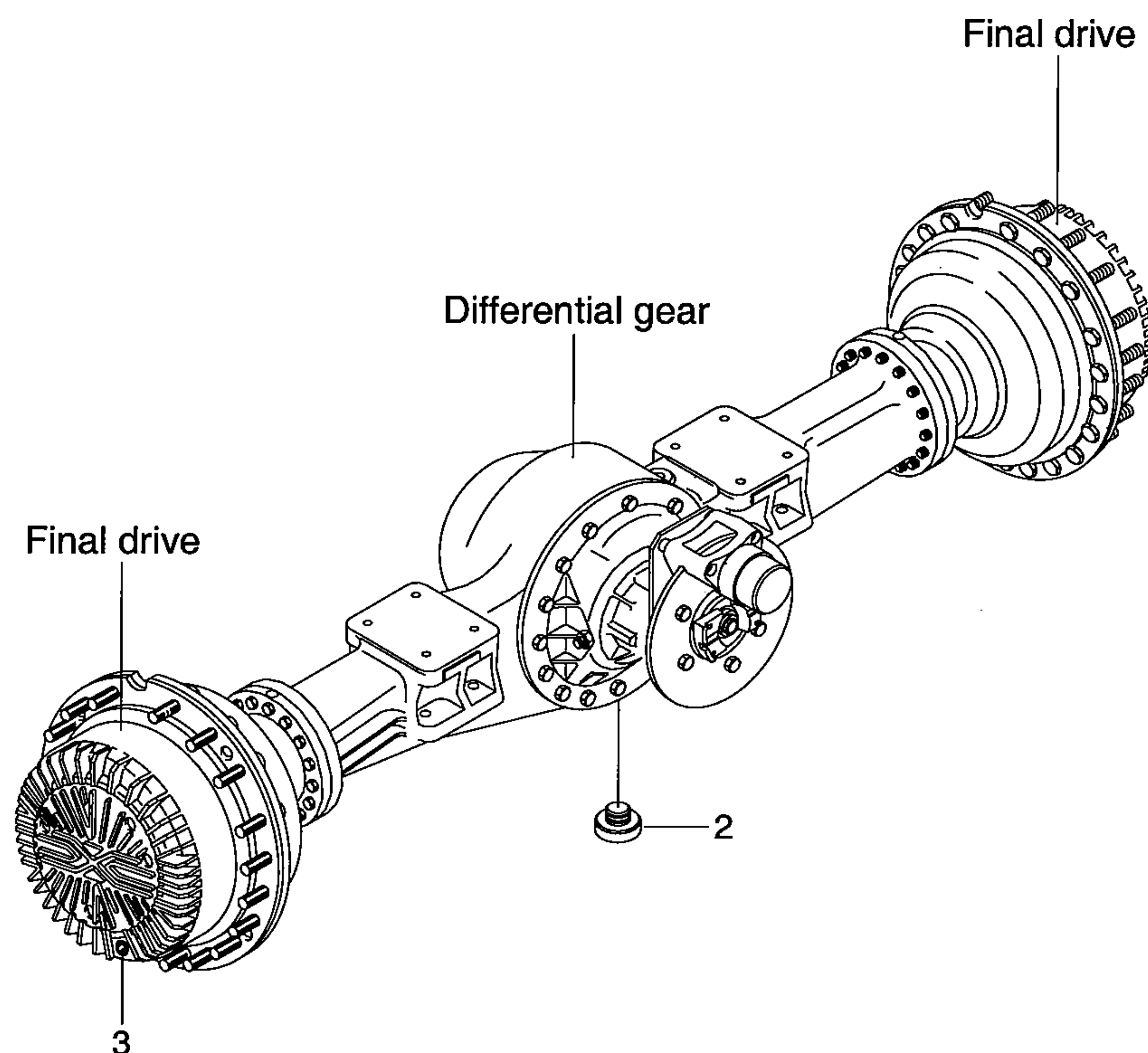
No.	Item	Torque	
		kgf · m	lbf · ft
1	Screws fixing sleeves to axle case	92 ± 4.6	665 ± 33
2	Screws securing bevel ring gear to differential case	49 ± 2.4	354 ± 17
3	Screws fixing differential half-cases	12 ± 0.6	87 ± 4
4	Screws securing differential caps	66 ± 3.3	477 ± 24
5	Screws securing differential to axle case	22 ± 1.1	159 ± 8
6	Screw securing pinion support	-	-
7	Screws fixing side gear carrier to wheel hub	7.1 ± 0.4	51 ± 3
8	Screws fixing side cover	3.6 ± 0.2	26 ± 3
9	Standard backlash of bevel gear set	0.25 ~ 0.33mm	

3) DISASSEMBLING AND ASSEMBLING AXLE UNITS

▲ Lift and handle all heavy components by using proper equipment.

Make sure that assemblies or components be held up by proper slings close to the unit to be lifted.

Location of oil filling and draining plugs on axle casing and side final drives.

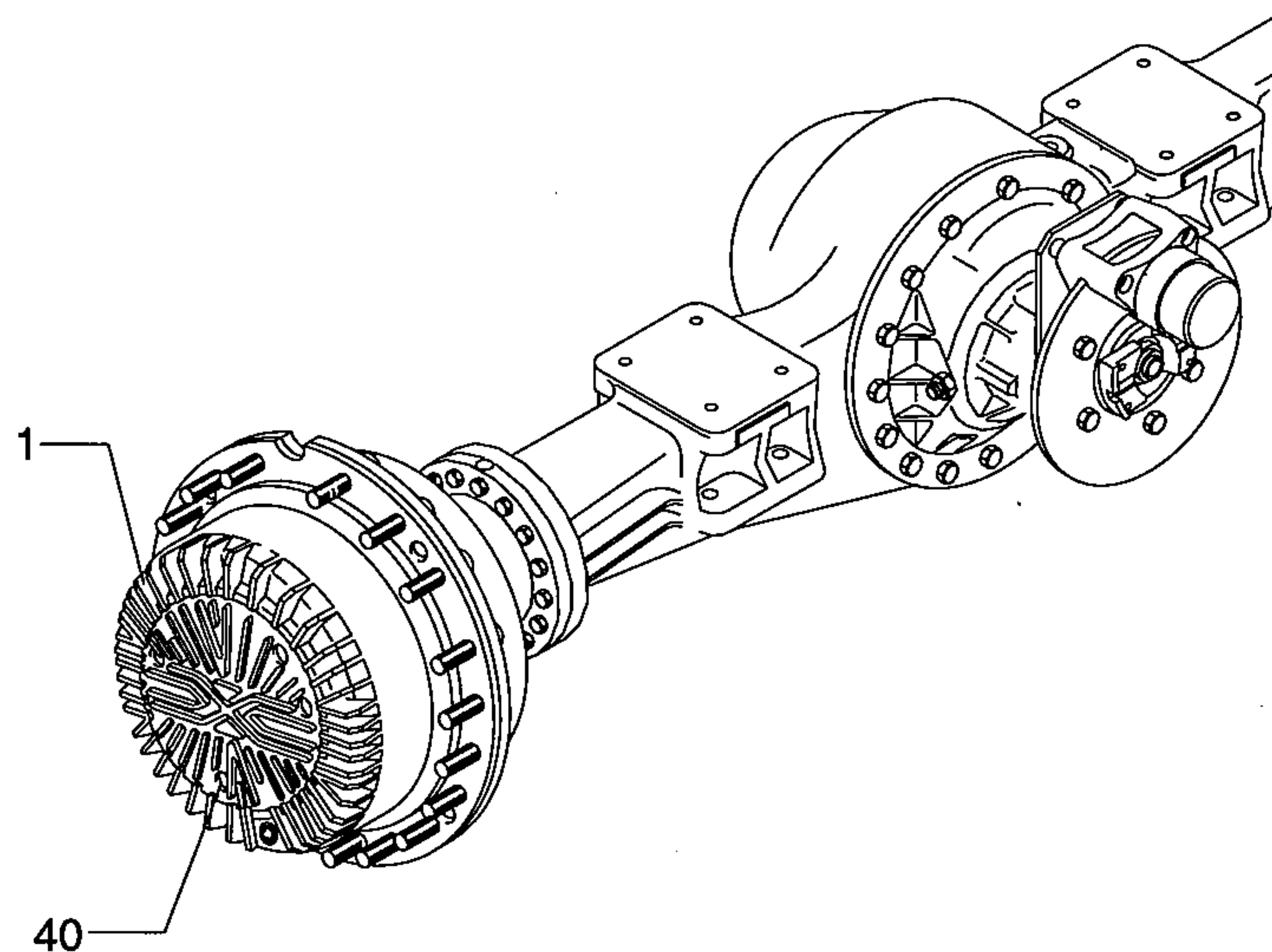


- Oil drain

Drain oil from central section thru plug 2.

Drain oil from side final drives thru plug 3.

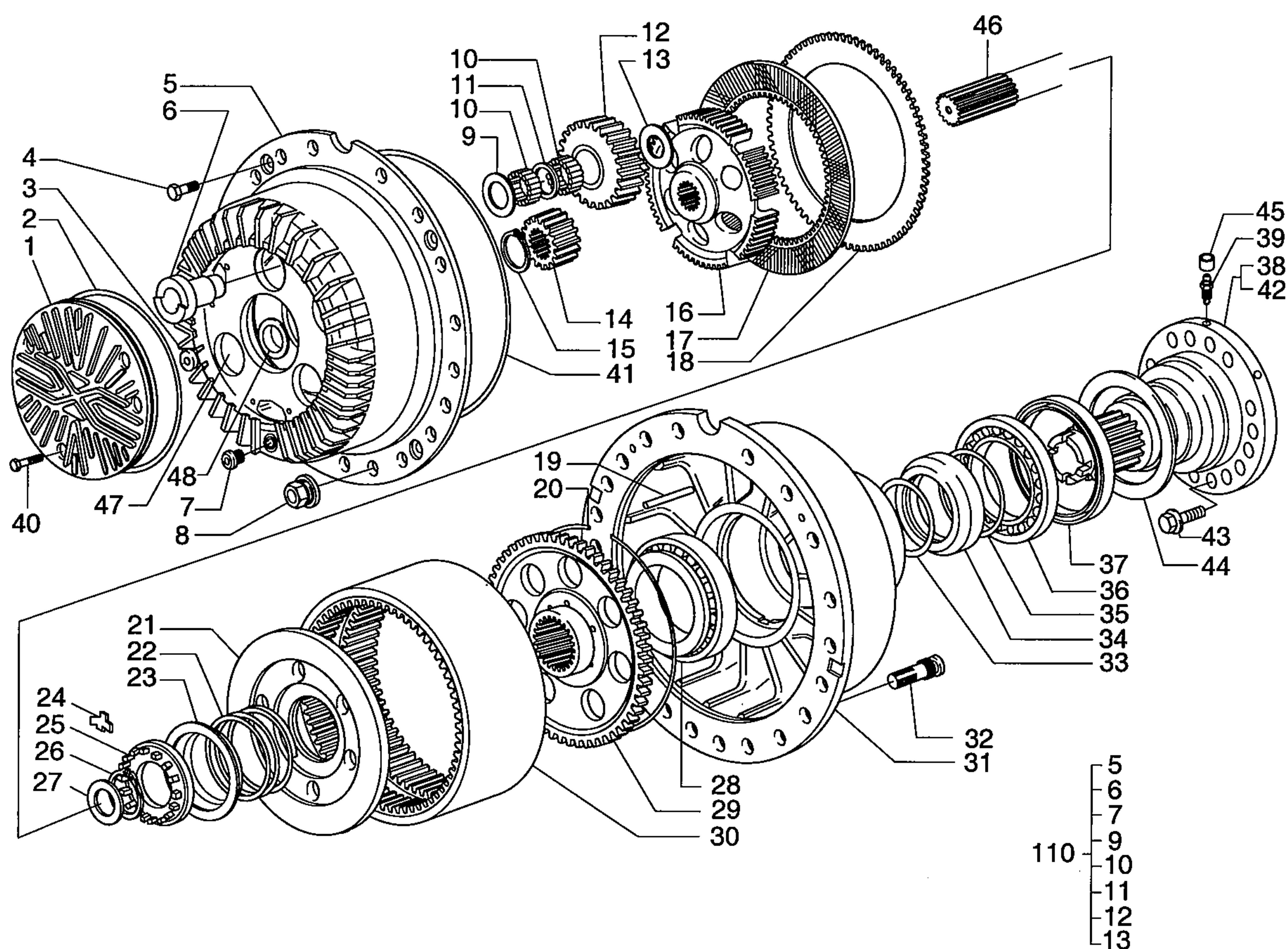
4) DISASSEMBLING SIDE FINAL DRIVES



(1) Remove final drive cover releasing the six screws(40).

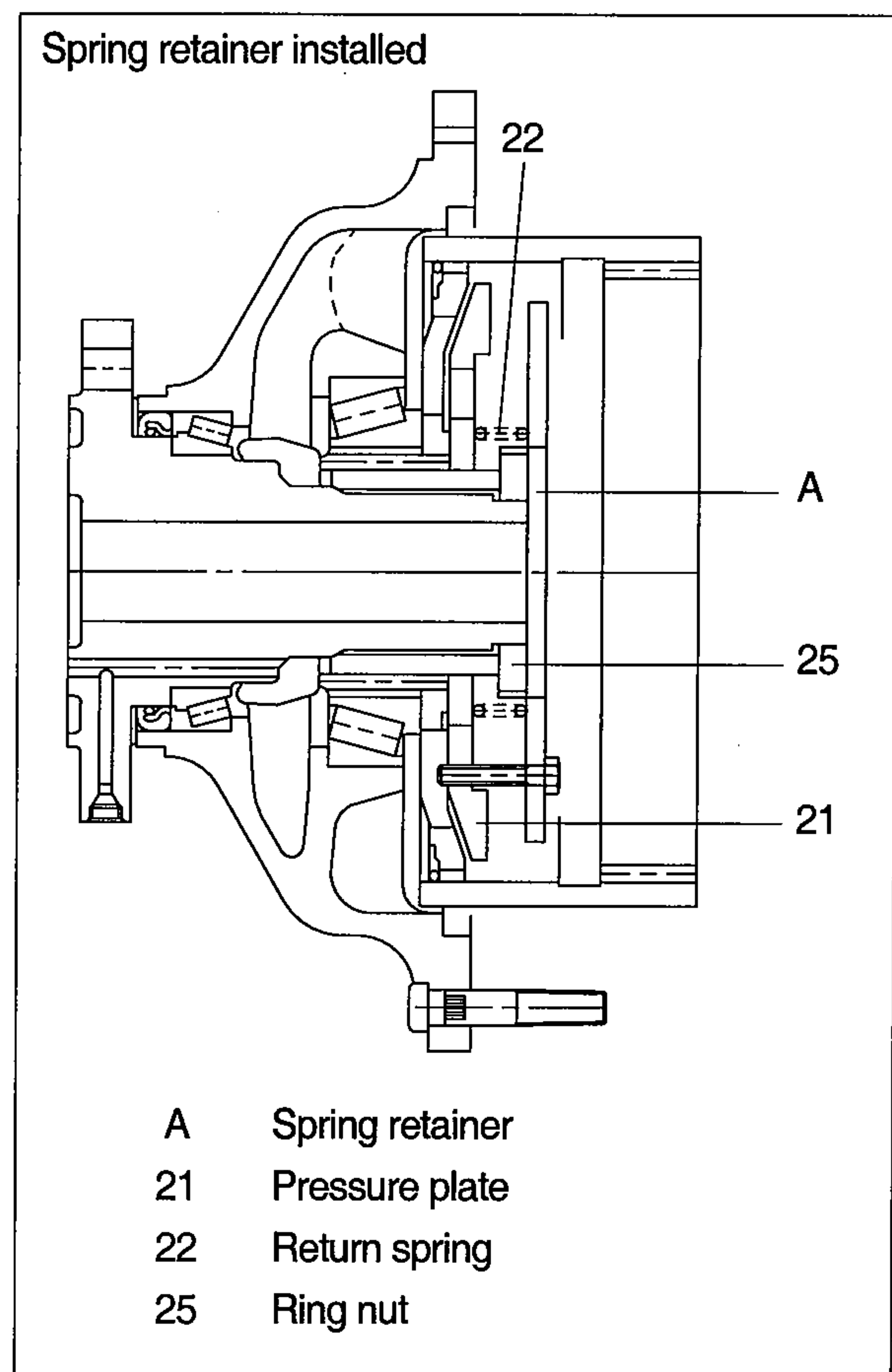
※ Cover(1) is provided with three threaded holes for puller screws.

DISASSEMBLING SIDE FINAL DRIVES

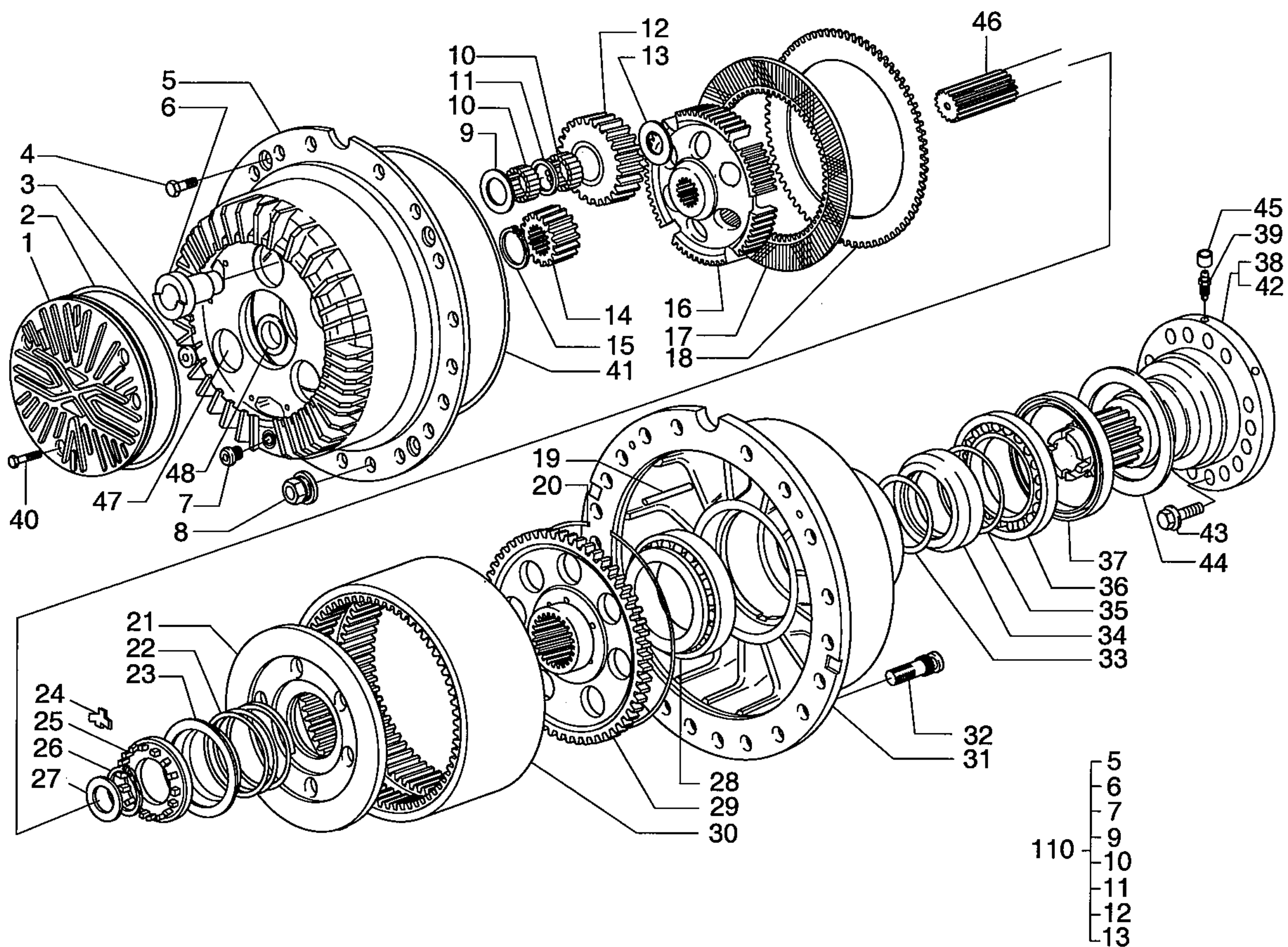


- (2) Remove O-ring seal(2).
- (3) Pull out axle shaft backing plate(3) using puller screw.
- (4) Undo screws(4) fixing side gear carrier(5) to wheel hub(31).
- (5) Suitably support side gear carrier(5), pry it off to separate carrier from wheel hub(31).
- (6) Pull out side gear carrier assy(5).
- (7) Remove lockring(15) retaining sun gear(14) on wheel shaft(46).
- (8) Pull out sun gear(14).
- (9) Remove disk carrier hub(16) along with thrust washer(27) resting against wheel hub sleeve.
- (10) Remove solid and lined disks(17,18) of brake.
- (11) Remove wheel shaft(46).
- (12) Pull out lockring(26), securing ring nut(25) and lock plates(24).
- (13) Remove lock plates(24).

- (14) Install the specific spring retainer.
Secured thru the three threaded holes of disk pressure plates(21) - to compress brake return spring(22) and allow ring nut (25) removal.
- (15) Unlock and turn out ring nut(25) from sleeve(38).
- (16) Remove pressure plate(21) along brake return spring retainer.

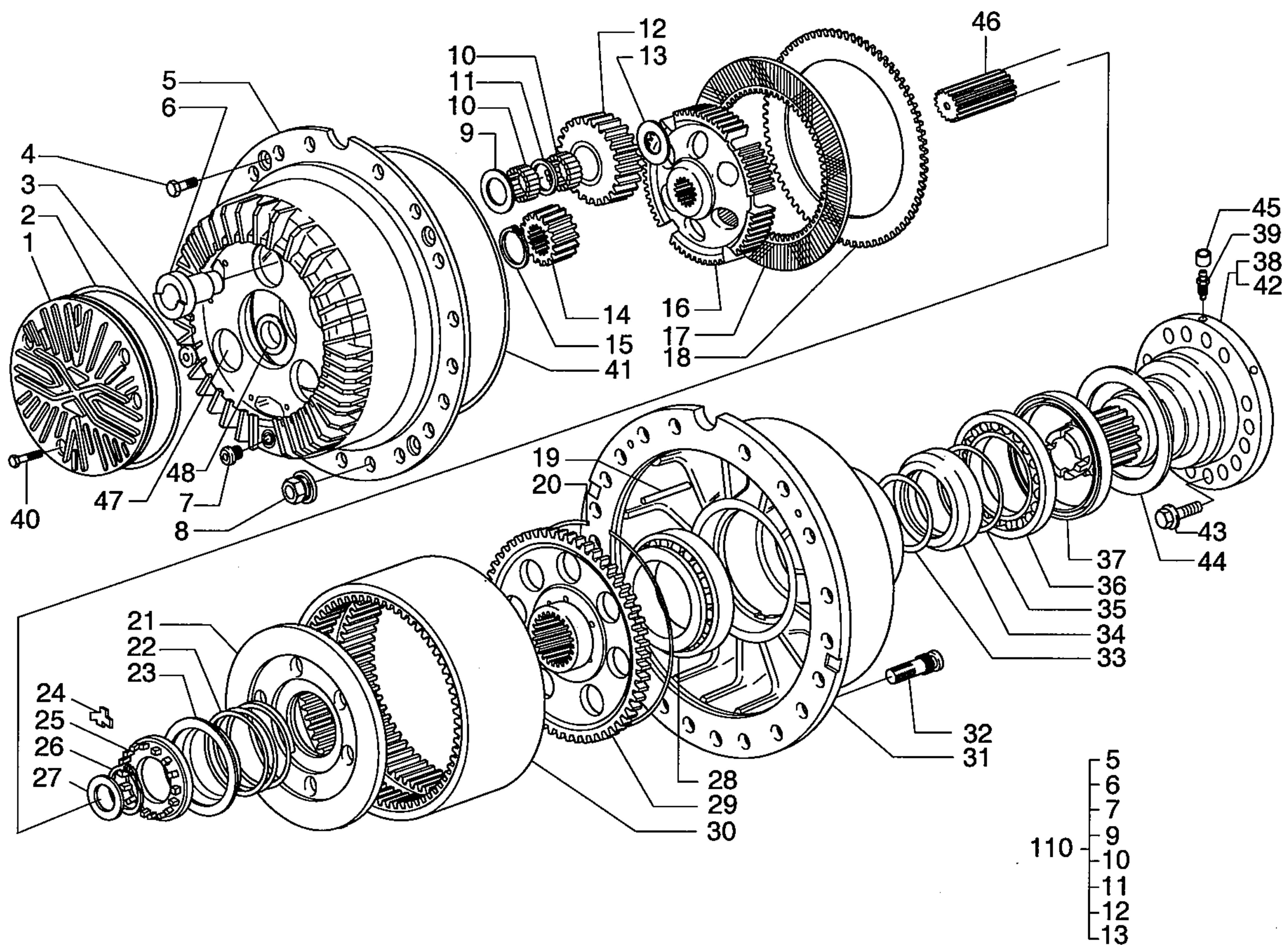


DISASSEMBLING SIDE FINAL DRIVES



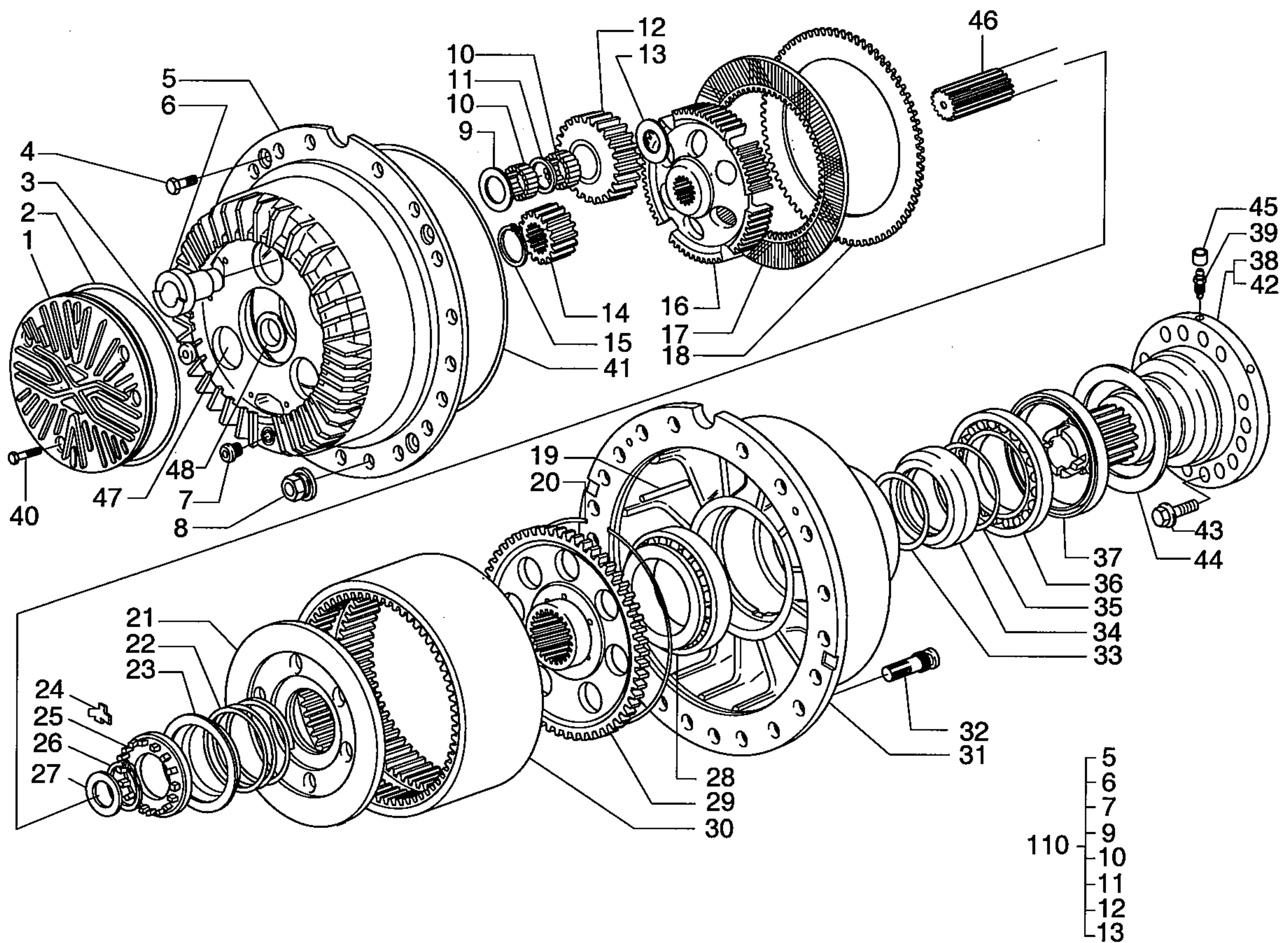
- (17) Suitably support wheel hub(31) and pull out ring gear unit(30) and relevant support(29).
- (18) Pick up the six rods(19) located in relevant seats on ring gear support(29).
- (19) Pry off lockring(20) from ring gear(30) by using a screwdriver.
- (20) Disassemble ring gear support(29) from ring gear(30).
- (21) Should replacement of outer wheel bearing(28) inner race be mandatory, old part can be removed by a proper puller or by a remover that can be inserted in the specific holes of ring gear support (29).
- (22) Remove retainer of brake unit spring, disassemble spring(22), retaining cup(23) and pressure plate(21).
- (23) Remove brake actuating piston(34) from wheel hub sleeve(38) by compressed air thru brake oil ducting.
- (24) Remove and replace the two O-ring seals(33 and 35) in relevant seats on brake actuating piston.
- (25) Pull out the complete wheel hub(31).
- (26) Remove O-ring seal(41).

DISASSEMBLING SIDE FINAL DRIVES



- (27) Pry off from wheel hub(31), seal(37) and remove inner race with roller cage of inner wheel bearing (36).
- (28) Push out, by a proper remover, outer races of outer and inner wheel bearings(28 and 37) from hub(31).
- (29) Should sleeve(38) be damaged, it can be removed by undoing relevant fixing screws(43). At reassembly, smear proper sealing compound on axle case joining flange and tighten screws with a torque of : See tightening torque No.1
- (30) Mark side gear pins(6), various components and seats(47) for identification of original position at reassembly.
- (31) Arrange side gear carrier(5) on wooden blocks and push out pins(6) with a proper remover.
- (32) Pick up all needle rollers(10,11).
- (33) It is important to keep matched needle rollers and thrust washers(9) with relevant pin(6), this is consequent to predetermined assembly tolerance limits.
- (34) Remove side gears(12) and relevant thrust washers(13) no gear can be removed prior having released all of them.

5) ASSEMBLING SIDE FINAL DRIVE



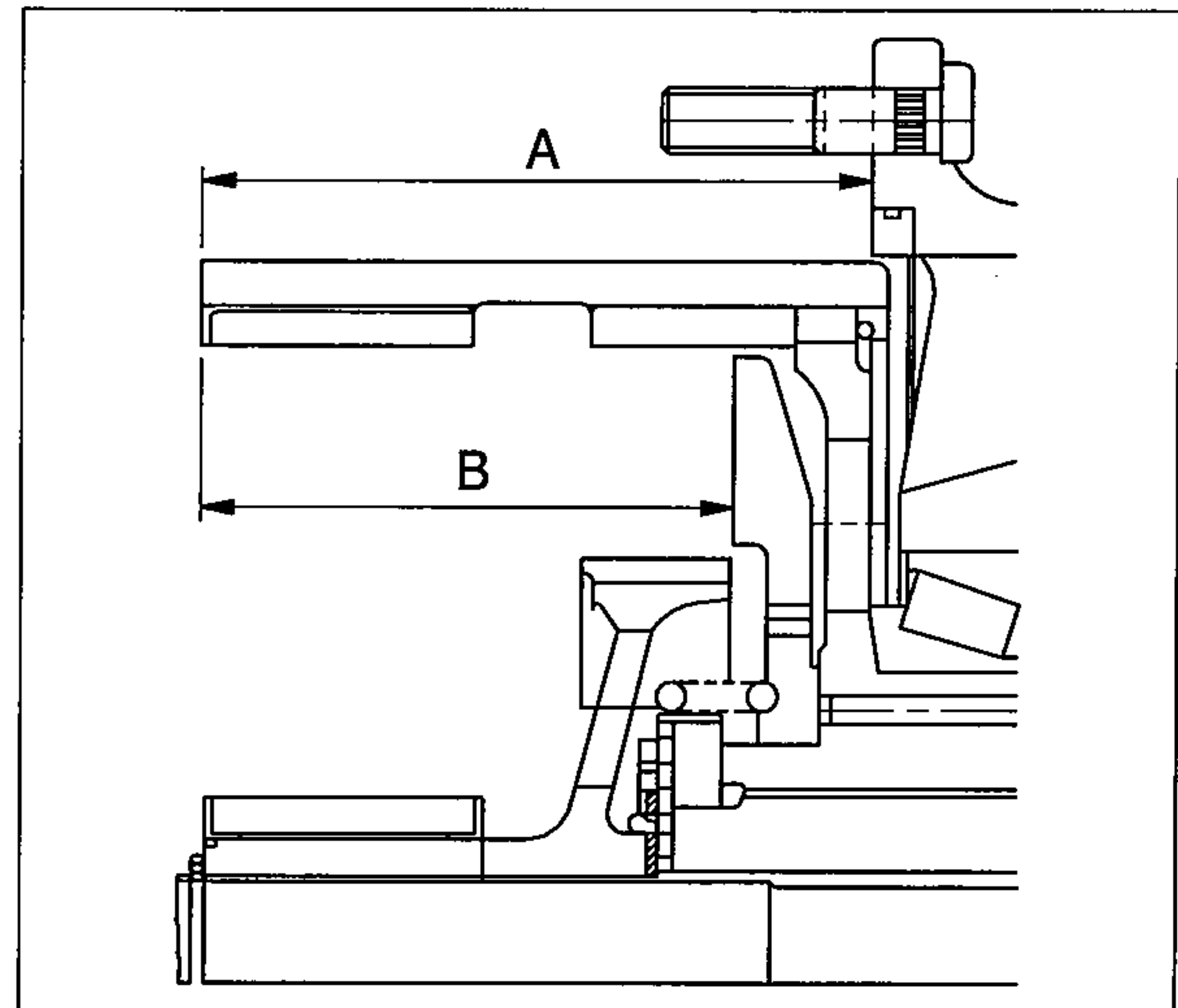
- (1) Reinstall wheel hub(31), first fit outer races of wheel inner and outer bearings(36 and 28), make sure they rest against relevant seats. Position inner race with roller cage of wheel inner side bearing(36) before fitting lip seal(37).
- (2) Refit O-ring seal(41).
- (3) Support suitably wheel hub(31) during the assembling stage to prevent seal damages, then, fit wheel inner bearing(36) in sleeve(38).
- (4) Lubricate seals(33 and 35) on piston(34), insert it at travel end on wheel hub sleeve(38).
- (5) Fit inner race of wheel outer bearing(28) on ring gear support(29), by heating equipment or proper installer ; then, mount support(29) in ring gear(30) and secure by lockring(20).
- (6) Mount ring gear and support unit(30 and 29) on sleeve(38).
- (7) Fit the six rods(19) in relevant seats on ring gear support(29).
- (8) Install the spring retainer(Figure at page 3-140) and compress spring(22) with relevant retaining cup(23) on pressure plate(21).
- (9) Mount the pressure plate-spring assembly on ring gear support(29).

※ **Determining the space available to form the brake disk pack**

Record depth from seating surface of side gear carrier on wheel hub to outer edge of ring gear, identify said value as **A**.

Record depth from ring gear outer edge to brake pressure plate, identify said value as **B**. Subtract the value recorded from value **A** recorded on previous step, identify it a **D**.

i.e. : $A - B = D$

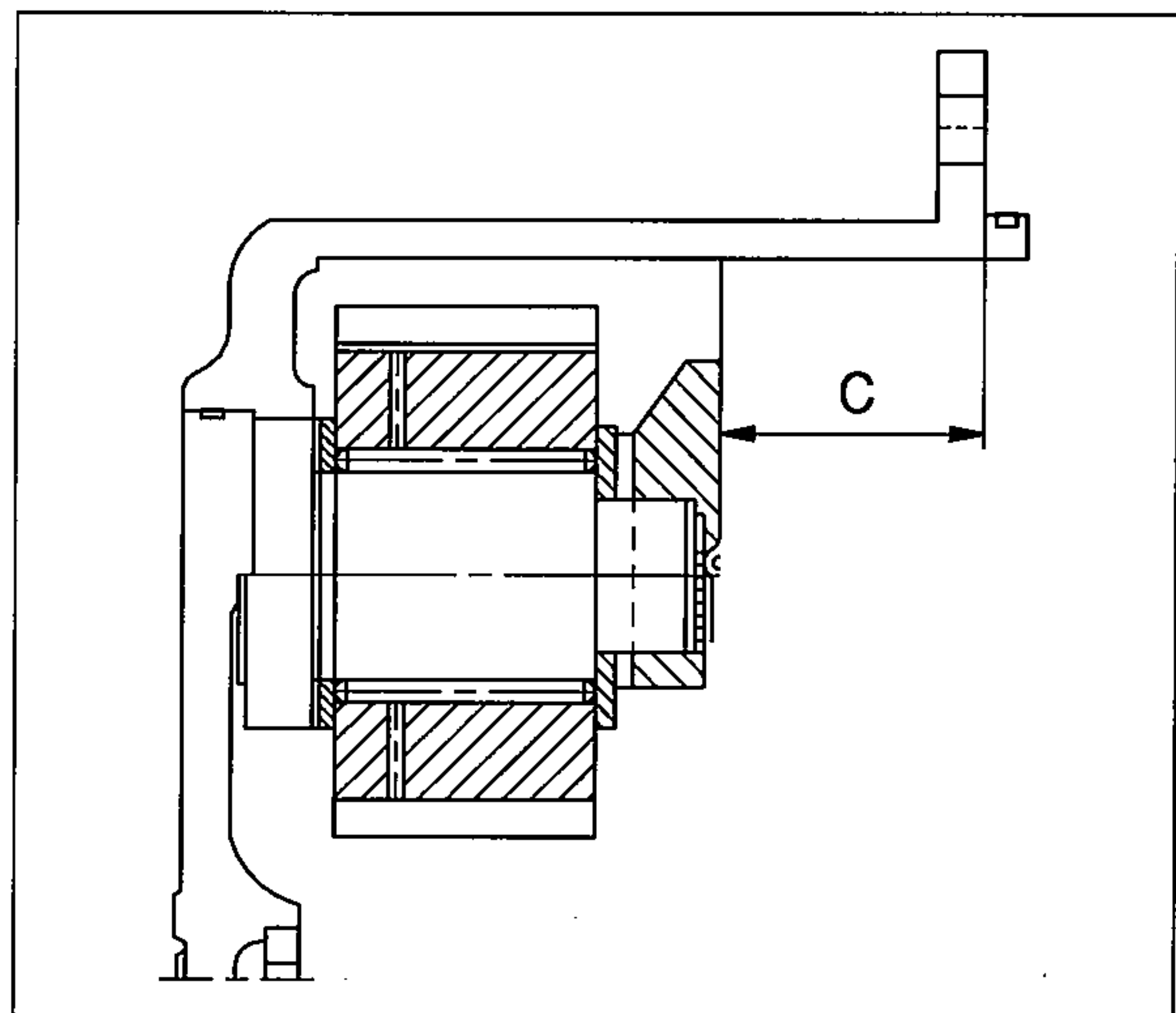


Record depth from disk reaction face to outer edge of side gear carrier.

Value recorded as **C** should be subtracted from value **D** previously recorded.

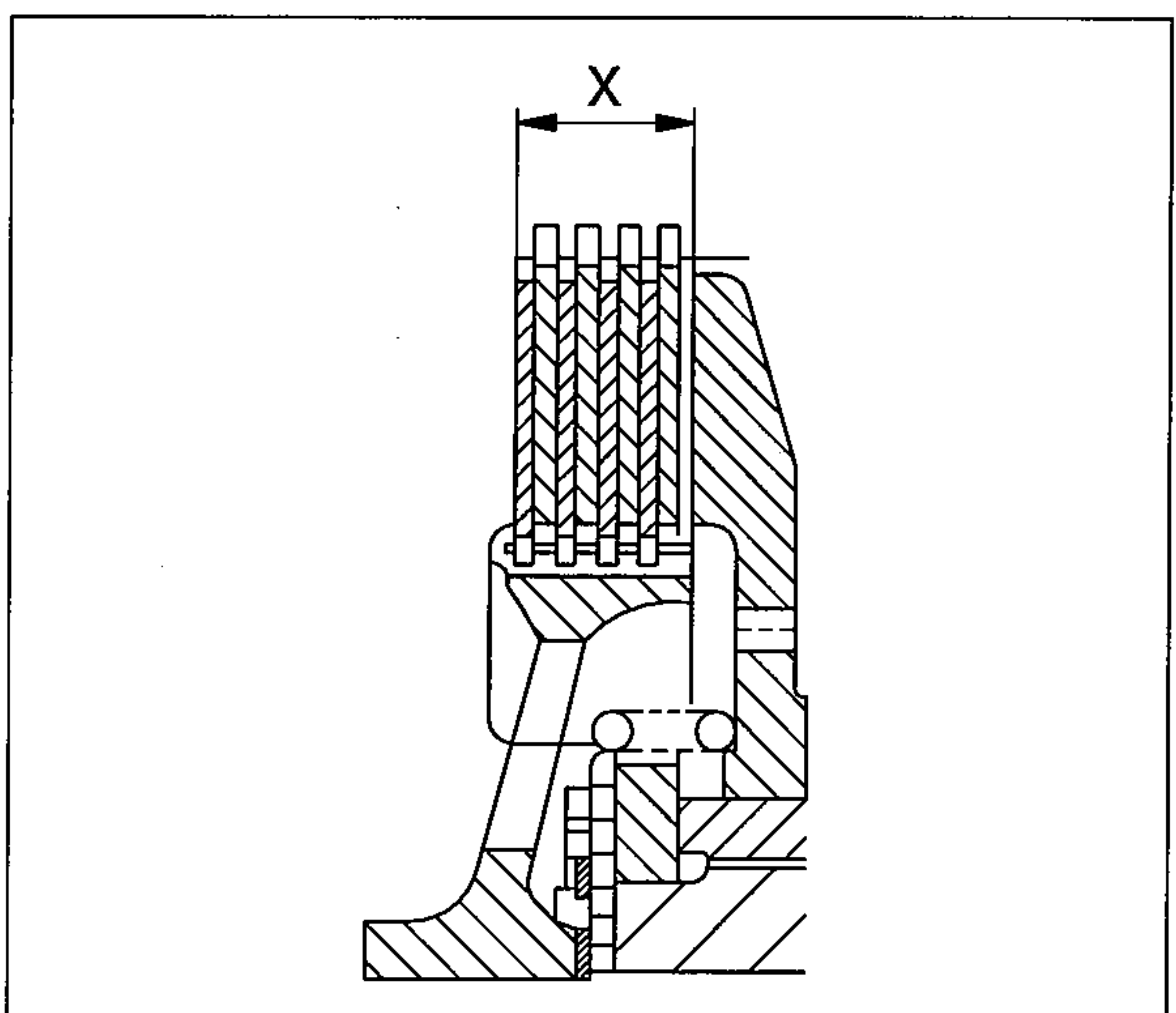
i.e. : $C + D = X$

This is the space available to form the brake disk pack.

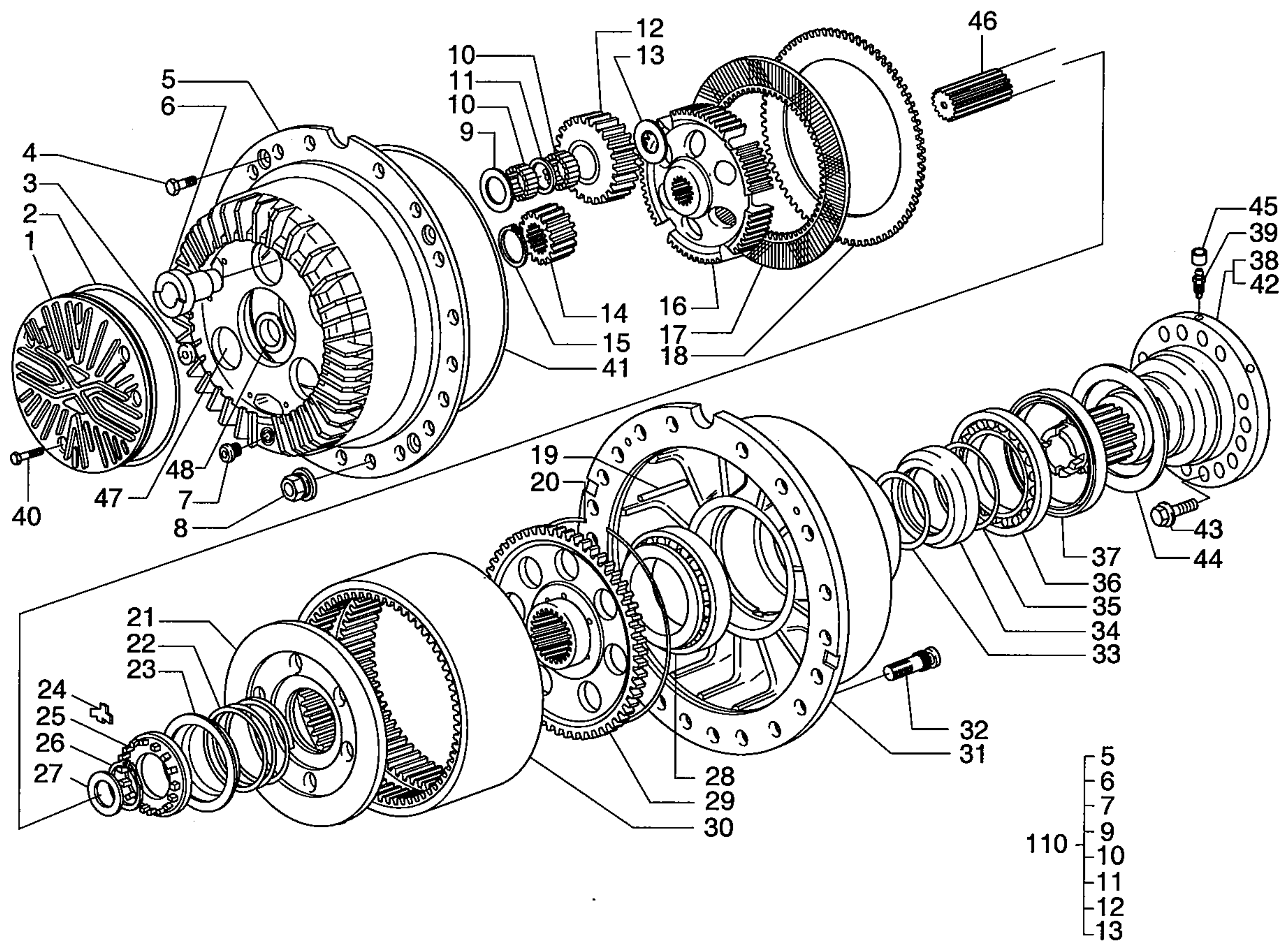


Forming the disk pack

Computing thickness of disk pack(Solid + lined ones) it is necessary to subtract the clearance of 1mm for each brake disk plus the total thickness of the lined disks from the space available for the remaining clearance with solid disks(Outer teeth) of proper thickness with a tolerance of $\pm 0.25\text{mm}$.

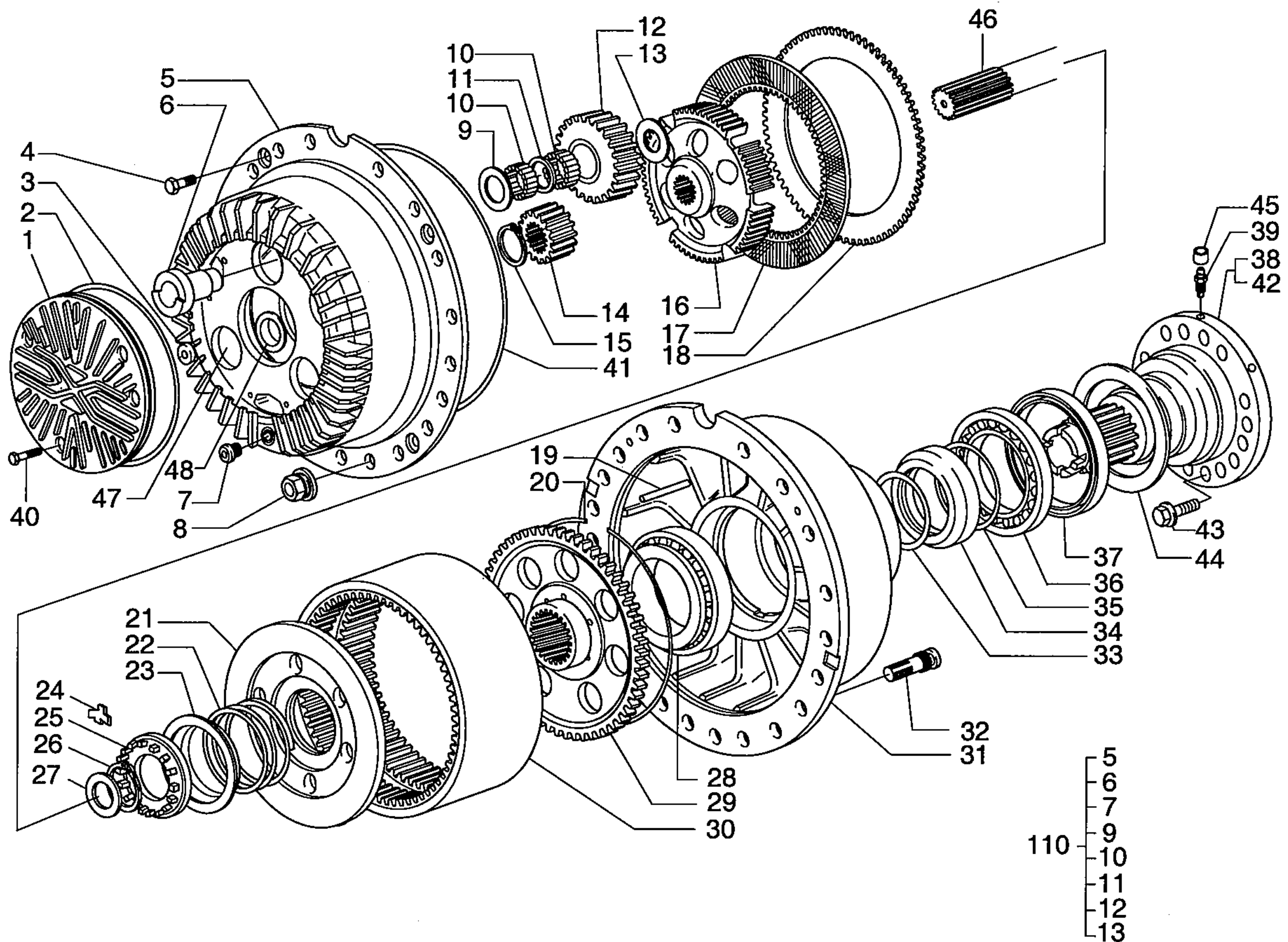


ASSEMBLING SIDE FINAL DRIVE



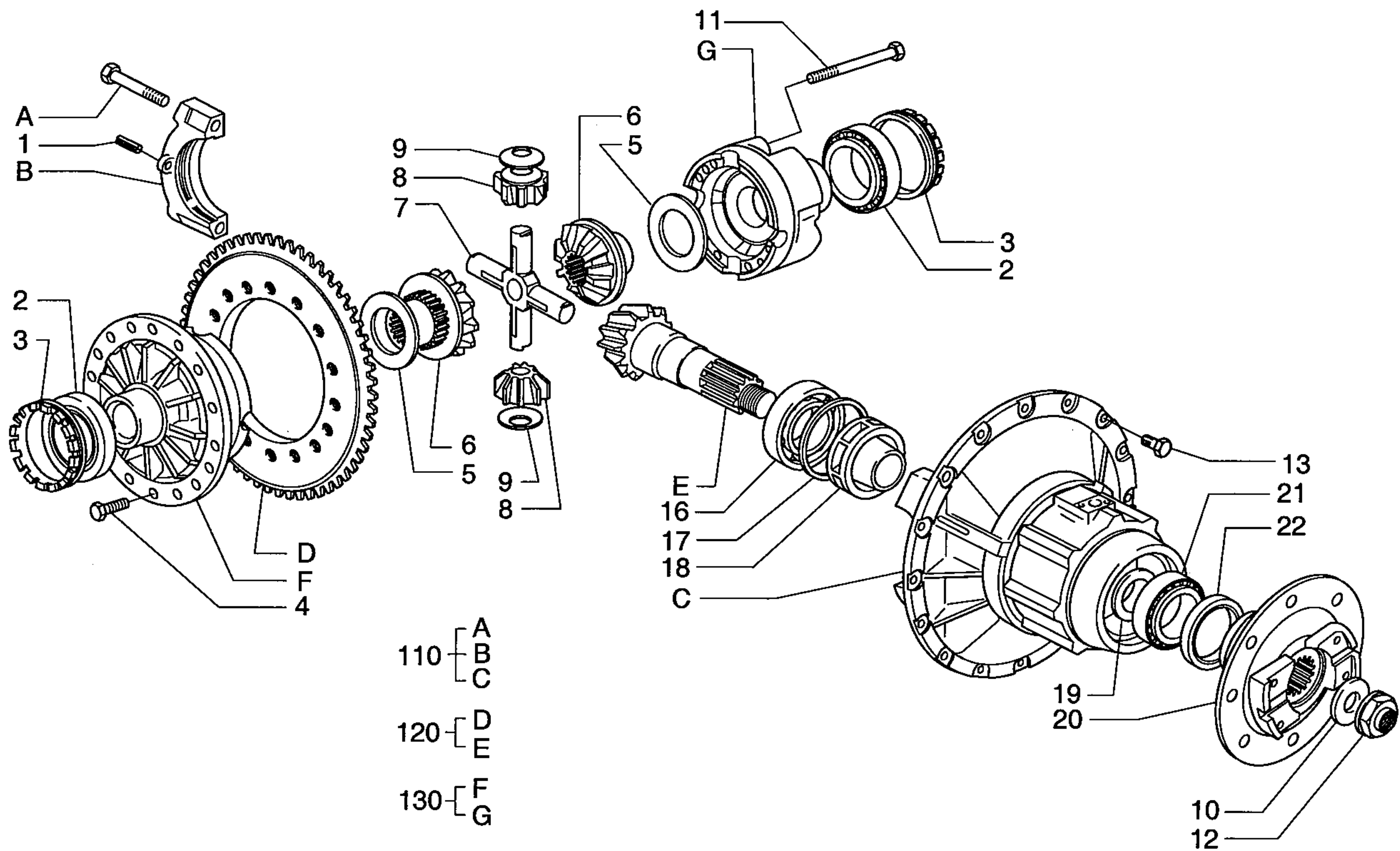
- (10) Hand screw ring nut(25) on wheel hub sleeve(38).
- (11) Tighten ring nut(25) by the proper wrench so as to reach the prescribed pre-load for wheel bearings and corresponding to a revolving torque of $1.5-3.1 \text{ kgf} \cdot \text{m}$ ($10.8-22.4 \text{ lbf} \cdot \text{ft}$) checking alignment for the lockplates(24).
 - ※ To prevent wrong recording of torque values, it is advisable to seat bearing properly before checks by revolving repeatedly the wheel hub.
- (12) Remove spring retainer compressing brake actuator return spring.
Insert lockplates(24), securing ring nut(25) and fit lockring(26).
- (13) Side gear carrier(5).
 - ※ Arrange the three side gears(12) in proper carrier seat.
 - ※ Two rows of needle rollers of the same selection class should be used for replacement in each single side gear pin.
- (14) Insert outer thrust washers(13), smear with grease pin lower portion(Head end) and position the first row of needle rollers, fit spacer, smear with grease pin upper portion and position the second row of needle rollers(10,11).
- (15) Position outer thrust washers(9) of side gear on side gear carrier and aline holes.
- (16) Insert and force fit complete pins(6) and avoid any bump or knock that could cause roller fall.

ASSEMBLING SIDE FINAL DRIVE



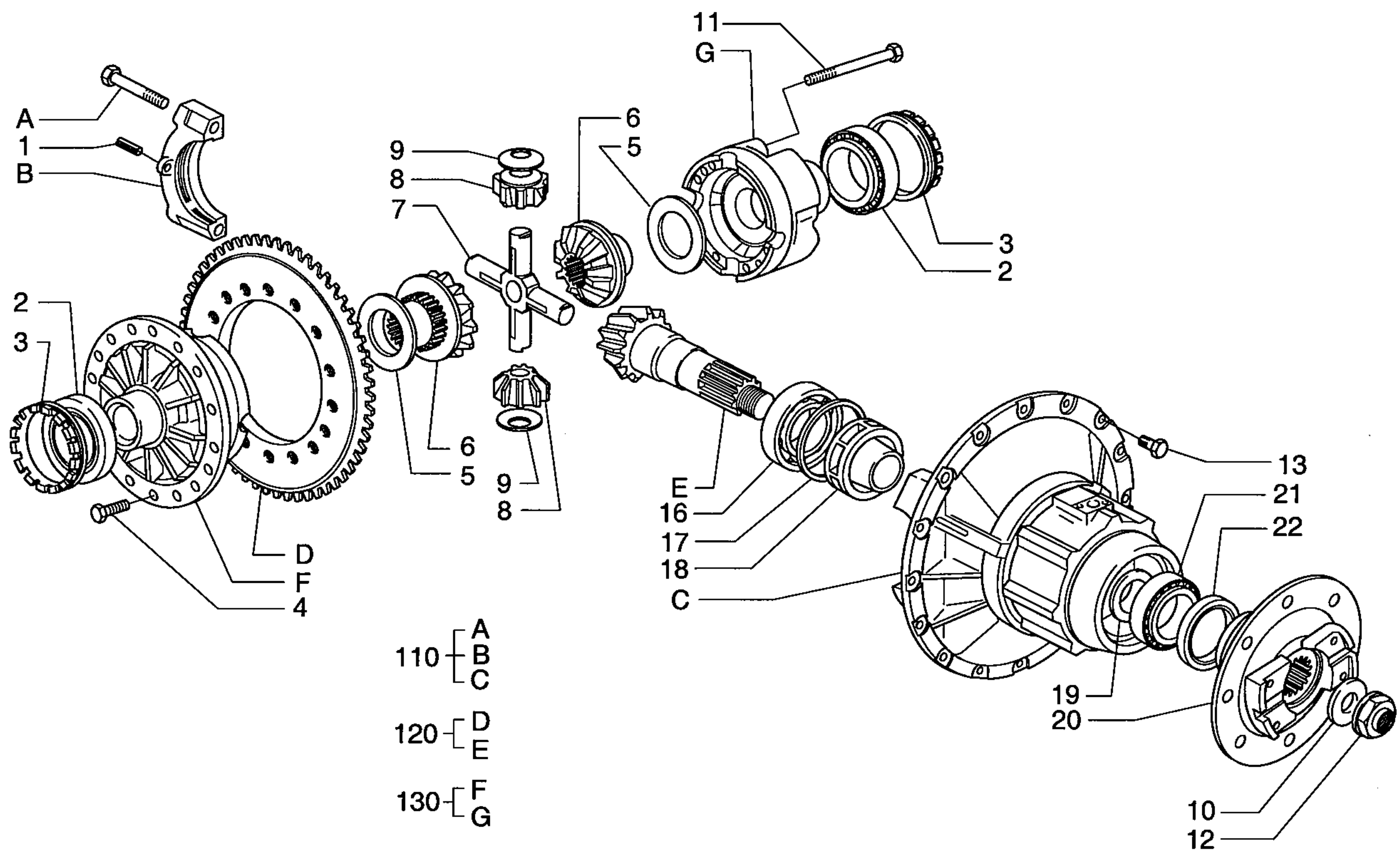
- (17) Insert wheel shaft(46).
- (18) Insert thrust washer(48).
- (19) Mount disk carrier hub(16) on wheel shaft(46).
- (20) Mount alternately solid disks and lined disks.
 ※ Insert a solid disk(Outer teeth) facing the pressure plate(27).
- (21) Insert sun gear(14) and secure with lockring(15).
- (22) Mount the side gear carrier assembly (5) on side gear unit and secure on wheel hub(31) locking fixing screws(4) with a tightening torque of : See tightening torque No.7.
- (23) Force fit wheel shaft backing plate(3).
- (24) Mount O-ring seal(2) on edge.
- (25) Rotate and align pins (6) to allow mounting of cover(1) which act also as pin lock to prevent their rotation.
- (26) Fit side final drive cover(1).
- (27) Smear fixing screws(40) with sealing compound, then, lock with a tightening torque of : See tightening torque No.7.

6) DISASSEMBLING DIFFERENTIAL UNIT(Front axle)



- (1) Hammer out spring pins(1) locking slotted rings(3) and release them.
- (2) Mark caps(B) to match parts at reassembly.
- (3) Release fixing screws(A) and remove caps(B) and relevant threaded rings(3).
- (4) Remove differential case unit from support(C).
- (5) Straighten locking notches on pinion nut collar(12), position reaction tool on drive flange to unlock nut(12), release pinion nut, remove drive flange(20) from pinion shank along with washer(10).
- (6) Pry off seal(22) from drive flange.
- (7) Remove bevel pinion(E) from differential support(C), hammer pinion shank with a proper remover, care not to damage threads.
- (8) Pick up inner race of pinion shank bearing(21).
- (9) Remove from differential support(C) outer races of outer and inner pinion bearings(21 and 16). Pick up shims(17) for pinion axial position adjustment.
- (10) Remove impeller(18) and shims(17) for bearing pre-load adjustment; Remove inner race of pinion underhead bearing(16) by using a proper puller.
- (11) Mark differential half-cases(F and G) for reference at reassembly.

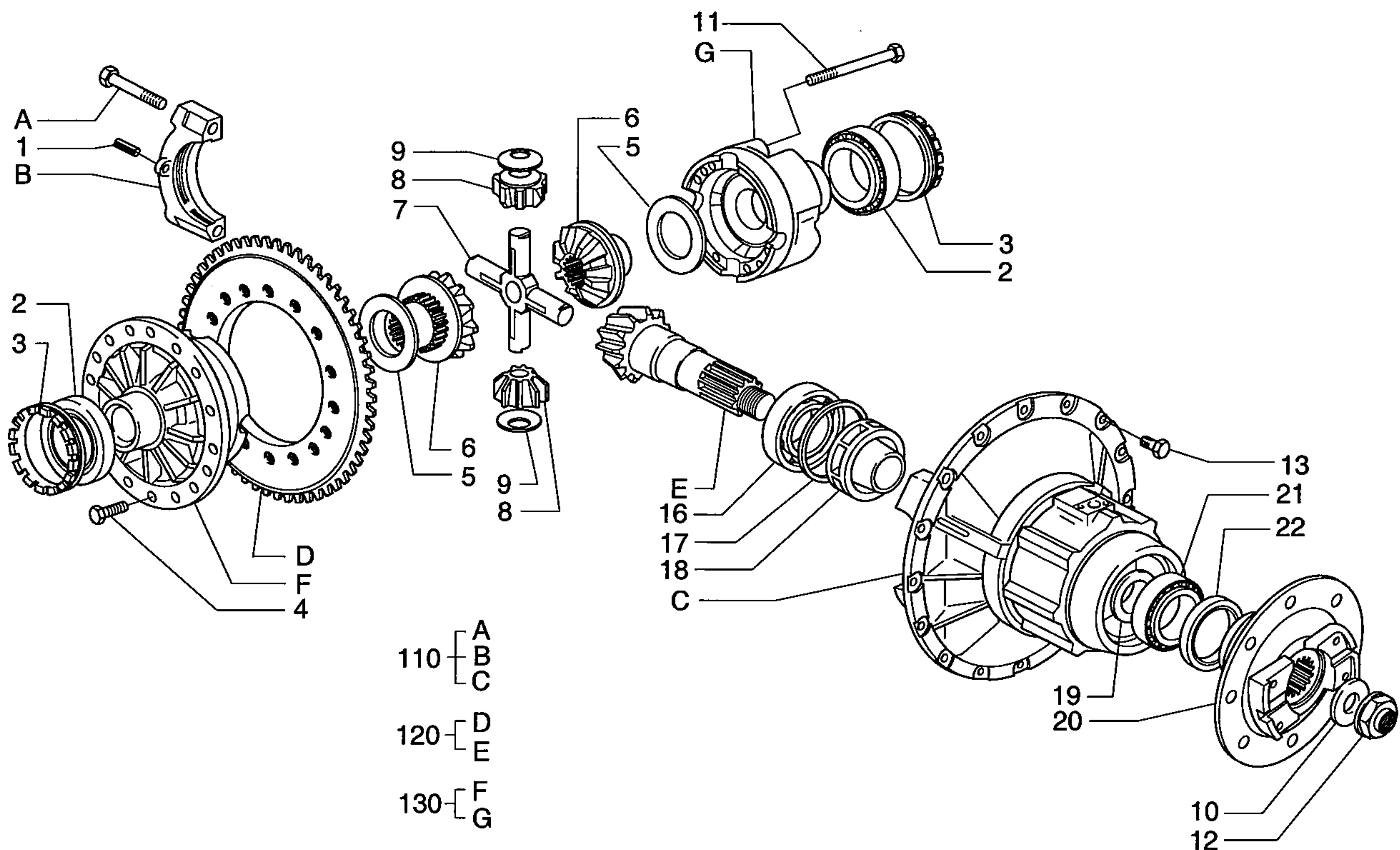
DISASSEMBLING DIFFERENTIAL UNIT(Front axle)



- (12) Remove fixing screws(11) and separate half-cases(F and G).
- (13) Have a visual and dimensional check of wear on sun and side gears(6 and 8) relevant thrust washers(5 and 9) and spider(7).
- (14) Remove bearings(2) from half-cases(F and G) by a proper puller.
- (15) Fit inner races of differential bearings(2) on half-cases(F and G).
 ※ This operation should be carried out by heating equipment or proper installer.
- (16) Clamp ring gear(D) in a vise fitted with soft caps and remove screws(4) securing ring gear(D) to case(F).
- (18) Mount bevel ring gear(D) on case(F) lock relevant fixing screws(4) with a tightening torque of :
 See tightening torque No. 2
- (18) Position differential components in relevant seats, then, join half-cases(F and G) matching reference marked prior disassembly.
- (19) Mount and lock half-cases fixing screws(11) with a tightening torque of : See tightening torque No.3.

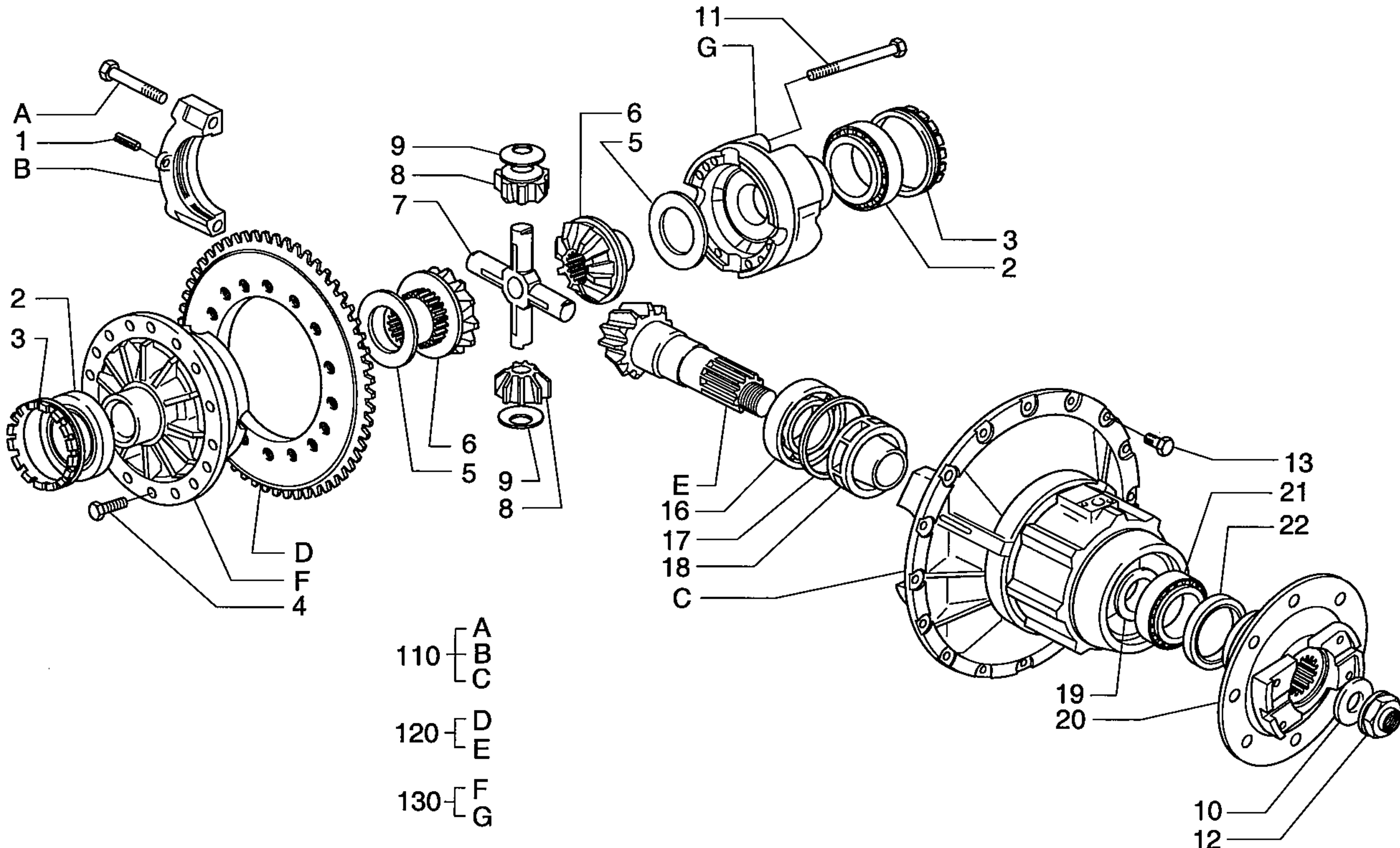
7) ASSEMBLING DIFFERENTIAL UNIT(Front axle)

Determining thickness of adjustment shims(Axial position of bevel pinion) : See clause 8 at page 3-152.



- (1) Press fit inner race of inner(Underhead) bearing(16) on pinion by heating equipment or proper installer.
- (2) Position shim(17), computed as per clause 8 at page 3-152, in its seat and press fit outer races of inner(Underhead) and outer bearings(16 and 21) of pinion.
- (3) Fit impeller(18) on pinion for bearing pre-load adjustment; Then, mount inner race of pinion outer bearing(21).
 - ※ To facilitate proper pre-load computation, it is advisable to mount as many shims as required to warrant a pinion end play and not a pre-load(That could be excessive) on bearings.
- (4) Fit drive flange(20) on pinion(E), position the specific reaction screw and tighten nut(12) with a torque of $5.8-6.4\text{kg} \cdot \text{m}$ ($42-46\text{lb} \cdot \text{ft}$).
 - ※ Check pinion end play by means of a dial gauge; then, disassemble parts and change shims so as to eliminate all end play and reach the intended pre-load.
 - ※ Reassemble components, check that proper pre-load of bearing be corresponding to a revolving torque(No seal installed) of $0.02-0.04\text{kg} \cdot \text{m}$ ($0.14-0.29\text{lb} \cdot \text{ft}$).
- (5) As the prescribed pre-load of bearings as been reached remove drive flange(20) and fit lip seal (22) in relevant seat.

ASSEMBLING DIFFERENTIAL UNIT(Front axle)



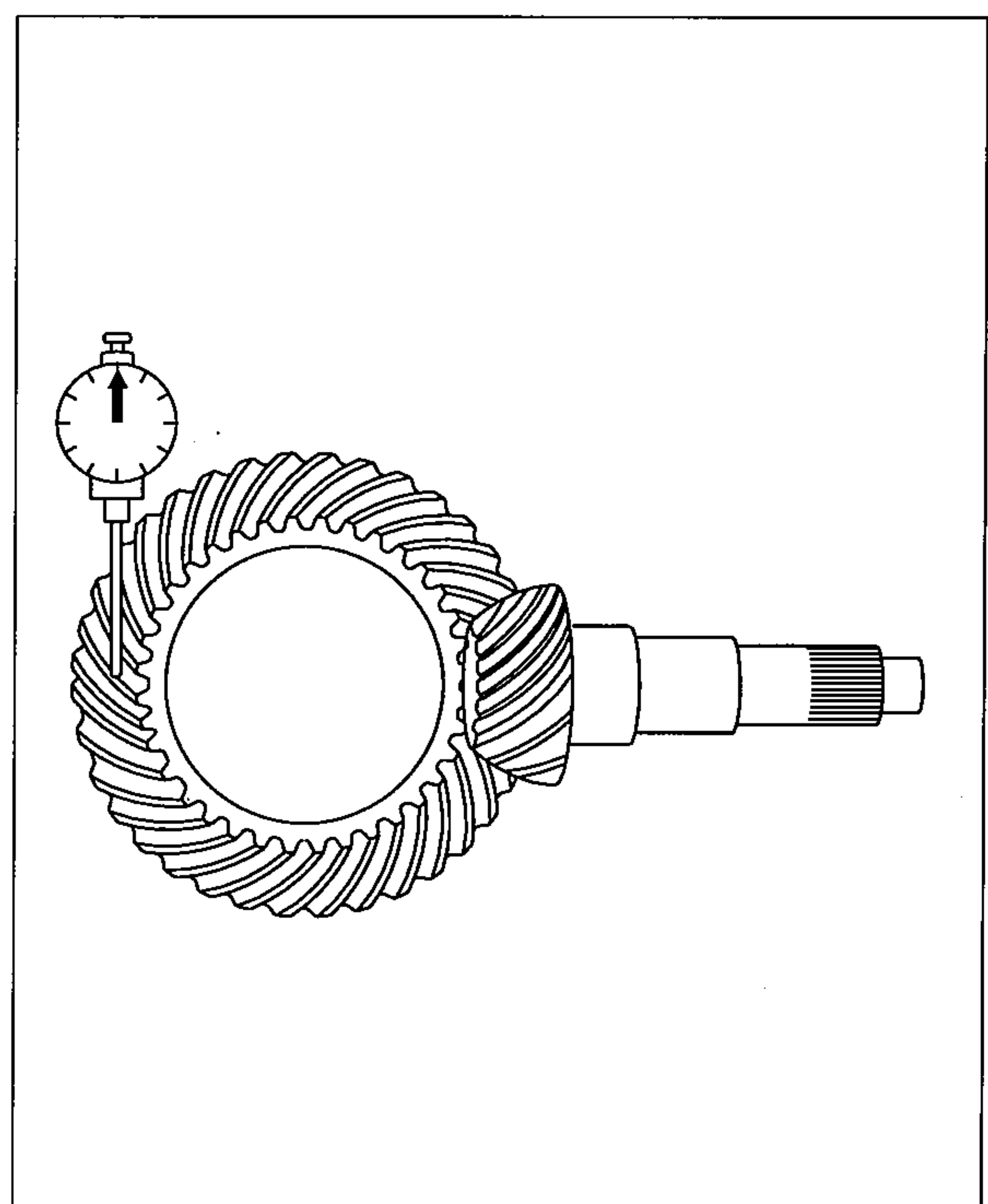
- (6) Remount drive flange again and tighten a specified above.
 - (7) Position differential assembly with ring gear on support(C) ; Insert ring nut(3) and adjust temporarily backlash.
 - (8) Mount caps(B), minding not to invert position and lock screws(A) fixing support to differential with a torque of : See tightening torque No.4.
- ※ Check differential end play by a dial gauge.
 - ※ Screw in a ring nut so as to have a notch alined against the slot of lock plate and actuate the opposite nut up to eliminate end play.
 - ※ As such a condition has been reached go on with bearing pre-load by screwing in ring nut further one more notch.

This diagram shows an exploded view of a mechanical assembly. The components are numbered 1 through 22. The assembly is organized into three main groups, indicated by brackets and letters:

- Group 110 (A, B, C):** Located at the top left, this group includes a bracket (A), a pin (B), and a small component (C).
- Group 120 (D, E):** Located in the center, this group includes a large gear assembly (D) and a central shaft component (E).
- Group 130 (F, G):** Located at the bottom left, this group includes a large gear assembly (F) and a pin (G).

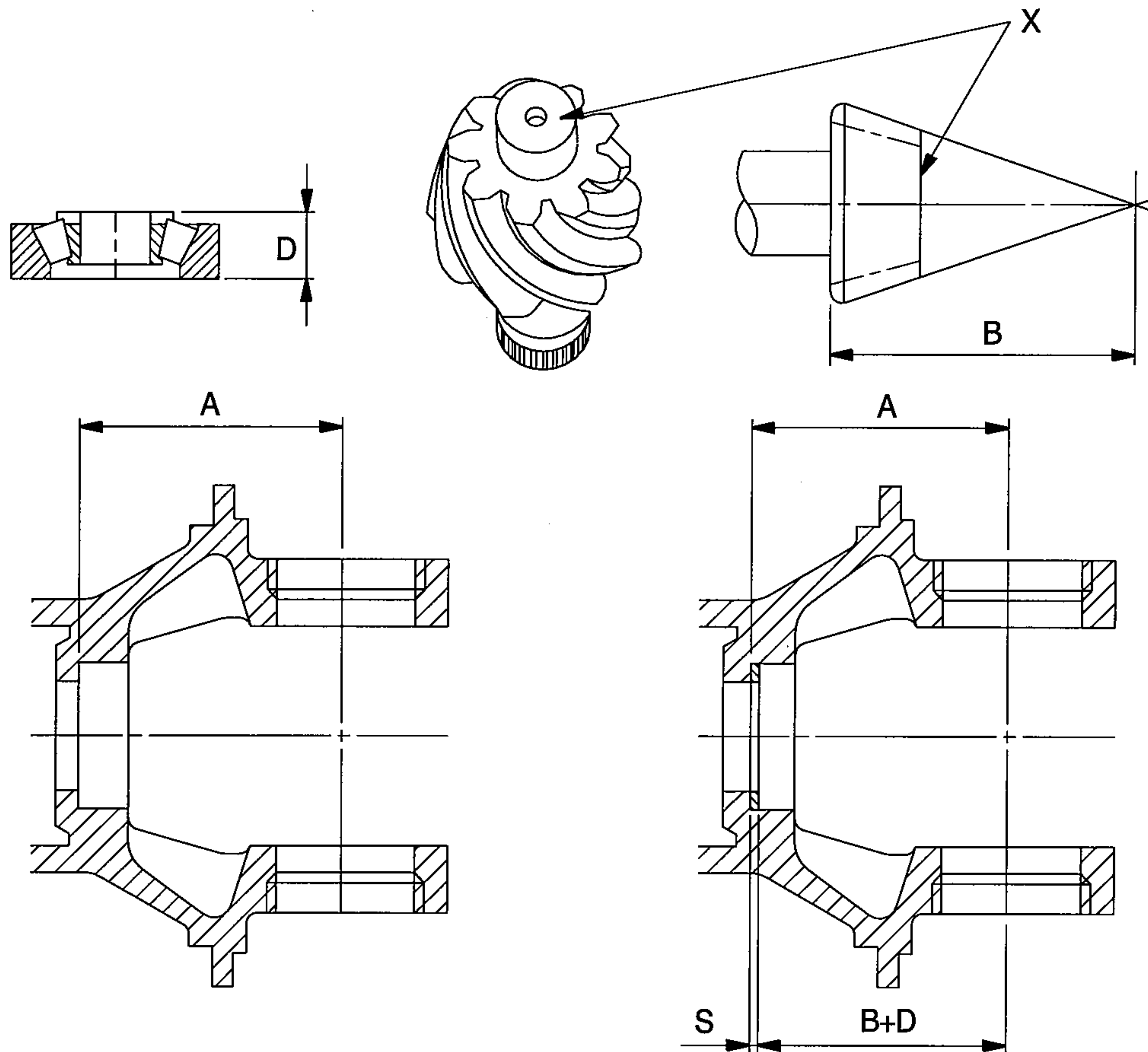
Other numbered parts include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, and 22. These parts represent various gears, bearings, shafts, and housing components that make up the complete assembly.

- ※ Brush red lead on some ring gear teeth, rotate to mesh pinion and ring gear repeatedly so as to make evident tooth contact. Proper and correct tooth contact marks are visible on a new bevel gear set as a result of an optimum contact approached on the tester, consequently, a proper axial position of pinion against ring gear will emphasize remarking of previous tester contact marking.



- 3-151

8) DETERMINING THICKNESS OF ADJUSTMENT SHIMS(Front axle)



- (1) Some dimensions should be recorded before starting reassembly of bevel pinion to determine thickness of spacer to be fitted between inner(Underhead) pinion bearing and backing of relevant seat in differential support.

Record dimension from ring gear axis to seat of inner(Underhead) pinion bearing(That will be identified as **A**).

Example : In our case **A** = 266.1mm

- (2) A number **X** prefixed by symbol $\pm$ is marked on bevel pinion face.

Said value, expressed in tenth of millimeter, indicate the deviation from the theoretical distance from pinion underhead to ring gear axis :

i.e. : $+ 1 = 0.1\text{mm}$

Consequently, the true distance(Identified as **B**) will be :

B = $208 \pm \text{Deviation}$

In our case : **B** = $208 + 0.1 = 208.1\text{mm}$

- (3) Measure thickness of pinion head bearing and identify as **D**.

Example : In our case **D** = 54.15mm

- (4) Compute thickness of shim **S** for proper axial position of bevel pinion :

$$\mathbf{S = A - (B + D)}$$

Example : In our case **S** = $266.1 - (208.1 + 54.15) = 3.85\text{mm}$

- (5) Increase by 0.05mm the computed thickness value to compensate subsequent bearing pre-load.

Round off to the nearest tenth of millimeter to the computed thickness value :

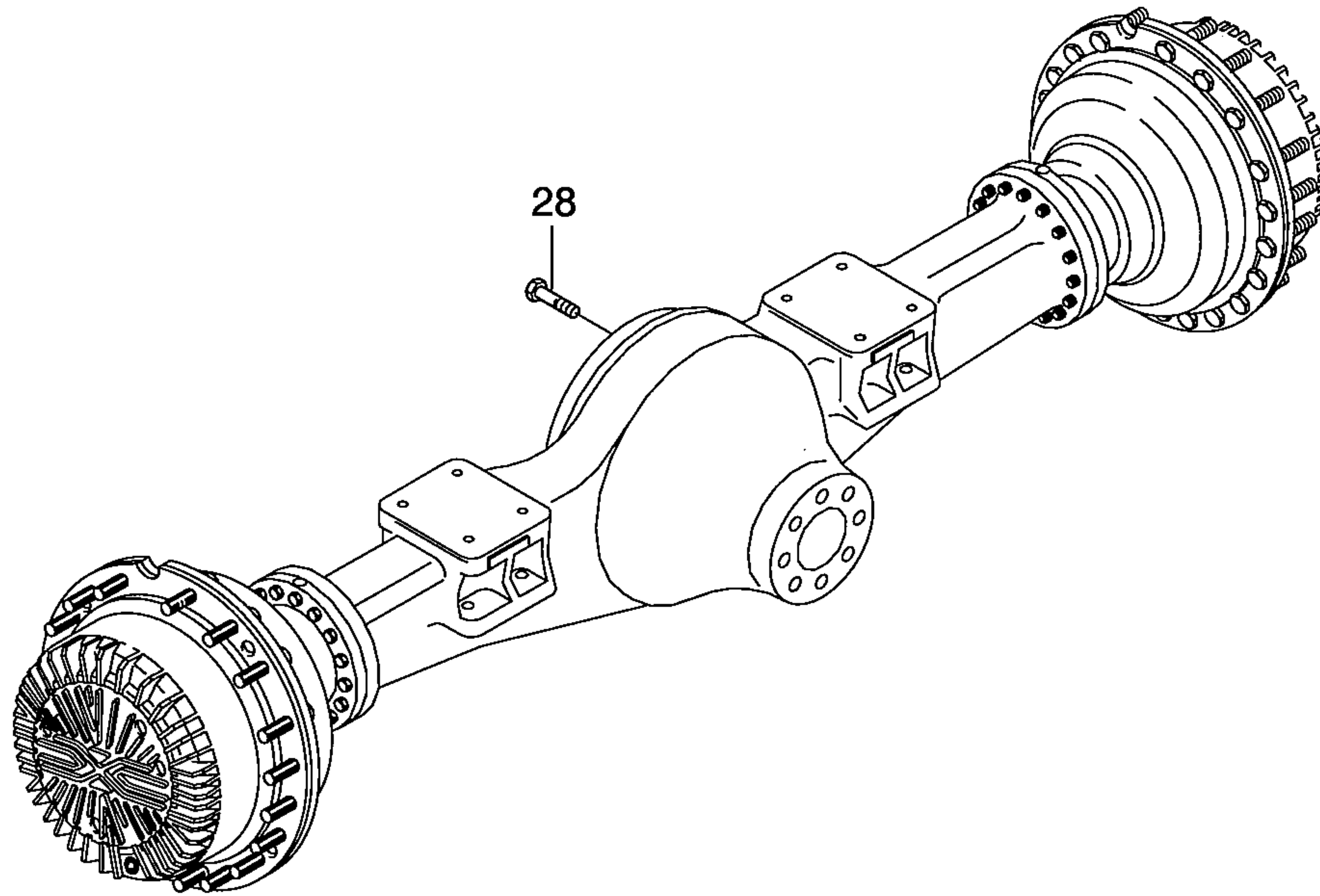
i.e. : 4.02 rounded off = 4mm

3.88 rounded off = 3.9mm

9) DISASSEMBLING DIFFERENTIAL UNIT(Rear axle)

(1) Disassembly

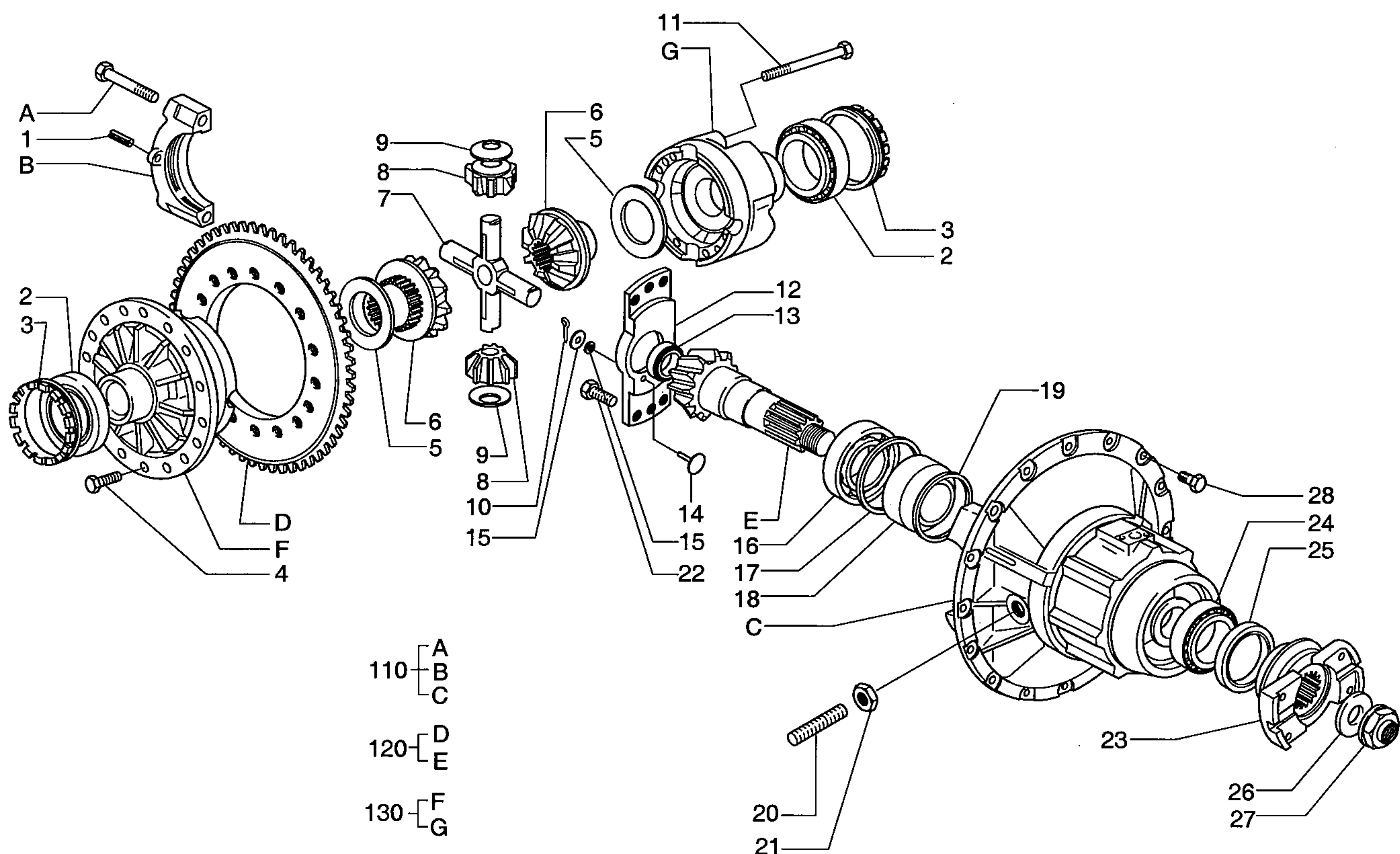
Unlock and undo screws(28) retaining differential unit then, remove it from axle case.



(2) Assembly

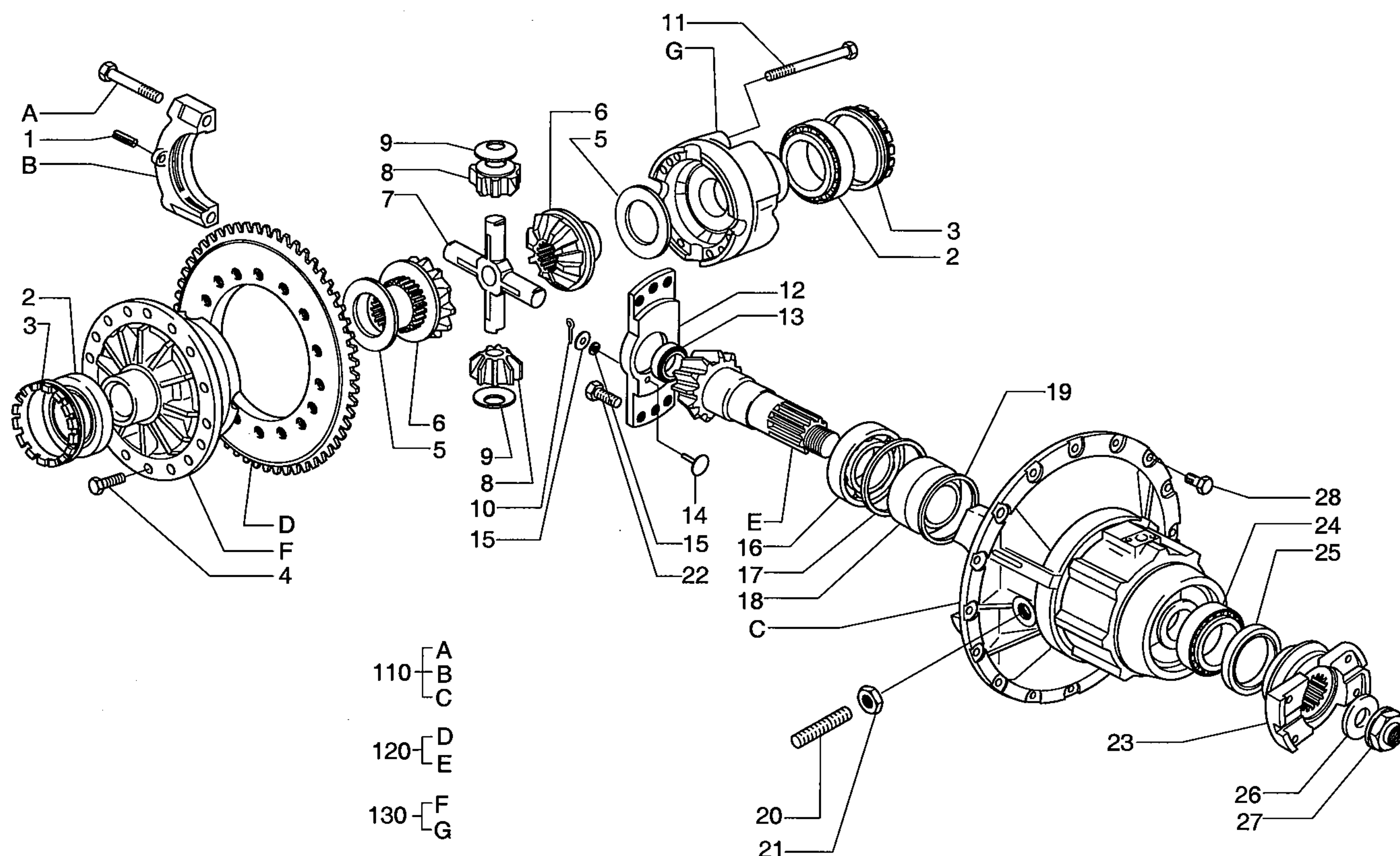
Clean thoroughly matching surfaces, apply sealing compound and mount differential unit on axle case, lock the screws(28) with a tightening torque of : See tightening torque No. 5.

(3) Disassembling differential unit(Rear axle)



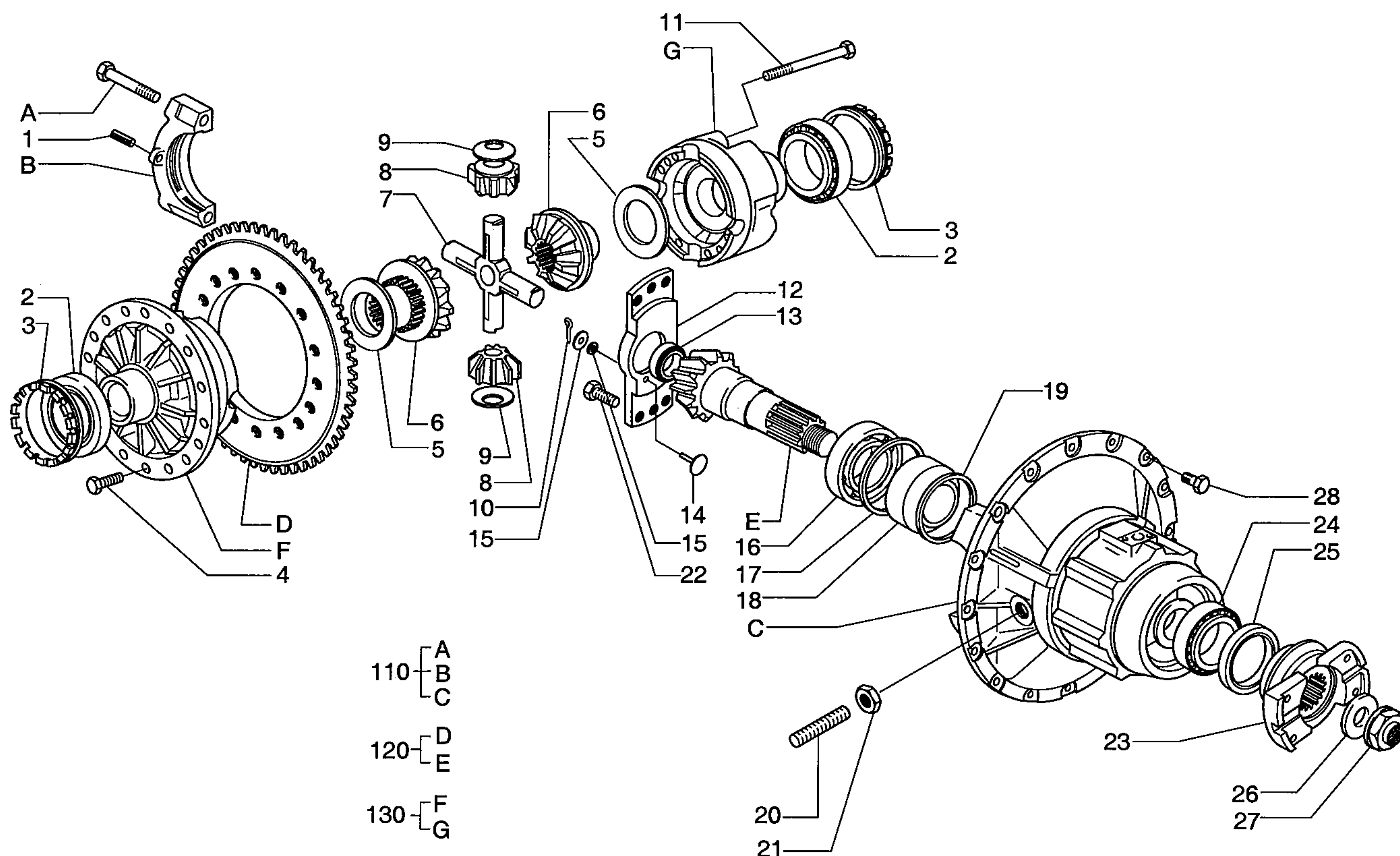
- ① Hammer out spring pins(1) locking slotted rings(3) and release them.
- ※ Mark caps(B) to match parts at reassembly.
- ② Release fixing screws(A) and remove caps(B) and relevant threaded rings(3).
- ③ Release and remove screws(22) securing support(12) of bearing(13) of bevel pinion shank.
- ④ Remove support(12) of bevel pinion bearing by means of puller screws.
- ⑤ Lift up differential unit from differential support(C), along with bearing support(12).
- ⑥ Remove ring gear deflection plunger(20) and relevant counternut(21).
- ⑦ Insert a screw in the seat of plunger(20) to react against unscrewing torque of pinion ring nut(27).
- ※ This screw should have a threaded length of 100mm, its tip should be shaped so as not to be damaged when contacting pinion teeth.
- ※ Make sure that screw be correctly engaged in pinion teeth.
- ⑧ Straighten notches on pinion ring nut(27).
- ⑨ Unlock and undo ring nut.
- ⑩ Remove drive flange(23), washer and pinion ring nut, then, back up reaction screw.

Disassembling differential unit(Rear axle)



- ⑪ Pry off seal(25) from drive flange.
- ⑫ Remove bevel pinion(E) from differential support(C), hammer pinion shank with a proper remover, care not to damage threads.
- ⑬ Pick up inner race of pinion shank bearing(24).
- ⑭ Remove from differential support(C) outer races of outer and inner pinion bearings(24 and 16). Pick up shims(17) for pinion axial position adjustment, spacer(18) and shim(19).
- ⑮ Flatten notches retaining bearing(13) race on pinion(E) shank.
- ⑯ Remove bearing(13) race from pinion(E) shank by a proper puller.
- ⑰ Remove pinion underhead bearing (16) by a proper puller.
- ※ Mark differential half-cases(F and G) for reference at reassembly.
- ⑱ Remove fixing screws(11) and separate half-cases(F and G).
- ※ Have a visual and dimensional check of wear on sun and side gears(6 and 8) relevant thrust washers(5 and 9) and spider(7).
- ⑲ Remove bearings(2) from half-cases(F and G) by a proper puller.
- ⑳ Fit inner races of differential bearings(2) on half-cases(F and G).

Disassembling differential unit(Rear axle)



※ This operation should be carried out by heating equipment or proper installer.

②① Clamp ring gear(D) in a vise fitted with soft caps and remove screws(4) securing ring gear(D) to case(F).

②② Overhauling pinion bearing support(12).

②③ Remove split pin(10), washer(15) and pin(14).

②④ Remove bearing outer race from support(12) of pinion(E).

②⑤ Check wear conditions of components, renew as required.

②⑥ Finally, press fit outer race of bearing(13) on support(12) of pinion(E).

②⑦ Finally, reassemble retaining washer(15), pin(14) and split pin(10) on support(12).

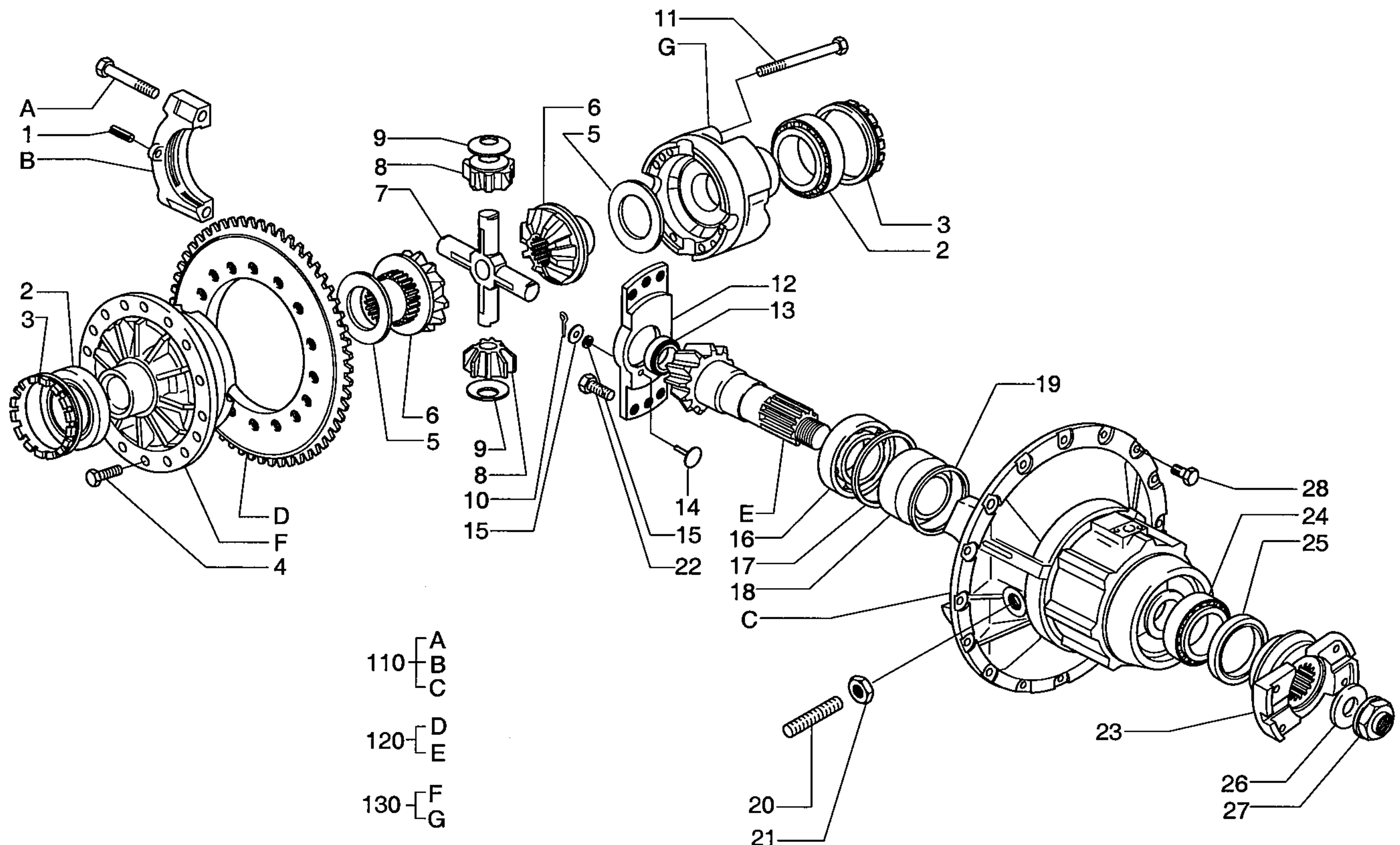
②⑧ Mount bevel ring gear(D) on case(F) lock relevant fixing screws(4) with a tightening torque of :
See tightening torque No.2.

※ Position differential components in relevant seats, then, join half-cases(F and G) matching reference marked prior disassembly.

②⑨ Mount and lock half-cases fixing screws(11) with a tightening torque of : See tightening torque No.3.

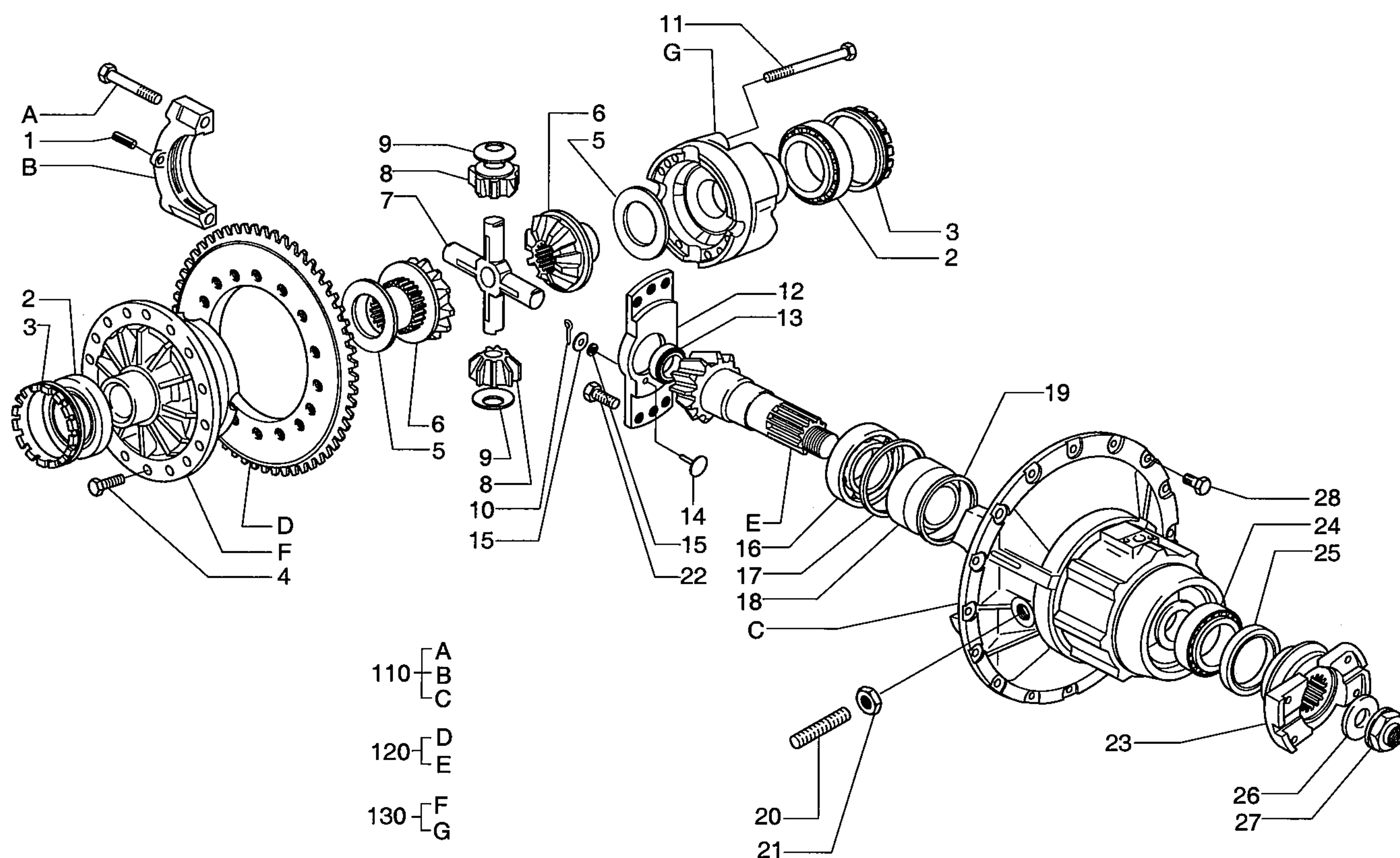
10) ASSEMBLING DIFFERENTIAL UNIT(Rear axle)

Determining thickness of adjustment shims(Axial position of bevel pinion) : See clause 11 at page 3-160.



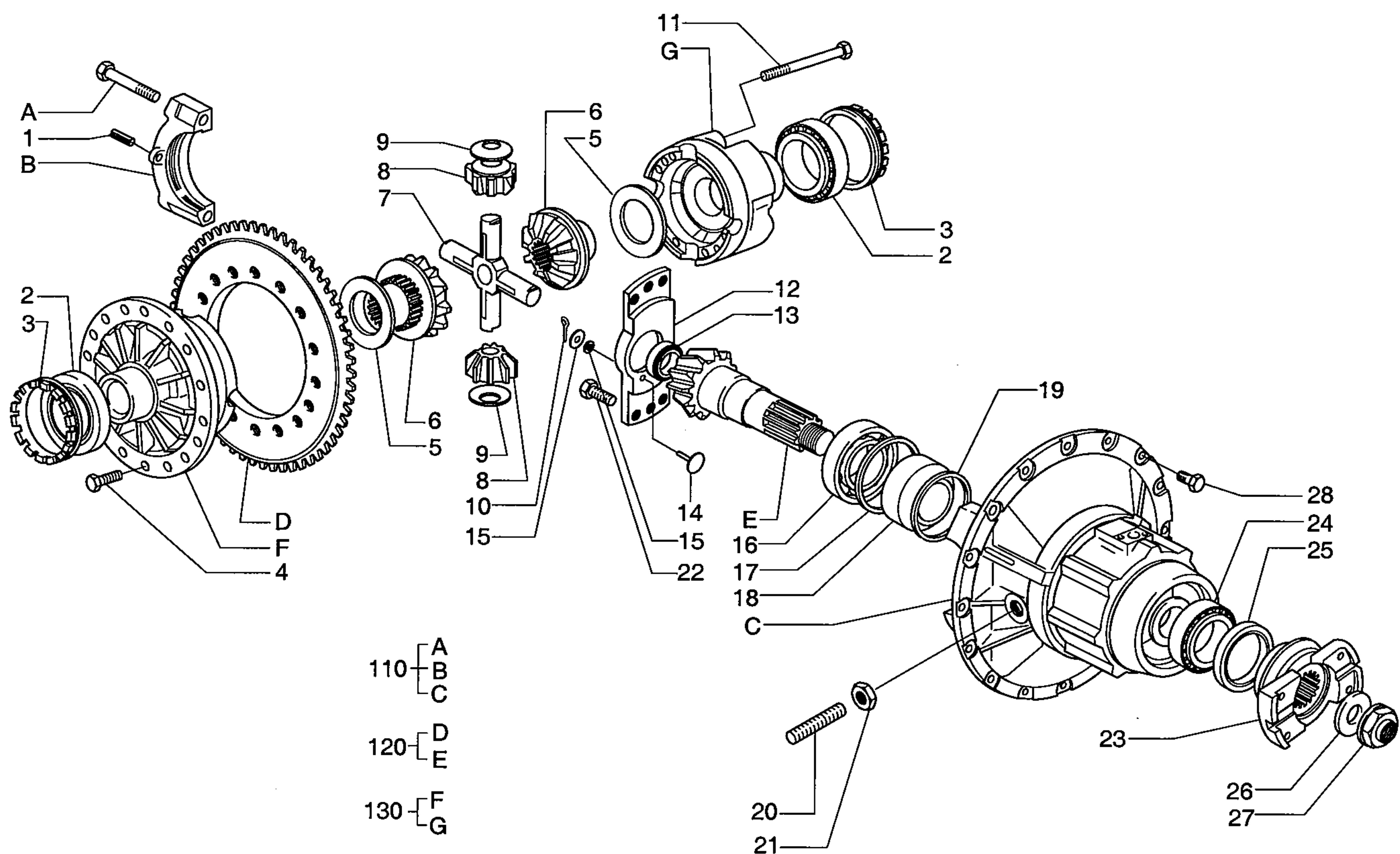
- (1) Press fit inner race of inner(Underhead) bearing(16) on pinion by heating equipment or proper installer.
- (2) Position shim(17), computed as per clause 11 at page 3-160, in its seat and press fit outer races of inner(Underhead) and outer bearings(16 and 24) of pinion.
- (3) Fit spacer(18) on pinion along with shims(19) for bearing pre-load adjustment; Then, mount inner race of pinion outer bearing(24).
 - ※ To facilitate proper pre-load computation, it is advisable to mount as many shims as required to warrant a pinion end play and not a pre-load(That could be excessive) on bearings.
- (4) Fit drive flange(23) on pinion(E), position the specific reaction screw and tighten nut(27) with a torque of 58.2 - 64.3kgf · m(420 - 464lbf · ft).
- (5) Back up reaction screw from pinion.
 - ※ Check pinion end play by means of a dial gauge; Then, disassemble parts and change shims so as to eliminate all end play and reach the intended pre-load.
 - ※ Reassemble components, check that proper pre-load of bearing be corresponding to a revolving torque(No seal installed) of 0.2-0.4kgf · m(1.4-2.9lbf · ft).
- (6) As the prescribed pre-load of bearings as been reached remove drive flange(23) and fit lip seal (25) in relevant seat.

ASSEMBLING DIFFERENTIAL UNIT(Rear axle)



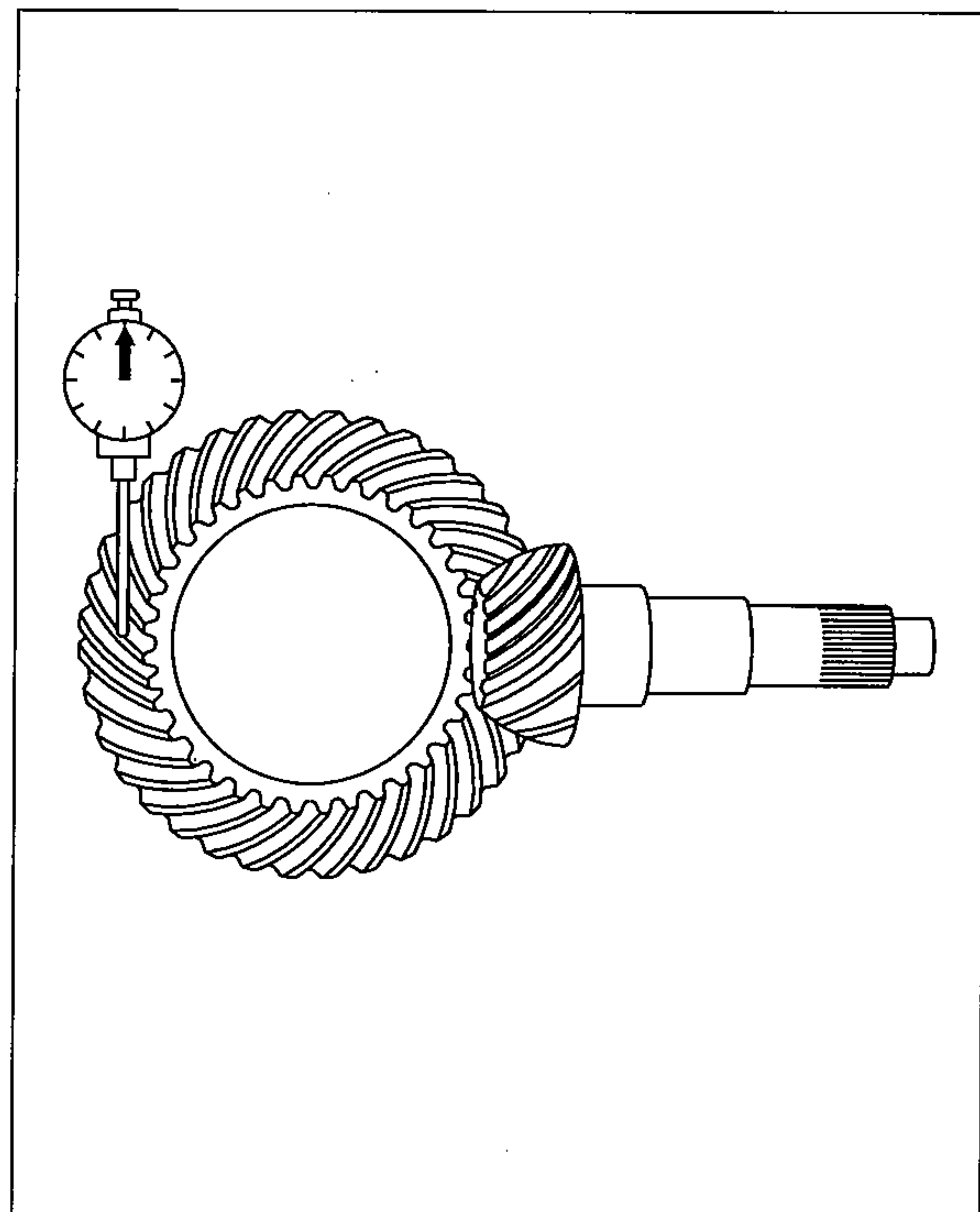
- (7) Remount drive flange again and tighten a specified above.
 - (8) Remove definitively, reaction screw from differential support.
 - (9) Position differential assembly with ring gear on support(C).
 - (10) Insert support(12) of bearing(13) while differential is lowered and tighten fixing screw(22) with a torque of : See tightening torque No.6.
 - (11) Insert ring nut(3) and adjust temporarily backlash.
 - (12) Mount caps(B), minding not to invert position and lock screws(A) fixing support to differential with a torque of : See tightening torque No.4.
- ※ Check differential end play by a dial gauge.
 - ※ Screw in a ring nut so as to have a notch alined against the slot of lock plate and actuate the opposite nut up to eliminate end play.
 - ※ As such a condition has been reached go on with bearing pre-load by screwing in ring nut further one more notch.

ASSEMBLING DIFFERENTIAL UNIT(Rear axle)



(13) Position a dial gauge perpendicular the ring gear(D) tooth(See figure) and check that, with pinion steady, backlash be of : See tightening torque No.9, otherwise rotate both ring nuts(3), displacing them of a same number of notches and nearing ring gear to pinion if backlash is excessive and moving away on the contrary.

※ Brush red lead on some ring gear teeth, rotate to mesh pinion and ring gear repeatedly so as to make evident tooth contact. Proper and correct tooth contact marks are visible on a new bevel gear set as a result of an optimum contact approached on the tester, consequently, a proper axial position of pinion against ring gear will emphasize remarking of previous tester contact marking.

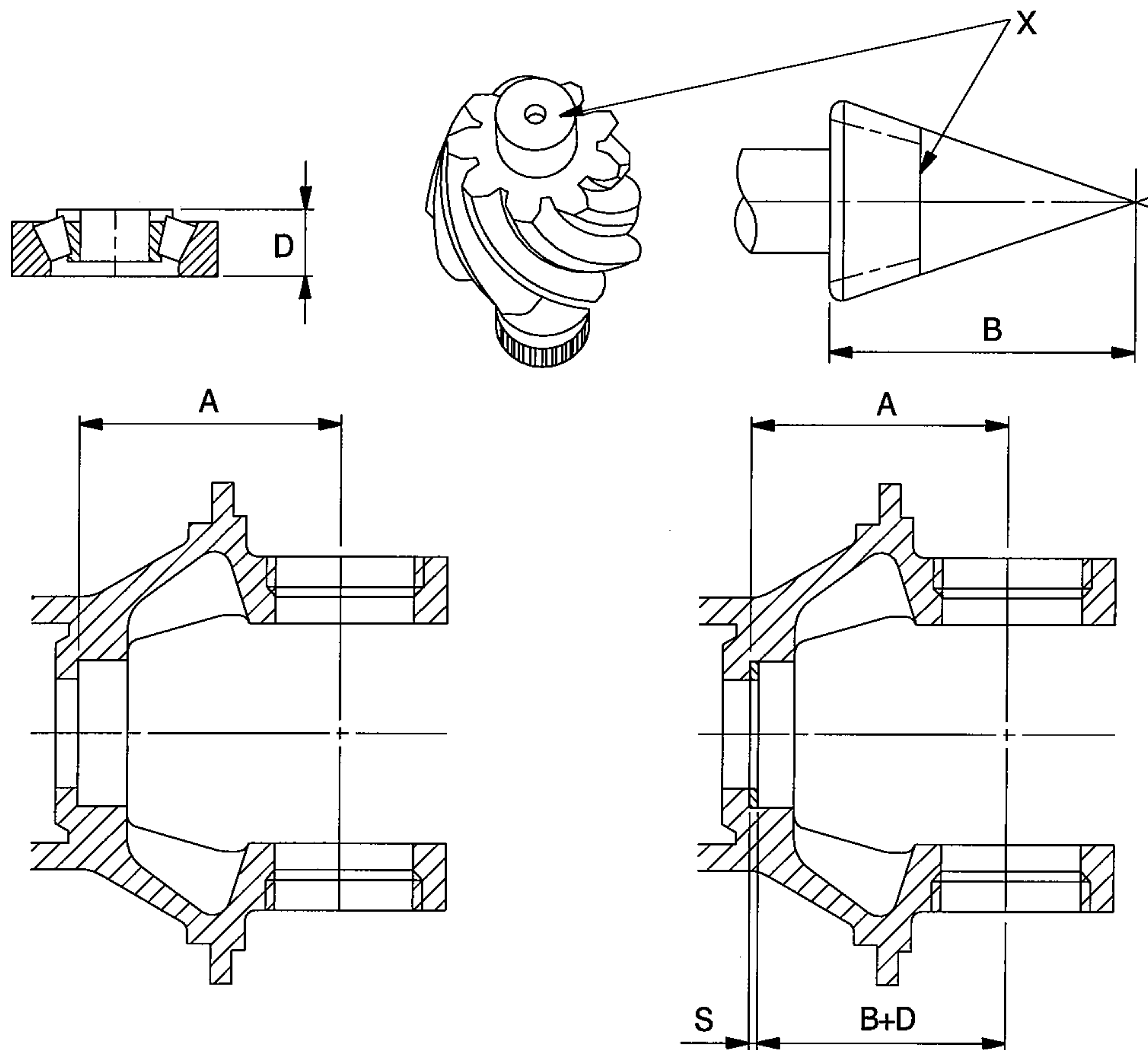


(14) Fit spring pins(1) to lock differential ring nuts.

(15) Make two lock notches on pinion nut collar(27).

※ Apply sealing compound to bevel ring gear deflection plunger(20), then, screw in up to contact; Turn back by about 90 degree to leave the required clearance and lock counternut holding plunger steady.

11) DETERMINING THICKNESS OF ADJUSTMENT SHIMS(Rear axle)



- (1) Some dimensions should be recorded before starting reassembly of bevel pinion to determine thickness of spacer to be fitted between inner(Underhead) pinion bearing and backing of relevant seat in differential support.

Record dimension from ring gear axis to seat of inner(Underhead) pinion bearing(That will be identified as **A**).

Example : In our case **A** = 225.1mm

- (2) A number **X** prefixed by symbol $\pm$ is marked on bevel pinion face.

Said value, expressed in tenth of millimeter, indicate the deviation from the theoretical distance from pinion underhead to ring gear axis :

i.e. : $+1 = 0.1\text{mm}$

Consequently, the true distance(Identified as **B**) will be :

B = $184 \pm \text{Deviation}$

In our case : **B** = $184 + 0.1 = 184.1\text{mm}$

- (3) Measure thickness of pinion head bearing and identify as **D**.

Example : In our case **D** = 37.15mm

- (4) Compute thickness of shim **S** for proper axial position of bevel pinion :

$$\mathbf{S = A - (B + D)}$$

Example : In our case **S** = $225.1 - (184.1 + 37.15) = 3.85\text{mm}$

- (5) Increase by 0.05mm the computed thickness value to compensate subsequent bearing pre-load.

Round off to the nearest tenth of millimeter to the computed thickness value :

i.e. : 4.02 rounded off = 4mm

3.88 rounded off = 3.9mm