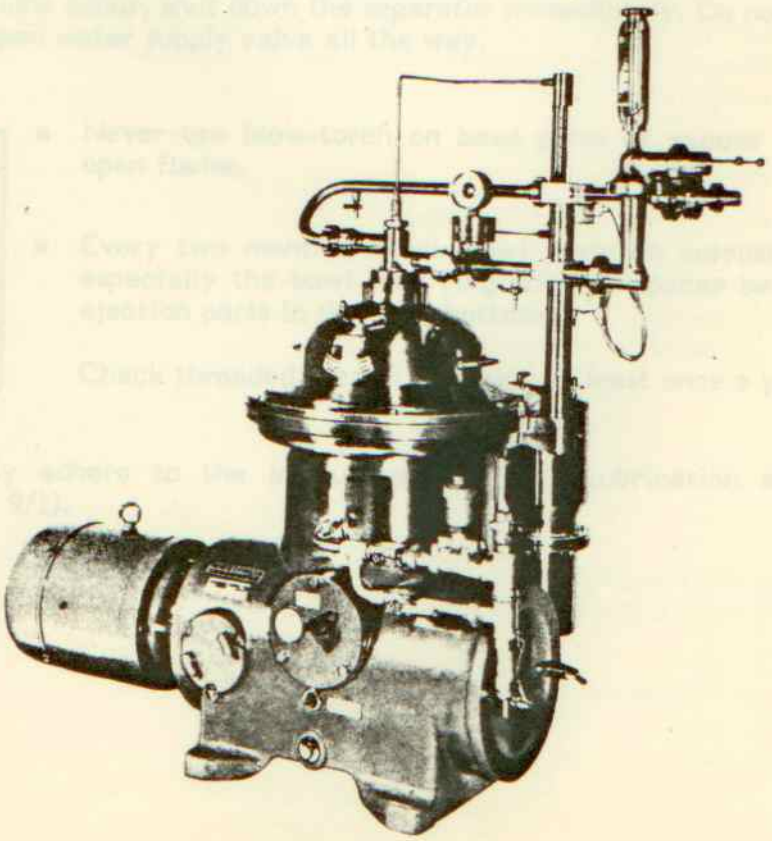
WESTFALIA SEPARATOR

Separator with Self-Cleaning Bowl

Model SB 14-36-076

Model SB 14-36-576



The WESTFALIA Separator is a high-speed centrifuge which works reliably, provided that it is operated and looked after in accordance with our Operating Instructions.

The bowl speed has been rated so as to ensure the operating safety of the separator. It depends on the densities of the centrifugally dry solids and of the clarified liquid. If the densities exceed those shown on the name-plate of the separator, check with the factory or with authorized representatives for detailed information, since in the majority of such cases the bowl speed will have to be reduced by changing the drive parts.

When assembling the bowl, strictly adhere to the instructions of this working manual, to avoid undue unbalance **which may result in heavy damage.**

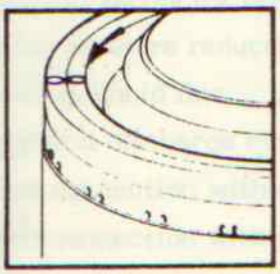
Corrosive liquids and liquids containing abrasive solids, particularly when being processed at high temperatures, may attack the bowl material after quite a short period of operation, resulting in impaired safety. To obviate the danger arising from impaired safety, keep a regular check on all bowl components.
Special attention must be given to the threads of the bowl bottom and of the bowl lock ring as well as to the area between the sludge ejection ports in the bowl bottom.

We, therefore, recommend in your own interest to have your separator inspected by WESTFALIA service engineers at regular intervals. Such inspections will keep your separator working reliably and prevent undesirable shut-downs.

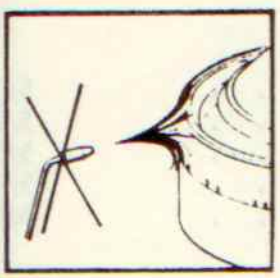
If bowl repair proves necessary, please advise us in time. We shall then check with you how to avoid interruption of operation.

The forces resulting from the high speed rotation of the bowl put great strain on the bowl material. To avoid the risk of impaired operating safety be sure to strictly adhere to the instructions of this manual regarding assembly, starting, shutting down and maintenance of the separator.

- **Do NOT loosen any part of the separator or of the feed and discharge connections before the bowl has stopped completely.**



- When assembling the bowl, be sure to strictly adhere to the instructions given in sect. 4.1 in order to avoid undue unbalance. The bowl must not be started before it is **completely** assembled.
- Be sure to tighten bowl lock ring thorougly; the "O" marks on bowl bottom and bowl lock ring must be in line with each other.
- Be sure to fasten hood, feed and discharge housing, and centripetal pump firmly.
- Feed product to the separator via a strainer.
- Before feeding the liquid to be processed, close the bowl hydraulically and check bowl on leakage (see section 6.2).
- Stop product supply before each complete de-sludging.
- When strong vibrations occur, shut down the separator immediately. Do not de-sludge bowl. If the bowl leaks, open water supply valve all the way.



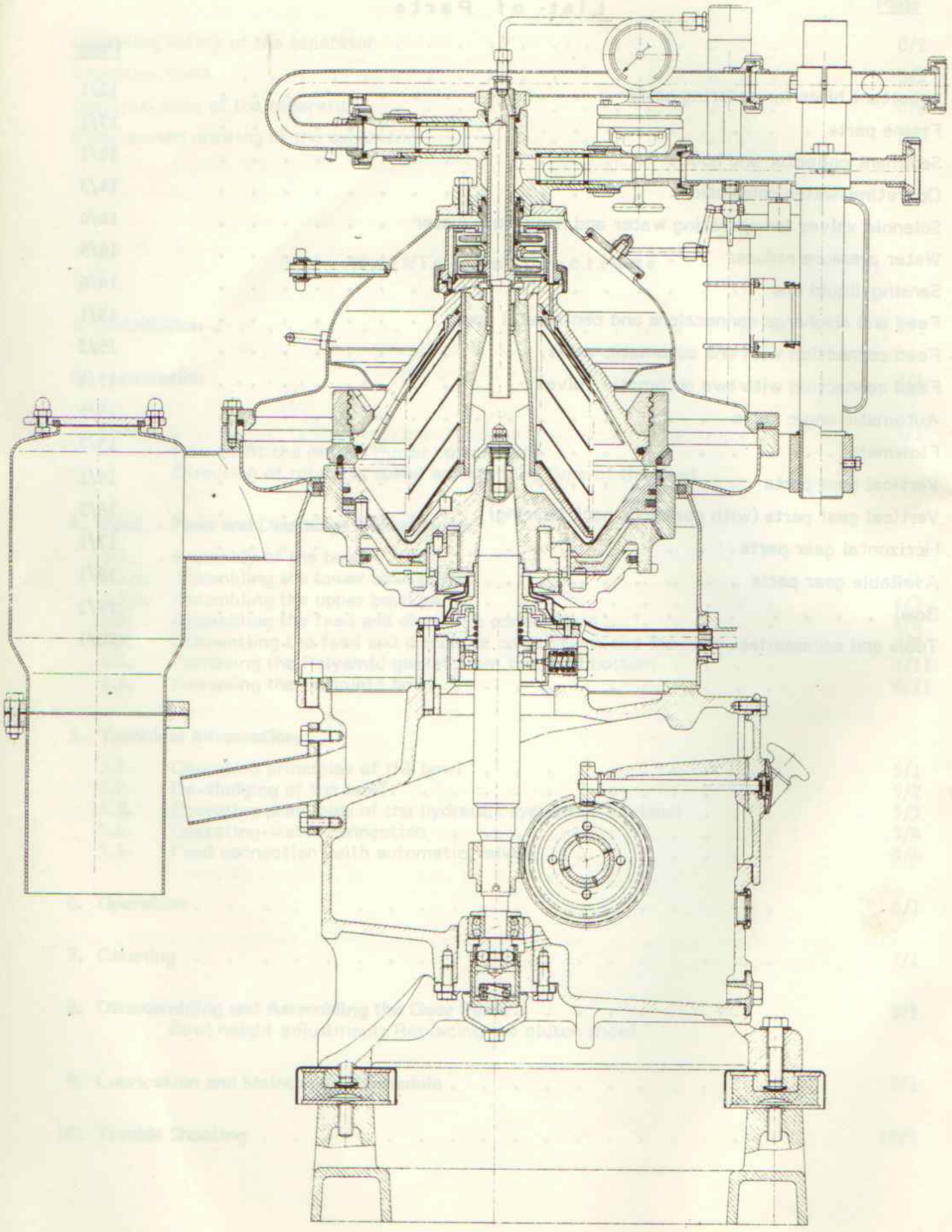
- Never use blow-torch on bowl parts or expose them to heat of open flame.
- Every two months, check bowl parts on corrosion and erosion - especially the bowl lock ring and the spaces between the solids ejection ports in the bowl bottom.

  Check threaded area of lock ring at least once a year.

- Be sure to strictly adhere to the instructions of the "Lubrication and Maintenance Schedule" (see page 9/1).

CONTENTS

List of Parts



1 Schleudergut - Zulauf
Feed
Alimentation

2 Verdrängungs - bzw Spulwasser - Zulauf
Displacement or flush - water feed
Alimentation en eau de déplacement ou de rinçage

3 Schleudergut - Ablauf
Liquid discharge
Sortie du liquide

4 Steuerwasserzulauf mit Magnetventil und Bypass
Operating - water connection with solenoid valve and by - pass
Système d'alimentation d'eau de commande avec vanne électromagnétique et by - pass

5 Feststoff - Ablauf
Solids discharge
Sortie des matières solides

6 Steuerwasser - Ablauf nicht mit einem Rohrleitungssytem verbinden. Steuerwasser muß frei in einen Kanal oder Schlammtank ablaufen können z. B. über einen Trichter.
Do not connect operating - water discharge line to a piping system. Operating - water must be able to discharge freely into a sewer or sludge tank e.g. via a funnel.
Ne pas relier la conduite de sortie de l'eau de commande avec un tuyau. L'eau de commande doit pouvoir s'écouler librement aux égouts ou bien dans un réservoir à boues, par exemple à travers un entonnoir.

7 Umlaufkontrolier
Revolution indicator disc
Indicateur des révolutions

8 Ölschauglas
Oil sight glass
Viseur d'huile

9 Bremse
Brake
Frein

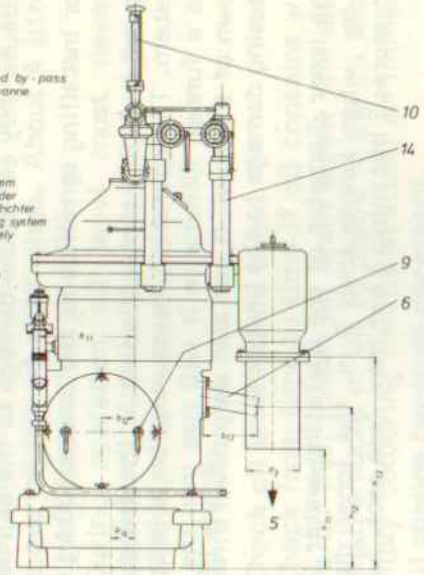
10 Durchflußmesser
Flowmeter
Débitmètre

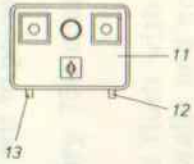
11 Steuergerät
Timing unit
Programmateur

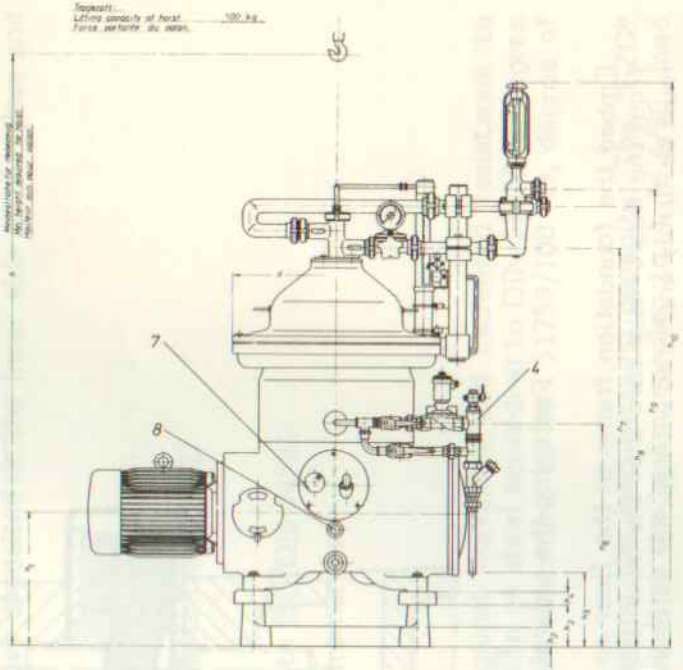
12 Zuleitung [Netz]
Power supply line [mains]
Ligne d'alimentation [réseau électrique]

13 zu dem Ventil
to valve
vers les vanne

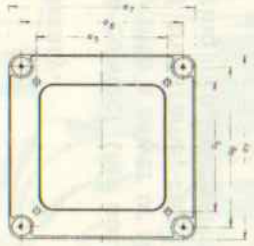
14 Steuerleitung
Control line
Ligne de commande

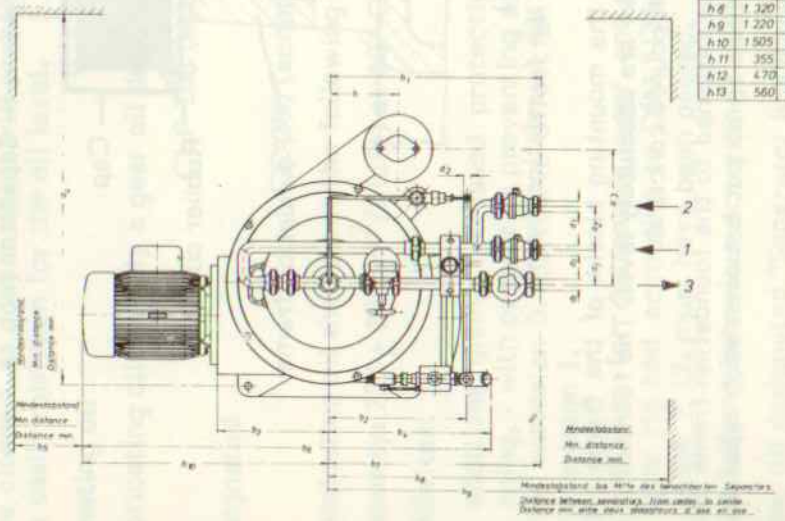






a	mm	inches
a 1	105	4,13
a2	130	5,12
a 3	404	15,95
a 4	1 100	43,31
a 5	392	15,43
a 6	480	18,90
a 7	555	21,85
b	200	7,87
b 1	615	24,21
b 2	400	15,75
b 3	320	12,60
b 4	335	13,19
b 5	200	7,87
b 6	1 195	47,05
b 7	585	23,03
b 8	1 000	39,37
b 9	1 800	70,87
b 10	760	29,92
b 11	305	12,01
b 12	100	3,94
b 13	150	5,91
b 14	73	2,87
d	Ø 622	Ø24,49
d1	NW 25	NW0,98
d2	R 1|2"	91|2"
d3	NW154	NW6,06
h	1 500	59,06
h1	400	15,75
h2	60	2,36
h3	130	5,12
h4	40	1,57
h5	215	8,46
h6	550	25,59
h7	1 155	45,47
h8	1 320	51,97
h9	1 220	48,03
h10	1 505	59,25
h11	355	13,98
h12	470	18,50
h13	560	22,05





Gesamtgewicht des Separators
Total weight of separator 900 kg
Poids total du séparateur

1. Installation

When installing the separator, make sure that sufficient room is available (at least 300 mm) to mount and to remove the motor and to remove the horizontal drive shaft which is to be pulled out towards the brake side of the frame.

Take care that the foundation of the separator cannot receive vibrations from other machines, because they can cause damage to the ball bearings.

For installing or removing the bowl a 500 kg hoist will be necessary.

Do **not** install a shut-off valve in the frame drain and do **not** connect this outlet to a piping system. The operating water must be able to discharge freely into a sewer or sludge tank, e.g. via a funnel. Otherwise it will rise into the upper section of the frame, resulting in slowing down of the bowl. It can also seep down through the neck bearing into the bearing housing, thus causing damage to the bearings.

The inner diameter of the operating-water line should be 1/2" when the line is not longer than 3 m; when longer than 3 m, the inner diameter should be 3/4". Required operating-water pressure: 2 bar min., 3 bar max. (see sect. 5.4).

It is recommended that a second shut-off valve be installed in the operating-water supply line. This is to protect the machine during standstill against inrush of water caused by unintended opening of the shut-off valve.

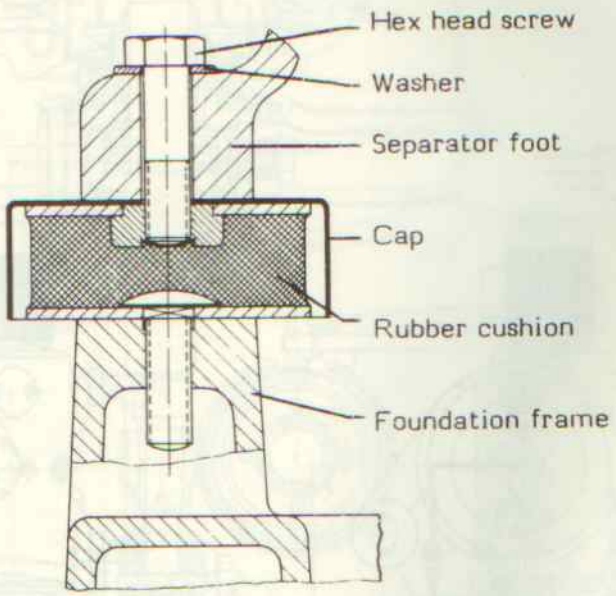


Fig. 1/1
Fastening the separator to the foundation frame

Embed the foundation frame in the floor so that the mounting blocks of the frame protrude from the floor. Make sure that the mounting blocks are **absolutely level.** The foundation frame must be firmly anchored with anchor bolts and with poured concrete.

After the concrete has set, the separator has to be fastened to the foundation frame as shown in Fig. 1/1. To absorb vibrations, a rubber cushion has to be put between each separator foot and mounting block.

2.1. Lubrication of bearings and gear parts

All bearings and gear parts are splash lubricated from a central oil bath.

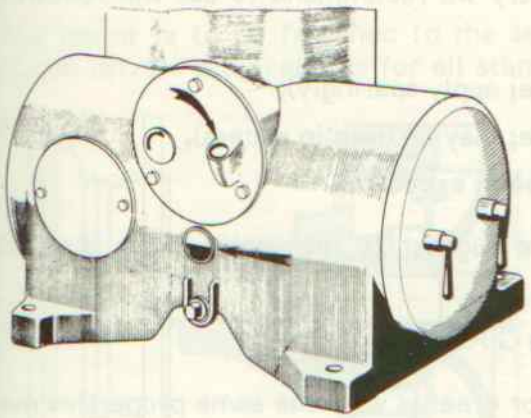


Fig. 2/1

Oil level

Before the initial start-up of the separator fill gear chamber with oil until oil level is slightly above middle of sight glass. About 4 litres of oil are required for one filling.
During operation oil level must never be allowed to sink below middle of sight glass; refill oil when necessary.

Oil check

Check oil level once a week.
Check from time to time if oil contains water. To do this, loosen oil drain screw and allow a small amount of oil to drain. If the oil shows a milky colouring (emulsification) an immediate oil change becomes necessary.

Oil change

Make first oil change after about 250 operating hours; then change oil every 750 operating hours. However be sure not to wait longer than 6 months to change the oil.

Each time when carrying out oil change, thoroughly clean gear chamber and flush with thin-bodied oil, prior to filling in new oil. Remove all metal particles from inner walls and corners of the gear chamber. Do **not** use fluffy cleaning rags or cotton waste. The sight glass should also be cleaned, as a layer of oil will probably have deposited on the inner side of the glass and this is easily mistaken for the oil level.

Lubricating oil

As lubricating oil use only a gear oil designated

CLP 200 (according to DIN 51502)

or designated

CC 200 (according to ISO/DIS 3498).

The lubricating oil shall meet the following requirements:

1) Viscosity: 220 $\pm$ 22 mm^2/s (cSt) at 40° C
2) Addivites:
   a) additives giving increased protection against corrosion and increased resistance to aging, - with properties preventing corrosion on steel according to DIN 51355/B, degree of corrosion 0. Corrosive effect on copper according to DIN 51759/100 A3, degree of corrosion 1.
   b) additives for decreasing wear and increasing the load-carrying capacity. The "FZG" gear rig test according to DIN 51354 as well as the test according to A 16.6/90, load grade > 12, must have been passed.
3) Demulsifying behaviour according to DIN 51599: < 60 minutes.

The gear oil designated "Separator lubricating oil CLP 220" which has been extensively investigated by us meets the above requirements and should preferably be used. For the order number refer to page 20/1 of the parts list.

2.2. Lubrication of threads and contact surfaces on bowl parts

Before assembling the bowl apply a thin film of one of the lubricants specified below to threads and contact surfaces of bowl bottom, bowl top, lock rings, etc.

For separators operating in the food processing industry we recommend to use the following lubricants:

Molykote D	(white paste; apply sparingly),
Molykote DX	(white paste; may be used in excess),
Klüber Grease KSB 8	(may be used in excess).

For separators operating in the chemical industry we suggest to use molybdenum disulfide pastes, e.g.

Molykote G or Molykote G Rapid.

Besides the above mentioned lubricants, other pastes or greases with the same properties may also be used.

2.3. Lubrication of the motor bearings

For lubrication of the motor bearings, refer to the instruction of the motor manufacturer (see motor plate).

3.1. General

The separator is powered by a 7.5 kW three-phase AC flange-type motor, type B5. The motor power is rated to cover the high acceleration current.

3.2. How to fit the motor

The motor is to be fastened to the separator by means of a flange. Appropriate flanges and clutch drivers are available for all standard flange-type motors, type B5.

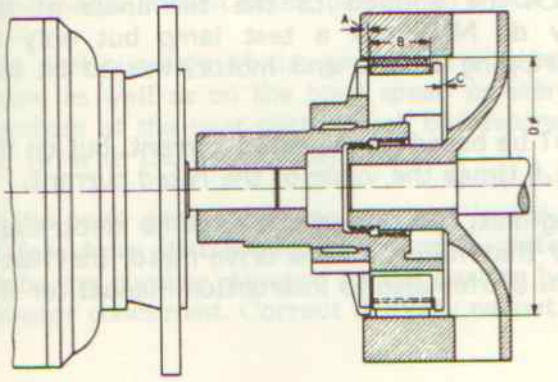


Fig. 3/1a

Position of the clutch driver in ring of clutch drum.

Dimensions in mm					
Fig. 3/1a				Fig. 3/1b	
A	B	C	D	E	d
0	59.5	3±0.5	180	M10	7

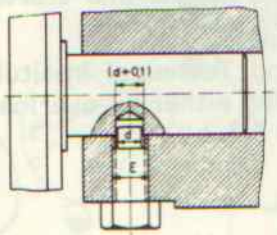


Fig. 3/1b

Fastening the clutch driver on the motor shaft.

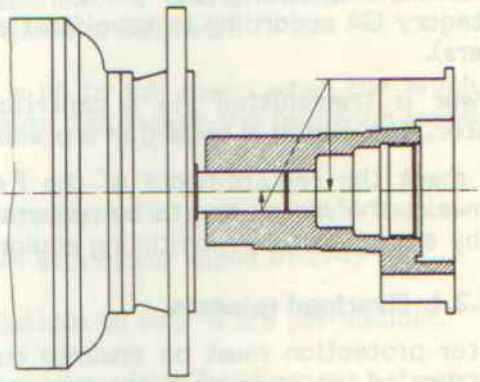


Fig. 3/1c

Tolerance between axis of clutch driver and axis of motor shaft.

The motor power is transmitted to the worm wheel shaft of the separator via a centrifugal clutch. For proper functioning of the centrifugal clutch fit the clutch driver onto the motor shaft end as shown in Fig. 3/1a and 3/1b in such a manner that, after mounting the motor, the clutch shoes rest with their entire widths against the ring of the clutch drum (see fig. 3/1a).

For fitting the clutch shoes refer to sect. 8.4.3.

Fasten clutch driver to motor shaft by screwing the hex head screw all the way in (see fig. 3/1b). Make sure that the screwhead rests tightly against recessed surface.

After fastening the clutch driver, check tolerance between axis of clutch driver and axis of motor shaft. The deviation of tolerance must not exceed 0.05 mm (see fig. 3/1c).

3.3. Motor connection

3.3.1. Three-phase AC motor

The motor is started via a motor control either across-the-line or in star-delta connection. In case of star-delta starting, change-over from star to delta connection has to take place after 4 to 6 seconds.

Motor protection is ensured by PTC resistor type temperature feelers incorporated in the winding of the motor. These temperature feelers have to be connected to the tripping device of the motor control.
External voltage higher than 2.5 volts must NOT be applied to the terminals of the temperature feelers. When testing for continuity do NOT use a test lamp but only an ohmmeter. The measuring circuit line (between tripping device and motor) has to be laid separate from other lines.

Dimensioning of switches, wiring and fuses must NOT be based on the rated current, but on the starting current which reaches approximately 1.5 - 1.8 times the value of the rated current.

If the separator is controlled by an automatic timing unit, the timing unit must be electrically interlocked with the motor control in such a manner that failure of the drive motor inevitably leads to closing of the automatic product feed valve. (Refer also to Instruction Manual for the Timing Unit).

3.3.2. Explosion-proof three-phase AC motor

For operation in explosion-hazarded plants, the separator is equipped with a three-phase AC motor of explosion-proof design, type B5, type of enclosure (Ex)d3n, flame-proof, ignition category G4 according to specifications 0171 of the VDE (Institute of German Electrical Engineers).

Power is transmitted via a centrifugal clutch which allows across-the-line starting of the motor. The clutch is housed in a pressure-tight section of the separator frame.

To meet the requirements of the Federal German Physical and Technical Institute, Braunschweig, the motor has to be protected against undue overheating either by overload releases or by a temperature monitoring equipment (see under 3.3.2.1 and 3.3.2.2).

3.3.2.1. Overload releases

Motor protection must be ensured during starting and during operation by thermal releases. Because of the increased starting current, the start release shall be adjusted to 1.4 times the value of the rated current of the motor. The release for operation shall be adjusted to the rated current of the motor. Switching over from start release to operation release must take place automatically as soon as the separator has reached its operating speed.

3.3.2.2. Temperature monitoring equipment

Instead of the thermal releases a temperature monitoring equipment approved by the Federal German Physical and Technical Institute, Braunschweig, can also be used for motor protection. This device consists of

three temperature feelers which are incorporated in the winding of the motor, and
one tripping device, type Calomat CK 121, which is to be installed in the motor control.

IMPORTANT: Before switching on the motor, make sure that the friction brakes are released.

3.4. Direction of rotation of the bowl

The bowl must turn in clockwise direction when looked at from above. The direction of rotation of the bowl is correct when the revolution indicator disc (fig. 3/3) turns in clockwise direction. If it turns in anti-clockwise direction (incorrect), reverse direction of rotation by interchanging two lead-in wires.

3.5. Speed and starting time of the bowl

The bowl speed has been rated so as to ensure the operating safety of the separator. It depends on the densities of the centrifugally dry solids and of the clarified liquid.

The bowl speed and the maximum permissible densities are shown on the name-plate of the separator.

If densities exceed those shown on the name-plate, the gear must be changed to reduce the bowl speed. In such cases, be sure to check with the factory.

The part-numbers of the gear parts marked with *** in the List of Parts depend on the motor speed as well as on the bowl speed as seen on the name-plate of the separator. For the part-numbers of the gear parts which correspond to the motor speed and bowl speed of your separator refer to the list on page 18/1.

If the bowl speed has been changed in the site by exchanging the gear parts and consequently differs from that shown on the name-plate of the separator, orders for new gear parts should state the number stamped on the part to be replaced as well as model and serial-no. of the separator concerned. Correct delivery cannot be ensured unless the order quotes these data.

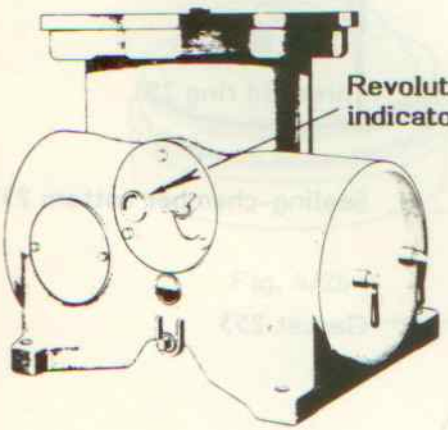


Fig. 3/3

The **revolution indicator disc** serves to indicate whether the bowl is rotating and in which direction (see 3.4). It also allows to check the operating speed of the bowl.

The bowl is up to full speed when the revolution indicator disc makes the following revolutions:

65 rpm at a motor speed of 1455 rpm,

78 rpm at a motor speed of 1745 rpm.

Speed variations up to 3 % are permissible.

The **starting time** of the bowl ranges between 4 and 6 minutes, depending on number and condition of the clutch shoes used.

Make sure that the bowl reaches its rated speed (as per name-plate of separator) within the starting time and that this speed is maintained during operation (see 10.1.1 - 10.1.3).

Important Hints

- Before assembling the bowl, make sure that all guide and sliding surfaces as well as the threaded areas of the bowl parts are clean.
- When installing the bowl parts, make sure that the "O" marks of the bowl parts are in line. "O" mark alignment will ensure that the parts are properly positioned and locked in place by arresting pins and guide ribs. To avoid damage to guide surfaces and arresting pins when installing or removing the bowl parts, make sure the hoist is in the correct position. The hoist is to be operated at the low lifting speed. Never use violence when istalling or removing the bowl parts.
- Before inserting gaskets, check them for wear. Make sure that grooves for gaskets and gaskets are clean and that gaskets are in perfect condition. Be careful not to twist the gaskets while inserting them and check to be sure that they fit properly in their grooves.
- If the plant has several separators, be sure not to interchange parts of different bowls, since each bowl has been balanced with its component parts. The main parts of the bowl are marked with the last three digits of the Serial-Number of the Separator.

4.1. Assembly of the bowl

4.1.1. Assembling the lower bowl parts

The lower bowl parts are assembled in the order shown in fig. 4/1, i.e. in a position inverted with regard to service position.

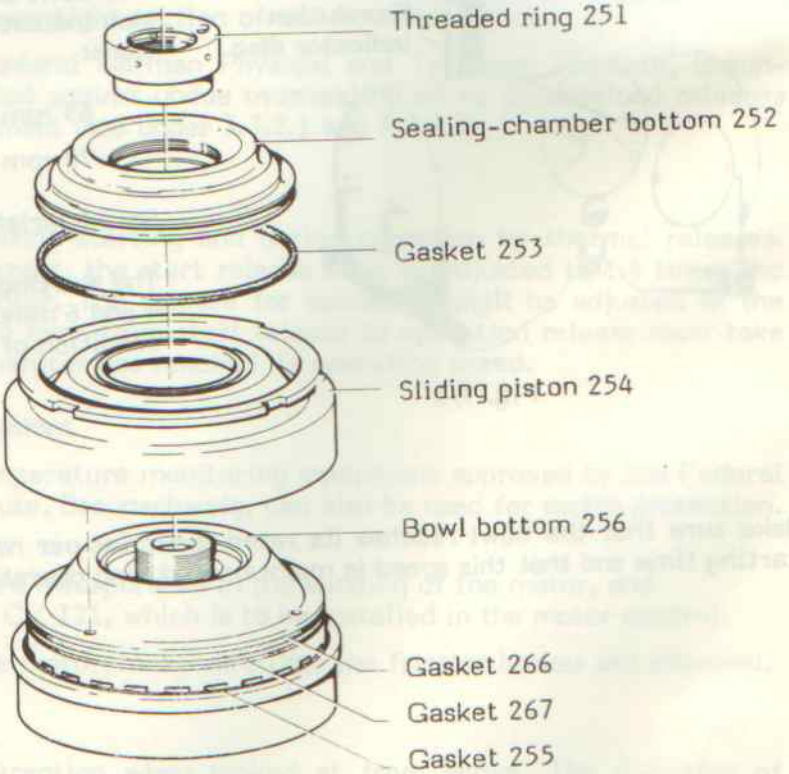


Fig. 4/1

Exploded view of lower bowl parts

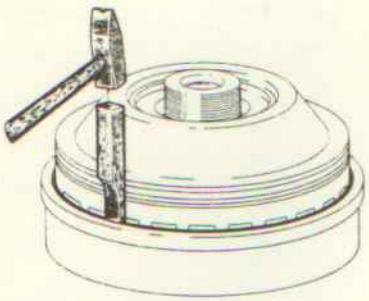


Fig. 4/2a

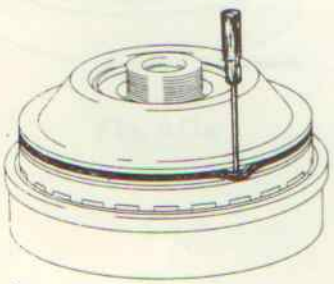


Fig. 4/2b

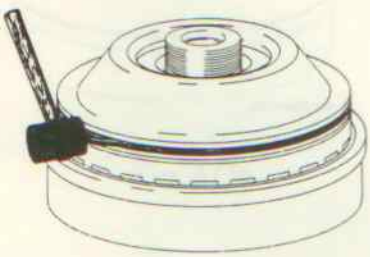


Fig. 4/2c

1) Thoroughly clean groove in bowl bottom for gasket 255.
Wipe gasket dry and insert it into groove of bowl bottom. Then place a piece of wood on gasket and hammer gasket into the groove so that it fits in evenly all around. See fig. 4/2a.

In order to make certain that the gasket is properly placed in the groove, proceed as follows after the separator has been completely assembled:

a) Block off all air circulation by closing solids run-off and feed and discharge pipes. The operating-water outlet on the frame must NOT be closed.

b) Turn on separator and let run for about 3 hours without feeding operating water. Bowl will warm up to about 90 °C through air friction.

c) Close bowl by briefly opening the valve in the operating-water supply line several times in succession. The gasket, which has become pliable through the heat of the bowl, will become firmly pressed into the anchor grooves.

d) Let bowl run closed an additional 15 minutes while feeding cold water at a low flow rate. **Important:** Before first solids ejection, be sure solids-run off has been reopened.

2) Thoroughly clean grooves in bowl bottom for gaskets 266 and 267 and rub in a thin layer of neutral grease (one with no harmful effect on the process liquid).

In case the gaskets are new and a bit too small, stretch them out equally all the way around until their perimeters are approximately equal to the perimeters of the grooves.

Place gaskets into their grooves.
Then put a screwdriver under the gaskets and run it around the bowl bottom two or three times (fig. 4/2b). (This equalizes the gasket fitting all the way around and makes for best sealing during operation).
Then tap the gaskets back into their grooves with a rubber hammer (fig. 4/2c).

If the machine has been dismantled (e.g. when cleaning the bowl) and the gaskets have not been removed or exchanged, then they should be pried up carefully at one point with a small screwdriver to allow water which has collected behind them to escape. The gaskets should then be tapped back into the grooves with a rubber hammer. This will make the job of re-installing the sliding piston much easier. The same procedure should be followed with gasket 253 in the sealing-chamber bottom.

3) Grease contact surfaces of sliding piston 254 (see 2.2).

   Before installing the sliding piston, heat its outer surface with hot water or steam for about 5 minutes. **Never use any other sources of heat, e. g. blow torch or welding torch.**
   Then place the sliding piston onto bowl bottom, by hand. The "O" marks of both parts must be in line with each other. The sliding piston is properly mounted when its sealing edge rests on gasket 255.

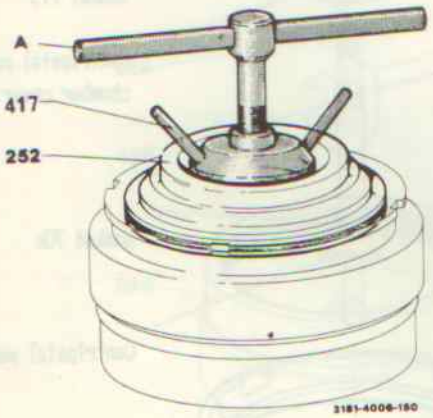


Fig. 4/3a

4) Put gasket 253 into groove of sealing-chamber bottom 252. Proceed by the same method as for gasket 267 (see para. 2).

5) Grease guide surfaces of sealing-chamber bottom (see 2.2). By means of jack 417 install sealing-chamber bottom in sliding piston (fig. 4/3a).
   By turning jackscrew "A" in counter-clockwise direction, the sealing-chamber bottom will gradually sink into the sliding piston. Be sure arresting pin of sealing-chamber bottom catches into hole of bowl bottom. The "O" marks of both parts must be in line with each other.

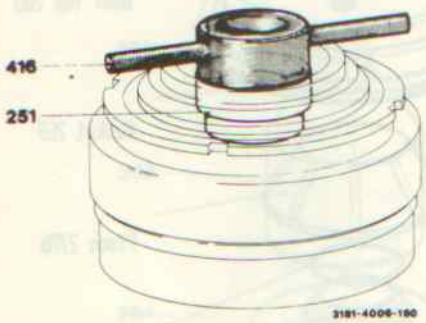


Fig. 4/3b

6) Grease threaded areas and contact surfaces on bowl bottom, threaded ring 251, and sliding piston (see 2.2). Then screw threaded ring, by hand, on to bowl bottom **(right-hand thread)** and tighten it with annular wrench 416 (fig. 4/3b) until "O" marks on sealing-chamber bottom and threaded ring are aligned.

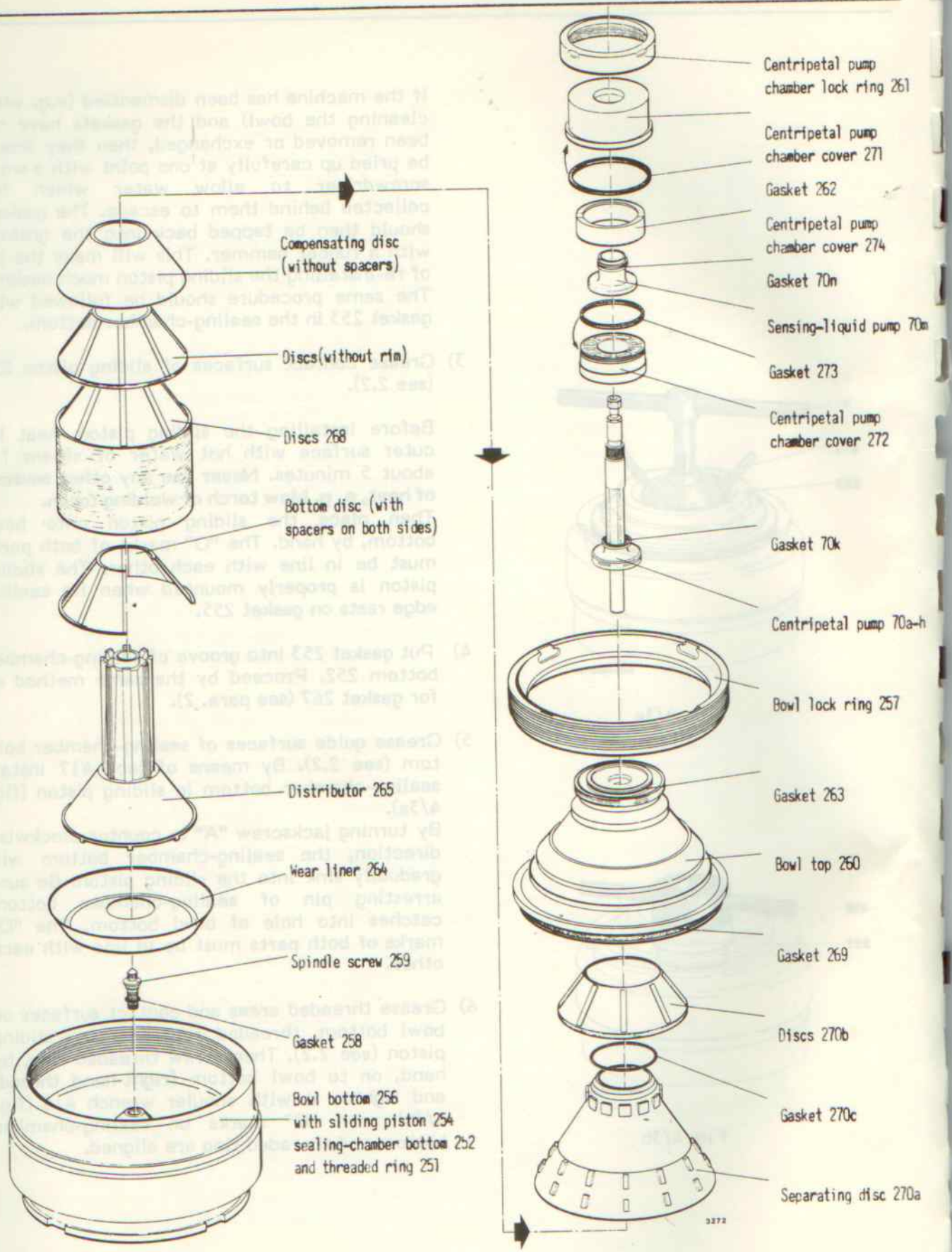


Fig. 4/4
Exploded view of the bowl

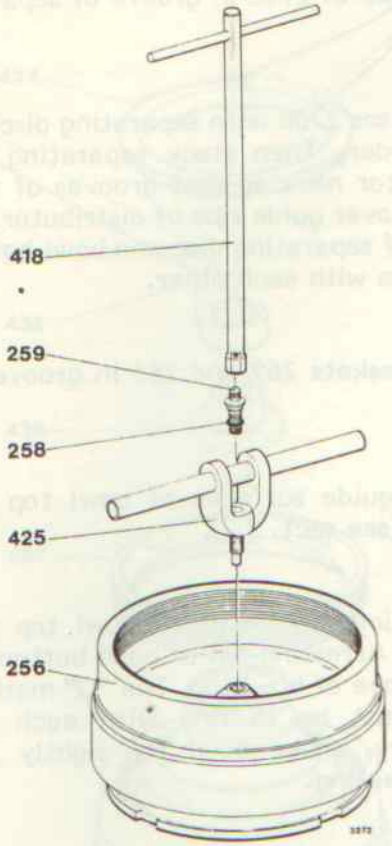


Fig. 4/5a

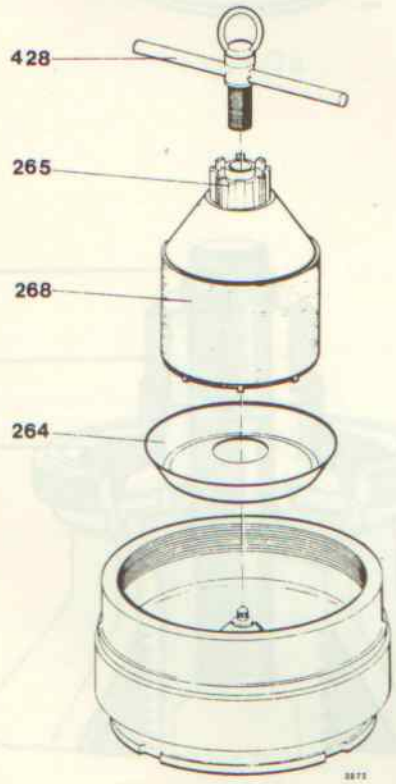


Fig. 4/5b

4.1.2. Assembling the upper bowl parts

Oil the upper part of the spindle (thread, cone and cylindrical guide surface for spindle cap). It must be possible to move the spindle cap easily up and down on the spindle. Then **clean and wipe dry the conical part of the spindle with a smooth rag. Carefully clean the inside of the bowl hub as well** to assure proper fitting.

Use jack 425 to place assembly of bowl bottom 256, sliding piston, sealing-chamber bottom and threaded ring onto the spindle (fig. 4/5a).

Insert gasket 258 in groove of spindle screw 259.

Use wrench 418 to screw spindle screw tightly into spindle **(left-hand thread).**

Insert wear liner 264 in bowl bottom (fig. 4/5b).

Stack discs onto neck of distributor in the following order:

a) Bottom disc (with spacers on both sides),

b) Discs 268 in numerical order,

c) Compensating disc (without spacers).
This disc is only used when a disc with an overall thickness less than that of the normal disc 268 (with spacers) is required to obtain the necessary pressure in the disc set.
It is included in the set of spare parts, unless it is already fitted in the bowl. When mounting the compensating disc, make sure to place it **on top of the disc stack,** directly below the separating disc.

Use device 428 to place distributor 265 with disc set into bowl bottom. Make sure arresting pin of distributor fits into groove of bowl bottom.
The "O" marks of both parts must be in line with each other.

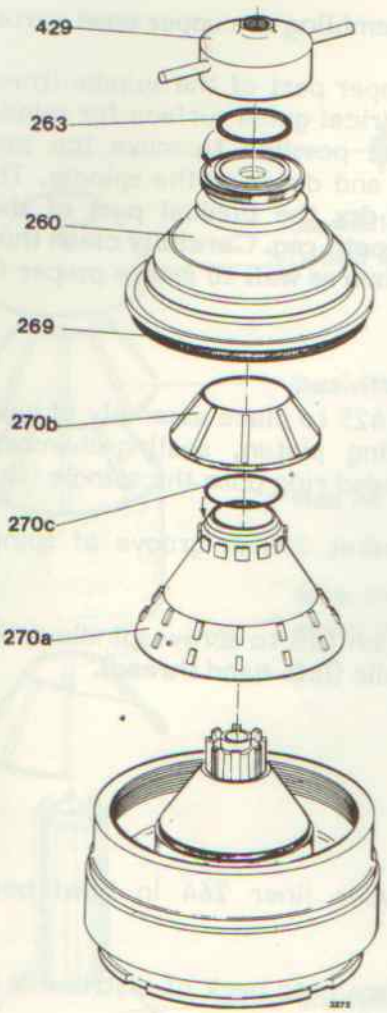


Fig. 4/6a

Insert gasket 270c in groove of separating disc 270a.

Place discs 270b onto separating disc, in numerical order. Then stack separating disc onto distributor neck so that grooves of separating disc fit over guide ribs of distributor. Then "O" marks of separating disc and bowl bottom must be in line with each other.

Insert gaskets 269 and 263 in grooves of bowl top 260.

Grease guide surfaces of bowl top and bowl bottom (see sect. 2.2).

Use device 429 to place bowl top into bowl bottom. Arresting pin of bowl bottom must fit into groove of bowl top. The "O" marks of both parts must be in line with each other. If neccesary, shake bowl top lightly to obtain proper seating.

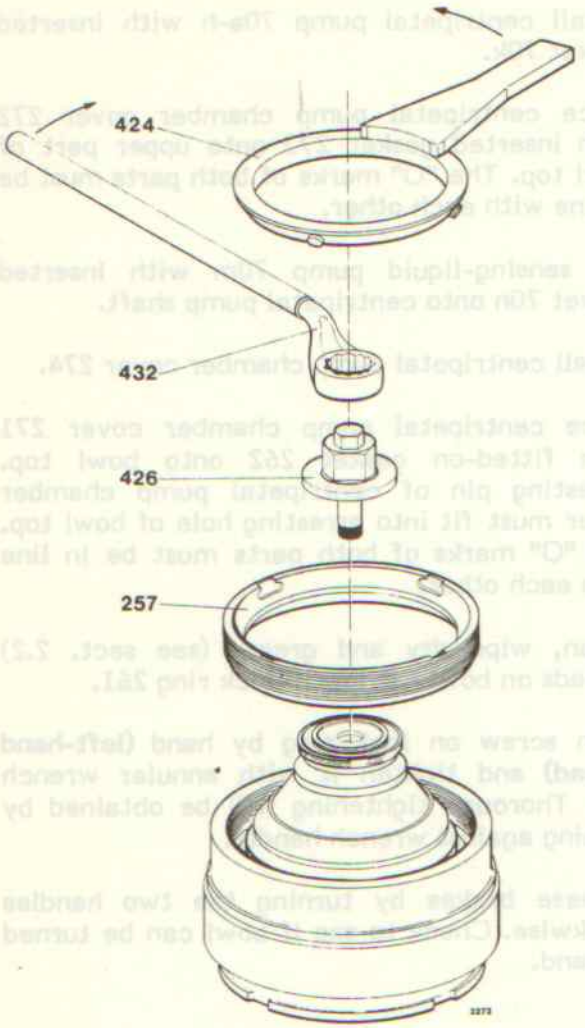


Fig. 4/7a

Thoroughly clean, wipe dry and grease (see sect. 2.2) threaded areas and guide surfaces of bowl bottom and bowl lock ring 257 as well as the contact surfaces of bowl top and bowl lock ring.

Screw bowl lock ring into bowl bottom, by hand **(left-hand thread)** and tighten it lightly with annular wrench 424.

To facilitate final tightening of the bowl lock ring compress disc stack with device 426 in the following manner:

Screw bolt A (fig. 4/7b) all the way down into distributor neck. Place disc C onto bowl top. Grease thread of bolt A. Then screw hexagon nut B onto bolt and tighten it with wrench 432.

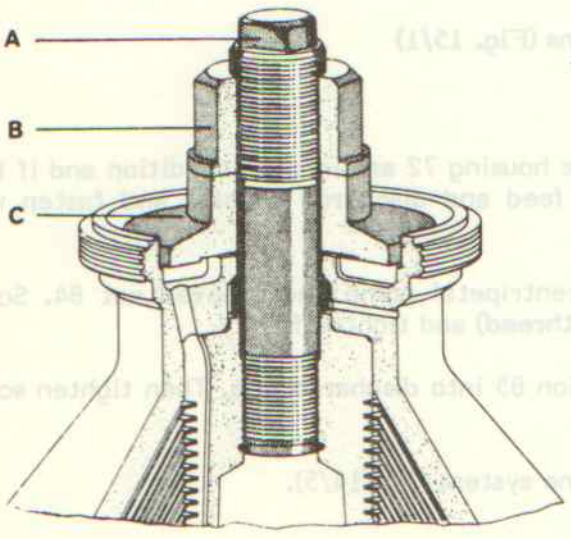


Fig. 4/7b

Now tighten bowl lock ring, by hand, with the aid of the annular wrench until the "O" marks on bowl bottom and bowl lock ring are close together. A few blows with mallet 415 against the wrench handle will then be sufficient to obtain **"O" mark alignment.** If the pressure in the disc stack has slackened so that it is possible to tighten the lock ring with the annular wrench without using a mallet, then a spare disc or a compensating disc has to be added.

Loosen hexagon nut B with wrench 432. Unscrew bolt A and remove it together with hexagon nut B and disc C.

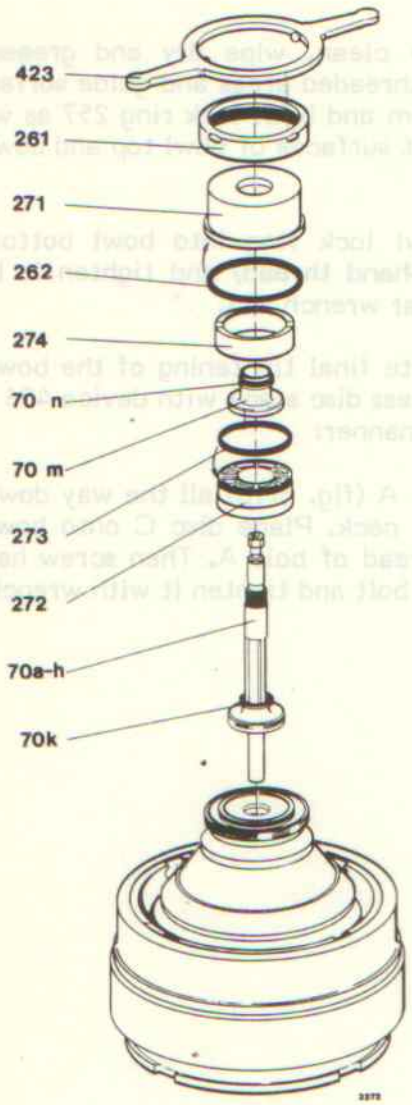


Fig. 4/8

Install centripetal pump 70a-h with inserted gasket 70k.

Place centripetal pump chamber cover 272 with inserted gasket 273 onto upper part of bowl top. The "O" marks of both parts must be in line with each other.

Fit sensing-liquid pump 70m with inserted gasket 70n onto centripetal pump shaft.

Install centripetal pump chamber cover 274.

Place centripetal pump chamber cover 271 with fitted-on gasket 262 onto bowl top. Arresting pin of centripetal pump chamber cover must fit into arresting hole of bowl top. The "O" marks of both parts must be in line with each other.

Clean, wipe dry and grease (see sect. 2.2) threads on bowl top and in lock ring 261.

Then screw on lock ring by hand **(left-hand thread)** and tighten it with annular wrench 423. Thorough tightening will be obtained by rapping against wrench handle.

Release brakes by turning the two handles clockwise. Check to see if bowl can be turned by hand.

4.2. Assembling the feed and discharge connections (Fig. 15/1)

1) Install hood and fasten with hex head screws.

2) Check to see if gaskets in feed and discharge housing 72 are in good condition and if they are properly placed in their grooves. Mount feed and discharge housing and fasten with screws.

3) Apply a thin film of grease to threads of centripetal pump and grooved nut 84. Screw grooved nut onto centripetal pump **(left-hand thread)** and tighten firmly.

4) Fit bend 78 into feed line and valve connection 85 into discharge line. Then tighten screw couplings firmly.

5) Connect pipes 66m and 66s of sensing-liquid line system (fig. 14/5).

4.3. Removing the feed and discharge connections, - Dismantling the bowl

For removal and dismantling proceed in reverse order of assembly (see 4.1 and 4.2). The following should be kept in mind:

Handle bowl parts with care.

Be sure to replace gaskets when worn.

Before opening the bowl release brakes by turning the handles clockwise.

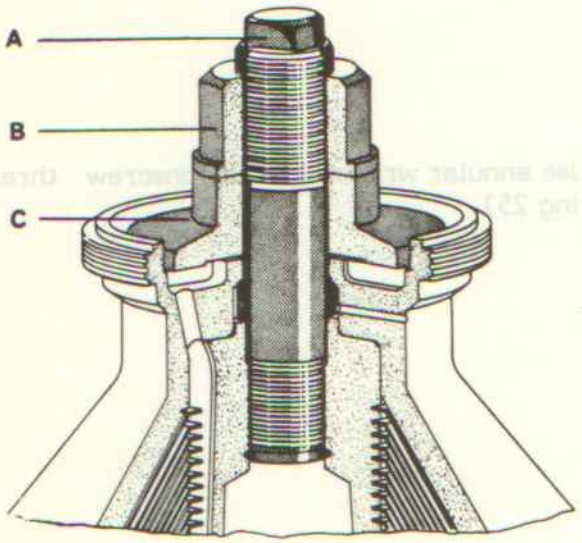


Fig. 4/9a

To facilitate loosening of the bowl lock ring, compress disc stack with the aid of device 426 in the following manner:

Screw bolt A all the way down into distributor. Place disc C onto bowl top. Grease thread of bolt A. Screw hexagon nut B onto bolt and tighten it with wrench 432.

Unscrew bowl lock ring by rapping with mallet 415 against handle of wrench 424 **(left-hand thread).** Then remove compressing device.

IMPORTANT: If the lock ring is jammed tight, unscrewing can be very much facilitated by warming up the upper rim of the bowl bottom with steam or hot water.

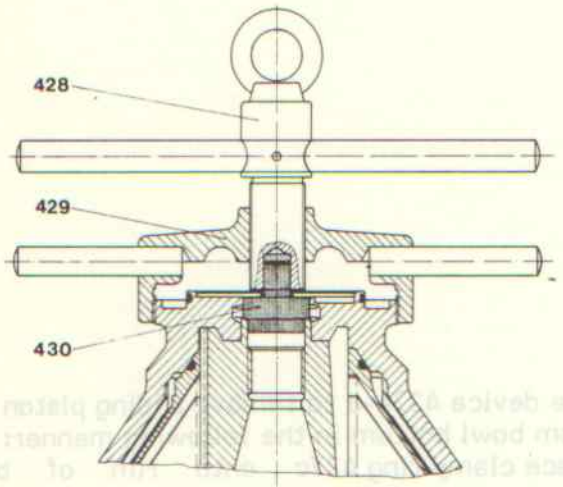


Fig. 4/9b

For removing the bowl top use devices 430, 429 and 428.

Fit pressure piece 430 into distributor.

Screw threaded ring 429 onto bowl top **(left-hand thread).**

Force off bowl top by turning jackscrew 428 clockwise.

Then remove bowl top and place it carefully on a wooden grate to avoid damage to the bearing surfaces.

With the aid of device 428 lift distributor 265 together with disc set out of the bowl bottom.

Normally the lower bowl parts such as bowl bottom, sliding piston, sealing-chamber bottom and threaded ring (see fig. 4/1) need only to be dismantled when new gaskets have to be inserted. Removal of sliding piston is facilitated by giving some oil into annular gap between bowl bottom and sliding piston to achieve better sliding of the gaskets. Let oil soak in for about 15 minutes. Then place assembly of lower bowl parts upside down on a stand and dismantle as follows:

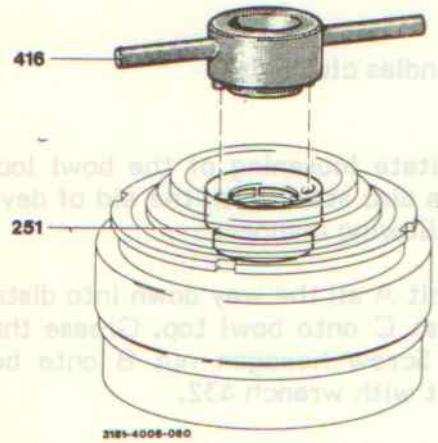


Fig. 4/10a

Use annular wrench 416 to unscrew threaded ring 251.

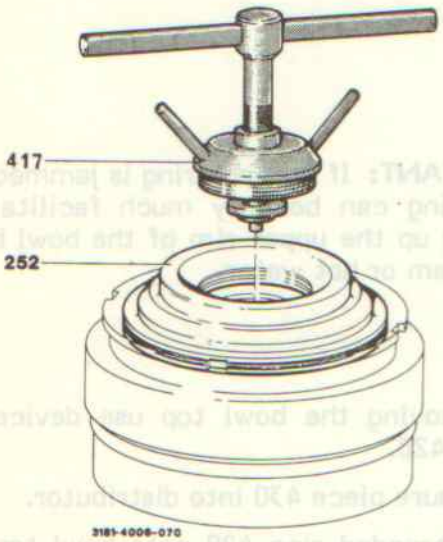


Fig. 4/10b

With the aid of jack 417 remove sealing-chamber bottom 252 from bowl bottom.

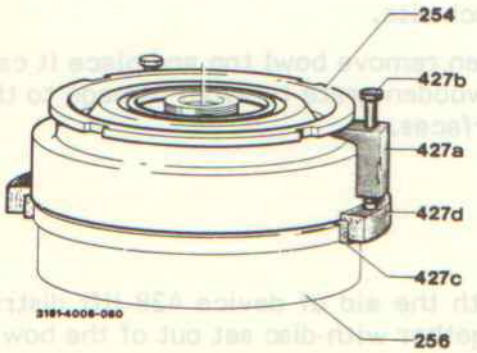


Fig. 4/10c

Use device 427a-d to remove sliding piston 254 from bowl bottom in the following manner: Place clamp ring 427c onto rim of bowl bottom. Place ring 427d onto clamp ring. Fit claws 427a - equally distributed - under the rim of sliding piston and tighten hex head screws alternately and evenly. By doing this, the sliding piston will gradually come off so that it is possible to lift it off by hand.

4.4. Removing Polyamid gasket from bowl bottom

Heat up gasket with hot water or steam (70-100°C) for about 10 minutes.

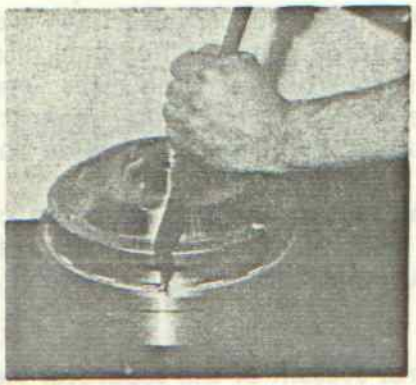


Fig. 4/11a

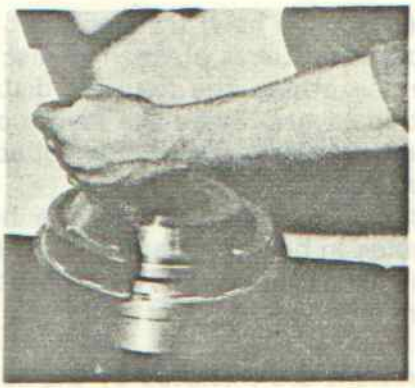


Fig. 4/11b

Use chisel 407 to cut a small triangular piece out of the gasket.

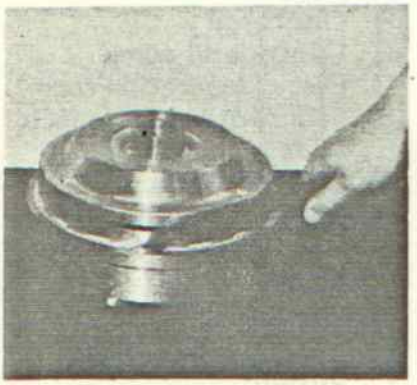


Fig. 4/11c

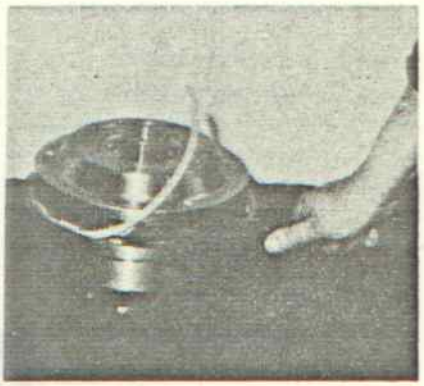


Fig. 4/11d

Press out gasket.

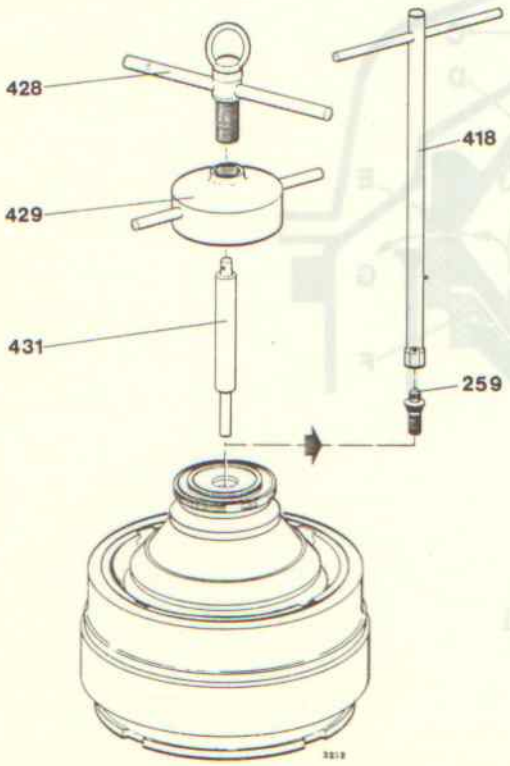


Fig. 4/11e

4.5. Removing the complete bowl

If the bowl is to be removed as complete assembly, then proceed as follows:

After having unscrewed the small lock ring **(left-hand thread)** force the centripetal pump chamber cover off the bowl top with the aid of the centripetal pump.

Use wrench 418 to unscrew spindle screw 259 **(left-hand thread).**

Introduce spindle 431 into bowl.

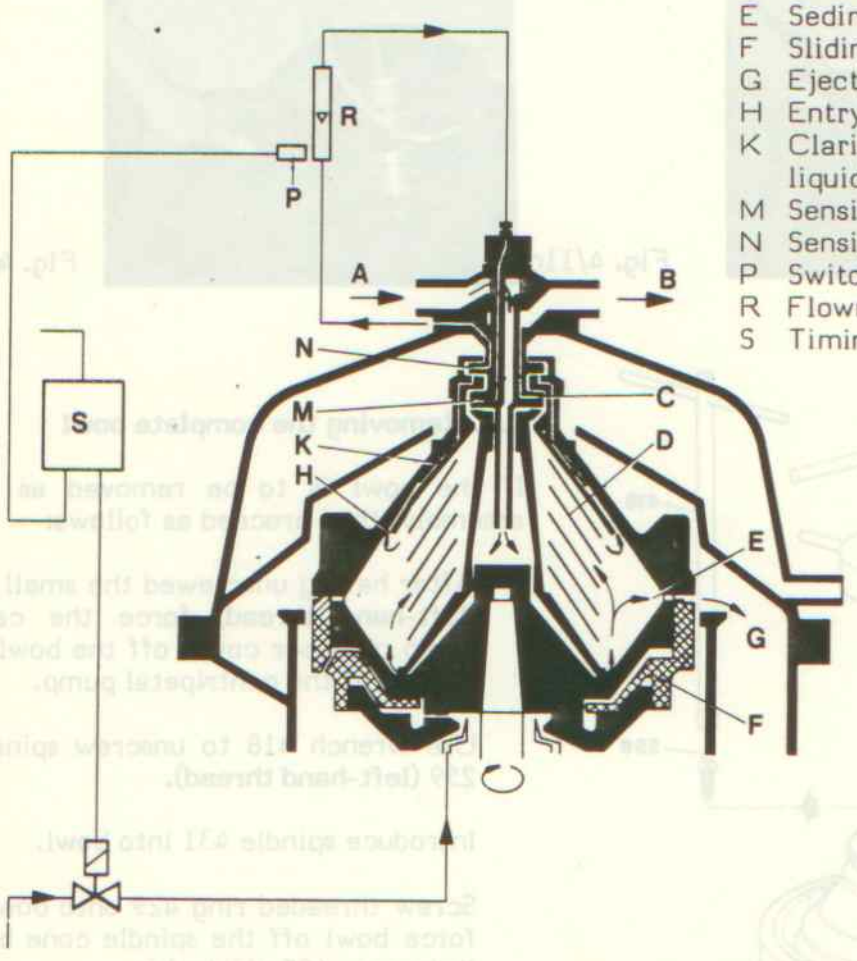
Screw threaded ring 429 onto bowl top and force bowl off the spindle cone by turning jackscrew 428 clockwise.
Then lift bowl out of the frame.

5.1. Operating principles of the bowl

The bowl is designed for the clarification of liquids. Clarification means the centrifugal removal of solids from a liquid which has a lower density than the solids.

The product enters the bowl through inlet A, and flows through the distributor into disc set D where the separation takes place. The disc set consists of a large number of conical discs placed one above the other. The liquid is distributed in the spaces between the discs where it is divided into thin layers. Since the layers of the liquid are very thin, the radial separation distance is extremely small. The solids collect on the top wall of each space and slide down into the sludge space E.
The clarified liquid flows towards the bowl center, enters the centripetal pump chamber through the holes in bowl top, and is discharged from the bowl foamfree and under pressure by means of centripetal pump C. The separated solids are automatically ejected through ports G in bowl bottom (see sect. 5.3).

The solids ejections are initiated by the self-thinker control system of the separator (see sect. 5.2) and performed by the timing unit according to a pre-set programme.



A Feed
B Discharge
C Centripetal pump
D Discs (Separation room)
E Sediment holding space
F Sliding piston
G Ejection ports
H Entry of sensing liquid
K Clarifying discs for sensing liquid
M Sensing liquid pump
N Sensing liquid pump
P Switch
R Flowmeter
S Timing unit

Fig. 5/1

4.4. Removing Polyamid gasket from bowl bottom

Heat up gasket with hot water or steam (70-100°C) for about 10 minutes.

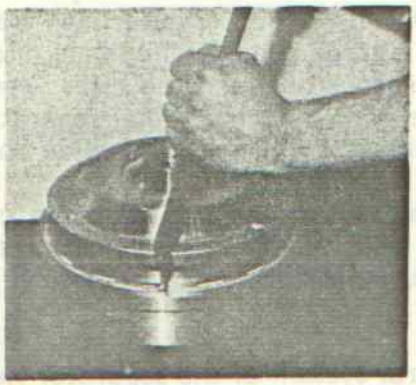


Fig. 4/11a

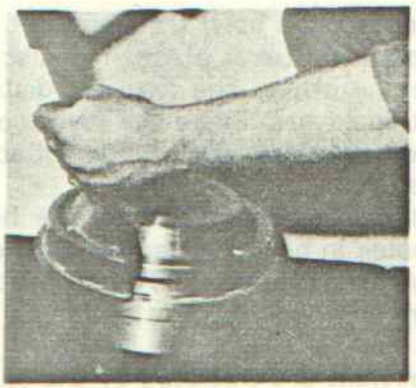


Fig. 4/11b

Use chisel 407 to cut a small triangular piece out of the gasket.

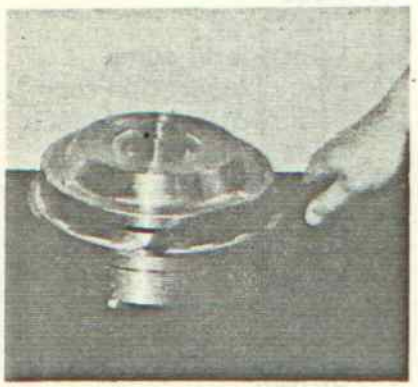


Fig. 4/11c

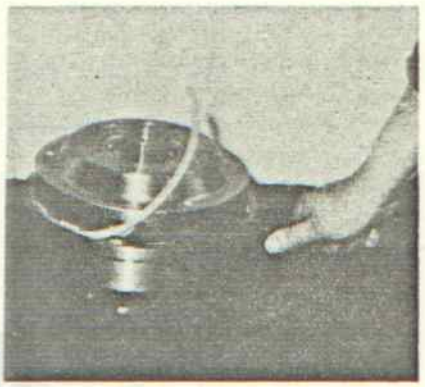


Fig. 4/11d

Press out gasket.

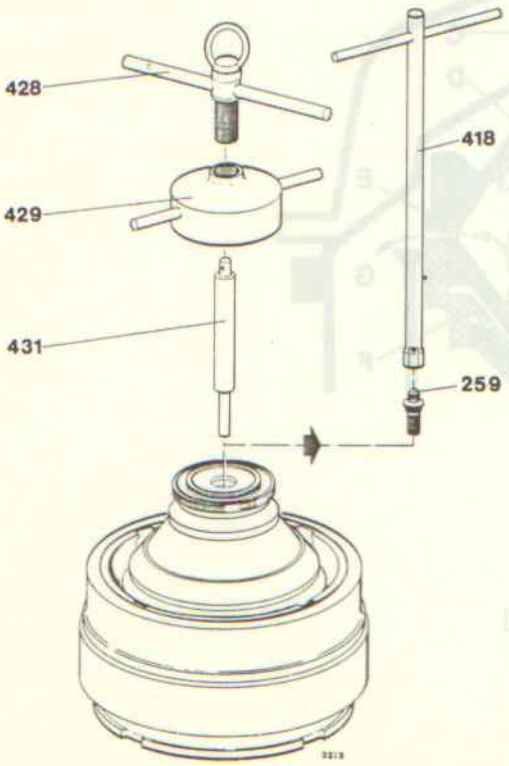


Fig. 4/11e

4.5. Removing the complete bowl

If the bowl is to be removed as complete assembly, then proceed as follows:

After having unscrewed the small lock ring **(left-hand thread)** force the centripetal pump chamber cover off the bowl top with the aid of the centripetal pump.

Use wrench 418 to unscrew spindle screw 259 **(left-hand thread).**

Introduce spindle 431 into bowl.

Screw threaded ring 429 onto bowl top and force bowl off the spindle cone by turning jackscrew 428 clockwise.
Then lift bowl out of the frame.

5.2. De-sludging of the bowl (solids ejection)

When to de-sludge the bowl?

As soon as the sediment space of the bowl is filled with solids, either a total de-sludging or a partial de-sludging has to be carried through. Total de-sludging means ejection of the whole bowl contents, whereas partial de-sludging means ejection of only part of the solids.
The specific application of partial ejection, total ejection or combined partial and total ejection depends on the behaviour of the solids during ejection.

Before each total ejection the feed liquid supply to the separator has to be stopped.

Displacement

The loss of process liquid - unavoidable during total de-sludging - can in most cases be reduced to a minimum by displacing the process liquid from the bowl, e. g. with water or another suitable liquid, before de-sludging takes place (important with particularly valuable process liquid).

The displacement liquid should be fed to the bowl at the same hourly capacity as the process liquid.

How long the displacement water has to be added should be found out by making a test. If displacing takes too long, water will discharge through the outlet for clarified liquid. If the time of displacement is too short, part of the valuable process liquid remains in the bowl and gets lost during ejection.

Flush de-sludging

It may happen that part of the solids stick to the bowl wall due to their particular properties or as a result of too long a retention time in the bowl. In such cases, either the time of separation has to be reduced, or the total de-sludging should be followed by a flush de-sludging. To accomplish flush de-sludging, fill the bowl with water and empty it by way of de-sludging.

Self-thinker control system (see Fig. 5/1)

Fully automatic solids ejections are initiated by the WESTFALIA Self-thinker control system which functions as follows: A sensing liquid senses the solids level in the bowl and solids ejections occur at the precise moment when the sediment holding space becomes filled.
The sensing liquid (part of the feed liquid) flows at point H over the outer edge of sensing zone disc to sensing liquid clarifying discs K and from there to sensing liquid pump N, which conveys it via flowmeter R outside the bowl, to sensing liquid pump M contained in the clarified liquid pump chamber. When solids build up at point H so that the flow of sensing liquid is hindered, then switch P signals timing unit S to perform a solids ejection (for further details refer to the instruction manual for "WESTFALIA Timing Unit").
The outer diameter of the sensing zone disc (overflow edge H) depends on the application of the machine. If the sensing zone disc is too large, the Self-thinker impulse will be initiated too early, i. e. when the sediment holding space of the bowl is not filled to the optimum level.

5.3. Functioning of the hydraulic system of the bowl

The operating liquid (normally water) fed into the bowl and rotating with it, develops high centrifugal pressure. This pressure is used to operate piston F which opens and closes the bowl.
The sliding piston F rotates at the same angular velocity as the other bowl parts, but unlike the other bowl parts it can be moved axially.

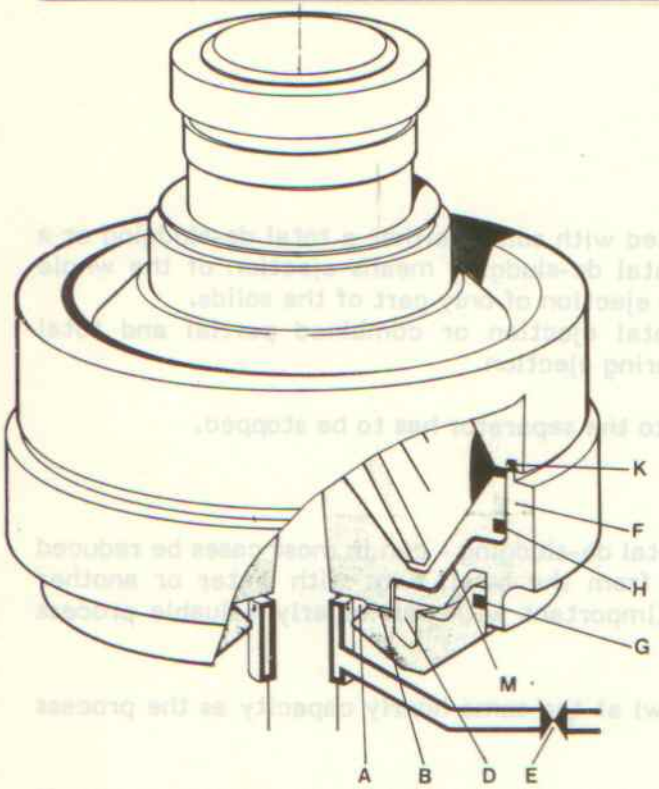


Fig. 5/2
Bowl, closed

Sealing of the bowl: After the bowl has reached its rated speed, the operating-liquid valve E is briefly opened several times in succession. The operating-liquid flows into injection chamber A and from there, through four holes B, into the sealing chamber D beneath the sliding piston.

The liquid pressure prevailing in the sealing chamber raises the sliding piston and presses it against bowl gasket K, thus sealing the bowl. Through centrifugal force, gasket G in the sealing chamber bottom seals off the sealing chamber and gasket H in the bowl bottom seals off opening chamber M and the centrifugation room.
Separation can now begin.

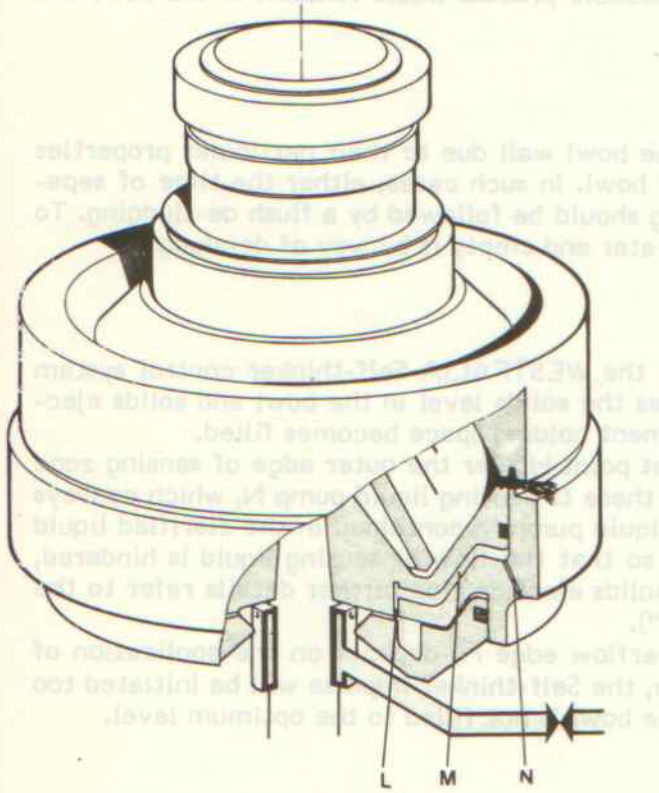


Fig. 5/3
Bowl, open

Opening of the bowl (solids ejection): When the sludge space of the bowl is filled with solids, operating-liquid valve E is opened. The operating-liquid is injected into chamber A, from where it flows into sealing chamber D. When the sealing chamber is filled, the liquid flows on into opening chamber M.

A small portion of the operating-liquid leaves the opening chamber through discharge nozzle N whose diameter has been selected so as to ensure that the amount of discharging liquid is less than the amount of liquid entering the chamber. Since the effective area of the sliding piston in the opening chamber is larger than that in the sealing chamber, the opening pressure resulting from the effective area and the liquid pressure, exceeds the sealing pressure and pushes the piston down. This opens the discharge ports in the bowl bottom for solids ejection.

Re-sealing of the bowl: After solids ejection, the operating-liquid supply is shut off again. The liquid contained in the opening chamber is ejected through discharge nozzle N. As the liquid level recedes, the opening pressure acting on the upper side of the sliding piston quickly declines. When the opening pressure has become smaller than the sealing pressure acting on the underside of the piston, the latter is pushed upwards, thus re-sealing the centrifugation room. The separation process can now recommence.

5.4. Operating-water connection (fig. 14/2)

The inner diameter of the operating-water supply line shall be 1/2" if the line is up to 3 m long; if it is longer than 3 m, the inner diameter shall be 3/4". The pressure in this line should be at least 2 bar and not more than 3.0 bar.
During partial de-sludgings pressure fluctuations must not exceed 0.2 bar. Consumption of operating water is approx. 3 - 4 litre for each total de-sludging and 1 - 2 litre for each partial de-sludging procedure.
The operating-water connection is provided with a water-pressure reducer by means of which the line pressure is to be throttled to approx. 2.5 bar. Pressure adjustment should be made while solenoid valve is open.
The operating water must be clean and should meet the following specifications:

Hardness:	≦	22° English hardness at separating temperatures of up to 40 °C
	≦	7° English hardness at separating temperatures exceeding 40 °C
Chlorine ions:	≦	100 mg/litre
pH value:		6.5 to 7.5

It is recommended to clean the strainer of the water pressure reducer from time to time by putting it for a short while into diluted vinegar or hydrochloric acid. Before re-installing the strainer, flush it thoroughly with water.

5.4.1. Solenoid valves for operating water and for * flush water for hood

The solenoid valves incorporated in the operating-water system are 2/2-way straight-flow diaphragm valves with internal piloting. The solenoid valve for operating water is equipped with a manual operator (override) for test purposes. The solenoid coil is entirely embedded in Epoxy resin which ensures protection against moisture, good dissipation of heat, and perfect electrical insulation. The valves are fully tropicalized.

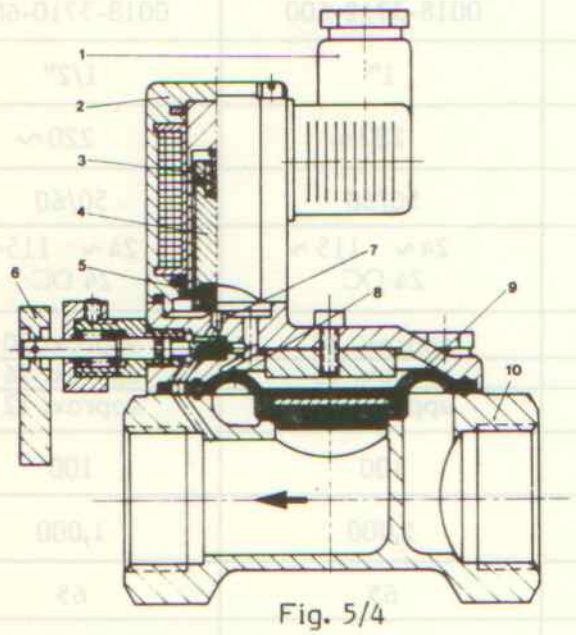


Fig. 5/4

1 Coupler socket
2 Solenoid head
3 Cylindrical pressure spring
4 Solenoid core
5 Plug (pilot valve)
6 Manual operator (override)
7 Outlet hole
8 Inlet hole
9 Diaphragm
10 Valve housing

* on special order only.

Operating principles

When the valve is closed (de-energized), the upper side and the underside of the diaphragm are exposed to the water line pressure, because water can flow from the valve inlet side through a small hole in the diaphragm into the chamber above the diaphragm. As the area exposed to the water line pressure on the upper side of the diaphragm is larger than the area exposed to the same pressure on the underside, the diaphram is kept pressed against the valve seating.

Upon energization of the solenoid coil, the plug which is integrally vulcanized in the solenoid core is lifted from the seating of the pilot valve thus opening a duct between the space above the diaphragm and the discharge side of the diaphragm valve. As this duct is larger in diameter than the small hole on the inlet side, the water can flow faster out of the space above the diaphragm than it flows into it. Thus the water pressure above the diaphragm drops so that the diaphragm is lifted by the pressure acting on its underside; the valve is opened.

If the energizing current is disconnected, the spring will drive the solenoid core downwards and the pilot valve will close. Consequently, the water pressure above the diaphragm builds up again so that the diaphragm is pressed against the valve seating; the valve is closed.

Maintenance

The solenoid valves do not require special maintenance. However, care should be taken that the coupler socket is always screwed tightly to the solenoid head to ensure perfect sealing action of the gasket.

Locating electric troubles

If it has been found that the control cabinet functions properly and that voltage is present at the valve terminals of the terminal strip while the corresponding time function element is operating, the trouble will have to be ascribed either to a defective solenoid coil, or to open circuit between terminal strip and valve, or to poor connection.

In the event of a defective solenoid coil, the solenoid head can be removed from the valve. To do this, remove first the coupler socket (loosen screw and pull out the socket), then loosen the fillister head screws.

Since the solenoid coil is entirely embedded in the solenoid head, the complete solenoid head (No. 0018-3710-800, see page 14/4) has to be replaced.

Technical data			
Solenoid valve	Type	40 A / 2451 for operating water	40 A / 122 for flush water
Part - Number		0018-3712-600	0018-3710-600
Pipe connection	R	1"	1/2"
Voltage	V	220 ~	220 ~
Frequency	Hz	50/60	50/60
Optional voltages	V	24 ~ 115 ~ 24 DC	24 ~ 115 ~ 24 DC
Power consumption: pull-in	VA	approx. 20	approx. 20
(AC operation) operation	VA	approx. 16	approx. 16
(DC operation)	W	approx. 12	approx. 12
Duty cycle	%	100	100
Frequency of operations	/h	1,000	1,000
Type of enclosure	IP	65	65
Pressure range	bar	0.5 - 10	0.5 - 10
Temperature: medium	°C	+90	+90
ambient	°C	+35	+35
Cable entry	Pg	9	9

5.5. Feed connection with automatic valve

The automatic valves incorporated in the feed connection are pneumatically or hydraulically operated, angle type piston valves. Control medium is supplied via hose connections by means of electromagnetically operated control valves.

5.5.1. Angle valve

Type of valve:

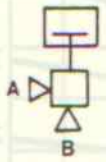
a) 2/2-way valve

b) 2/2 way valve with basic flow adjustment

Valve operation:

The valve closes by spring pressure and opens when control medium is supplied

Installation:



Inlet and outlet form a right angle. The valve can be fitted in any position; usually the lateral connection (A) is used as inlet and the lower connection (B) as outlet.

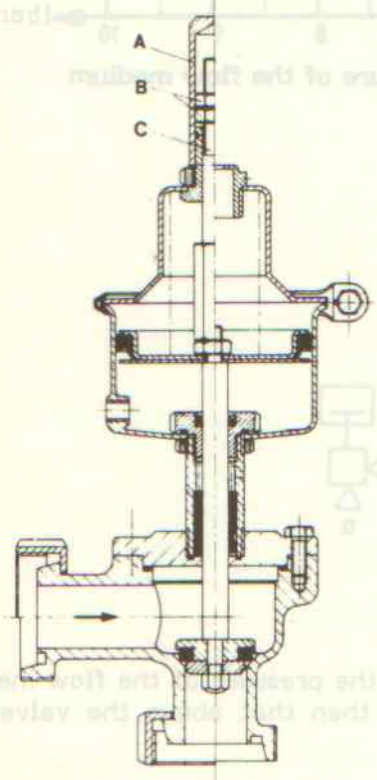


Fig. 5/6

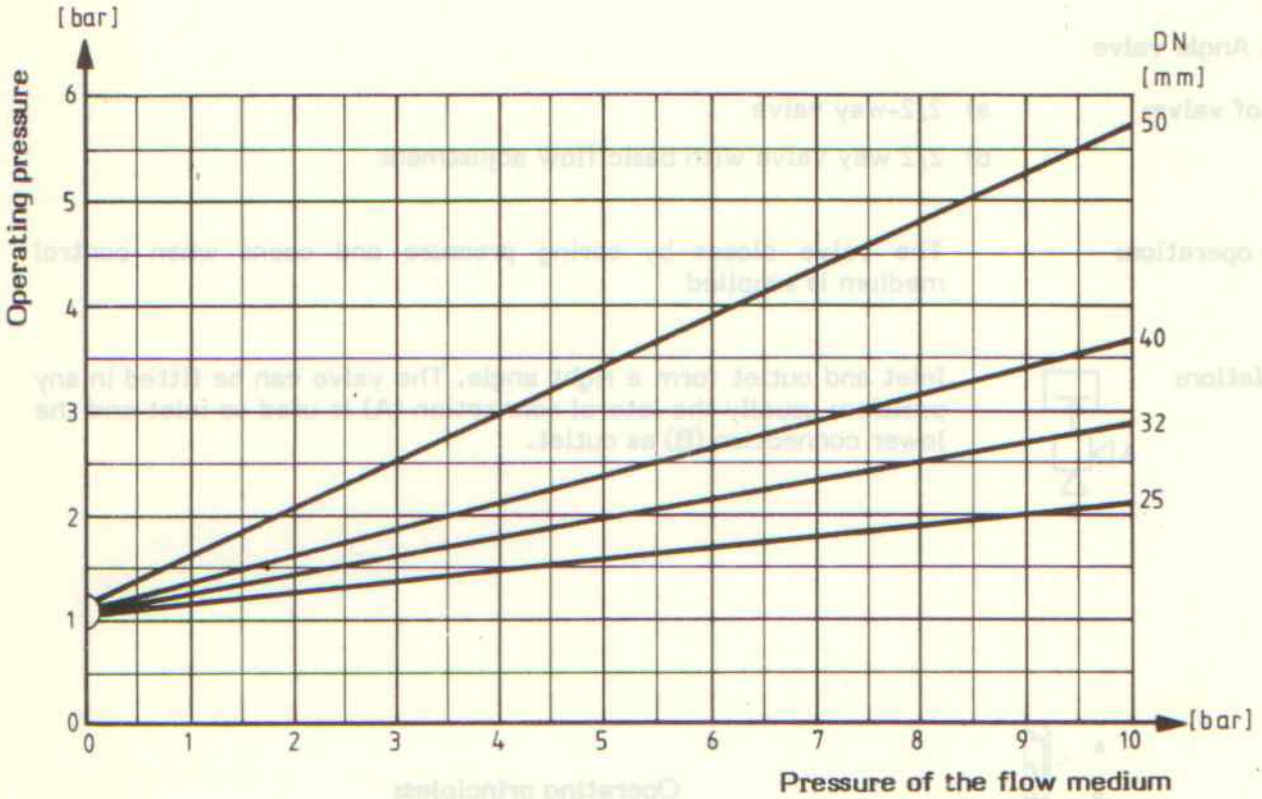
Operating principles:

When the solenoid valve has opened the control-air inlet, the piston is pushed upwards against the force of the spring, thus lifting the valve disk from its seat.
When the air pressure acting on the piston is interrupted, the spring can force the piston back into closing position.
The valve disk is equipped with a Teflon sealing ring.
Instead of compressed air water can be used as control medium.

When using valves with basic flow adjustment the stroke of the valve spindle can be limited by removing cap A and loosening check nuts B and then screwing threaded piece C upwards.
The position of the threaded piece then determines to what extent the valve outlet is left open.

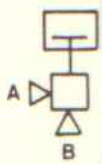
Operating-pressure diagram:

Angle-valve design: a) spring-closing: flow direction A → B
b) spring-opening: flow direction B → A



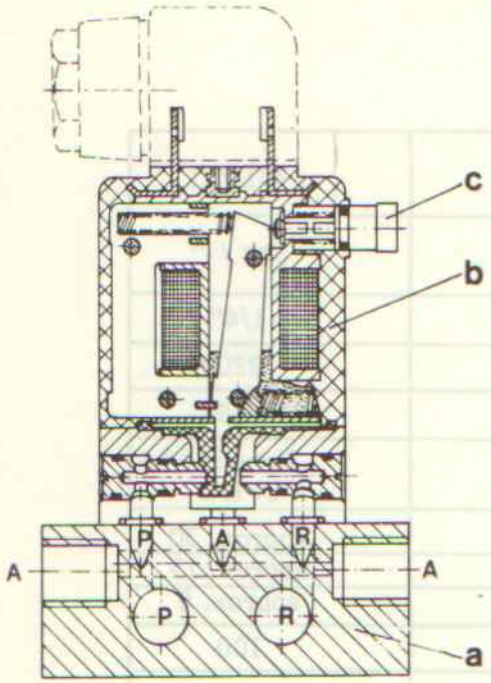
Critical pressure conditions on the 2/2-way angle-type valve

DN	Δ p
25	3.5 bar
32	2.4 bar
40	1.3 bar
50	0.6 bar



a) The **spring-closing** valve opens automatically as soon as the pressure of the flow medium under the valve disk (connection B) is by Δ p higher than that above the valve disk (connection A).

b) The **spring-opening** valve does **not** open any more, when the pressure of the flow medium above the valve disk (connection A) is by Δ p higher than that under the valve disk (connection B).



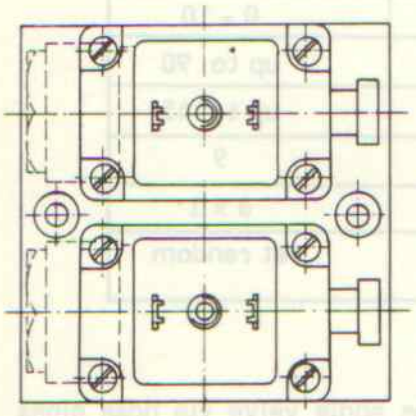


Fig. 5/8: Two-valve connection block

a Connection block
b Solenoid valve
c Manual operator

Important: When fitting the valves on the connection block be sure that the designations R and P on the valve and on the connection block correspond with each other.

5.5.2. Solenoid valve for control medium

Design and operating principle

These valves are direct acting 3-port/2-position solenoid valves, where outlet A is relieved when the solenoid is de-energized. The valves are equipped with a manual operator C (or override) for checking; it also serves for switching over the valves when the solenoid coils are de-energized. The manual operator can be arrested by pressing and turning it by 90°.
The solenoid head is completely moulded in Epoxy resin, thus ensuring perfect protection against entry of moisture, good dissipation of heat and perfect electrical insulation. These valves are fully tropicalized.

The armature of the solenoid head is incorporated in an oil-filled chamber which is completely isolated from the flow medium by a diaphragm.

The brass valve body is fastened to the solenoid head by means of two screws. These screws and the precisely adjusted valve seats must not be removed or re-adjusted.

The control valve of an one-valve connection block (feed connection with one automatic angle valve) is designed as sleeve valve whereas the control valves of a two-valve connection block (feed connection with two automatic angle valves) are designed as flange valves. The valves are mounted on the connection block (single or double connection block) with two screws each. On the two-valve connection block the pressure and relief connections are combined to a common connection each. The ports of the connection block and valves are marked as follows (fig. 5/8):

P = Pressure connection
A = Valve outlet
R = Relief connection

When the solenoid is de-energized, valve port P is closed while port R is open and in communication with outlet A. When energized, the solenoid attracts the armature, causing the diaphragm to be shifted from the left-hand valve seat to the right-hand one. Passage P - A is thus opened and passage R - A is closed.

Maintenance

The solenoid valves do not require any maintenance.

Malfunctions

If it has been found that the timing unit functions properly and that voltage is present at the valve terminals, malfunction has to be ascribed to a defective solenoid coil. In such a case, the complete solenoid valve, Part-No. 0018-4485-800 (double connection) or Part-No. 0018-3715-630 (single connection) must be replaced. The same applies to mechanical failures.

Technical data (solenoid valve for control medium)

Solenoid valve, Part-No. 0018-4485-800, for two-valve connection block	Type	331 / C
Solenoid valve, Part-No. 0018-3715-630, for one-valve connection block	Type	330 / C
Pipe connection	R	1/4"
Voltage	V	220 ~
Frequency	Hz	50/60
Optional voltages	V	24 ~ 115 ~ 24 DC
Power consumption: pull-in	VA	approx. 30
(AC operation) operation	VA	approx. 15
(DC operation)	W	approx. 8
Duty cycle (ED)	%	100
Frequency of operations	/min	approx. 1000
Type of enclosure	IP	65
Pressure range	bar	0 - 10
Temperature: medium	°C	up to 90
ambient	°C	up to 45
Cable entry	Pg	9
Screw couplings for air hoses	mm	8 x 1
Mounting position		at random

5.5.3. Connection of control medium line

The control medium is conveyed from the control valves to the angle valve via hose pipes 8 x 1. For connecting the hose pipes, quick-action hose fittings are used.

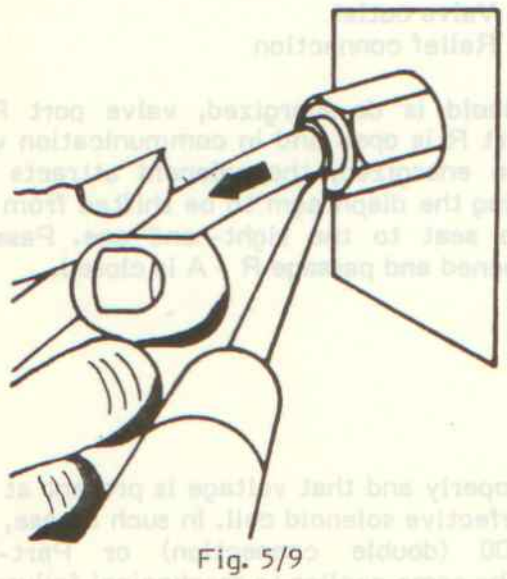


Fig. 5/9

Connection of a hose pipe

Insert hose pipe into the quick-action hose fitting as far as it will go, thus ensuring absolute tightness of the connection up to a pressure of 18 bar.

Loosening the hose pipe

Loosening of the hose pipe is effected by exerting a slight pressure onto the bush surrounding the hose pipe and simultaneously drawing back the hose pipe.

The operating instructions given in this chapter are merely general directions. The operation of each individual separator depends on the timing unit and valves employed and on the application of the machine (see instruction manual for the timing unit used in connection with the separator).

6.1. Before starting the separator

Check to be sure that

oil level is slightly above middle of sight glass,

brakes are released (to do this, turn handles clockwise),

separator is properly assembled (pay special attention to hex head screws on hood and discharge and to grooved nut 84 on centripetal pump to see if they are tightened firmly),

manual shut-off valves for process liquid and water are closed and rapid-closing valve for operating water is open.

6.2. Starting the separator

Switch on the motor. If strong vibrations occur, stop the separator and check to see if the bowl is clean and properly assembled.

Switch on the timing unit as soon as the bowl has reached its rated speed which is after about 4 - 6 minutes.

Close the bowl hydraulically by repeatedly actuating push button "De-sludging" on the timing unit.

Check bowl for leakage:
Fill bowl with water by opening manual shut-off valve in the water supply line. If the water supply line is also equipped with a solenoid valve then that valve has to be opened via the timing unit.
Open inspection cover on the solids outlet. If water discharges from the solids outlet **while the bowl is being filled,** the bowl is leaky (also recognizable by increased power consumption of the motor: see ammeter of motor control). In this case open and close the bowl by actuating push button "de-sludging" on the timing unit. Repeat this procedure until the bowl closes properly. After each de-sludging keep a waiting time of 15 - 20 seconds before feeding water again.
Feed process liquid by opening manual shut-off valve in process liquid supply line. If this line is also equipped with a solenoid valve then that valve has to be opened via the timing unit.
Adjust to hourly capacity.

The hourly capacity of the separator is up to 8,000 l/h.

The hourly capacity of the separator depends on the desired degree of purity of the clarified liquid. The degree of purity depends on the viscosity and, hence, on the temperature of the process liquid. It further depends on the difference in densities of the carrier liquid and of the solids as well as on the size and nature of the solids to be removed.

If the particle size of the solids is very small and if the density of the solids is almost equal to that of the carrier liquid, then the hourly capacity has to be reduced to extend the retention time of the process liquid in the bowl.

By means of the throttle valve adjust the pressure in the discharge line so that the clarified liquid discharges free of foam.

6.3. De-sludging of the bowl (solids ejection)

The separation programme including the solids ejections is automatically performed by the timing unit in connection with the self-thinker control system. By actuating the respective push buttons on the timing unit, the programme in action can be interrupted at any time and an automatic partial or total de-sludging can be initiated immediately.

6.3.1. Total de-sludging

Upon actuation of the push button "total de-sludging" the following programme is performed:

Closing of the process liquid supply valve.

* Displacement of the liquid bowl contents (see 5.2 "Displacement").

Total de-sludging of the bowl.
Operating water is supplied for 10 seconds. Although the solids ejection procedure takes only a few seconds, the shut-off valve in the operating-water line should remain open for 10 seconds in order to be sure that even the difficult to dislodge solids will be ejected from the bowl. Solids which remain in the bowl can harden and thus lead to trouble.

* Flush de-sludging (see 5.2 "Flush de-sludging").

After each total de-sludging a waiting time of 15 - 20 seconds should be kept before feeding process liquid or flush liquid.

* depending on the timing unit, the valves employed, and the pre-set programme.

6.3.2. Partial de-sludging

Partial de-sludging means partial emptying of the sediment space of the bowl. It is not feasible with all types of liquid, but only with products whose centrifugally removed solids are soft and pasty in character, and free of fibres. It can be accomplished, for example, when separating pulp from juices, when clarifying citrus and pine apple juices, when separating yeast from beer and wine, when processing fermentation broths, etc.
During partial de-sludging, the process liquid valve normally remains open.

After actuating the push button "partial de-sludging" operating water is supplied for the time of 1 - 2.5 seconds. The time of operating-water supply (= partial de-sludging time) depends on the amount of ejected solids and on the operating-water pressure. To ensure that always equal amounts of sludge are ejected, the operating-water pressure must be kept constant.
The exact time of partial de-sludging is to be found out by checking the solids ejections and by evaluating the ejected solids, while the machine is running.

6.4. Stopping the separator

- Close the product feed valve.

- Displace bowl filling: see 5.2, "Displacement".

- De-sludge the bowl.

- Flush bowl several times with water and de-sludge to ensure that no solids will be left in the bowl. To do this, proceed as follows:
  Fill bowl with water. When the bowl is filled, that is, when water appears in the sight glass of the discharge line, de-sludge the bowl. Repeat this procedure several times.

- When cleaning in place with heated detergent solutions, finish up by flushing with cold water. During cleaning, the valve in the centripetal pump discharge line is to be throttled several times for a few seconds to obtain heavy overflow. By doing this, the hood will be flushed thoroughly. Which detergent is to be selected for cleaning depends on the residues in the bowl.
  Alkaline and (or) acid cleansing solutions may be used. To avoid corrosion be sure to use only approved detergents.

- Fill the bowl with water. If the bowl is leaky, leave the water supply valve open.

- Switch off the timing unit.

- Stop the motor.

- Apply the brakes by turning the handles in anti-clockwise direction.
  IMPORTANT: Do **not** loosen any part of the separator before the bowl has stopped completely.
  Note that the bowl has not stopped before the revolution indicator disc (fig. 3/3) has ceased rotating.

- Close main shut-off valve in operating-water line.

- If dismantling of the bowl is intended, it should be done immediately after stopping of the bowl when the contact surfaces of the bowl parts are still wet.

7.1. Cleaning the bowl

Self-cleaning bowls need not be taken apart for cleaning at the end of a run, unless the nature of the separated solids makes bowl dismantling for thorough cleaning necessary. Experience will show how often the bowl has to be dismantled.

During the first few months of operation, the lock rings should be removed every two weeks for greasing the threads, to prevent seizing. Later on, the greasing intervals may be extended. However **the bowl should be dismantled at least every two months** for thorough cleaning of the inner bowl parts.

Never use metal scrapers or metal brushes for cleaning the discs and bowl parts.

Remove gaskets from the bowl parts and clean grooves and gaskets to prevent corrosion. Replace damaged gaskets. Swollen gaskets should be left to dry at a warm place so that they can regain their original dimensions and can be re-used.

The gaskets in bowl bottom and sealing-chamber bottom whose edges have been frayed through abrasion, can be re-used after grinding off the edges with an emery wheel. When grinding, be careful not to damage the sealing surfaces.

Special care should be taken in cleaning the small orifices in threaded ring, sealing-chamber bottom and sliding piston for feed and discharge of operating water (Fig. 10/1) to ensure trouble-free performance of the de-sludging process.

Be sure to remove dirt which has accumulated in the distributor neck, using brush 414. Dirt accumulation in the distributor neck will hinder the feed, which may result in overflow.

Clean and wipe dry guide surfaces and threads of bowl parts and grease them (see 2.2). Spindle cone and inside of bowl hub should be oiled and then **wiped clean and dry with a smooth rag.**

Re-assemble bowl immediately after cleaning.

7.2. Cleaning the operating-water feeding system

The strainer in the water pressure reducer (fig. 14/4) and the small holes in the operating-water feeding device should be cleaned every 3 - 6 months.

7.3. Cleaning the gear chamber

When changing oil, clean gear chamber thoroughly with kerosene. Be sure to remove all metal particles from walls and corners. Do NOT use fluffy cleaning rags or cotton waste.

7.4. Cleaning prior to a long-term shut-down of the separator

Prior to a long-term shut-down, clean the separator thoroughly (see 7.1). The clean bowl parts and all unvarnished machine parts should be wiped dry and greased to avoid corrosion. The clean grease-coated bowl should be kept in a dry place.

To prevent gaskets from getting brittle, keep them in a cool and dry room, protected from dust and light.

Drain the lubricating oil and fill gear chamber with corrosion-preventing oil, e.g. SHELL Ensis Oil 30. Oil level must be up to middle of sight glass. Let separator run without bowl for approx. 10 minutes to make sure that all gear parts are coated with the corrosion-preventing oil. Then drain the oil. Oil upper end of spindle by hand and protect it with splash cover 411.

Check water shut-off devices for leakage. If necessary, remove connecting piping between faulty shut-off device and separator to avoid damage which may be caused by drip water.

Stop operating-water supply at the branch point of the water mains to prevent inrush of water into the separator, caused by unintended opening of the shut-off valve.

Before re-starting the separator, fill gear chamber with the lubricating oil specified on page 2/1. Oil level must be slightly above middle of sight glass. Then let the separator run without bowl for 10 minutes.

8.1. Removing the vertical gear parts

After dismantling the upper bowl parts unscrew spindle screw **(left-hand thread).** Use jack 425 to remove bowl bottom from the spindle cone and to lift the whole assembly out of the frame.

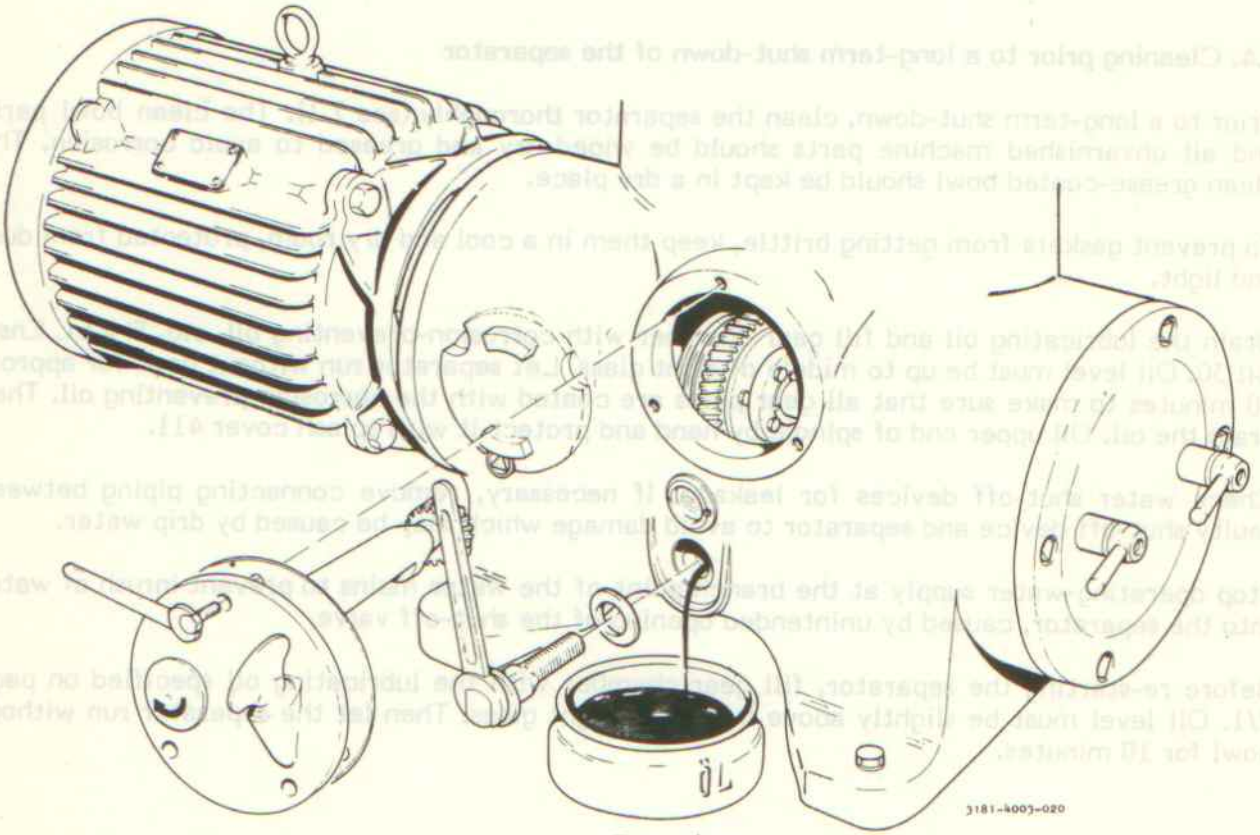


Fig. 8/1a

Undo oil drain screw and let oil drain into oil pan.

Unscrew hex head screws of revolution indicator housing.

Remove the housing.

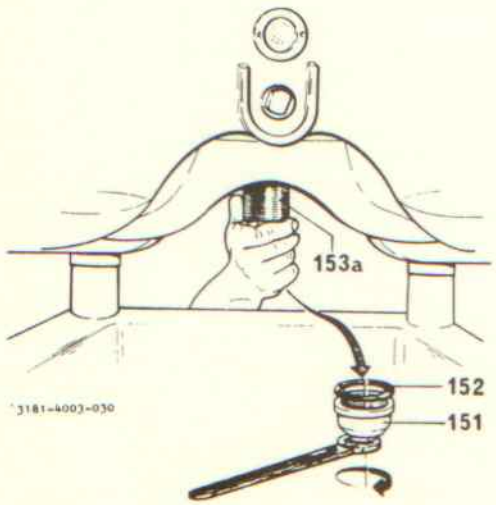


Fig. 8/1b

Unscrew bottom bearing cap 151 and remove gasket 152.

Unscrew bottom bearing threaded piece 153a and remove it together with the other parts of bottom bearing.

If bottom bearing housing 156 (fig. 16/1) has to be replaced, straighten tab washers 155 and unscrew hex head screws 154. Then take two hex head screws and screw them into two opposite tapholes of the housing. By doing this, the housing will come out of the lower section of the frame.

Unscrew hex head screws 160 and remove operating-water feeding device 161 and spindle cap 158m.

Unscrew hex head screws 159r from neck bearing (be sure not to lose gaskets 159n and washers 159p).

Remove neck bearing protection cap 159m and spindle spring 158k.

Screw spindle screw 259 onto worm spindle, by hand. Then pull out worm spindle together with neck bearing bridge.
IMPORTANT: Be sure not to damage gaskets 159k and 159a; if necessary, install new gaskets.

Detach neck bearing bridge from worm spindle by turning spindle upside down and tapping it on a piece of wood (see fig. 8/2b).

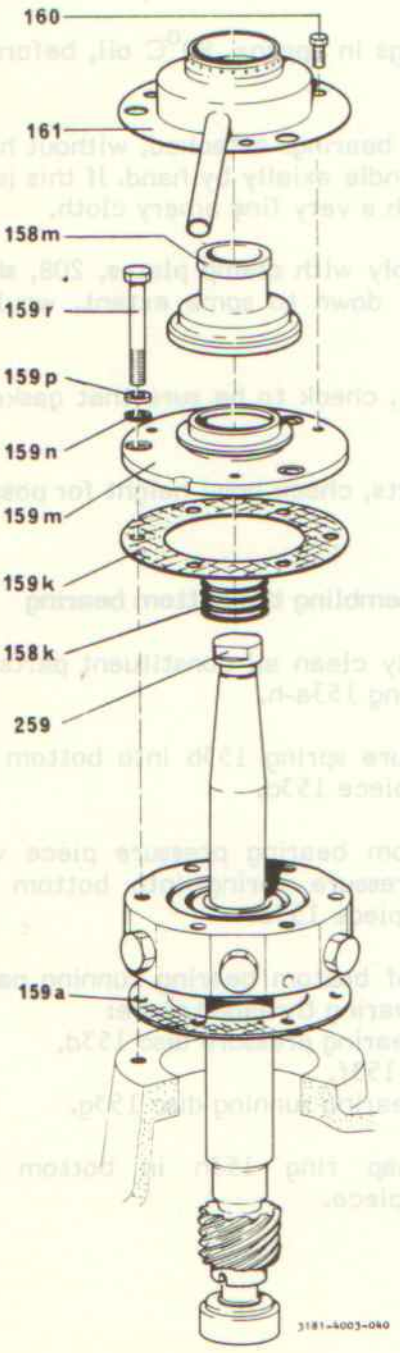


Fig. 8/2a

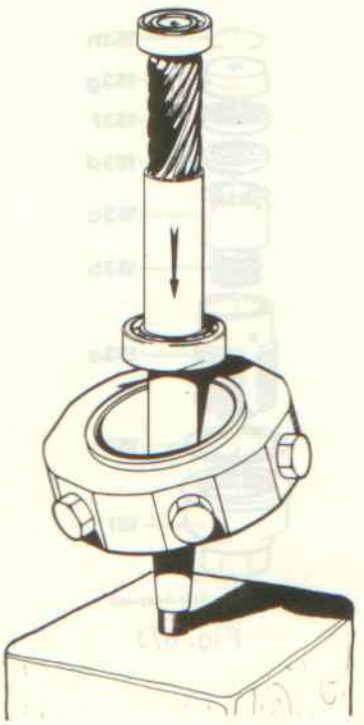


Fig. 8/2b