Service & Maintenance

Self-cleaning Hermetic Separators

	Product No.:
A MRPX 614HGV-14C	**881208-01-01**
C MRPX 614HGV-74C	**881208-01-01**
H MRPX 614HGV-74C	**881208-01-01**
W MRPX 614HGV-74C	**881208-01-01**
A MRPX 714HGV-14C	**881208-02-01**
B MRPX 714HGV-14C	**881208-02-01**
C MRPX 714HGV-74C	**881208-02-01**
H MRPX 714 HGV-74C	**881208-02-01**
W MRPX 714HGV-74C	**881208-02-01**
B BRPX 714HGV-34C	**881208-02-01**
D MRPX 714HGV-34C	**881208-02-01**
C MRPX 518HGV-74C	**881209-01-01**
H MRPX 518HGV-74C	**881209-01-01**
W MRPX 518HGV-74C	**881209-01-01**
B MRPX 618HGV-14C	**881209-02-01**
C MRPX 618HGV-74C	**881209-02-01**
F MRPX 618HGV-74C	**881209-02-01**
H MRPX 618HGV-74C	**881209-02-01**
W MRPX 618HGV-74C	**881209-02-01**
B BRPX 618HGV-34C	**881209-02-01**
D MRPX 618HGV-34C	**881209-02-01**
C MRPX 718HGV-74C	**881209-03-01**
H MRPX 718HGV-74C	**881209-03-01**
W MRPX 718HGV-74C	**881209-03-01**
H MRPX 818HGV-74C	**881210-01-01**
B MRPX 818HGV-14C	**881210-01-02**
B BRPX 818HGV-34C	**881210-01-02**
H MRPX 818HGV-74C	**881210-01-02**
W MRPX 818HGV-74C	**881210-01-02**

Product No.:	Multiple
Book No.:	1271059-02 V5

Alfa Laval

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Study instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

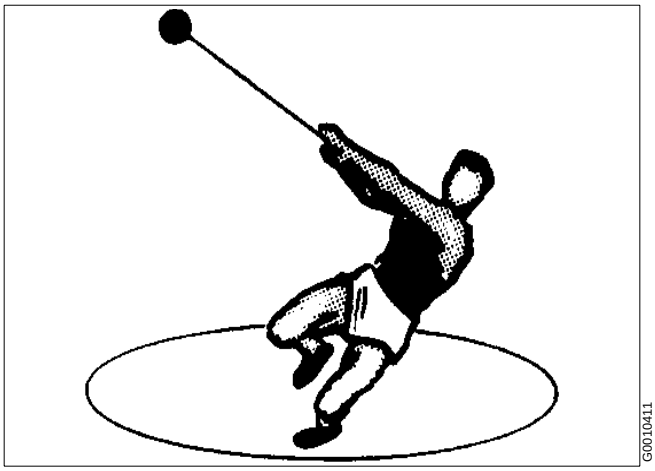
In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.

Contents

1 Safety Instructions

The centrifugal separator includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- Great forces are generated
- Stopping time is long



Manufacturing tolerances are extremely fine. Rotating parts are carefully balanced to reduce undesired vibrations that can cause a breakdown. Material properties have been considered carefully during design to withstand stress and fatigue.

The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose.

Incorrect operation and maintenance can result in unbalance due to build-up of sediment, reduction of material strength, etc., that subsequently could lead to serious damage and/or injury.

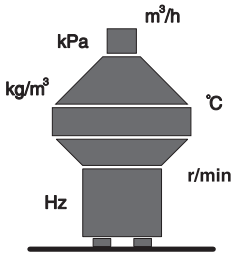
The following basic safety instructions therefore apply:

- **Use the separator only for the purpose and parameter range specified by Alfa Laval.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**

DANGER

Disintegration hazards

- Use the separator only for the purpose and parameter range specified by Alfa Laval.
- If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.
- When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.
- Check that the gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.
- Welding or heating of parts that rotate can seriously affect material strength.
- Wear on the large lock ring thread must not exceed safety limit. ϕ-mark on lock ring must not pass opposite ϕ-mark by more than specified distance.
- Inspect regularly for **corrosion** and **erosion** damage. Inspect frequently if process liquid is corrosive or erosive.



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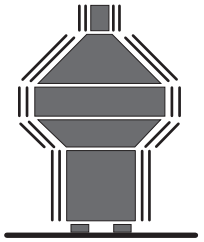

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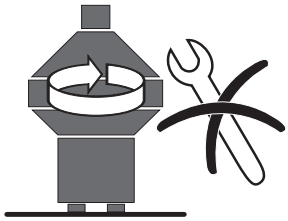
DANGER

Entrapment hazards

- Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.
- To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.
- Assemble the machine **completely** before start. **All** covers and guards must be in place.

Electrical hazards

- Follow local regulations for electrical installation and earthing (grounding).



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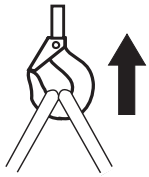
WARNING

Crush hazards

- Use correct lifting tools and follow lifting instructions.
- Do **not** work under a hanging load.



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Noise hazards

- Use ear protection in noisy environments.

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CAUTION

Burn hazards

- Lubrication oil and various machine surfaces can be hot and cause burns.

Cut hazards

- Sharp edges on separator discs and lock ring threads can cause cuts.

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Warning signs in the text

Pay attention to the safety instructions in this manual. Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.

DANGER

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **fatal injury** or fatal damage to health.

WARNING

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **disabling injury** or disabling damage to health.

CAUTION

Type of hazard

This type of safety instruction indicates a situation which, if not avoided, could result in **light injury** or light damage to health.

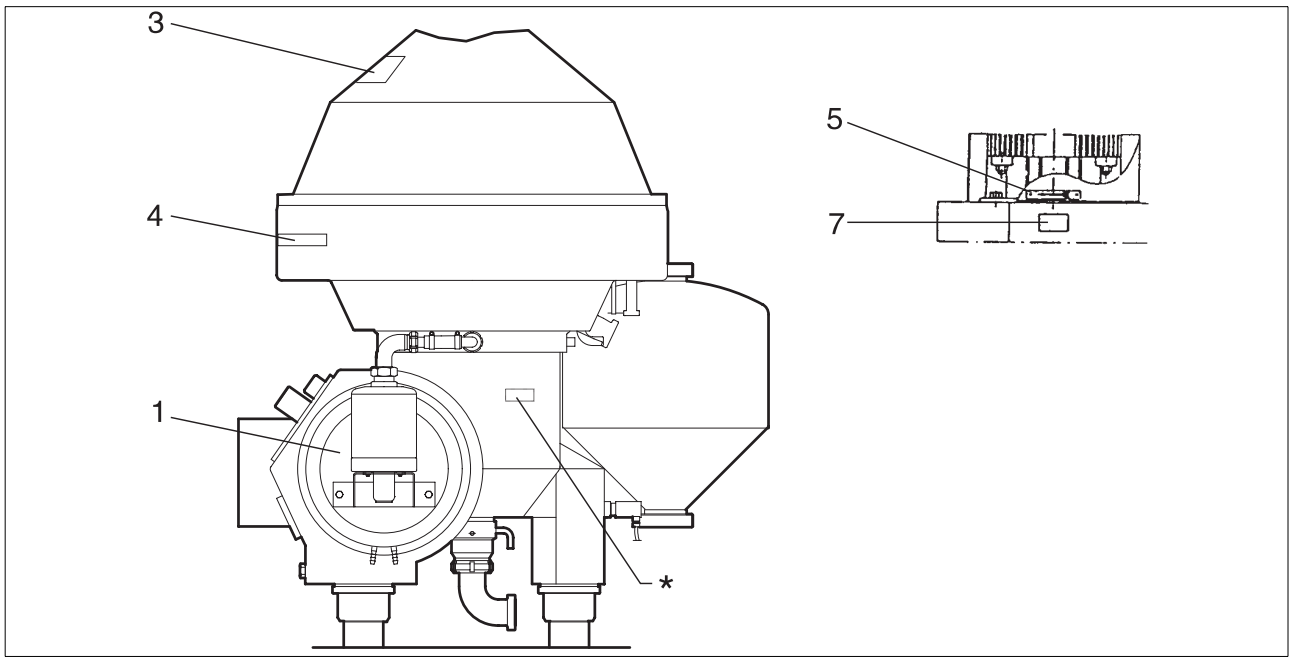
NOTE

This type of instruction indicates a situation which, if not avoided, could result in damage to the equipment.

2 General advice

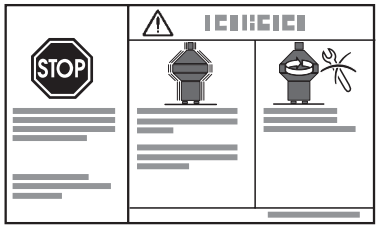
Contents

2.1 Identification and safety signs on the machine



1. Machine plate	Text on plate (**example**):
Separator	A MRPX 614HGV-14C
Manufacturing serial No / Year	XXXX
Product No	88208-01-01
Machine top part	552032-02
Outlet	562013-02
Bowl	546860-12
Machine bottom part	553136-41
Max. speed (bowl)	4265 r/min
Direction of rotation (bowl)	←
Speed motor shaft	1500 r/min
El. current frequency	50 Hz
Recommended motor power	18,5 kW
Max. density of feed	1100 kg/m^3
Max. density of sediment	1380 kg/m^3
Max. density of operating liquid	1000 kg/m^3
Process temperature min./max.	0 - 100 °C

3. Safety label



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Text on label:

DANGER

Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

Failure to strictly follow instructions can lead to fatal injury.

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

Out of balance vibration will become worse if bowl is not full.

Separator must **stop rotating** before **any** dismantling work is started.

4. Name plate

Alfa Laval

S0063211

5. Arrow

Indicating direction of rotation.

7. Power supply frequency, all separators except HM/BM/BB/WM/ RPX 818

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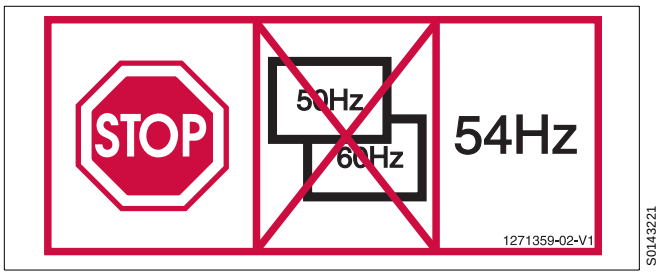
Power supply frequency,
HMRPX 818 (spec. 881210-01-01)



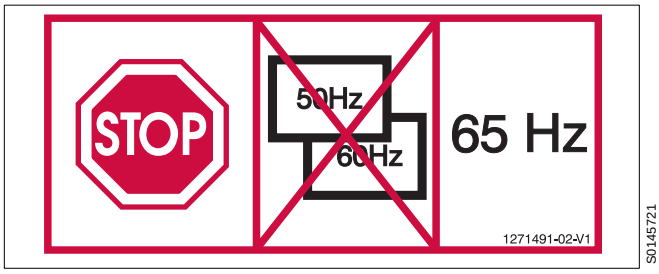
Power supply frequency H MRPX 818

Power supply frequency,
HM/BM/BB/WM/ RPX 818 (spec. 881210-01-02)

DANGER

Disintegration hazard

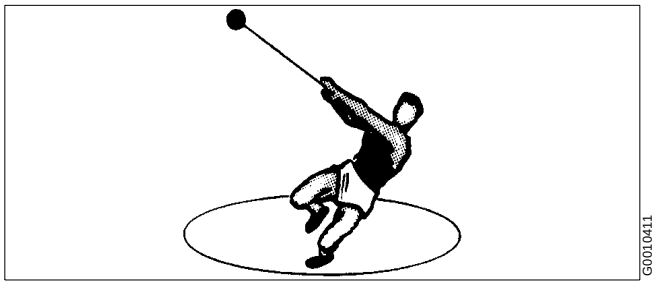
This machine must not be operated with higher bowl speed than 4607 r/min.



Power supply frequency HM/BM/BB/WM/RPX 818

*** Space reserved for plate indicating representative**

2.2 The maintenance concept



A centrifugal separator is capable of generating great forces in all directions and is subject to the law of centrifugal force.

The separator, like any other machine is subject to wear. Corrosion, erosion and just ordinary wear due to normal operation, all take their toll.

To ensure safe and efficient operation over a long period, certain parts will by and by have to be replaced. Proper care and maintenance will prolong the life of the separator and ensure good performance.

DANGER

Disintegration hazards

Worn, eroded or improperly assembled machine parts may cause severe damage. Follow maintenance instructions and check for possible damage.

2.2.1 Forms of maintenance

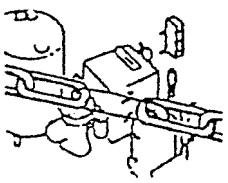
Two forms of maintenance exist: **Preventive maintenance** and **Corrective maintenance**. Preventive maintenance can be defined and planned, corrective maintenance cannot. This instruction book takes primarily preventive maintenance into consideration, but it also covers the normal requirements for corrective maintenance.

2.2.2 Maintenance strategy

The customer decides what form of maintenance or combination of forms shall be put into practice, depending on local conditions. The following specification shows the different forms of maintenance in relation to the **System effectiveness**.

System effectiveness	**Preventive maintenance Predictable**	**Corrective maintenance Uncertain**
Economy	High availability/production. Maintenance costs according to budget.	Uncertain availability / production. Maintenance costs unknown.
Production availability	Service according to plan.	Unexpected production break.
Reliability	Maintenance at known intervals.	Maintenance at unforeseeable intervals.
Maintainability	Easy to disassemble.	Disassembly made difficult by dirt and lack of lubrication
Service preparedness	Personnel and spares available (either at customer or by service-agreement with the supplier).	Preparedness uncertain
Performance	Known. Performance checked periodically.	Deterioration of performance identified too late.
Safety	Periodically checked safety by properly trained personnel.	Checking of safety must be carried out according to a separate programme for inspections to be found in the Directions for Maintenance.

Preventive maintenance reduces the risk of unexpected stoppages to a minimum. The different forms of maintenance are often used in combinations to give the best **System effectiveness** for the customer.



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2.2.3 Direction for maintenance / maintenance log

With preventive maintenance the directions for maintenance state what is to be checked and replaced at recommended intervals.

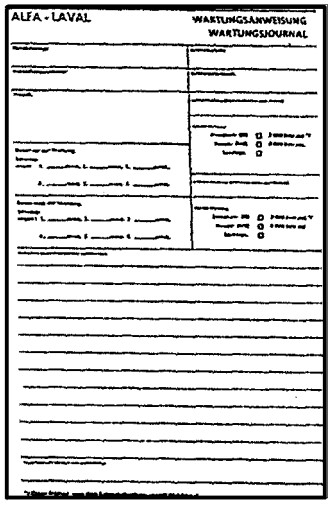
The directions also state what is to be checked from a safety point of view. The directions serve as a check list for different sub-actions when used for corrective maintenance. The directions for maintenance can be used as a maintenance log and a work sheet for performing the actions recommended by the supplier.

IS Intermediate service.

Includes inlet, outlet, bowl and friction linings.

MS Major service

Includes the actions taken for intermediate service (IS) as well as the driving device.



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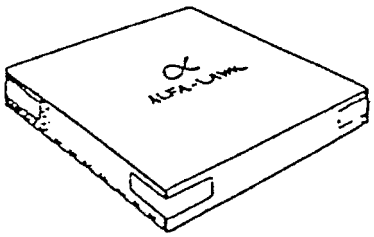
2.2.4 Kits of spares

The kits of spares available for intermediate service (IS) and major service (MS) include the spares that are to replace the corresponding existing parts in the separator with preventive service (periodically).

Note that the parts for IS are **not** included in the MS kit.

The contents of the service kits are described in the *Spare Parts Catalogue*.



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IS-kit contains:
- Seals, gaskets, O-rings
- Valve plugs, wear rings
- Lubricants

MS-kit contains:
- Seals, gaskets, O-rings
- Ball bearings
- Rubber buffers
- Elastic plates
- Friction pad
- Height adjusting rings
- USIT-rings

In addition there is a service kit (rubber cushions) for foundation feet to be used every third year.

The kits of spares can also be used at corrective maintenance from a preparedness point of view. With preventive service the parts included in the kits are to replace corresponding existing parts in the separator to safeguard an operation free of problems till next overhaul.

2.2.5 Stock of spares at the customer

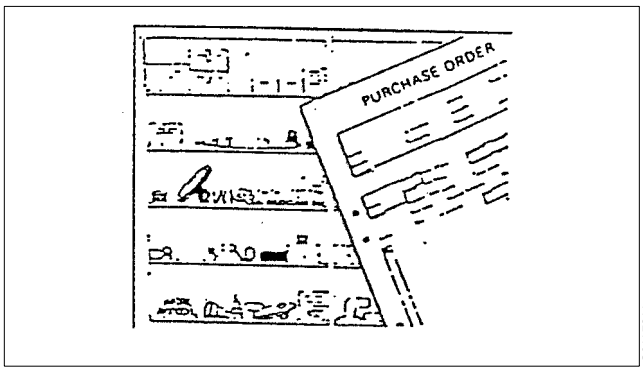
IS-kit shall always be available at the operation place.

MS-kit should always be available at the operation place.

If special difficulties exist, such as

- a long distance to the service unit
- commercial problems
- demands for a high production availability

both kits should be available.



NOTE

Always use Alfa Laval genuine parts as otherwise the warranty will become invalid.

Alfa Laval takes no responsibility for the safe operation of the equipment if non-genuine spare parts are used.

DANGER

Disintegration hazards

Use of imitation parts may cause severe damage.

2.2.6 Safety inspections

Preventive maintenance

The directions for maintenance prescribe the safety inspections which, with preventive maintenance, are periodically followed up by the user. In doing so he will discover any defects before safety is jeopardized.

Corrective maintenance

With corrective maintenance the safety inspections according to the directions for maintenance must be carried out specially from a separate program by the user.

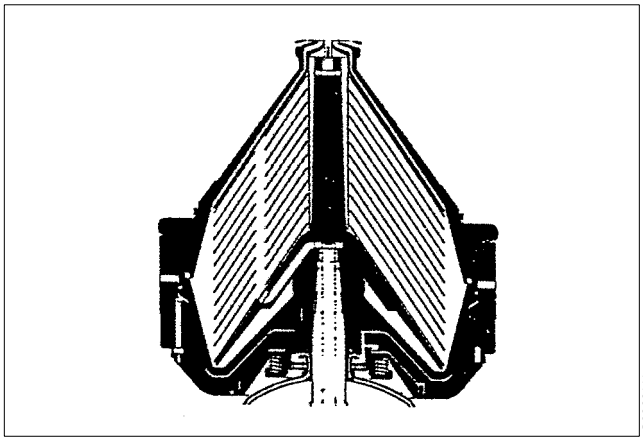
2.3 Major bowl parts

2.3.1 Balancing

Alfa Laval separator bowls are statically and dynamically factory balanced as **complete** bowl assemblies.

- Therefore, major bowl parts cannot be replaced without rebalancing the **entire** bowl.

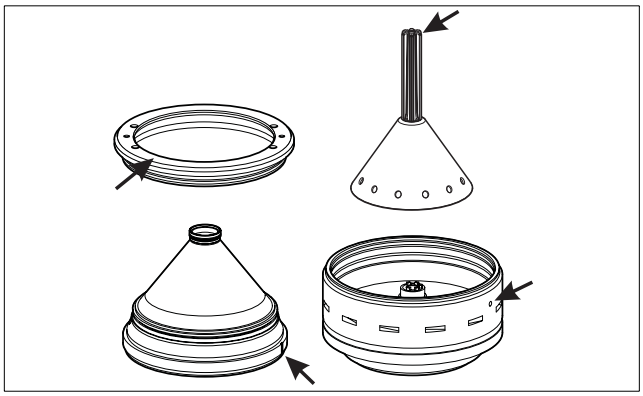
Bowl parts must never be interchanged from one machine to an other. This is just as imperative where machines of the same or a similar type are concerned. The bowl parts of each machine are stamped with the machine manufacturing number or the last three digits of that number.



2.3.2 Locating means

The bowl parts are assembled in a certain relative position to each other. Alignment marks, guide pins and lugs are provided on major parts and must be undamaged and legible.

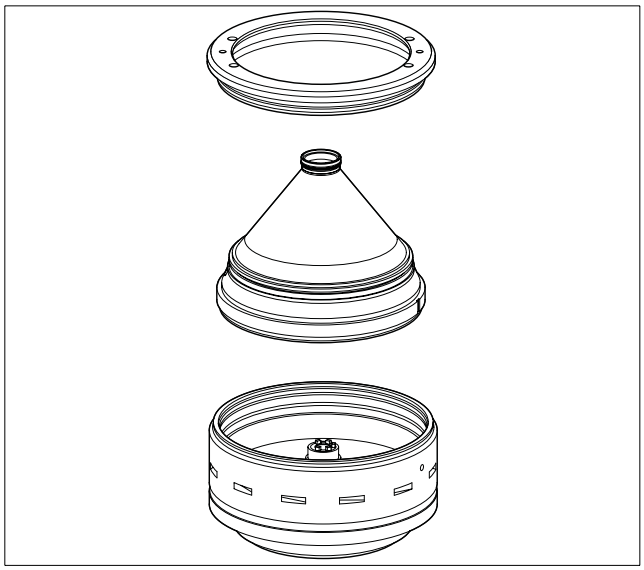
- Never operate the machine when these locating means are not in the proper relative position, or are illegible.



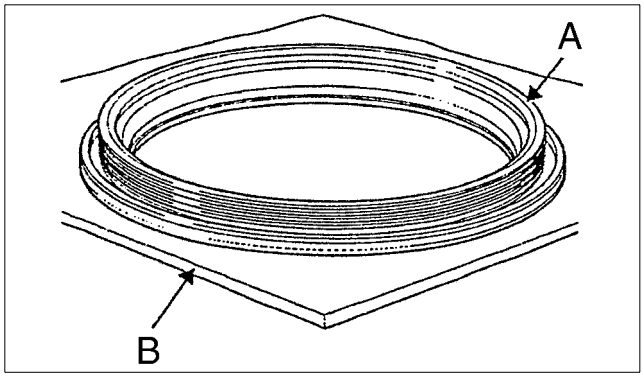
2.3.3 Handling

Great forces are generated when a separator bowl rotates. Its parts must, therefore, be high-precision- made to ensure perfect relative fit. The size of the bowl parts may easily give the impression that they need not be handled with the care that is, in fact, essential where precision-made articles are concerned. Any carelessness in this respect will very likely result in seizure damage.

Besides, the risk of seizure will increase when two or more parts in contact with each other are made of stainless steel and not properly lubricated.



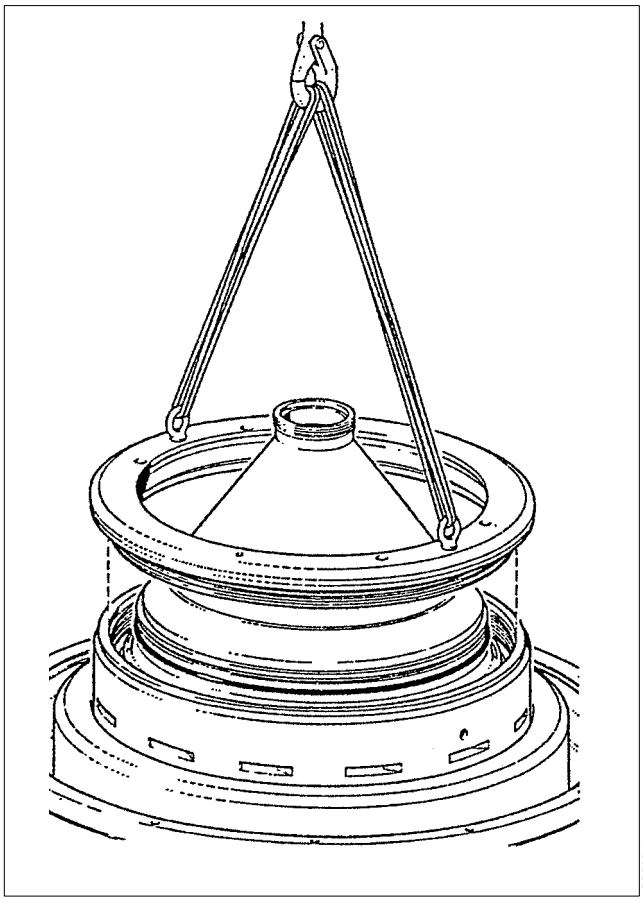
Handle all bowl parts very gently. Always put them on a **clean** and **soft** base. By way of example, the contact surface (A) of a lock ring provided with external thread should never rest on a dirty base. Scratches and dirt particles on contact and guiding surfaces as well as on threads must be avoided.



A. Contact surface
B. Clean and soft base (e.g. a rubber mat)

Use the lock ring lifting tools, if any. Even when the ring can be lifted by hand it may be difficult to put it gently on the bowl body. Denting may be the result if the ring thuds against the bowl body.

Align the hoisting device very exactly when assembling and disassembling. **Never** use a hoist that works jerkily. Use a lifting hook with catch.



2.4 Vibration

Abnormal vibration or noises are clues that something is wrong. Stop the machine and look for the cause.

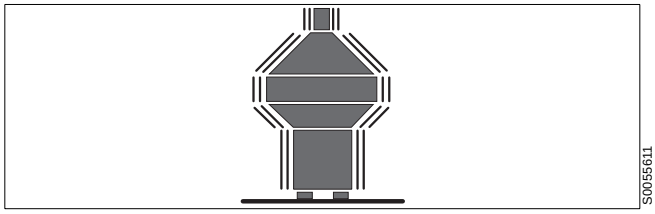
Vibration may occur, for shorter period, during the start. This is normal and pass without danger.

DANGER

Disintegration hazard

When excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

The cause of the vibrations must be identified and corrected before the separator is restarted. Excessive vibrations may be due to incorrect assembly or poor cleaning of the bowl.



2.5 Cleaning

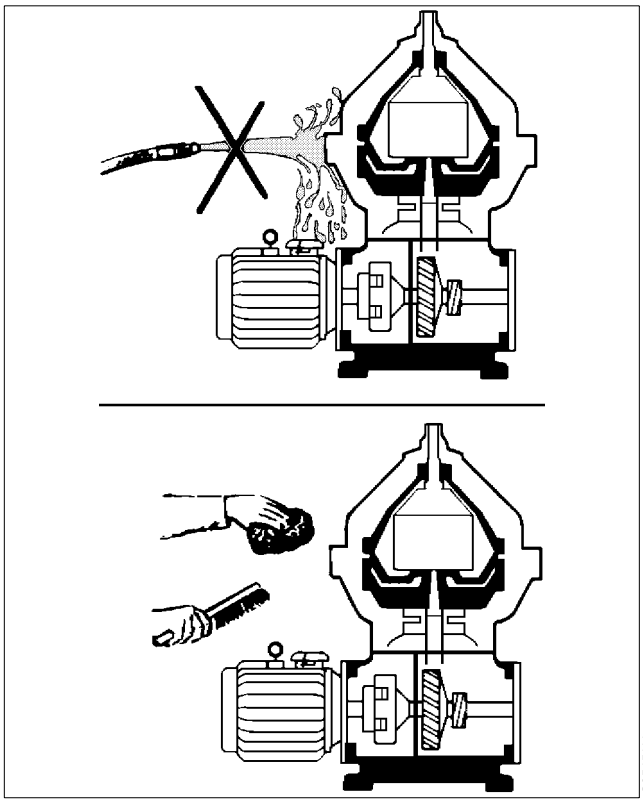
When using chemical cleaning agents, observe general rules and the supplier's recommendations as to ventilation, personal protection etc.

2.5.1 Frame / Motor

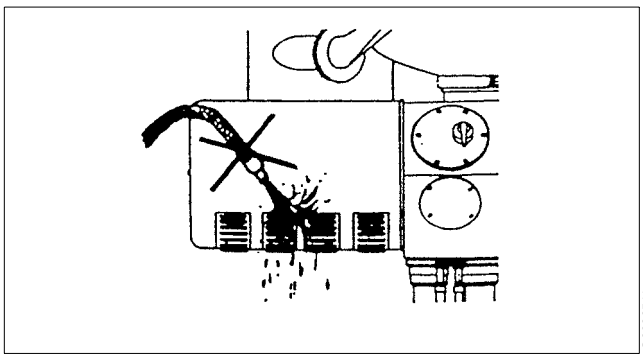
Never wash down a separator with a direct water stream. Totally enclosed motors can be damaged by direct hosing to the same extent as open motors and even more than those, because:

1. many operators believe that these motors are sealed, and normally they are not.
2. a water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
3. water directed on a hot motor may cause condensation, and subsequently produce grounding and internal corrosion.

The external cleaning of the machine should be restricted to brushing, sponging or wiping while the motor is running or is still hot.



Be careful even when the motor is equipped with a protecting hood. Never play a water jet on the ventilation grill of the hood.



2.5.2 Brake lining

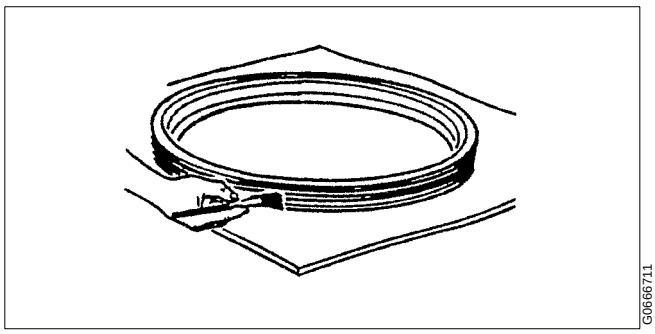
To degrease the lining and the corresponding friction surface use a suitable degreasing agent.

2.5.3 Other parts

Use white spirit, cleaning kerosene or any other solvent with equivalent properties.

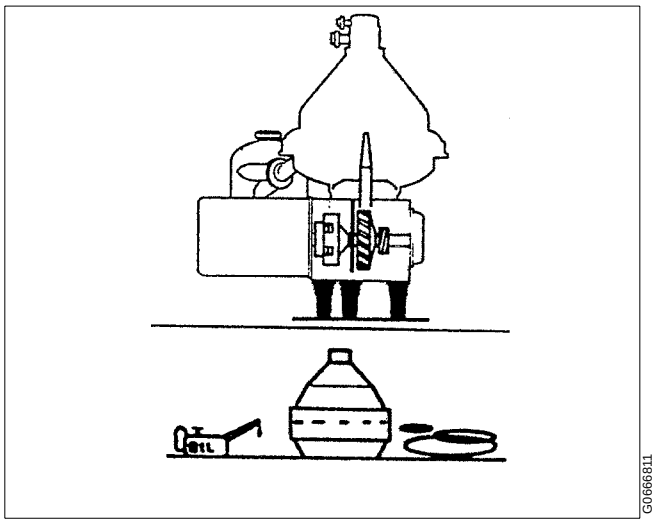
2.6 Lubrication

Wipe and oil all parts after cleaning. Protect the parts against dust and dirt when not to be mounted at once. Follow strictly the lubrication instructions given for the bowl lock ring joint.



2.7 Shut-downs

If the machine is shut down for some time, the bowl should not be left on the spindle, and its O-rings should be removed. Apply some oil on the bowl spindle taper for rust protection.
When the machine is to be set in operation again:



After some weeks

- Lubricate top bearing with some drops of oil
- Wipe the bowl spindle taper clean. Apply a few drops of oil (absolutely not Molykote) to the spindle taper. Wipe off with a clean cloth.
- Fit and lubricate the O-rings in the bowl. Reinstall the bowl.
- Check electric insulation in motor. If necessary, dry up the motor to obtain correct insulation value.
- Flush the pipings clean.

After some months, further actions

- Fit and lubricate new O-rings in the bowl.
- Check the rubber discs between motor shaft and worm wheel shaft with respect to cracks. Replace if necessary.

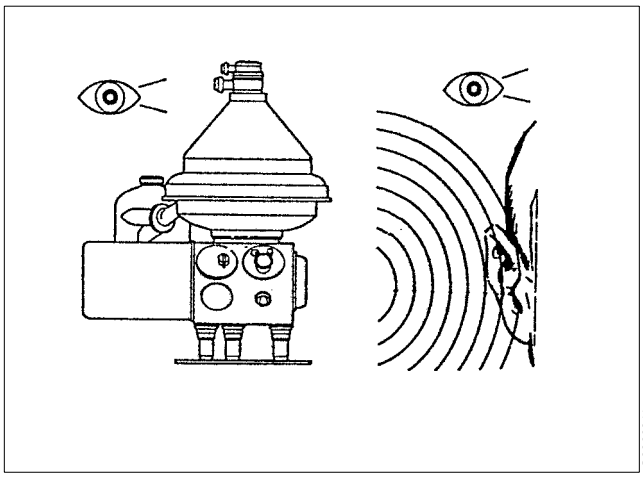
2.8 Before starting the overhaul

Try to form a conception of the machine action. The observations may be very useful when you have to decide whether a part should be replaced.

- Note visible leakage.
- Initiate some ejections and check the ejecting function.
- Note symptoms which you regard as differing from normal machine running.

The trouble tracing schedules may be of some help, see *Operator's Manual*.

However, the working experience gained from similar estimations will be the best aid.



2.9 Ball and roller bearings

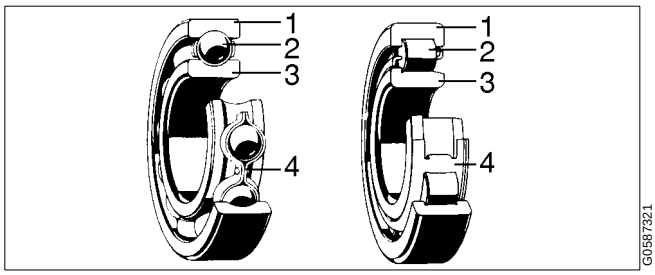
Use the greatest cleanliness when handling rolling bearings. Avoid unnecessary dismounting of bearings. **Do not refit a used bearing. Always replace it with a new one.**

Important: Special design bearings for the bowl spindle

The bearings used for the bowl spindle are specifically designed to withstand the speed, vibration, temperature and load characteristics of high-speed separators.

Do not use other bearings than those stated in the *Spare Parts Catalogue***.**

A bearing that in appearance looks equivalent to the correct bearing may be considerably different from the latter in various respects: inside clearances, design and tolerances of the cage and ball (roller) races as well as material and heat treatment. **Any deviation from the correct bearing may cause a serious breakdown.**



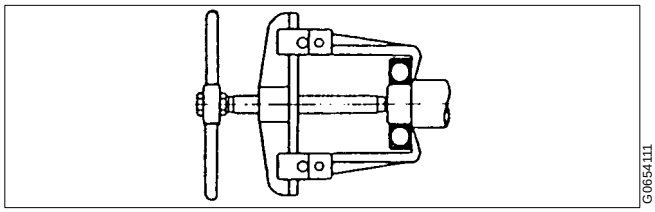
1. *Outer race*
2. *Ball/roller*
3. *Inner race*
4. *Cage*

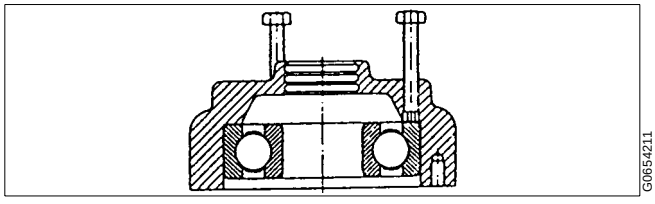
2.9.1 Dismounting

Detach the bearing from its seat by pressing against the race having the tightest fit. Use a puller or a special tool. Thus, apply the pressure to the inner race when the bearing sits tightly on the shaft, and to the outer race when the bearing is tightly fitted in the housing respectively.

Arrange dismounted bearings and other parts in assembling order to avoid confusion.

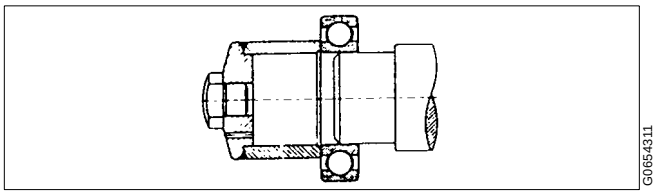
Check the shaft end and the bearing seat in the housing for damage indicating that the bearing has rotated on the shaft, and in the housing respectively. Replace the damaged part, if the faults cannot be remedied by polishing or in some other way.





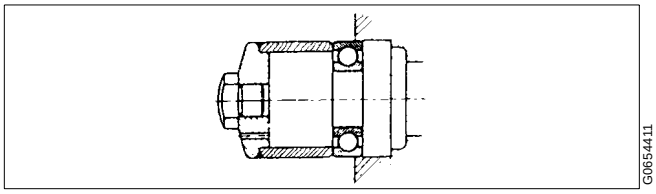
2.9.2 Fitting

Leave new bearings in original wrapping until ready to fit. The antirust agent protecting a new bearing need not to be removed.



Fit a bearing on a shaft by pressure applied to the inner race and in a housing by pressure applied to the outer race. Use a suitable piece of pipe or a metal drift and a hammer. Never strike the bearing directly.

When mounting ball bearings on the spindle and worm as described below, the bearings must be heated in oil to max 125 °C.



NOTE

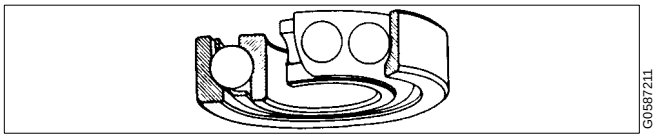
Heat the bearing in a clean container with cover.

Use only clean oil with a flash point above 250 °C.

The bearing must be well covered by the oil and must not be in direct contact with the sides or bottom of the container. Place the bearing on some kind of support or suspend it in the oil bath.

2.9.3 Angular contact ball bearings

Always fit single-row angular contact ball bearings with the **wide** shoulder of the **inner** race facing **upwards**.



NOTE

Observe that it is extremely important that this bearing is positioned correct.

A bearing of this kind turned upside down cannot carry any load. It collapses when loaded resulting in serious breakdown of the machine.

2.10 Tightening of screws

When tightening screws, use the torques stated in the table below unless otherwise stated. The figures apply to lubricated screws tightened with a torque wrench.

METRIC THREAD		
Thread	Torque in Nm	
	Stainless steel	Carbon steel
M6	7	8
M8	17	20
M10	33	39
M12	57	68
M16	140	155
M20	275	325
M24	470	570

3 Directions for maintenance

3.1 Intermediate service (every 3rd month *) IS

To be carried out by customer or supplier.

The IS-kit spares are to be used.

Main parts and operations	Remarks	Done
Inlet/ outlet		
Renew rubber rings / packings included in the IS-kit		
Check parts for wear / erosion / corrosion / damage. Rectify any surface damage		
Check height adjustments		
Check wobble and eccentricity		
Separator bowl		
Renew rubber rings / packings included in the IS-kit		
Renew valve plugs for operating slide and bowl hood seal ring		
Clean and inspect all bowl parts for erosion / corrosion / damage. Rectify any surface damage		
Clean and inspect nave of bowl body		
Clean and treat lock ring threads. See		
Check disc stack pressure		
Check bowl spindle taper for run-out. Rectify any surface damage		
Paring disc device/operating water		
Renew rubber rings / packings included in the IS-kit		
Clean channels		
Check water flow		
Check height adjustment		

*/ or 2000 hours

Main parts and operations	Remarks	Done
Frame		
Renew brake lining		
Renew oil in worm gear housing, if necessary. See “5.1 Lubricants” on page 178		
Renew oil drain plug packing		
Renew safety label if damaged or not legible		
Check play in speed transmitter (if any)		
Monitoring equipment		
Verify function of monitoring equipment		

3.2 Major service * (once a year **) MS

To be carried out by supplier or customer.

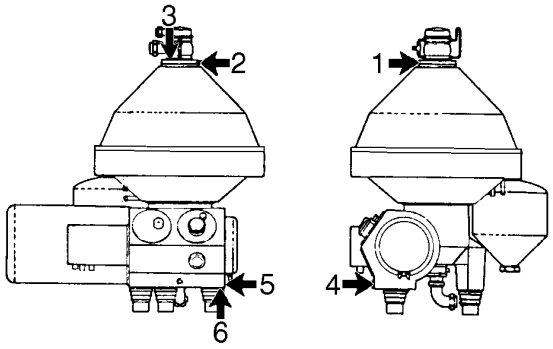
The MS-kit spares are to be used.

Main parts and operations	Remarks	Done
Vertical driving device		
Renew rubber rings / packings included in the MS-kit		
Renew ball bearings included in the MS-kit		
Renew buffers (rubber buffers or buffers with springs)		
Check worm gear for abnormal wear		
Check bottom bearing housing for any signs of rotating outer ring		
Horizontal driving device		
Renew rubber rings / packings included in the MS-kit		
Renew ball bearings included in the MS-kit		
Renew elastic plates of coupling		
Renew the corrugated shim and O-ring in end shield		
Check worm wheel shaft for wobbling and eccentricities		
Check bearing seats for any signs of damage		
Frame		
Renew rubber dampers (at least every third year. Use the service kit for foundation feet)		
Check foundation		
Check vibrations		
Motor		
Lubricate according to manufacturer’s recom-mendations (see plate on motor and motor cover)		

*/ includes “Intermediate service” **/ or 8000 hours

3.3 Vibration report (separator)

Separator Type:	**Measuring points - example**
Manufacturing No:	
Vibration measurement procedure and instrumentation according to SS-ISO 2372 and SS-ISO 2954 standards.	
Instrument Type:	
Manufacturing No:	



Vibration velocity RMS, mm/s

(RMS stands for Root-Mean-Square Value)

Running conditions	**Measuring position**						Vibration severity: (max. value from 1-6*)	Date: Signature:
	1	**2**	**3**	**4**	**5**	**6**		
1.								
2.								
3.								
4.								
5.								
6.								
7.								

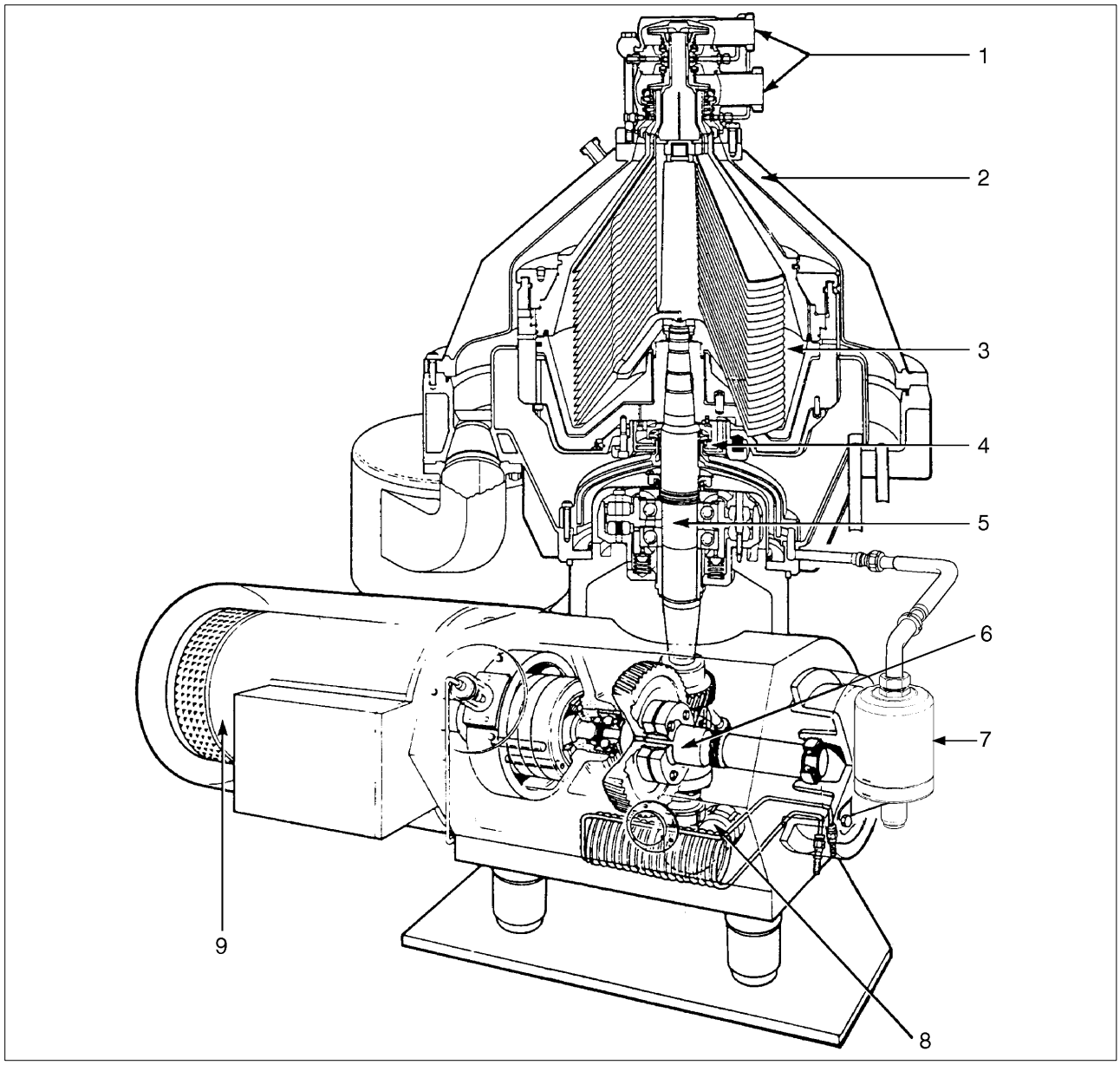
* Vibration limit, see “Technical data” in *Installation Manual*. If higher, contact the supplier.

4 Dismantling - Assembly

4.1 Main parts

NOTE

If **inlet** or **worm wheel** is going to be disassembled it's recommended to do this while the bowl still remains in the machine.



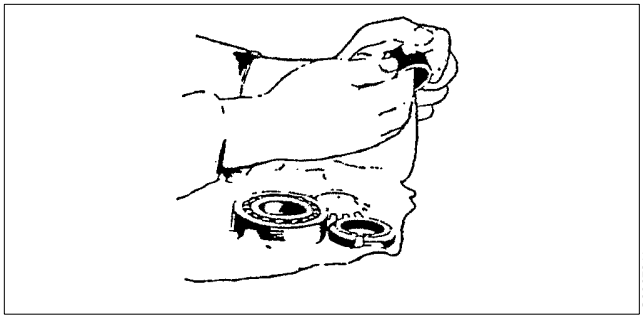
1. *Outlets*
2. *Machine top part*
3. *Bowl*
4. *Operating paring disc device*
5. *Vertical driving device*
6. *Horizontal driving device*
7. *OWMC*
8. *Inlet*
9. *Motor*

In the following chapters it is described how to disassemble and assemble the separator in the correct order by means of the proper tools. The symbol ✔ appears here and there in the text and illustrations. It refers to the heading Checkpoints in the chapter in question (or in another chapter stated) where description of the checking method / recommendation is to be found.

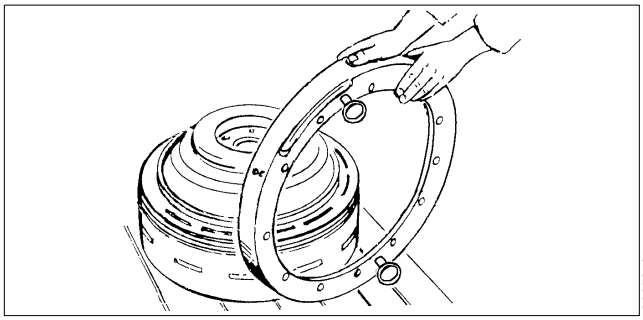
Part number for each part is stated in the *Spare parts catalogue (SPC)*.

4.1.1 Remember

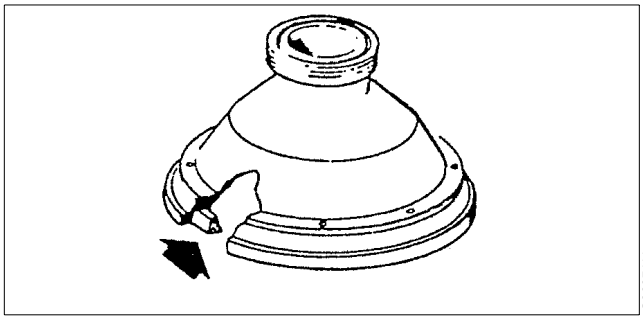
1. Handle the parts with care. Protect them against damage, dust and dirt. Make sure that the parts are clean and free from burrs when mounting.



2. Never place parts directly on the floor. Use a clean rubber mat, fibreboard or a suitable pallet as base.



3. Be particularly careful of the bowl hood seal ring. It may easily get scratched if the hood is put down carelessly and on a dirty base.

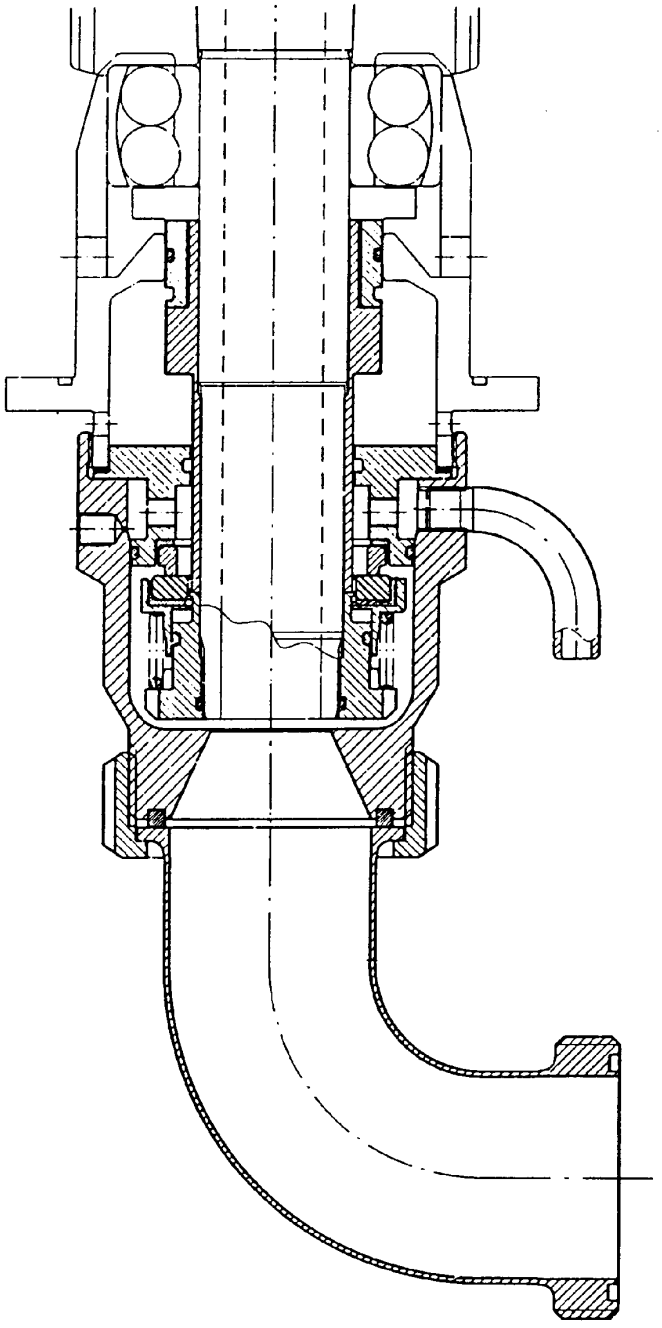


4. Position the hoisting device very exactly when assembling and disassembling. **Never** use a hoisting device that works jerkily. Use a lifting hook with catch.

   An electrically operated hoist should have two speeds: 1,5 m/min and 6 m/min, approx. The lower speed is used when lifting parts out of and into the machine.

5. Use a lifting sling certified for 500 kg load when lifting separator parts without specified weight.

4.2 Inlet



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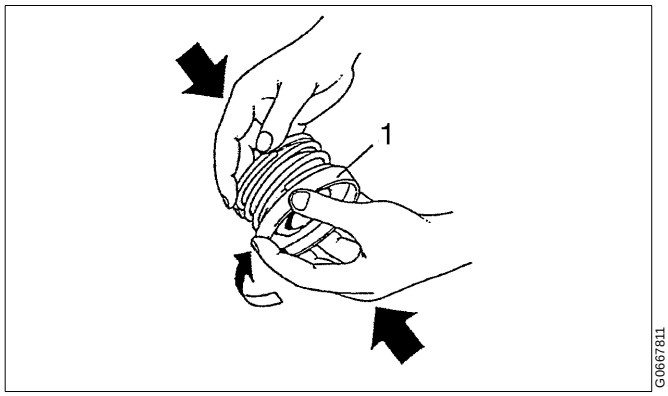
4.2.1 Disassembly

Never undo any part of the machine until the bowl is at a standstill.

1. Undo the ring nut and remove the elbow 20.
2. Unscrew the inlet housing 18 with a hook spanner (right hand thread).
3. Unscrew the guide sleeve 15 with a hook spanner (right hand thread). The following parts will accompany the sleeve as one unit:
   - O-ring 14
   - O-ring 13
   - Spring 12
   - Wear ring holder 11
   - Gasket 10
   - Wear ring 9

   all joined together by a bayonet holder between guide sleeve and wear ring.



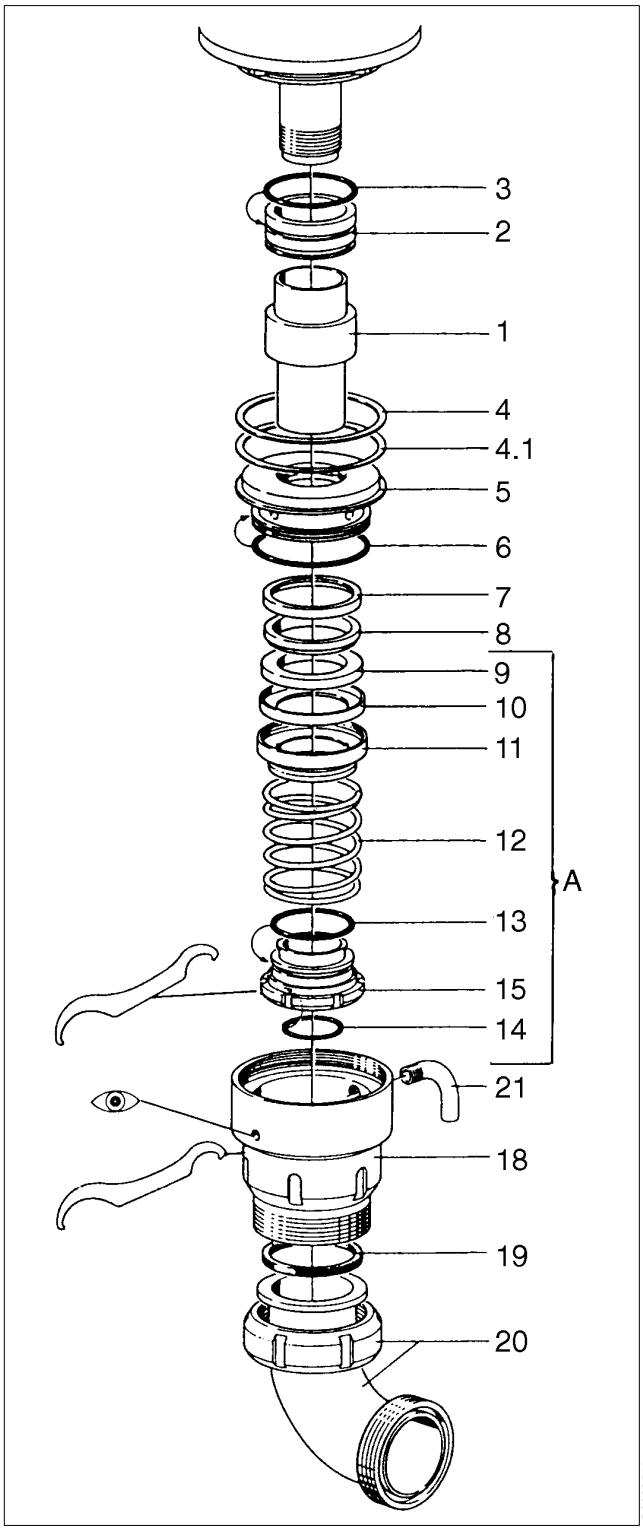
1. Holder

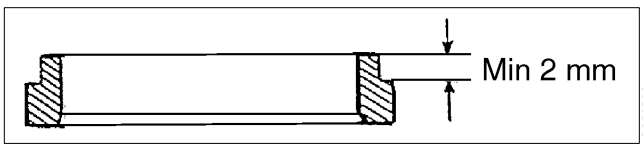
4. Seal ring 8, gasket 7 and intermediate part 5 with O-ring 6 and height adjusting rings 4 can now be brought straight down, also the sleeve 1.
5. Finally, remove the throttling ring 2 (carbon ring) and O-ring 3 straight downwards. A machined groove at the bottom of the ring provides a grip

✔ Check point

Check especially:

- Cooling water inlet hole (1,2 mm)
- O-rings, seal ring, wear ring

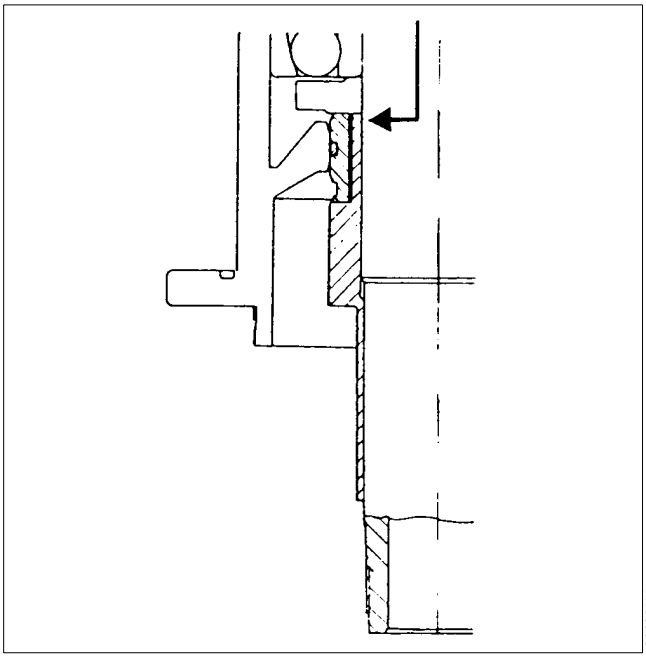




Checking the seal surface of a seal ring

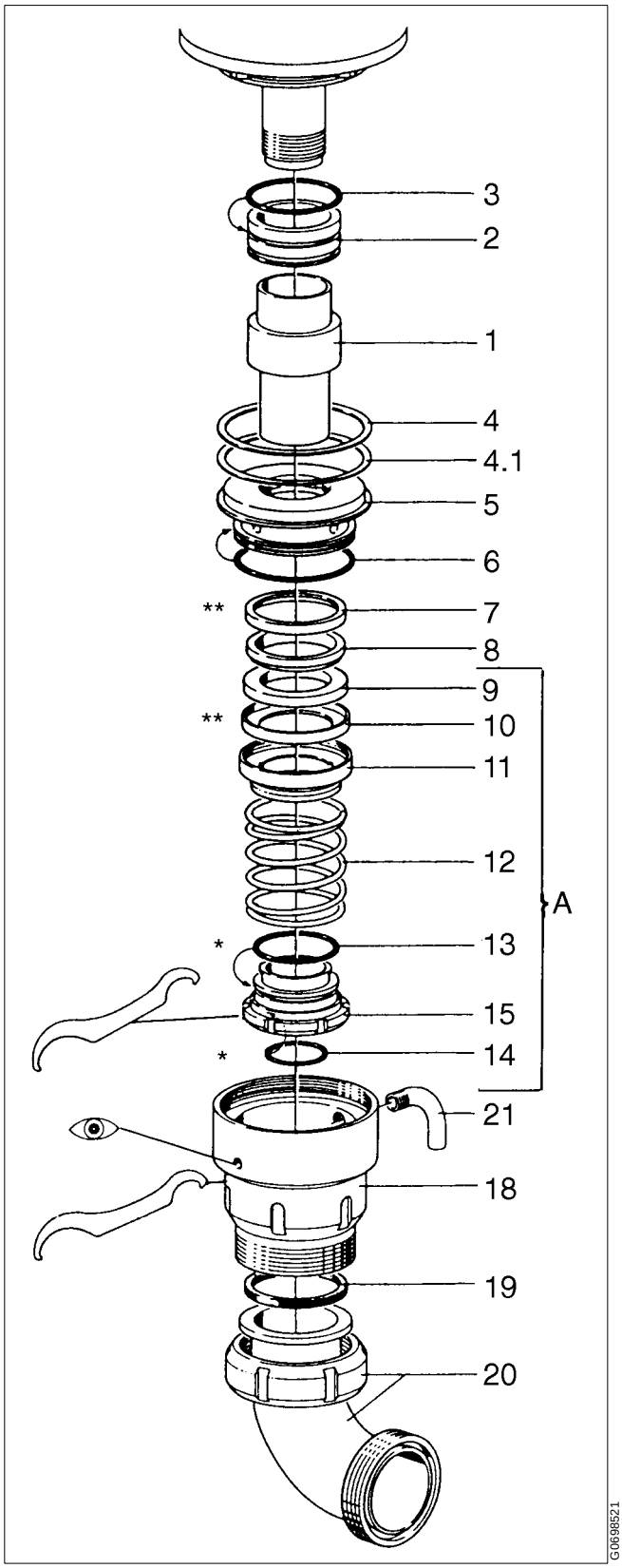
4.2.2 Assembly/ Height adjustment

1. Assemble the unit A, i.e. the guide sleeve 15 and the wear ring holder 11 (bayonet holder) with other parts:
   - Wear ring 9
   - Gasket 10
   - Spring 12
   - O-ring 13
   - O-ring 14.
2. Place the throttling ring 2 (carbon ring) with O-ring 3 on the sleeve 1. Push the sleeve 1 up the spindle until it is hard up against the stop – see arrow.



3. Push up intermediate part 5 with height ring 4 (possibly also height adjusting ring 4.1), O-ring 6, gasket 7 and seal ring 8 on to the sleeve 1.
4. Screw on the unit A, pre-assembled according to paragraph 1 above, using a hook spanner.

   Height adjustment: Next page.

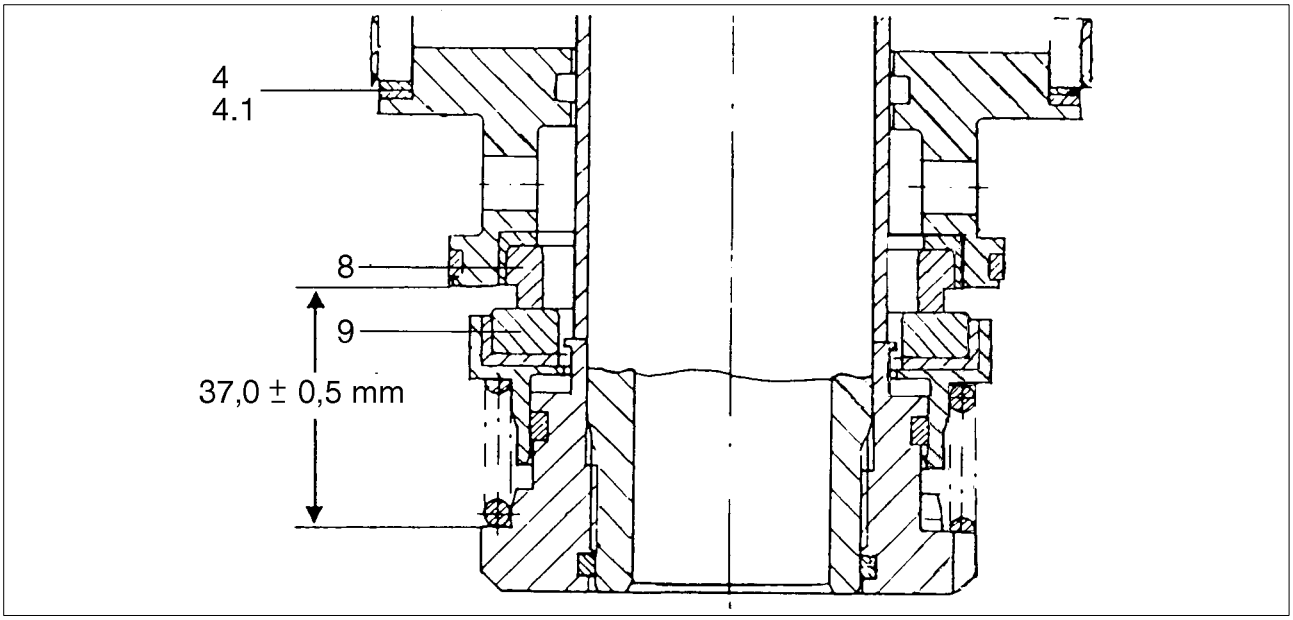


Lubricate with:

* Silicone grease

** Soapy water

5. Height adjustment



Correct height setting will provide the correct clamping force between seal ring 8 and wear ring 9. A clamping force that is too low will cause leakage of process liquid into the cooling water side. If the clamping force is too high, the seal ring will be rapidly worn out.

Check the height setting after every assembly.
The bowl must be mounted on the spindle when this check is made.

Measure the height dimension given as 36,5 - 37,5 mm in the figure. If necessary, obtain the correct dimension with the aid of the height adjusting rings 4 (thickness 1,0 mm).

If measured dimension is less than 36,5 mm: Remove one height adjusting ring.

If measured dimension is greater than 37,5 mm: Insert one height adjusting ring.

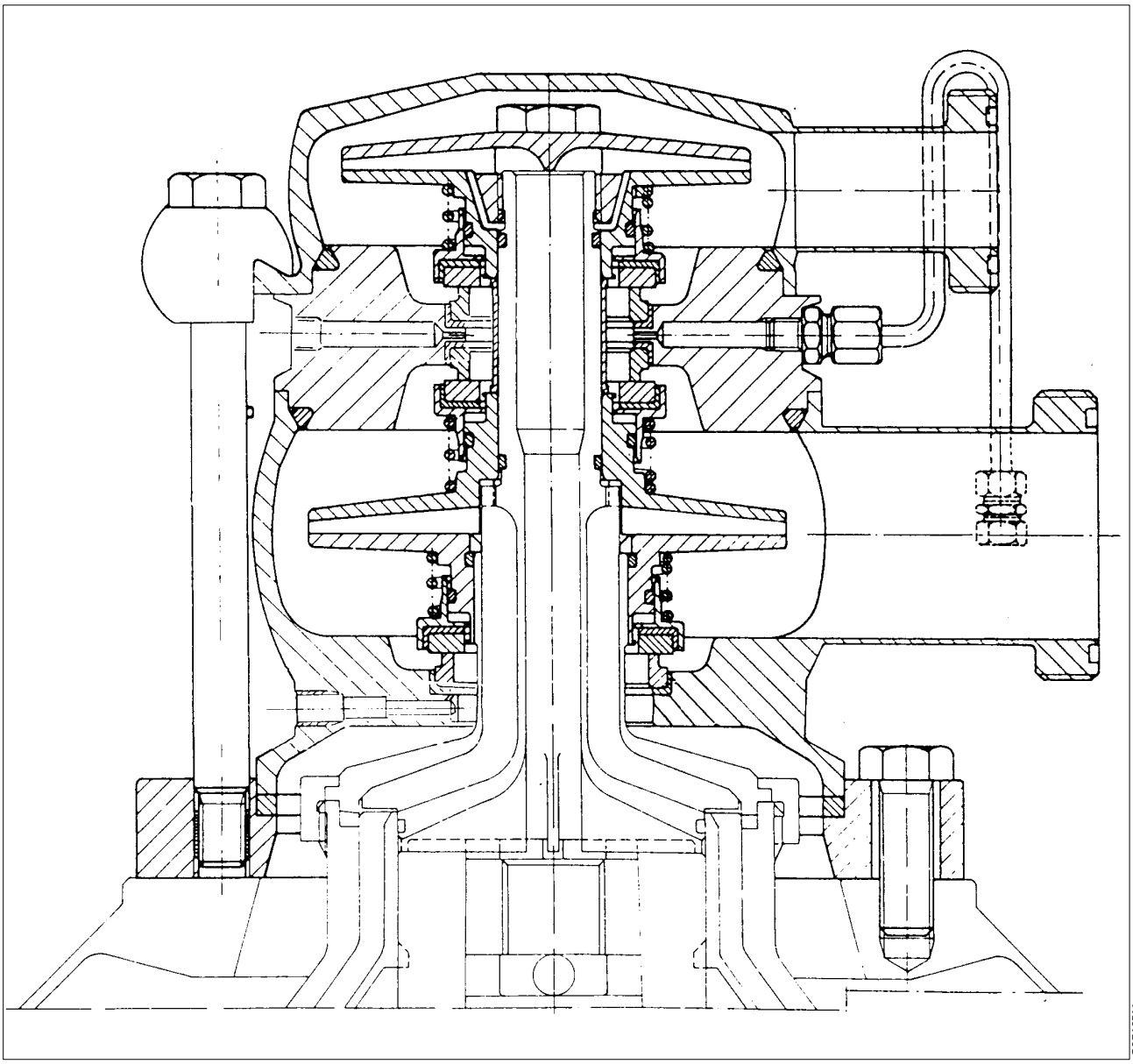
Rotate the bowl by hand and check that it can turn freely.

6. Screw on inlet housing 18 with a hook spanner. The diametrical positions of cooling water inlet and outlet can be adjusted, if necessary, with height adjusting ring 4.1 (thickness 0,5 mm).

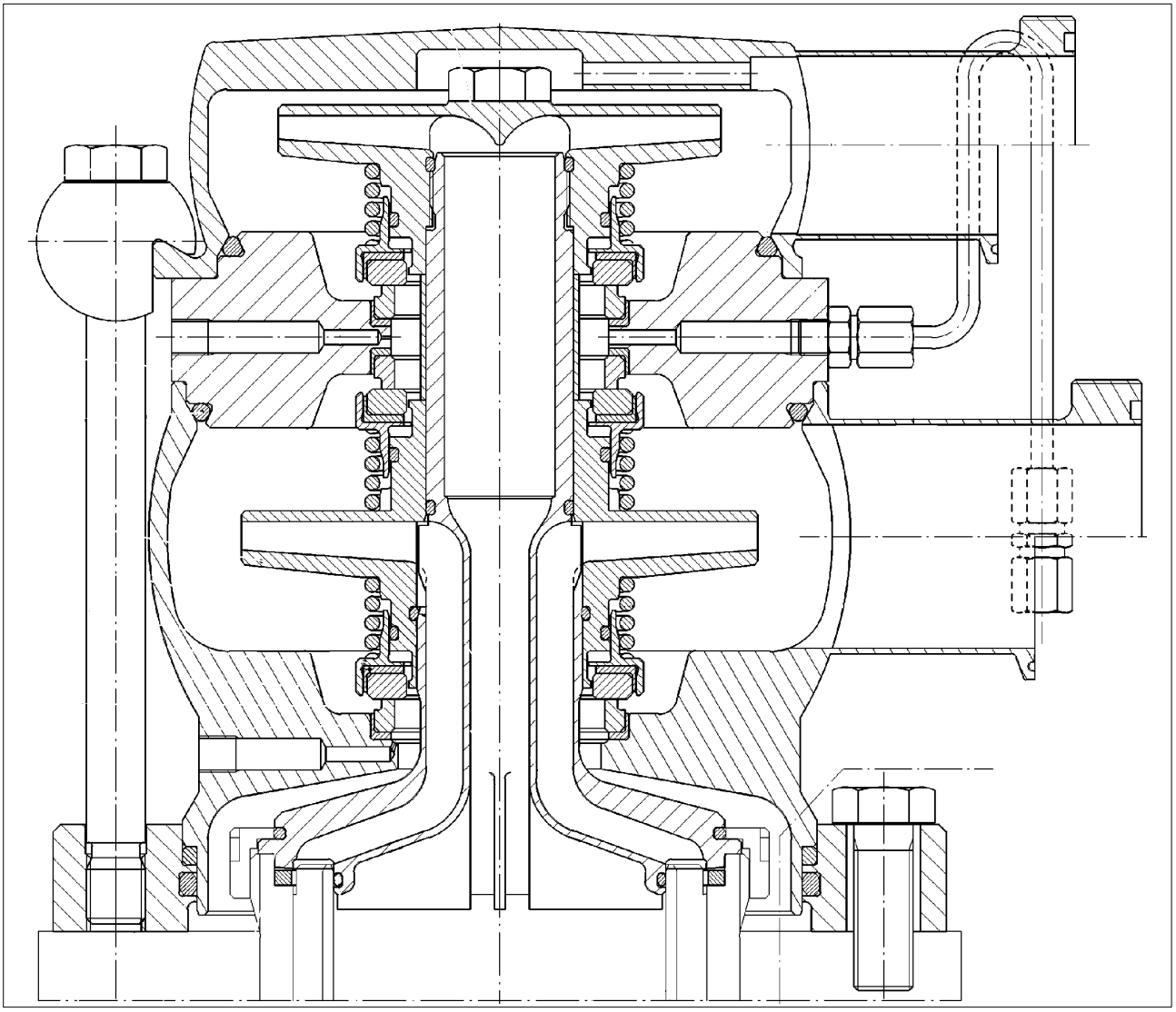
7. Connect the elbow 20 to the inlet housing.

4.3 Outlets (twin phase separators)

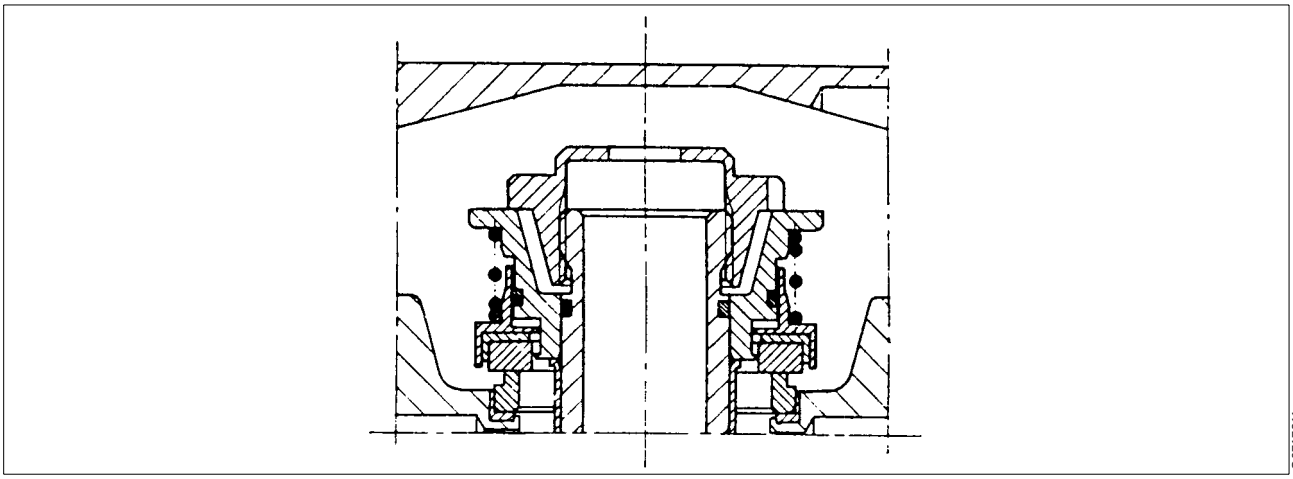
4.3.1 C MRPX, H MRPX, W MRPX except C / H / W MRPX 718 and H /W MRPX 818



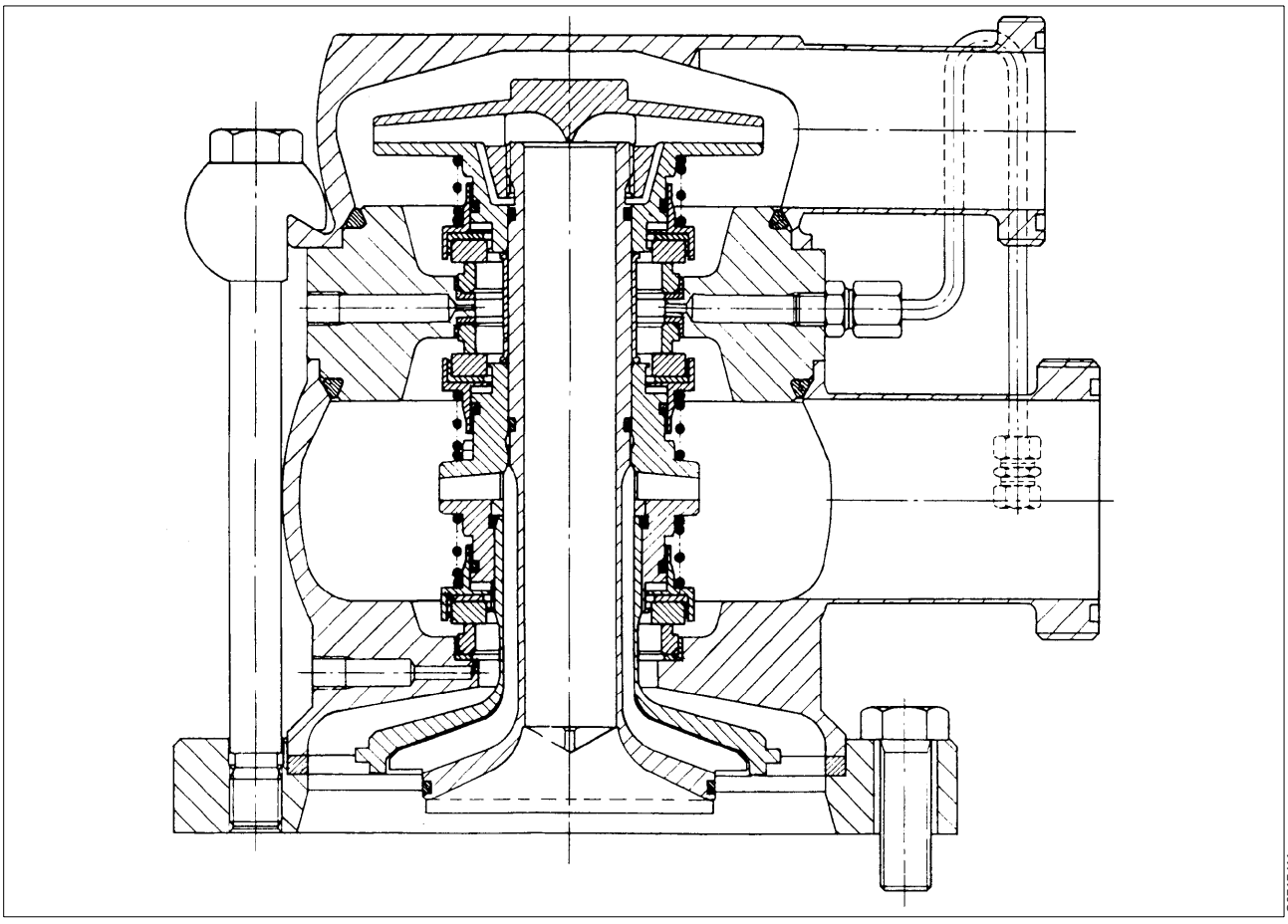
4.3.2 C / H / W MRPX 718 and H / W MRPX 818



4.3.3 A MRPX, B MRPX, F MRPX



A MRPX

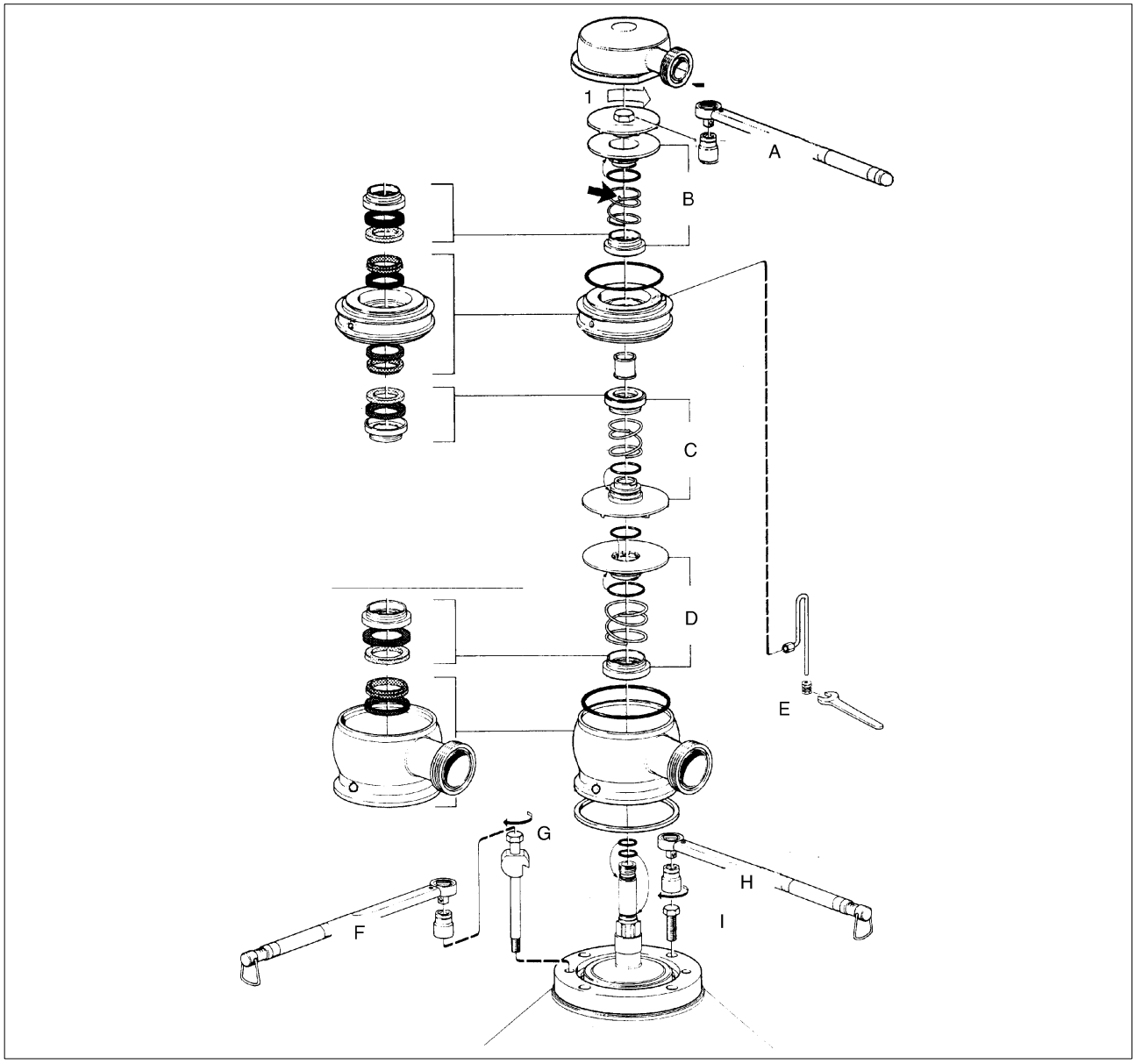


B MRPX, F MRPX

DANGER

Entrapment hazard

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work. The revolution counter indicates separator rotation.

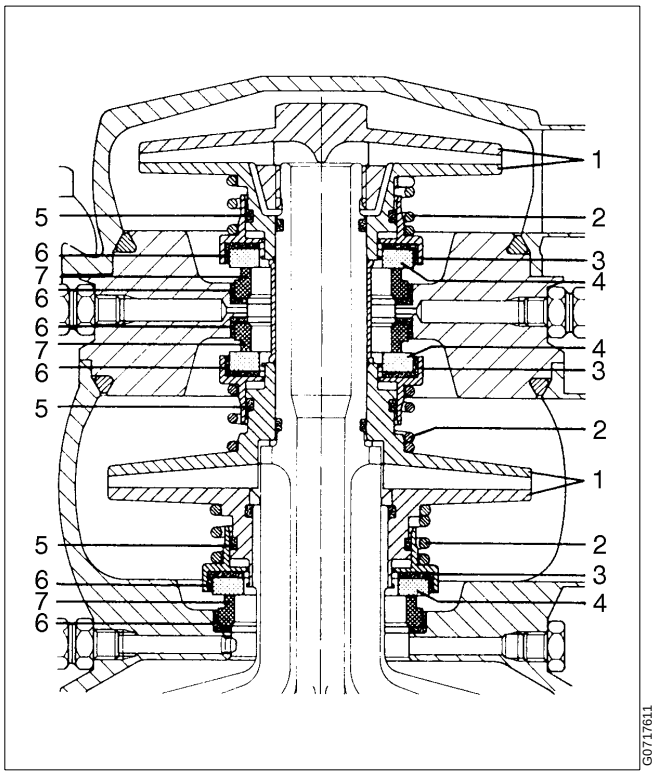


A. Width over flats 24 mm
B. Bayonet fitting (left-hand wound compression spring)
C. Bayonet fitting (right-hand wound compression spring)
D. Bayonet fitting (left-hand wound compression spring)
E. Width over flats 14 mm
F. Width over flats 24 mm
G. 50 Nm
H. Width over flats 24 mm
I. 100–120 Nm

4.3.4 Disassembly

The axial seals consist of:

1. *Pump impeller, top / bottom part*
2. *Compression spring*
3. *Support*
4. *Wear ring*
5. *O-ring*
6. *Rubber packing*
7. *Seal ring*



Remove the pipings for process liquid and cooling water.

The relative order of the parts appears from the adjoining figure. Use the tools shown. The following points should be observed:

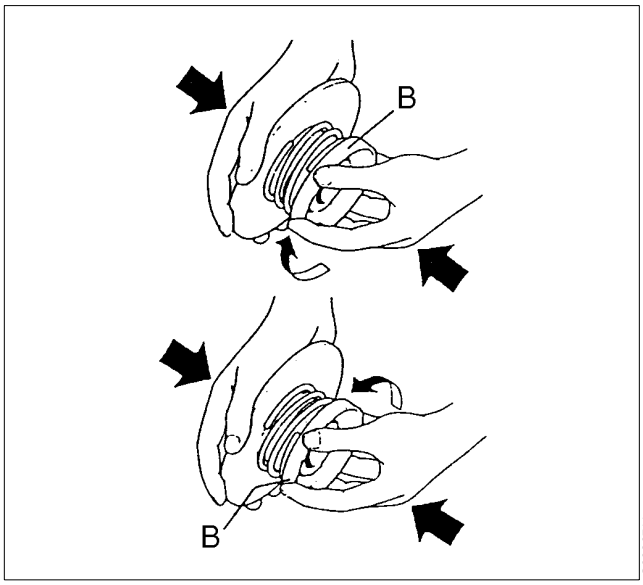
- Start by removing the hook screws.

  The top part of the upper pump impeller is left-hand threaded.

  The axial seals are connected by bayonet fitting to
  - the bottom part of the upper pump impeller
  - the top and the bottom part of the lower pump impeller and will therefore be brought with these impeller parts when disassembling.

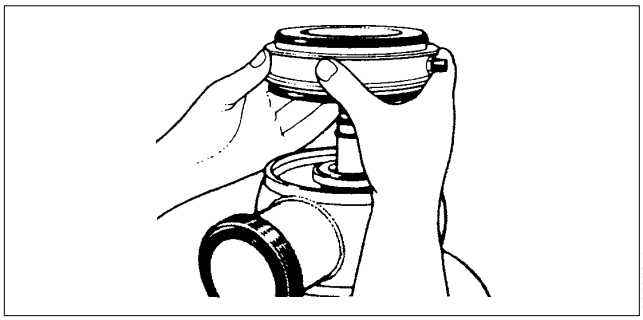
1. Dismantling a bayonet fitting: Press the parcel and turn at the same time the support against the bent end of the spring (it cannot be turned in the other direction). Be careful that the parts do not fly out when fitting is disengaged.

   The coil spring of the intermediate seal is right-hand wound. The springs of the two other seals are left-hand wound.

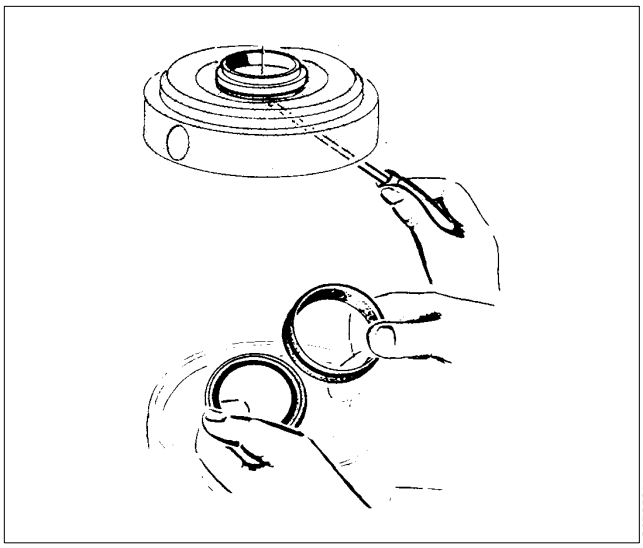


B. Support

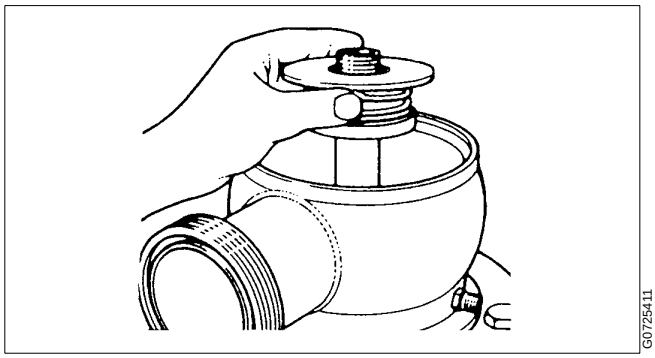
2. Lift off the intermediate part **carefully straight upwards** so as to avoid damaging its carbon seal rings.



3. If a seal ring or a wear ring is to be removed: Cautiously prize the part loose by means of a screw driver. Then remove the rubber packing.

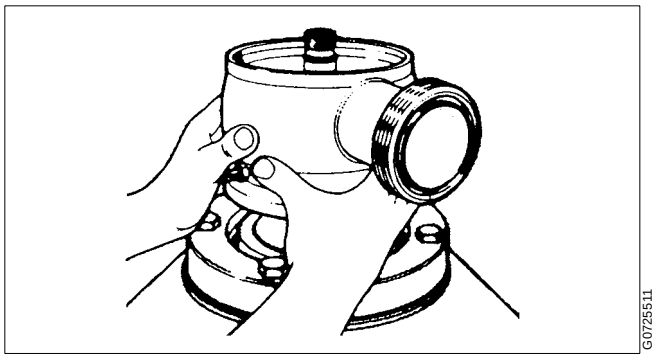


4. Dismount the axial seal together with the bottom part of the pump impeller. When using the larger pump impellers it is not possible to grasp the bottom part, and the latter must therefore be lifted off together with the outlet housing.



5. Prize out the housing with two screwdrivers on each side. Lift off the outlet housing.

   Note that a carbon seal ring is placed in the bottom of the housing and that this ring may easily be damaged. Therefore lift the housing **carefully straight upwards** until the outlet pipe is passed.



✔ **Check point**
“ Axial seals” on page 54.

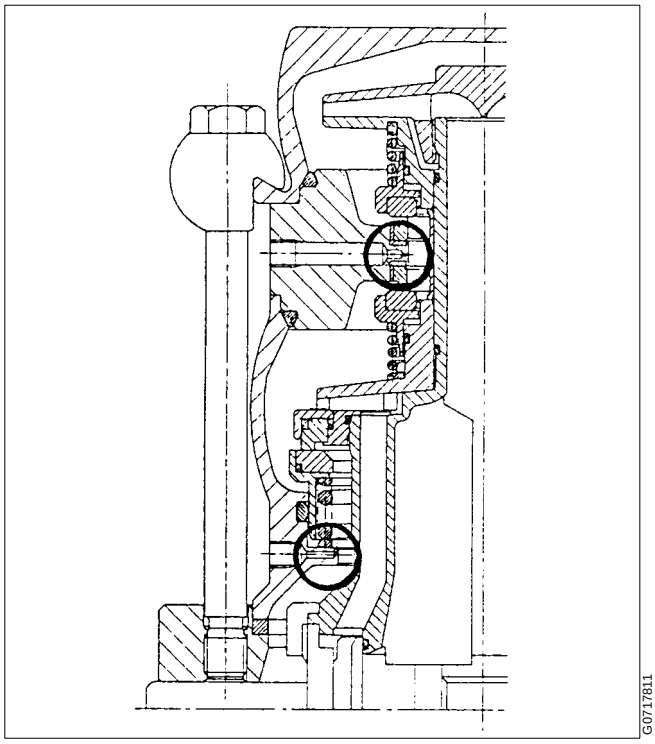
6. Carefully note where the parts of the axial seals belong if they are to be reused after disassembly. Do not confuse carbon rings of identical dimension, as they have been bedded in against their “old” wear rings.

4.3.5 Check points

Cooling water nozzles

1. Cooling water must be fed to the seals during the starting and stopping periods as well as during operation. CIP-liquid must be fed during cleaning. See *Operator’s Manual.* It is important, therefore, that the cooling water nozzles are not obstructed. Hole diameter of the nozzles: 1,2 mm.

   Clean the nozzles with an iron wire or the like.



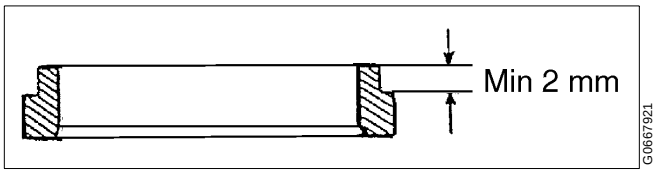
Axial seals

1. Defective axial seals will cause a leakage of process liquid from the machine.

   The sealing surfaces of wear ring and seal ring must be free of deposits and defects which can give rise to leakage and exceptionally rapid wear. In certain cases damaged sealing surface of the seal rings can be remedied see below. However, for practical reasons it is best to have new or reconditioned seal rings available when inspecting the seals, so that defective seal rings can be replaced at once when required. The old seal rings may then be repaired when convenient and put to use again at a later inspection. The **wear rings** can not be remedied.

2. If the damage is not excessive the sealing surface can be reconditioned by turning in a lathe and subsequent polishing on an abrasive cloth (grain size 600) placed on a face plate. In certain cases polishing alone will be sufficient.

   After repair, the sealing surface should have a polished, bright finish perfectly free from perceptible marks.



Repairing the sealing surface of a seal ring

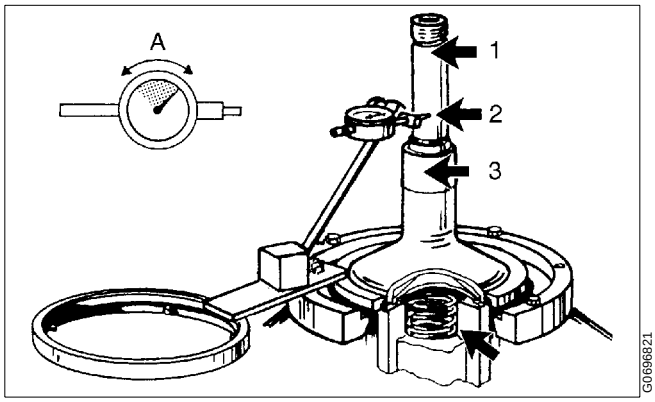
4.3.6 Assembly

Assembly takes place by reversing the sequence of operations for disassembly. Observe the following:

Wobble of outlet pipe

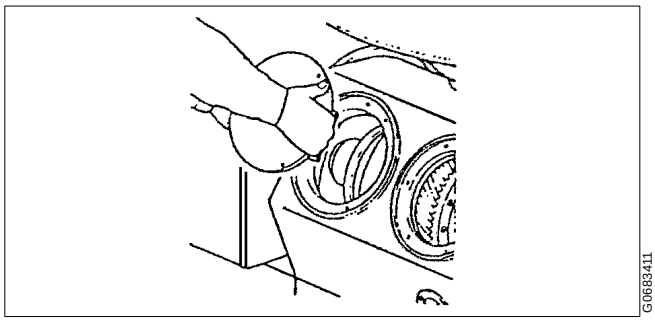
Excessive radial wobble of the outlet pipe will cause wear on the seals.

Fit a spring between distributor and outlet pipe, as shown in the figure. This spring is included in the tool kit.



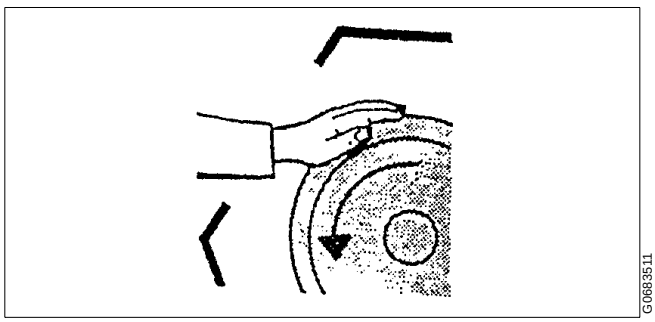
Checking the wobble of outlet pipe
A*: Max 0,3 mm*

Tighten the spanner for the small lock ring in the ring situated on the top of the frame hood with one of the hexagon screws see figure. Place the support of the dial indicator on the handle of the spanner and measure the wobble at 1, 2 and 3. Remove the brake cover and revolve the outlet pipe by turning the coupling drum by hand.



Max. permissible wobble is **0,3 mm**.

If the wobble is excessive, turn the pipe in the distributor, check that it is not riding on distributor or bowl hood, thus being forced into an incorrect position.



Outlet pipe, guide sleeve and distributor are marked with alignment marks. They shall be assembled with these marks exactly aligned. If the max. permissible wobble is exceeded, try in a new position. If a position is found where the wobble is acceptable, make new punch marks in the new position.

Remove the spring, refit the outlet pipe and the guide sleeve and clamp the small lock ring.

If an unacceptable wobble cannot be remedied in this way, the bowl spindle cone must be checked with respect to defects, even the bowl body nave may be defective. See “4.6 Separator bowl” on page 74.

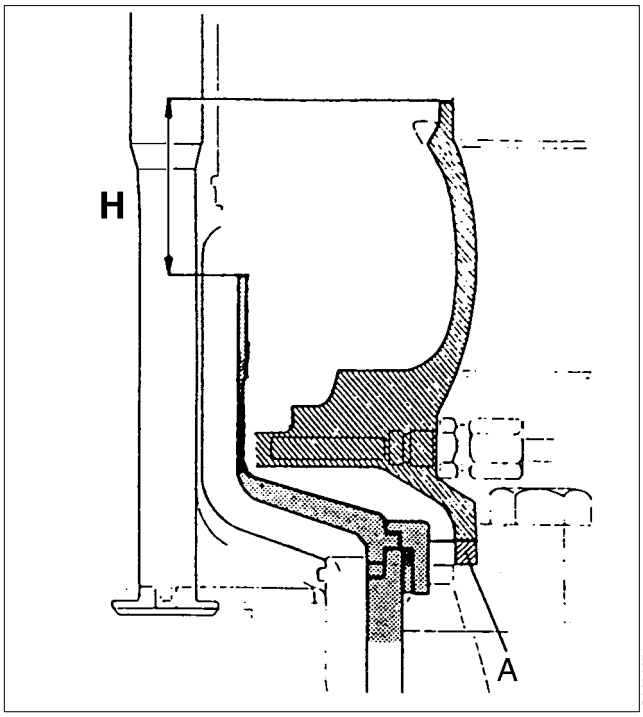
Height adjustment

Check the height position after each assembly.

Use two steel rules or a depth gauge.

If the height measure does not correspond with the measure stated in the figure: Replace the inserted height adjusting ring A by a ring with more suitable thickness.

Check the height position by removing the brake cap and rotating the coupling drum by hand. The bowl should then move freely and easily.



MRPX 614 / 714 / 518 / 618 except A MRPX 614 / 714

H = 47 ±0,5 mm

A MRPX 614 / 714

H = 44 ±0,5 mm

MRPX 718 / 818

H = 61 ±0,5 mm

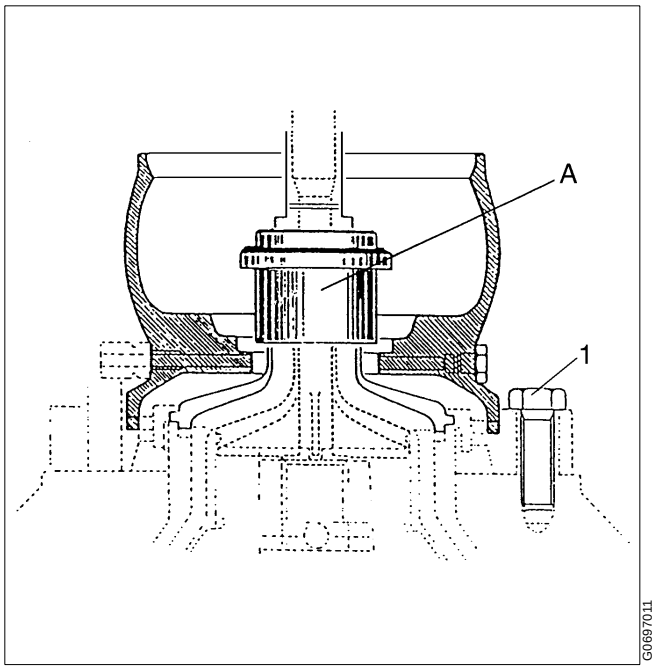
Checking eccentricity of outlet pipe / outlet housing

Excessive eccentricity between the outlet housing and the outlet pipe will cause increased wear on the axial seals. The eccentricity must always be checked when mounting the outlet device.

- Undo the four screws (**1**) of the centering ring (if not already done).
- Fit the outlet housing (its height position should already have been checked). The seal ring and rubber packing must not be fitted when mounting the outlet housing.
- Pass the gauge (**A**) for checking centering over the outlet pipe and press down the gauge in the bottom hole of the outlet housing.
- Tighten the four screws (**1**) with a torque of **100 - 120 Nm** (10 - 12 kpm).
- Lift out the gauge. Notice that it should be easy to lift out.
- Remove the outlet housing and fit seal ring and rubber packing of the axial seal.
- Fit the outlet housing on the frame hood.

  The checking could also be done with the seal ring and rubber packing fitted. The gauge (A) should then be turned upside down relative the figure above.

  Be careful not to cause any damage.

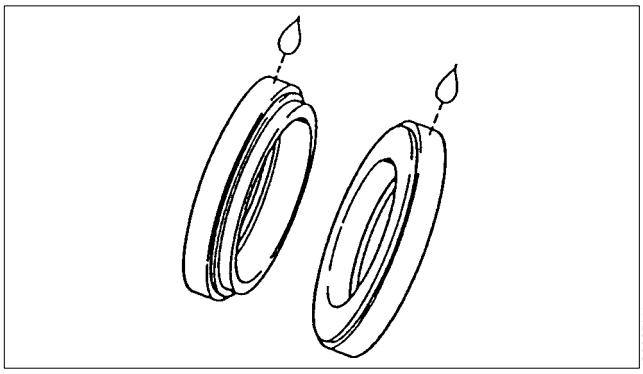


Setting outlet housing and outlet pipe

Axial seals

1. Clean the parts and ascertain that they are undamaged. Press down the seal rings and the wear rings in their rubber packings. Lubricate the packings on their external surface with soapy water (not oil) and press them down (with rings) in the parts to which they belong, i.e. in the supports, the intermediate part and the lower outlet housing respectively.*

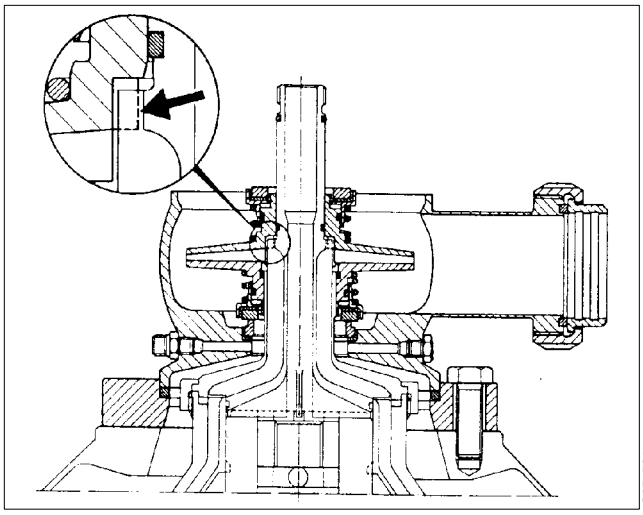
   Lubricate the O-rings of the impellers with silicone grease.** Assemble the parts to be locked by bayonet fitting. Note: The compression spring of the uppermost seal has a small hook at one end which must fit into the bottom part of the upper impeller.



2. Press the parcel and turn at the same time the support against the bent end of the spring until the parts are engaged. Finally check that the support slides easily on the O-ring.

   Ascertain that the grooves of the top part of the lower impeller fit over the ribs of the outlet pipe.

   Do not forget the spacing sleeve.



NOTE

Connections for cooling water to intermediate part.

Inlet: **Small** hole in bottom
Outlet: **Somewhat** larger hole in the bottom.

* The wear ring and the seal ring must be handled with care. When the parts are to be pressed down in their seats together with the rubber packings, the power must be uniformly distributed around the periphery. It is likewise important not to damage the sealing surface on which power is applied. Preferably use a plastic tube with a smooth end surface.

** Quality requirements – see “5.1 Lubricants” on page 178.

Outlet housings

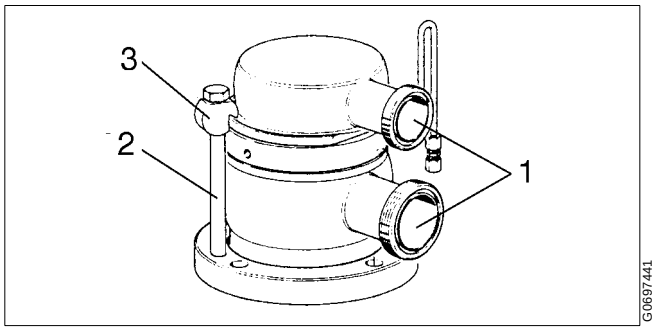
It is important that the long fixing screws are placed straight. Tightening the screws in a skew position will create excessive forces when tightened. This might damage the threads and as a consequence be a potential risk.

WARNING

Skin irritation hazards

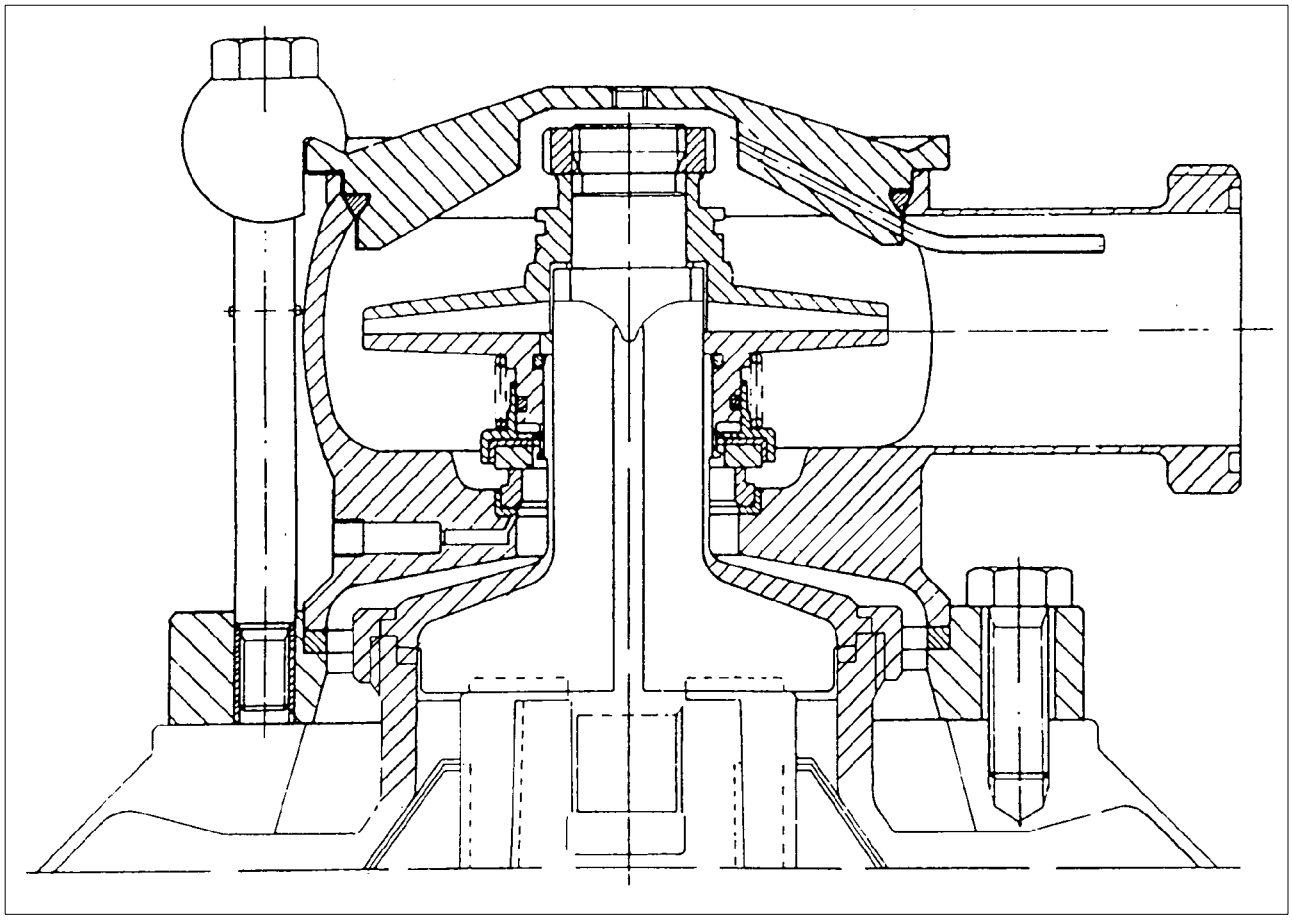
Ensure that the outlet housing fixing screws are properly fitted and tightened to avoid leakage / splash of dangerous liquids.

1. Make sure that the outlet pipes (1) are in correct position before the fixing screws (2) are tightened. Never turn the outlet housings unless the fixing screws are fully loose.
2. Make sure that the screw hooks (3) are properly seated in the outlet housing groove.
3. Make sure that the fixing screws are centred in their holes. Tighten with a torque of **50 Nm**.

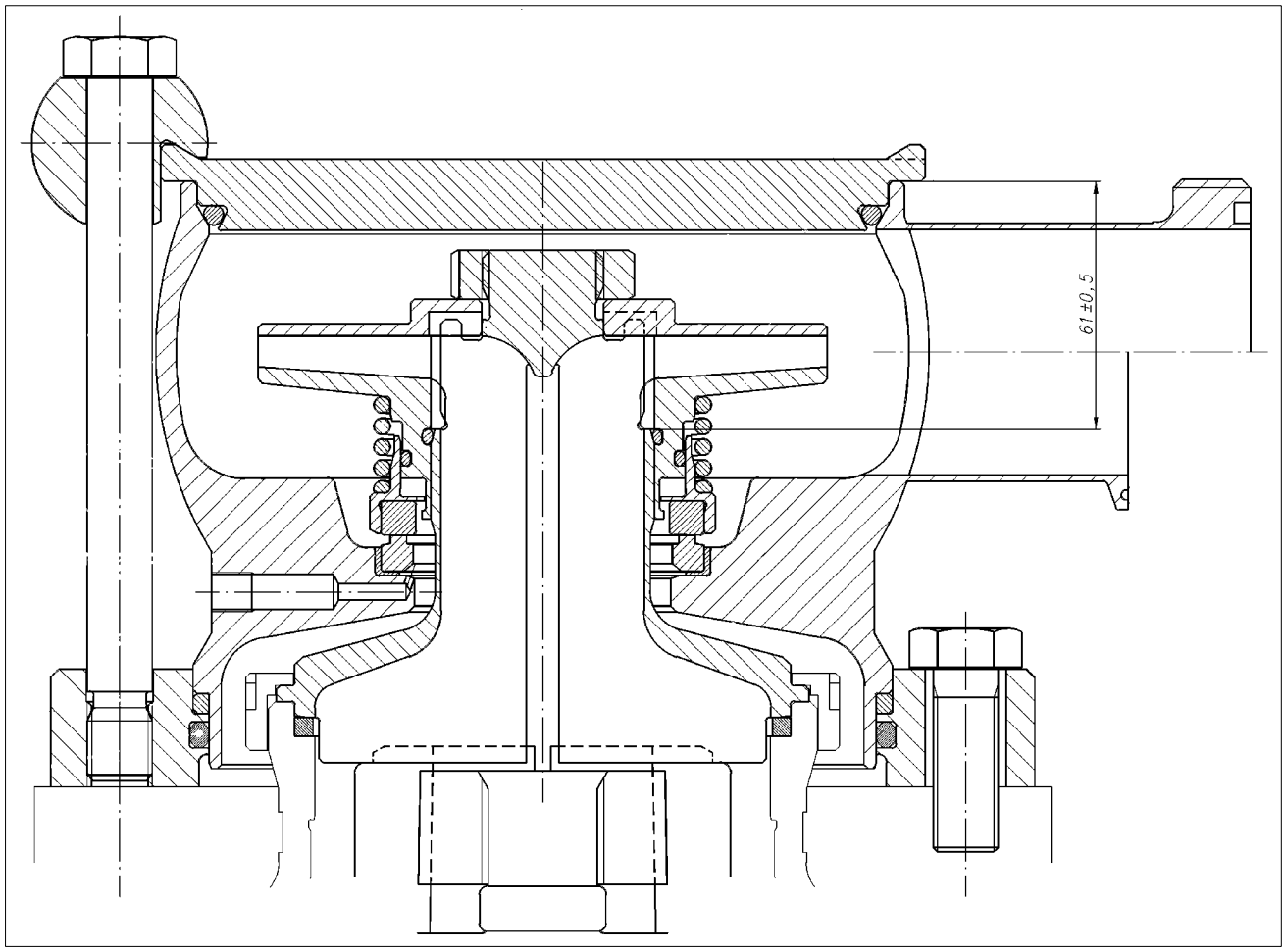


4.4 Outlet (single phase separators)

4.4.1 B BRPX / D MRPX 714, 818 / 618



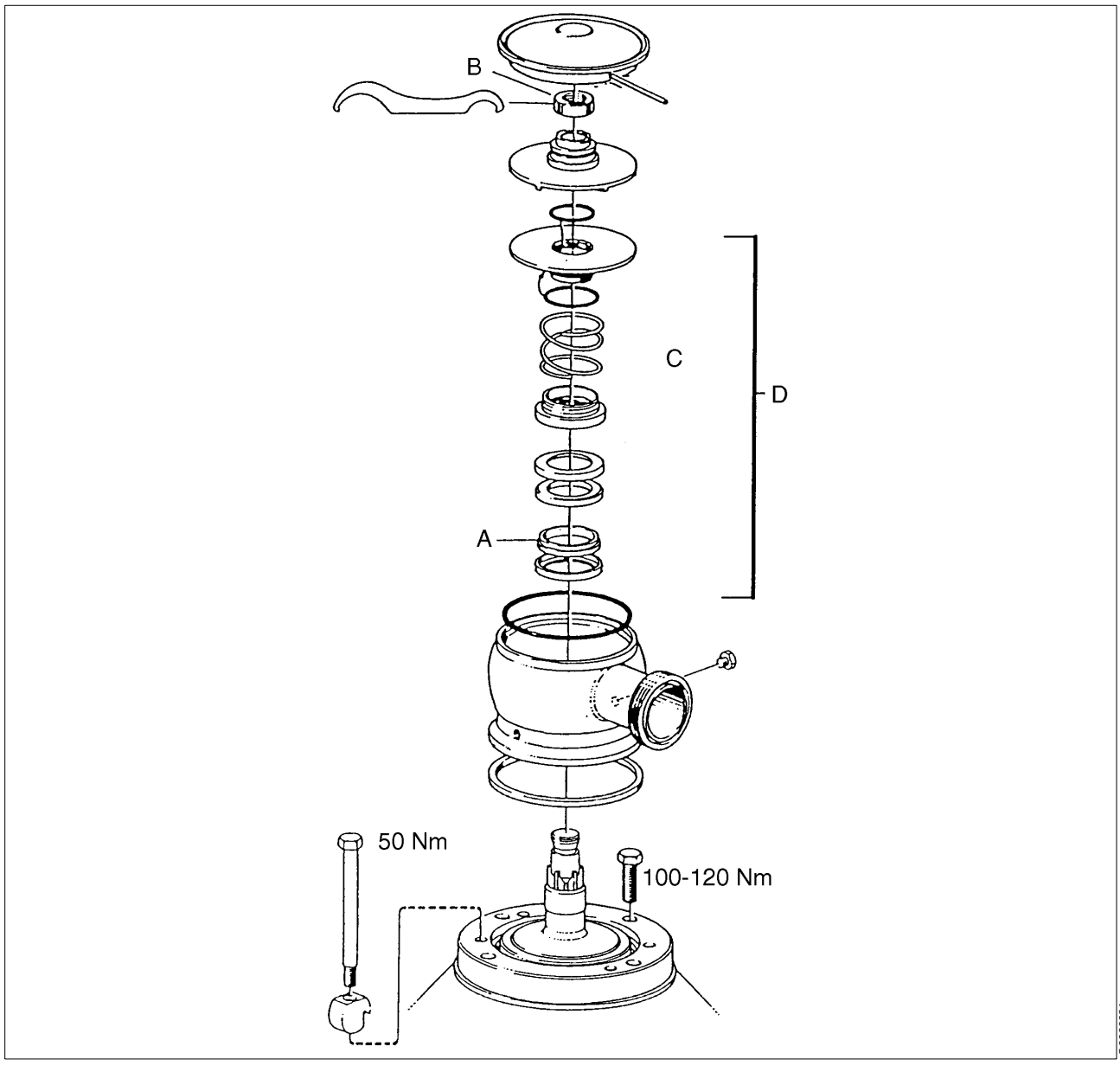
4.4.2 B BRPX 818, high flow



DANGER

Entrapment hazard

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work. The revolution counter indicates separator rotation.

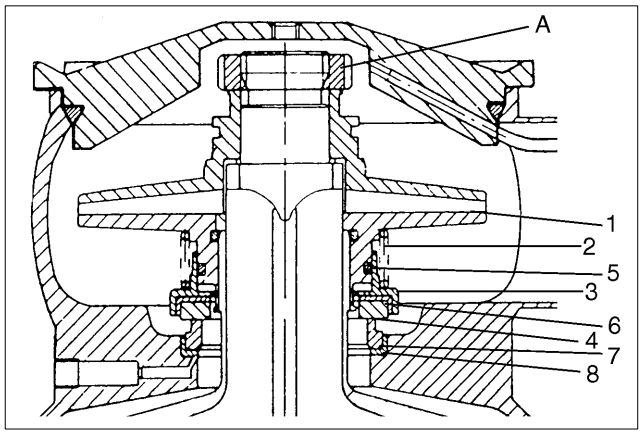


A. Seal ring, left-hand thread
B. Nut, Note! Left-hand thread
C. Bayonet fitting (left-hand wound compression spring)
D. To be removed as a complete unit. Note! Lift straight up, otherwise the seal ring (A) can be damaged

4.4.3 Disassembly

The axial seals consist of:

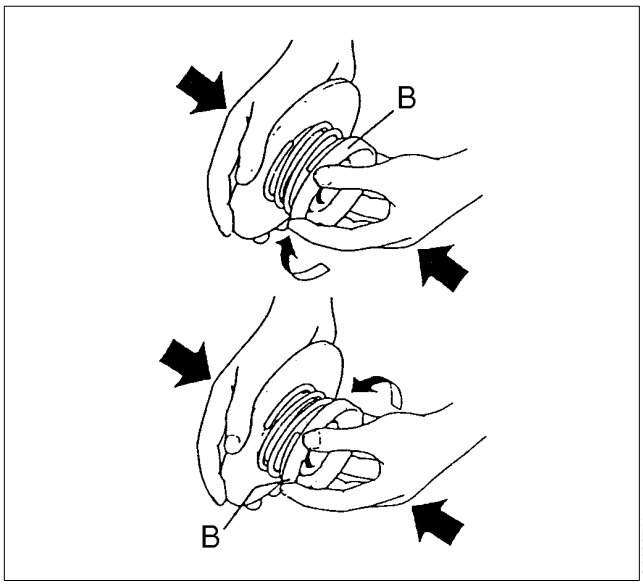
A. Nut
1. Pump impeller, top / bottom part
2. Compression spring
3. Support
4. Wear ring
5. O-ring
6. Rubber packing
7. Seal ring
8. Rubber packing



Remove the pipings for process liquid and cooling water.

When dismantling, note that the nut (A) which secures the impeller has left-hand thread.

1. Dismantling a bayonet fitting: Press the parcel and turn at the same time the support (B) against the bent end of the spring (it cannot be turned in the other direction). Be careful that the parts do not fly out when fitting is disengaged.

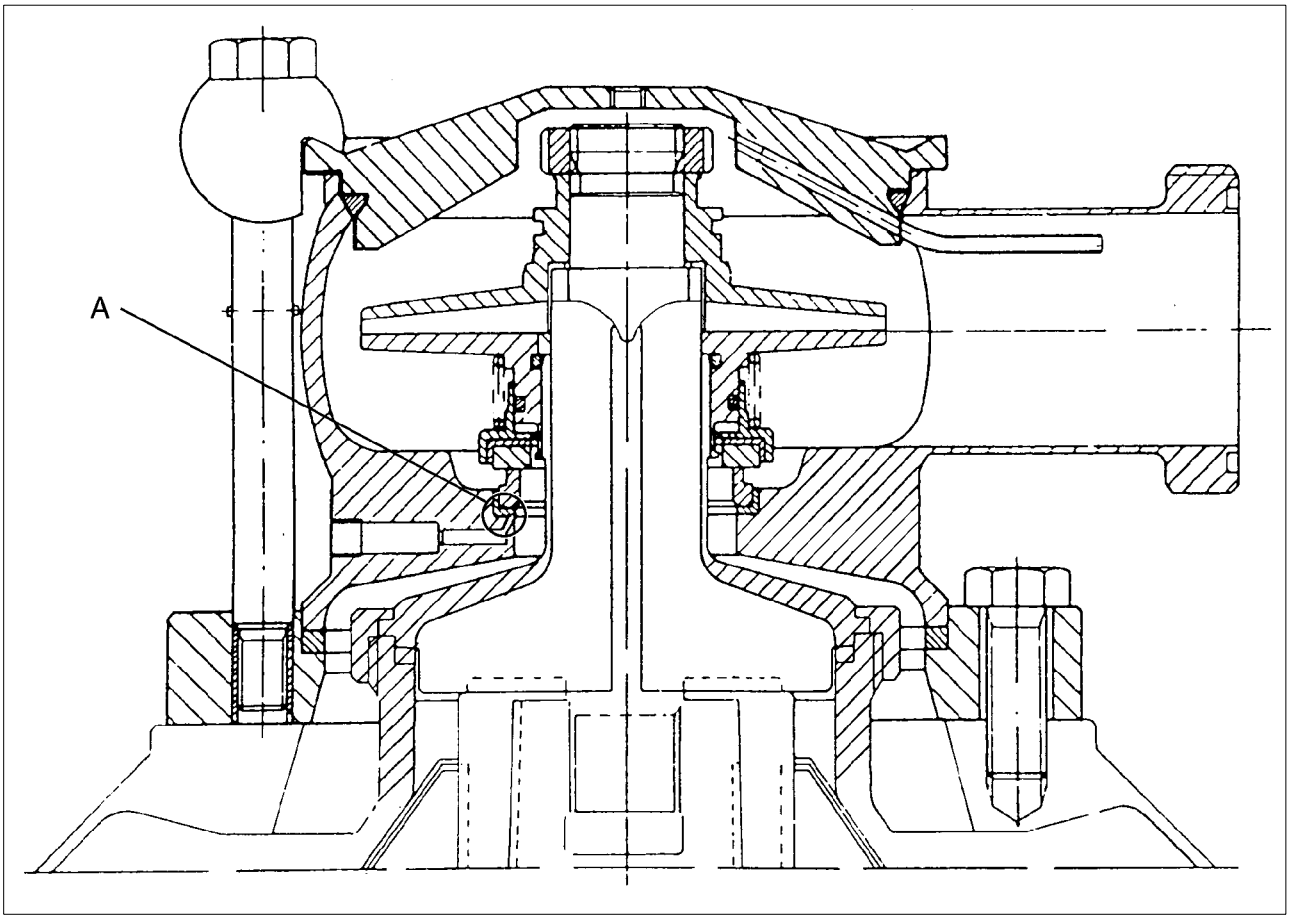


B. Support

(Assembly takes place by reversing the sequence of operation for disassembly).

4.4.4 Check points

Cooling water nozzle



1. Cooling water must be fed to the seals during the starting and stopping periods as well as during operation. CIP-liquid must be fed during cleaning. See *Operator's Manual.* It is important, therefore, that the cooling water nozzle (**A**) is not obstructed. Hole diameter of the nozzle: **1,2 mm**.

   Clean the nozzle with an iron wire or the like.

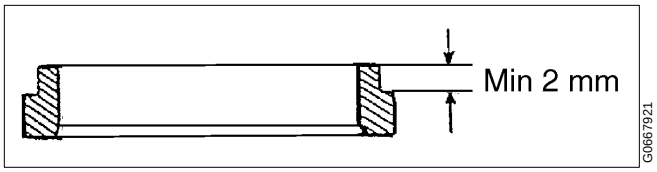
Axial seals

1. Defective axial seals will cause a leakage of process liquid from the machine.

   The sealing surfaces of wear ring and seal ring must be free of deposits and defects which can give rise to leakage and exceptionally rapid wear. In certain cases damaged sealing surface of the seal rings can be remedied see below. However, for practical reasons it is best to have new or reconditioned seal rings available when inspecting the seals, so that defective seal rings can be replaced at once when required. The old seal rings may then be repaired when convenient and put to use again at a later inspection. The **wear rings** can not be remedied.

2. If the damage is not excessive the sealing surface can be reconditioned by turning in a lathe and subsequent polishing on an abrasive cloth (grain size 600) placed on a face plate. In certain cases polishing alone will be sufficient.

   After repair, the sealing surface should have a polished, bright finish perfectly free from perceptible marks.



Repairing the sealing surface of a seal ring

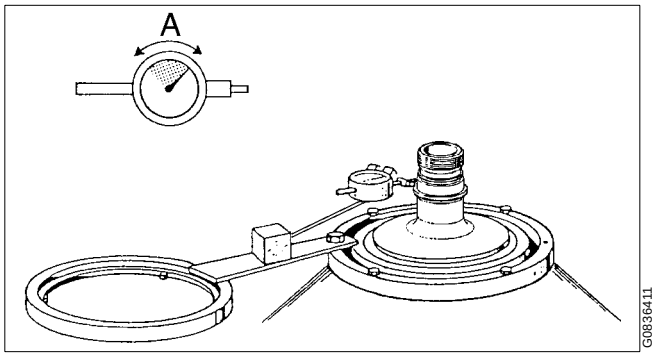
4.4.5 Assembly

Assembly takes place by reversing the sequence of operations for disassembly. Observe the following:

Wobble of outlet pipe

Excessive radial wobble of the outlet pipe will cause wear on the seals.

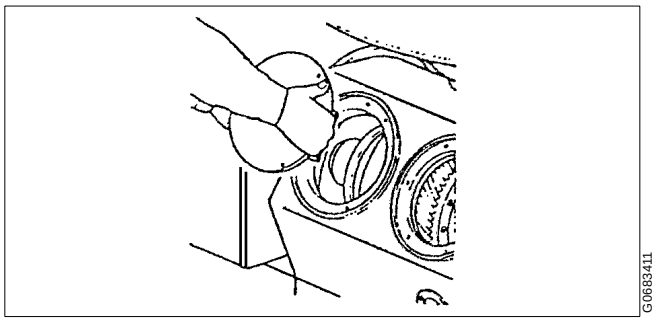
Fit a spring between distributor and outlet pipe, as shown in the figure. This spring is included in the tool kit.



Checking the wobble of outlet pipe
A*: Max 0,3 mm*

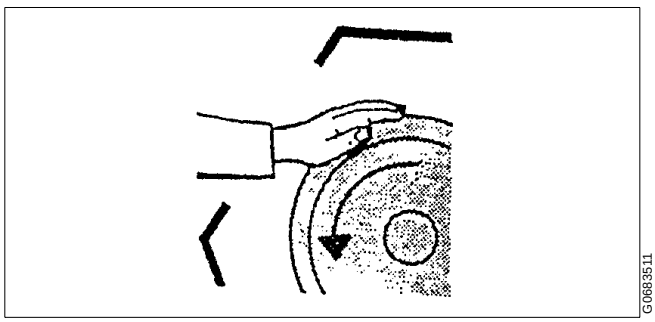
Tighten the spanner for the small lock ring in the ring situated on the top of the frame hood with one of the hexagon screws see figure. Place the support of the dial indicator on the handle of the spanner and measure the wobble at 1, 2 and 3. Remove the brake cover and revolve the outlet pipe by turning the coupling drum by hand.

Max. permissible wobble is **0,3 mm**.



If the wobble is excessive, turn the pipe in the distributor, check that it is not riding on distributor or bowl hood, thus being forced into an incorrect position.

Outlet pipe, guide sleeve and distributor are marked with punch marks. They shall be assembled with these marks exactly aligned with each other. If the max. permissible wobble is exceeded, try in a new position. If a position is found where the wobble is acceptable, make new punch marks in the new position.



Remove the spring, refit the outlet pipe and the guide sleeve and clamp the small lock ring.

If an unacceptable wobble cannot be remedied in this way, the bowl spindle cone must be checked with respect to defects, even the bowl body nave may be defective. See “4.6 Separator bowl” on page 74.

Height adjustment,

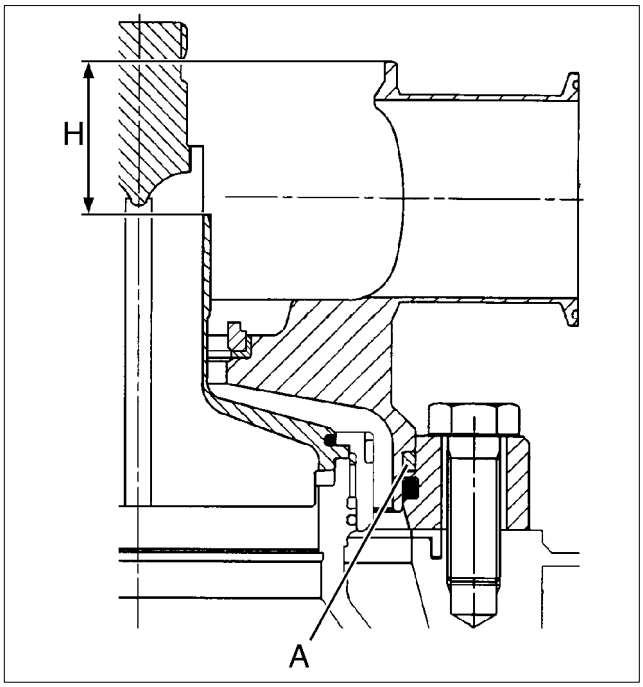
Check the height position after each assembly.

Use two steel rules or a depth gauge.

If the height measure does not correspond with the measure stated in the figure: Replace the inserted height adjusting ring (A) by a ring with more suitable thickness.

Check the height position by removing the brake cap and rotating the coupling drum by hand. The bowl should then move freely and easily.

H = 47 ±0,5 mm



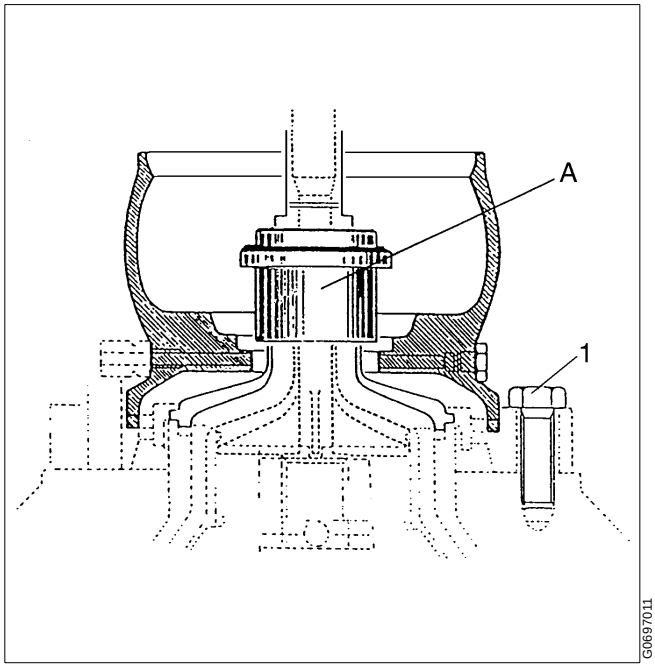
Checking eccentricity of outlet pipe / outlet housing

Excessive eccentricity between the outlet housing and the outlet pipe will cause increased wear on the axial seals. The eccentricity must always be checked when mounting the outlet device.

- Undo the four screws (**1**) of the centring ring (if not already done).
- Fit the outlet housing (its height position should already have been checked). The seal ring and rubber packing must not be fitted when mounting the outlet housing.
- Pass the gauge (**A**) for checking centring over the outlet pipe and press down the gauge in the bottom hole of the outlet housing.
- Tighten the four screws (**1**) with a torque of **100 - 120 Nm** (10 - 12 kpm).
- Lift out the gauge. Notice that it should be easy to lift out.
- Remove the outlet housing and fit seal ring and rubber packing of the axial seal.
- Fit the outlet housing on the frame hood.

  The checking could also be done with the seal ring and rubber packing fitted. The gauge (A) should then be turned upside down relative the figure above.

  Be careful not to cause any damage.

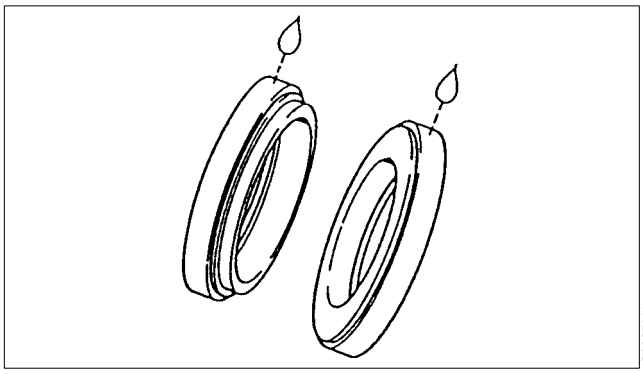


Setting outlet housing and outlet pipe

Axial seals

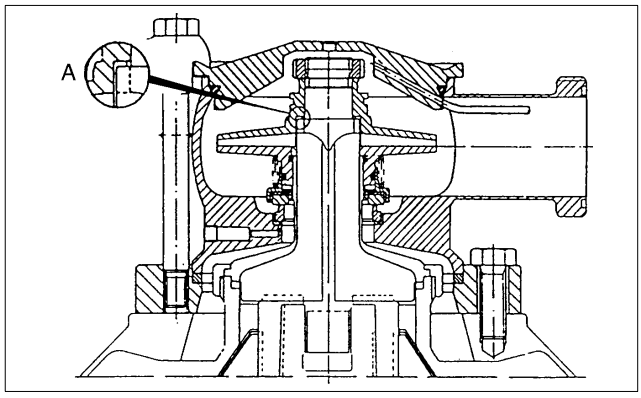
1. Clean the parts and ascertain that they are undamaged. Press down the seal rings and the wear rings in their rubber packings. Lubricate the packings on their external surface with soapy water (not oil) and press them down (with rings) in the parts to which they belong, i.e. in the support and the outlet housing respectively.*

   Lubricate the O-rings of the impellers with silicone grease.** Assemble the parts to be locked by bayonet fitting.



2. Press the parcel and turn at the same time the support against the bent end of the spring until the parts are engaged. Finally check that the support slides easily on the O-ring.

   Ascertain that the grooves of the top part of the impeller fit over the ribs of the outlet pipe (**A**).



* The wear ring and the seal ring must be handled with care. When the parts are to be pressed down in their seats together with the rubber packings, the power must be uniformly distributed around the periphery. It is likewise important not to damage the sealing surface on which power is applied. Preferably use a plastic tube with a smooth end surface.

** Quality requirements – see “5.1 Lubricants” on page 178.

Outlet housing

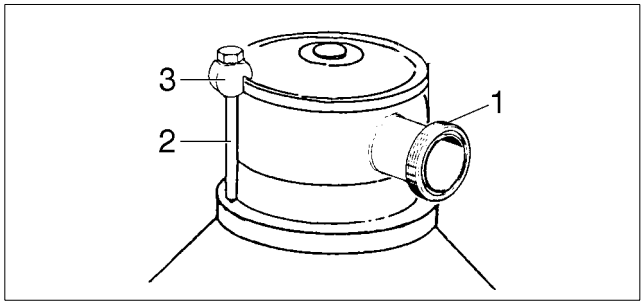
It is important that the long fixing screw are placed straight. Tightening the screws in a skew position will create excessive forces when tightened. This might damage the threads and as a consequence be a potential risk.

WARNING

Skin irritation hazards

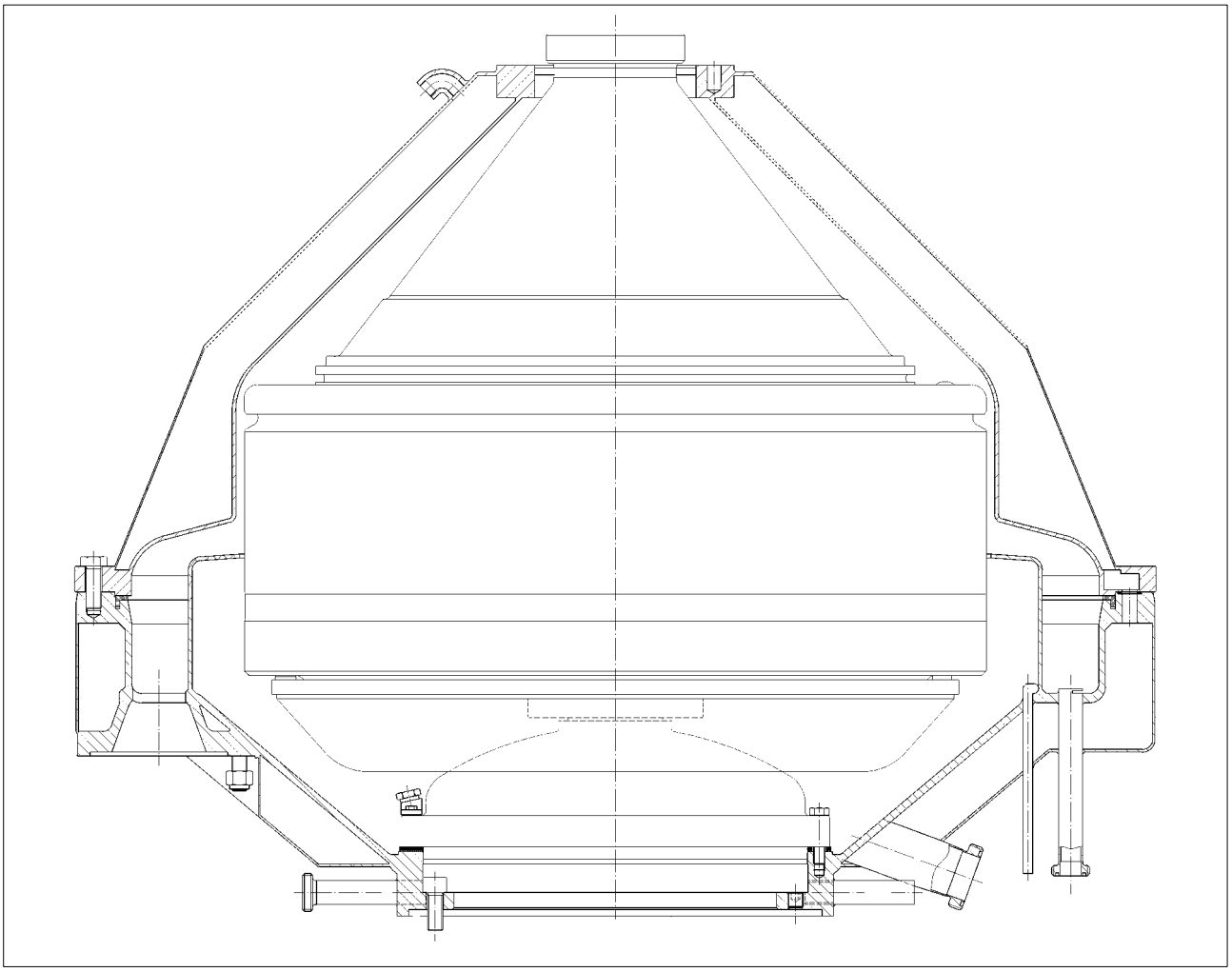
Ensure that the outlet housing fixing screws are properly fitted and tightened to avoid leakage / splash of dangerous liquids.

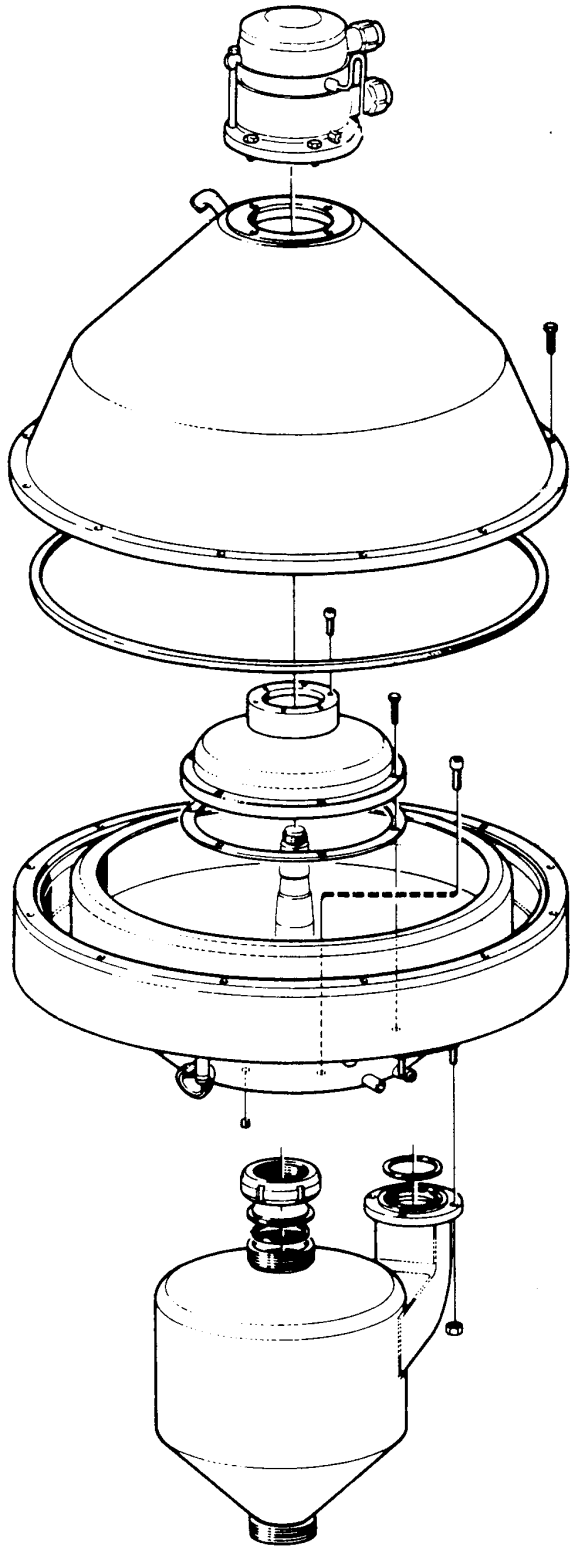
1. Make sure that the outlet pipe (1) is in correct position before the fixing screws (2) are tightened. Never turn the outlet housing unless the fixing screws are fully loose.
2. Make sure that the screw hooks (3) are properly seated in the outlet housing groove.
3. Make sure that the fixing screws are centred in their holes. Tighten with a torque of **50 Nm**.



4.5 Machine top part

Alfa Laval ref. 562032, rev. 0





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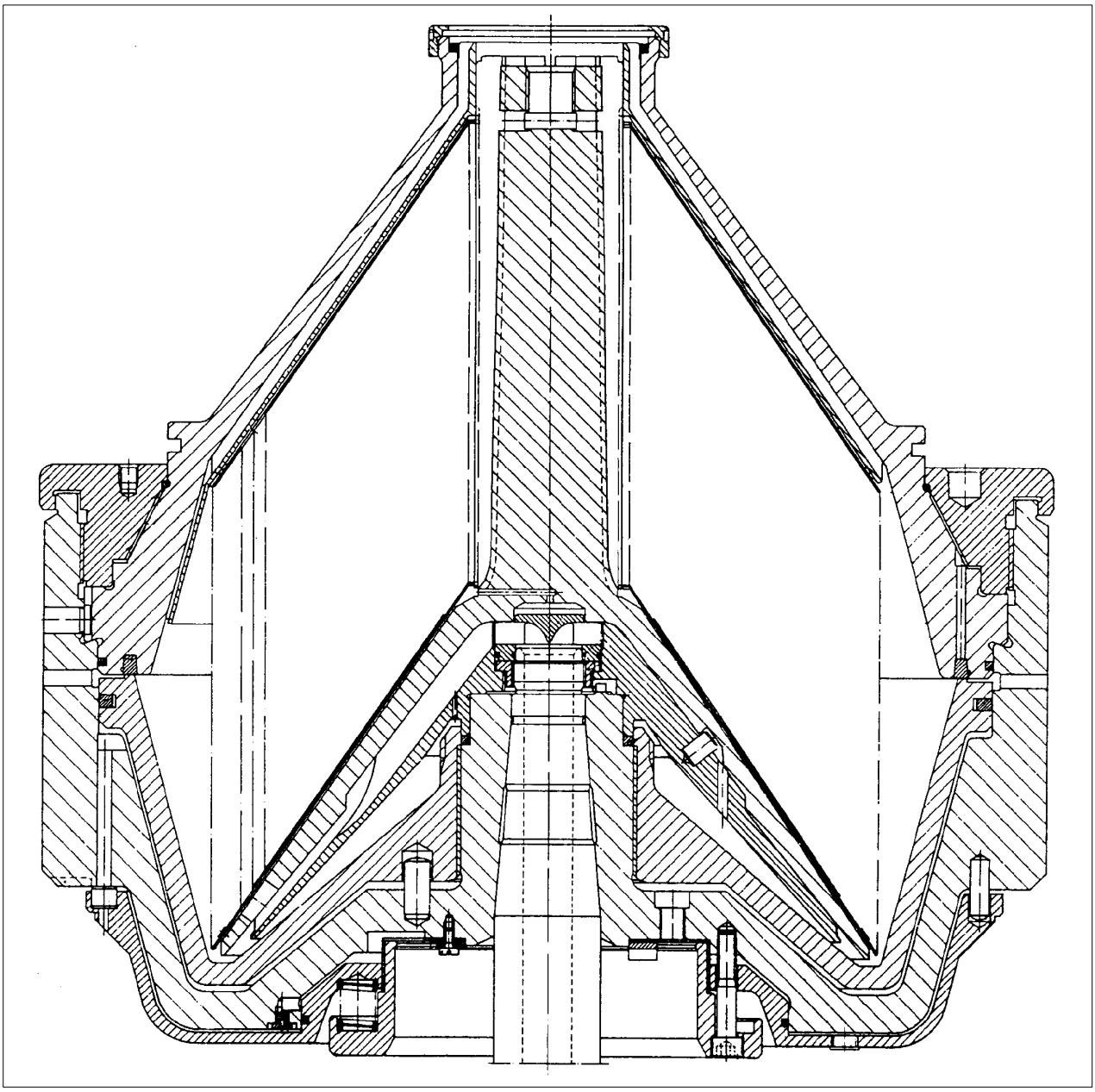
4.6 Separator bowl



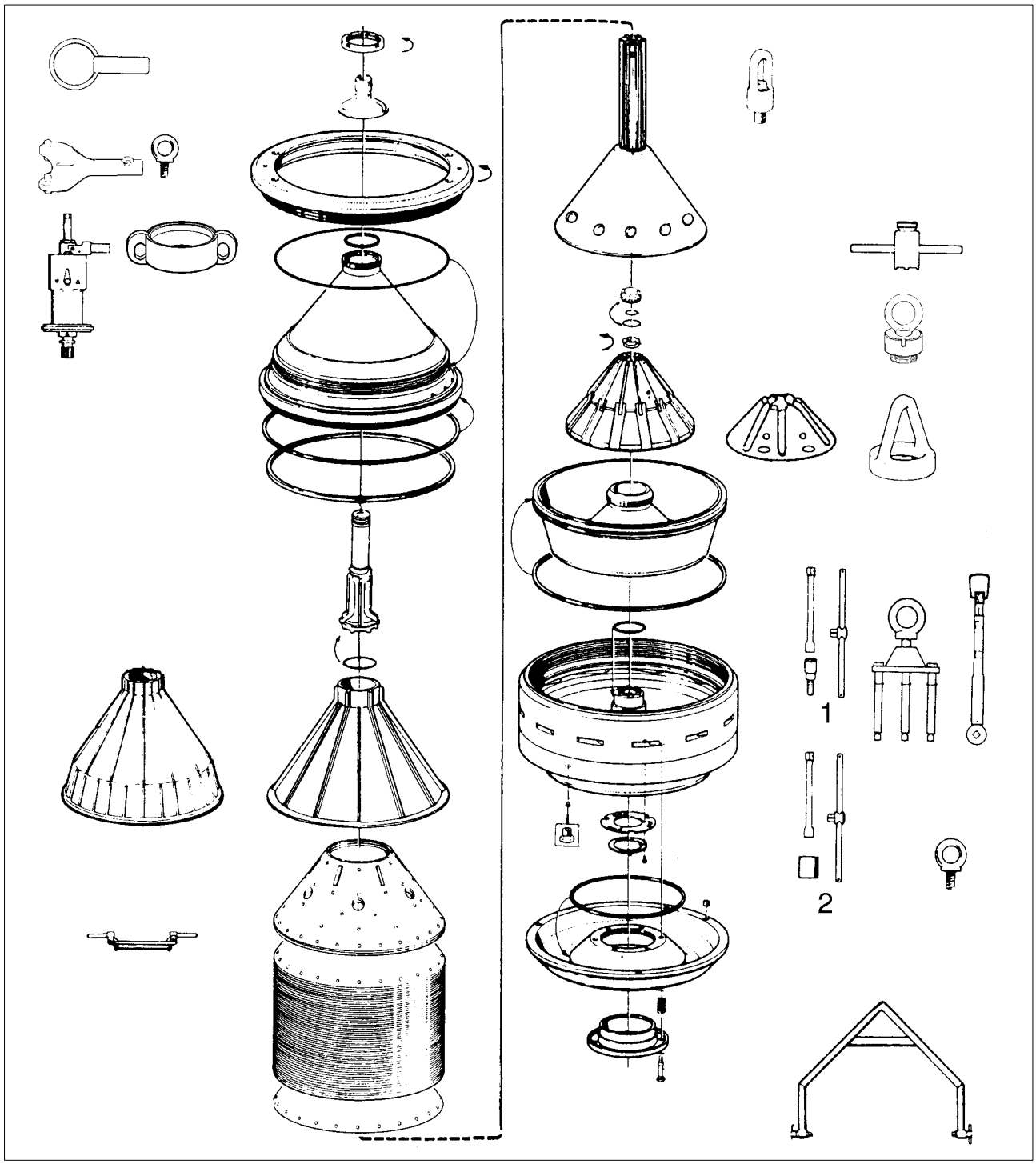
B MRPX

DANGER

Entrapment hazard

Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work. The revolution counter indicates separator rotation.

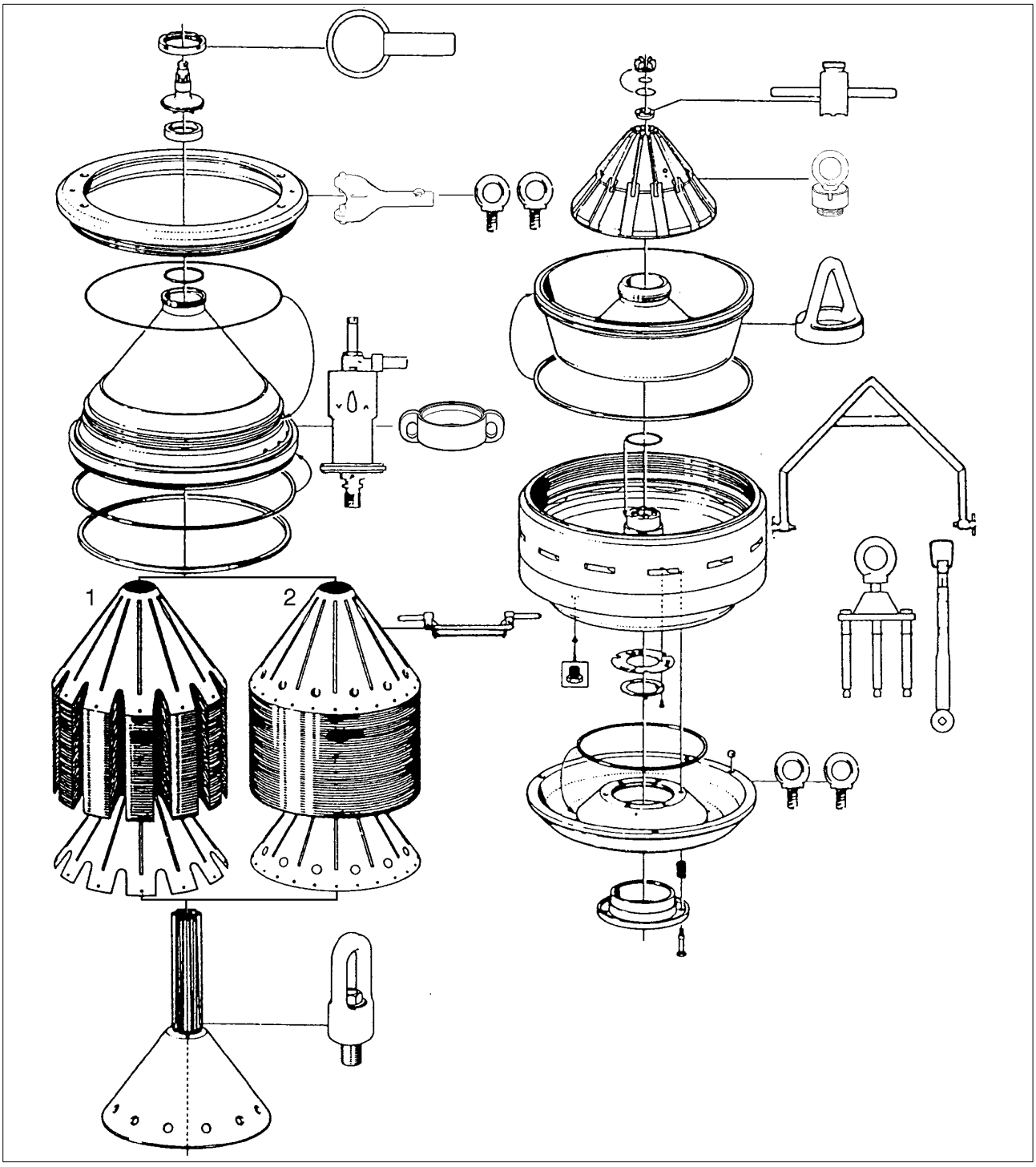
Twin phase separators



1. *Width over flats 10 mm*
2. *Width over flats 24 mm*

A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other bowl. Make sure that no parts are left out during assembly. All major parts are marked with the full serial number or the last three digits for identification purposes.

Single phase separators



1. *D MRPX 714 / 618*
2. *B BRPX 714 / 618 / 818*

A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other bowl. Make sure that no parts are left out during assembly. All major parts are marked with the full serial number or the last three digits for identification purposes.

4.6.1 Disassembly

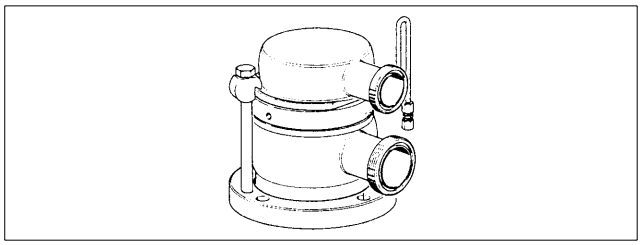
DANGER

Entrapment hazard

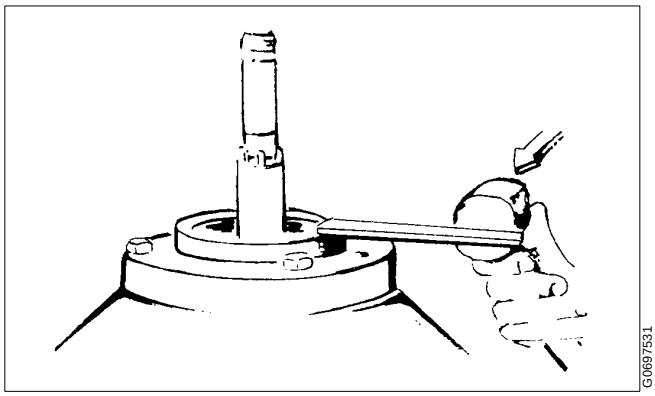
Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work. The revolution counter indicates separator rotation.

Uncovering the bowl

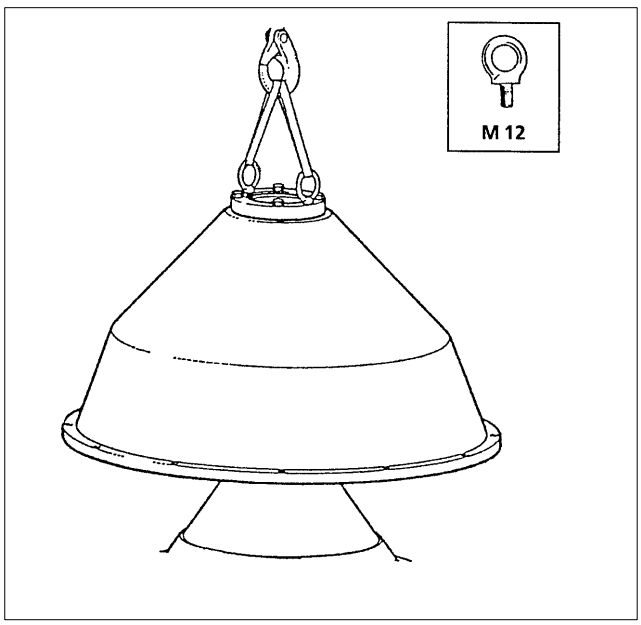
1. Dismantle outlet parts as advised in “4.3 Outlets (twin phase separators)” on page 47 or “4.4 Outlet (single phase separators)” on page 60.



2. Unscrew small lock ring clockwise (**left-hand thread**). Remove outlet pipe and guide sleeve.



3. Remove the screws for the frame hood. Drain off the cooling jacket before lifting. Screw the lifting eyes into the threaded holes for the hook screws in the centring ring. Lift off the frame hood with the aid of the eyes.

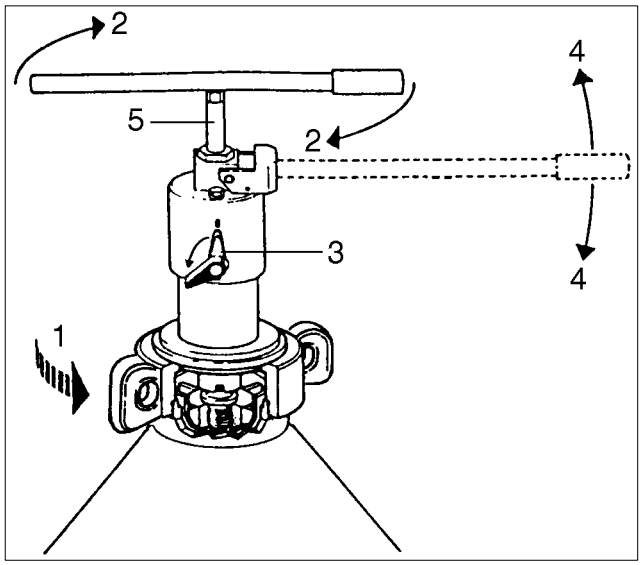


Large lock ring

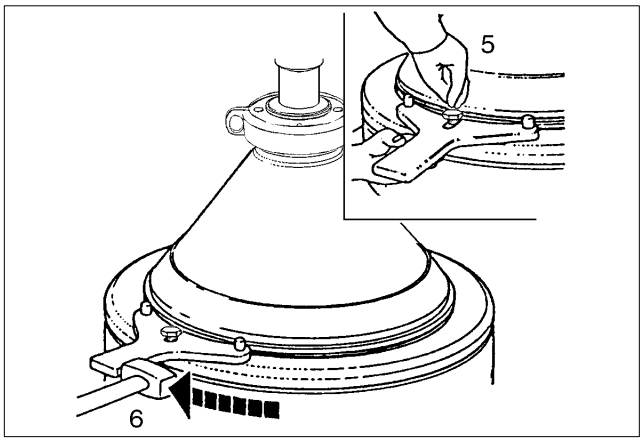
1. Before loosening the large lock ring, the disc set pressure must be neutralized by means of a compressing tool. The latter is used together with a lifting ring, which is to be screwed on to the bowl hood. (See also directions in the instruction book for the compressing tool.)

   Note! To avoid damage on the threads in the distributor, the tool must be well tightened, operation 2.

   Carry out operations (1– 3). Note: Pump (4) **until full pressure** is obtained (automatic release at correct disc stack compression).Centre rod moves upwards.

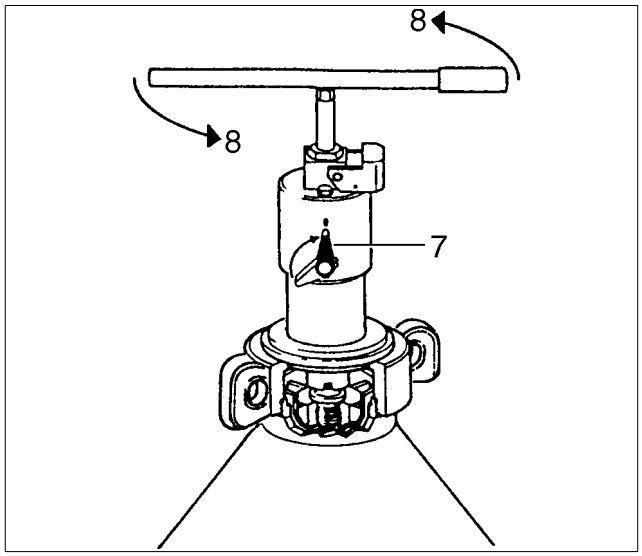


2. Fit large lock ring spanner (5). Unscrew large lock ring clockwise (**left-hand thread**) (6).



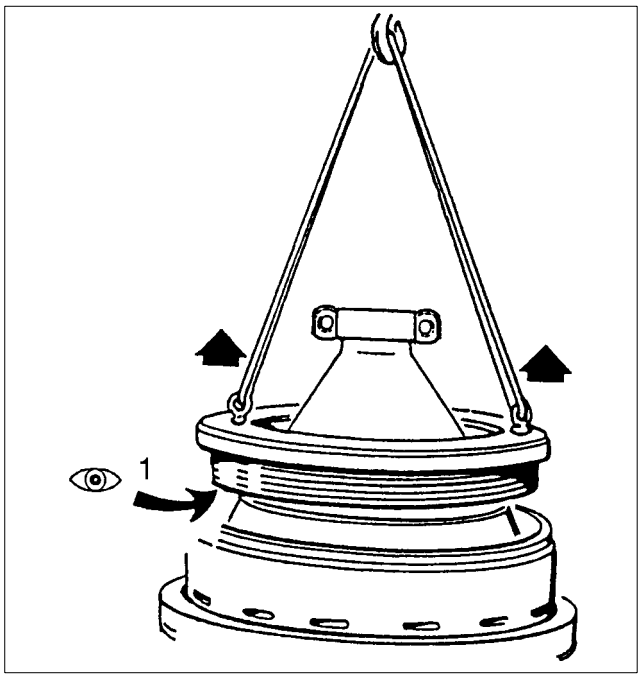
3. Undo and remove the compressing tool. Operations (7 – 8).

   Remove the large lock ring spanner.

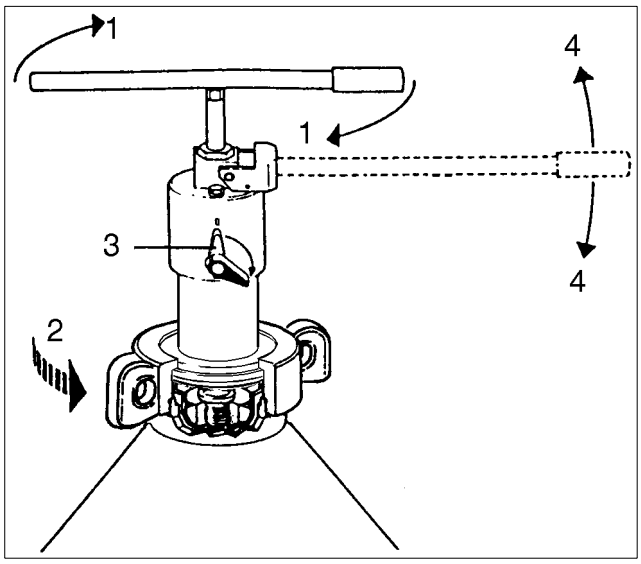


4. Check that the lock ring is entirely screwed off before lifting it. Take care not to damage the contact surface (1).

✔ **Check point**

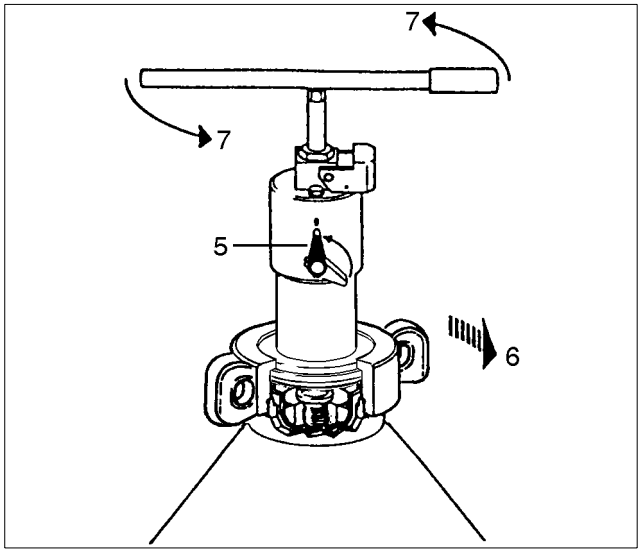


5. If the bowl hood sticks in the bowl body, use the compressing tool to ease off the hood. Carry out operations (1 - 3). Note: Fit the compressing tool before fitting lifting ring. Pump. Centre rod moves downwards (4).

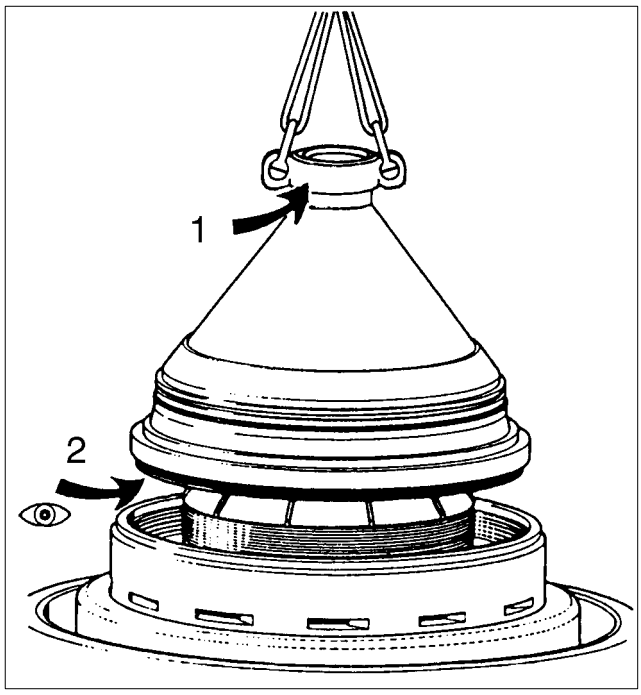


6. Undo and remove the tools.

   Operations (5 - 7).

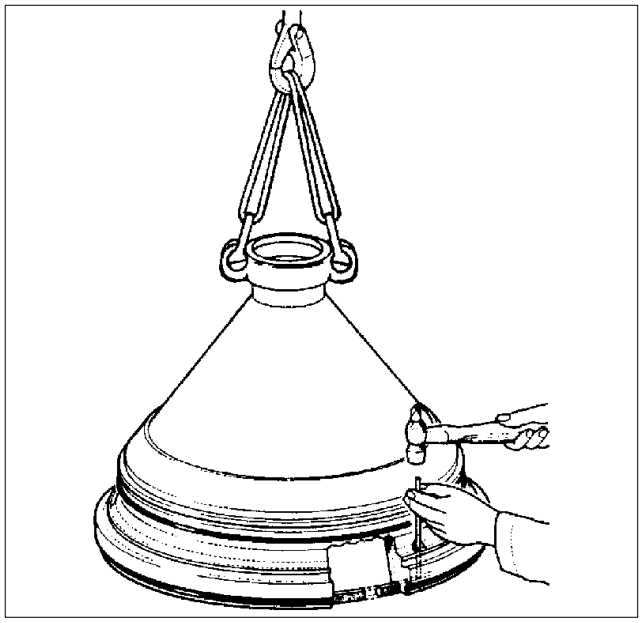


7. Lift the bowl hood by means of lifting ring (1). Never with compressing tool fitted. Check if the top disc (this top disc does not exist in the B BRPX and D MRPX separators) has got stuck in the hood. If so, knock loose the top disc with some easy blows from a soft hammer or put a drift through holes in the lifting tool and knock directly on the top disc. Take care to prevent that the top disc falls down uncontrolled. Take care not to damage the seal ring (2).



✔ **Check point**

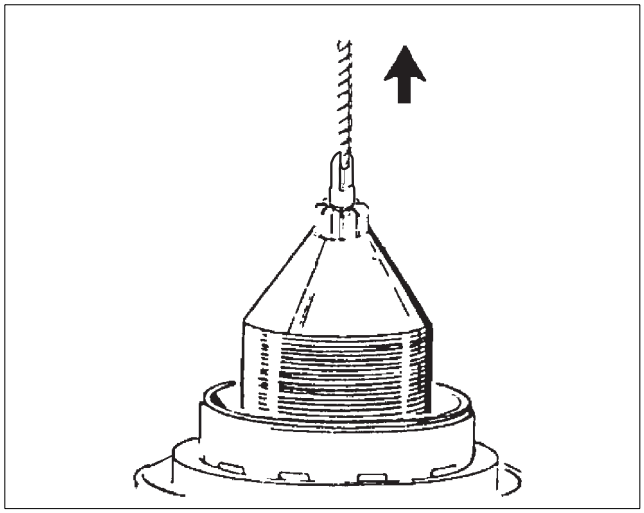
8. When seal ring in lower edge of bowl hood needs replacement, force out the ring by means of a drift, inserting it alternately in the holes intended for this purpose. When the seal ring has been forced out of that part of the groove which is situated under the holes, pull it off by hand.



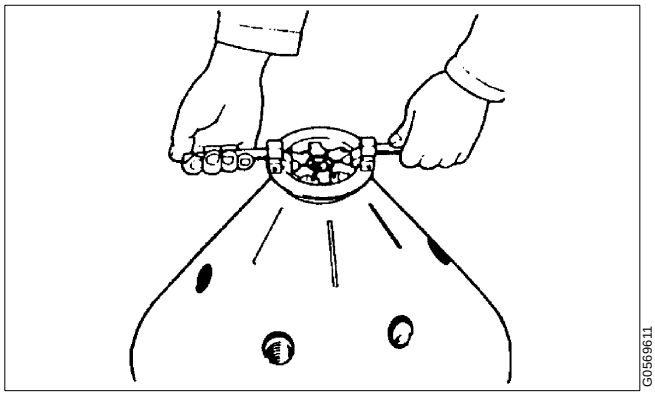
Distributor with disc stack, Sleeve with wings, Cap nut and Distributing cone.

1. Remove top disc (twin phase separators only) before fitting the tool. Lift out the distributor with disc stack. If the discs are to be removed, use gloves for finger protection.

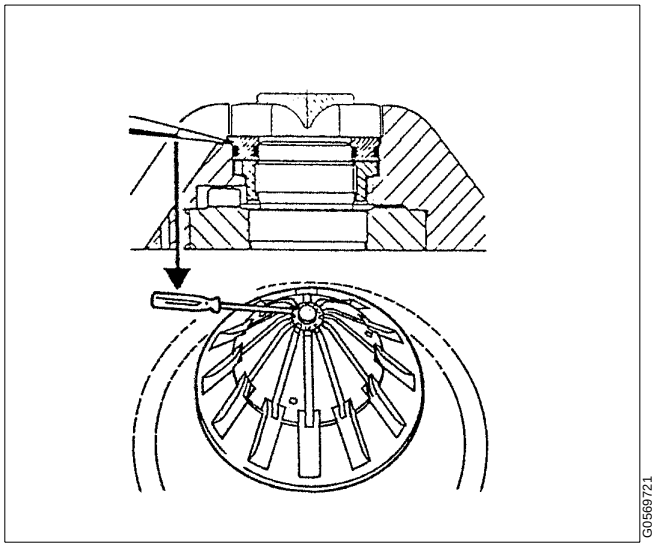
   Check the cleaning efficiency, see *Operator's Manual.*



2. If the discs are to be removed, use the special tool.

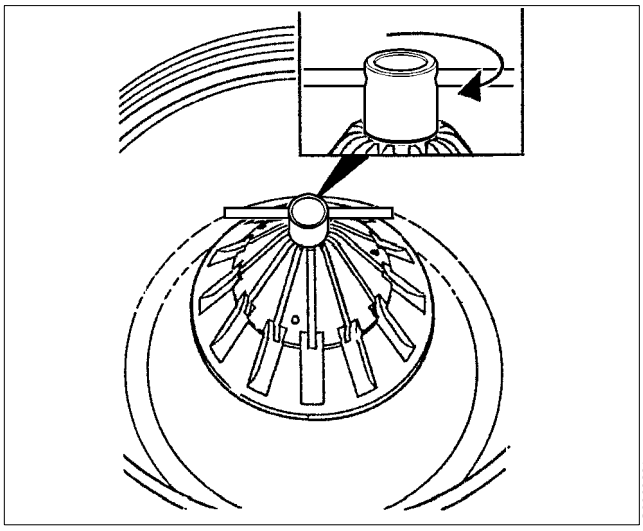


3. Carefully remove the wing crown by means of a screw driver. Note, that there is one internal and one external O-ring in the sleeve with wings.

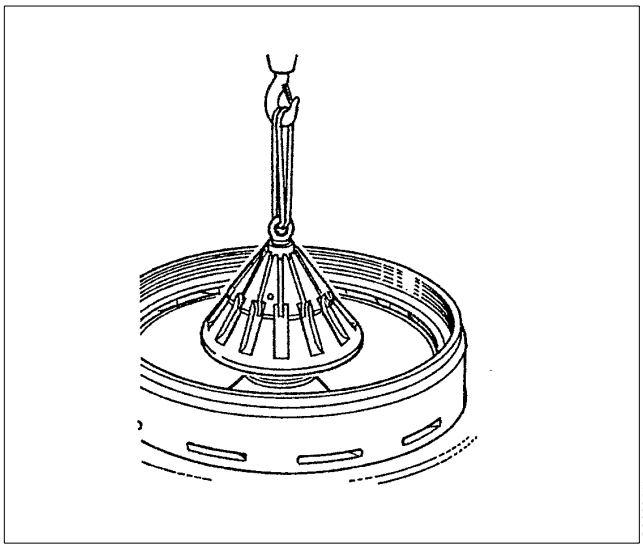


4. Unscrew and remove the cap nut.

   Left-hand thread!

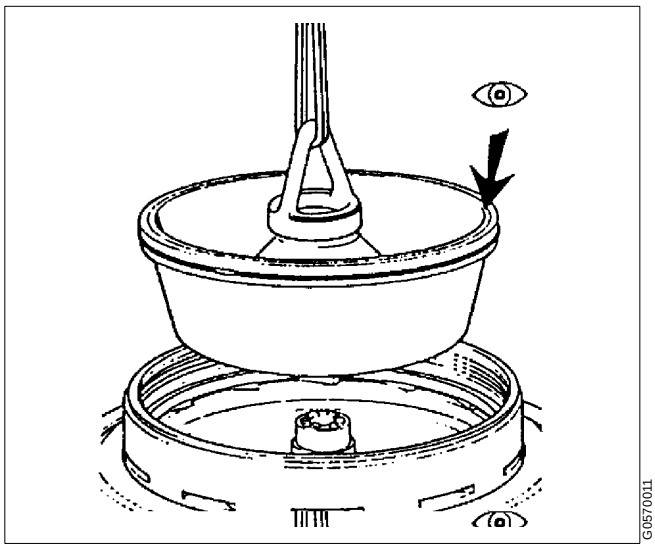


5. Fit the lifting tool into the distributing cone and lift it out.

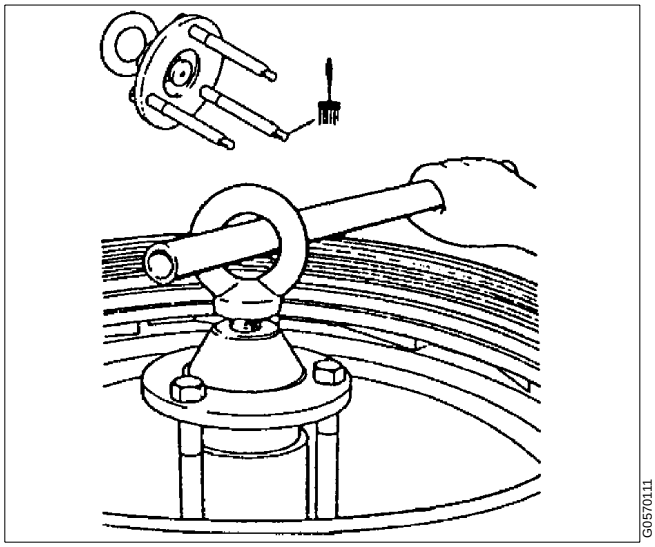


Sliding bowl bottom - Bowl body - Ejection mechanism

1. The sliding bowl bottom edge sealing against the bowl hood ✔. Look out for erosion!



2. Remove the screws for the bowl body. Mount lifting tool.

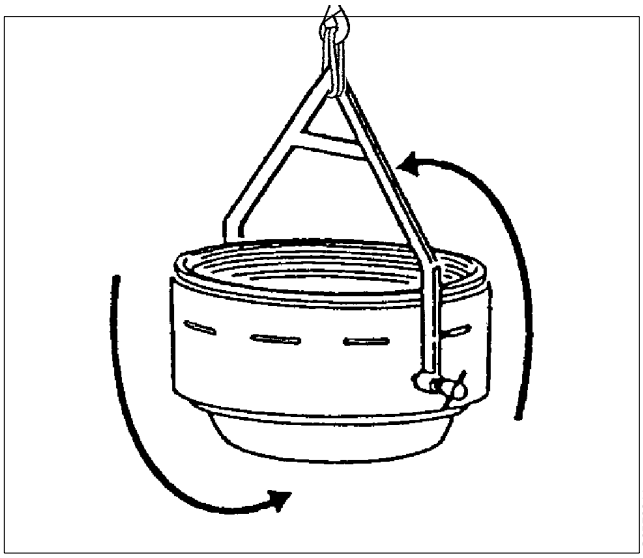


NOTE

Screw back the lifting eye to allow the three screws to be properly screwed down.

Tighten the three screws to the bowl. Ease off the bowl body from the spindle top by tightening the central screw (lifting eye). Use a hoist to lift the bowl.

3. Remove the two plugs in the bowl body wall and fit the turning tool. Ensure that the screw on the turning tool is properly tightened.



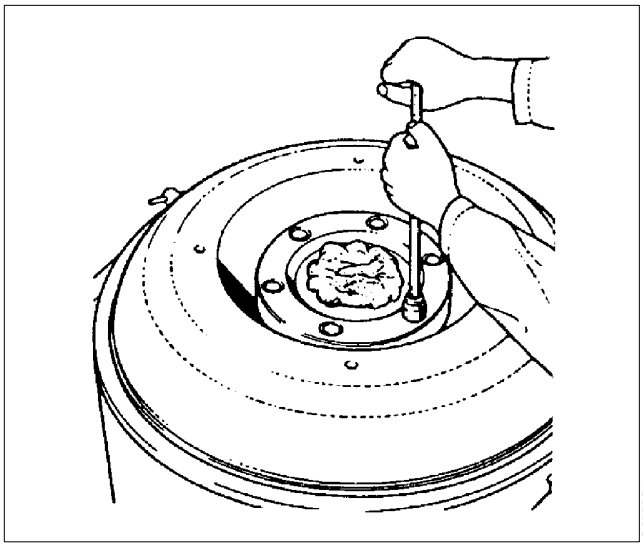
WARNING

Crush hazard

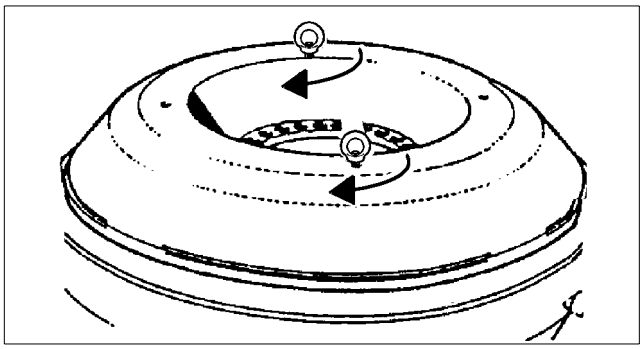
Risk for jamming injury when turning the bowl body.

Turn the bowl body upside down.

4. Protect the nave bore in bowl body with a rag. Loosen the screws of the spring support alternately and a little at a time.



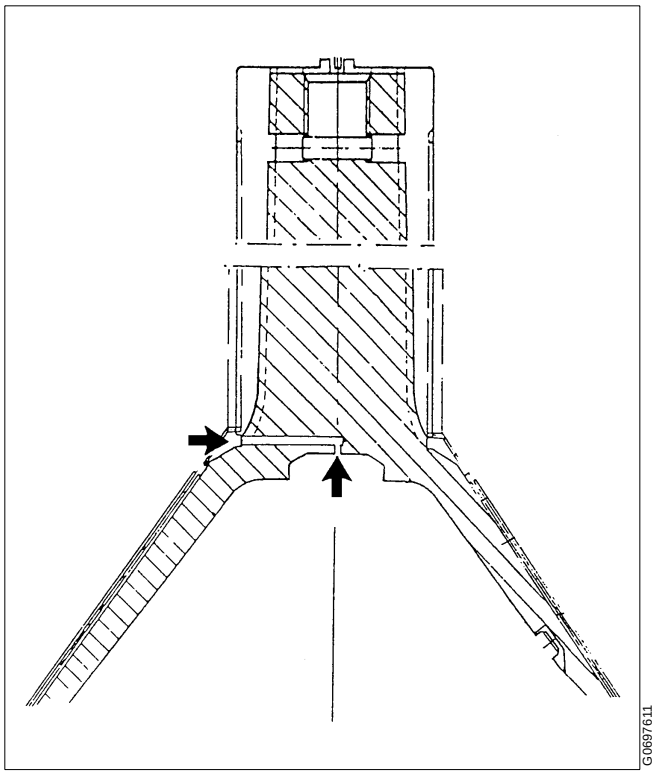
5. Remove the two threaded plugs in the operating slide and fit the two lifting eyes from the tool set in the plug holes. Ease off the operating slide with the aid of two lifting eyes. These are also used for lifting the operating slide.



4.6.2 Check point - Duct in distributor

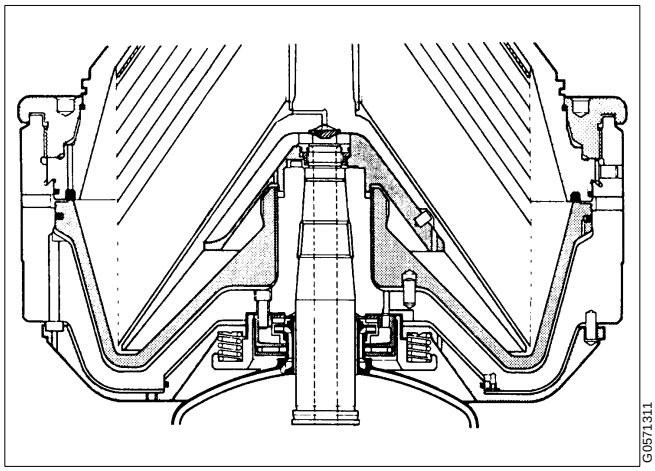
A clogged duct may cause difficulties in getting the liquid flowing when starting the process and after large discharges.

It is therefore important to clean this duct when tendency towards rising inlet pressure is observed.



4.6.3 Check points - Parts of ejection mechanism on bowl

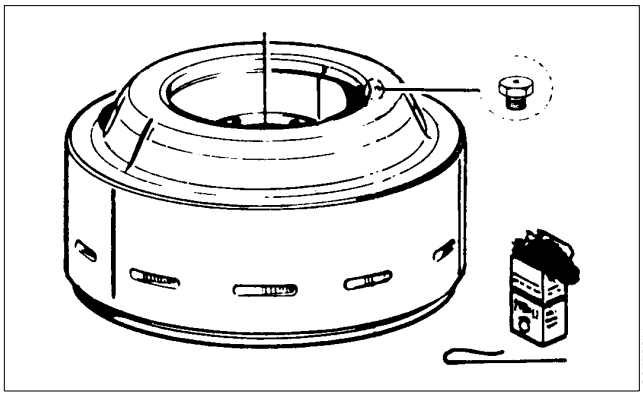
Dirt and lime deposits in the ejection mechanism may cause bad ejecting function or none at all.



Nozzle, ducts

Clean the nozzle (Ø 5,0 mm) and the ducts with a soft iron wire or the like. If necessary unscrew the nozzle.

Remove deposits on other surfaces with steel wool.



Guiding surfaces etc

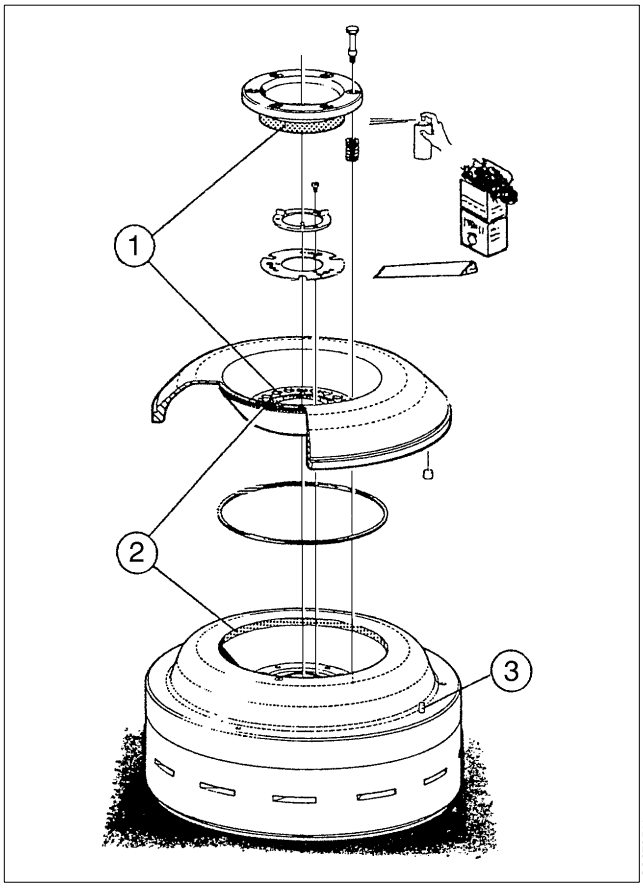
Examine the guiding surfaces (1) of spring support and operating slide. Clean the surfaces, remove any marks and lubricate the surfaces. Proceed in the same way as for repair of seizure damage in lock ring joint, see later in this chapter.

Polish sealing surfaces (2) of operating slide and bowl body with steel wool.

Inspect guide pin (3) for the operating slide. If worn (eroded) so much as to jeopardize the polar location of the slide, replace it.

NOTE

There must be clearance between operating slide and guide pin.



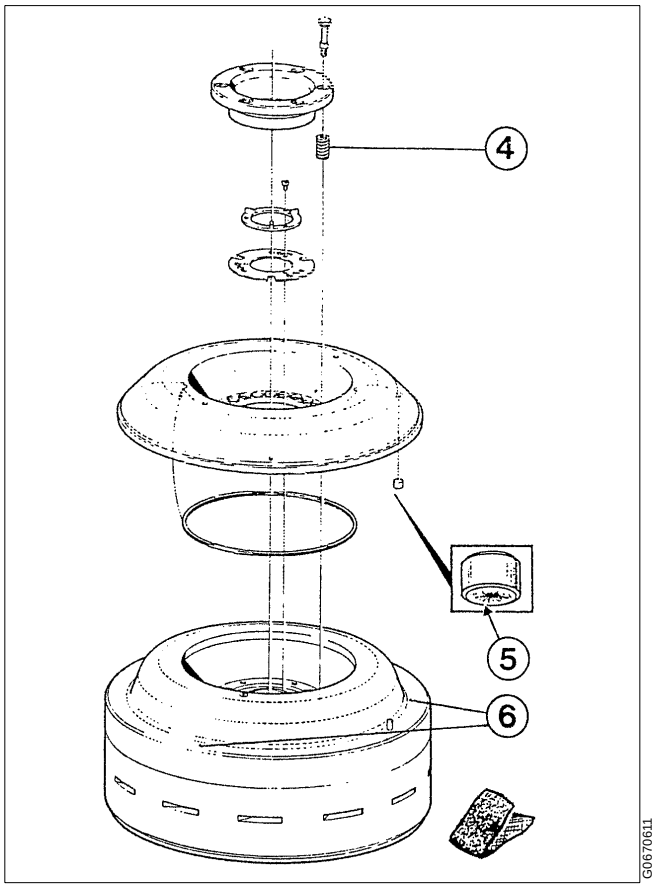
Springs, valve plugs

Defective or broken springs, as well as poor sealing between the valve plugs of operating slide and the bowl body, may prevent complete closing of the bowl.

If one or more springs (4) differ appreciably from the other ones in regard to length or which seem to be defective in other respects, replace all springs.

Check the sealing surface (5) of the three valve plugs. Preferably replace all plugs even if only one of them is defective (scratches, pores).

Examine the three sealing surfaces (6) of the bowl body in contact with the valve plugs. Remove any marks and lime deposits with a very fine-grain emery cloth.

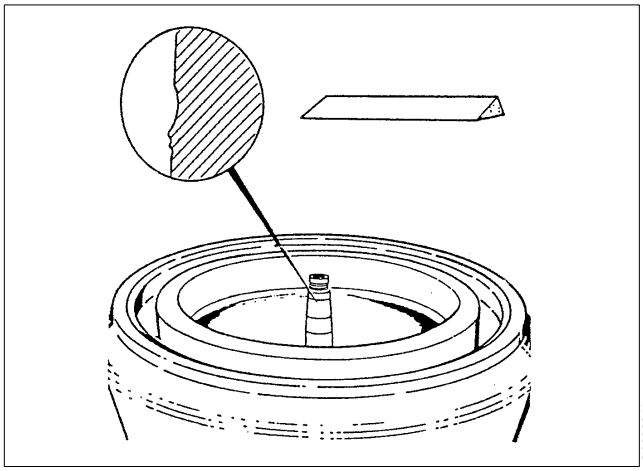


4.6.4 Check points - Wear, impact marks, seizure damage

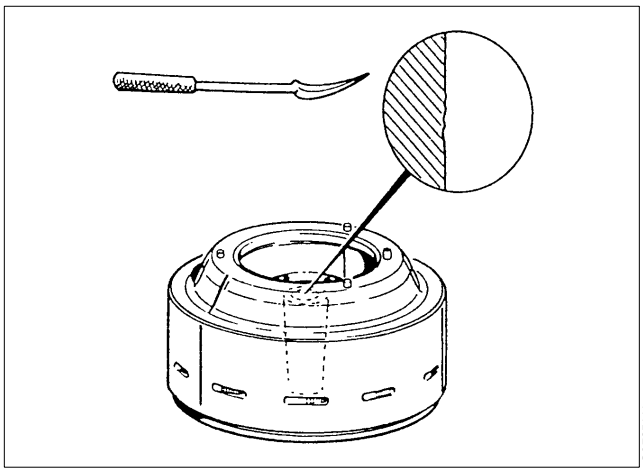
Bowl body nave - Bowl spindle cone

Impact marks and similar on the spindle cone and / or in the nave may cause bad bowl run.

Clean spindle cone with a suitable defatting agent. Remove any impact marks on cone with an oil-stone.



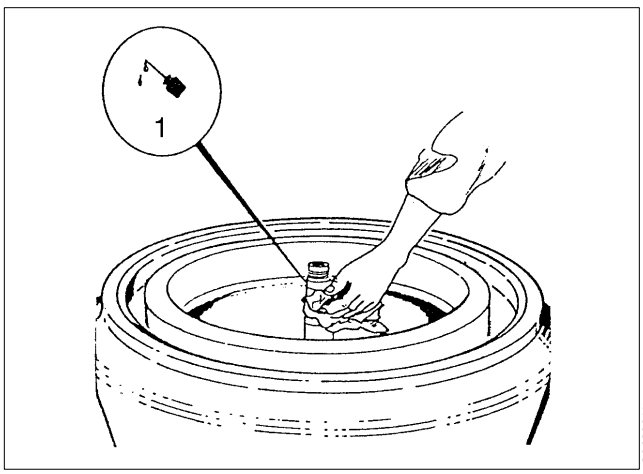
Clean bowl body nave with a suitable defatting agent. Remove any impact marks on nave with a scraper.



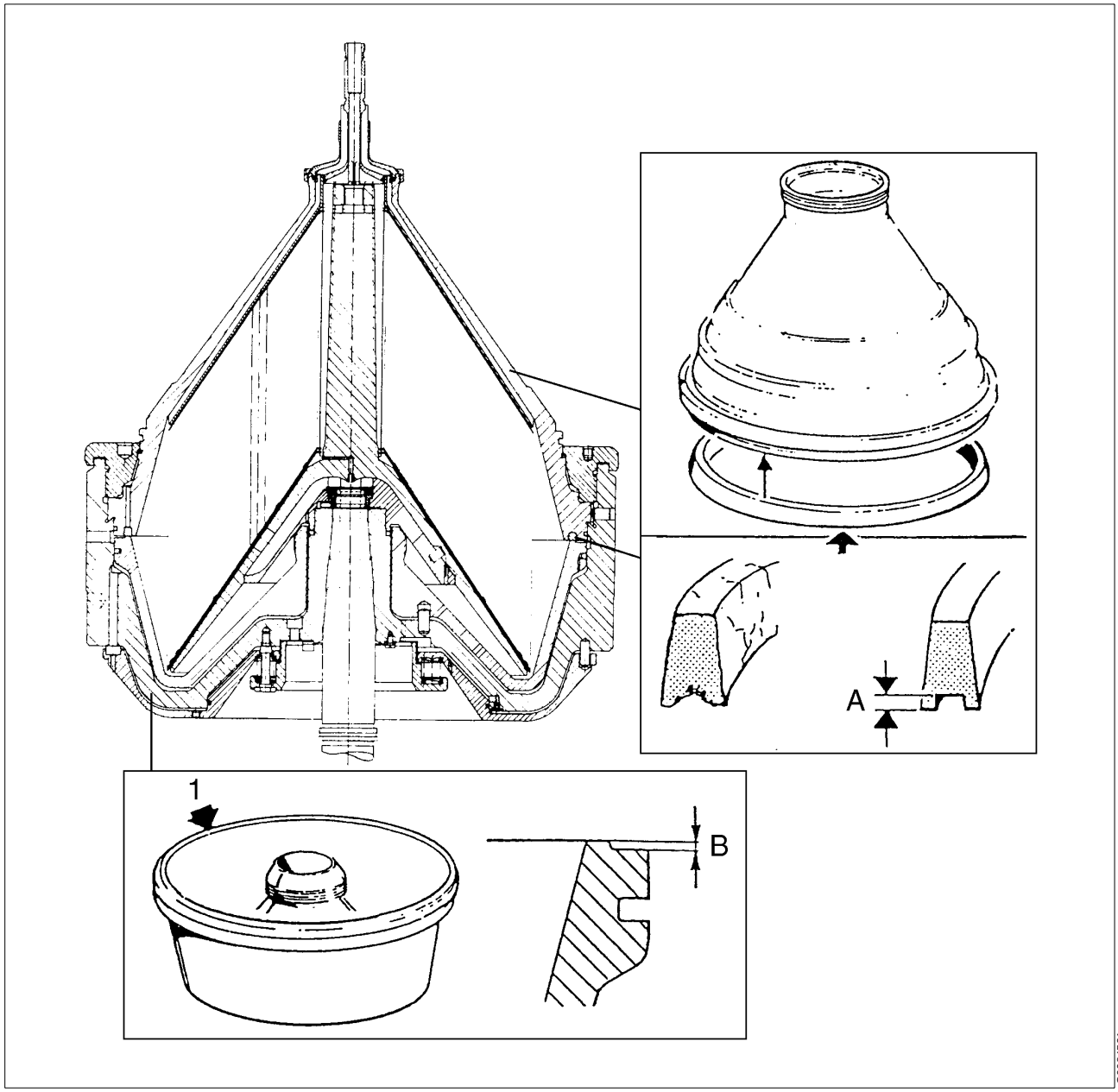
NOTE

Always use the scraper with great care. The conicity must not be marred.

Whenever fitting the bowl body on the spindle first apply a few drops of oil (1) to the spindle cone for corrosion protection reasons and then wipe it with a clean cloth.



Bowl hood / Sliding bowl bottom



A. *Max.* ***1 mm***
B. *Original profile height:* ***2,0 mm*** *(models 614 / 714),* ***2,5 mm*** *(models 518 / 618 / 718 / 818)*

Poor sealing between the bowl hood seal ring and the sealing edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.

Replace the bowl hood seal ring if it has fissures or pores, deep scratches or indentations made by course solid particles.

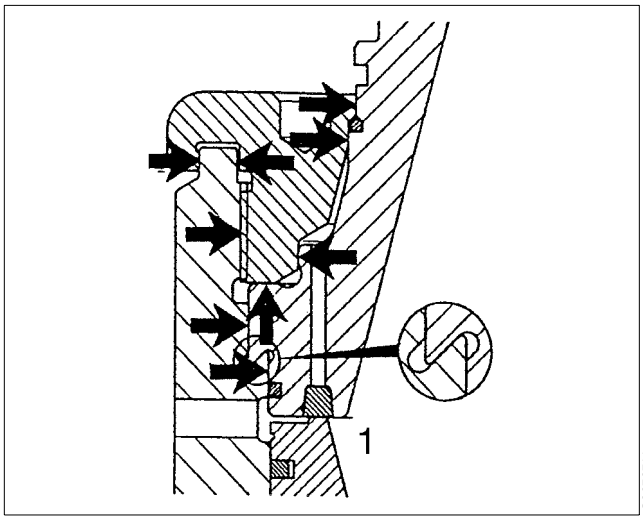
The ring should be replaced also when its sealing surface is depressed by more than 1 mm, even though acceptable in other respects.

Also check the sealing edge (1) of the sliding bowl bottom. If damaged through corrosion or erosion or in other ways it can be rectified by turning in a lathe, provided that suitable equipment is available. Maximum permissible reduction of the original profile height: **0,5 mm**.

Lock ring joint - Seizure damage

1. Impact marks and similar scores on lock ring, bowl hood or body can cause seizure damage.

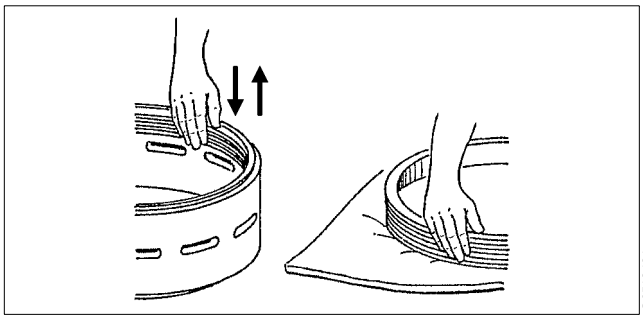
   Check threads as well as contact- and guiding surfaces see arrows.



1. *Dovetail slot*

2. Check the parts for seizure damages by letting your fingers lightly slide over the area to be inspected. Note, however, that these damages are very sharp and easily cut your fingers. Therefore, always use a piece of cloth or gloves when making this inspection.

   An obvious sign of seizure damage is when the lock ring does not fit with the main guide.



NOTE

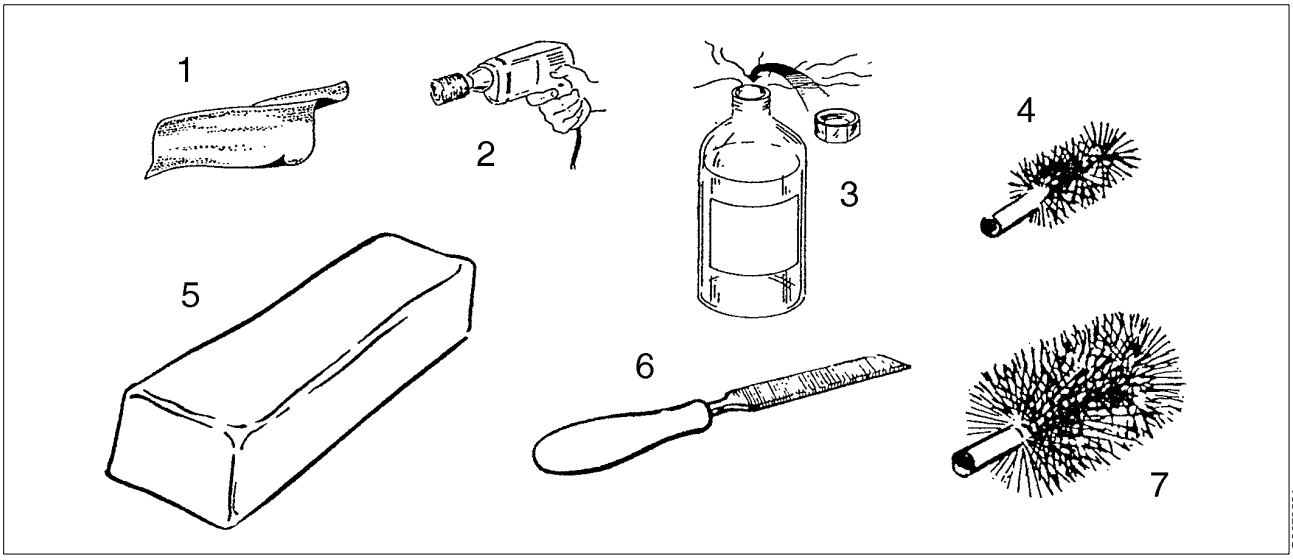
Never force any parts together. It can be very time-consuming and expensive to repair these defects. Careful handling is therefore of utmost importance.

CAUTION

Cut hazard

Lock ring threads may have sharp edges and can cause cuts.

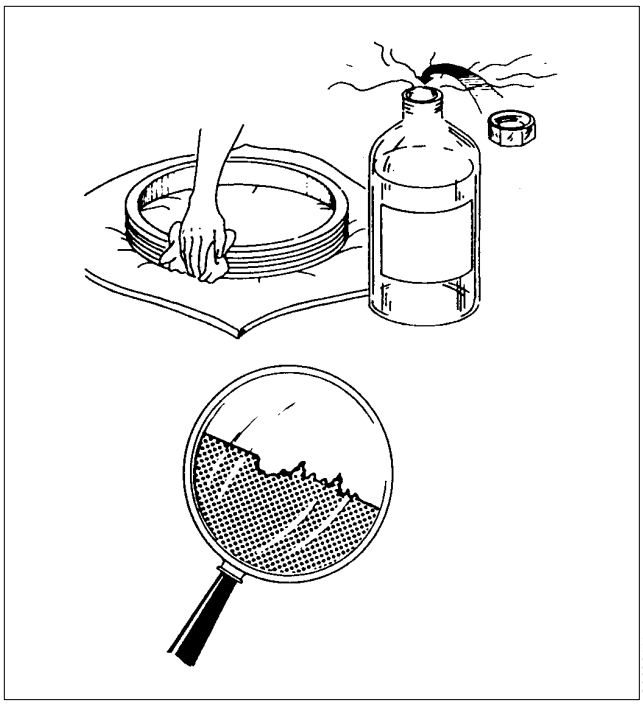
3. If damage has occurred due to seizure or other reasons, use the following to repair the damage:



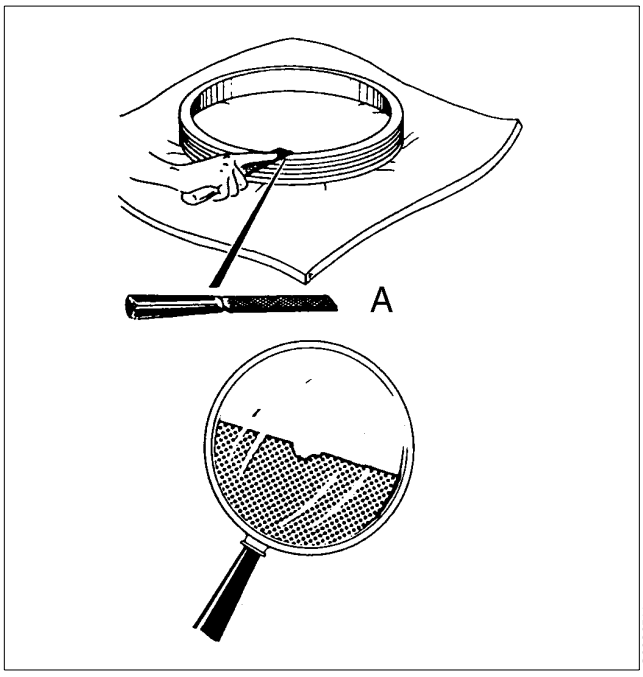
1. *Emery cloth (grain size: 240)*
2. *Hand drilling machine*
3. *Defatting agent*
4. *Fibre brush ø25 mm (1”)*
5. *Brush wax (grain size: 600)*
6. *Very fine-cut file (single-cut)*
7. *Fibre brush ø50 mm (2”)*

Procedure for seizure damage repair

1. Clean threads, contact and guiding surfaces with a defatting agent, HNO_3 (0,5% solution) or NaOH (1 - 2%) to absolute clean material. This is important as the following programme otherwise is of minor value.

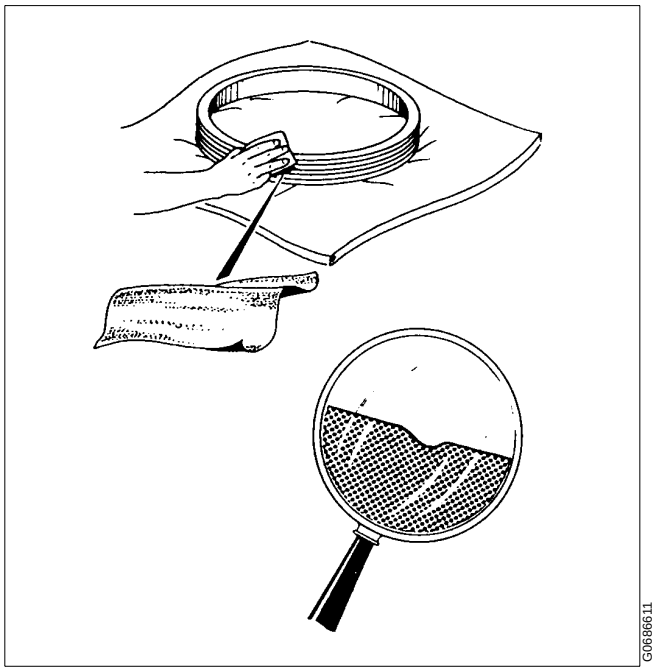


2. If the seizure damage is large, first use a fine and single-cut file, but moderately. Otherwise the damage may get worse. Remove the seizure damage material on top of the surface. Don't use rotating files etc. Just take away the damage, not the undamaged material.

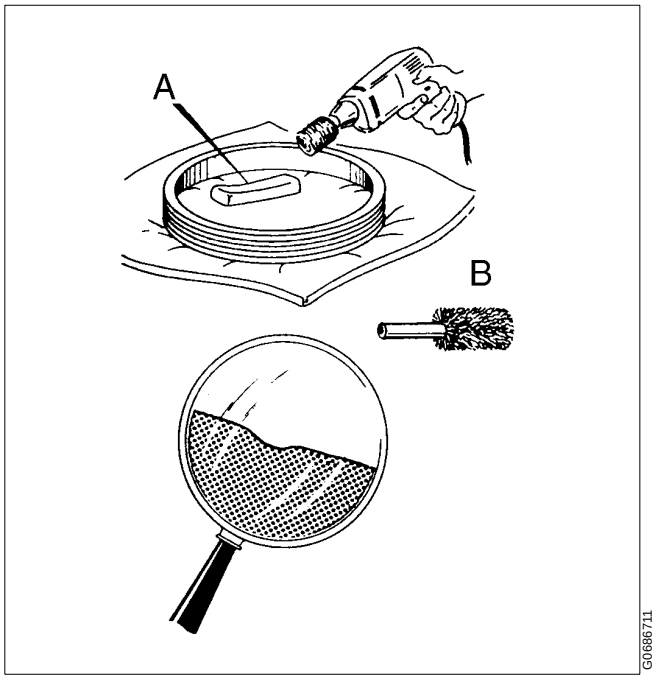


A. *Very fine-cut file (single-cut)*

3. A fine-grain emery cloth, i.e. 240 should be used to smoothen off the edges and to remove the burnt impurities.

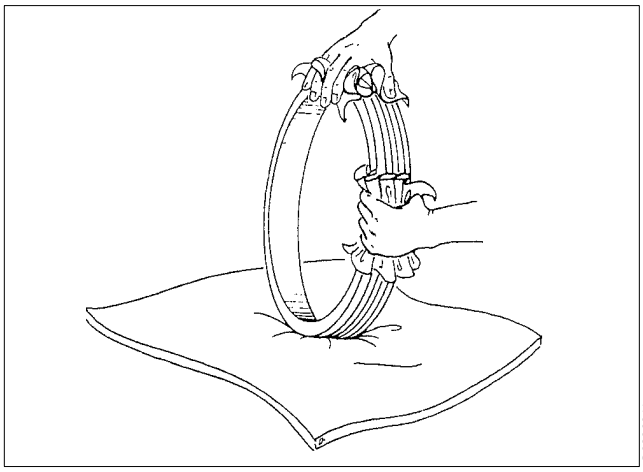


4. Accomplish the remedy by polishing the damaged spot with the fibre brushes and brush wax. It is recommended to polish the whole area where seizure damage may occur. The polishing will smoothen out the complete damage, even in the deepest parts.

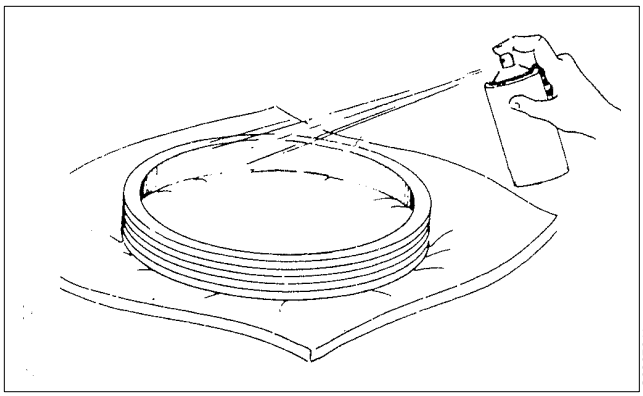


A. *Brush wax (grain size: 600)*
B. *Fibre brush: Ø 25 mm, Ø 50 mm*

5. The lock ring shall now be thoroughly cleaned, preferably with a detergent and afterwards with hot water (70-90 °C). The water temperature will warm the lock ring so that it will dry quickly. It is essential that the lock ring is perfectly polished and dry before applying any Molykote.

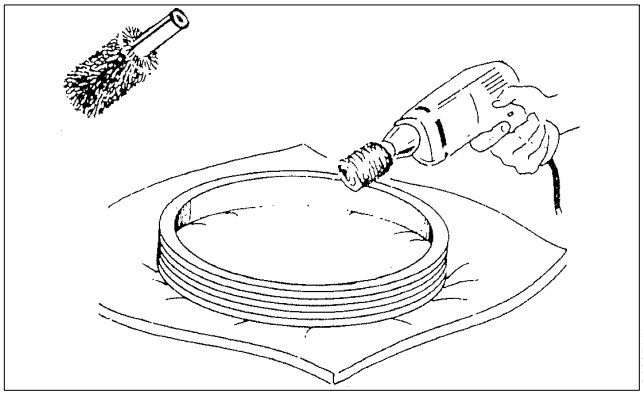


6. Spray the clean and dry surface with Molykote 321R and let it dry for 10 min.

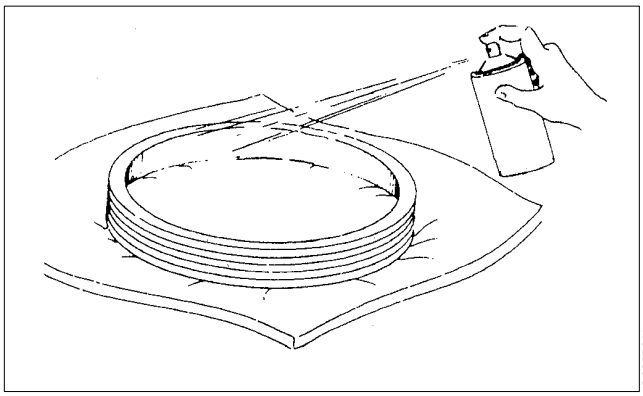


7. Use a fibre brush to polish the Molykote into the surface. The black spray will look like black shoe cream well polished when right performed.

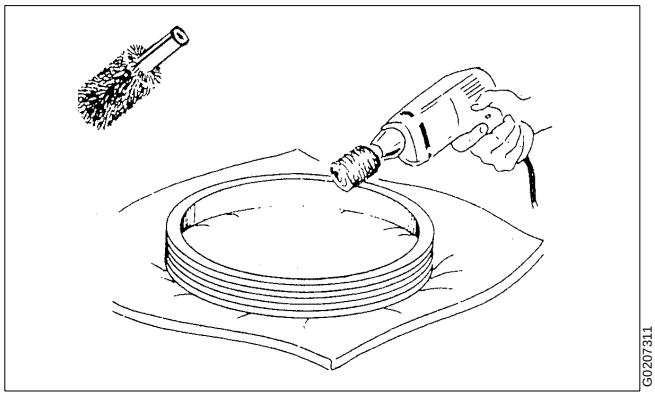
Note! Never use the same brush as in previous operation.



8. Spray the lock ring a second time and let it dry for 10 min.

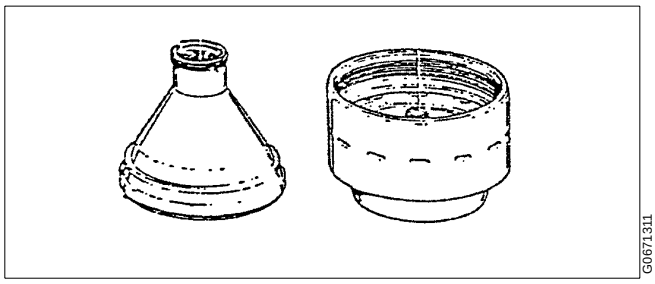


9. Polish the Molykote to a black shining surface which now can last about one year. Smaller dam - ages can be repaired locally.

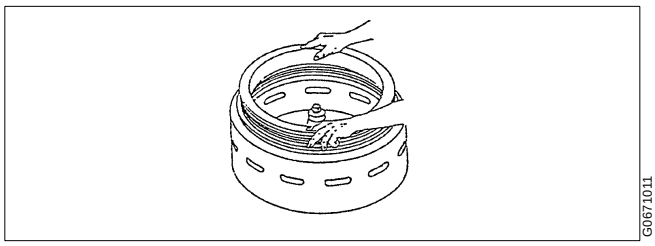


10. Proceed in the same way with the bowl hood and bowl body guides.

    Before final mounting of the bowl check as a precaution that the lock ring turns easily on the bowl body threads. To this end the ring should be screwed on by hand without using the spanner. If it turns heavily, adjust according to recommendation in this instruction.



11. Check the roundness of the lock ring, if it is still turning heavily at different positions (oval).

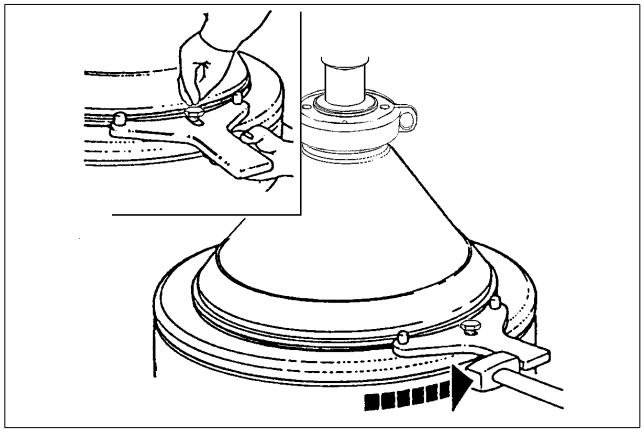


12. Final mounting of the lock ring.

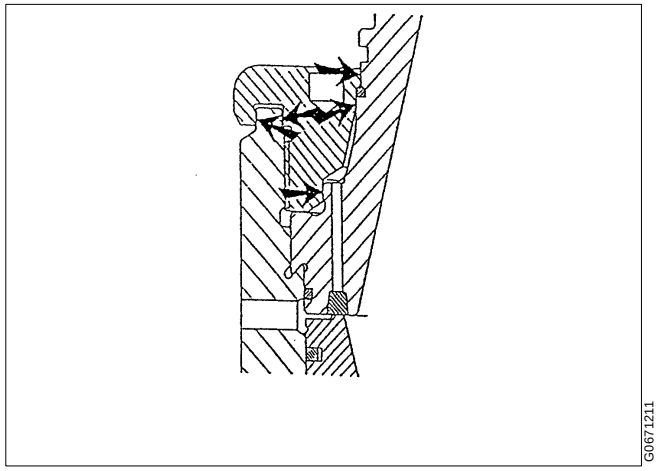
    Assemble
    - distributor with disc stack
    - top disc (twin phase separators only)
    - bowl hood

    Assemble the lock ring according to directions in this chapter.

    The following must, however, be taken into consideration:

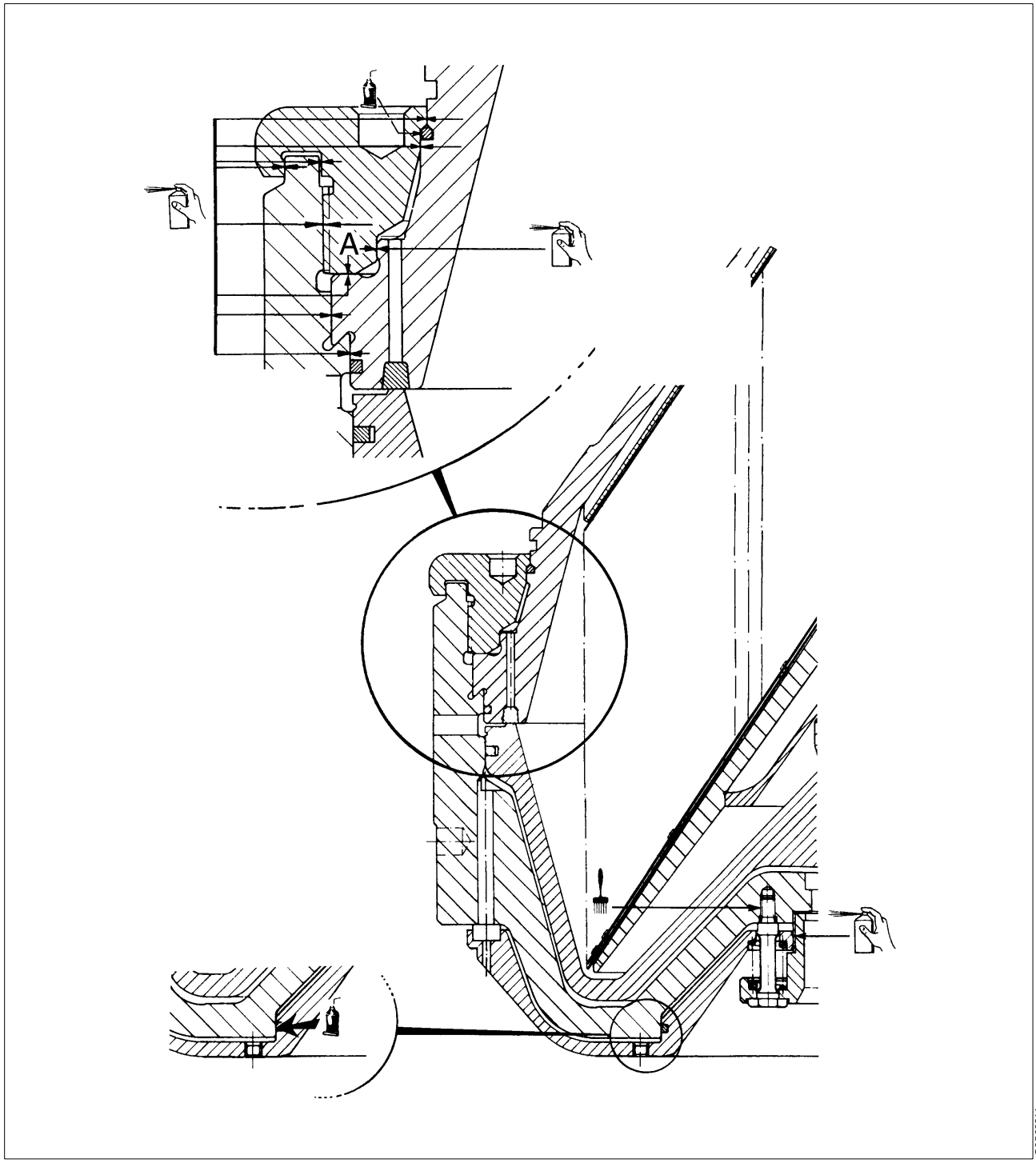


13. Screw the lock ring on by hand before pumping the compressing tool. Do this slowly and gently.
When the guiding surfaces bowl body/bowl hood are approaching each other, be extra careful. Shift the hands from the spanner handle to either side of the lock ring in order to feel, while gently continuing the screwing, that the guiding surfaces of the lock ring easily enter the corresponding surfaces of the bowl hood and bowl body.



Guiding surfaces

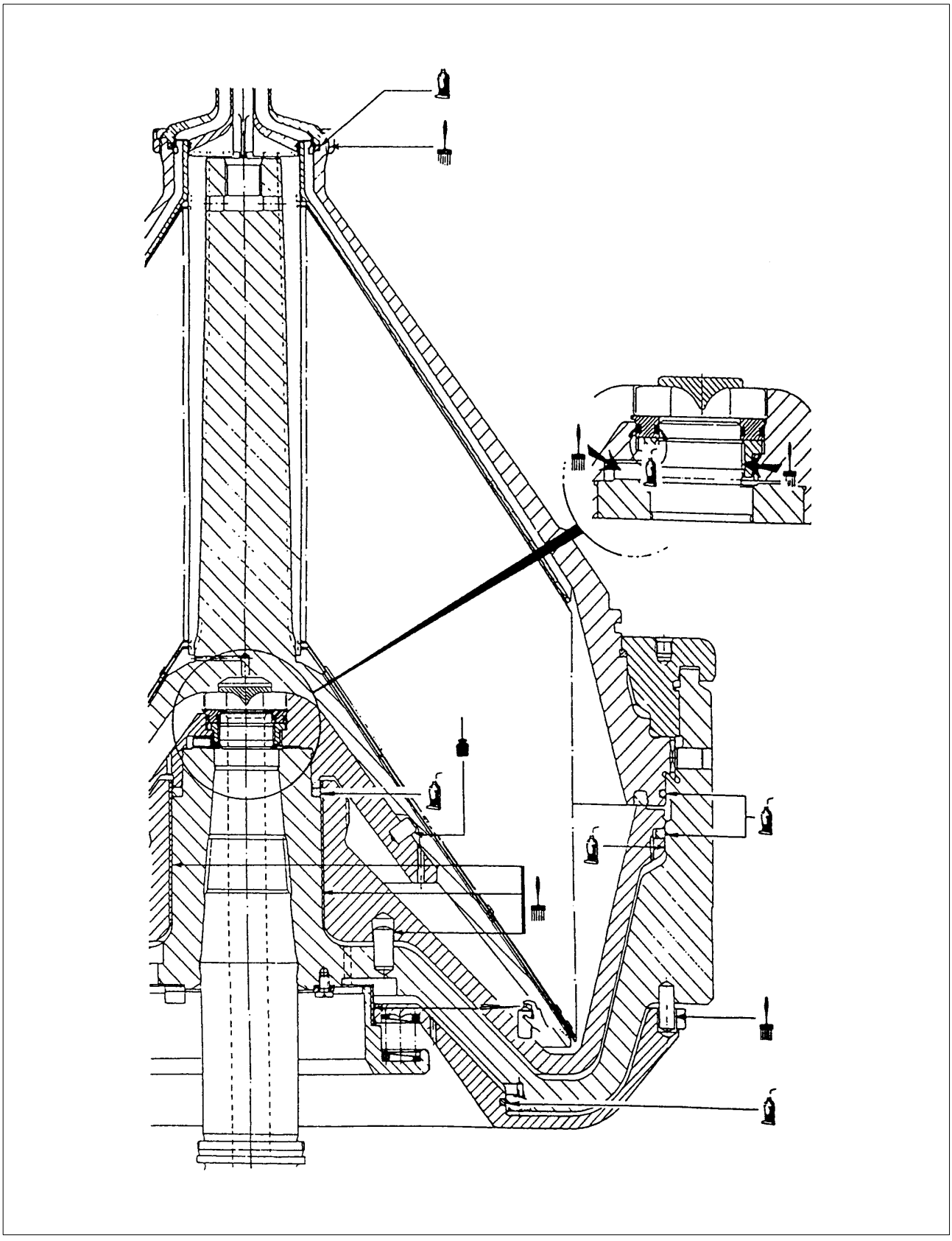
4.6.5 Check point - Lubrication



Lock ring joint

Degrease lock ring threads, contact and locating surfaces. Prime and lubricate the threads and surfaces stated according to “5.1 Lubricants” on page 178. The alternative with spray-lubrication is recommended in first place.

The surfaces at “A” must be well cleaned. When using another lubricant than spray, ascertain that only a thin layer is applied.

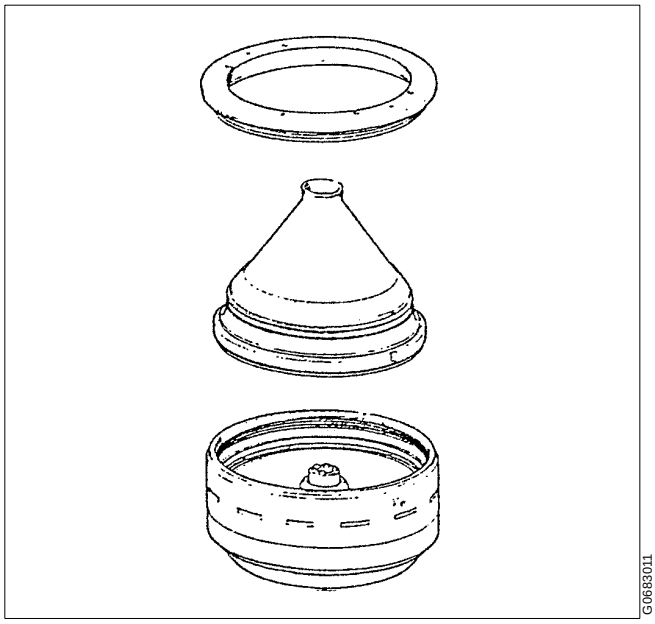


Lubricants are specified in chapter “5.1 Lubricants” on page 178.

4.6.6 Check points - Corrosion / erosion

Corrosion

Evidence of corrosion attacks should be looked for and rectified each time the separator is dismantled. Main bowl parts such as the bowl body, bowl hood and lock ring must be inspected with particular care for corrosion damage.



DANGER

Disintegration hazard

Inspect regularly for corrosion damage. Inspect frequently if process liquid is corrosive.

Always contact the supplier if you suspect that the largest depth of the corrosion damage exceeds 1,0 mm or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by the supplier.

Cracks or damage forming a line should be considered as being particularly hazardous.

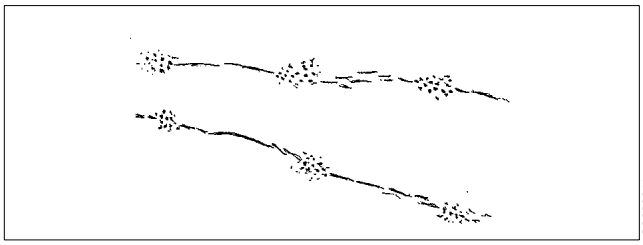
Non-stainless steel and cast iron parts

Corrosion (rusting) can occur on unprotected surfaces of non-stainless steel and cast iron. Frame parts can corrode when exposed to an aggressive environment.

Stainless steel

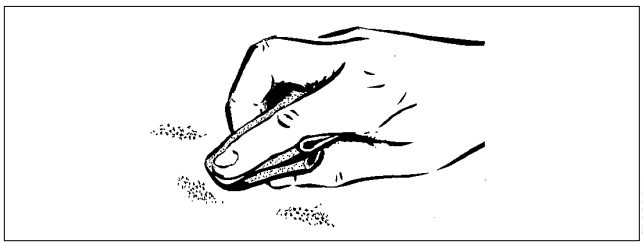
Stainless steel parts corrode when in contact with either chlorides or acidic solutions. Acidic solutions causes a general corrosion. The chloride corrosion is characterised by local damage such as pitting, grooves or cracks. The risk of chloride corrosion is higher if the surface is:

- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH value.



Corrosion damage caused by chlorides on stainless steel begins as small dark spots that can be difficult to detect.

- Inspect closely for all types of damage by corrosion and record these observations carefully.
- Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage.



DANGER

Disintegration hazard

Pits and spots forming a line may indicate cracks beneath the surface.

All forms of cracks are a potential danger and are totally unacceptable.

Replace the part if corrosion can be suspected of affecting its strength or function.

Other metal parts

Separator parts made of materials other than steel, such as brass or other copper alloys, can also be damaged by corrosion when exposed to an aggressive environment. Possible corrosion damage can be in the form of pits and/or cracks.

Cracks

Cracks can initiate on the machine after a period of operation and propagate with time.

- Cracks often initiate in an area exposed to high cyclic material stresses. These are called fatigue cracks.
- Cracks can also initiate due to corrosion in an aggressive environment.
- Although very unlikely, cracks may also occur due to the low temperature embrittlement of certain materials.

The combination of an aggressive environment and cyclic stresses will speed-up the formation of cracks. Keeping the machine and its parts clean and free from deposits will help to prevent corrosion attacks.

DANGER

Disintegration hazard

All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.

Always replace a part if cracks are present.

It is particularly important to inspect for cracks in rotating parts and especially the pillars between the sludge ports in the bowl wall.

Always contact the supplier if you suspect that the largest depth of the damage exceeds **1,0 mm**. Do not continue to use the separator until it has been inspected and cleared for operation by the supplier.

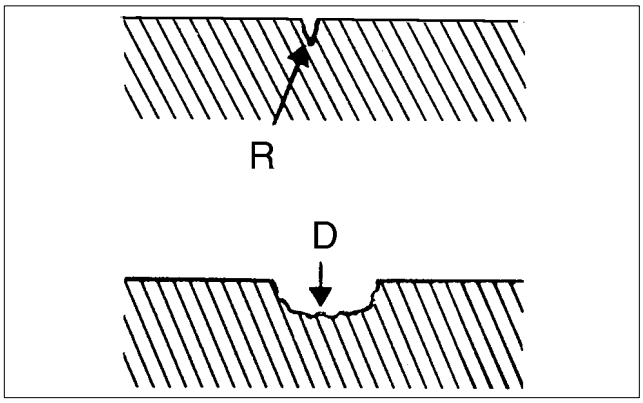
Erosion

Erosion can occur when particles suspended in the process liquid slide along or strike against a surface. Erosion can become intensified locally by flows of higher velocity.

DANGER

Disintegration hazard

Inspect regularly for erosion damage. Inspect frequently if the process liquid is erosive.



R. *Smallest permissible radius is* **1 mm**
D. *Largest permissible depth is* **1 mm**

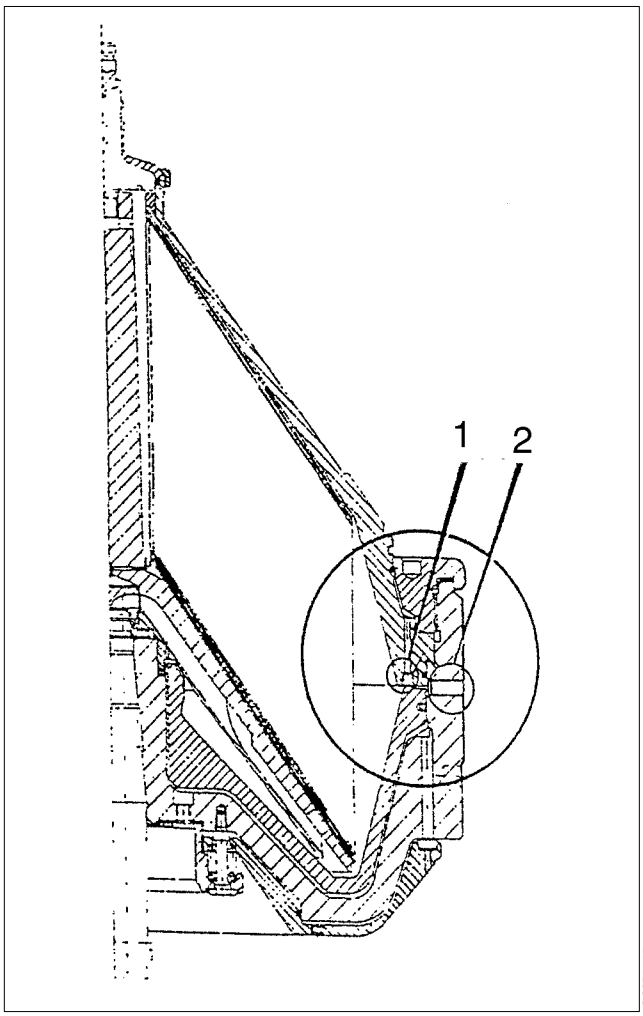
Always contact the supplier if the largest depth of any erosion damage exceeds **1,0 mm**. Valuable information as to the nature of the damage can be recorded using photographs, plaster impressions or hammered-in lead.

Erosion is characterised by:
- Burnished traces in the material.
- Dents and pits having a granular and shiny surface.

Surfaces particularly subjected to erosion are:

1. The sealing edge of the sliding bowl bottom, and the seal ring in the bowl hood.
2. The bowl wall portions (“pillars”) between the sludge ports in the bowl body.

Look carefully for any signs of erosion damage. Erosion damage can deepen rapidly and consequently weaken parts by reducing the thickness of the metal.



DANGER

Disintegration hazard

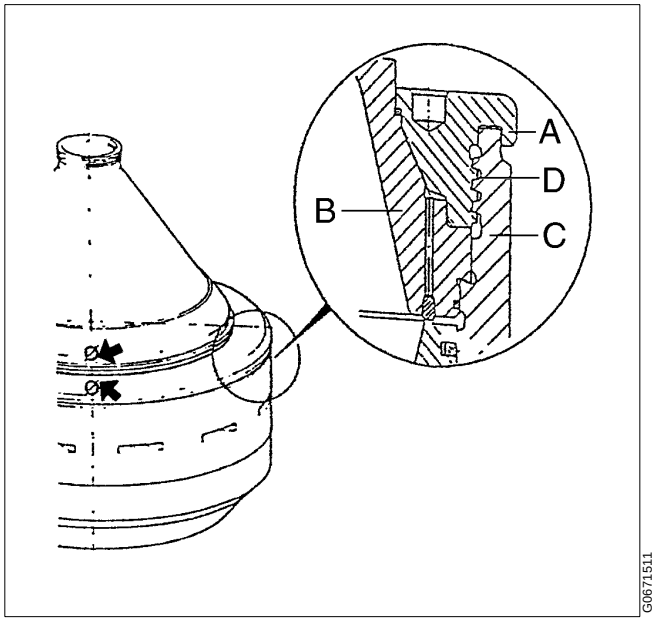
Erosion damage can weaken parts by reducing the thickness of the metal. Pay special attention to the pillars between the sludge ports in the bowl wall. Replace the part if erosion can be suspected of affecting its strength or function.

4.6.7 Check point - Limit for thread wear

Wear - Threads of large lock ring and bowl body

- The purpose of the lock rings (A) is to keep the bowl hood (B) securely in position against the bowl body (C) during operation. No play is permissible here. The threads (D) on the lock ring joint must not be worn to such an extent that the security of the lock ring joint is jeopardized.

  Excessive wear of these threads may involve risk of personal injury or damage of the equipment.



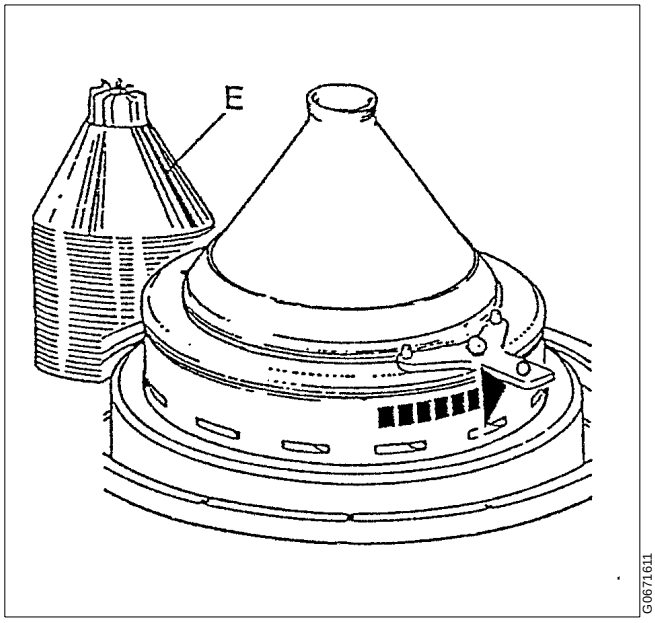
NOTE

By using the hydraulic disc compressing tool, thread wear is reduced to a minimum.

1. When the bowl is new the Ø-marks (see arrow) on bowl hood and lock ring are positioned exactly against each other. After some time, due to thread wear, these marks will pass each other when the lock ring is properly tightened.

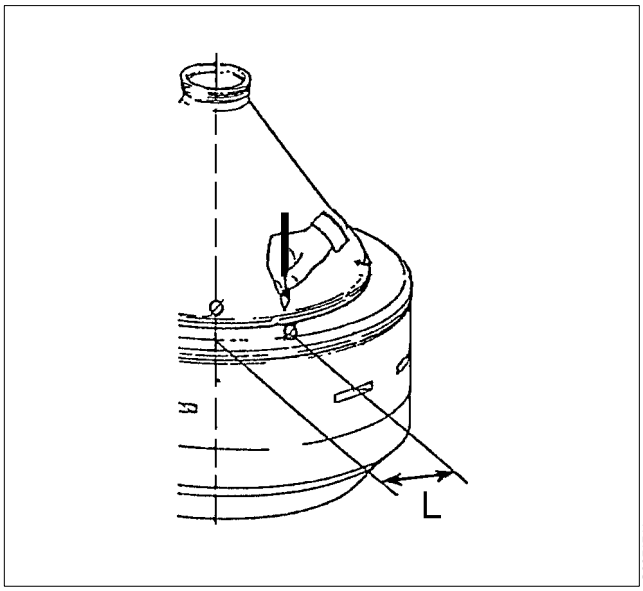
2. To check the thread wear, the threads of lock ring and bowl body must be properly cleaned and lubricated first. Remove the disc stack (E) and tighten the lock ring with a few blows of a lead hammer until it is fully tightened. The position of the lock ring relative to the bowl body and hood has now been established.

   If the Ø-marks are exactly aligned with each other, proceed to the chapter ‘‘4.6.8 Check point - Disc stack pressure” on page 105.



3. If the Ø-mark on the large lock ring has passed the Ø-mark on the bowl hood, mark the position of the lock ring mark with a felt-tipped marker pen on the bowl hood. This mark indicates the actual position of the lock ring by which the bowl hood is attached to the bowl body. This mark is needed for the following disc stack pressure check.

   Measure the distance “L” between the Ø-marks.
   - If the distance “L” is less than **150 mm** proceed to the chapter ‘‘4.6.8 Check point - Disc stack pressure” on page 105.
   - If the distance “L” exceeds **150 mm**, the bowl must **not** be used! Get in touch with the supplier.



DANGER

Disintegration hazard

Wear on the large lock ring thread must not exceed the safety limit. The Ø-mark on the lock ring must not pass the corresponding Ø-mark on the bowl hood by more than the specified distance.

4.6.8 Check point - Disc stack pressure

This check will ensure that the number of discs in the bowl is correct, so that two conditions have been fulfilled:

- The disc stack pressure is sufficient.
- Bowl hood and bowl body are securely attached to each other.

NOTE

Ensure that the disk stack pressure is sufficient to maintain bowl balance.

Insufficient pressure in the disk stack can cause vibration and reduce life of ball bearings.

Assumptions:

- The wear on the lock ring joint has been checked. See ‘‘4.6.7 Check point - Limit for thread wear” on page 103.
- The position of the Ø-mark on the lock ring has been marked with a marker pen (only applies if the Ø-marks are **not** exactly aligned with each other).
- All parts of the bowl have been cleaned.
- The sliding bowl bottom and distributing cone are in place.

Procedure:

Insert the complete disc stack in the bowl. The distributor fits into the guide pin and locked so that it cannot be turned in relation to the bowl body.

Remove the lifting eye from the distributor. Place the bowl hood in position. Make sure that the groove in the hood fits into the guide pin in the bowl body. The bowl hood should drop down over the guide pin. Don’t remove the bowl hood lifting tool.

Place the large lock ring on the bowl. Fit the lock ring tool on the lock ring and tighten the lock ring by hand.

Fit the hydraulic disc compressing tool. The valve on the tool should point upwards “Unloaded position”. Use the handle to tighten the piston rod in the distributor.

Set the valve on the tool into the left position. Pump until no resistance can be felt in the handle. The disc stack has now been compressed by the hydraulic tool against the bowl hood and the axial force of the disc stack against the lock ring joint is thus unloaded.

Tighten the large lock ring by hand, then with a few blows of a lead hammer until it is tight. Pump again and tighten the ring finally with blows of the lead hammer until it is fully tightened.

- If the Ø-mark positions are as in ”Check points - Threads of large lock ring and bowl body”, proceed to instructions for “Pressure checking”.
- If the Ø-mark positions are **not** as in ‘‘4.6.7 Check point - Limit for thread wear” on page 103, the reason could be an incorrectly assembled bowl or too many discs in the disc stack. The bowl hood is not attached to the bowl body.

Disassemble the bowl and check that it is correctly assembled. If it is, then remove one or more discs and repeat the above described procedure. See also the instructions ‘‘ Disc stack” on page 107.

Pressure checking

The position of the Ø-marks are now according to chapter “Check points - Threads of large lock ring and bowl body”.

a. The condition that the Ø-marks are exactly aligned with each other has been fulfilled, or

b. The condition that the Ø-mark is exactly aligned with the felt-pen mark has been fulfilled.

Pump a few strokes until no resistance is felt in the handle.

Measure the height (**H1**) of the piston rod (see fig.) with the depth gauge of a slide callipers. Make a note of the reading obtained.

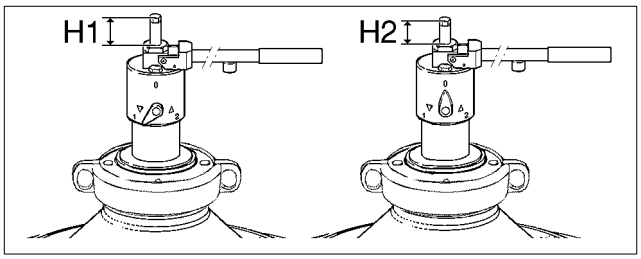
Set the valve on the tool in the upwards position “Unloaded position”. The piston rod will now move down slightly when the disc stack is released inside the bowl.

Measure once again the height (**H2**) of the piston rod with the slide callipers and make a note of the reading obtained.

If the height difference H_1-H_2 is less than the measure in the table below, the disc stack pressure is correct.

If the height difference exceeds the measure in the table below, the number of discs is not sufficient. Add one or more discs and repeat the above described check until correct disc stack pressure is obtained.

An insufficient number of discs permits the disc stack to wobble and cause unbalance in the bowl when running, resulting in vibration that cannot be eliminated by balancing.



Measure of disc stack pressure with use of a compressing tool

Bowl disc caulk thickness	Height difference, H_1 - H_2 *)
0,4 mm	1,5 mm
0,5 mm	2,0 mm
0,6 mm	2,0 mm
0,8 mm	2,5 mm

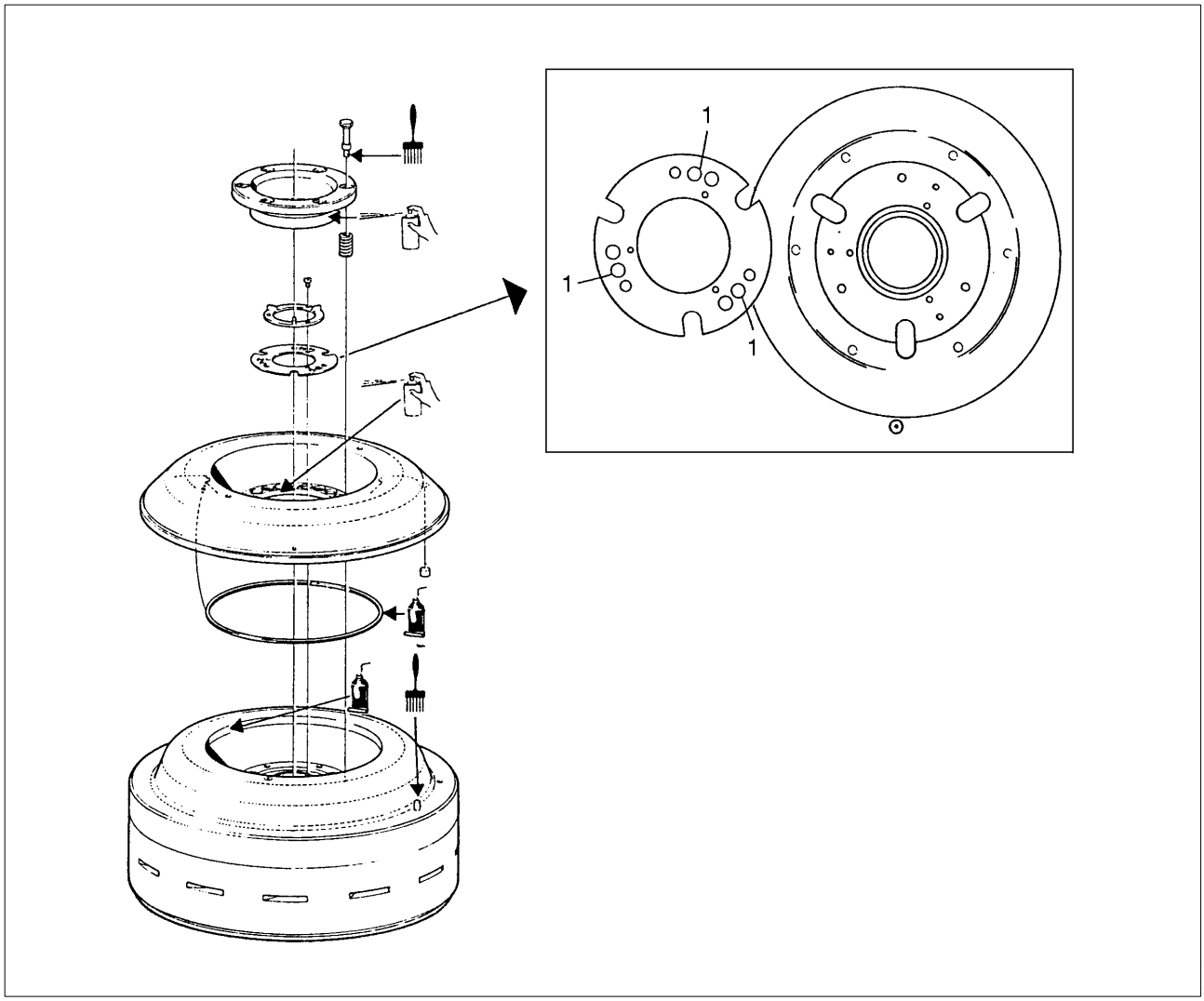
*) Calculated approx. values to be used as guidance

Disc stack

The uppermost disc has thicker caulks than the other ones. The thick-caulked disc must always be located uppermost in the disc stack. If disc stack pressure is too low, add one or more bowl disc (not thick-caulked discs) to the top of the normal-caulked part of the stack. Refit the thick-caulked disc uppermost in the stack. Fit the bowl hood.

4.6.9 Assembly

Ejection mechanism

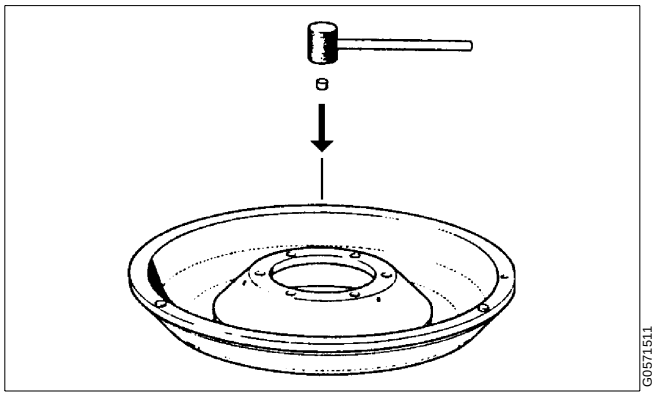


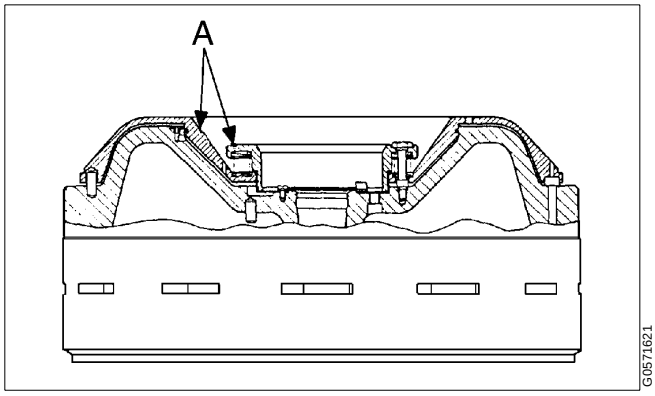
Bowl body

Turn the gasket the right way. A gasket turned the wrong way could block the ducts for operating water. (This gasket is used for many separator types. For the types dealt with in this book the holes “1” have no function.)

Lubrication of ejection mechanism. Specified directions are to be found in this chapter.

When inserting new plugs, use a rubber hammer or the like so as not to damage the sealing surface.

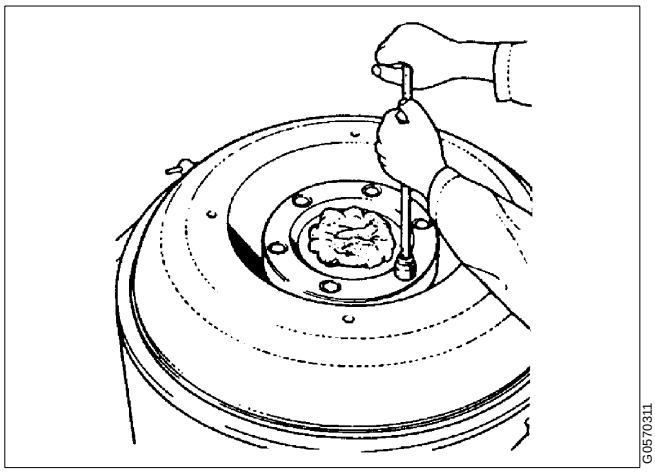




A. *Angular position of spring support indicated by punch marks*

Ejection mechanism - Bowl body

1. Protect the nave bore in bowl body with a rag. Start with two diametrically opposite screws. Then tighten screws successively a little at a time. Final tightening torque **40 Nm**.

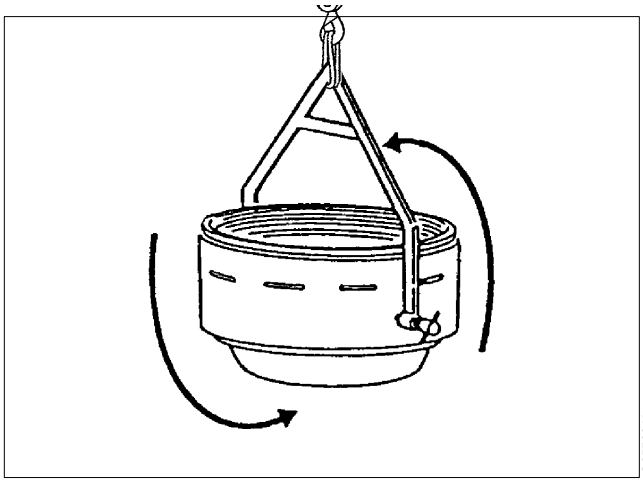


2. Ensure that the screw on the turning tool is properly tightened.

WARNING

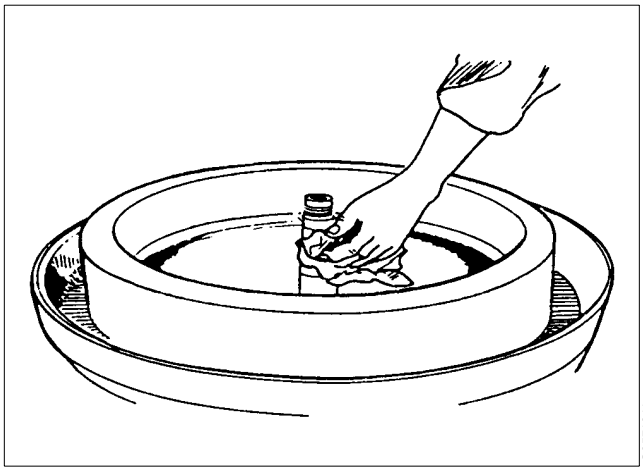
Crush hazard

Risk for jamming injury when turning the bowl body.

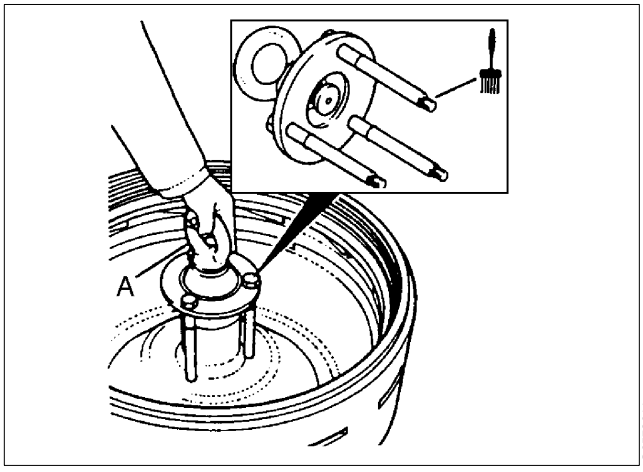


3. Turn the bowl body back upright.
   Refit the two plugs in the bowl body wall when the turning tool has been removed.

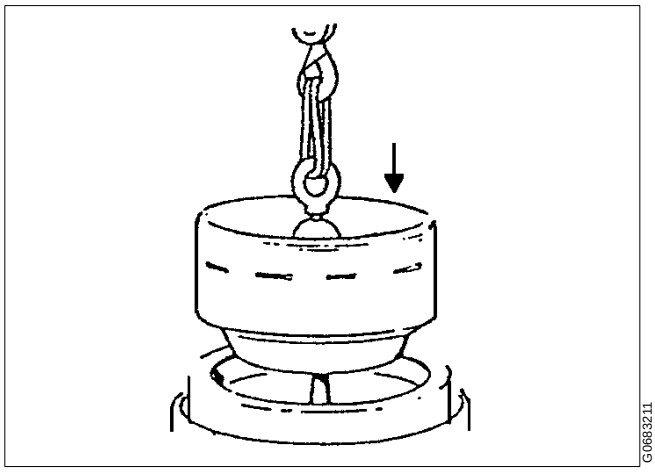
4. Clean spindle taper and nave bore in bowl body.



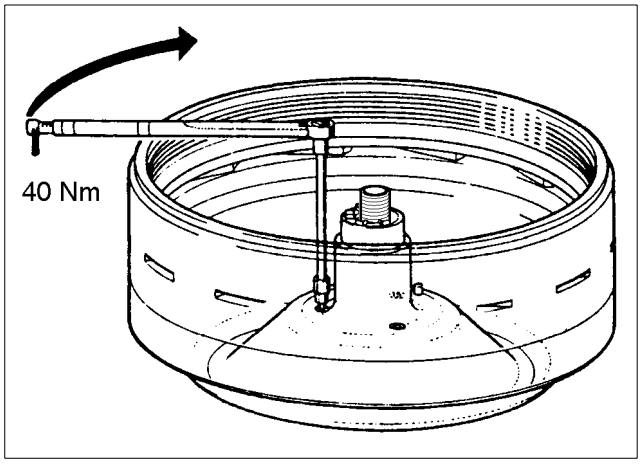
5. Apply the lifting tool of the bowl body.
   Important: Be sure that the three screws beeing properly screwed down into the bowl body. Screw down the centre screw (**A**) to the bottom position. Lift the bowl body onto the spindle.



6. Lower bowl body until central screw rests on spindle top. Now unscrew the centre screw so that bowl body sinks down on the spindle taper.



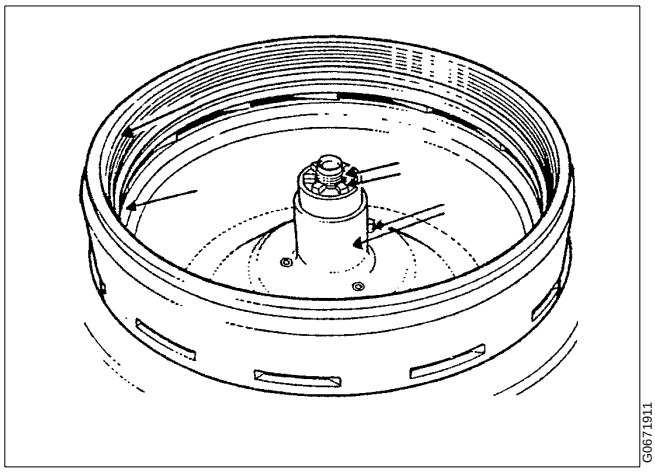
7. Lubricate the screw threads with Molykote 1000 paste. Rotate the bowl body slowly and align it so that the screw holes in its bottom are exactly above the holes in the distributing ring. Lift up the distributing ring and tighten it against the bowl body by means of the three screws. Final tightening torque **40 Nm**.



Bowl body - Sliding bowl bottom - Distributing cone

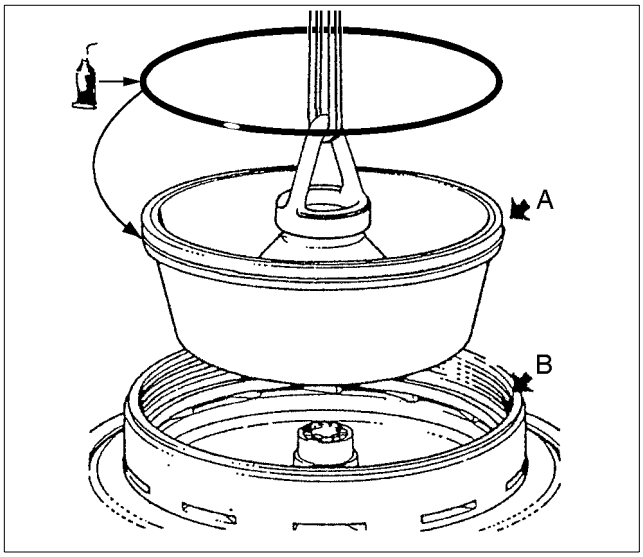
1. Apply lubricant on
   - threads of bowl body
   - threads of bowl spindle
   - bowl body nave on guiding surface and lugs
   - guide pin in bowl bottom
   - guiding surface for the sliding bowl bottom under the ejection openings in the bowl body.

   See specified “4.6.5 Check point - Lubrication” on page 97 in this chapter.



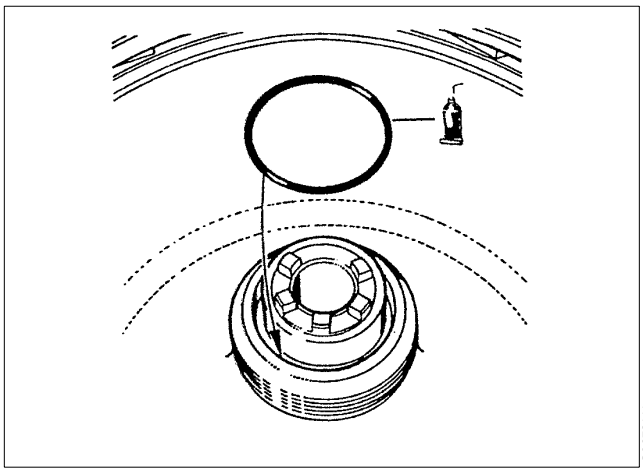
2. Take care to bring drill mark on sliding bowl bottom right in front of the guide lug in bowl body. This will ensure that sliding bowl bottom drops into correct position.

   Note! Guide pin in the bottom.



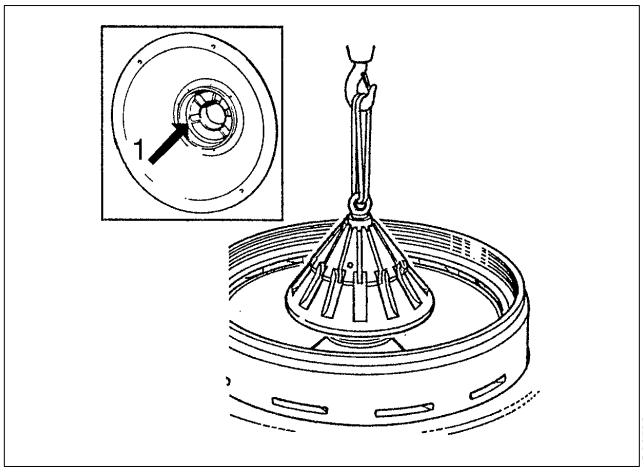
A. *Drill mark*
B. *Guide lug*

3. Avoid the risk of deforming the seal ring by fitting if after fitting the sliding bowl bottom. As the bowl is completely full of process liquid under pressure, a defective seal ring can cause leakage of process liquid into the operating water system.



Important!

4. The recesses in the underside of the distributing cone must fit over the lugs on the bowl body nave. The mark on the distributing cone must be in line with the guide lug on the bowl body.

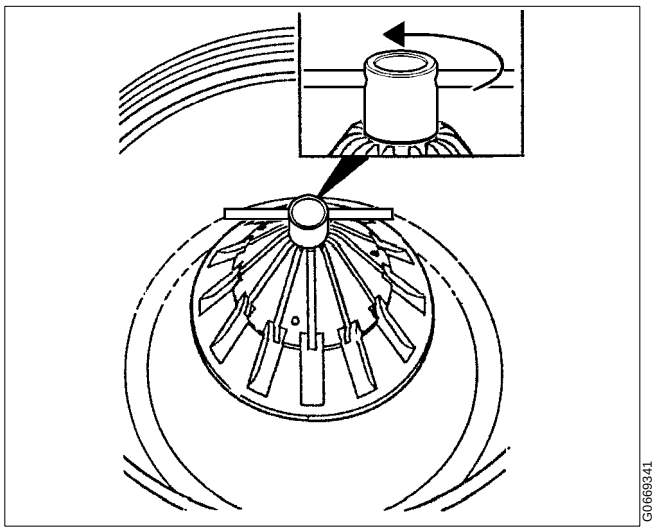


1. Recesses

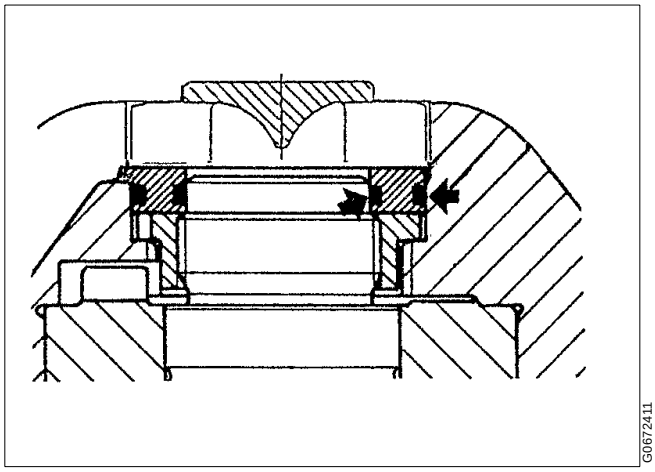
Cap nut - Wing crown - Disc stack - Distributor - Top disc*)

1. Tighten the cap nut firmly by using the special tool.

   Left-hand thread!



2. Apply silicone grease on the two O-rings for the wing crown. Put the O-rings in their grooves and press down the wing crown in the distributing cone. Knock cautiously with a soft hammer to get the wing crown into correct position. Apply a light, non-toxic lubricant onto the guide pins of the distributing cone.

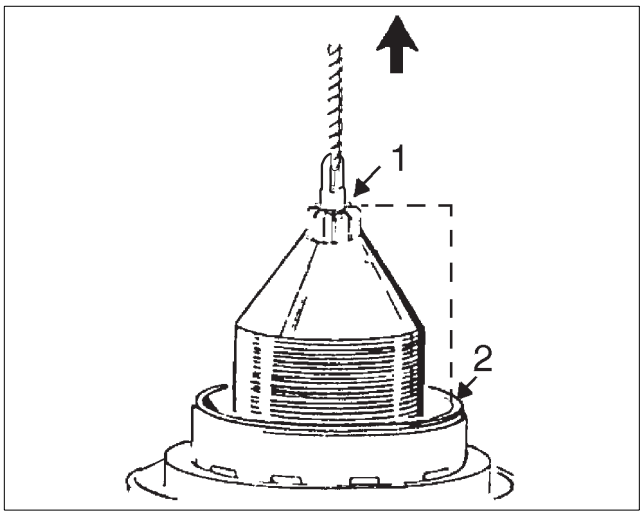


*) Twin phase separators only

3. Disc stack pressure see “4.6.8 Check point - Disc stack pressure” on page 105 in this chapter.

   Important!

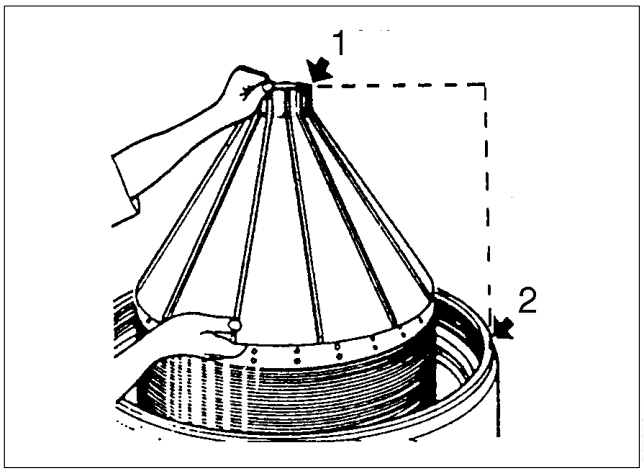
   Make sure that the three guide pins of the distributor enter correctly into corresponding holes in the distributing cone. Do it like this: Place the distributor intentionally slightly offset in relation to the guide lug on the bowl body. Use a screwdriver or similar tool to turn the distributor carefully until it drops into place in the correct position.



1. *Broad rib with groove*
2. *Guide lug*

4. Fit top disc.

   Note: This top disc does not exist in the B BRPX and D MRPX separators.

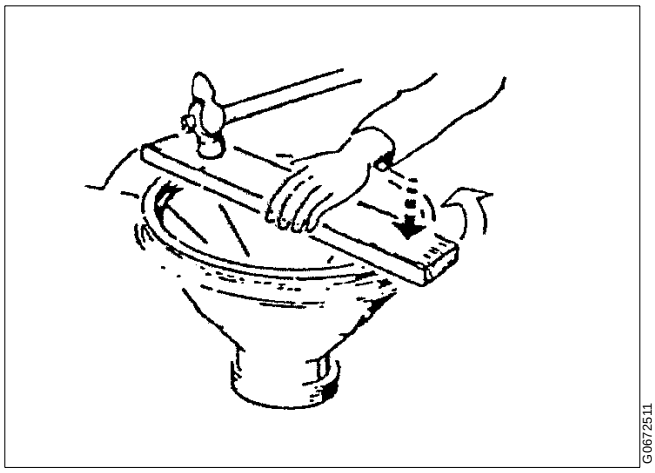


1. *Bore mark*
2. *Guide lug*

Bowl hood

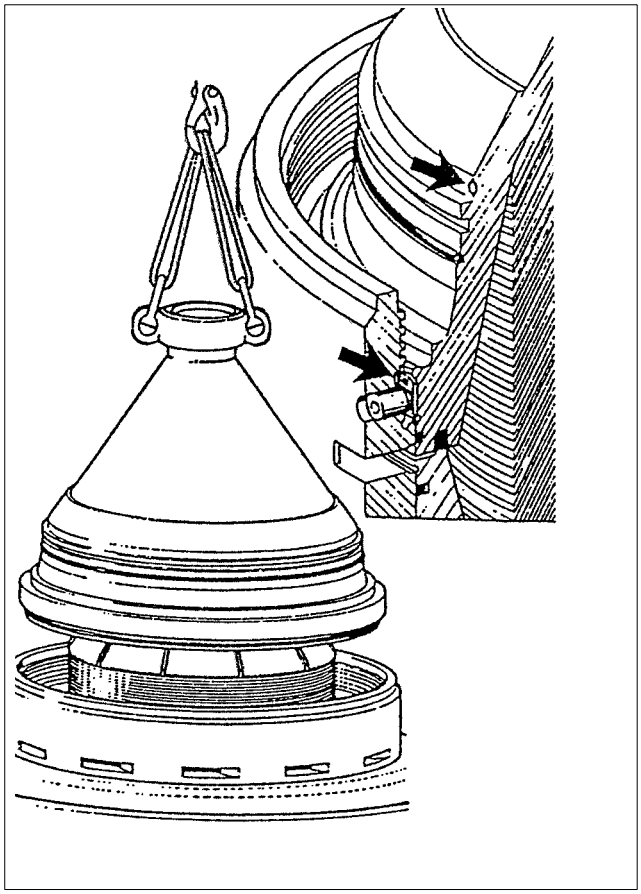
1. When fitting a new seal ring in bowl hood:

   If a new seal ring of nylon (amide resin) proves to be too wide when fitting, this is due to absorption of moisture. It will regain its correct dimensions after drying for about 24 hours at a temperature of 80 - 90 °C. If the ring is too narrow put it in hot water, 70 - 80 °C, for about 5 minutes.



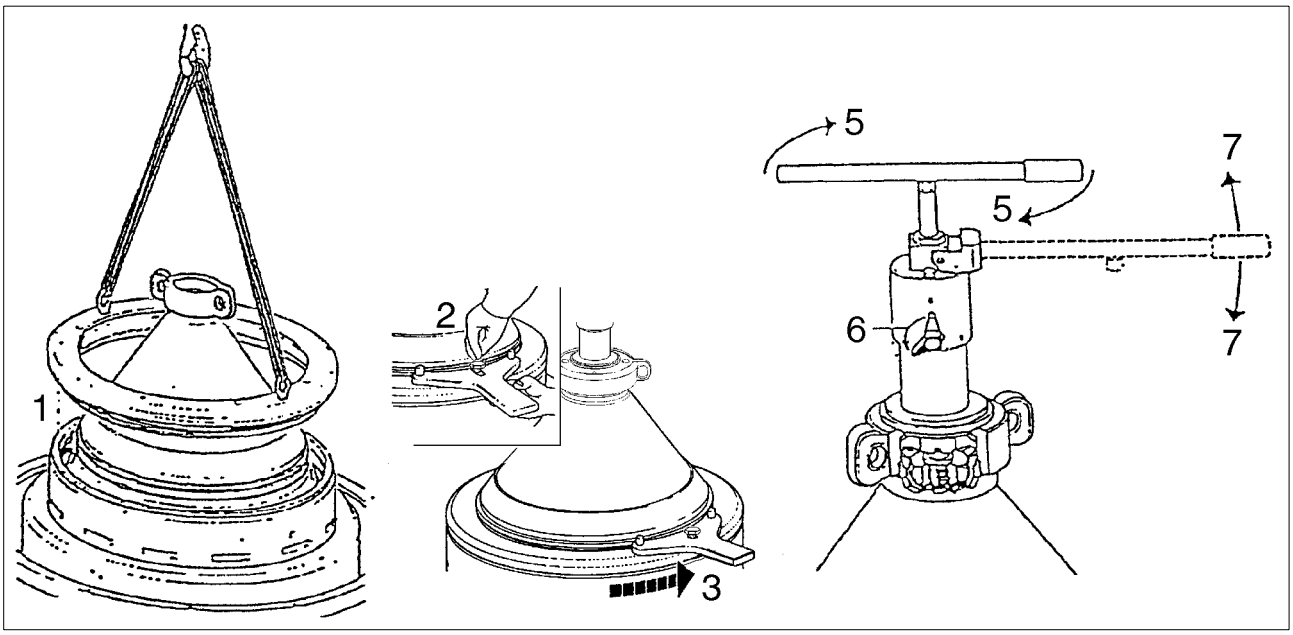
Important!

2. Make sure that the groove in the bowl hood enters the guide lug in the bowl body.



See “4.6.5 Check point - Lubrication” on page 97 in this chapter.

Large lock ring

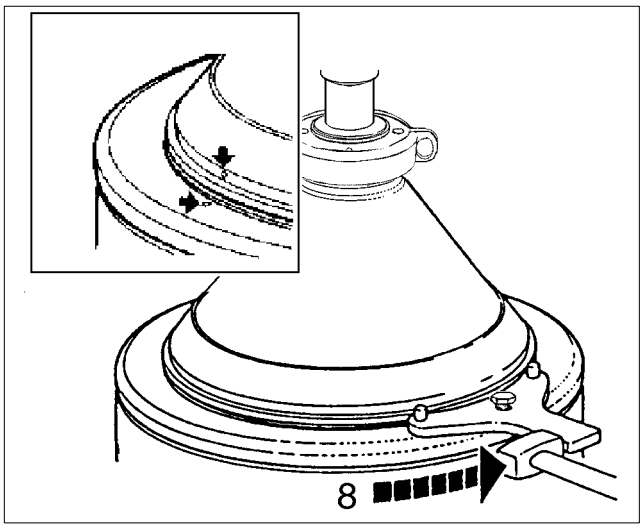


✔ **Check point**
See “ Disc stack” on page 107.

Lower the lock ring gently onto the bowl body (1). Fasten the lock ring spanner (2). Screw on the lock ring by hand as far as possible (3). Apply the compressing tool and carry out operations 5-6. Pump (7) and tighten the lock ring by hand (3) alternately a few times.

Ascertain that full pressure is obtained in the compressing tool.

As a rule the lock ring can be tightened by hand until the distance between the Ø-mark on the lock ring and that of the bowl hood is 20-30 mm. The final tightening is carried out by hitting the spanner handle (8) until the spanner handle feels stiff, then check that the Ø-marks are at least aligned with each other.

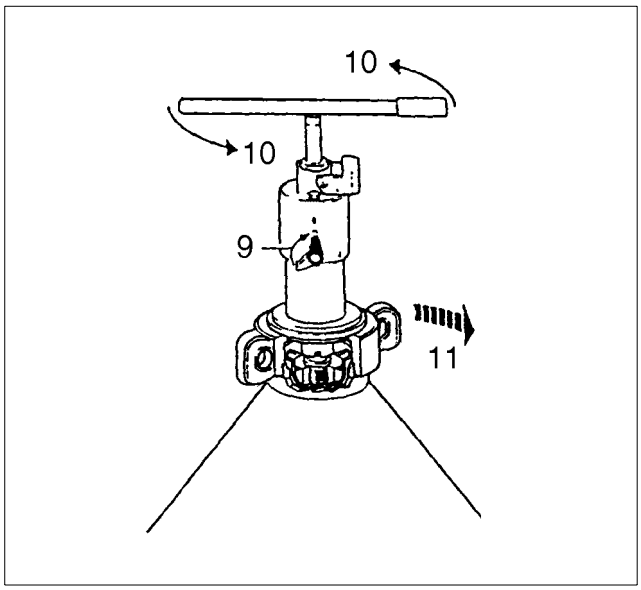


DANGER

Disintegration hazard

It is extremely important that the large lock ring is tightened properly to ensure calm running and avoiding parts coming loose.

Undo and remove tools. Operations (9-11).

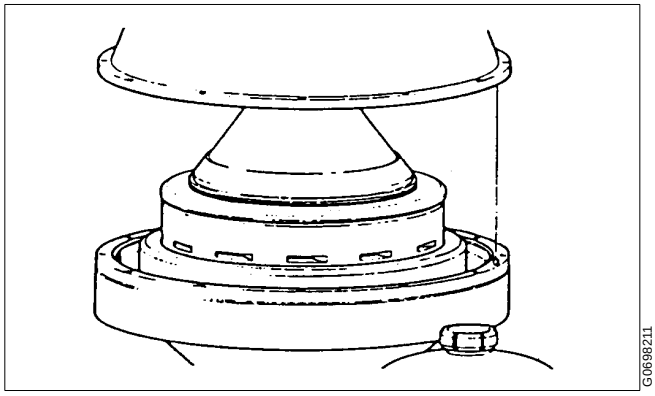


NOTE

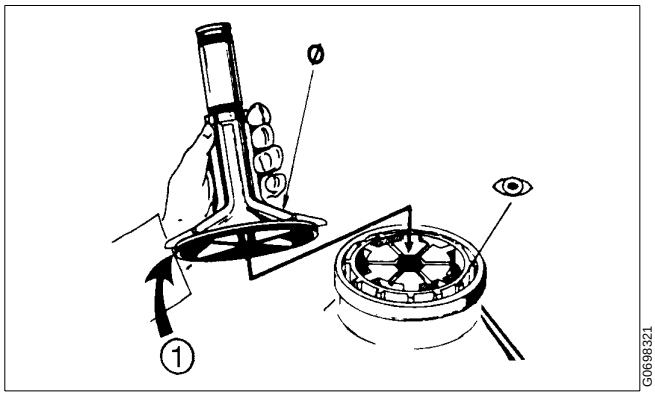
If the paring disc device for operating water also has been assembled, check its height setting by rotating the bowl by hand and make sure the latter rotates freely.

Outlet pipe - Guide sleeve - Small lock ring (Frame hood. Outlet)

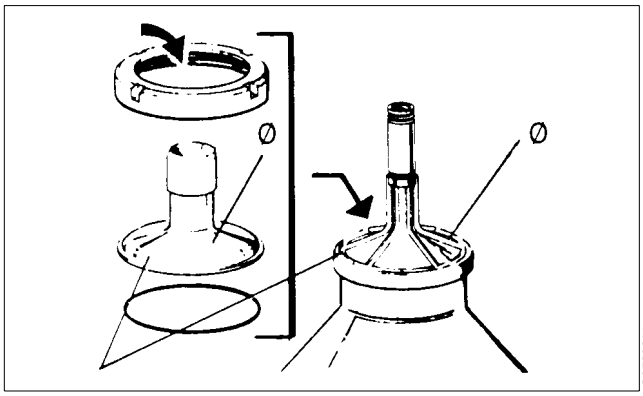
1. Note the angular positioning of the frame hood. Tighten the frame hood with the screws.



2. **Note**: Make sure that the seal ring (1) is undamaged. The outlet pipe is marked with a punch mark. This mark shall be aligned with the top disc drill mark when assembling (twin phase separators only).



3. The guide sleeve is marked with a punch mark. When fitting the guide sleeve on the outlet pipe, the punch marks shall be exactly aligned with each other (MRPX 614, 714, 518 and 618, twin phase).

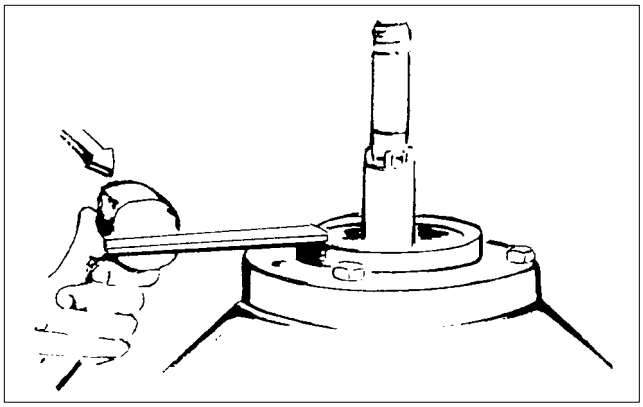


4. Tighten the small lock ring properly.

DANGER

Disintegration hazard

It is very important that the small lock ring is tightened properly to ensure calm running and avoiding parts coming loose.

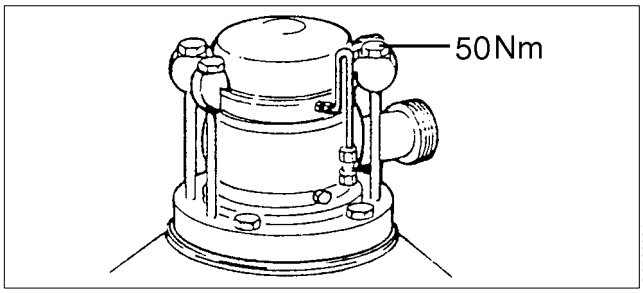


✔ **Check point**
Radial wobble of outlet pipe.

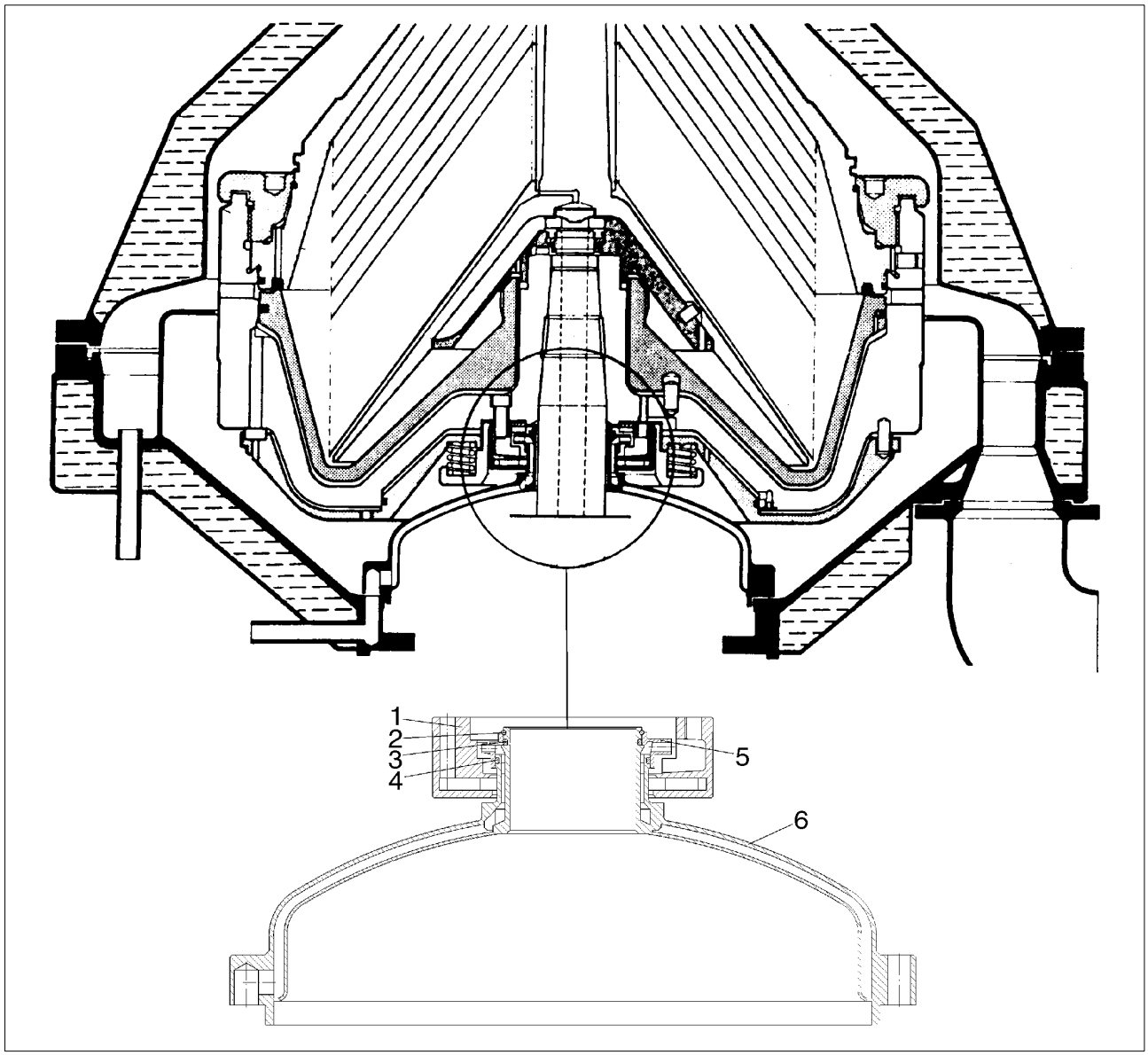
✔ **Check point**
When fitting, check eccentricity between outlet pipe and pump housing. See “ Checking eccentricity of outlet pipe / outlet housing” on page 57.

5. Assemble the outlet parts as instructed in chapter “4.3 Outlets (twin phase separators)” on page 47 or “4.4 Outlet (single phase separators)” on page 60.

   Note: The hook screws are tightened with a torque of **50 Nm** (5 kpm).

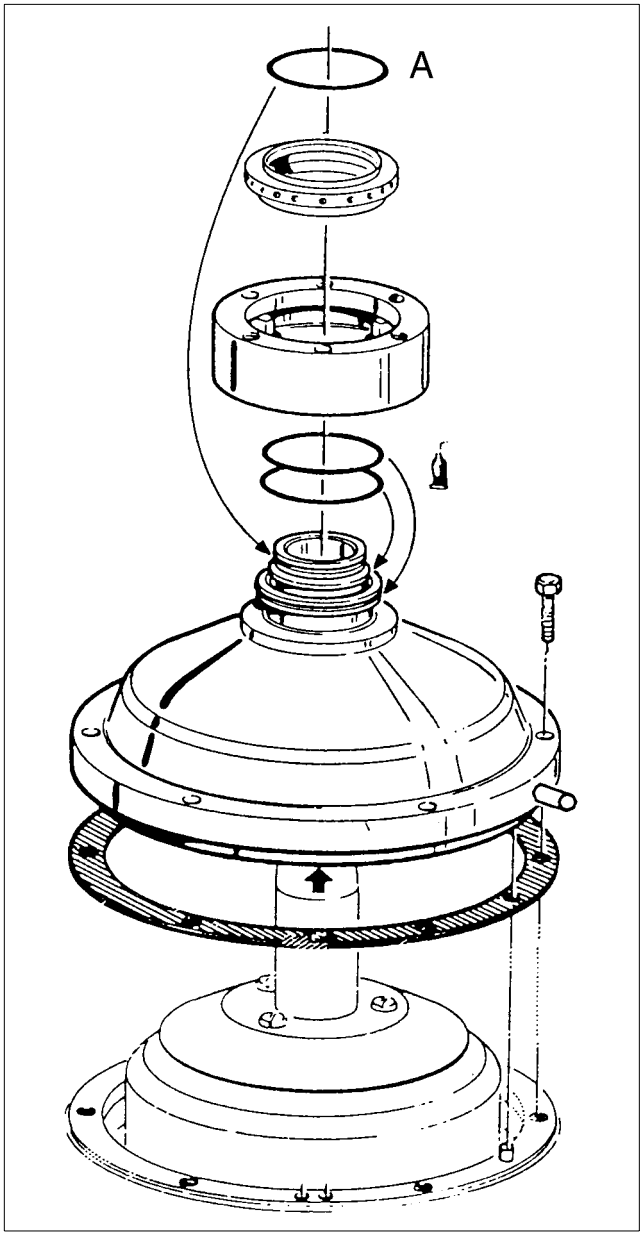


4.7 Paring disc device for operating water



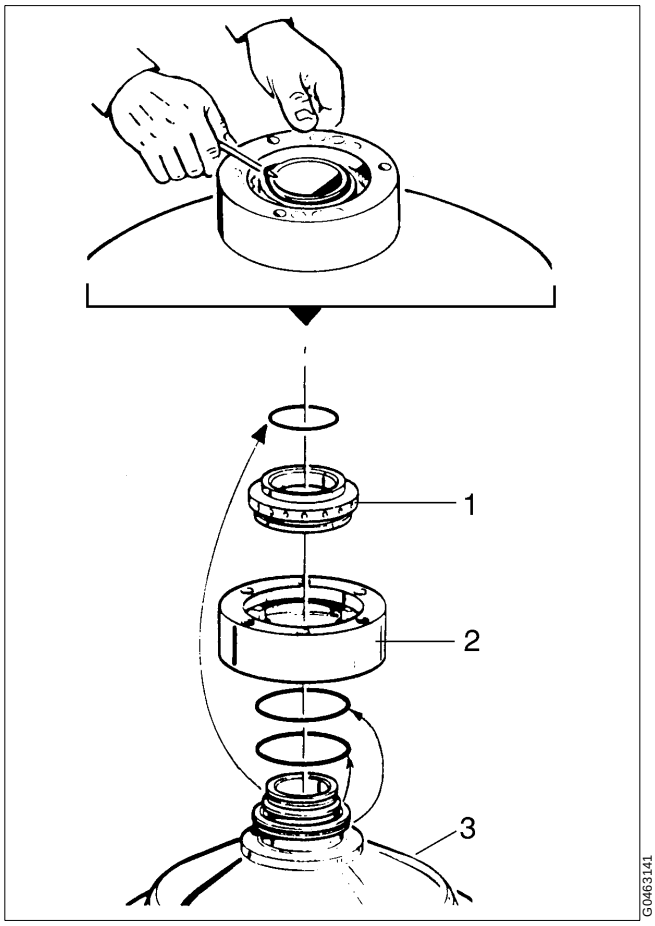
1. Distributing ring
2. O-ring
3. O-ring
4. O-ring
5. Control paring disc
6. Distributing cover

Apply lubricating grease of silicone type on to the two lower O-rings.
See “5.1 Lubricants” on page 178.
The upper O-ring (A), which has a locking function, must not be lubricated.



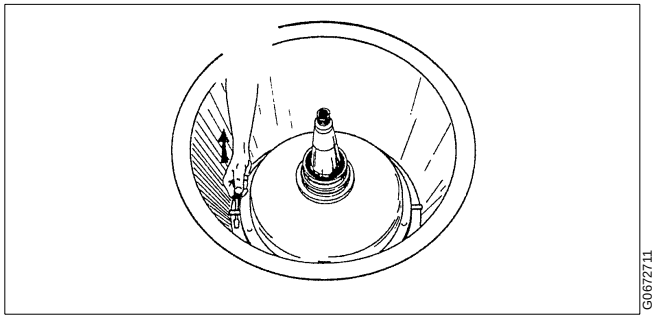
4.7.1 Disassembly

1. Tap the control paring disc carefully with a soft drift, so that the upper O ring is unloaded. Remove the O-ring with a small screwdriver or similar tool. Remove the control paring disc by lifting up the distributing ring.

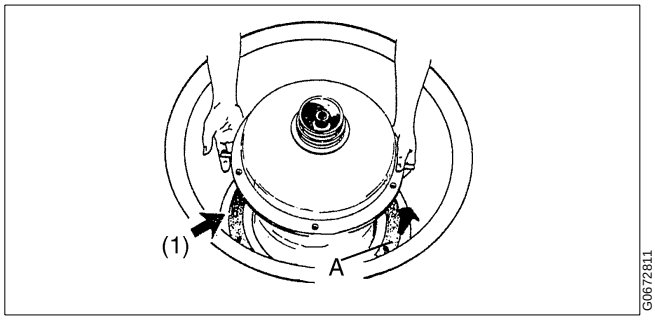


1. *Control paring disc*
2. *Distributing ring*
3. *Distributing cover*

2. Remove the distributing cover as shown in the figure.



3. Notice the guide pin (1).



A. *Height adjusting ring*

4.7.2 Check points - Assembly

Ducts

- Dirt and lime deposits in the ejection mechanism may cause bad ejecting function or none at all.

Clean all ducts with a soft iron wire or the like. Remove deposits on other surfaces with steel wool.

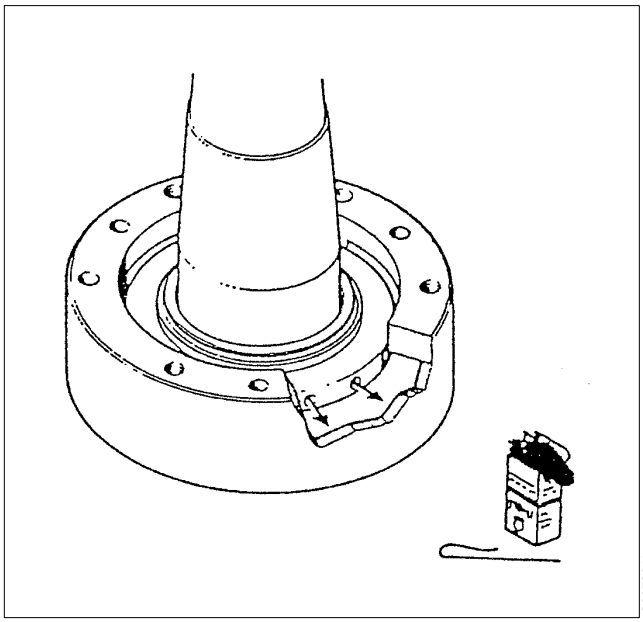
Rechecking water flow:

When the solenoid valve for make-up water is open, there should be **weak** water jets.

At operation the make-up water consumption is zero when the water pressure is less than 50 kPa (0,5 bar).

At discharge the water jets should be **strong** (1,5 - 3 litres / discharge).

Finally, when the machine is completely assembled, make a test run to make sure that the discharge function is in order.



Assembly

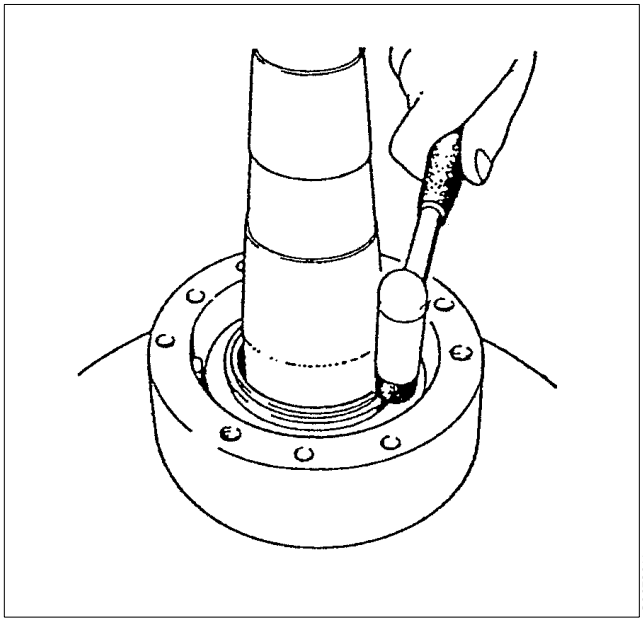
Assembly takes place by reversing the sequence of operations for disassembly. Observe the following:

The distributing cover is angularly positioned by a guide pin.

If it is difficult to press down the control paring disc in position by hand, knock it down cautiously by means of a plastic hammer.

Check that the uppermost O-ring (locking the paring disc) lies properly in its groove without being twisted.

In order to ensure a good sealing between the paring disc and the O-rings, jerk a few times in the distributing ring after assembly.



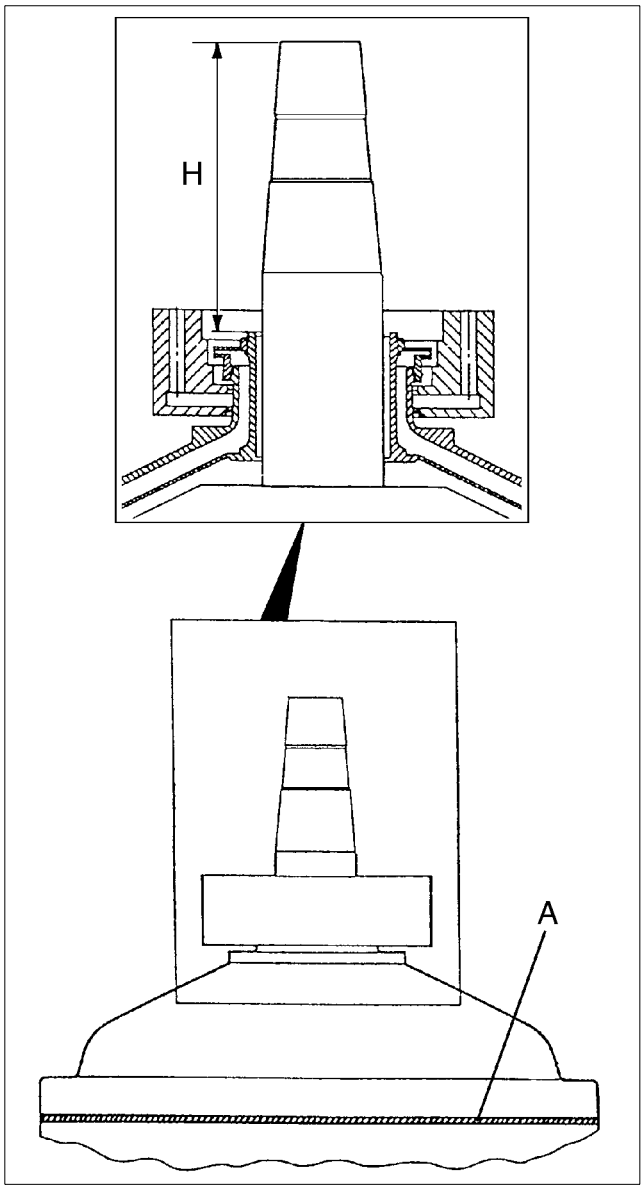
4.7.3 Height adjustment

Alfa Laval ref. 543759, rev. 0 / 539324, rev. 0

Check the height position after each assembly.

Use two steel rules or a depth gauge.

Any adjustment is made by means of one or more height adjusting rings **A** (1,0 mm thickness).



PX 614[1] and PX 714

H = 185 ±0,5 mm

PX 518[2], PX 618, PX 718 and PX 818

H = 223 ±0,5 mm

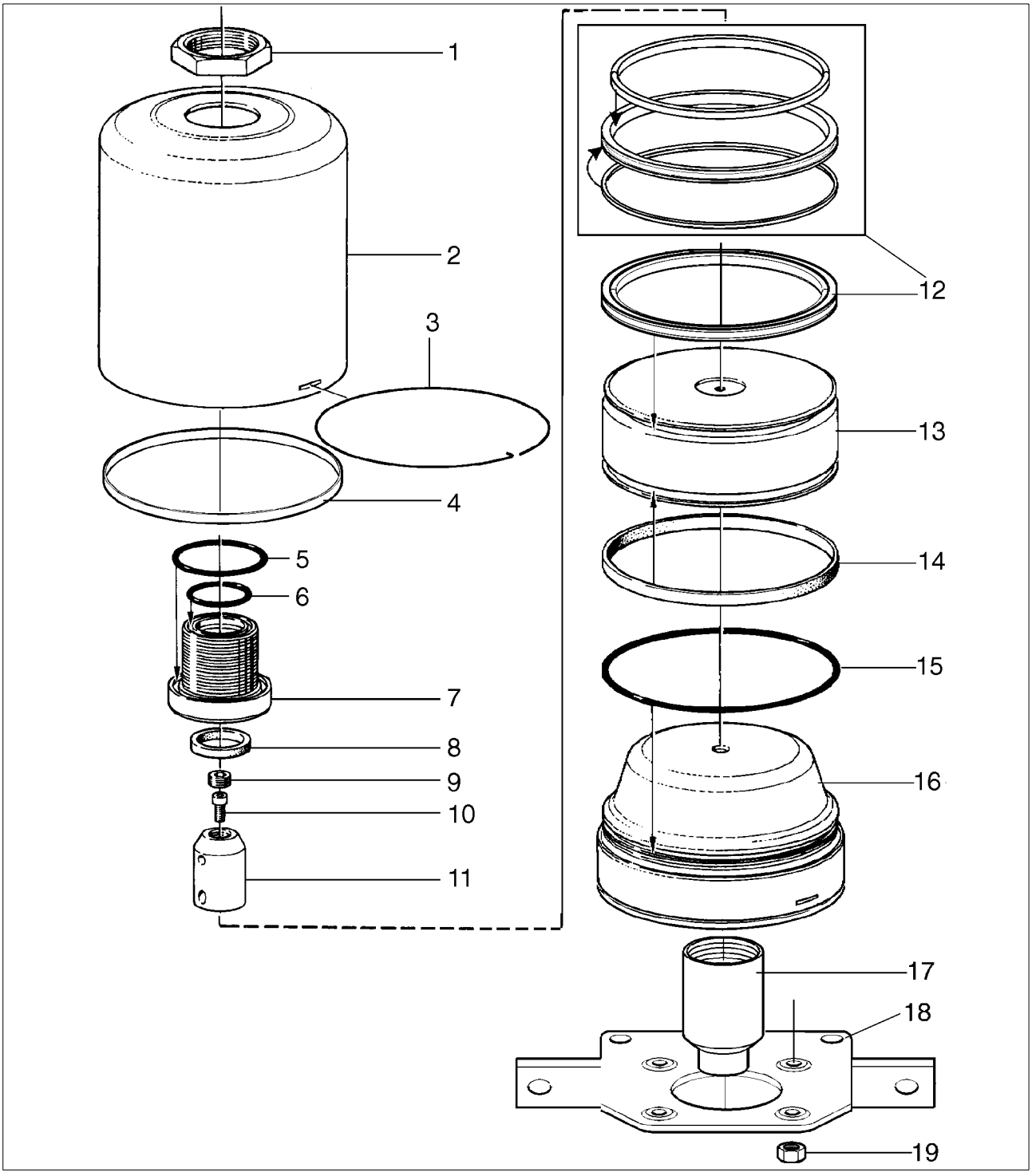
NOTE

Recheck the height position when the bowl has been mounted on the spindle by rotating the bowl by hand and make sure that it moves freely. A scraping noise may be an indication of incorrect positioning – readjust!

[1] For example H MR**PX 614**HGV
[2] For example C MR**PX 518**HGV

4.8 Operating water module (OWMC)

4.8.1 Exploded view



1. *Nut*
2. *Cylinder*
3. *Locking wire, upper*
4. *Garter strap*
5. *O-ring*
6. *O-ring*
7. *Outlet*
8. *Turcon variseal “M”*
9. *Nozzle*
10. *Screw*
11. *Two-pulse adapter*
12. *Turcon AQ-seal (3 pieces)*
13. *Piston*
14. *Turcite slidering*
15. *O-ring*
16. *Air tank*
17. *End protection*
18. *Bracket*
19. *Nut*

4.8.2 Dismantling (MS service)

The figures within brackets refer to the exploded view on page 124.

When dismantling, the OWMC Service kit is needed.

1. Shut off the air and operating water supply to the OWMC.

DANGER

Crush hazard

Never dismantle the OWMC when pressurized.

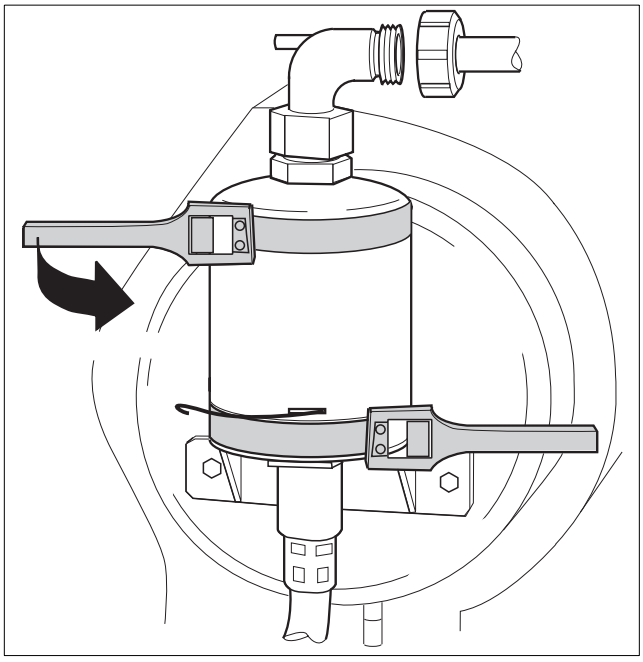
2. Remove the connections for operating water.

NOTE

The Air tank (16) must only be dismantled by Alfa Laval personel.

3. Turn the cylinder (2) anti-clockwise relative to the air tank (16). The upper locking wire is thereby forced out.

   Use two belt wrenches when turning the cylinder, see the illustration. The lower tool prevents the air tank from rotating.



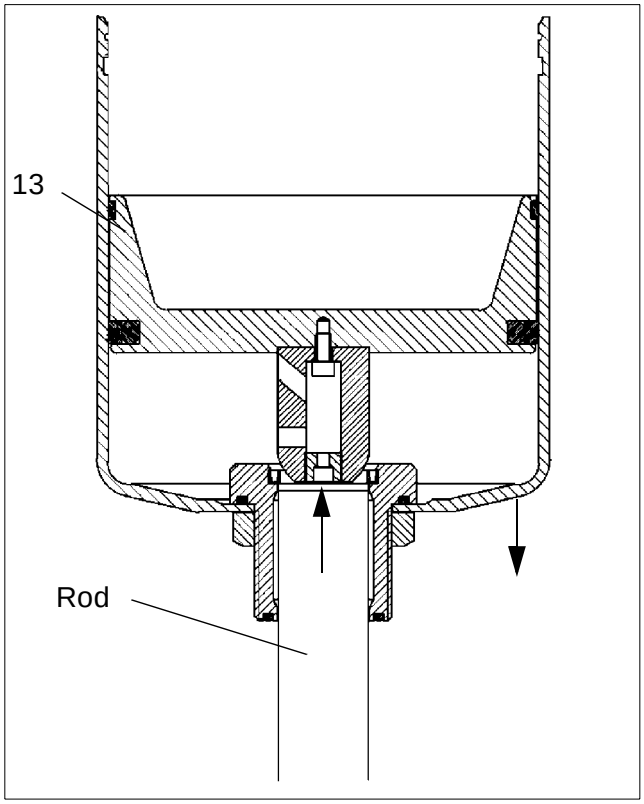
NOTE

Be careful to keep the cylinder straight against the air tank.

NOTE

In order not to damage the water tank, make sure to place the upper wrench at the top of the water tank, as illustrated.

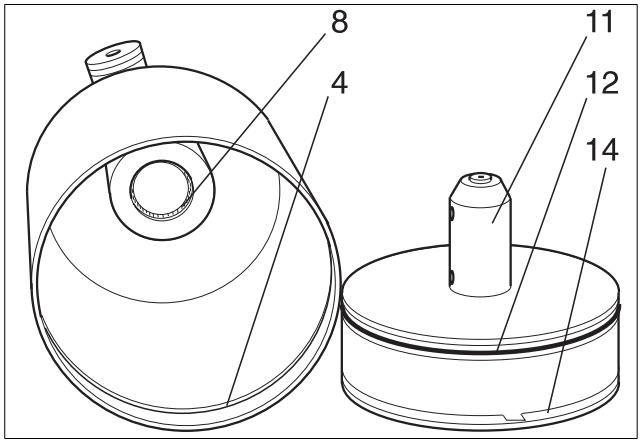
4. Pull off the cylinder (2)
5. Carefully press the piston (13) out of the cylinder using a soft rod or similar.



4.8.3 Check points

Clean and check the condition of the dismantled parts.

- Check the cylinder (2), piston (13) and two-pulse adapter (11) for scratches and scuffing marks.
- Renew the garter strap (4) fitted inside the cylinder.
- Renew the piston seal rings (12 & 14) and the seal (8) which are included in the service kit for the module.
- Renew all other parts included in the service kit.

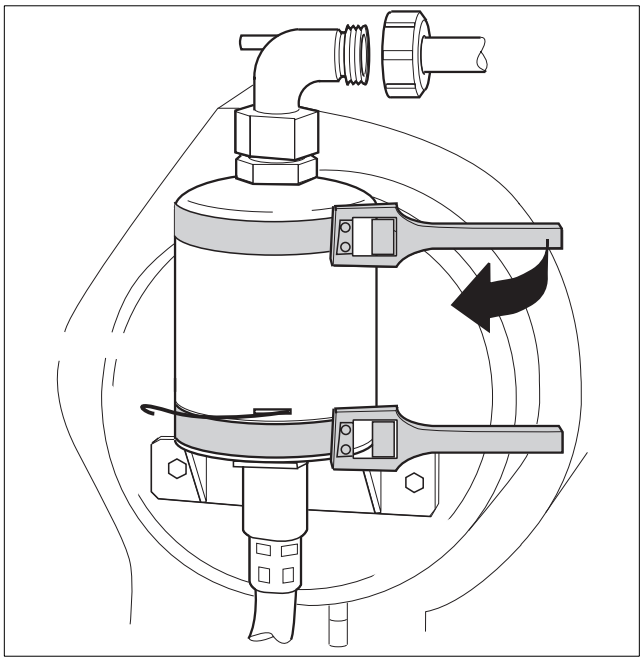


4.8.4 Assembly (MS service)

1. Check that the piston and inside of the cylinder are well cleaned.

   Lubricate the inside of the cylinder with the grease included in the Service kit for OWMC.

2. Assemble the OWMC unit opposite the dismantling.

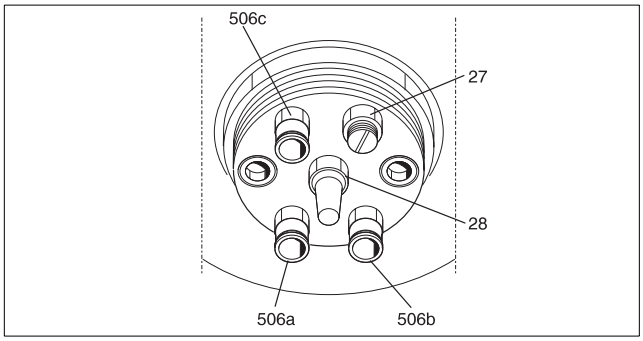


NOTE

Make sure that the hole in the groove (for the locking wire end) on the air tank can be seen through the slot on the cylinder.

3. Lubricate the locking wire with the grease included in the Service kit for OWMC.
4. Place the locking wire end in the hole in the air tank. Secure the cylinder to the air tank with the locking wire by turning the cylinder clockwise relative to the air tank until the hook on the locking wire reaches the groove.

5. Fit water and air connections.
6. Turn on the air and operating water supply. Check that there are no leakages.



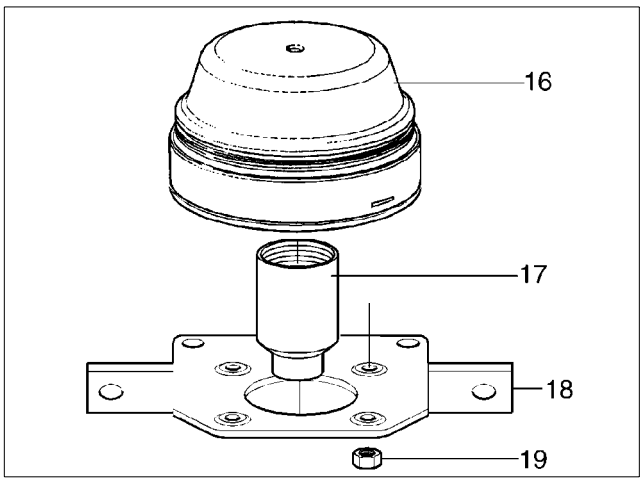
See connection list in the Installation Manual

4.8.5 Air tank

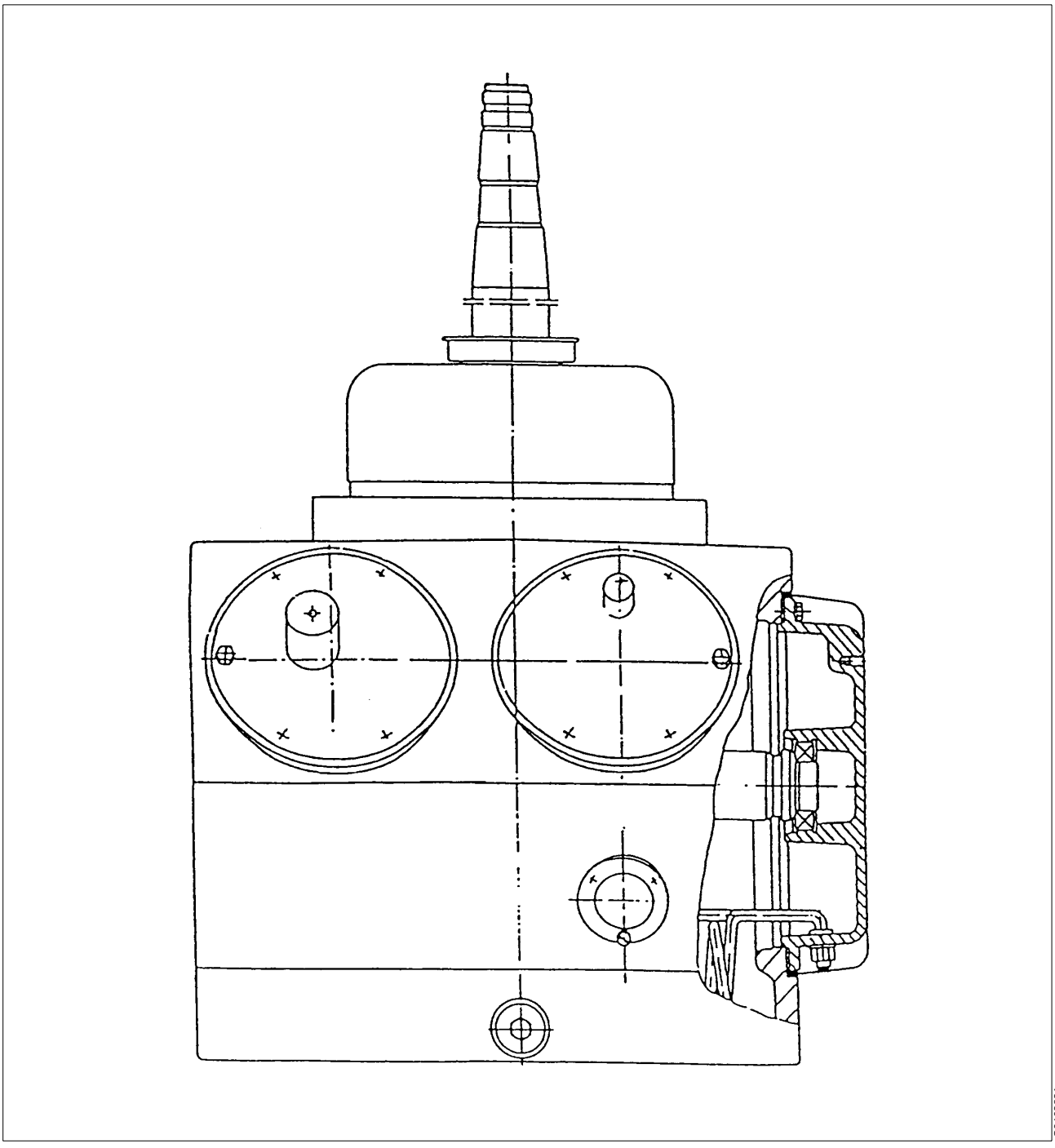
If the air tank has to be dismantled (i.e. repair) it is removed by removing the nuts (19).

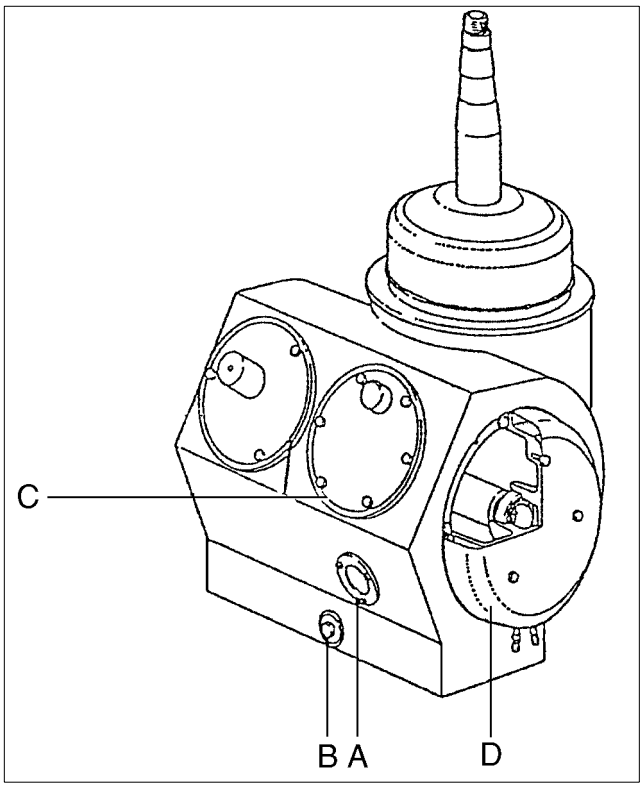
NOTE

If problems are related to the Air tank (16), always contact Alfa Laval representative.

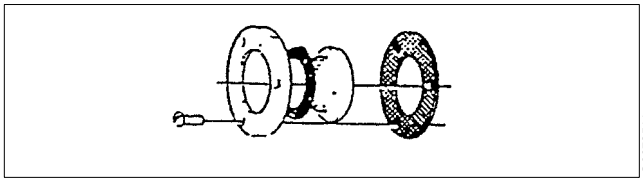


4.9 Frame parts

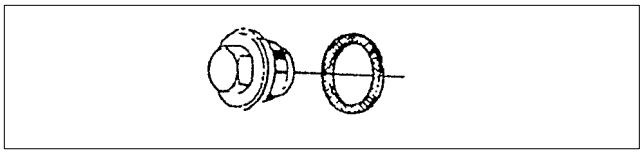




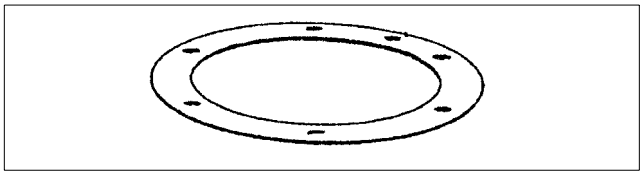
A. Oil gauge glass



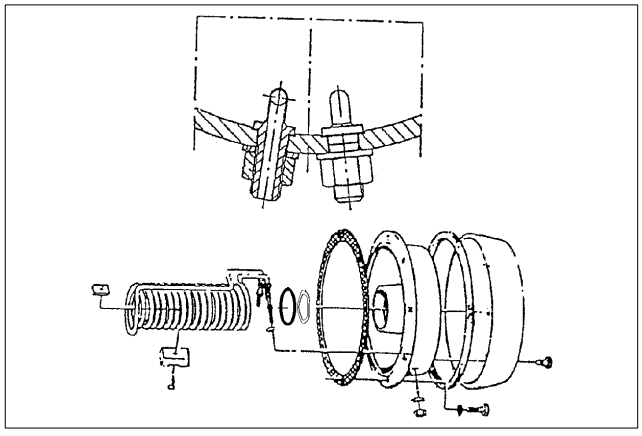
B. Oil drain plug



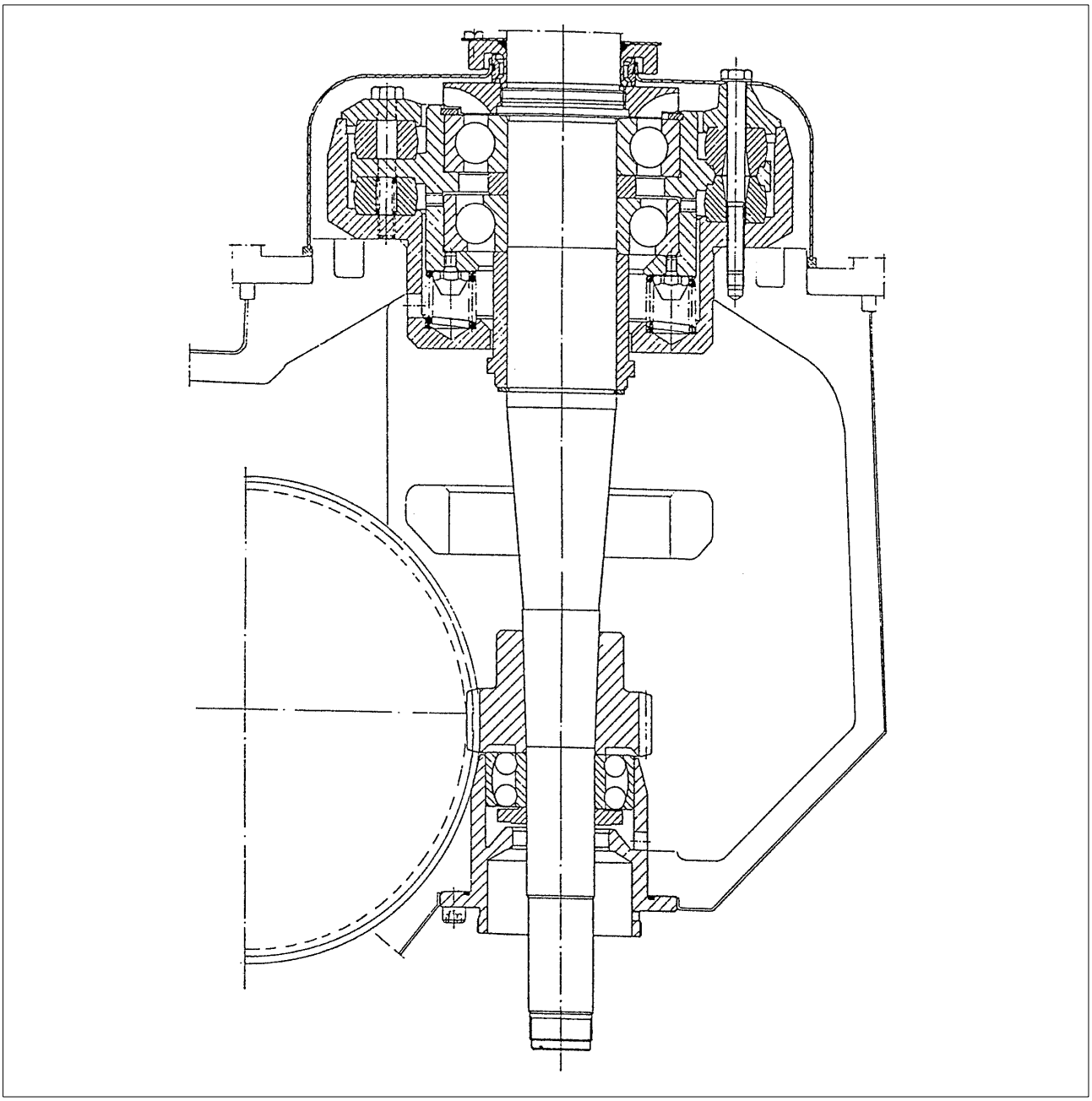
C. Gasket for brake protecting cover and worm wheel guard

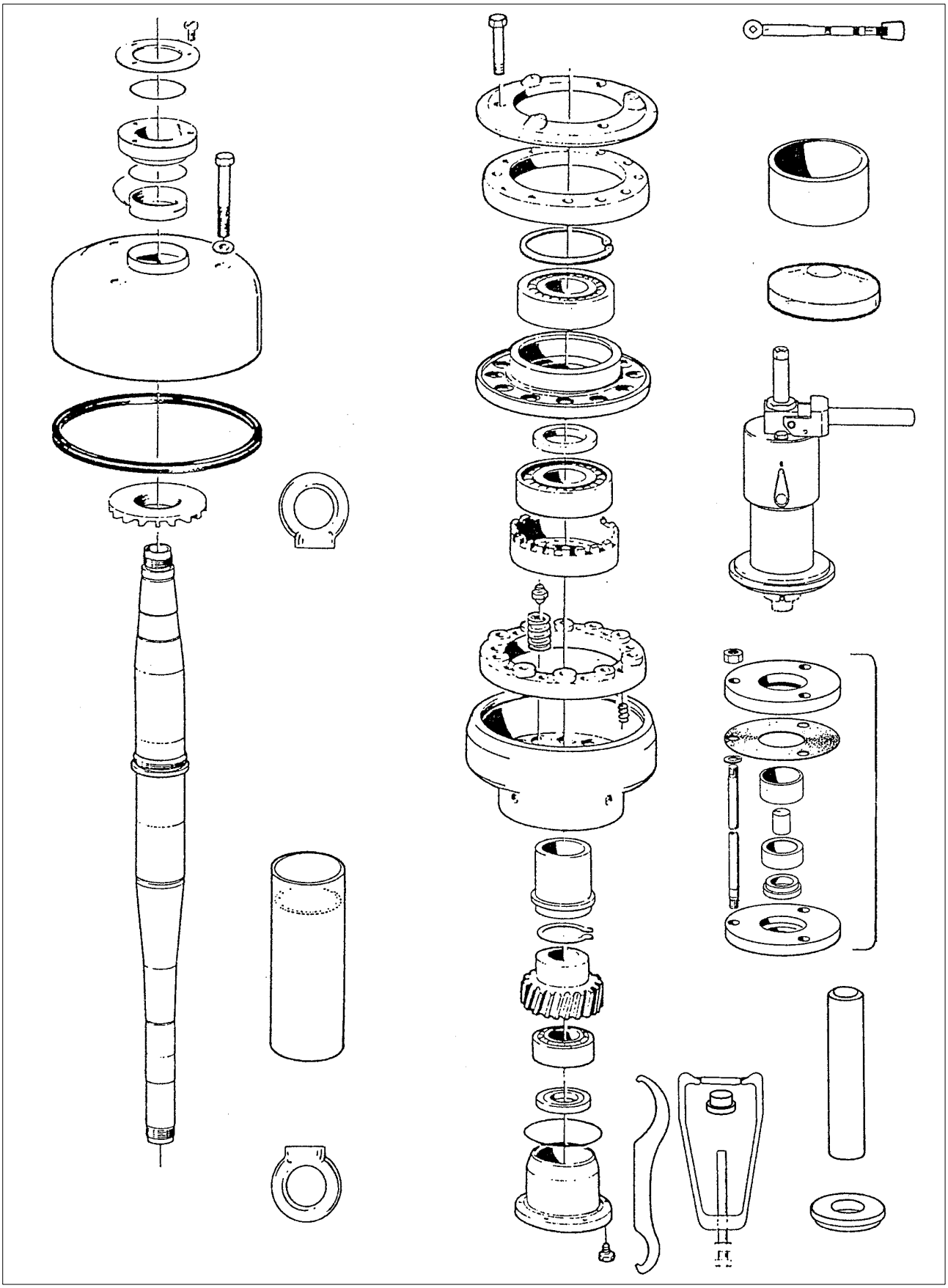


D. Cooling coil
Bearing shield



4.10 Vertical driving device

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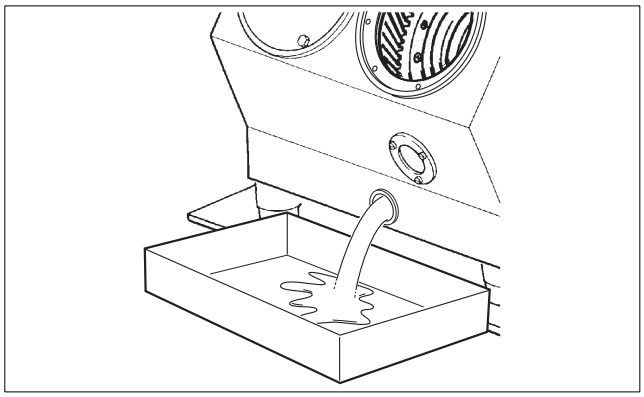
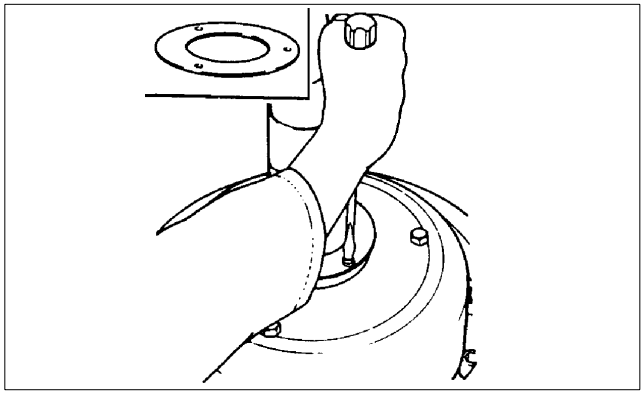
4.10.1 Disassembly

Drain off oil from worm gear housing. The assembly is then accessible after the following parts have been removed in the order stated:

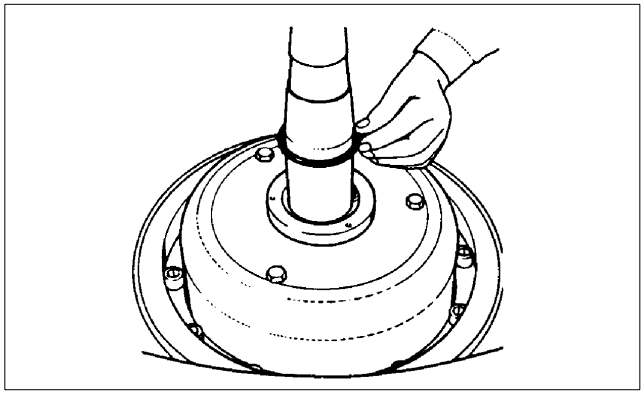
- Outlet
- Frame hood
- Inlet
- Separator bowl and control paring disc device for operating water



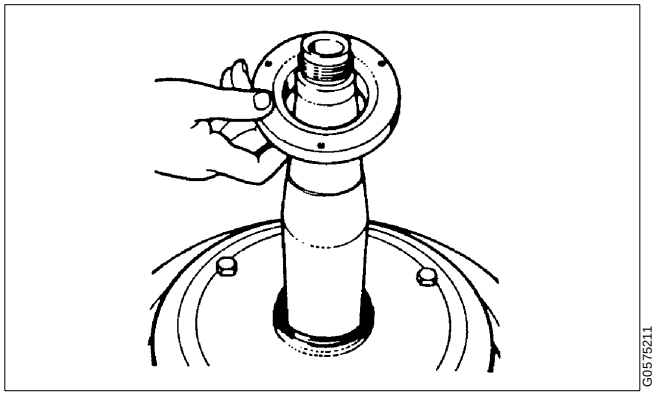
1. Unscrew the three screws and remove the protecting plate.



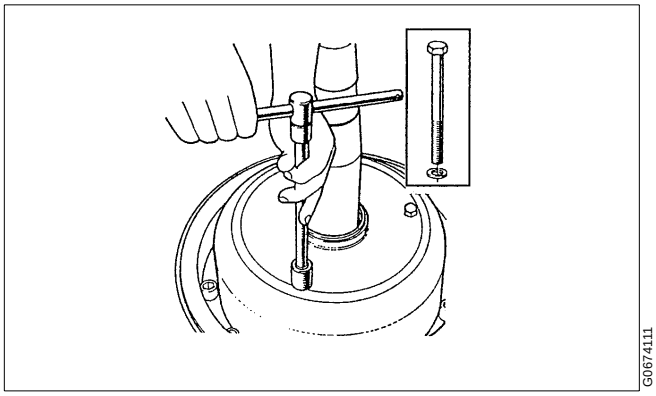
2. Remove the O-ring fitted above the protecting collar.



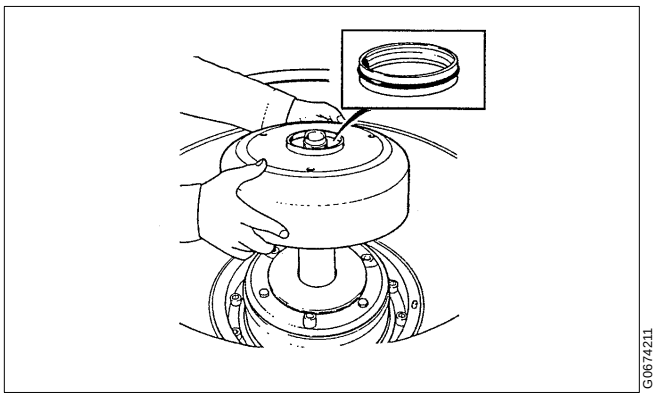
3. Pull off the protecting collar – there are no threads.



4. Unscrew the three screws and remove the guard.

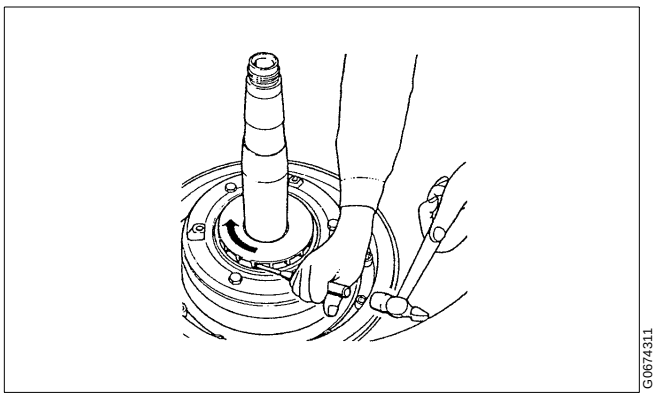


5. Remove the seal fitted in the guard.

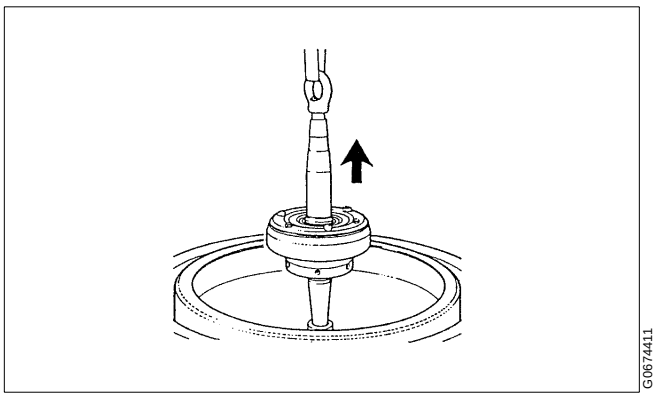


6. Remove the oil fan by hitting with light blows on the wings.

   Left-hand thread!



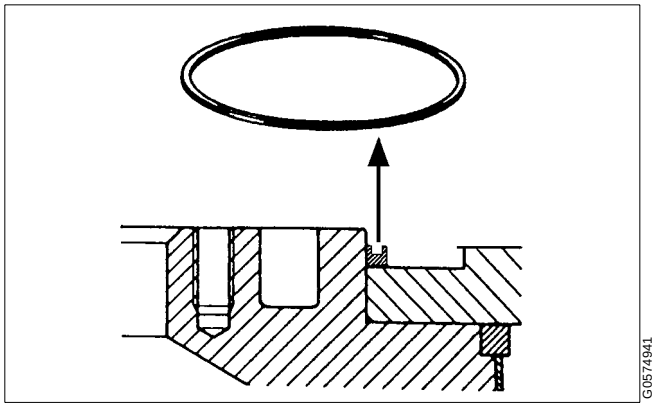
7. To avoid damaging the teeth when lifting the bowl spindle, lift slowly and with great care.



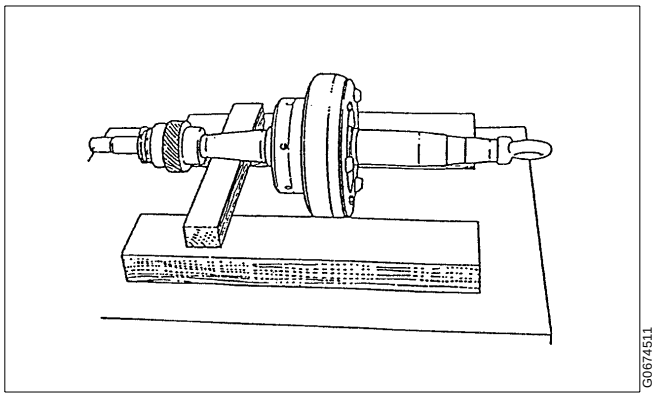
NOTE

Never lift anything but the vertical driving device with the spindle lifting eye.

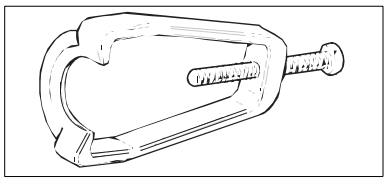
8. Remove the seal ring.

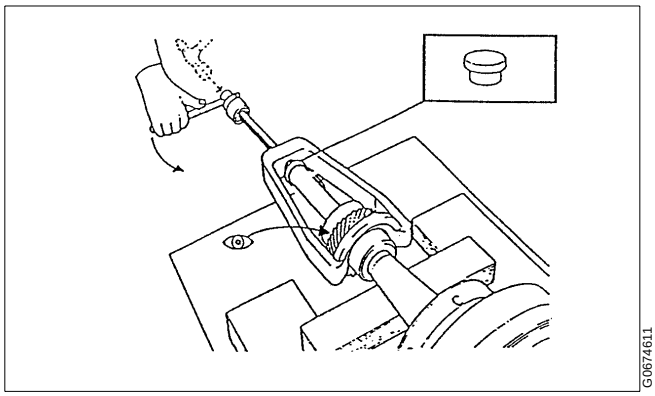


9. Make a wooden support to be used during certain sub-operations



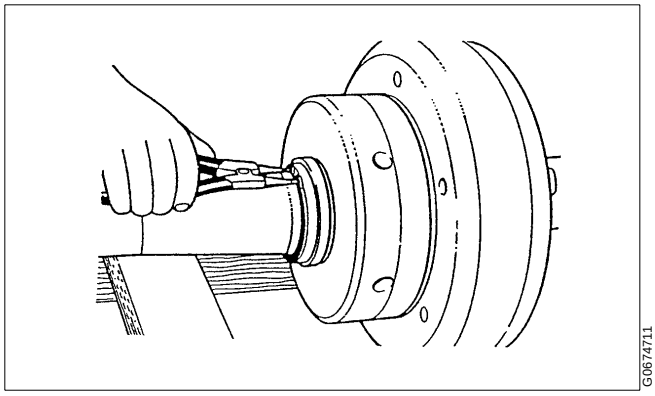
10. Place the plug (included in the tool kit) in the end of the hollow spindle.
Fit the puller tool and pull off the protecting collar, the ball bearing and the worm. Now and then hit on the head of the centre screw.



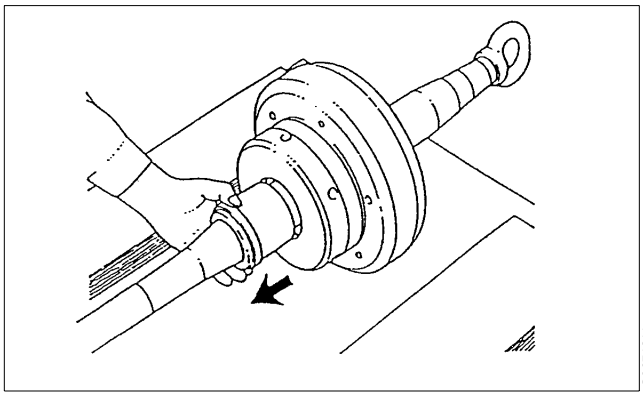


Wear of teeth “4.10.5 Examples of various tooth appearances after operation” on page 154.

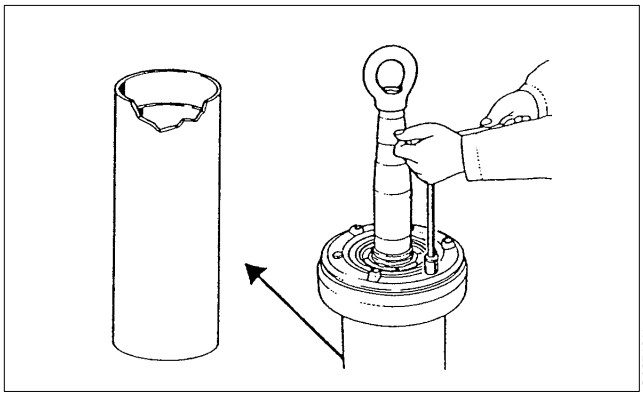
11. Remove the snap ring.



12. Just pull – there are no threads.



13. Place the spindle in the tube included in the set of tools. Loosen the screws of the top bearing cover alternately and a little at a time. Remove the cover.

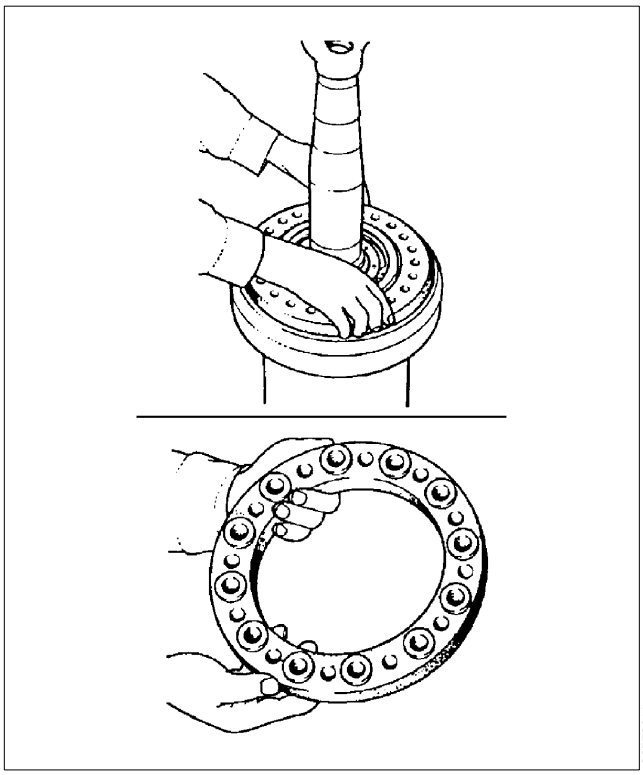


WARNING

Risk for eye injury by flying snap ring

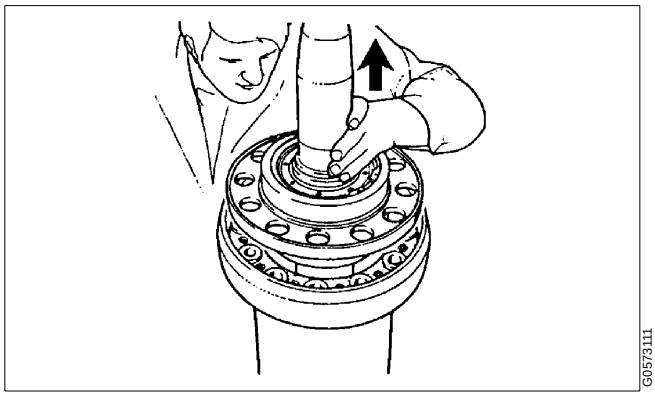
Use the correct pliers for dismantling and assembly of snap ring to avoid accidental release.

14. Remove the upper rubber buffer (not provided with springs).

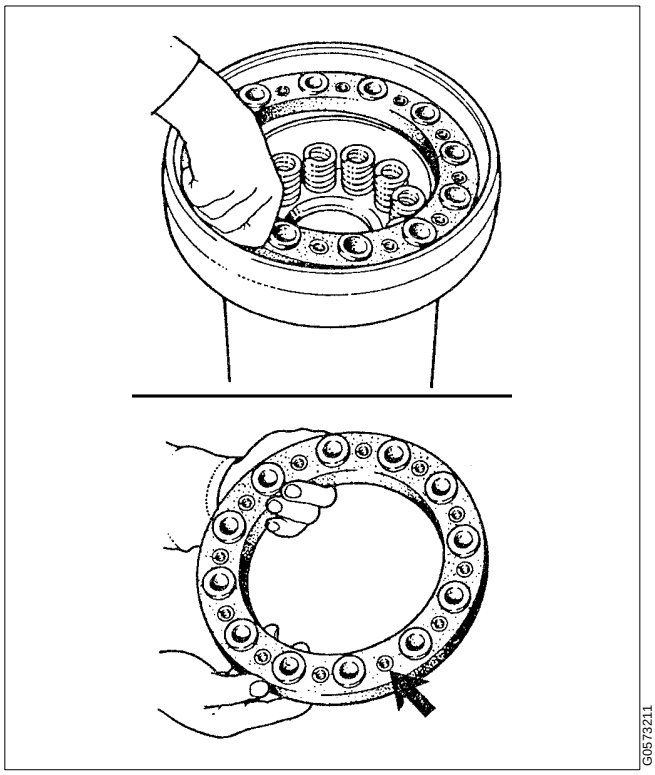


The upper rubber buffer is not provided with springs

15. Lift the spindle out of the spring support.



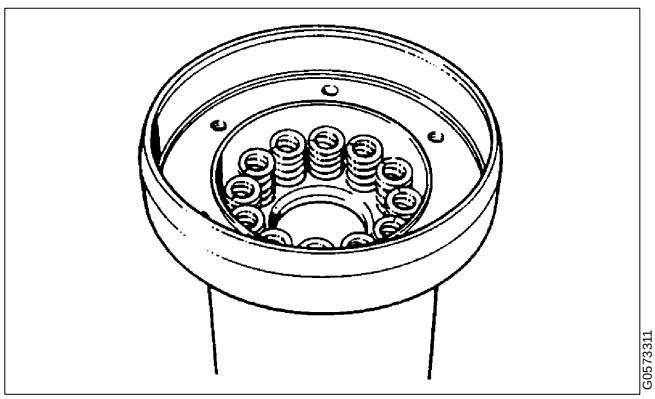
16. Remove the lower rubber buffer (provided with springs) from the top bearing support.

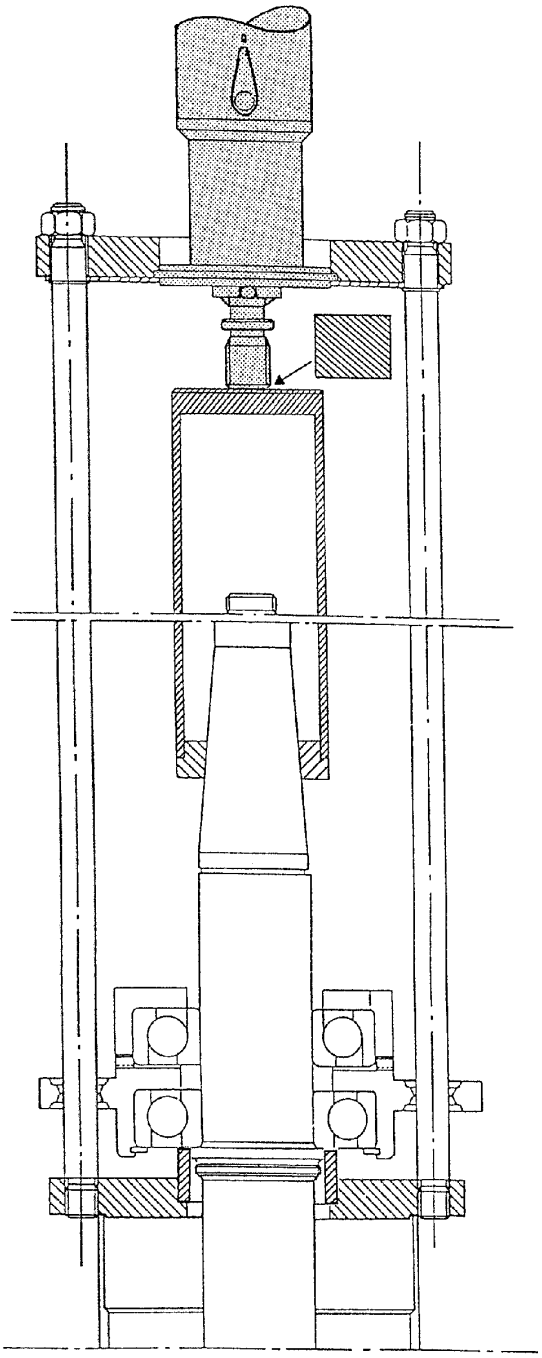


The lower rubber buffer is provided with springs.

17. Remove the springs from the top bearing support.

18. Then remove the top bearing support from the mounting tube.





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19. Disassembly of top bearings support from the spindle.

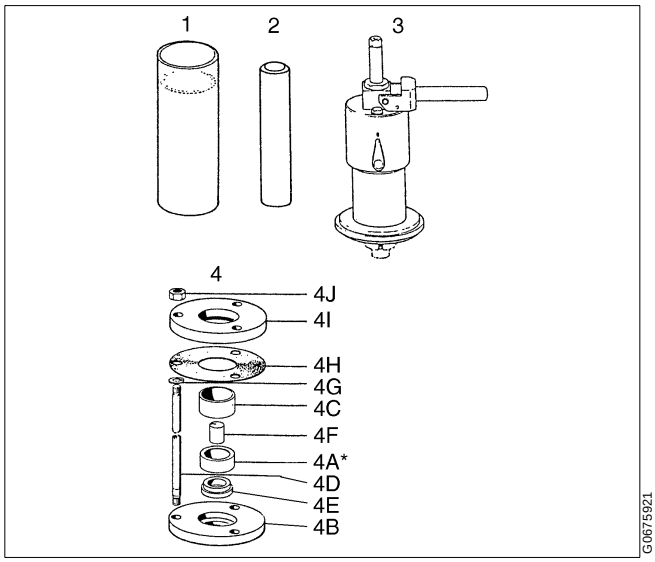
Tools:

1. Tube	544288-01
2. End tube	531296-81
3. Compressing tool	543135-06
4. Disassembly and assembly tool	545540-80

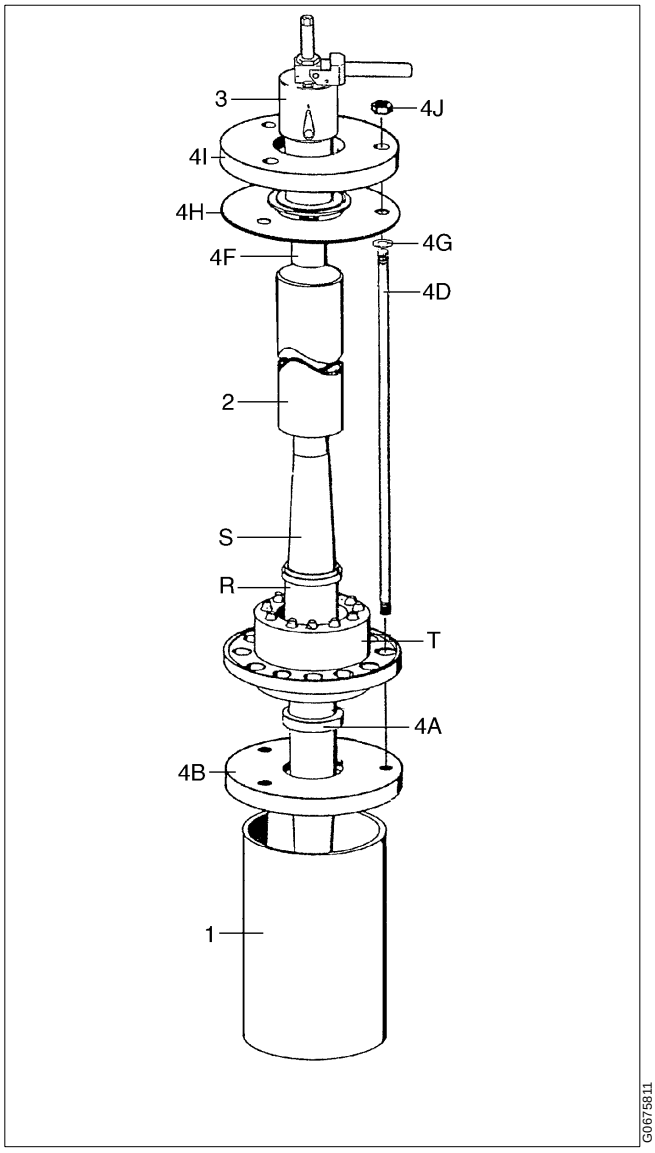
- Arrange the tube (1) on a firm support. Fill the tube with rags to protect the spindle from damage when pressing out.
- Fit the bottom plate (4B) on the tube (1).
- Fit the sleeve (4C) with inside diameter Ø 90 mm on the bottom plate (4B).
- Place the spindle (S) upside down in the bottom plate (4B). Check that the inner race of the ball bearing is in contact with the face of the sleeve (4C).
- Mount the three rods (4D) by fitting them through the holes in the top bearing support (T) and screwing them into the bottom plate (4B).
- Fit the support ring (4E) on the spindle (S). **Note**! The inside diameter of this ring is tapered.
- Fit the end tube (2) over the spindle (S) and let it rest on the support ring (4E).
- Check that the retaining rings (4G) have been fitted. Then fit the washer (4H) for the compressing tool (3) onto the rods (4D).
- Fit the compressing tool (3). **Note**! The piston must be in the top position.
- Fit the top plate (4I) and secure the assembly with the three nuts (4J).
- Arrange the handle of the compressing tool (3) in Pos. 2 and then pump until the piston has reached the bottom position.
- Bring the handle into Pos. 1 and pump until the piston reaches its upper position.
- Place the spacer (4F) between piston and end tube (2).
- Set the handle to Pos. 2 again and continue to pump until the spindle is fully apart from the ball bearings.

NOTE

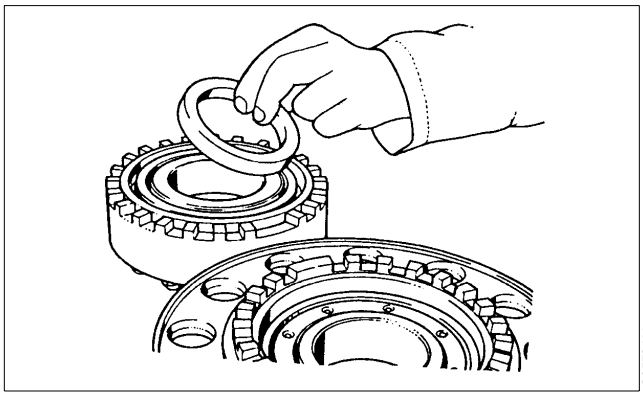
Pump slowly during the final stage of pressing out to avoid damage to the spindle when this is released.



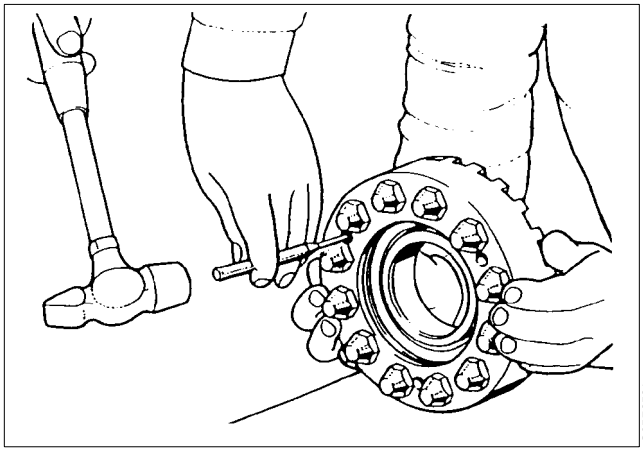
* *Not used during disassembly*



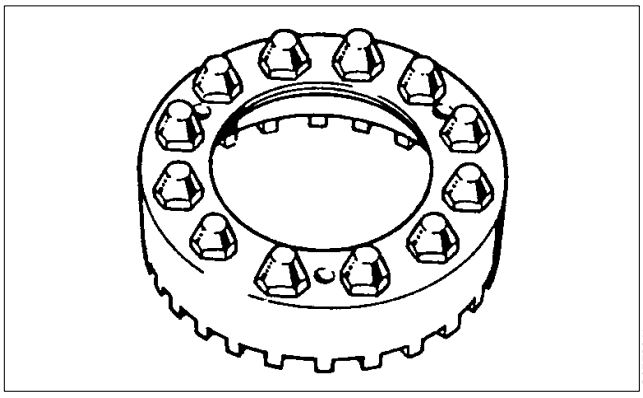
20. The parts removed are the upper and lower ball bearing housings and the spacing sleeve.



21. Force out the ball bearing.



22. Check the guide pins. Replace any damaged pins but do not loosen the others.

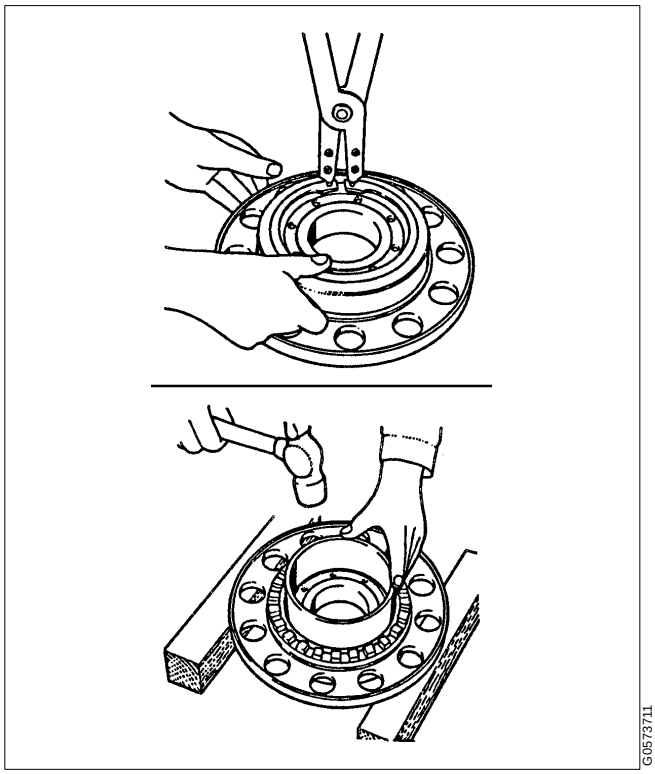


23. Remove the snap ring.
    Force out the ball bearing.

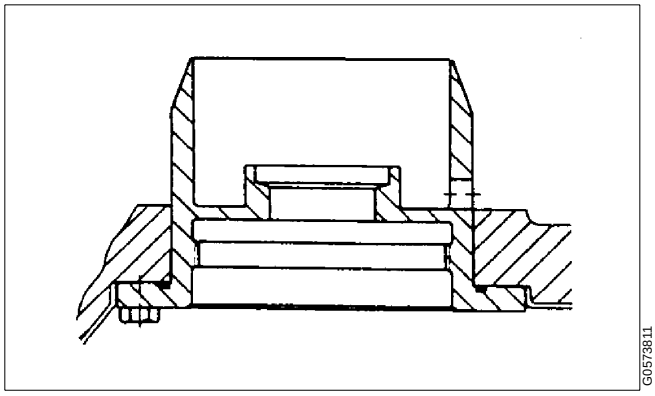
WARNING

Risk for eye injury by flying snap ring

Use the correct pliers for dismantling and assembly of snap ring to avoid accidental release.



24. The bottom bearing housing should normally remain sitting in the frame. It should be dismounted only when it is necessary to replace it, when its O-ring must be replaced or when the separator is to be reconditioned.



4.10.2 Assembly

Note!

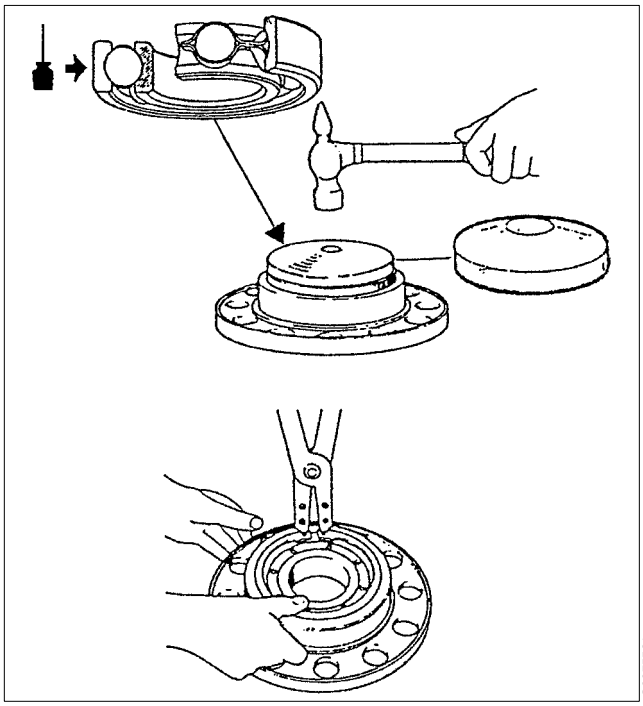
- The deep groove ball bearing is to be fitted in the upper housing and the angular contact ball bearing in the lower one.
- Before fitting the bearings, wipe off the bearing seats of the spindle and apply some oil to the seats.
- See chapter “2.9 Ball and roller bearings” on page 29.

1. Lock the upper ball bearing with the snap ring.

WARNING

Risk for eye injury by flying snap ring

Use the correct pliers for dismantling and assembly of snap ring to avoid accidental release.

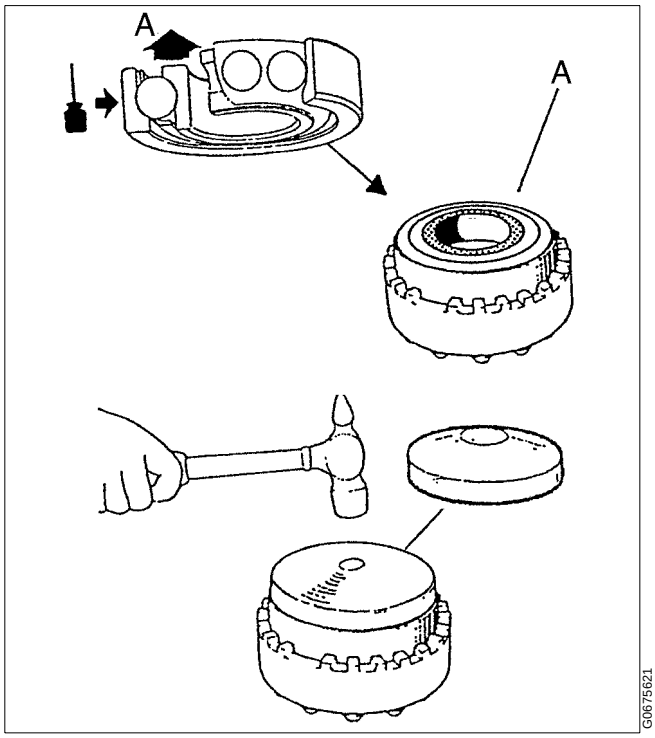


Fitting the deep groove ball bearing

2. Apply the mounting washer and force the ball bearing in position.

   Important:

   Turn the angular contact ball bearing the right way - the **wide** shoulder of the **inner** race must face upwards (A).

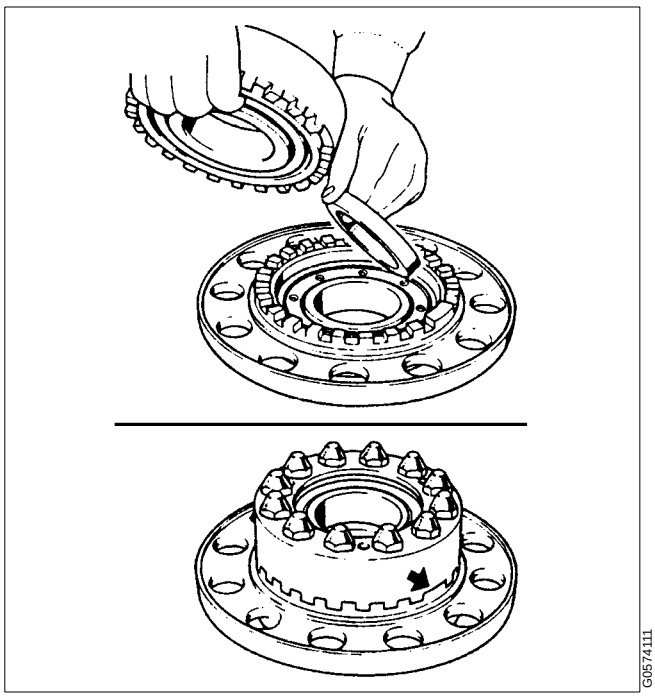


Fitting the angular contact ball bearing

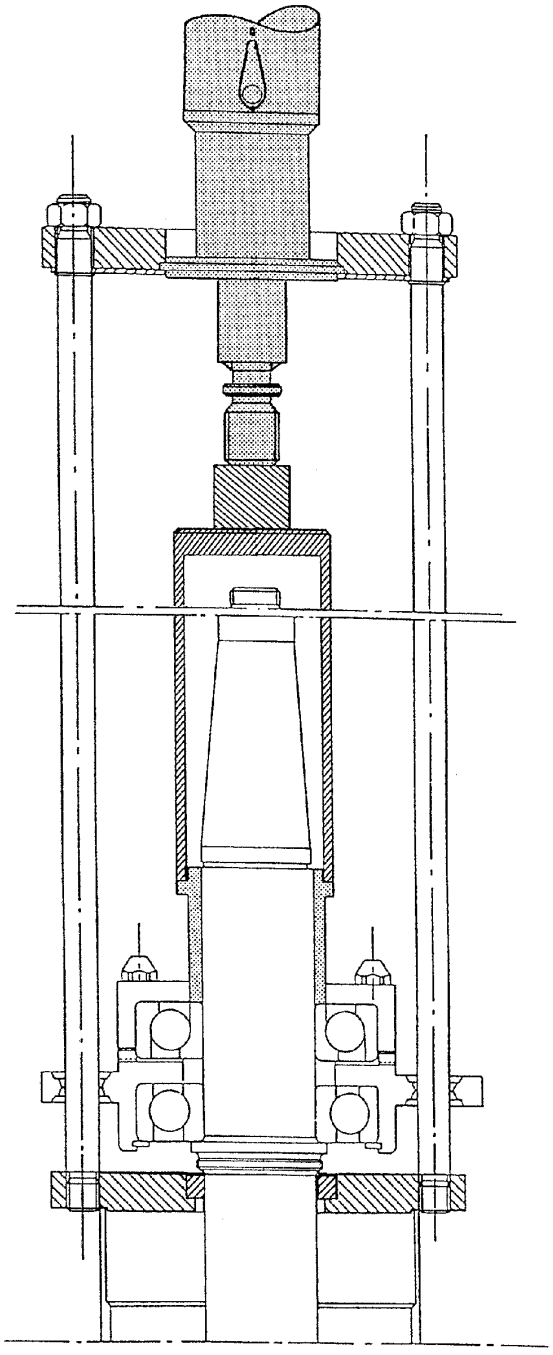
NOTE

A bearing of this kind turned upside down cannot carry any load. It collapses when loaded resulting in breakdown of the machine

3. Assemble the two housings and the space sleeve into a unit.



Assembly of the bearing housing
One tooth and the corresponding recess is wider than the others



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4. Assembly of top bearings on the vertical drive

Tools to be used:

1. Tube	544288-01
2. End tube	531296-81
3. Compressing tool	543135-06
4. Disassembly / Assembly tool	545540-80

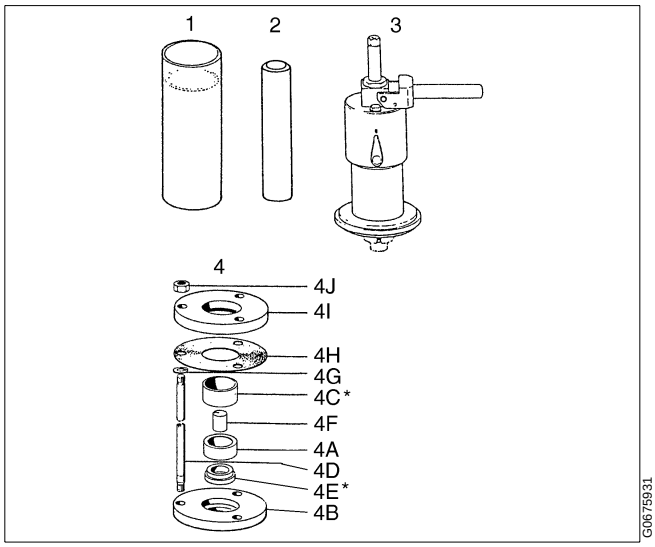
- Arrange the tube (1) on a firm support.
- Fit the bottom plate (4B) on the tube (1).
- Fit the ring (4A) with inside diameter Ø 77 mm in the bottom plate (4B).
- Place the spindle (S) upside down in the bottom plate (4B). **Note**! The collar on the spindle (S) must be resting on the ring (4A).
- Fit the ball bearing housing (T) onto the spindle (S). Note! The top bearing is to be mounted upside down. See fig.
- Mount the sleeve (R), which must be in contact with the inner race of the ball bearing.
- Fit the end tube (2) on the sleeve (R).
- Screw the three rods (4D) into the bottom plate (4B).
- Check that the retaining rings (4G) have been fitted. Fit washer (4H), compressing tool (3) and top plate (4I). Secure the assembly by tightening the three nuts (4J).

Arrange the handle of the compressingcompressingcompressing tool (3) in Pos. 2 and pump until the piston has reached the bottom position.

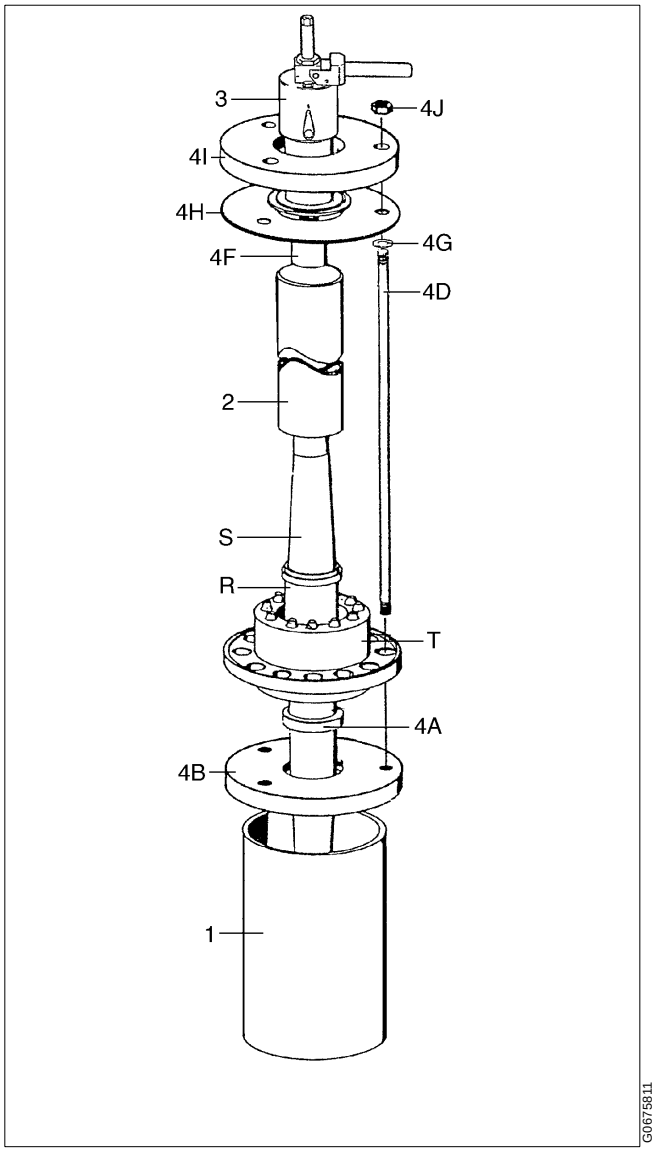
Move the handle to Pos 1. Pump up the piston into the top position.

Place the spacer (4F) between end tube (2) and piston of the compressing tool (3). Bring the handle to Pos. 2 and continue compressing until the inner race of the ball bearing is in contact with the collar on the spindle (S).

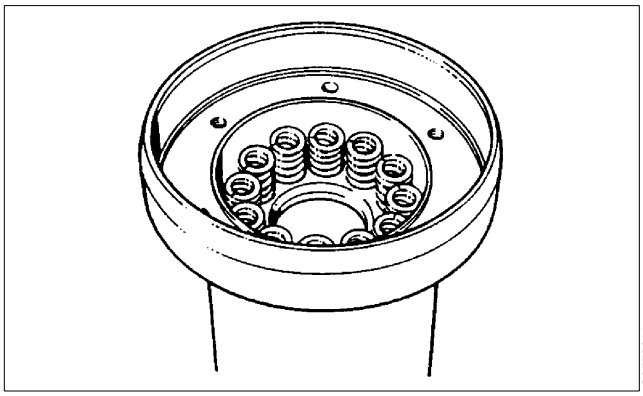
Remove the tool and continue with the mounting of the other parts for the vertical drive.



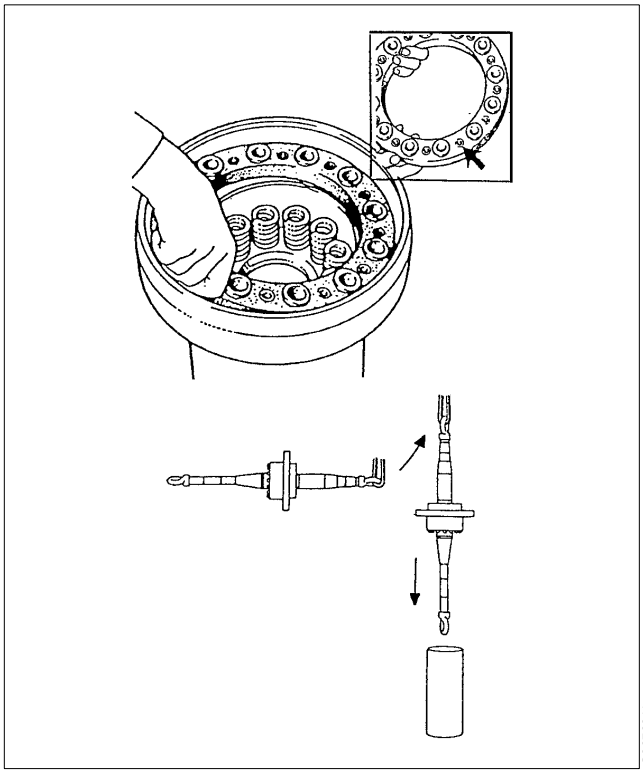
* *Not used during assembly*



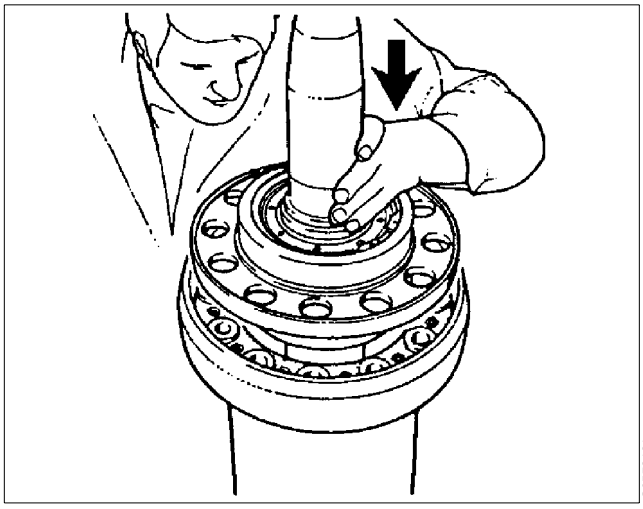
5. Fit the top bearing support in the tube end and put the springs in place.



6. Mount the rubber buffer with springs.

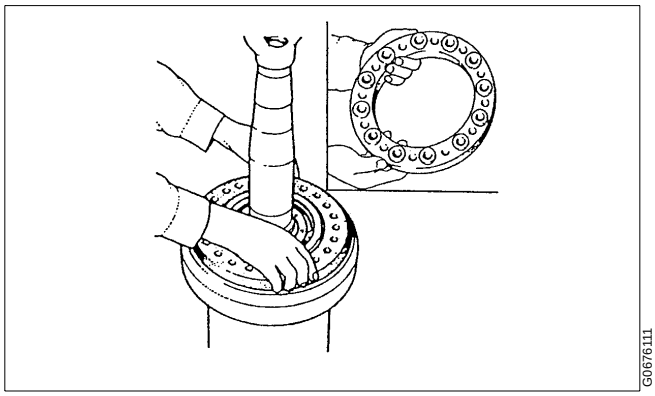


7. Lower the spindle into the top bearing support. Ascertain that the guide pins enter the springs.



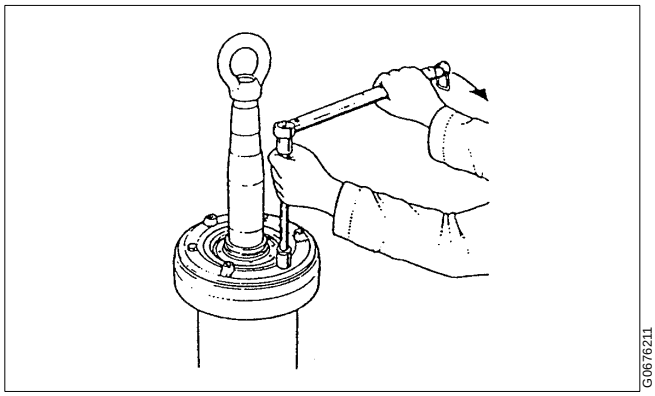
Pour a few drops of oil in the ball bearings (of the same quality as is used in the worm gear housing)

8. Mount the rubber buffer without springs.



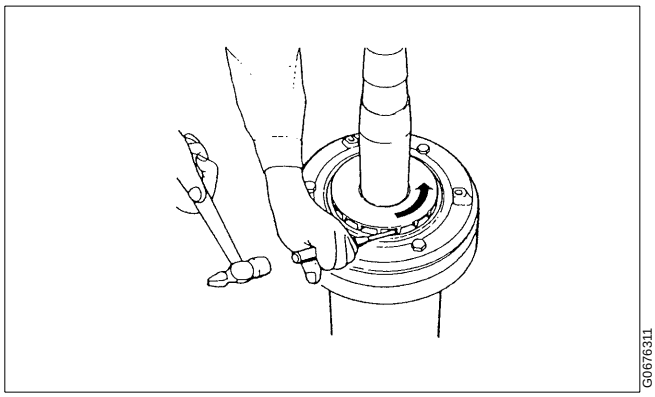
9. Mount the cover and tighten its screws alternately, a little at a time. Do not use pneumatic tools.

   Final tightening torque: **60 Nm**.

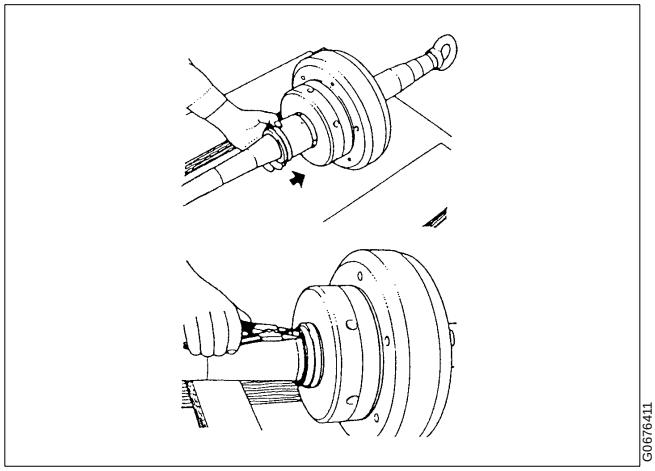


10. Hit with light blows on the wings of the oil fan to tighten it.

    Left-hand thread!



11. Lay down the spindle, fit the sleeve and lock it with the snap ring.

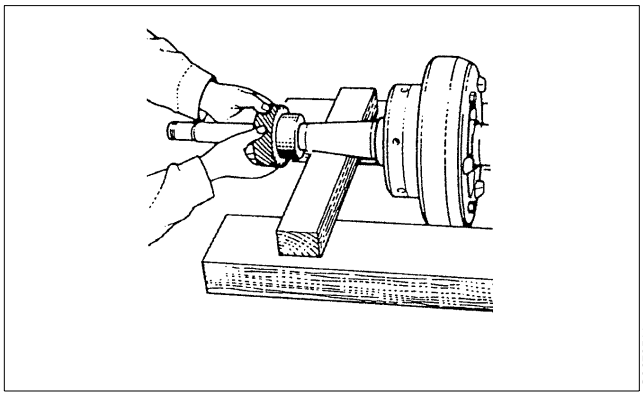


WARNING

Risk for eye injury by flying snap ring

Use the correct pliers for dismantling and assembly of snap ring to avoid accidental release.

12. Make sure that the conical surfaces inside the worm and on the spindle are clean and free from oil before the worm is fitted.



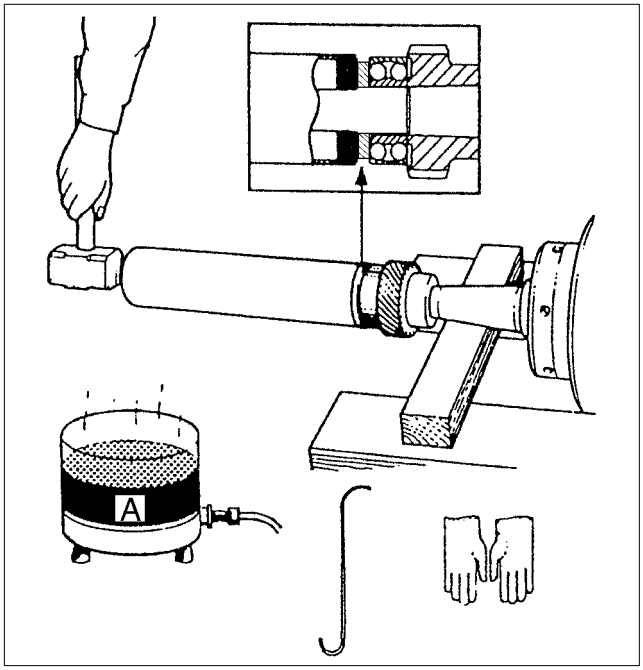
13. Wipe off and grease the bearing seat before fitting the ball bearing.

    The bearing can be assembled either in hot or in cold condition.

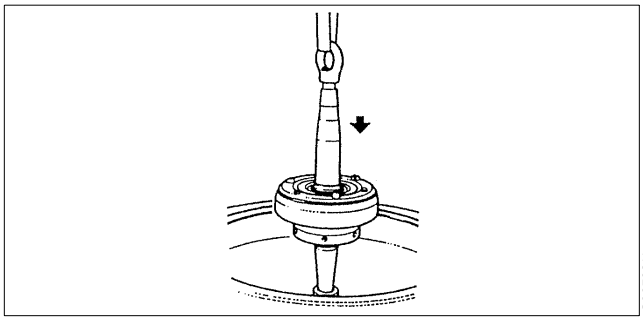
    Assembly in hot condition (recommended by the supplier): Heat the bearing in oil (A), max.100 °C, about 10 minutes, or in a heating cabinet. If the oil heating method is used, the oil must be absolutely clean.

    Also heat the protecting collar.

    Fit the bearing. Fit the protecting collar. When it has cooled, fit the ring and the driving-on tool as shown in the figure and hit it a few times to ascertain that the bearing and the protecting collar are in the correct position.

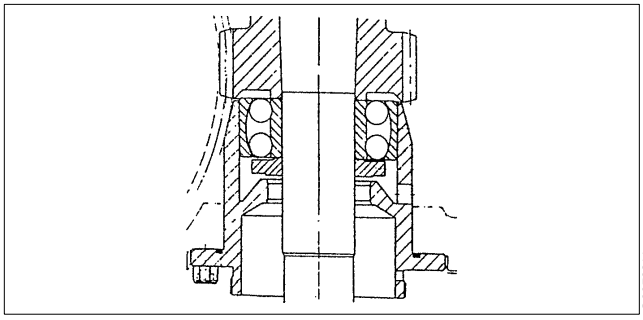


14. To avoid damaging the teeth, the spindle should be lowered with great care.

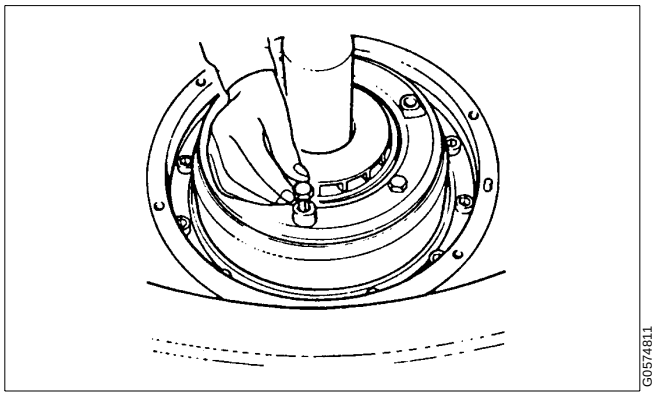


15. Guide the bearing into the bottom bearing housing. If it does not quite bottom in its seat, knock lightly on the spindle top with a tin hammer.

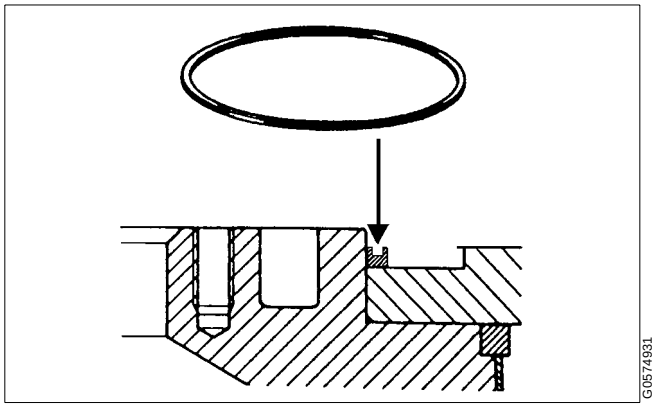
    Wait, however, to knock it down entirely until next suboperation 16 is carried out.



16. Make sure that the ball bearing housings are in their correct angular position by means of one of the screws that fastens the top bearing. Then lower the spindle to the bottom.

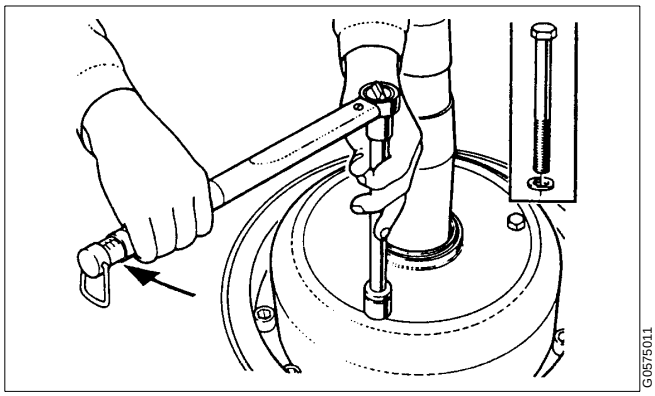


17. Fit the seal ring. Lower the guard into position.

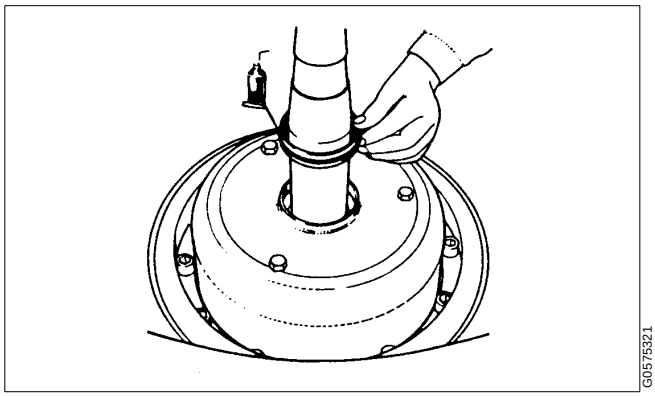


18. Fit new seal rings under the screw heads. Tighten the screws alternately, a little at a time. Do not use pneumatic tools.
Final tightening torque: **40 Nm**.

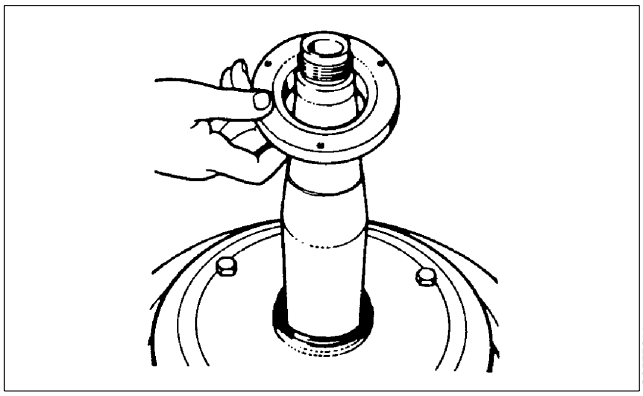
✔ **Check point**
“4.10.3 Check points - Radial wobble of bowl spindle” on page 151.



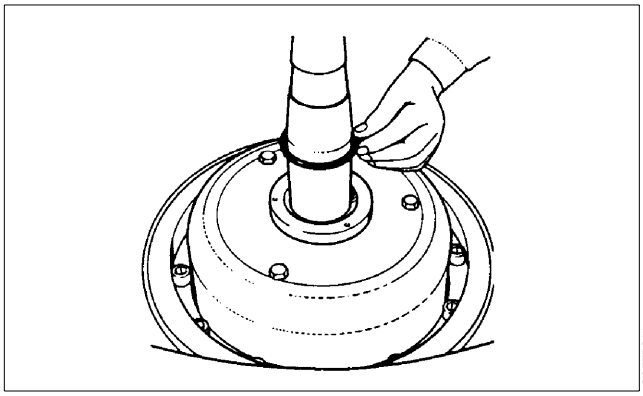
19. Fit the seal.



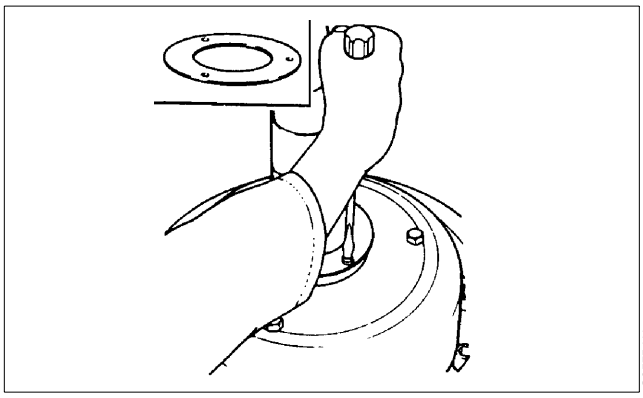
20. Fit the protecting collar and push it **firmly** down against the oil fan.



21. Fit the O-ring dry – do not grease.



22. Fit the protecting plate and tighten the screws.



4.10.3 Check points - Radial wobble of bowl spindle

- Excessive radial wobble at the top of the spindle is indicated by uneven running of the bowl (vibration).

Check the wobble as a precautionary measure at each intermediate service (IS), before every disassembly and after every assembly of the spindle.

Set up a dial indicator on a magnetic stand. Use the key for the large lock ring as a support for the stand – see the figures. (The key can also rest on the protecting cap of the top bearing.)

Measure the wobble at the taper end of the top of the spindle.

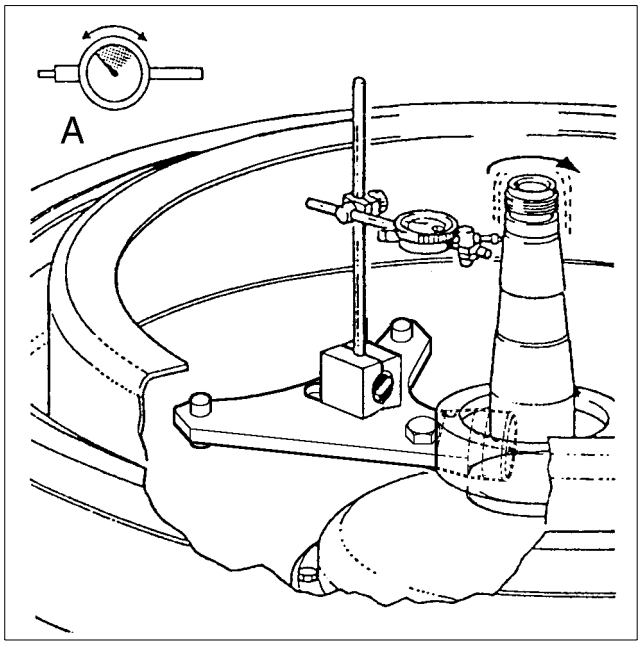
Maximum permissible wobble (**A**) is **0,05 mm**

If the wobble is excessive, the spindle unit must be removed from the frame and dismantled for closer examination. Get in touch with the supplier. The spindle may need to be replaced.

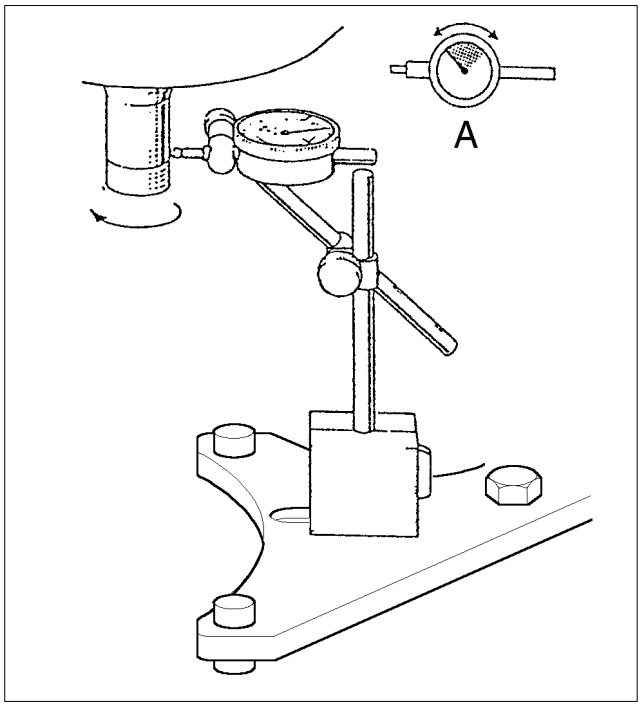
When the separator has a hollow spindle, the wobble should also be checked at the cylindrical part right at the bottom of the spindle above the threads.

Maximum permissible wobble (**A**) is **0,05 mm**

Excessive wobble can cause abnormal wear in the axial seal and result in leakage.



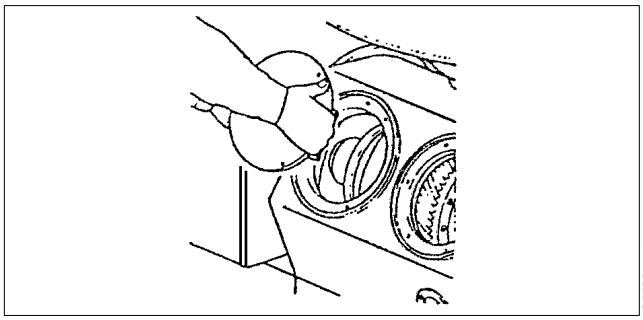
A. *Max. 0,05 mm*

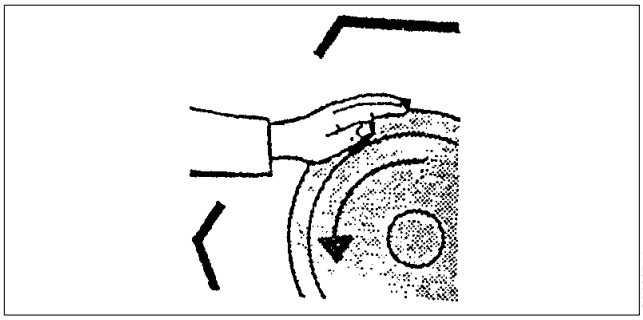


A. *Max. 0,05 mm*

Important!

During indication the spindle must be revolved by hand with the aid of the coupling drum.





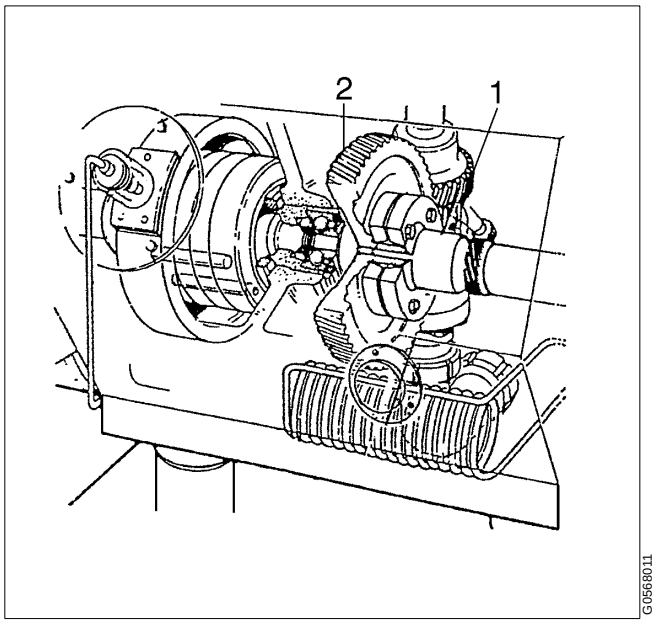
4.10.4 Check points - Worm gearing

Worm and worm wheel (worm gearing)

Check the teeth of worm wheel and worm for wear. Examine the contact surfaces and compare the tooth profiles. The gearing may work satisfactorily even when worn to some degree. Replace worm at the same time as the worm wheel.

Presence of metal chips in the oil bath is an indication that the worm wheel is wearing abnormally.

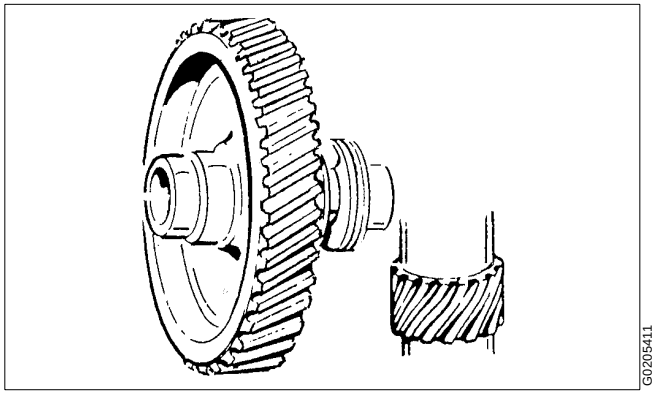
To avoid damaging the teeth when lifting the bowl spindle, first push the worm wheel aside. For the same reason put the spindle in place before mounting the worm wheel.



1. Worm
2. Worm wheel

When replacing the gearing, always ensure that the new parts have the correct number of teeth.

See Technical data in the *Installation Manual*.



DANGER

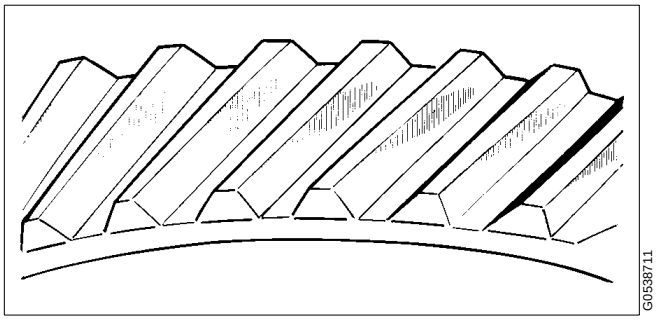
Disintegration hazard

Check that gear ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious breakdown.

4.10.5 Examples of various tooth appearances after operation

Satisfactory teeth

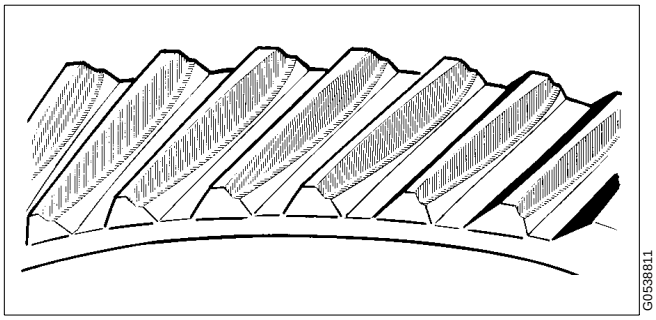
Uniform wear of contact surfaces. Surfaces are smooth. Good contact surfaces will form on the teeth when the gear is subjected only to moderate load during a running-in period.



Worn teeth

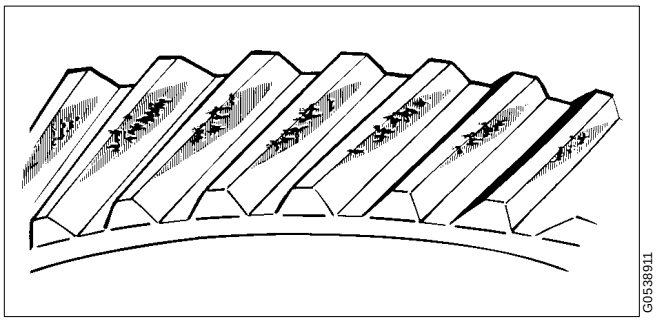
Permissible wear is as a rule 1/3 of the thickness of a tooth, provided that

- the wear is uniform over the whole of the flank of a tooth.
- all teeth are worn in the same way.



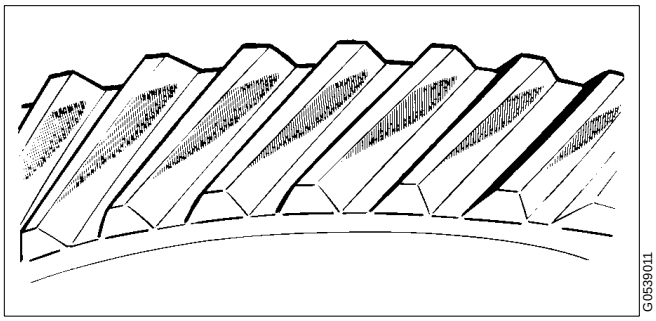
Spalling

Small bits of the teeth have split off, so-called spalling. Generally due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.

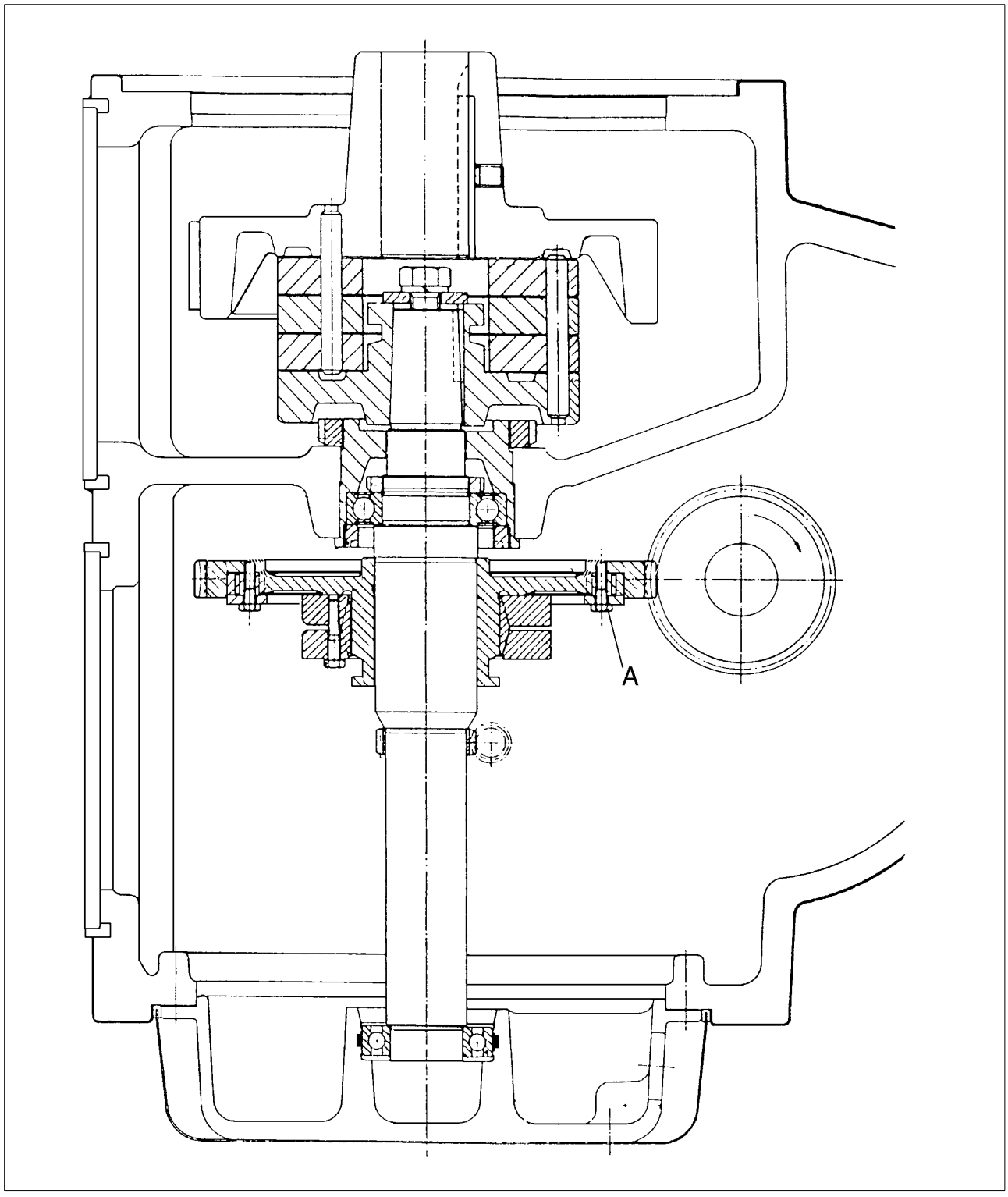


Pitting

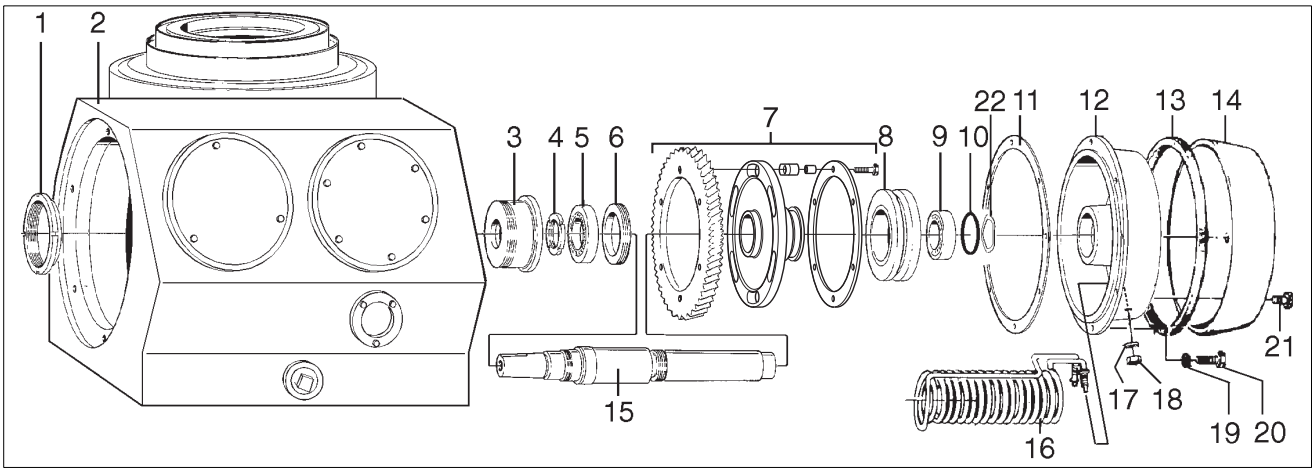
Small cavities in the teeth, so-called pitting. This is often due to excessive load or improper lubrication. Damage of this type need not necessitate immediate replacement, but careful checking at short intervals is imperative.



4.11 Horizontal driving device



A. *Tightening torque* **25 Nm**
Locked with Loctite 270



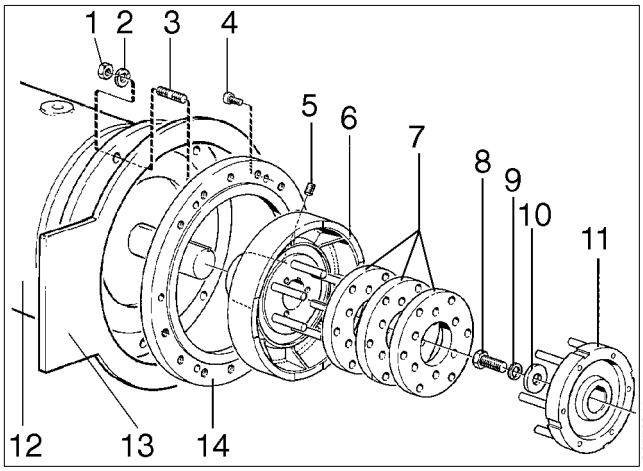
Worm gear end

1. Round nut*
2. Frame bottom part
3. Bearing housing*
4. Round nut
5. Large ball bearing
6. Lock ring (left hand thread)
7. Worm wheel
8. Clamp element
9. Small ball bearing
10. O-ring
11. Gasket
12. Bearing shield
13. Seal strip
14. Guard
15. Worm wheel shaft
16. Cooling coil
17. Washer
18. Nut
19. Washer
20. Screw
21. Screw
22. Corrugated shim

** The bearing housing should normally remain sitting in the frame. It should be dismantled only when it is necessary to replace it, or when the separator is to be reconditioned.*
If it is to be removed, observe that the round nut (1) is locked with Loctite. The nut is therefore easier to unscrew when heated.
The bearing housing is also fixed with Loctite.
When fitting a new bearing housing, apply Loctite 603 on its guiding surface against the frame and Loctite 243 on the threads.

Drive motor end

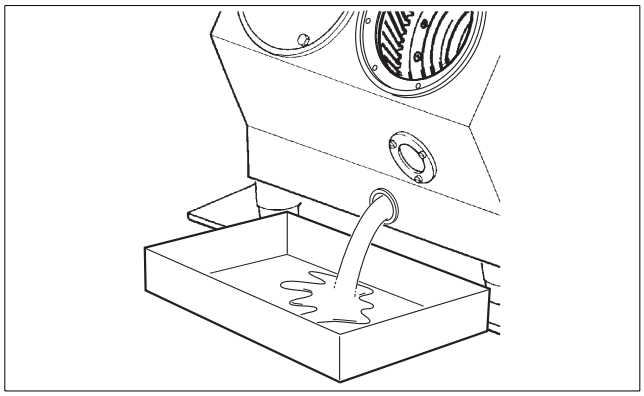
1. Nut
2. Washer
3. Stud bolt
4. Screw
5. Stop screw
6. Brake pulley
7. Elastic plate
8. Screw
9. Spring washer
10. Washer
11. Coupling disc
12. Electric motor
13. Guide ring
14. Motor adapter



4.11.1 Disassembly

The horizontal driving device is dismantled as follows. It will be easiest to loosen the clamping of the worm wheel if the bowl and spindle are still fitted in the machine.

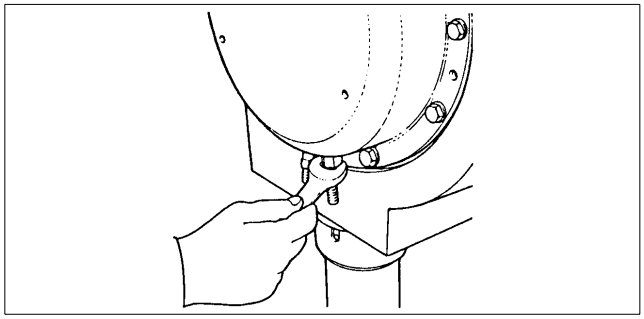
1. Shut off the water supply and disconnect the cooling water connections to the cooling coil in the worm gear housing.
2. Drain off oil from worm gear housing.



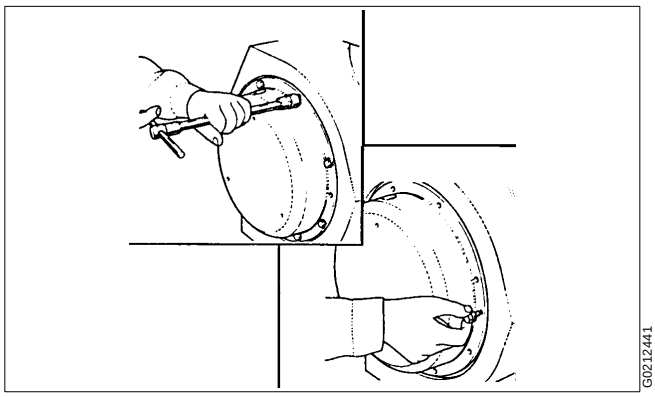
CAUTION

Burn hazards

Lubricating oil and various machine surfaces can be hot and cause burns.



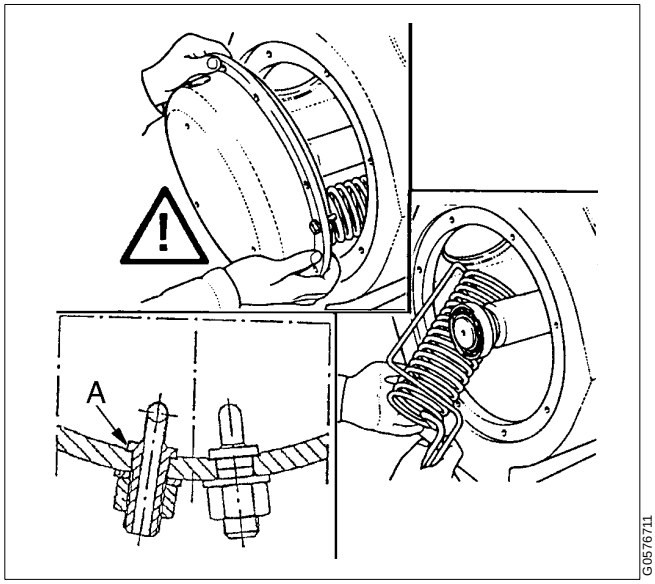
3. Remove the worm wheel guard with the revolution counter.
4. Remove the brake cover.
5. Disconnect the cooling water connections. Remove the bearing shield cover.
6. Remove the nuts and washers of the cooling coil and press the two tube ends into the bearing shield.
7. Remove the bearing shield: Ease it off by means of two of the fastening bolts.



CAUTION

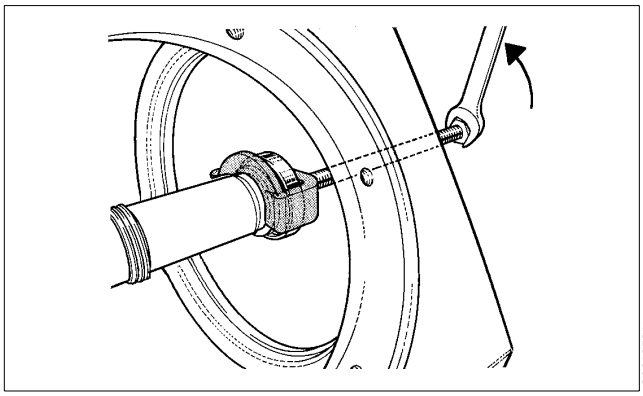
Crush hazard

The shield is quite heavy (15 kg cast iron). Hold the shield firmly or use two longer screws as guide pins so as not to drop it during dismantling.

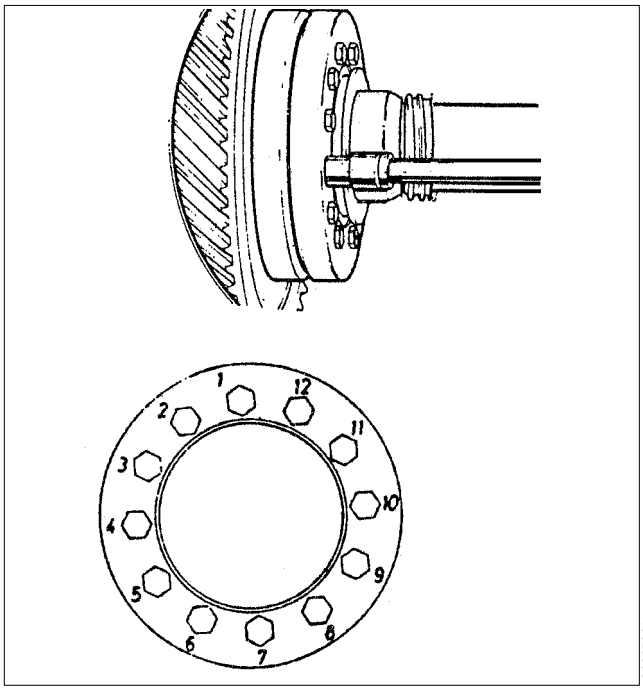


8. Lift out the cooling coil and take care of the gaskets (A).

9. Fit the puller tool and pull off the ball bearing.



10. Loosen the clamp screws uniformly and successively around the clamping rings in the order stated. In the first round, do not loosen them more than 1/4 turn to avoid wryness in the clamping rings. Do not screw out the clamp screws entirely.
11. Remove the clamping element and the worm wheel. See “4.10.5 Examples of various tooth appearances after operation” on page 154

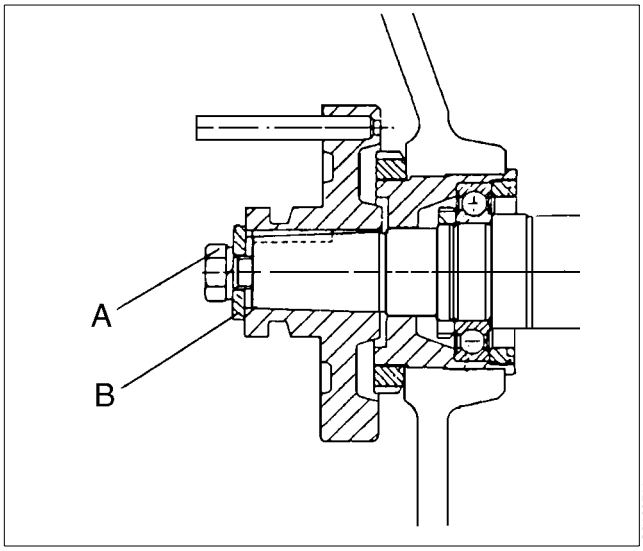


CAUTION

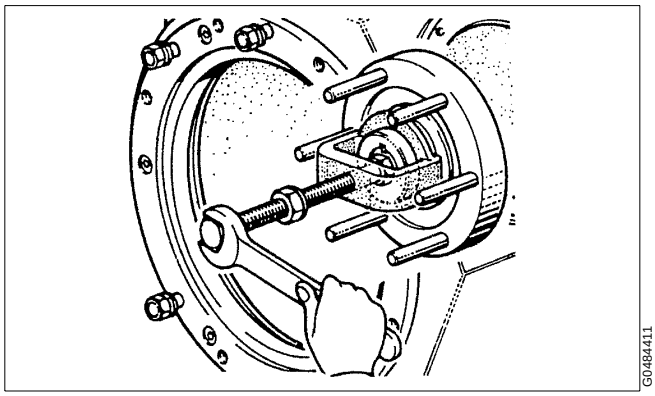
Crush hazard

The worm wheel is quite heavy. Hold it firmly when dismantling. Risk for jamming injury.

12. Remove the motor. See “4.16.2 Removing the motor” on page 172.
13. Remove the rubber discs from the coupling.
14. Unscrew the centre screw (A) and remove the plain washer (B). Then tighten the screw (A) again to protect the shaft during next operation.

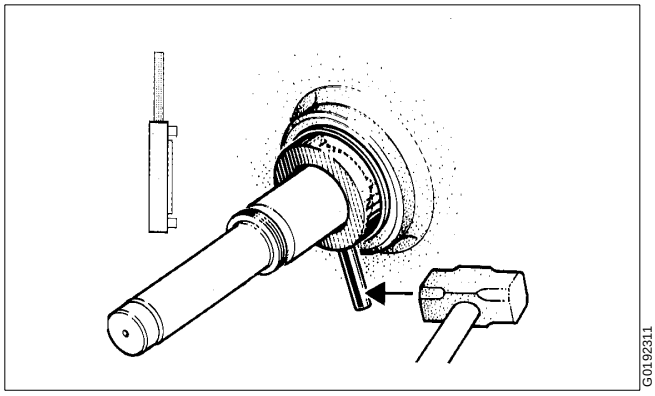


15. Fit the puller tool and pull off the coupling.

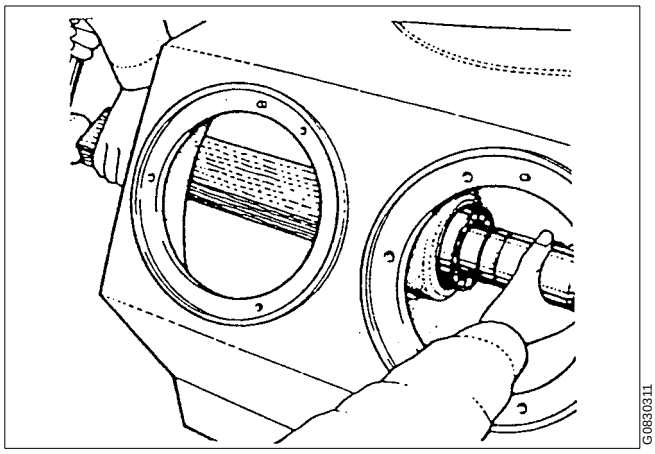


16. Remove the lock ring. Use the pin spanner or a drift.

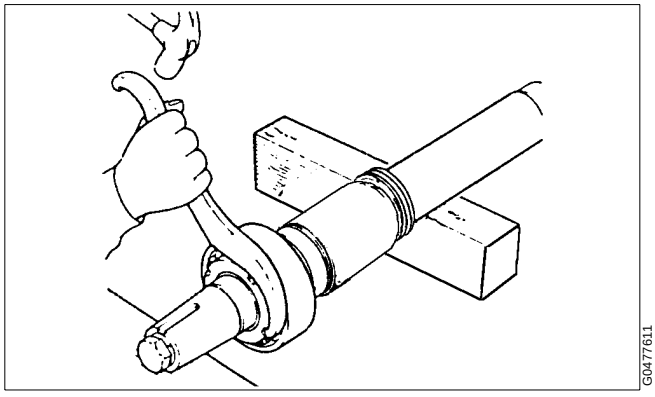
    Left-hand thread!



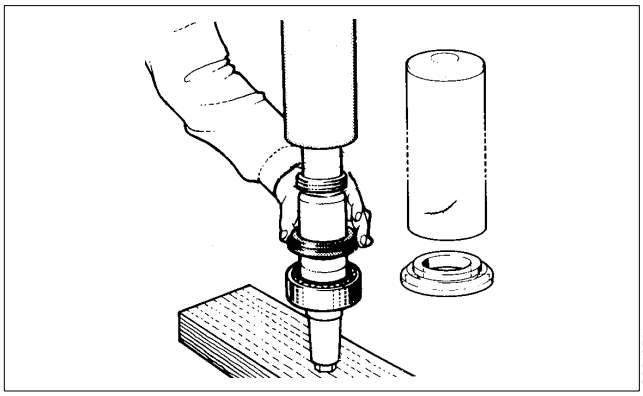
17. Knock loose the worm wheel shaft from the motor side with a piece of wood and a tin hammer.



18. Screw off the round nut.



19. Remove the ball bearing. Position the smaller sleeve against the inner race of the ball bearing. Put a piece of paper or cloth inside the tube in order to avoid damage on the shaft.



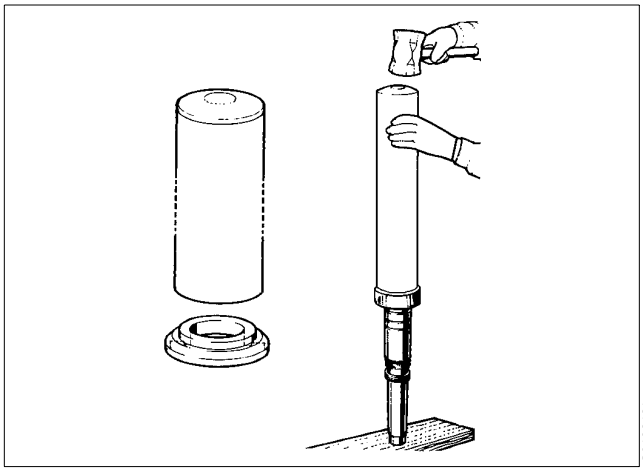
4.11.2 Assembly

Clean and oil the bearing seat on the worm wheel shaft.

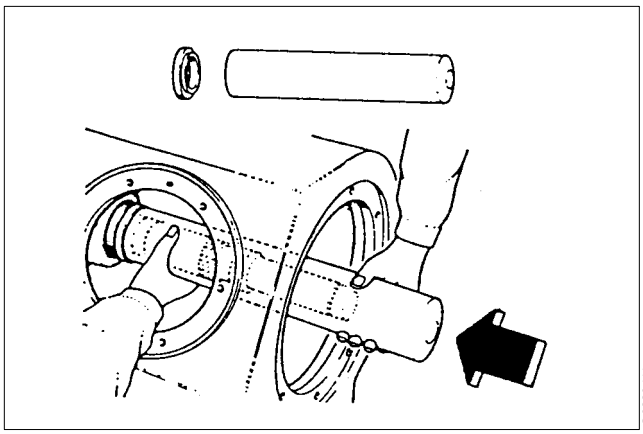
1. Mount the ball bearing in cold condition by using the tools. Use the larger sleeve which acts against the inner race of the ball bearing.

   This procedure is recommended by the supplier.

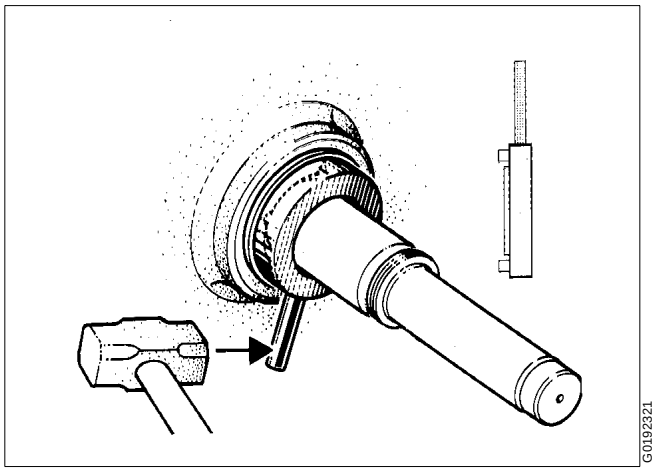
   Do not heat this ball bearing in oil!



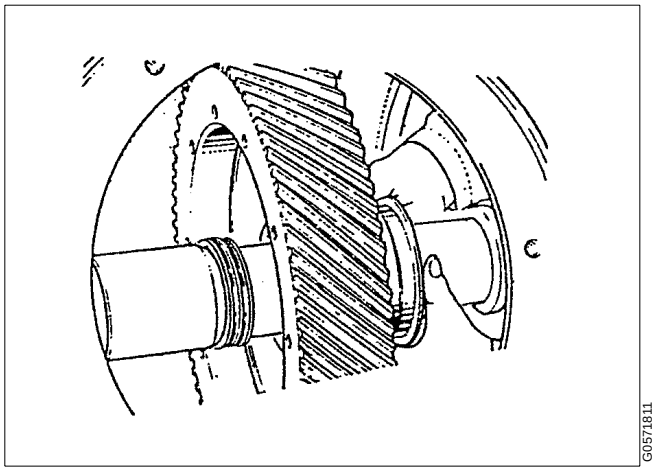
2. Screw the round nut onto the shaft (compare 17 on previous page).
3. Clean the bearing seat in the frame. Apply some oil on the outer race of the ball bearing and force the worm wheel shaft into position. Use the sleeve which acts against the outer race of the ball bearing. Use a tin hammer.



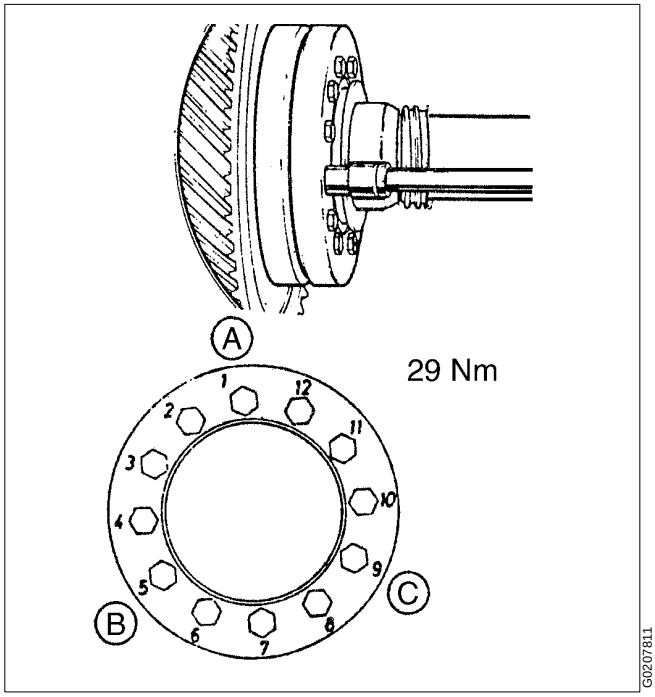
4. Mount the lock ring. Use the pin spanner or a drift.
   Left-hand thread!



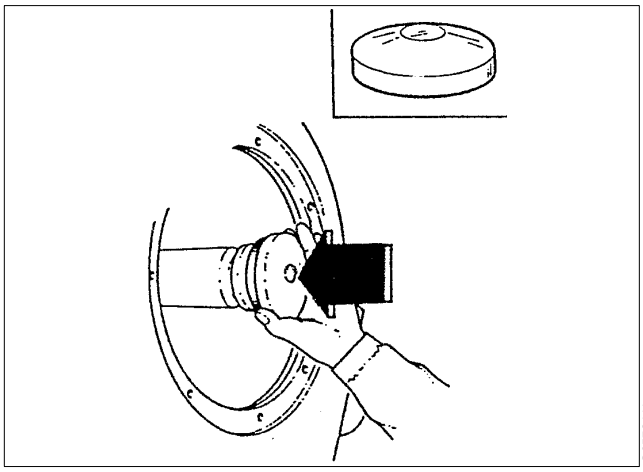
5. Fit the coupling half. Note the key. Fit the centre screw (with spring washer and plain washer) and tighten it. Fit the elastic plates.
6. Before fitting the worm wheel and the clamping element, clean all surfaces thoroughly with a clean cloth. Push the worm wheel on the shaft as far as possible.



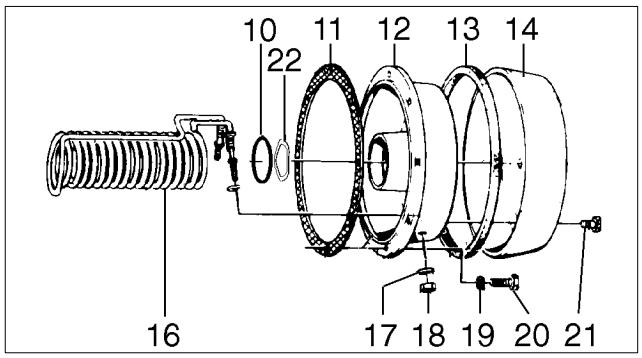
7. Oil the inner surface of the clamping element. The oil must be of the same quality as is used in the worm gear housing. Slip the clamping element onto the worm wheel.
8. First tighten the three clamp screws A, B and C, but only so little that the clamping element just sticks on the worm wheel shaft. Then tighten the clamp screws uniformly and successively around the clamping ring in the order (1 – 12) stated in the figure.
   Do not tighten crosswise.
   Tightening torque **29 Nm**.
   This must be repeated several turns around until full torque on every screw is reached.
   Check continuously that the clamping rings remain plane parallel.



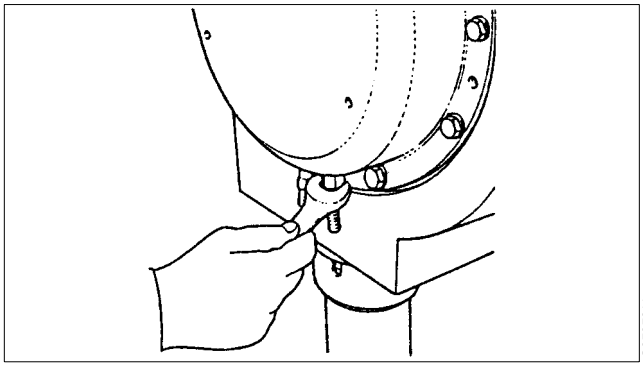
9. Mount the bearing. Apply the mounting washer and hit a few blows on the latter to ascertain that the bearing is in correct position. Use a tin hammer.
10. Make certain that the worm gear housing and the magnet of the cooling coil have been properly cleaned. Insert the cooling coil.



11. Clean the bearing seat in the bearing shield (13). Fit a new corrugated shim (22) and O-ring (10) into the bearing shield.
The parts are included in the MS-kit.
12. Renew the gasket (11) and fit the bearing shield. Use the two guide pins in the tool set to position the shield. Note that the shield can be fitted in one position only.
If necessary, pull it into position using the screws or tap its centre with a tin hammer.

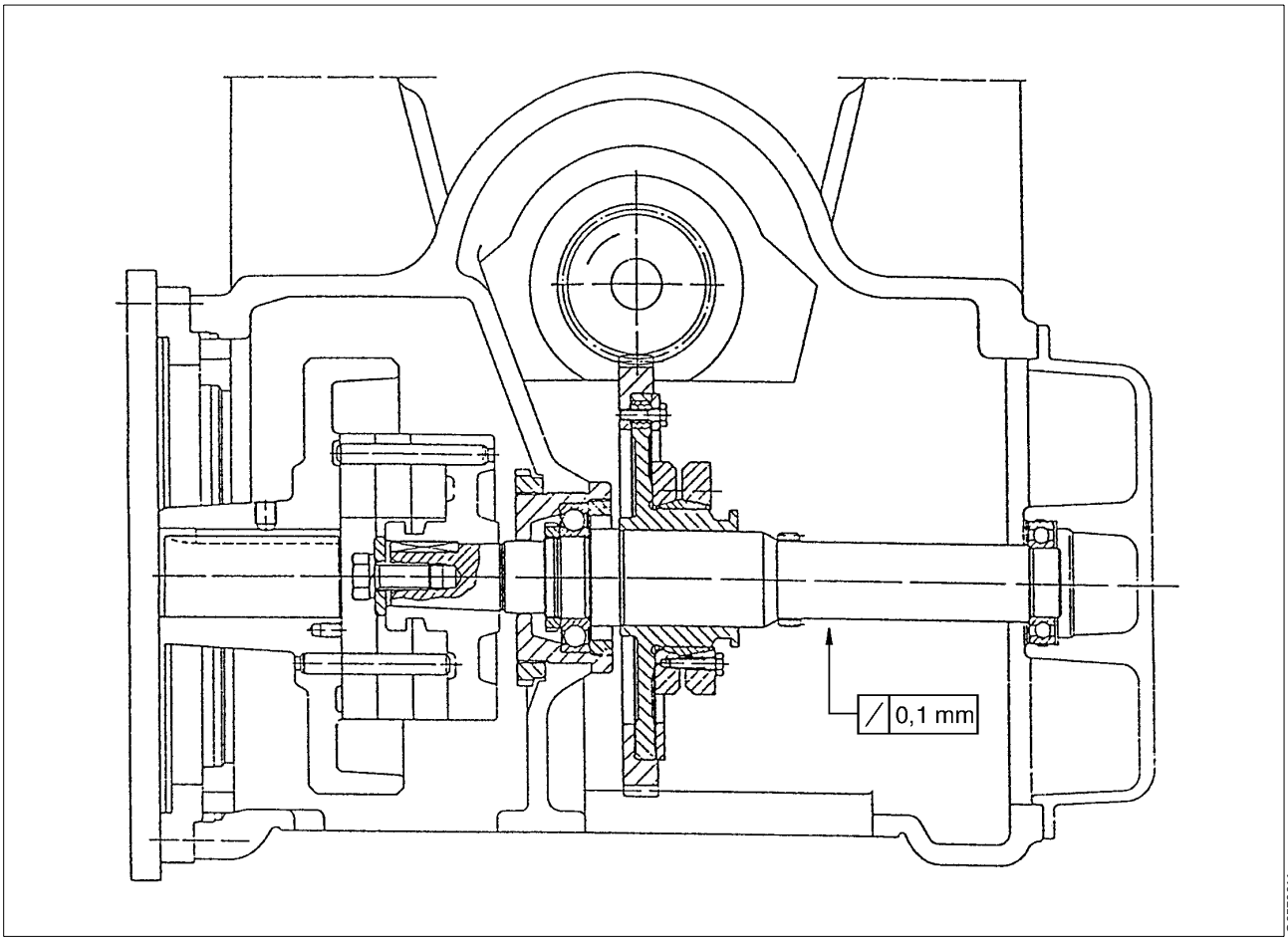


13. Press the two tube ends of the cooling coil (16) into the bearing shield.
14. Fit the washers (17) and nuts (18) and tighten the coil to the shield.
15. Connect the cooling water to the coil. Supply the cooling water and check for leakages.
16. Fit the seal strip (13) and the guard (14) covering the bearing shield (see previous illustration).



17. Fill oil before the worm wheel guard is mounted. Quantity: See “Technical data” in *Installation Manual.* Quality: See ‘‘5.1 Lubricants” on page 178.
18. Fit the gasket and the worm wheel guard.
19. Fit the motor. Fit the seal strip and the protection cap of the motor.
20. Fit the gasket and the brake cover.

4.11.3 Check points - Radial wobble of worm wheel shaft

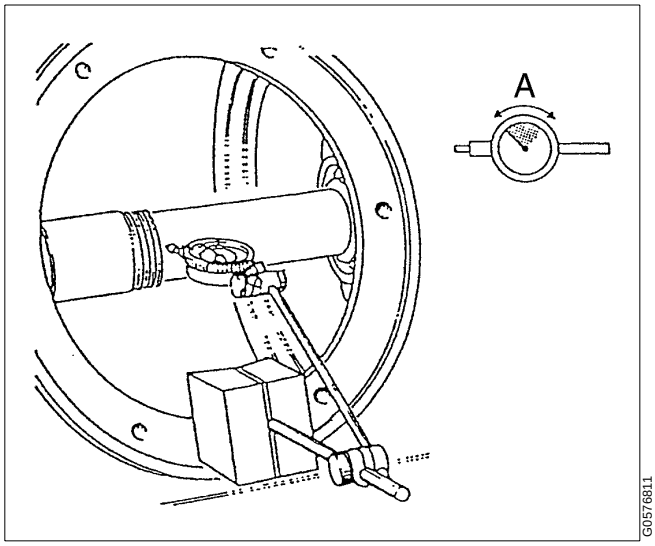


- Excessive wobble on the worm wheel shaft may cause vibration and noise.

Clamp a dial indicator in a magnetic support and fasten the latter to the plane for the worm wheel guard (the gasket should be removed). Revolve the worm wheel shaft by hand.

Max. permissible radial wobble (**A**) is **0,1 mm**.

If the wobble is excessive, the worm wheel shaft must be removed from the frame for closer examination. Get in touch with the supplier. The worm wheel shaft may need to be replaced.



4.12 Remote controlled brake (pneumatic)

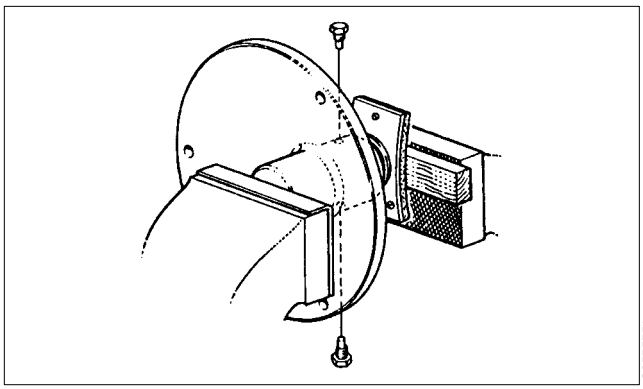
4.12.1 Changing brake lining - Checking for formation of rust

Checking for formation of rust

- Formation of rust on the brake parts may cause the brake to jam.

How to carry out the Intermediate Service for the brake unit is described below.

1. Dismantle the brake unit by compressing it in a screw wise and remove the two stop screws (2), see the illustration.



WARNING

Risk for eye injury by flying parts

Be careful when decompressing the unit, the spring power can rip parts.

2. Remove any rust and brake dust from the surface of the brake shoe (7) and the corresponding guiding surface in the cover (1).
   Formation of rust on the brake parts may cause the brake to jam.
3. Rub the surfaces, for instance with Molykote Paste 1000 or similar.
4. Renew the O-ring (3) and check piston (4) and its cylinder in the cover (1). Rub the cylinder with Molykote Paste 1000 or similar.
5. Renew the spring (5) if it has lost its stiffness. Oil the spring when assembly.

NOTE

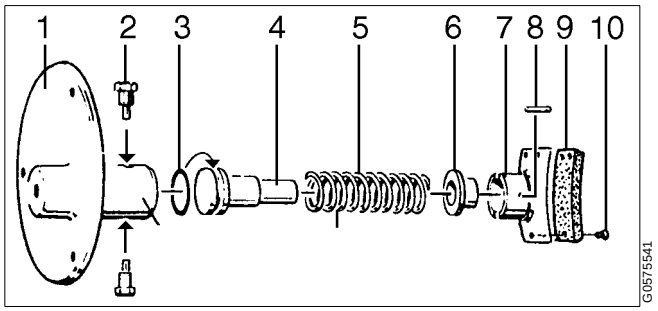
When assembly, depress the brake shoe (7) entirely in the cover (1) before tightening the stop screws (2), otherwise the screws may jam the brake shoe.

WARNING

Risk for eye injury by flying parts

Be careful when compressing the unit, the spring power can rip parts.

6. Supply compressed air to the brake unit and check the brake function.

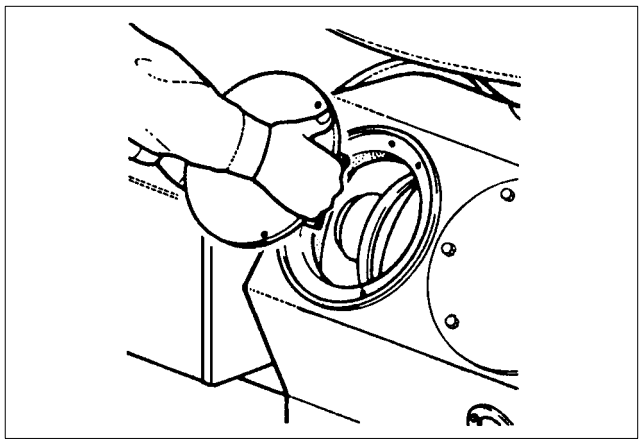


1. *Cover*
2. *Stop screw*
3. *O-ring*
4. *Piston*
5. *Spring*
6. *Gland*
7. *Brake shoe*
8. *Slotted pin*
9. *Friction pad*
10. *Screw*

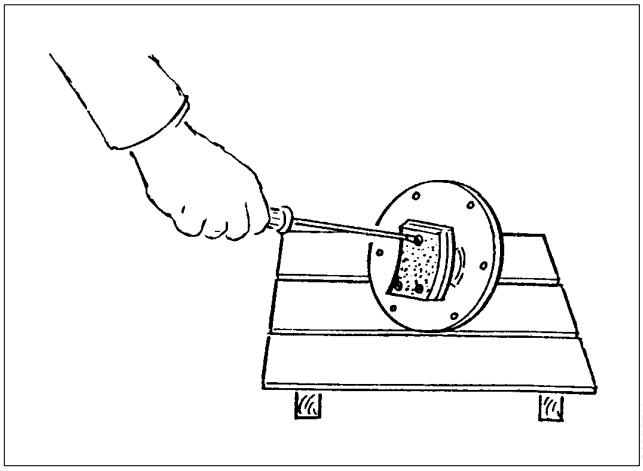
Changing brake lining

- A worn lining will lengthen the braking period.

1. Remove the brake cover.

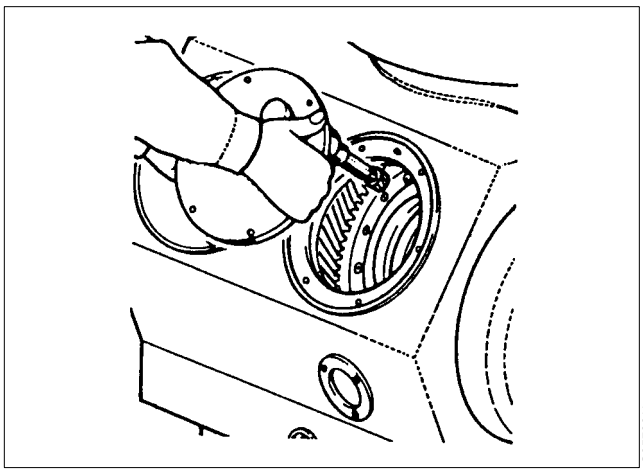


2. Remove the screws and exchange the lining.
Note! The screws are slotted at both ends.



4.12.2 Revolution counter

Remove the cover from the separator frame if not already done.



Dismantle the revolution counter unit for cleaning and examination as described below.

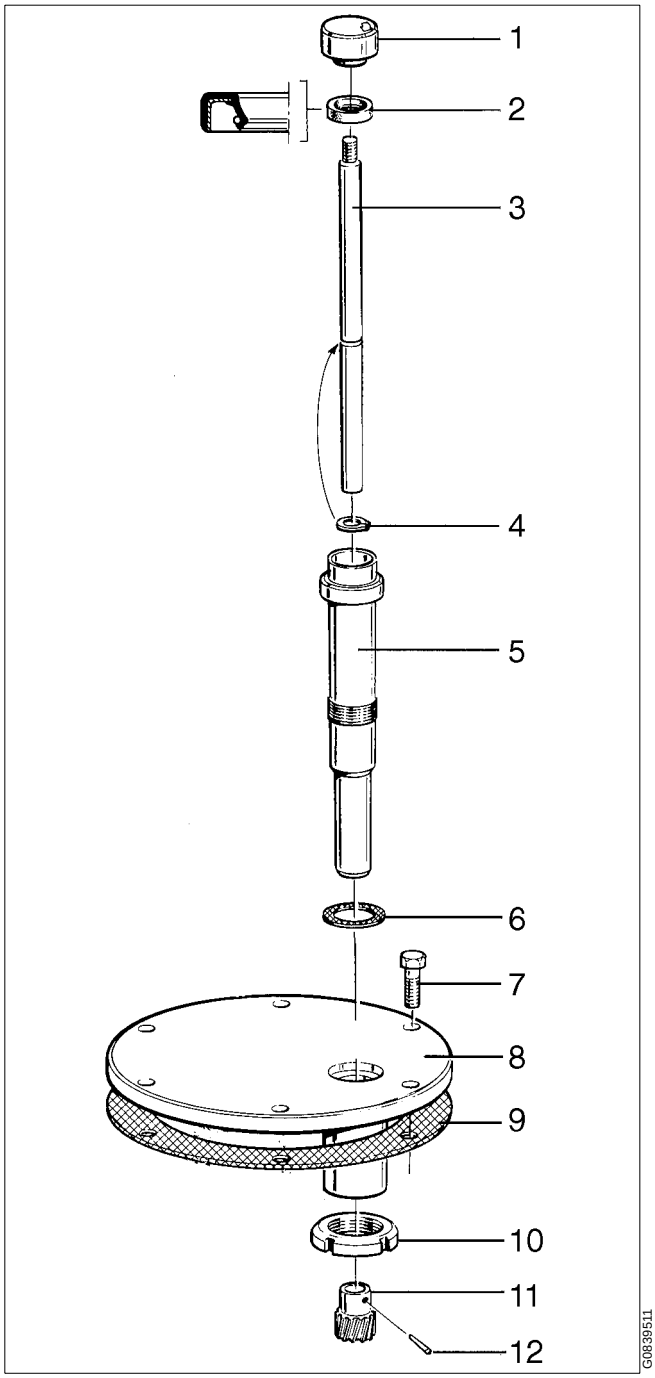
1. Knock out the taper pin (12) and pull off the gear wheel (11).
2. Push out the shaft (3) and protecting collar (1).
3. Unscrew the round nut (10).

4. Push out the bushing (5) from the cover (8).
5. Clean all parts and examine for wear and damage.
6. Assemble in reverse order.
   Renew the seal ring (2) and rectangular ring (6). These parts are included in the MS-kit.

NOTE

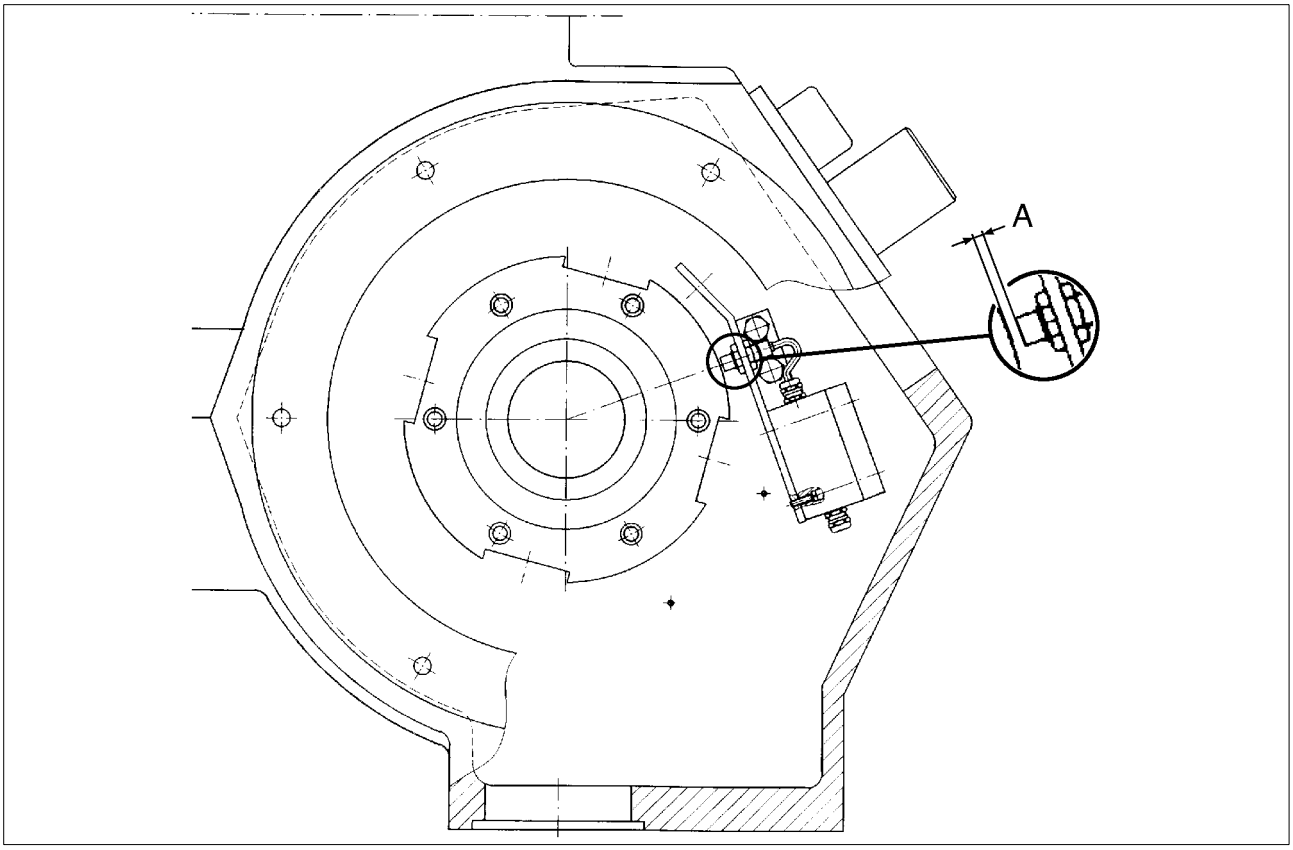
Fit the seal ring (2) in correct direction, see the illustration.

7. Fit a new gasket (9) when mounting the cover on the separator frame.



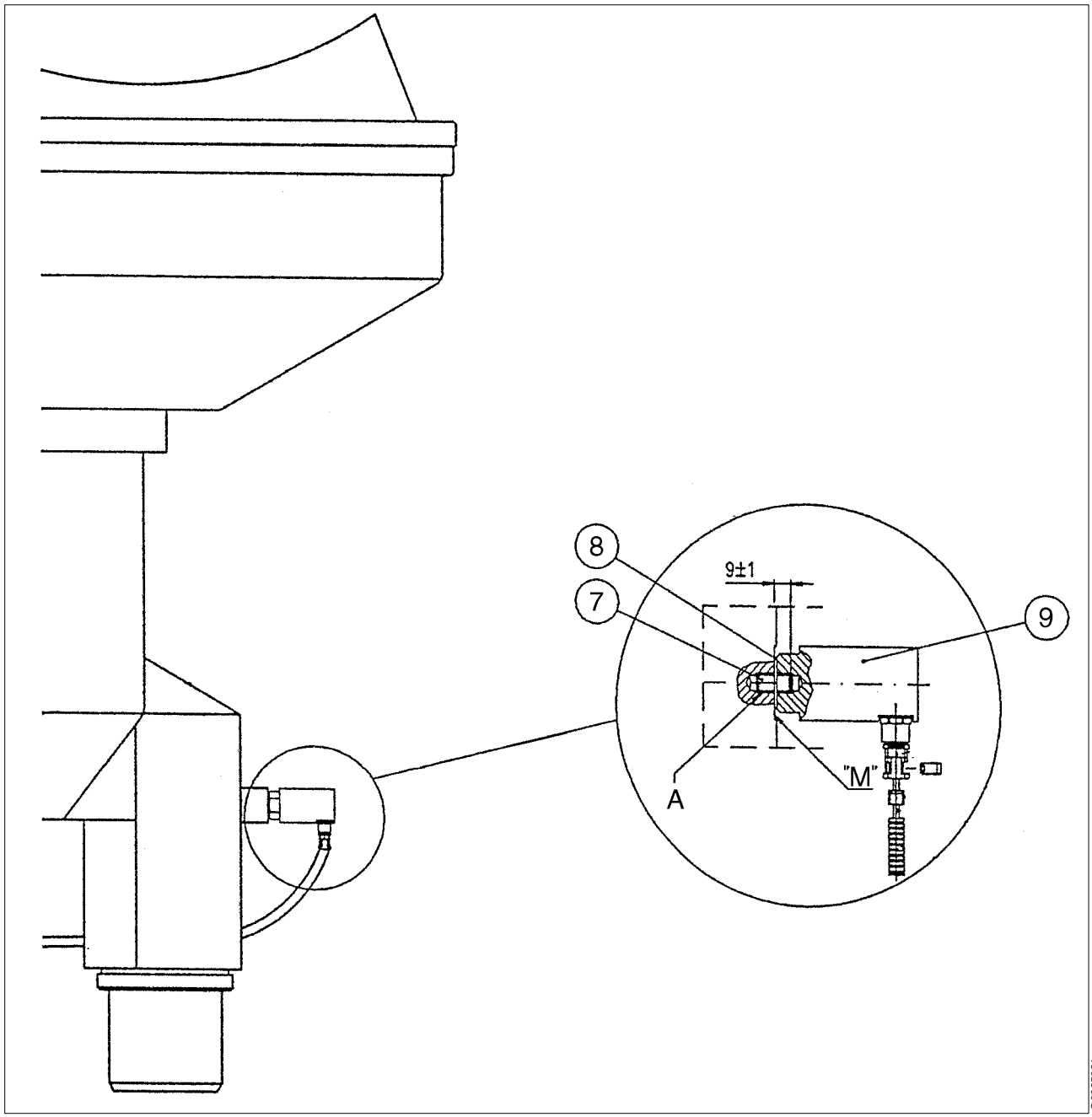
1. Protecting collar
2. Seal ring
3. Shaft
4. Snap ring
5. Bushing
6. Rectangular ring
7. Screw
8. Cover
9. Gasket
10. Round nut
11. Gear wheel
12. Taper pin

4.13 Speed sensor for remote indication (option)



The speed sensor is accessible when the brake cover has been removed.
*The distance (***A***) between the speed sensor head and the wheel should be adjusted to* **1,5 – 2,5 mm**.
For technical data and further information, see Installation Manual.

4.14 Vibration sensor (option)

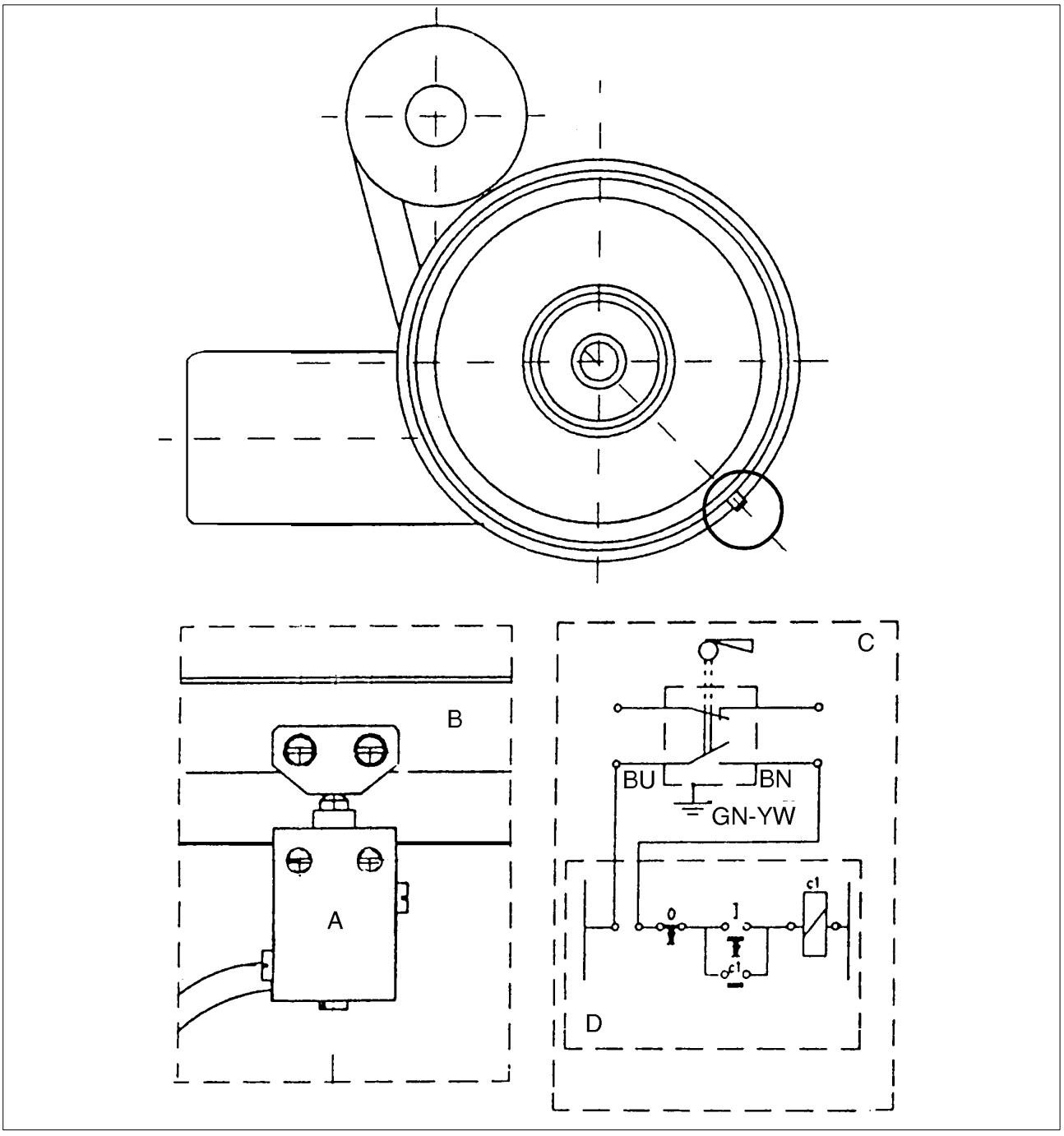


Mounting instructions

- Fit the screw 7 in the frame, secure with Loctite 243 (**A**)
- Fit the vibration sensor 9, adjust with washer(s) 8 in order to get the cable downwards.
- Tightening torque **35 Nm** (3,6 kpm).

For technical data and further information, see Installation Manual.

4.15 Lock switch (option)

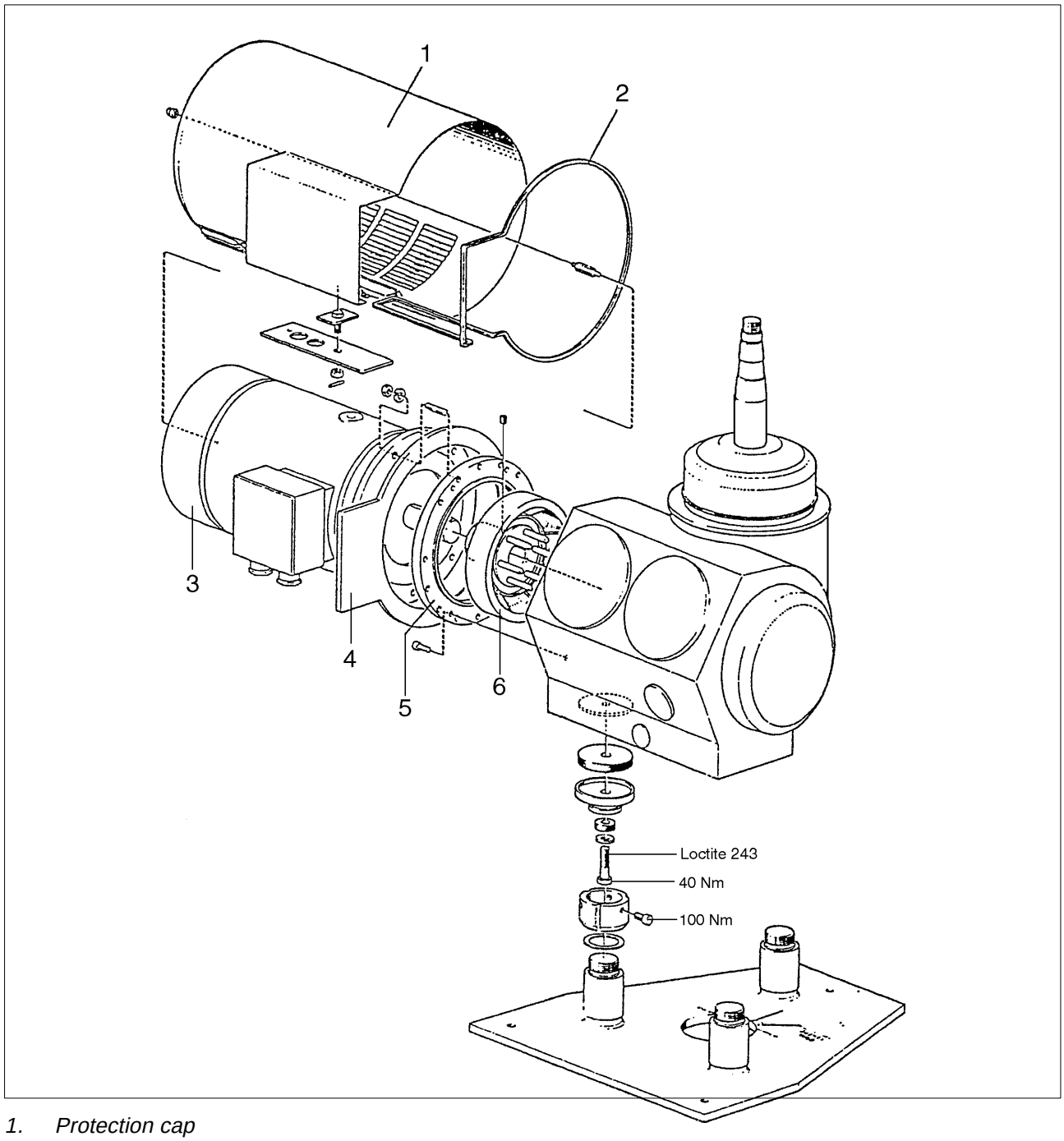


A. Lock switch (activated)
B. Frame hood
C. Safety circuit connection, lock switch not activated
D. Starter, contactor circuit

For technical data and further information, see Installation Manual.

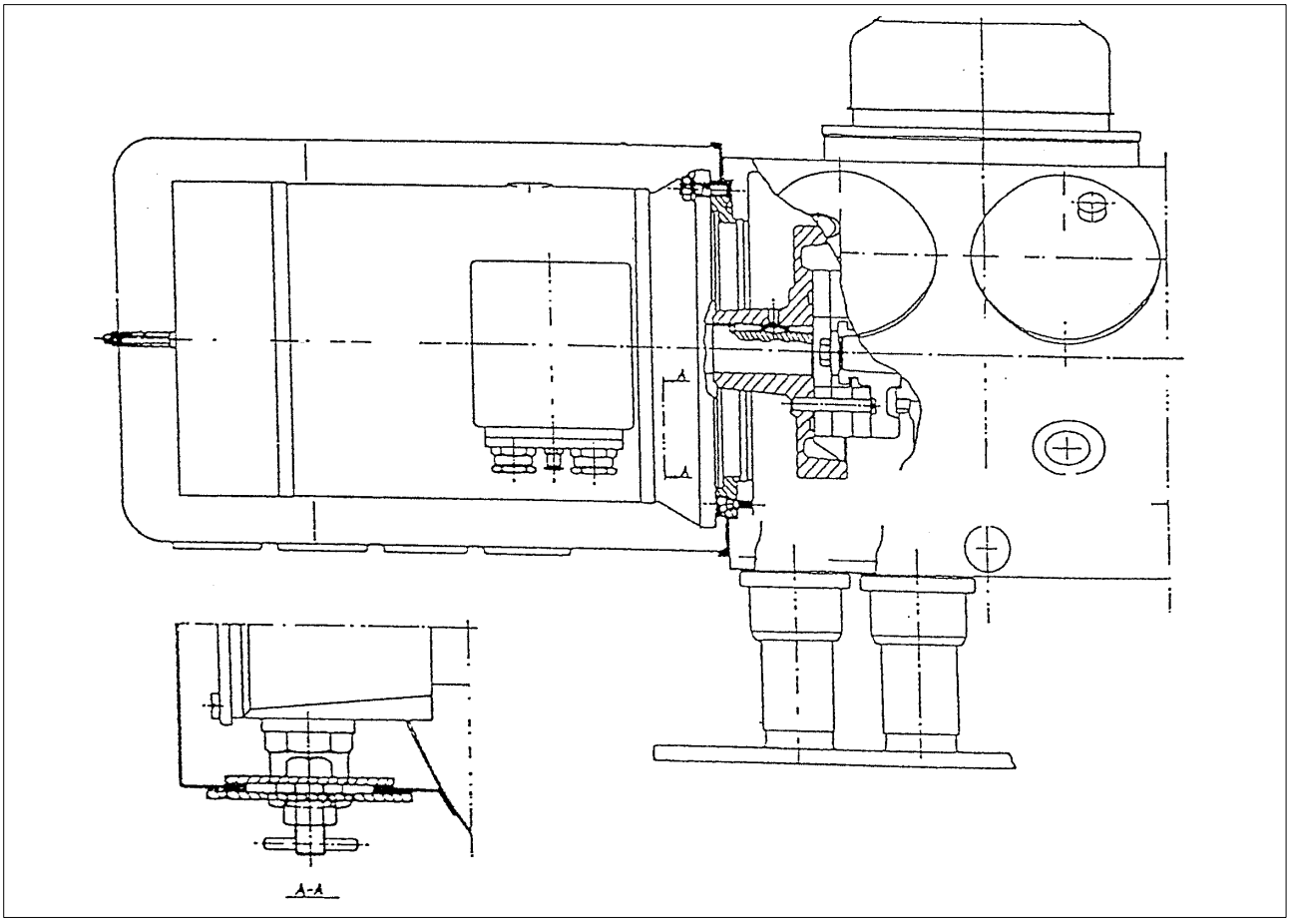
4.16 Motor

4.16.1 Parts for mounting of motor



1. *Protection cap*
2. *Seal strip*
3. *Motor*
4. *Cover*
5. *Motor adapter*
6. *Brake pulley*

4.16.2 Removing the motor



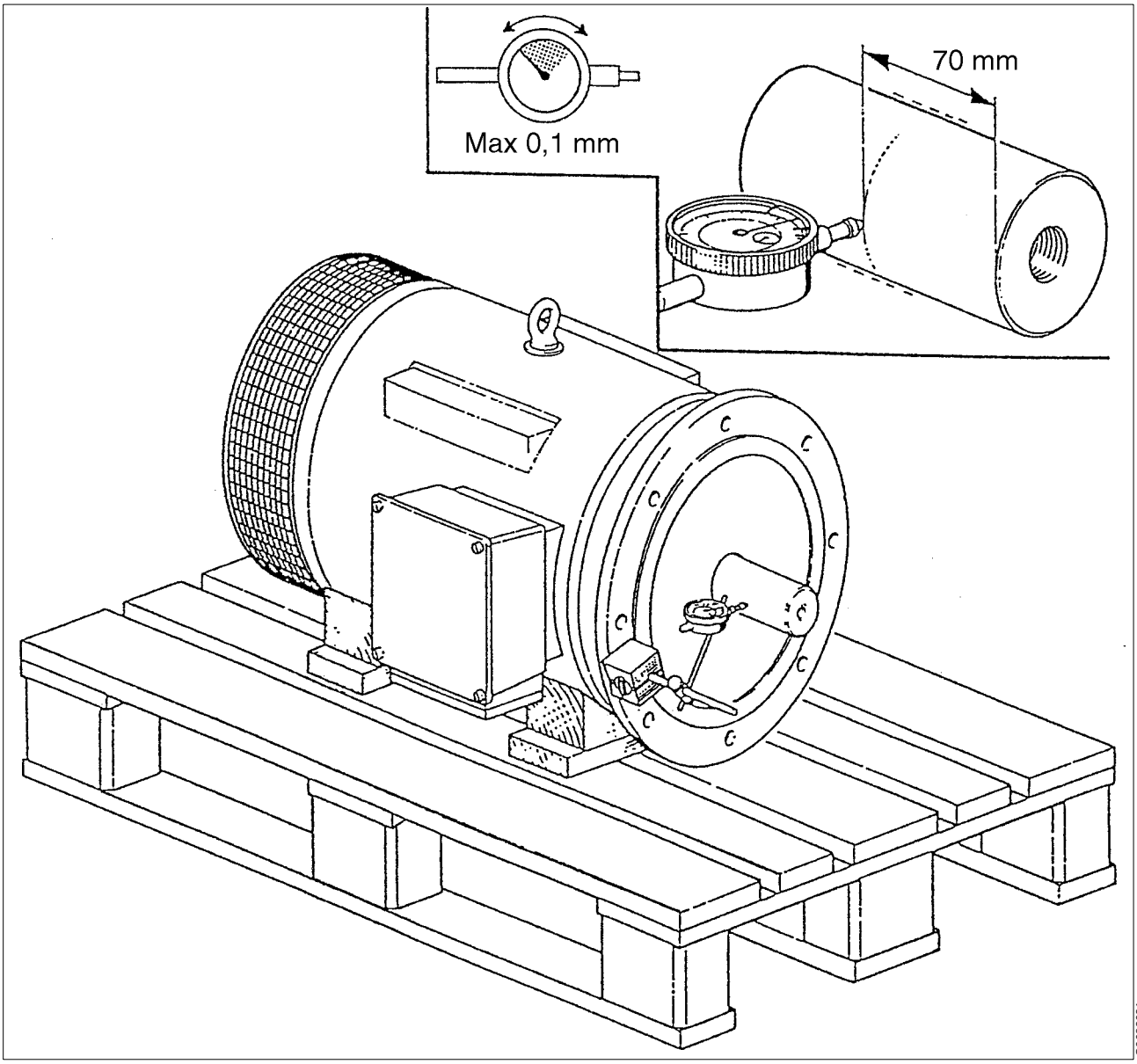
- Remove motor cover.
- Disconnect the electric cables to the motor.
- Fit the lifting eye on top of the motor and tighten it securely.
- Hook up the motor in a hoist. Use a lifting sling between the lifting hook and the lifting eye. Stretch the lifting sling with the hoist.
- Loosen and undo the six nuts fixing the motor flange to the separator frame.
- Pull out the motor with coupling pulley (brake pulley) from the separator frame and lift it away.

DANGER

Disintegration hazard

When power cables have been connected, always check direction of rotation. If incorrect, vital rotating parts could unscrew causing disintegration of the machine.

4.16.3 Check points - Radial wobble of motor shaft



- Excessive wobble on the motor shaft may cause vibration and noise.

Clamp a dial indicator in a magnetic support, and fasten the latter to the flange of the motor. Revolve the motor shaft by hand. Read the wobble on the shaft according to measurement in the figure.

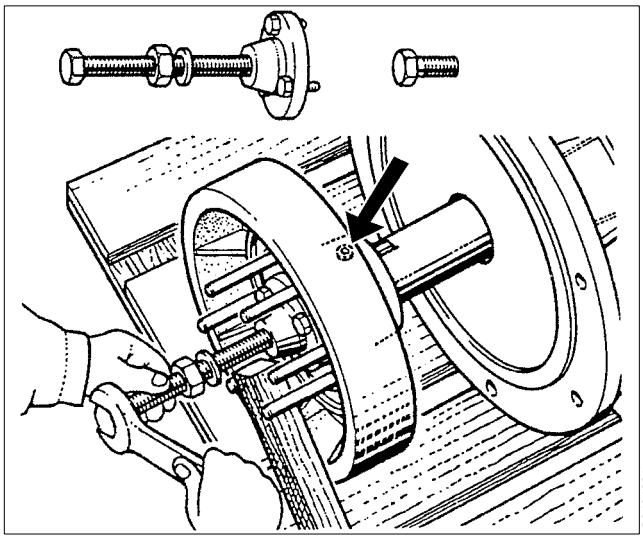
Max permissible radial wobble: See figure.

If the wobble is excessive, contact the supplier.

4.16.4 Disassembly

Loosen the lock screw (arrow). Apply some grease on the centre screw of the tool. Mount a M20 screw on motor shaft. The screw will serve as a support when pulling off the coupling disc. (The screw from the worm wheel shaft may be used, then don't forget to remount it).

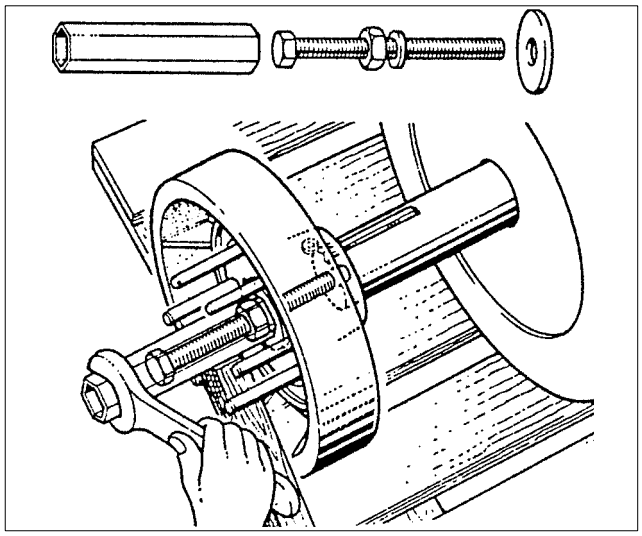
Fit the tool as shown in the illustration and pull off the coupling disc.



4.16.5 Assembly

Lubricate motor shaft, for instance with Molykote paste 1000. Knock the coupling on to the motor shaft as far as possible by means of a piece of wood and a hammer. Screw home the nut on the mounting tool (the centre screw of the dismantling tool) and screw it into the motor shaft.

Apply some grease on the washer ahead of the nut and press the coupling into position by tightening the nut using the socket sleeve and a screw wrench. Lock it with the lock screw.



4.17 Mounting on the foundation feet

The vibration dampers are to be replaced at least every third year, and all at the same time.

Lifting the machine, see *Installation Manual*.

Apply Loctite 243 on the screws (1) and tighten them. Tightening torque **40 Nm** (4 kpm). The dampers must be replaced at least every second year.

Level against the upper face of the three holders (3). When necessary screw the holders so as to compensate for the inclination. Any gap between a holder and the foundation foot must be filled with one or more adjusting washers (4).

Lower the frame on to the foundation feet.

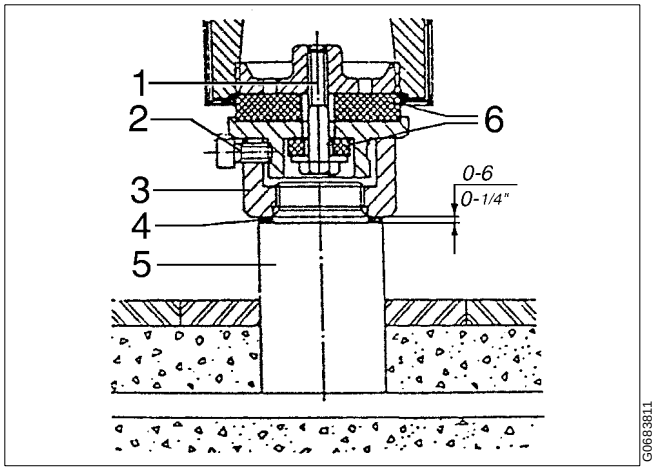
Tighten the set screws (2) by hand (or by a hand tool, if necessary) until all of them are in contact with the frame feet, then tighten them with a tightening torque of **100 Nm**. Mount the bowl and check that the frame is horizontal by means of a spirit level placed on the outer frame rim. Make a new adjustment if necessary.

NOTE

Tighten the set screws (2) before mounting the bowl or the cyclone.

Mount in the order stated

- Separator bowl
- Motor with protecting cover
- Cyclone
- Inlet
- Frame hood
- Outlet
- Operating Water Module, OWMC



1. *Screw and washer*
2. *Set screw*
3. *Holder*
4. *Adjusting washer*
5. *Foundation foot*
6. *Vibration damper*

5 Lubrication

Contents

5.1 Lubricants

5.1.1 Recommended lubricating oils

Alfa Laval ref. 553219-04, rev. 0

Two different groups of lubricating oils are approved. They are designated as Alfa Laval lubricating oil groups B and D. The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands acc. to document 553218-05 and 553218-06, see"5.1.2 Recommended oil brands" on page 179

Ambient temperature °C	Alfa Laval lubricating oil group	Time in operation Oil change interval
Between +5 and +45	B/320	1500 h
Between +2 and +65	D/320	2000 h

Note:

- In a new installation or after change of gear transmission, change oil after 200 operating hours.
- When the separator is operated for short periods, lubricating oil must be changed every 12 months even if the total number of operating hours is less than stated in the recommendations above.
- Check and prelubricate spindle bearings on separators which have been out of service for 6 months or longer.
- In seasonal operation: Change oil before every operating period.

5.1.2 Recommended oil brands

Alfa Laval ref. 553218-05, rev. 2

NOTE

The data in below tables is based on supplier information in regards to lubrication properties. Trade names and designations might vary from country to country, contact your local supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

Alfa Laval lubrication oil group B	
Viscosity grade VG (ISO 3448/3104) Viscosity index VI (ISO 2909)	320 >92
Manufacturer	**Designation**
Bel-Ray	100 Gear oil 90
BP	Energol GR-XP 320
Castrol	Alpha SP 320
ELF	Epona Z 320
Esso/Exxon	Spartan EP 320
Fina	Giran 320
Gulf	EP HD 320
Mobil	Mobilgear 632 (Mobilgear SHC 320) ***** Synthetic
Optimol	Optigear BM 320
Q8/Kuwait Petroleum	Goya 320
Shell	Omala 320 (Delima HT 320) *****Synthetic
Texaco/Caltex	Meropa 320

***** These oils must be used when the frame temperature is above 80 °C.

If you can't verify the temperature by measuring, a rough estimate is that 80 °C is when you can touch the surface of lower part of frame for a short time only.

Alfa Laval ref. 553218-06, rev. 2

NOTE

The data in below tables is based on supplier information in regards to lubrication properties. Trade names and designations might vary from country to country, contact your local supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

Alfa Laval lubrication oil group D	
Viscosity grade VG (ISO 3448/3104) Viscosity index VI (ISO 2909)	320 >135
Manufacturer	**Designation**
Alfa Laval	542690-84 (20 litres) 542690-85 (4 litres)
Castrol	Alphasyn EP 320
Chevron	Tegra 320
ELF	Epona SA 320
Esso/Exxon	Terrestic SHP 220 Teresso SHP 220
Mobil	Mobilgear 632
Optimol	Optigear Synthetic A 320
Q8/Kuwait Petroleum	Schumann 320
Shell	Delima HT 320 Paolina 320

5.1.3 Recommended lubricants

Alfa Laval ref. 553217-01, rev. 7

NOTE

The data in below tables is based on supplier information in regards to lubrication properties. Trade names and designations might vary from country to country, contact your local supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

Pastes for non-food applications:

Manufacturer	Designation	Alfa Laval No	
Fuchs Lubritech	Gleitmo 805K Gleitmo 705K		
Dow Corning	Molykote 1000 (Paste) Molykote 1000 (Paste) Molykote G-rapid plus (Paste)	537086-02 (1000 g) 537086-03 (100 g) 537086-04 (50 g)	
Rocol	Antiscuffing (ASP) (Paste)		
Klüber	Wolfracoat C (Paste)		

Bonded coatings:

Manufacturer	Designation	Alfa Laval No	
Fuchs Lubritech	Gleitmo 900 (Varnish or spray)		
Dow Corning	Molykote D321R (Spray) Molykote D321R (Varnish)	535586-01 (300 ml) 535586-02 (60 ml)	

Pastes for food applications

Manufacturer	Designation	Comment	Alfa Laval No	
Fuchs Lubritech	Gleitmo 805			
	Geralyn 2	USDA H1	561764-01 (50 g)	
Dow Corning	Molykote TP 42 Molykote D			
	Molykote Foodslip EP-2	USDA H1 (Mineral oil base)	537086-07 (50 g)	
Klüber	Klüberpaste 46 MR 401			
	Klüberpaste UH1 96-402	USDA H1		
Lubrication Engineers	LE 4025	USDA H1		

Silicone grease for rubber rings:

Manufacturer	Designation	Alfa Laval No	
Dow Corning	Molykote 111 (Compound) Molykote 111 (Compound)	539474-02 (100 g) 539474-03 (25 g)	
Fuchs Lubritech	Gleitmo 750		
Klüber	Unisilkon L 250 L		
Wacker	Silicone P (Paste)		

Greases for ball and roller bearings:

> **NOTE**
>
> Always follow the specific recommendation for lubrication as advised by the manufacturer.

Manufacturer	Designation	Alfa Laval No
BP	Energrease MM-EP2 Energrease LS2	
Castrol	APS 2 Grease EPL 2	
Chevron	Dura-Lith Grease EP2	
Elf	Epexa 2	
Esso/Exxon	Beacon EP2 Unirex N2	
Fina	Marson EPL 2A	
Mobil	Mobilith SHC 460 Mobilux EP2	
Gulf	Gulflex MP2	
Q8/Kuwait Petroleum	Rembrandt EP2	
Shell	Alvania EP Grease 2 Albida Grease EP2	
SKF	LGEP2 or LGMT2	
Texaco	Multifak AFB 2	

5.1.4 Lubrication chart, general

Alfa Laval ref. 553216-01, rev. 6

Lubricating points	Type of lubricant
Bowl spindle ball bearings and buffers are lubricated by oil mist	Lubricating oil as specified in “Recommended lubricating oils”
Bowl spindle taper	Lube oil, only a few drops for rust protection
Metal buffers of bowl spindle	Lube oil
Bowl: Sliding contact surfaces and pressure loaded surfaces such as lock rings, threads of lock rings, bowl hood and cap nut	Pastes as specified in “Lubricants”
Rubber seal rings	Grease as specified in “Lubricants”
Friction coupling ball bearings	The bearings are packed with grease and sealed and need no extra lubrication
Electric motor	Follow manufacturer's instructions

NOTE

The **Lubrication chart, general** can be complemented with more detailed charts, showing the lubrication points in detail and what type of lubricant to use.

Instructions related to a specific design of the machine, refer to the general assembly drawings.

Some application processes demand special lubrication.

If not specified otherwise, follow the supplier’s recommendation about method of application.

Alfa Laval Lubricating Oil Groups

- **Group A oil:** a high quality gear oil on paraffin base with stable AW (anti wear) additives.
- **Group B oil:** a high quality gear oil on paraffin base with stable EP (extreme pressure) additives.
- **Group D oil:** a synthetic base oil with additives stable at high operating temperatures.
- **Group E oil:** Characteristics as a group D-oil but suitable at a higher operation power (≤55 kW)

Do not mix different oil brands or oils from different oil groups.

Always use clean vessels when handling lubricating oil.

Great attention must be paid not to contaminate the lubricating oil. Of particular importance is to avoid mixing of different types of oil. Even a few drops of motor oil mixed into a synthetic oil may result in severe foaming.

Any presence of black deposits in a mineral type oil is an indication that the oil base has deteriorated seriously or that some of the oil additives have precipitated. Always investigate why black deposits occurs.

If it is necessary to change from one group of oil brand to another it is recommended to do this in connection with an overhaul of the separator. Clean the gear housing and the spindle parts thoroughly and remove all deposits before filling the new oil.

NOTE
Always clean and dry parts (also tools) before lubricants are applied.

CAUTION

Check the oil level before start.
Top up when necessary.
Oil volume = see “Technical Data”.

It is of utmost importance to use the lubricants recommended in our documentation.

This does not exclude, however, the use of other brands, provided they have equivalently high quality properties as the brands recommended. The use of oilbrands and other lubricants than recommended, is done on the exclusive responsibility of the user or oil supplier.

Applying, handling and storing of lubricants

Always be sure to follow lubricants manufacturer’s instructions.