MACHINERY WORLD

WESTFALIA SEPARATOR

INSTRUCTION MANUAL AND PARTS LIST

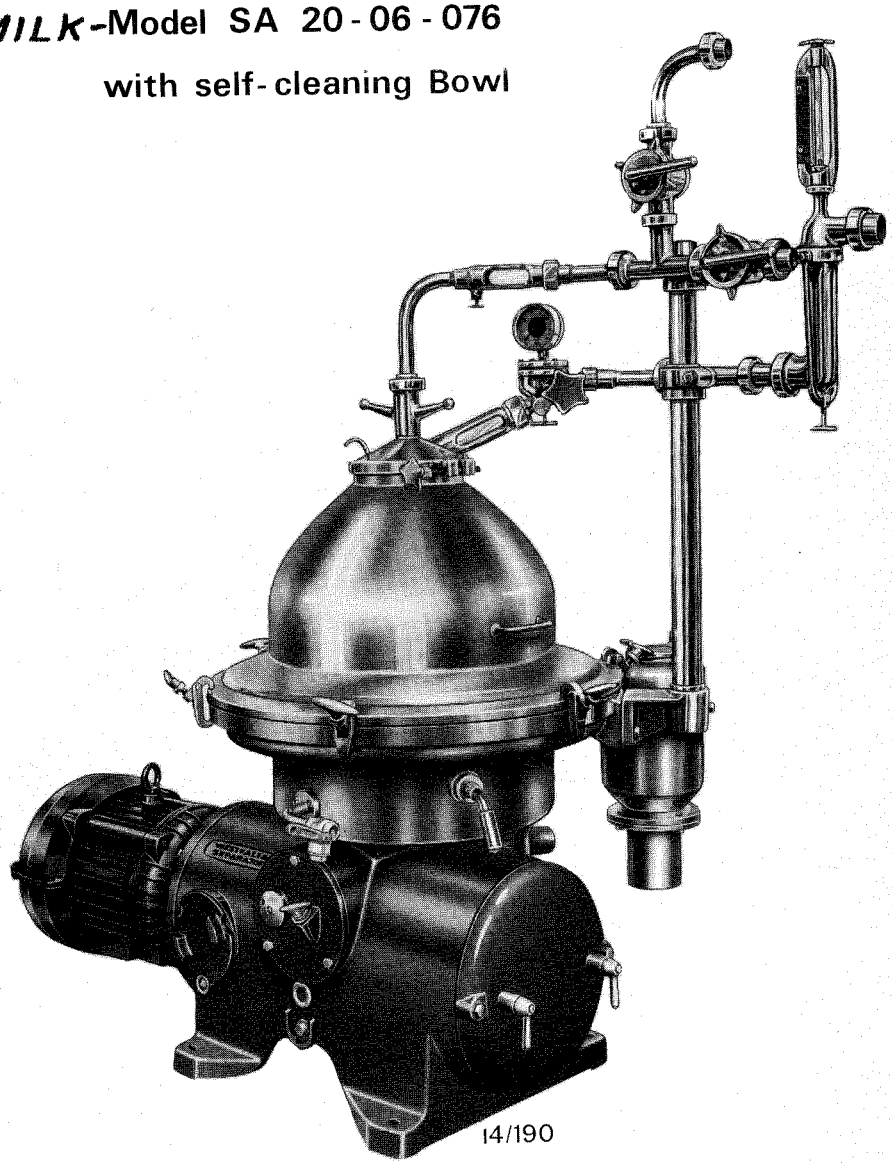
No. 3182 - 9001 - 010

WESTFALIA

Separator

MILK-Model SA 20 - 06 - 076

with self-cleaning Bowl



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WESTFALIA SEPARATOR AG./4740 OELDE 1 (W.-GERMANY)

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No. 3506/275 engl.

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Operating Safety of the Separator

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 specific gravities of the centrifugally dry solids and of the heavy liquid. If the specific gravities 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.

The amount of solids in the feed liquid must be kept as constant as possible.

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.

Important Hints

1) Do NOT loosen any part of the separator or of the feed and discharge assembly before the bowl has stopped completely.

   The bowl has not stopped before the revolution indicator disc (fig. 3/4) has ceased rotating.

2) The bowl speed as seen on the name-plate of the separator, is rated for specific gravities of the centrifugally dry solids and of the heavy liquid up to the maximum values also shown on the name-plate. In case of higher specific gravities, check with the factory or any authorized representative for detailed information. Be sure to refer to sect. 3.5!

3) Do NOT start feeding liquid until bowl has been closed by briefly opening operating-water valve several times in succession.

4) The feed liquid must be strained before entering the bowl.

5) If the bowl reaches its rated speed (as per name-plate of separator) in less than 4 minutes, the motor will pull too high a starting current. In this case, the number of clutch shoes has to be reduced to 4 or 3 shoes. Be sure to refer to sect. 8.4!

6) Every two months, check all bowl parts for corrosion and erosion. Pay special attention to the bowl lock ring and to the space between the sludge ejection ports in the bowl bottom.

7) Check the threaded area of the bowl lock ring at least once a year.

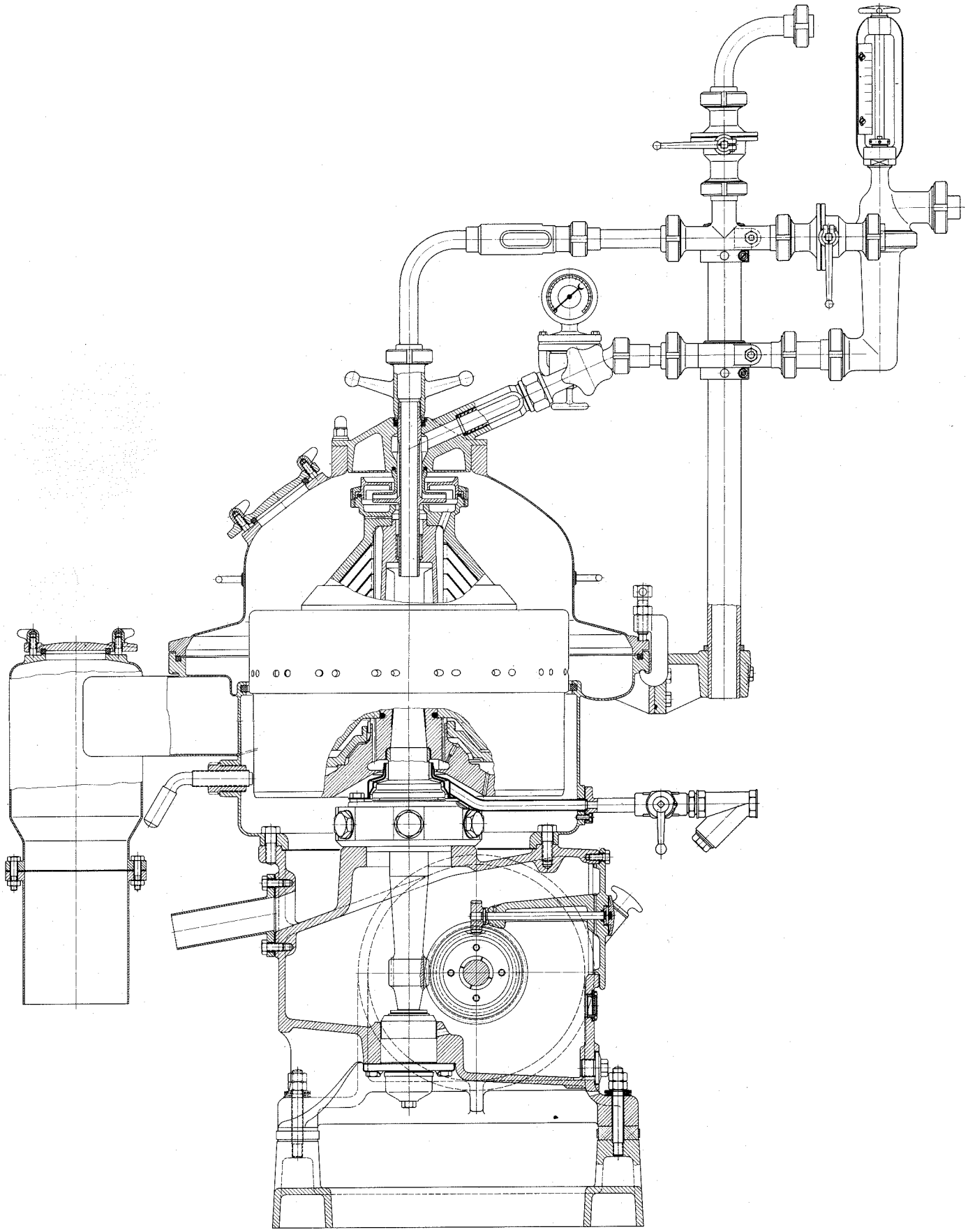
8) Never use blow-torch on bowl parts or expose bowl to heat of open flame.

C O N T E N T S

OPERATING INSTRUCTIONS

List of Parts

Vertical Section of Separator SAMR 5036



2. Lubrication

2.1. Lubrication of separator bearings

All bearings of the separator are splash lubricated from a central oil bath.

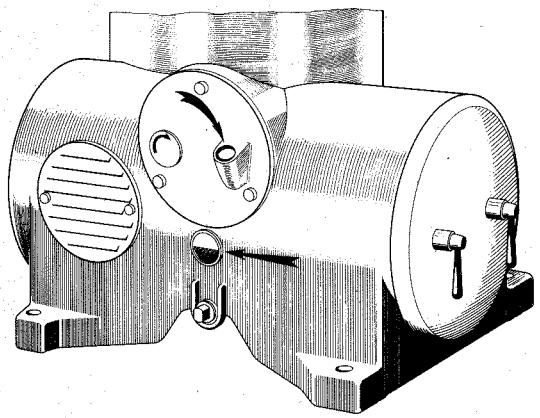


Fig. 2/1

FILLING OF OIL, OIL LEVEL

Prior to use of the separator be sure to fill gear chamber with oil- through filling hole - until oil level is slightly above middle of sight glass. About 4 litres of oil are required for a filling. Oil level must NOT sink below middle of sight glass; refill oil whenever necessary.

OIL CHECK

An oil sample should be taken from time to time. This must be done from the oil drain hole. If the oil contains water or is considerably dirty, then the oil must be changed.

OIL CHANGE

The first oil change has to be made after about 250 working hours. Then the oil has to be changed whenever necessary, that is, in general, every 750 working hours. However, do NOT wait longer than 6 months to change the oil.

When changing oil, clean gear chamber thoroughly with kerosene. 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 been deposited on the inner side of the glass and this is easily mistaken for the oil level. To remove the sight glass use wrench 406.

Before filling in fresh oil make sure oil drain screw has been tightened firmly.

LUBRICATING OIL

For lubrication use only high grade solvent-refined mineral oils of the viscosity range

from 10 - 16E = 76 - 122 cSt (SAE 40).

When processing liquids at temperatures higher than 80°C, lubricating oils of the viscosity 13 - 16E at 50°C are to be used.

EP oils (i.e. oils with high pressure additives) may only be used for lubrication if they have no corrosive effect.

2.2. Lubrication of threads and contact surfaces on the bowl parts

Before assembling the bowl apply a thin film of any of the following lubricants to the threads and the contact surfaces of the 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 characteristics may be also used.

2.3. Lubrication of the motor bearings

The instructions of the motor manufacturer, found on the appropriate plate on the motor, apply to the lubrication of the motor bearings.

3. MOTOR

3.1. General

The separator is powered by a three-phase A.C. flange-type motor with **11** kW, of type B5. The motor power is rated to cover the high acceleration current. It is therefore impossible for the motor to be overloaded during operation, because of lower power consumption.

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.

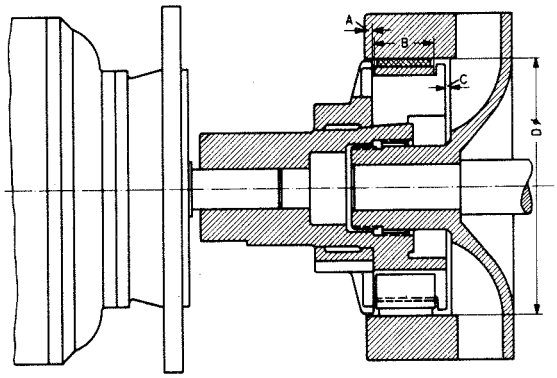


Fig. 3/1

Position of the clutch driver in ring of clutch drum.

Dimensions in mm					
Fig. 3/1				Fig. 3/2	
A	B	C	D	E	d
0	**59,5**	**3 ± 0,5**	**180**	M10	7

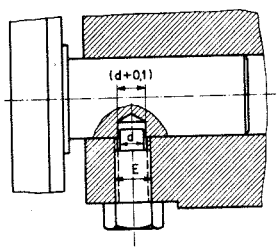


Fig. 3/2

Fastening the clutch driver onto the motor shaft end.

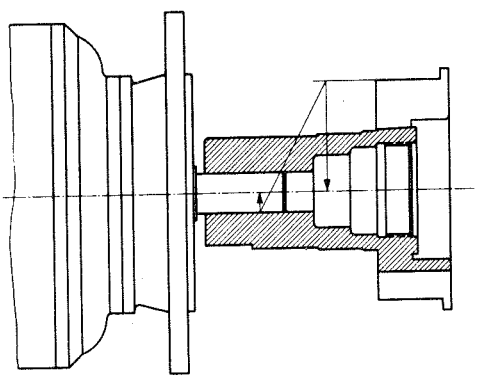


Fig. 3/3

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. 3/1 and 3/2 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. 3/1).

For fitting the clutch shoes refer to sect. 8.4.3.

Fasten clutch driver to motor shaft by screwing hex head screw all the way in (see fig. 3/2). If the screw does not go in completely, then it has not found the hole in the motor shaft.

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

3.3. Motor connection

3.3.1. Three-phase AC motor

The motor can be started either across-the-line or through a star-delta switch. When using a star-delta switch, change-over from star to delta has to take place after 4 - 6 seconds.

The starting current of the motor can reach 1.5 to 1.8 times the value of the rated current. To assure perfect protection of the motor, two three-phase contactors, each equipped with a thermal release should, therefore, be provided.

The release of the starting contactor has to be adjusted to the starting current. As soon as the bowl has reached its rated speed, switching over to the operating contactor has to take place. The release of this contactor has to be set to the rated current.

Dimensioning of switches, wiring, and fuses must be based upon the starting current and NOT on the rated current.

If the separator is to be controlled by an automatic timing unit, the timing unit must be electrically interlocked with the motor starter, so that it can only be put into operation when the separator motor is switched on.

3.3.2. Explosion-proof three-phase A.C. motor

For operation in explosion-hazarded plants, the separator is equipped with a three-phase A.C. motor of explosion-proof design, type of enclosure (Ex) d2, flame-proof, ignition category G4 according to the specifications 0171/2.65 of the VDE (Institute of German Electrical Engineers).

Power is transmitted via a centrifugal clutch which allows across-the-line starting of the motor. Both the clutch and the friction brakes are housed in a flame-proof section of the separator frame (type of enclosure (Ex) d2).

Before starting the motor, make sure that both friction brakes and both bowl lock screws are released.

Motor protection during starting and during operation of the separator must be assured by thermal releases. Because of the increased starting current, the starting-up release has to be set to 1.4 times the value of the rated current. At the end of the starting time, the operating release - set to the rated current of the motor - must be actuated automatically by a timing relay.

If the electrical equipment is not of explosion-proof design, it has to be installed outside the explosion-hazarded room.

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. 3/4) 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 specific gravity of the centrifugally dry solids and on the specific gravity of the heavy liquid.

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

If specific gravities exceed those shown on the name-plate, the gear must be changed to reduce the bowl speed. In this case, be sure to check with the factory.

The part-numbers of the gear parts marked with *** in the Parts List depend on the rpm of the motor as well as on the rpm of the bowl as seen on the name-plate of the separator. For part-numbers of the gear parts which correspond to the motor speed and bowl speed of your separator, refer to the chart 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-number of the separator concerned. Correct delivery cannot be assured unless the order quotes these data.

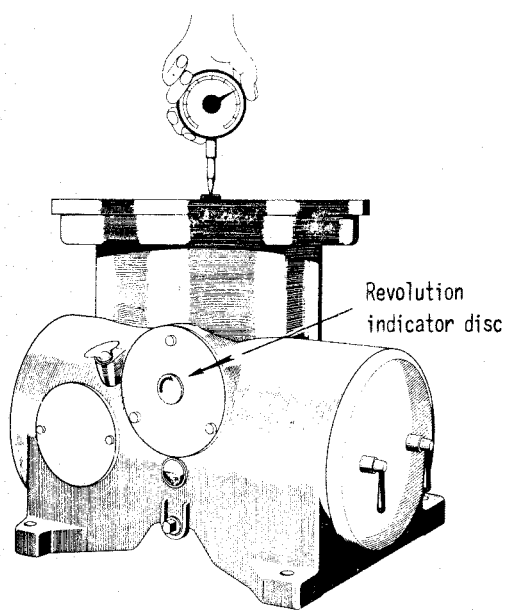


Fig. 3/4

Checking the spindle speed with a hand-tachometer.

The rpm of the spindle (equals rpm of bowl) must be checked before the first use of the separator and also after every change of the gear parts. This is done with a hand-tachometer as shown in fig. 3/4.

The revolution indicator disc shows if the bowl is turning and in which direction. It also allows to check the revolutions of the bowl. See fig. 3/4.

The bowl has reached its full speed, when after start-up of the bowl, 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.

A deviation of the bowl speed up to 3% is permissible.

The bowl takes about **5 - 8** minutes to reach its running speed.

Be 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).

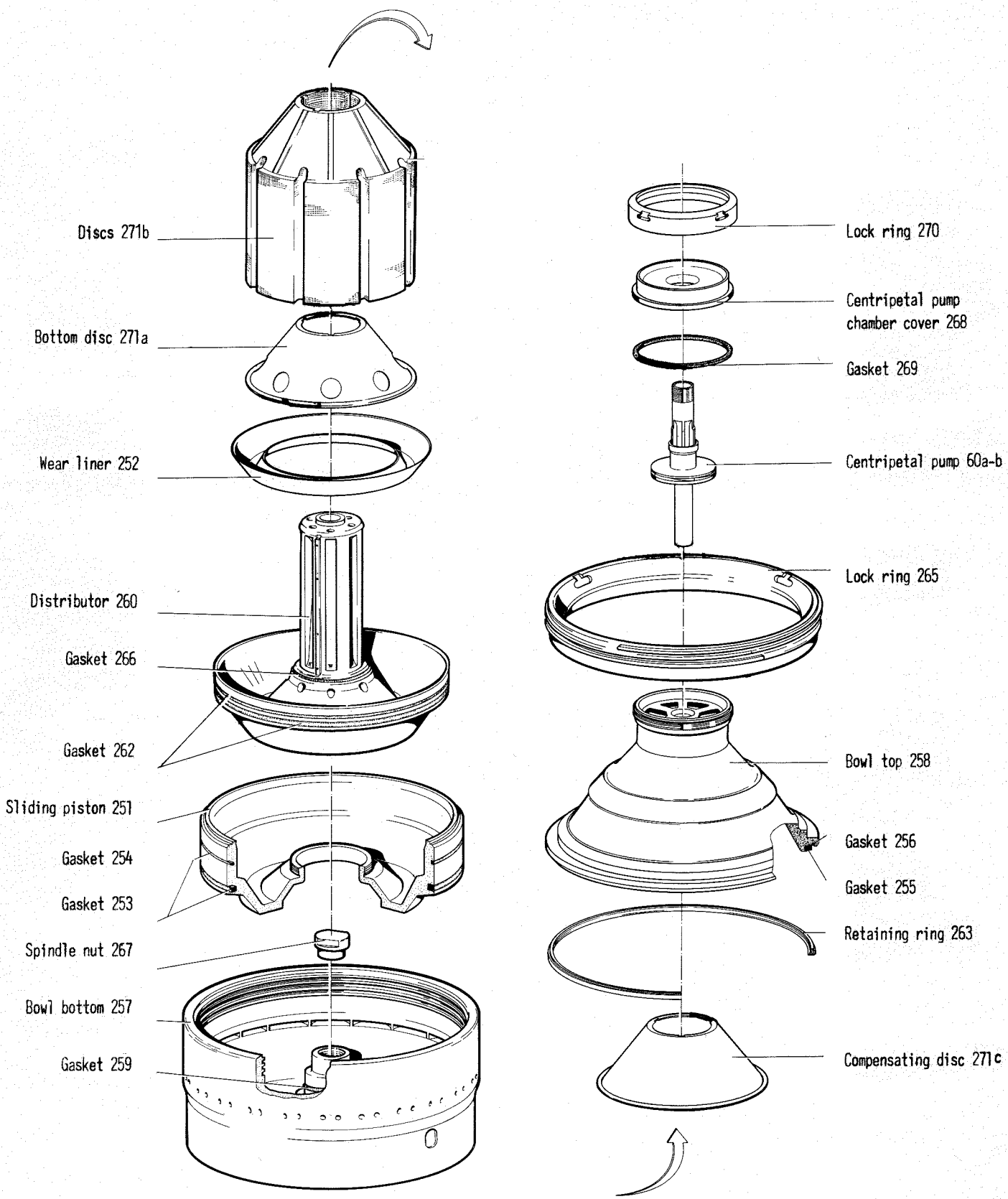


Fig. 4/1

Component Parts of Bowl in the Order of Assembly.

4. Bowl, Feed and Discharge Connections

4.1. Assembling the bowl

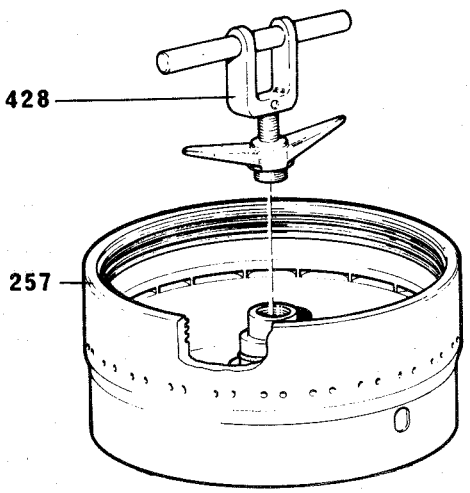


Fig. 4/2

Prior to assembling the bowl, make sure that the contact surfaces of the bowl parts are clean.

When installing the bowl parts, see that the "0" marks of all parts are aligned.

If the plant consists of several separators, be careful not to interchange parts of different bowls, since each bowl has been balanced individually. The main parts of the bowl are marked with the last three digits of the serial-number of the separator.

Be sure to replace worn gaskets.

1) Oil the upper part of the spindle (thread, cone, and cylindrical guide surface for spindle cap 160t). It must be possible to move the spindle cap easily 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.

2) Use jack 428 to place bowl bottom 257 on spindle (fig. 4/2).

3) Turn bowl lock screws into recesses of bowl bottom without applying pressure. One of the recesses is situated below the "0" mark of the bowl bottom.

4) Use wrench 417 to screw on spindle nut 267 tightly. Note that the nut has left-hand thread. See fig. 4/3.

5) Insert gasket 259 in groove of bowl hub.

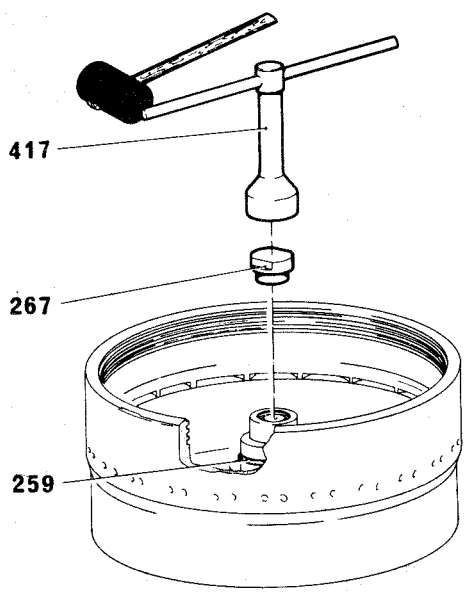


Fig. 4/3

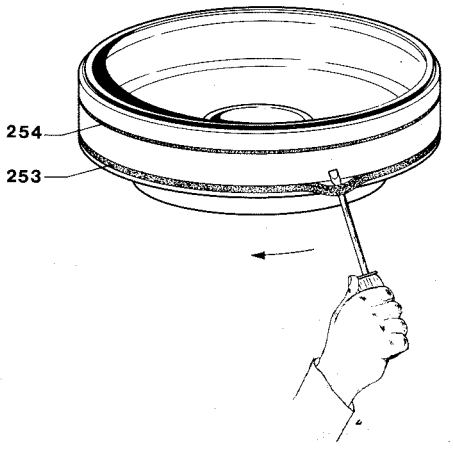


Fig. 4/4

6) Carefully clean the grooves for the gaskets 253 and 254 in the sliding piston, and apply a thin film of grease.

If the gaskets to be inserted are new, stretch them evenly until their outer diameter is approx. the same as the outer diameter of the grooves in the sliding piston.

Insert gaskets 253 and 254 in grooves of sliding piston. To make sure that the gaskets are stretched evenly all over and that they fit tightly at all points of the guide surfaces during operation, proceed as follows: Use a screwdriver to lift the gaskets from their grooves and move it two or three times around the sliding piston. See also fig. 4/4. Then hammer the gaskets back into their grooves, using a rubber hammer.

7) Grease guide surface of sliding piston 251 (see 2.2).

Use jack 430 to install sliding piston in bowl bottom. Groove of sliding piston must fit over arresting piece of bowl bottom. Make sure that the "0" marks of both parts are aligned.

To facilitate the installation of the sliding piston, the bottom ring of jack 430 is furnished with two slots, one of which should be placed over the slot in the sliding piston, so that the arresting piece in the bowl bottom can be seen.

Turn threaded spindle "A" counterclockwise in order to lower sliding piston slowly into bowl bottom. Arresting piece of bowl bottom must snap into groove of sliding piston. If the arresting piece of the bowl bottom has not snapped completely into the groove, it may be necessary to shake the sliding piston. ATTENTION: Be sure not to damage sealing lip of sliding piston.

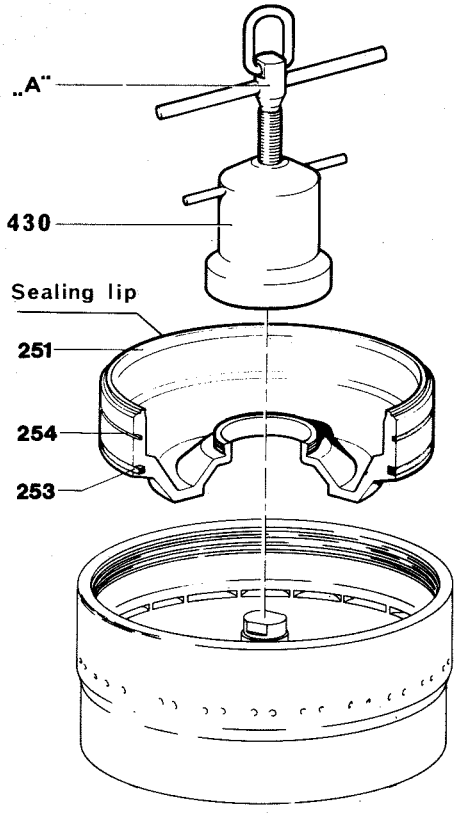


Fig. 4/5

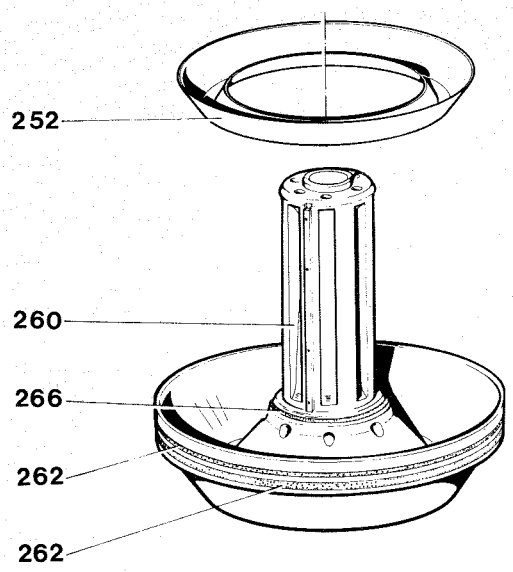


Fig. 4/6

8) Put gaskets 262 and 266 in appropriate grooves of distributor 260 (see fig.4/6). Proceed by the same method as for gaskets in sliding piston (see item 6) and note the following:

If the separator is taken apart for some reason (e.g. to clean the bowl) and the gaskets 262 are not changed or taken out, then it is highly advisable to pry them out in one place with a small screwdriver to allow water which has collected behind the gaskets to flow out. The gaskets should then be tapped back in with a rubber hammer. This will make the job of re-installing the distributor much easier.

9) Place wear liner 252 into distributor.

10) Stack discs 271a-c on neck of distributor in the following order:

a) bottom disc 271a (with thick spacers on the underside),

b) discs 271b in numerical order,

c) compensating disc 271c.
If the compensating disc (unperforated, without spacers) is used in order to obtain the necessary pressure in the disc set, be sure to place it always on top of the disc stack so that it lies directly under the bowl top.

11) Grease contact surfaces of distributor (see 2.2).

Use jack 424 (see fig. 4/7) to lift distributor into bowl bottom.
By turning threaded spindle "A" of jack in counter-clockwise direction, distributor will gradually sink into bowl bottom.
Be sure arresting pin of distributor catches hold of groove in bowl bottom.
If necessary, shake distributor lightly, until arresting pin snaps in.

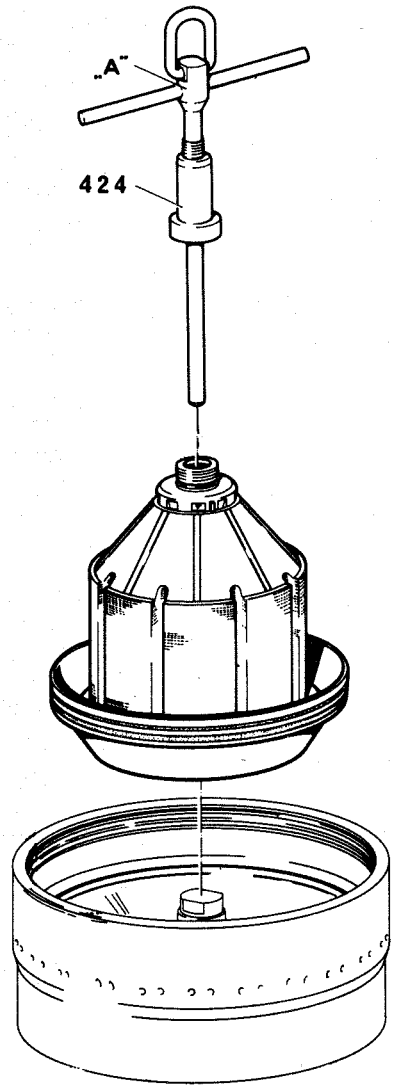


Fig. 4/7

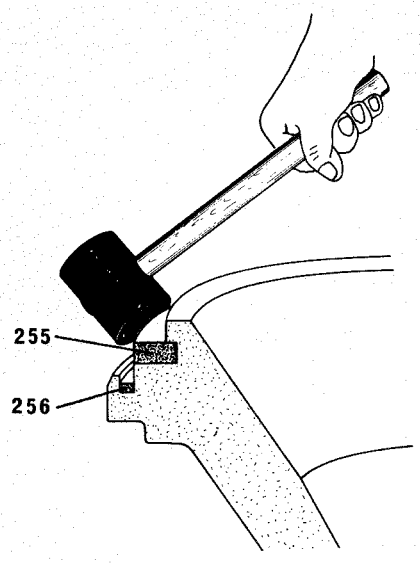


Fig. 4/8

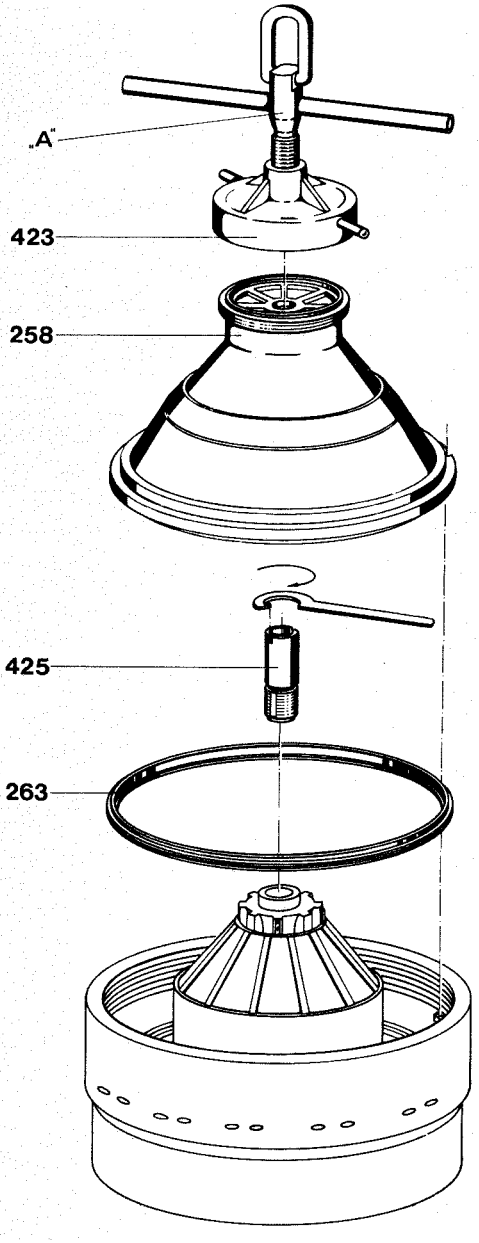


Fig. 4/9

12) Thoroughly clean groove in bowl top for rubber gasket 255. Fit gasket around bowl top as shown in fig. 4/8 and tap it into the groove with a rubber hammer. (If instead of the rubber gasket a gasket made of plastic is used, then proceed according to the instructions given under sect. 4.2).

13) To assure good adhesion of gasket 256 (fig. 4/8) apply some neutral grease (one with no harmful effect on the feed liquid) to the respective groove in bowl top.
Then insert gasket 256.

14) Install retaining ring 263 (fig. 4/9) in bowl bottom.

15) Screw threaded bolt 425 - which serves as support for jack 423 - into distributor neck.

16) Grease contact surfaces on bowl top and on bowl bottom (see 2.2).
By means of jack 423 place bowl top into bowl bottom. By turning threaded spindle "A" bowl top will gradually sink into bowl bottom. Make sure that the arresting piece of bowl bottom fits into the groove of bowl top. The "O" marks of both parts must be in line.
Then screw out threaded bolt 425 and remove it.

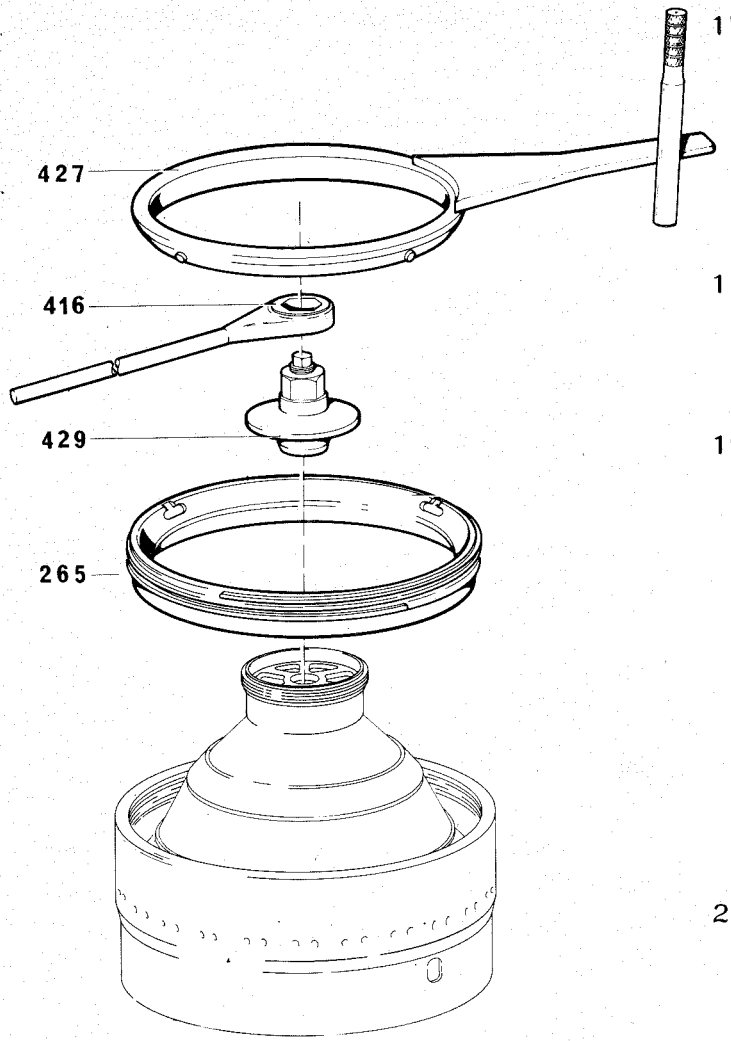


Fig. 4/10

17) Carefully clean, wipe dry, and grease threaded areas and guide surfaces of bowl bottom and of bowl lock ring 265 as well as the contact surfaces of bowl top and bowl lock ring (refer to sect. 2.2).

18) Screw bowl lock ring into bowl bottom (left-hand thread) and tighten with wrench 427 (hand-tight only).

19) To facilitate tightening of the bowl lock ring, compress disc stack by means of special device 429. To do this, proceed as follows:

Thread bolt A (fig. 4/11) into distributor neck. Make sure to screw down completely. Place disk C onto bowl top. Grease thread of bolt A. Then screw hex nut B on bolt A and tighten it with ratchet wrench 416.

20) Bring the "0" marks on the bowl lock ring and on the bowl bottom as closely together as possible with the annular wrench. Then they must be exactly aligned by rapping wrench handle with mallet 415. Only a few raps will be necessary to close the bowl. Do NOT slip a pipe over wrench handle to obtain leverage!
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 the mallet, add a spare disc.

21) Loosen hex nut B with ratchet wrench. Screw bolt A out of the distributor and remove it together with hex nut B and disk C.

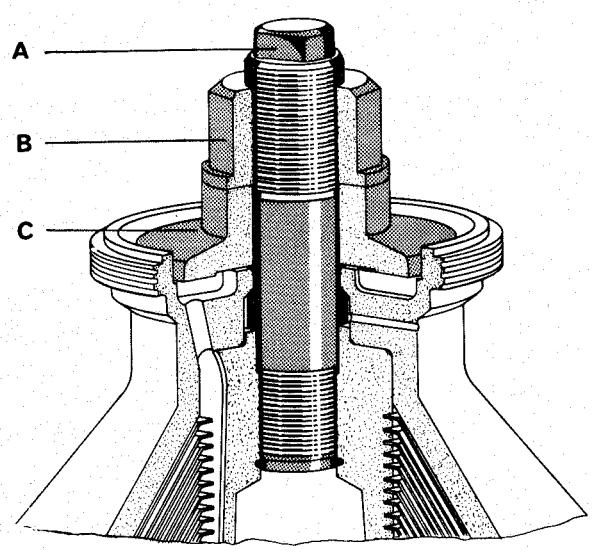


Fig. 4/11

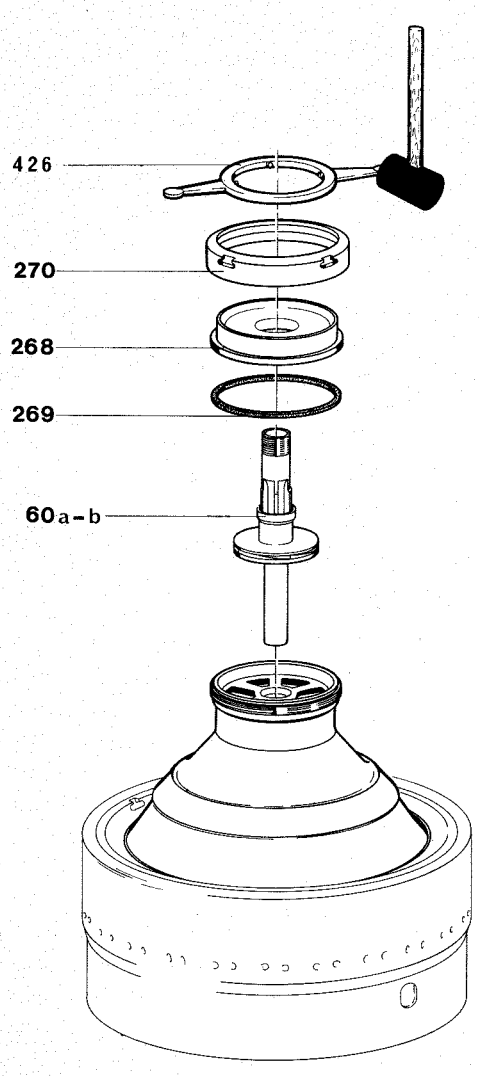


Fig. 4/12

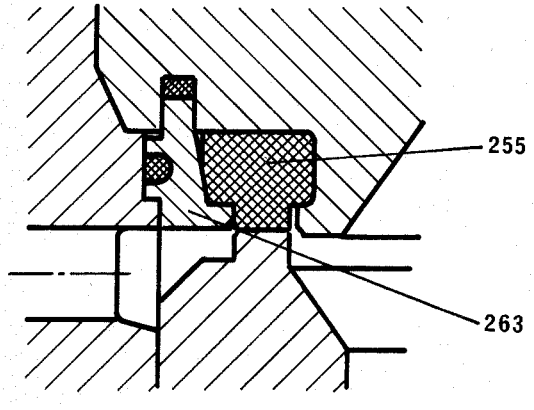


Fig. 4/13

22) Fit centripetal pump assembly **60** a-b.

23) Insert gasket 269 in groove of centripetal pump chamber cover 268. Place centripetal pump chamber cover on bowl top.

24) Clean, wipe dry, and grease threaded areas on bowl top and in lock ring 270 (see 2.2).

Then screw on the lock ring by hand (left-hand thread) and tighten it by rapping handle of wrench 426.

25) Release brakes by turning the two handles **22**f clockwise (fig. 13).

26) Slacken back lock screws 32 (fig. 14) and make sure bowl can be turned by hand.

4.2. Installing the plastic main bowl gasket

1) Carefully clean groove in bowl top for gasket 255.

2) Heat up the plastic gasket in warm water (at 80°C) for approx. 5 minutes. By this means, the gasket will expand so that it fits readily around the bowl top. When cooling down, the gasket will contract, thus coming into the groove of the bowl top.

3) Before fitting retaining ring 263 into the bowl bottom, make sure that it can be pushed over the plastic gasket.

4) While the separator is in operation, the sliding piston presses against the lip of the plastic gasket. The gasket expands slightly under continuous use. Before reassembling a bowl with a used gasket, therefore make sure the retaining ring can be pushed over the plastic gasket. If this is not possible, remove excessive material on the circumference of the plastic gasket by means of a coarse file or emery paper so that the retaining ring fits. Do NOT file off too much material.

4.3. Assembling the feed and discharge connections

1) Place on hood 55 and fasten it with clamps 37.

2) Check if gasket 61a is properly seated in groove of discharge 61. Then install discharge and fasten it with cap nuts 55f.

3) Clean threads on centripetal pump and on handle connection piece 71 and apply some grease. Screw handle connection piece on the centripetal pump and tighten firmly. While tightening, block centripetal pump with wrench 403 to prevent it from rotating.

4) Screw on feed line assembly 73 and bend 64.

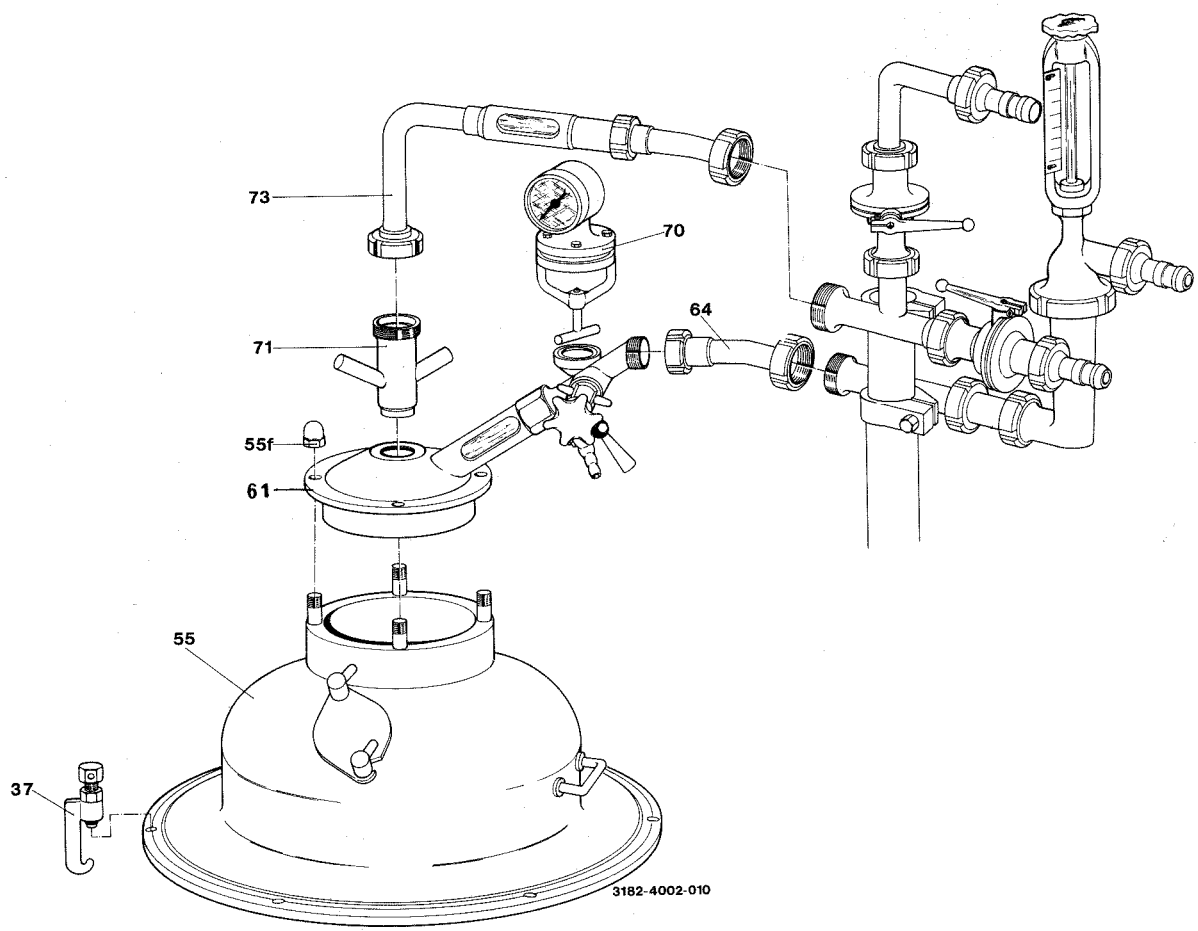


Fig. 4/14

4.4. Removing the feed and discharge connections, - Disassembling the bowl

ATTENTION: DO NOT LOOSEN ANY PART OF THE SEPARATOR OR OF THE FEED AND DISCHARGE CONNECTIONS BEFORE THE BOWL HAS STOPPED COMPLETELY!

Disassemble the bowl immediately after it has come to a stop. For disassembly, proceed in reverse order of assembly (see 4.1 and 4.3). The following should be kept in mind:

Bowl parts must be handled with care.

Be sure to replace worn gaskets.

Prior to opening the bowl, release brakes by turning the two handles clockwise and turn lock screws into recesses of bowl bottom without applying pressure. One of the two recesses is situated below the "0" mark of the bowl top.

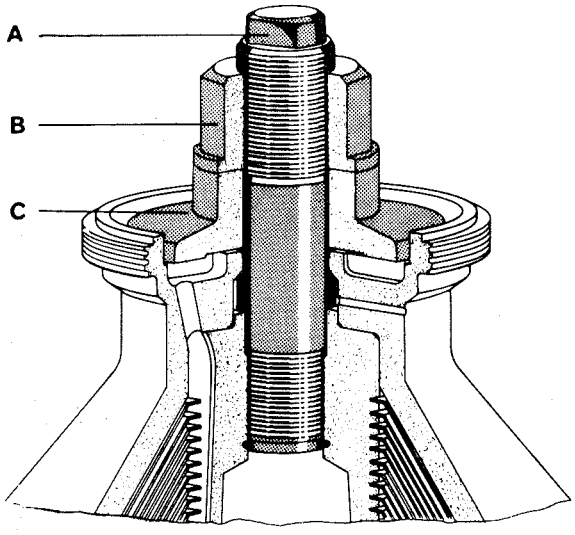


Fig. 4/15

To facilitate loosening of the bowl lock ring, compress disc stack by means of special device 429. To do this, proceed as follows:

Thread bolt A into distributor. Make sure to screw down completely. Place disk C onto bowl top. Grease thread of bolt A. Then screw hex nut B on bolt A and tighten it with ratchet wrench 416.

Unscrew bowl lock ring (left-hand thread) by rapping with mallet 415 against handle of wrench 427. Then remove the disc stack compressing device.

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

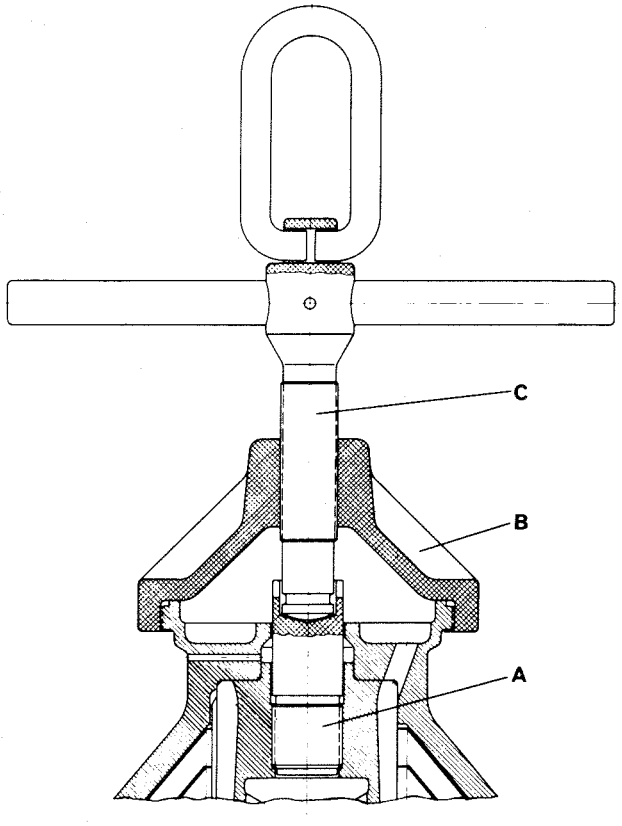


Fig. 4/16

To push off the bowl top, use tools 423 and 425 as follows:

Screw bolt A into distributor.

Screw threaded ring B onto bowl top.

Force off bowl top by turning spindle C.

Remove bowl top and place it carefully on a wooden surface to avoid damage to contact surfaces.

The distributor may only be removed with the aid of guide piece 431 (figs. 4/17, 4/18); otherwise it will jam in the sliding piston causing it and the piston to come out together, making it very difficult to separate the two parts.

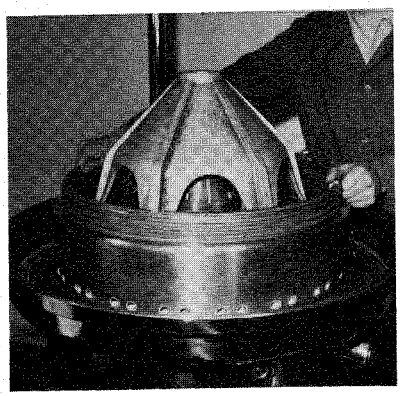


Fig. 4/17

Place guide piece 431 on bowl bottom. Arresting piece of bowl bottom must fit into groove of guide piece. Then screw bowl lock ring into bowl bottom, hand-tight only (left-hand thread).

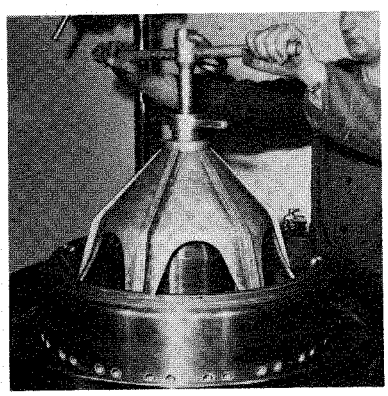


Fig. 4/18

Screw jack 424 into neck of distributor. Force distributor out of sliding piston by turning spindle clockwise.

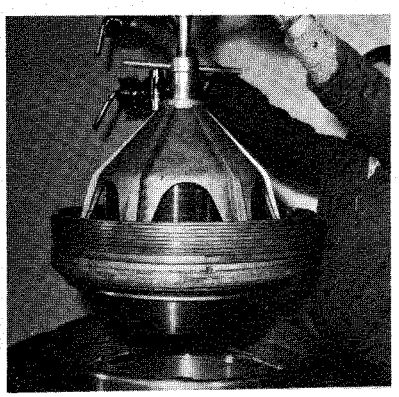


Fig. 4/19

Unscrew lock ring. Then lift out distributor together with disc set, guide piece, and lock ring.

5. Operating principles of the hydraulically controlled sliding piston of the self-cleaning bowl

The operating liquid (generally water) rotating with the separator bowl develops high centrifugal pressure which is used to operate the sliding piston for opening and sealing the bowl.

The sliding piston is situated in the bowl bottom, as shown in fig. 5/1. It rotates at the same angular velocity as the other bowl parts, but unlike the other bowl parts, it can be moved axially.

Sealing of the bowl:

When the bowl has come up to its rated speed, the operating-liquid valve is briefly opened several times in succession. The operating liquid flows into the injection chamber of the bowl bottom, from where it is directed, through nozzle A, into the sealing chamber beneath the sliding piston. The sealing pressure developed in this chamber is controlled by overflow channels C which are so arranged that the outer section of the chamber remains filled with liquid while the bowl is rotating.

The liquid pressure prevailing in the sealing chamber raises the sliding piston and presses it against gasket 255 of the bowl top, thus sealing the bowl. Through centrifugal force, gasket 253 in the sliding piston seals off the sealing chamber, and gasket 261 in the distributor seals off the opening chamber and the centrifugation room.
Separation can now be started.

Opening of the bowl (de-sludging):

When the sludge space of the bowl has filled with solids, the operating-liquid valve is opened. The operating-liquid flows into the injection chamber from where a small amount of liquid passes on into the sealing chamber. The liquid volume in the sealing chamber is controlled by the overflow channels.

The major part of the operating-liquid flows through the injection chamber via channels B into the opening chamber above the sliding piston. A small amount of liquid escapes through nozzle D, the diameter of which has been selected so as to ensure that the amount of liquid discharging from the opening chamber is smaller than that of the incoming liquid. Since the opening chamber fills up towards the axis of rotation with a greater amount of liquid than that filling the sealing chamber, the opening pressure exceeds the sealing pressure. The sliding piston is forced down, thus opening the ports in the bowl bottom for solids ejection.

Re-sealing of the bowl:

After sludge ejection, the operating-liquid supply is shut off. The liquid contained in the opening chamber is ejected through discharge nozzle D. As the liquid level recedes, the opening pressure acting on the upper side of the sliding piston quickly decreases. As soon as it has dropped below the sealing pressure acting on the underside of the piston, the latter is forced upwards, thus re-sealing the centrifugation room. The separating process can be resumed.

The de-sludging process lasts only a few seconds. It can be controlled manually or by means of an automatically operating timing unit. Operating-liquid consumption amounts to only **4 - 5** litres per de-sludging. During separation, operating-liquid need not be supplied.

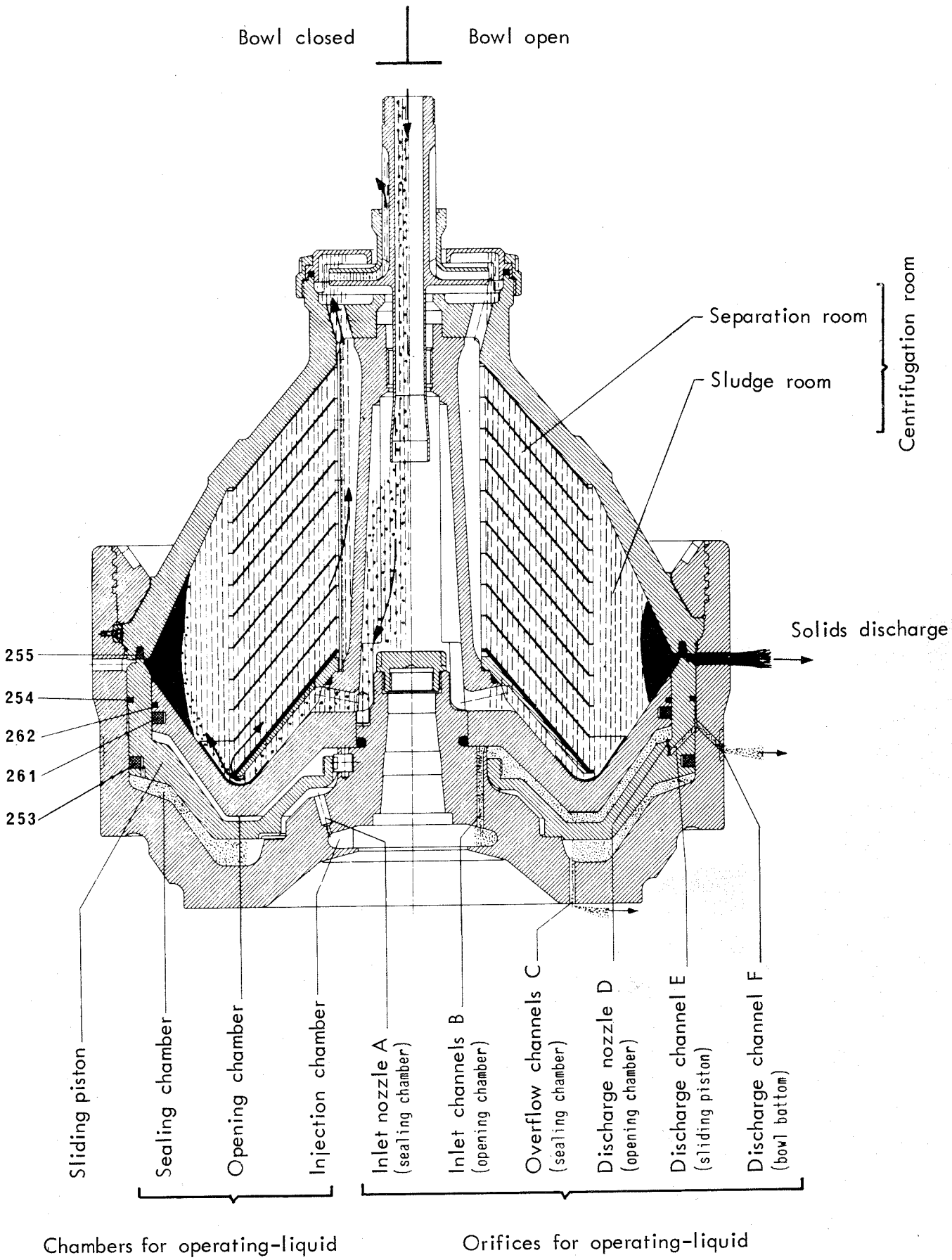

Bowl closed
Bowl open
Separation room
Sludge room
Centrifugation room
Solids discharge
255
254
262
261
253
Sliding piston
Sealing chamber
Opening chamber
Injection chamber
Inlet nozzle A (sealing chamber)
Inlet channels B (opening chamber)
Overflow channels C (sealing chamber)
Discharge nozzle D (opening chamber)
Discharge channel E (sliding piston)
Discharge channel F (bowl bottom)
Chambers for operating-liquid
Orifices for operating-liquid

Fig. 5/1

6. OPERATION

6.1. Starting the separator

1) Prior to starting the separator, make sure that
   a) oil level in gear chamber is slightly above middle of sight glass,
   b) brakes are released (to release them, turn both handles clockwise),
   c) bowl lock screws are slackened back,
   d) clamps for fastening the hood and cap nuts for fastening the discharge are tightened securely,
   e) handle connection piece is tightened securely on centripetal pump tube.
2) Turn on the motor and check immediately if revolution indicator disc rotates. Wait until the bowl has come up to its rated speed as seen on the name-plate, that is, after **5** to **8** minutes.
3) Close bowl hydraulically by briefly opening the operating-liquid valve several times in succession.
4) Check bowl for leakage:

   Fill it with water (if permitted) or with liquid to be processed. Open inspection cover **53** at sludge outlet. If liquid discharges from the sludge outlet while the bowl is being filled, the bowl proves to be leaky. In this case, open operating-liquid valve for about 10 seconds to accomplish opening and closing of the bowl. This should be repeated until the bowl is properly sealed. Always keep a waiting time of **15** to **20** seconds between closing and re-opening of the operating-liquid valve.
5) Feed liquid to be processed. Adjust valve in feed line to desired hourly capacity.

   Throughput capacity of the separator: up to **12 000** litres/hr.

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

   If the particle size of the solids is very small and if there is only little difference between the specific gravities of the solids and of the carrier liquid, the hourly capacity has to be reduced to extend the retention time of the product to be processed in the bowl.
6) Adjust discharge pressure by means of throttle valve so that the clarified liquid discharges free of foam.

6.2. De-sludging of the bowl (solids ejection):

6.2.1. General

When to de-sludge the bowl

The intervals at which solids ejections have to take place, depend on the solids content and on the nature of the feed liquid. Complete filling of the sludge space (sediments space) should be avoided. As soon as the separating efficiency begins to decrease, be sure to accomplish either a"complete de-sludging" or a "partial de-sludging". Complete de-sludging means ejection of the total contents of the bowl, whereas partial de-sludging means ejection of only part of the sediments.

Before each complete ejection be sure to stop the supply of feed liquid to the separator.

Displacement

The loss of valuable feed liquid - unavoidable during complete de-sludging - can in many cases be reduced to a minimum by displacing the residual feed liquid left in the bowl (for example with water) before solids ejection takes place.

The displacement-liquid should be fed at the same hourly capacity as the feed liquid.

The duration of the displacement-liquid supply has to be found out by experiment. If the time of displacement is too long, displacement-liquid will discharge through the outlet for the processed material. If the time of displacement is too short, part of the valuable feed liquid will remain in the bowl and then be ejected with the sludge.

Flush de-sludging

It may happen that part of the sediments stick to the walls of the sludge space due to particular properties or as a result of having been retained too long in the bowl. To overcome this condition, the time of separation should be reduced, or "complete de-sludging" should be followed by 1 - 3 "flush de-sludgings". Flush de-sludgings are accomplished by filling the bowl with water and emptying it by way of de-sludging.

Programme control

Complete, partial, and flush de-sludgings as well as displacement of feed liquid at pre-determined intervals are controlled in the most dependable way by using an automatic timing unit. For details, refer to the instruction manual"WESTFALIA Timing Unit".

6.2.2. Complete de-sludging

1) Stop feed liquid supply.

2) Displace liquid from bowl: see 6.2.1, section "Displacement".

3) De-sludge the bowl by opening operating-liquid valve for about 10 seconds.

   Sludge ejection is finished after a few seconds. However, the operating-liquid valve should be left open for 10 seconds, to be sure that even the difficult to dislodge solids will be ejected. Solids that remain in the bowl, can harden and thus lead to trouble.

4) If flush de-sludgings are necessary in order to remove residual solids from the bowl, proceed as follows:

   Fill bowl with water. The bowl is filled when water can be seen through the sight glass in the discharge line. Then de-sludge bowl again by opening operating-liquid valve for approx. 10 secs. This procedure should be repeated 1 - 2 times, if necessary.

5) After final de-sludging, wait **15 - 20** seconds before opening the feed liquid valve.

   Be sure to keep always a waiting time of **15 - 20** seconds between complete or flush de-sludgings and re-opening of the feed liquid valve.

6.2.3. Partial de-sludging

Partial de-sludging means partial emptying of the sludge space of the bowl. It is not feasible with all types of liquid, but only with products whose centrifugally removed sludge is 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 feed liquid valve normally remains open.

To accomplish partial de-sludging, open operating-liquid valve briefly. The period of time during which the valve is to be kept open, depends on the operating-liquid pressure and on the nature of the centrifugally removed solids. The bowl should be opened for so short a period of time that only part of the solids is ejected from the sludge space. The amount of ejected sludge is determined by the period of time the valve is kept open. To ensure that equal amounts of sludge are ejected, equal operating-liquid pressure must be maintained (refer to page 10/7).

To be sure that partial de-sludgings are accomplished at regular intervals, a programmed control is required.

6.3. Stopping the separator

1) Shut off the feed liquid supply.
2) Displace the liquid from the bowl (see 6.2.1, section "Displacement").
3) Switch off the timing unit (if used with this machine).
4) De-sludge the bowl: see 6.2.2, para. 3.
5) Flush bowl several times with water and de-sludge, to be sure that no solids are left in the bowl. To do this, proceed as follows:

   Fill bowl with water. The bowl is filled when water can be seen through the sight glass in the discharge line. Then de-sludge bowl again by opening operating-liquid valve for approx. 10 secs. This procedure should be repeated several times.

   After the final flush de-sludging, make sure that the operating-liquid valve is closed.

   When cleaning in place with a 2 - 3% caustic solution at a temperature of 70 - 80°C, finish up by flushing with hot water and finally with cold water. Towards the end of the cleaning process, the discharge valve should be throttled to obtain heavy overflow. By this means, hood and sludge collector are flushed thoroughly. To avoid corrosion, be sure to use only approved detergents.

6) Fill bowl with water. If there is water seepage, be sure to leave the feed valve open.
7) Switch off the motor.
8) Apply brakes by turning handles counter-clockwise. Wait until bowl has stopped completely. Note that bowl has not stopped rotating before revolution indicator disc (fig. 3/1) has ceased rotating.

   CAUTION! Do NOT loosen any part (of the separator or of the feed and discharge assembly) before the bowl has stopped completely.

9) If the bowl is to be disassembled, it should be started immediately after shut-down, while the contact surfaces of the bowl parts are still wet.

7. Cleaning

7.1. Cleaning the bowl

In general self-cleaning bowls need not be disassembled for cleaning, unless the nature of the product to be processed makes bowl disassembling necessary or the separator is to be shut down for an extended period.

IMPORTANT: It is, however, recommended to disassemble the bowl for inspection every two weeks (see 4.4). On this occasion, clean, wipe dry, and grease guide surfaces and threaded areas of bowl parts. The bowl bottom can be left on the spindle.

If it becomes necessary to clean the individual discs and bowl parts,

do NOT use metal scrapers or metal brushes!

Be sure to remove the solid sludge which has collected in the distributor neck, using brush 414. Dirt accumulation in the distributor neck will hinder the feed, which can result in overflow.

Be sure to replace worn gaskets.

The gaskets in distributor and sliding piston, 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.

Swollen gaskets should be left to dry in a warm place so that they can reassume their original dimensions and can be re-used, if possible.

7.2. Cleaning the upper section of the frame

From time to time, the inside of the upper section of the frame has to be cleaned in the area below the bowl. After removing the bowl (4.4), place splash cover 411 over spindle to prevent wash liquid from seeping into the drive and rendering the lubricating oil unserviceable.

7.3. Cleaning the strainer and the operating-water feed system

Strainer **44** and the small orifices in the operating-water feed system should be cleaned every 3 - 6 months.

7.4. 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.

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

Prior to a long-term shut-down of the separator, clean the separator thoroughly (see 7.1 and 7.2). 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 corrosion-preventing oil, e.g. SHELL Ensis Oel 40, into gear chamber. 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 wetted with corrosion-preventing oil. Then drain the oil. Oil upper end of spindle and protect it with splash cover 411.

Prior to re-starting the separator, fill in lubricating oil as specified on page 2/1. Special measures for the removal of the coating of corrosion-preventing oil need not be taken.

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 make sure that no water can get into the separator by unintended opening of the operating-water valve.

8. The Gear Parts

8.1. Removal of the vertical gear parts

1) After dismantling of the bowl (see 4.4.) unscrew spindle nut 267 with wrench 417 (left-hand thread). Force bowl bottom 257 off the spindle cone. Then slacken back bowl lock screws and lift bowl bottom out of the frame.

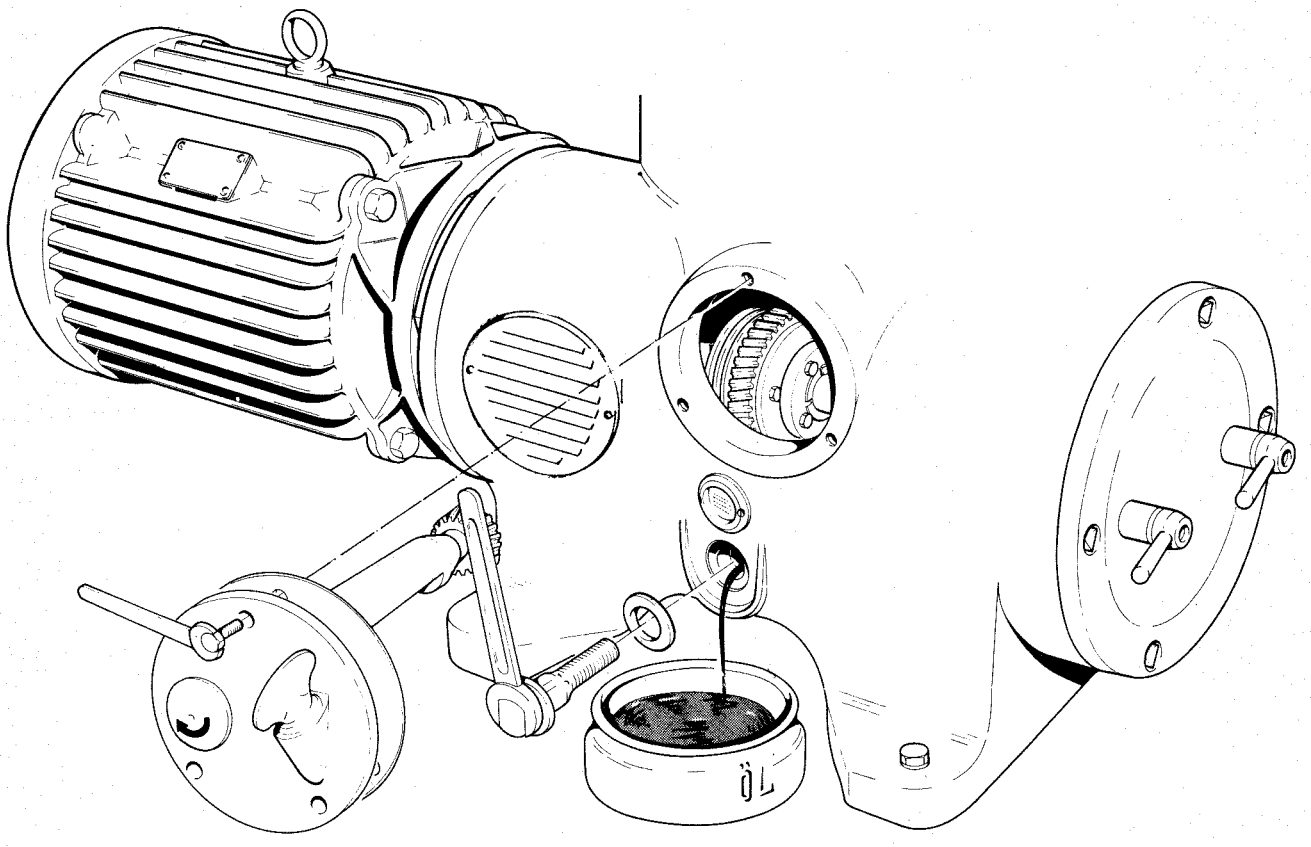


Fig. 8/1

2) Loosen oil drain screw and let oil drain into oil pan.

3) Screw hex head screws out of the revolution indicator housing.

4) Remove the housing.

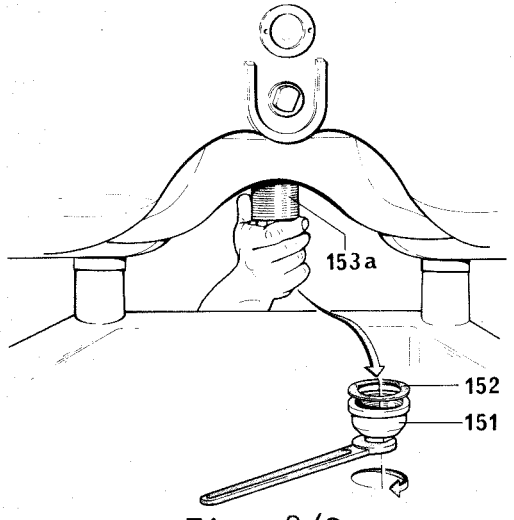


Fig. 8/2

5) Unscrew bottom bearing cap 151 and remove it along with gasket 152.

6) Screw out bottom bearing threaded piece 153a and remove it along with the other parts of bottom bearing.

In case bottom bearing housing 156 (fig. 16) must be replaced, bend safety washers 155 flat and screw out hex head screws 154. Then screw two hex head screws opposite each other into two of the threaded holes of the housing. This will force the housing out of the lower section of the frame.

7) Undo hex head screws 161r and remove operating-water feed 162.

8) Loosen threaded pin 158p in spindle cap 158n. Remove spindle cap and neck bearing protection cap 161n.

9) Press neck bearing bridge out of the upper section of the frame. This is accomplished by alternately screwing the three hex head screws 161r into the threaded holes of the neck bearing bridge.

10) Screw spindle nut 267 on worm spindle, by hand, and pull out worm spindle together with neck bearing bridge.
IMPORTANT: Be sure not to damage gaskets 161a and 161m while removing the spindle; otherwise new gaskets have to be inserted.

11) To remove neck bearing bridge, hold spindle in inverted position, upper end down, and tap spindle lightly against a wooden surface. Neck bearing bridge will then slide off. See fig. 8/4.

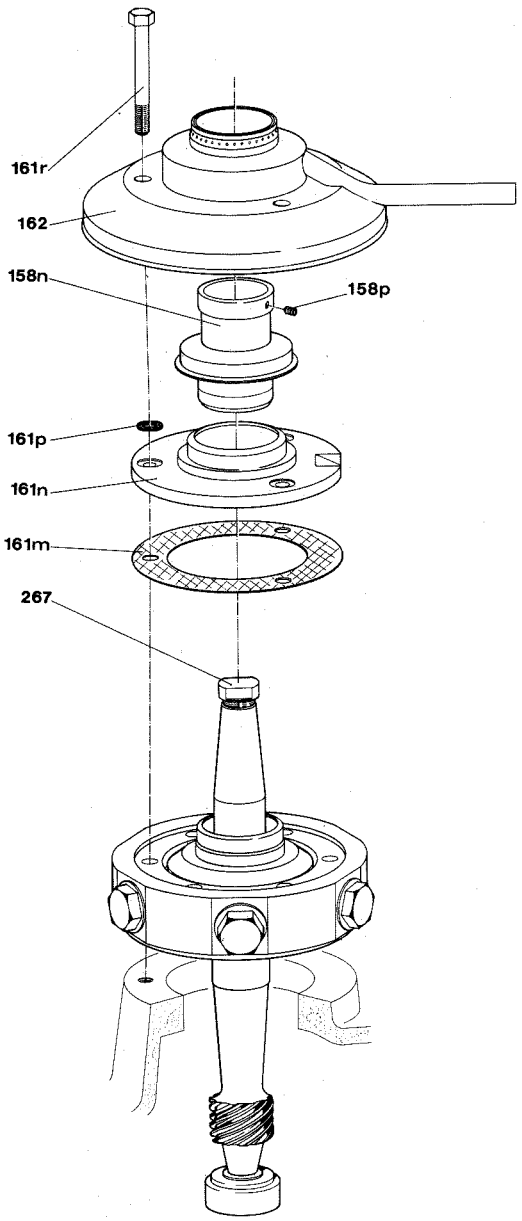


Fig. 8/3

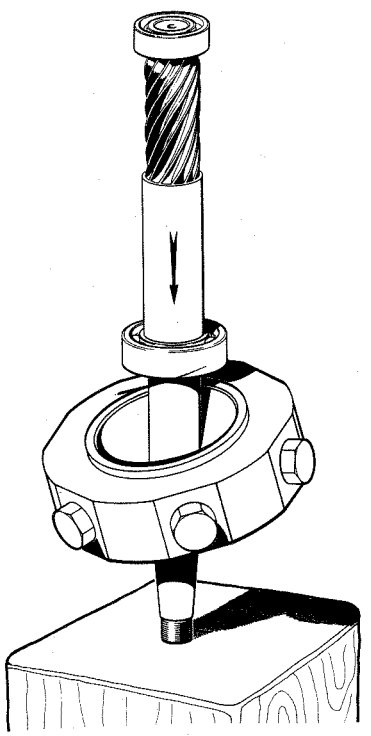


Fig. 8/4

8.2. Assembly of the Vertical Gear Parts

For assembly of the vertical gear parts proceed in reverse order of removal (see 8.1) and according to the instructions given below (see 8.2.1 - 8.2.3).

8.2.1. Important hints for assembly

1) Before assembly clean gear chamber thoroughly (see 7.4).
2) Check over ball bearings 158a and 158f before every installation. IMPORTANT: Only the high precision ball bearings listed in the back of this book may be used.
3) Warm up ball bearings 158a and 158f as well as the ball bearing protection rings in approx. 176°F oil, in preparation for fitting them on the spindle.
4) The spindle, with ball bearings attached, must be installed without having to be hit on the upper end, and must fit so that it is axially movable by hand.
The outer ring of the pendulum ball bearing 158a must fit snug in the bottom bearing housing. If it does not, then all burrs or similar obstructions in the bottom bearing housing have to be removed with a very fine emery cloth.
5) When replacing the worm spindle, the entire worm wheel assembly with clamp plates, 208a-h, should be replaced at the same time, since it is no longer in perfect condition either and would thus cause premature wear to the new worm spindle.
6) When installing the neck bearing bridge assembly 161b-h, check to be sure that gaskets 161a and 161m are in good condition.
7) IMPORTANT: After every installation of the vertical gear parts, the height of the bowl must be checked and, if necessary, it must be re-adjusted (see 8.3).

8.2.2. Assembly of the bottom bearing

1) Thoroughly clean all constituent parts of bottom bearing 153a-h (fig. 8/5).
2) Fit pressure spring 153b into bottom bearing pressure piece 153c.
3) Put bottom bearing pressure piece along with pressure spring into bottom bearing threaded piece 153a.
4) Place set of bottom bearing running parts into bottom bearing threaded piece:
Bottom bearing pressure disc 153d,
Ball cage 153f,
Bottom bearing running disc 153g.
5) Insert snap ring 153h into bottom bearing threaded piece.

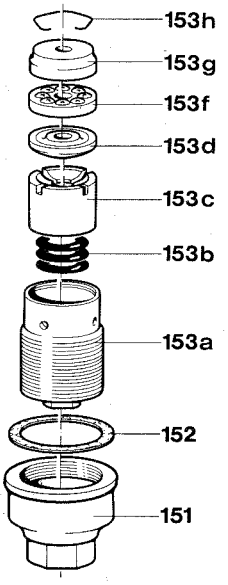


Fig. 8/5

8.2.3. Assembling the neck bearing bridge (Gas-tight design)

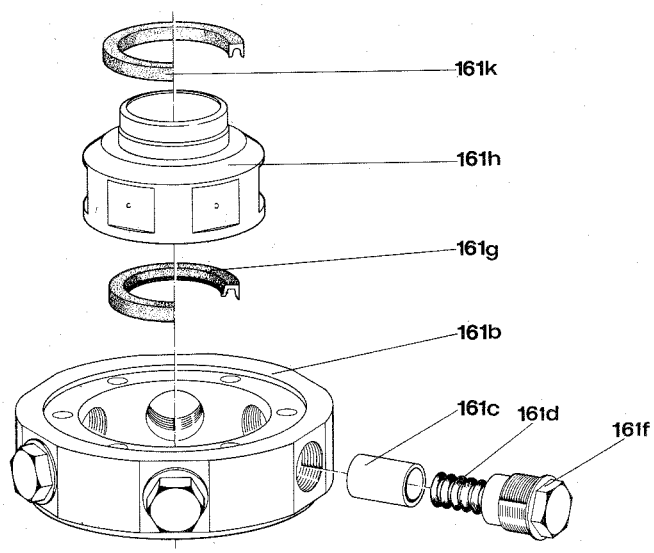


Fig. 8/6 -

The upper ball bearing of the worm spindle is contained in pressure ring 161h, which is held by six radially arranged, equally distributed springs 161d.

1) Fit grooved ring 161k onto pressure ring 161h. The position of the grooved ring is correct, when its sealing lips point downwards.

2) Fit sealing ring 161g - with its sealing lip pointing downwards - into the pressure ring.

3) Put pressure ring so into neck bearing bridge 161b that the six recesses in the pressure ring face the six holes in the neck bearing bridge.

4) Thoroughly grease spring pistons 161c. Put neck bearing springs 161d into spring pistons and slip threaded plugs 161f on spring pistons.

5) Screw threaded plugs, together with spring pistons and neck bearing springs, into corresponding tapholes of the neck bearing bridge.

8.3. Re-adjustment of bowl height

The bowl height has been adjusted at the factory prior to shipment of the separator. It must be checked for possible re-adjustment after re-assembling the vertical gear parts, after exchanging the bowl or the centripetal pump, and as soon as the centripetal pump shows grinding marks.

Correct bowl height adjustment can only be made when the bowl is properly closed, i.e. when the "0" marks of bowl lock ring and of bowl bottom are aligned.

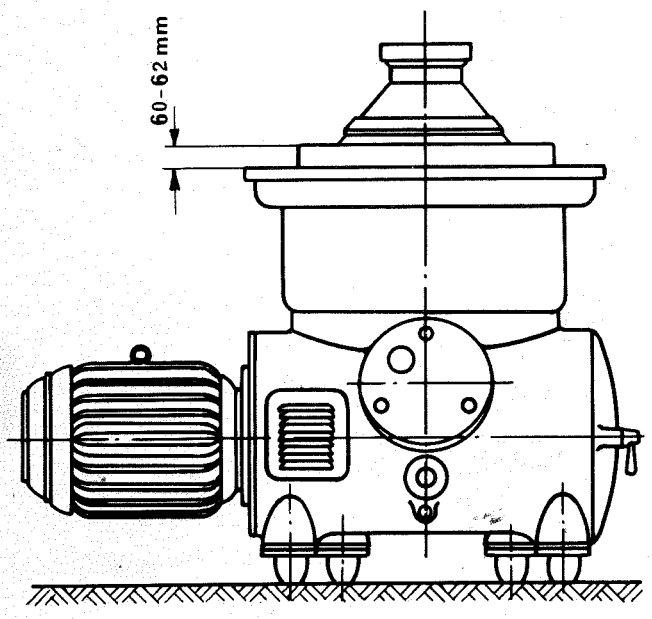


Fig. 8/10
Height adjustment of bowl

The bowl height is properly adjusted when the clearance between upper edge of sludge collector and upper edge of bowl lock ring is **60** to **62** mm (fig. 8/10).

Check also whether the centripetal pump has proper clearance in the pump chamber (approx. **4** mm above and below). To do this, loosen cap nuts on discharge of completely assembled machine and raise discharge together with centripetal pump and handle connection piece to limit (thus bringing centripetal pump against pump chamber cover). The centripetal pump has equal clearance in the pump chamber when there is a distance of **3** to **4** mm between hood and discharge.

If the distance does not conform with this measurement, remove bottom bearing cap 151 and re-adjust bowl height by turning bottom bearing threaded piece 153. A full turn of the bottom bearing threaded piece raises or lowers the bowl by 2 mm.

ATTENTION: Under no circumstances should the bowl be placed so high that the upper ball bearing is exposed to axial stress since this would result in uneven running of the separator and in premature wear of the ball bearing. It is, therefore, recommended that, upon adjustment, the bottom bearing threaded piece be turned counter-clockwise by half a turn to lower the bowl by 1 mm. By this means, axial stress on the upper ball bearing will be eliminated.

After adjusting to proper bowl height, replace bottom bearing cap with gasket and tighten it securely.

8.4. The Centrifugal Clutch

8.4.1. General

The centrifugal clutch gradually brings the bowl up to its rated speed, eliminating premature wear on gear parts and motor. The acceleration time can be controlled by the number of clutch shoes used.

When fewer clutch shoes are used, the friction moment will be lower, the starting time longer, and wear on gear parts and motor less. The number of clutch shoes used must be either 2, 3, 4 or 6, depending upon the power to be transmitted by the motor.
The clutch shoes are to be fitted - equally distributed - into the clutch driver (see 8.4.3).
Note that the driving effect of new clutch shoes will improve after several starts.
Smoking of the clutch during the first few starts is quite normal and will disappear after a short time of operation.

If the bowl comes up to rated speed as per name-plate of separator in less than 4 minutes, the motor will pull too high a starting current. This condition can be easily overcome by reducing the number of clutch shoes to 4, 3 or 2. Be sure to keep the shoes equally distributed (fig. 8/9).

The condition of the clutch shoes must be checked from time to time. As soon as a clutch shoe lining is nearly worn down to the rivet heads, all shoes must be replaced to avoid damage to the running surface of the ring of the clutch drum (never replace only one shoe!). Damage of the running surface would lead to premature wear of the new clutch shoes.

8.4.2. Removing the clutch shoes

1) Remove ventilation grid 11.

2) Use socket wrench 402 to undo screw 201a.

3) Push clutch cover 201b towards motor side.

4) Remove clutch shoes 201c by pulling out in direction of motor.

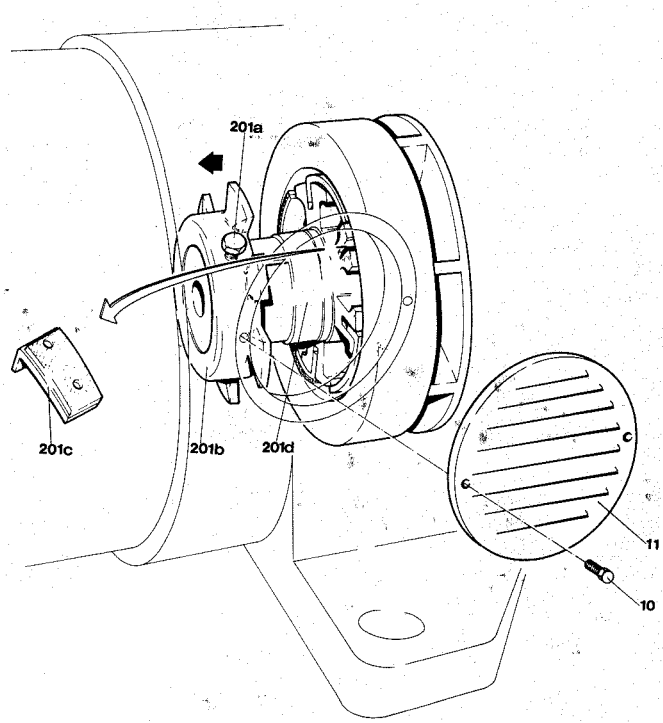


Fig. 8/8

8.4.3. Installation of the clutch shoes

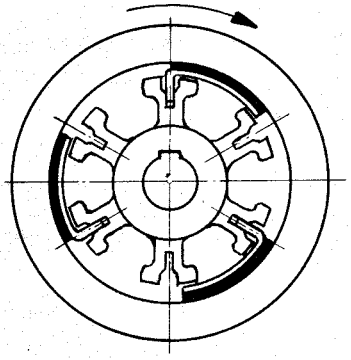


Fig. 8/9

Clutch driver with clutch shoes (seen from motor side)

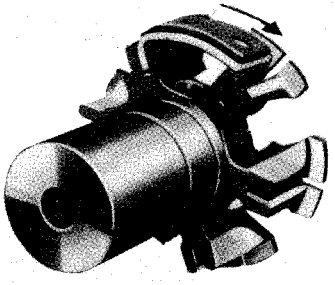


Fig. 8/10

Clutch driver with one clutch shoe.

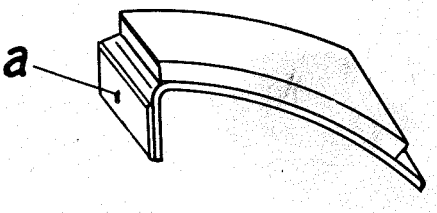


Fig. 8/11

Clutch shoe.

1) Put clutch shoes 201c (either 2,3,4 or 6 shoes) - equally distributed- in slits of clutch driver 201d in such a manner that they will be pushed by the driver (not pulled). See figs. 8/9 - 8/10.

2) Push clutch cover 201b forward until it rests on the centering rim of the clutch driver 201d. Make sure that it rests on and not before the centering rim.

3) Tighten hex head screw 201a in clutch cover, using socket wrench 402.

4) Screw on ventilation grid 11.

5) In case the clutch emits disturbing noises during the acceleration period, apply a very thin coat of molybdenum disulfide paste to the lips "a" of the clutch shoes (see fig. 8/11). If too much paste is applied, there is the chance that some might be thrown by centrifugal force on the friction surfaces, leading to clutch slippage.

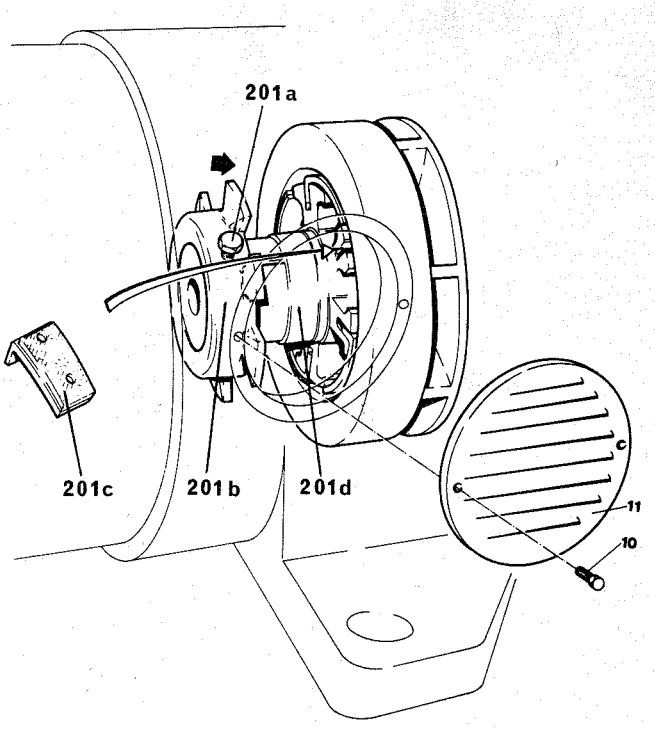


Fig. 8/12

8.5. Removal of the Horizontal Gear Parts

8.5.1. Removing the motor

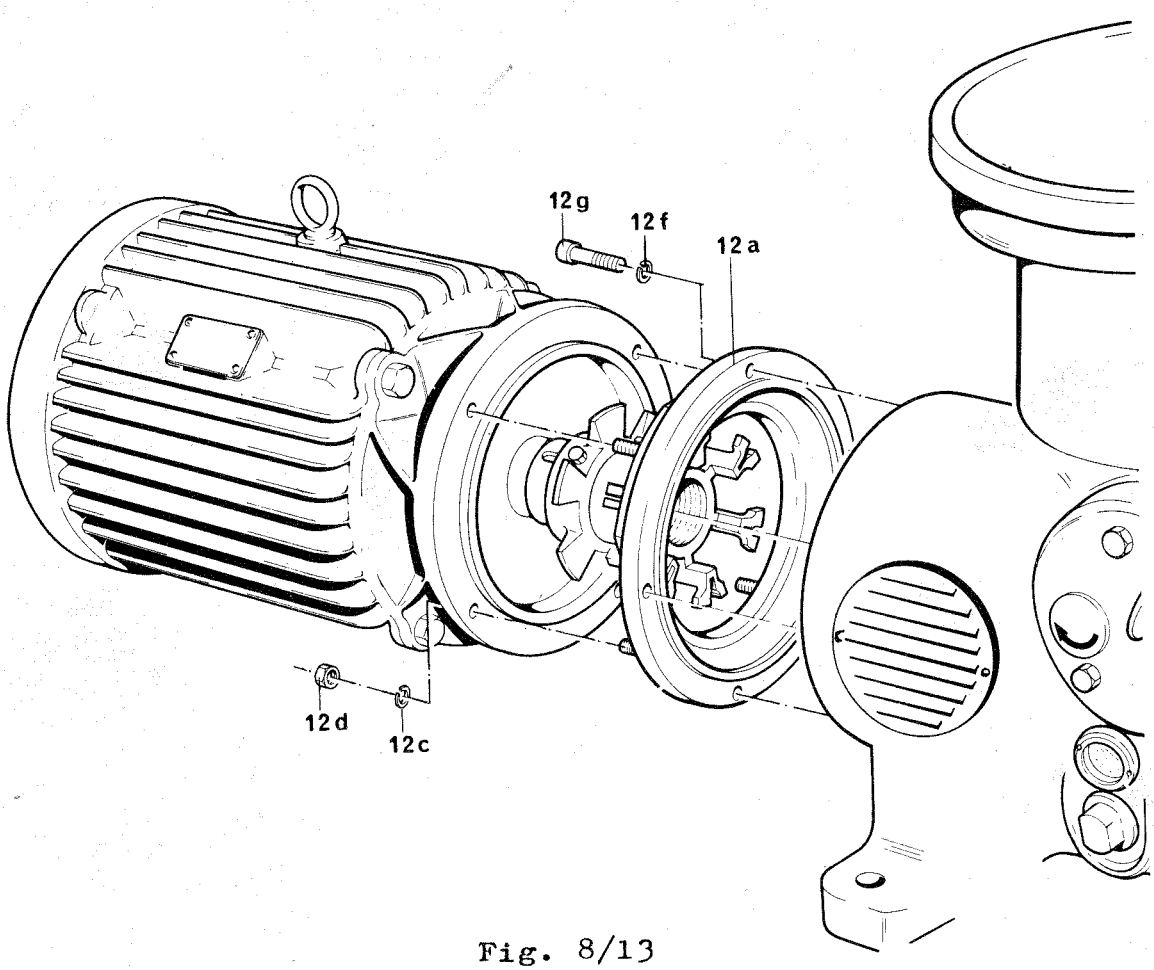


Fig. 8/13

1) Remove lead-in wires from motor terminals.

2) Remove clutch shoes (see 8.4.2).

3) Screw hexagon nuts 12d out of motor flange and remove lock washers 12c.

4) Remove motor together with clutch driver 201d.

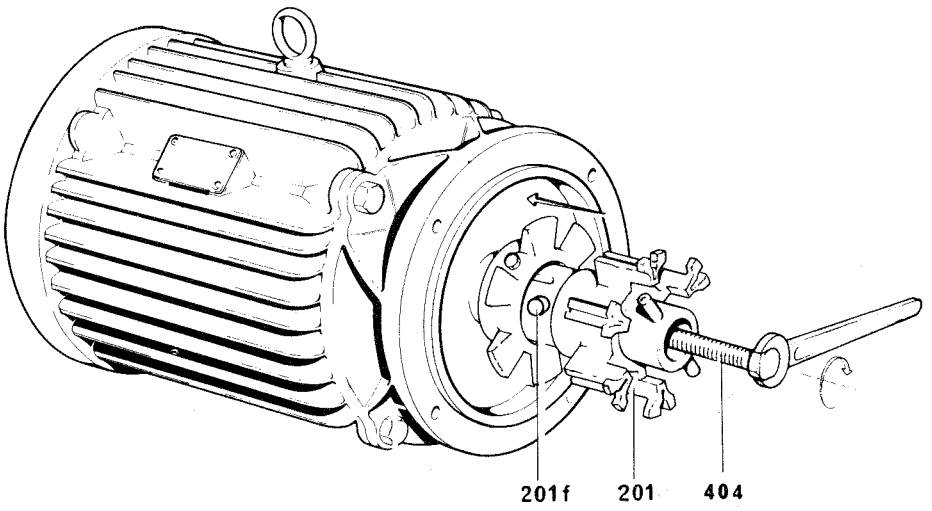


Fig. 8/14

5) Use wrench **402** to loosen hex head screw 201f in the clutch driver.

6) By means of pulling device **404** remove clutch driver from motor shaft end.

8.5.2. Removing the centrifugal clutch

1) Remove the motor (see 8.5.1, no. 1-4).

2) Unscrew Allen screws **12g** from the flange **12a** and remove flange (fig. 8/13).

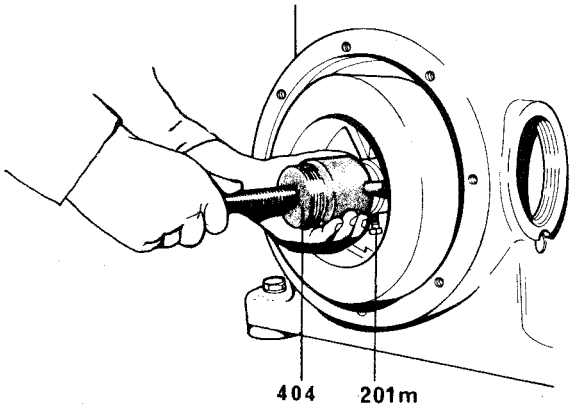


Fig. 8/15

3) Loosen hex head screw 201m which is found in the hub of the clutch drum 201h.

4) Use pulling device **404** to withdraw clutch drum from worm wheel shaft end, on motor side. Then remove clutch drum, by hand.

8.5.3. Removing the worm wheel shaft and the worm wheel

1) Remove the motor (see 8.5.1).
2) Take off the flange (fig. 8/13).
3) Loosen oil drain screw and let oil drain into oil pan (fig. 8/1).
4) Remove revolution indicator housing (fig. 8/1).

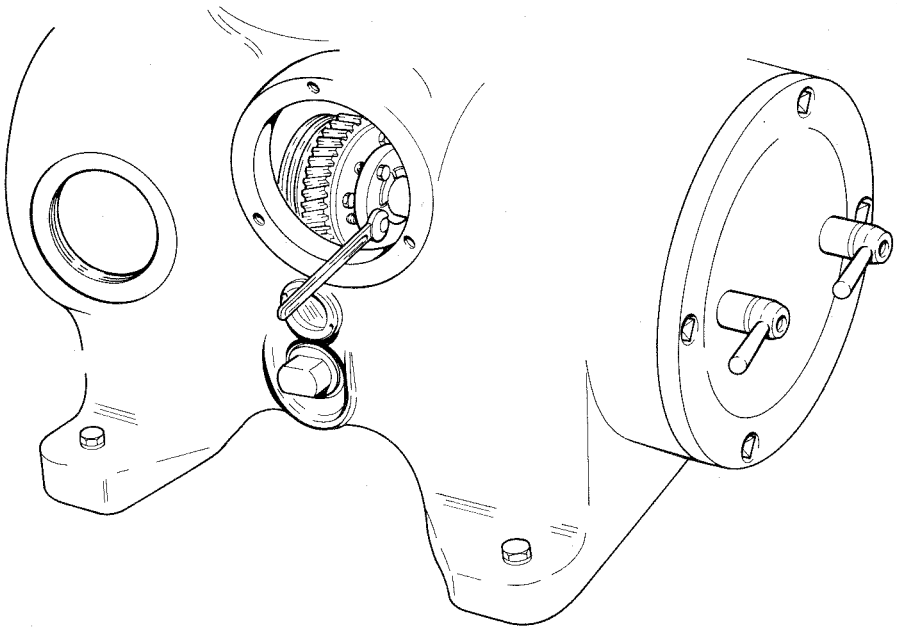


Fig. 8/16

5) Loosen hex head screws 208h in clamp plates of worm wheel. While doing so, block clutch drum to prevent worm wheel shaft from rotating.

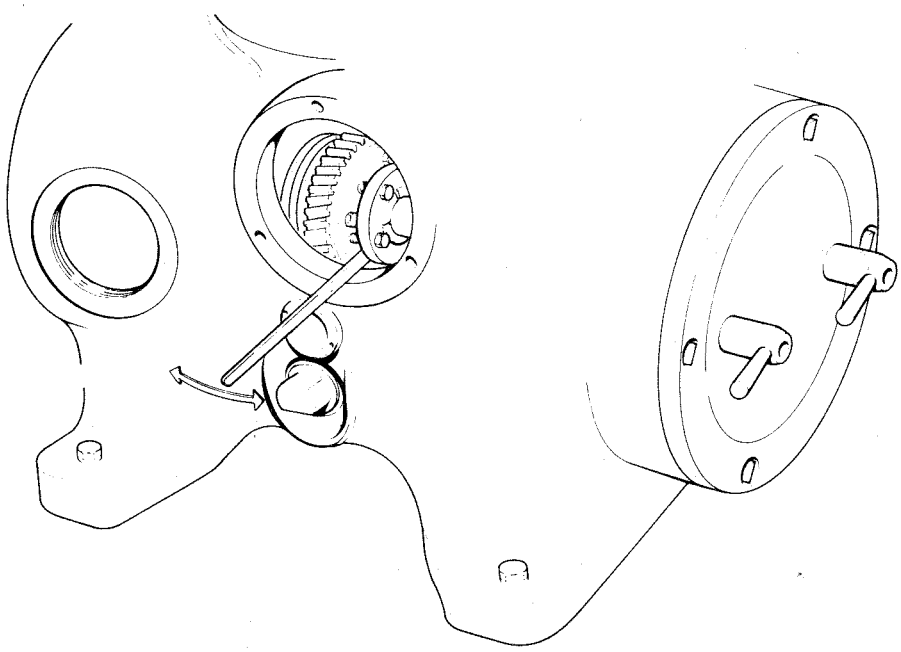


Fig. 8/17

6) Loosen clamp plates 208a and 208guntil it is possible to move the worm wheel on the worm wheel shaft.

7) Loosen hex head screw 201m in hub of clutch drum.

8) Use pulling device 404 to withdraw clutch drum 201h from worm wheel shaft end, on motor side. Then remove clutch drum by hand. See fig. 8/15.

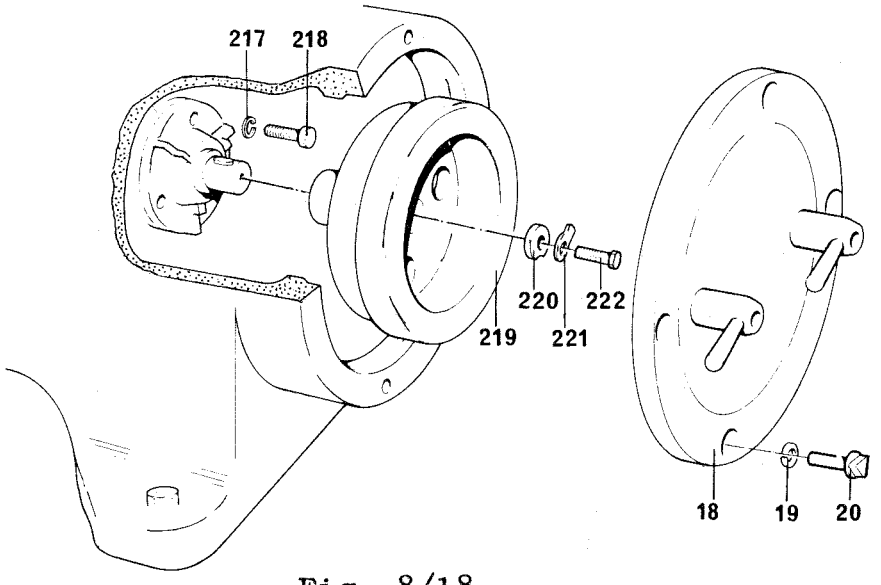


Fig. 8/18

9) Undo triangular screws 20 and remove cover 18.

10) Straighten safety washer 221. Then screw out hex head screw 222 and remove safety washer and centering disc 220.

11) Remove brake drum 219 by hand.

12) Use socket wrench to screw hex head screws 218 out of the bearing cover.

13) Remove keys from shaft end, on motor side (see fig. 8/19).

14) Place a hard wood block against worm wheel shaft end and hit it with a hammer to drive out shaft towards brake side.

15) When shaft has completely loosened from ball bearing, on motor side, remove shaft by hand. While doing so, hold worm wheel to prevent damage to gear teeth.

16) Take worm wheel assembly with clamp plates out of the gear chamber.

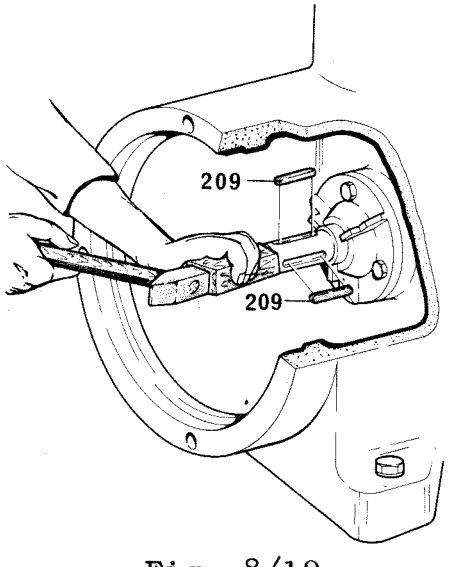


Fig. 8/19

8.6. Assembly of the Horizontal Gear Parts

For assembly proceed in reverse order of removal (see sect. 8.5). However, the following should be kept in mind:

1) The worm wheel with clamp plates 208a-h has been balanced in the factory as a complete assembly. To avoid unbalance, clamp plates 208a and 208g must, therefore, not be rotated on the wheelbody, and parts 208a-d and 208g must not be individually replaced.

2) When mounting the worm wheel assembly with clamp plates, push worm wheel towards brake side until it rests against shoulder of worm wheel shaft 210. This will assure correct positioning of the toothed rim with reference to the worm spindle.

3) The worm wheel must be firmly tightened to the worm wheel shaft, accomplished by tightening screws 208h in both clamp plates. Tighten the screws crosswise, by single turns, to make sure clamp plates are drawn together evenly.

4) IMPORTANT: When toothed rim 208c is worn and needs replacement, the complete worm wheel assembly with clamp plates 208a-h should be replaced and, at the same time, worm spindle 158c, since the latter part will no longer be in a perfect condition either and would thus cause premature wear to the new toothed rim.

5) After assembling new gear parts, install the bowl and adjust the bowl to correct height (see 8.3).

6) Prior to running in new gear parts, apply a thin film of molybdenum disulfide paste to the gearing. Then turn worm spindle clockwise, by hand, for about 5 minutes to cause the paste to penetrate into the teeth surfaces.

7) Fill gear chamber with oil as specified in sect. 2. Oil level must be slightly above middle of sight glass.

8) Check speed of spindle with a hand tachometer (see 3.5) and check direction of rotation of bowl (see 3.4).

9) To run in new gear parts (worm wheel, worm spindle), let separator run - without bowl - for about one hour.

10. TROUBLE SHOOTING

10.1. General

Troubles	Causes	Remedies
10.1.1. The bowl does not come up to rated speed or takes too long to do so (see 3.5.).	1) Brakes are on.	Release the brakes by turning the handles in clockwise direction.
	2) Bowl lock screws are in.	Slacken back lock screws.
	3) Motor is incorrectly connected.	See wiring diagram.
	4) Friction surfaces of clutch shoes are oily.	Wipe friction surfaces dry. Do NOT use benzine, nor trichlorethylene, nor any other solvent!
	5) Linings of clutch shoes are worn.	Replace clutch shoes (see 8.4.2. and 8.4.3).
	6) Insufficient number of clutch shoes.	Add one or two clutch shoes (see 8.4.1 and 8.4.3).
	7) Bowl is too high or too low and, therefore, rubs against centripetal pump.	Adjust to proper bowl height (see 8.3).
	8) Liquid or sludge has collected in the concentrate collector, resulting in slowing-down of the bowl.	Check frame drain; liquid must run out freely (see sect. 1). Clean concentrate collector underneath the bowl.
	9) Clamp plates are not tight; worm wheel slips on shaft.	Tighten long hex head screws on worm wheel evenly and firmly. Tighten crosswise, by single turns.
10.1.2. The bowl speed drops during operation.	1) Friction surfaces of clutch shoes are oily.	Wipe friction surfaces dry. Do NOT use benzine, nor trichlorethylene, nor any other solvent!
	2) Motor speed drops during operation.	Inspect motor and line voltage!

Troubles	Causes	Remedies
10.1.3. The bowl comes up to rated speed too quickly (in less than 4 minutes). Motor pulls too high a starting current.	Too many clutch shoes are used. Note that the driving effect of new clutch shoes will improve after several starts.	Reduce number of clutch shoes, to 4 or 3 or 2 shoes. Make sure they are equally distributed (see 8.4.1 and 8.4.3).
10.1.4. Uneven run of the separator.	1) The separated solids have deposited unevenly in the bowl.	De-sludge the bowl several times (see 6.2.2). If de-sludgings do not improve conditions, close the bowl and fill it with feed material or water in order to attenuate vibrations which occur during slowing-down of the bowl. Stop the separator and apply brake. If bowl leaks, leave feed open. Clean bowl thoroughly.
	2) Bowl is not properly assembled or, if plant has several separators, parts of different bowls may have been interchanged.	Assemble bowl properly (see 4.1).
	3) Tension of disc stack has slackened.	Make sure bowl lock ring is screwed on tightly (see 4.1 , no. 20). Check disc count. If necessary, add spare disc or compensating disc.
	4) Bowl is damaged and, therefore, out of balance.	Send bowl to factory or authorized factory repair shop. Do NOT attempt to make your own repairs. Never weld or solder. Bowl is made of heat-treated steels.
	5) Neck bearing springs are weak or broken.	Replace all six neck bearing springs.
	6) Pressure spring in bottom bearing is broken. Bowl is found to be about 2 mm too low in the frame.	Install new pressure spring (see 8.2.2). Adjust bowl to proper height (see sect. 8.3).

Troubles	Causes	Remedies
10.1.4. Uneven run of the separator (cont'd.)	7) Ball bearings are worn.	Replace damaged bearings. IMPORTANT! When replacing, use only the high precision ball bearings to be found in our Parts List!
	8) Gear parts are in bad condition as a result of 1. normal wear, 2. premature wear caused by: a) lack of oil, b) oil of too low a viscosity, } in general, recognizable by blue tempering colour of gear parts c) metal abrasives present in the lubricating oil due to the following possible causes: - viscosity of oil is too low, - oil has not been changed in time, - gear chamber has not been cleaned; d) replacement of one gear part only, instead of both parts, e) water breaking-in because operating-liquid pressure is too high or because operating-liquid valve was open for a longer period after shut-down of the separator.	Clean gear chamber thoroughly (see 7.4.). Replace damaged gear parts (see 8.2 no. 5 and 8.6 no. 4). Fill in fresh oil (see sect. 2). If necessary, change oil more often. Regarding water breaking-in, the following should be kept in mind: The operating-liquid pressure must range between 28 - 43 psi. Make sure that operating-liquid valve is always closed during shut-down of separator. If necessary, provide a second shut-off valve.

10.2. Bowl performance (refer to fig. 10/1)

Troubles	Causes	Remedies
10.2.1. The bowl fails to close.	1) Nozzle 7 in bowl bottom - between injection chamber and sealing chamber - is plugged or dirt has collected in the injection chamber.	Remove bowl bottom (see 4.4). Clean nozzle and injection chamber.
	2) Nozzle 4 in sliding piston, which discharges the water from the opening chamber, is plugged.	Remove sliding piston (see 4.4). Clean nozzle. Make sure not to enlarge diameter of nozzle bore (1.2 mm).
	3) Sludge has deposited at the periphery of the opening chamber. This prevents the piston from rising to its highest position.	Disassemble bowl (see 4.4). Clean opening chamber. Replace upper gasket 2 which protects lower gasket against dirt. If necessary, replace lower gasket as well. Check operating water for impurities.
	4) Gasket 2 in distributor or gasket 1 in sliding piston is damaged; or their edges have been frayed through the up- and down-movement of the piston.	Replace damaged gaskets. If, however, only the edges of the gaskets are frayed and the gaskets are not damaged otherwise, they can be reused after grinding them off with an emery wheel.
10.2.2. The bowl does not close properly.	1) Gaskets in distributor or in sliding piston do not fit properly at all points of the outer guide surfaces.	If necessary, stretch gaskets. Prior to inserting gaskets, apply a <u>thin</u> film of grease to grooves in distributor or in sliding piston (see 4.1, para. 6 and 8).
	2) Gasket 3 in bowl top is damaged.	Replace damaged gasket.
	3) Gasket 6 has not been inserted in hub of bowl bottom.	Insert gasket.

Troubles	Causes	Remedies
10.2.2. The bowl does not close properly (contd.).	4) Sealing edge of sliding piston is damaged.	Face sealing edge of sliding piston: by 0.3 mm max. when a rubber ring is fitted, by 2.5 mm max. when a plastic gasket is fitted. Be sure to face sealing edge as soon as the slightest traces of erosion are to be seen.
	5) Shut-off valve 9 for operating-liquid does not close properly.	Replace shut-off valve.
10.2.3. The bowl does not open at all or not completely.	1) Operating-water pressure is too low or fluctuates too much due to tapping water for other purposes.	Check water pressure. If necessary, install operating-water line separately to avoid fluctuations of pressure.
	2) Strainer 10 in operating-water line is dirty.	Clean strainer.
	3) Gasket 8 is displaced or swollen, thus hindering the operating-water supply.	Insert gasket properly or replace it.
	4) Operating-water line is partially blocked:either through dirt accumulation or through damage.	Clean operating-water line or replace it.
	5) Dry sludge or rubber scraps have become lodged between guide surfaces of distributor and sliding piston or between sliding piston and bowl bottom.	Clean bowl parts (see 7.1). Round off edges of gaskets. Replace damaged gaskets. Grease guide surfaces.
	6) Dirt has deposited in sealing chamber.	Disassemble bowl (see 4.4). Clean sealing chamber.
10.2.4. Partial desludgings are irregular.	Operating-water pressure fluctuates.	Prevent fluctuations in pressure of more than 3 psi, for instance, by installing a separate line or by providing a small pressure vessel (about 50 to 100 litres) with a pressure-controlled pump ahead of the separator. The operating-water pressure should be 28 to 43 psi.

L I S T O F P A R T S

IMPORTANT!

When ordering parts, please state the following:

1) Model 2) Serial-No.	of the Separator: Both designations are shown on the name-plate of the separator. The Serial-No. also appears on the rim of the sludge collector.
3) Description 4) Part-No.	of the part to be replaced: For details, see List of Parts. The Part-No. is also shown on all major parts.
5) Bowl Serial-No.	(only required when ordering bowl parts): The Bowl Serial-No. appears, in large figures, on bowl lock ring and on bowl bottom.

Part-Nos. ending with letter "L" (e.g. 3158-1021-L) designate parts which are available in different designs for the separator concerned. To ensure correct delivery of these parts, Model and Serial-No. of the Separator MUST be stated.

Frame Parts

No. in Fig.	Part - No.	Qty.		Part Description
-	3117-3495-000	1		Revolution indicator assembly (1a-h)
1a	3117-3497-010	1		Revolution indicator disc
1b	0026-1049-030	2		Cylindrical pin
1c	3117-3488-010	1		Shaft
1d	0007-2502-750	1		Gasket 12/3 ø
1f	3117-3493-000	1		Housing
1g	0019-1741-800	1		Oil fill screw
1h	3117-3487-010	1		Worm wheel
2	0019-6935-400	3		Hex head screw M 10x25 DIN 933
3	0004-5358-700	1		Gasket 165/202x1
4	0019-0840-640	1		Oil drain screw
5	0004-5037-710	1		Gasket 38/50x1,5
6	0001-0006-640	1		Sight glass
7	0004-5034-760	1		Gasket 35/44 x 1,5
10	0019-6839-300	2		Hex head screw M 6x10 DIN 933
11	3182-1085-000	1		Ventilation grid
-	3036-1028-L	1		Flange assembly (12a-g)
12a	3036-1028-L	1		Flange
12b	0019-7726-090	4		Stud M 16x40 DIN 939
12c	0026-1330-190	4		Lock washer A 16 DIN 127
12d	0013-0282-400	4		Hexagon nut M 16 DIN 934
12f	0026-1328-190	4		Lock washer A 12 DIN 127
12g	0019-6167-150	4		Allen screw M 12x40 DIN 912
13	3163-1001-020	1		Lower section of frame
-	3036-1020-050	1		Foundation frame assembly (17a-g)
17a	3036-1003-020	1		Foundation frame
17b	0019-7739-090	4		Stud M 16x110 DIN 939
17c	0021-3015-750	4		Rubber cushion
17d	0026-0150-300	4		Ring
17f	0006-4331-010	12		Cup spring
17g	0013-0282-150	8		Hexagon nut M 16 DIN 934
18	3163-1066-010	1		Cover
19	0026-1328-190	4		Lock washer A 12 DIN 127
20	0019-8621-100	4		Triangular screw AM 12x40 DIN 22424
21	0019-5050-060	2		Threaded pin M 8x10 DIN 553
-	1073-1043-020	2		Brake assembly (22a-f)
22a	1073-1031-020	2		Brake bolt, complete
-	0021-4100-880	2	*	Brake lining
-	0026-1262-550	2	*	Countersunk rivet
22b	0006-4337-160	2		Cylindrical pressure spring
22c	0021-3544-640	2		Brake housing
22d	0004-1872-720	2		Gasket 18/25x2
22f	0021-3515-690	2		Handle
23	0019-6968-300	2		Hex head screw M 12x25 DIN 933
24	3036-1045-000	1		Frame drain
25	0004-5457-740	1		Gasket 52/80x122x1

* This part is included in brake bolt, complete, but it is also available as separate item.

Frame Parts

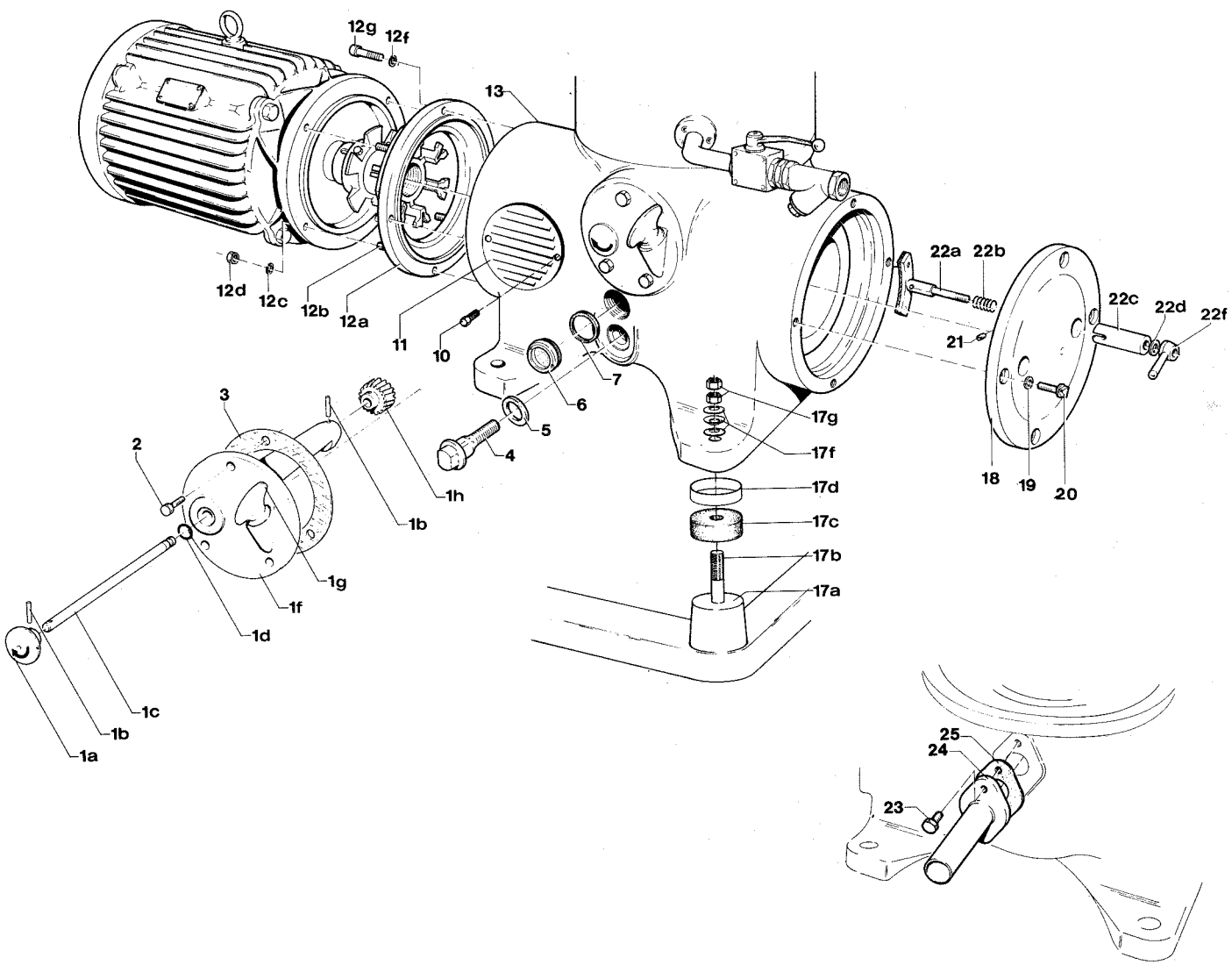


Fig. 13

Sludge Collector and Hood

No. in Fig.	Part - No.	Qty.	Part Description
31	0019-7038-400	4	Hex head screw M 16x45 DIN 933
32	0019-0895-160	2	Lock screw
33	0019-0783-400	2	Threaded bush
34	3163-1018-040	1	Sludge collector
35	0004-2364-758	1	Packing cord 8x8x2200
36	0007-2697-840	1	Gasket 485/505x9,8
-	3159-1150-010	6	Clamp assembly (37a-c)
37a	3159-1153-010	6	⌈Clamp
37b	0013-0282-400	6	|Hexagon nut M 16 DIN 934
37c	0019-0165-400	6	⌊Hex head screw M 16x65
-	3163-1297-000	1	Operating-water feed assembly (38-43)
38	0007-2152-750	1	⌈Gasket 12/18x3
39	0019-2265-300	3	|Cylindrical screw AM 8x20 DIN 84
40	3163-2184-000	1	|Bend
41	0018-1710-640	1	|Shut-off valve
42	0018-0971-050	1	|Pipe nipple 1/2" DIN 2982
43	0018-0871-260	1	⌊Reducing nipple 1" - 1/2" N4 DIN 2950
44	0018-2525-630	1	Strainer
45	0013-0279-400	6	Hexagon nut M 10 DIN 934
46	3145-2208-000	1	Pipe
47	0004-5193-750	1	Gasket 159/210x2
48	0019-6513-300	6	Hex head screw M 10x45 DIN 931
49	0019-6901-400	1	Hex head screw M 8x15 DIN 933
50	3033-1145-010	1	Holder
51	0019-6968-300	2	Hex head screw M 12x25 DIN 933
52	0007-2150-750	1	Gasket 94/110x8
53	3145-1061-030	1	Inspection cover
54	0013-2852-640	2	Cap nut M10
-	3163-7759-L	1	Hood assembly (55a-f)
55a	3163-7765-L	1	⌈Hood
55b	0007-2150-750	1	|Gasket 94/110x8
55c	3145-1061-030	1	|Inspection cover
55d	0013-2646-300	2	|Cap nut M10
55f	0013-2626-400	4	⌊Cap nut M12

Sludge Collector and Hood

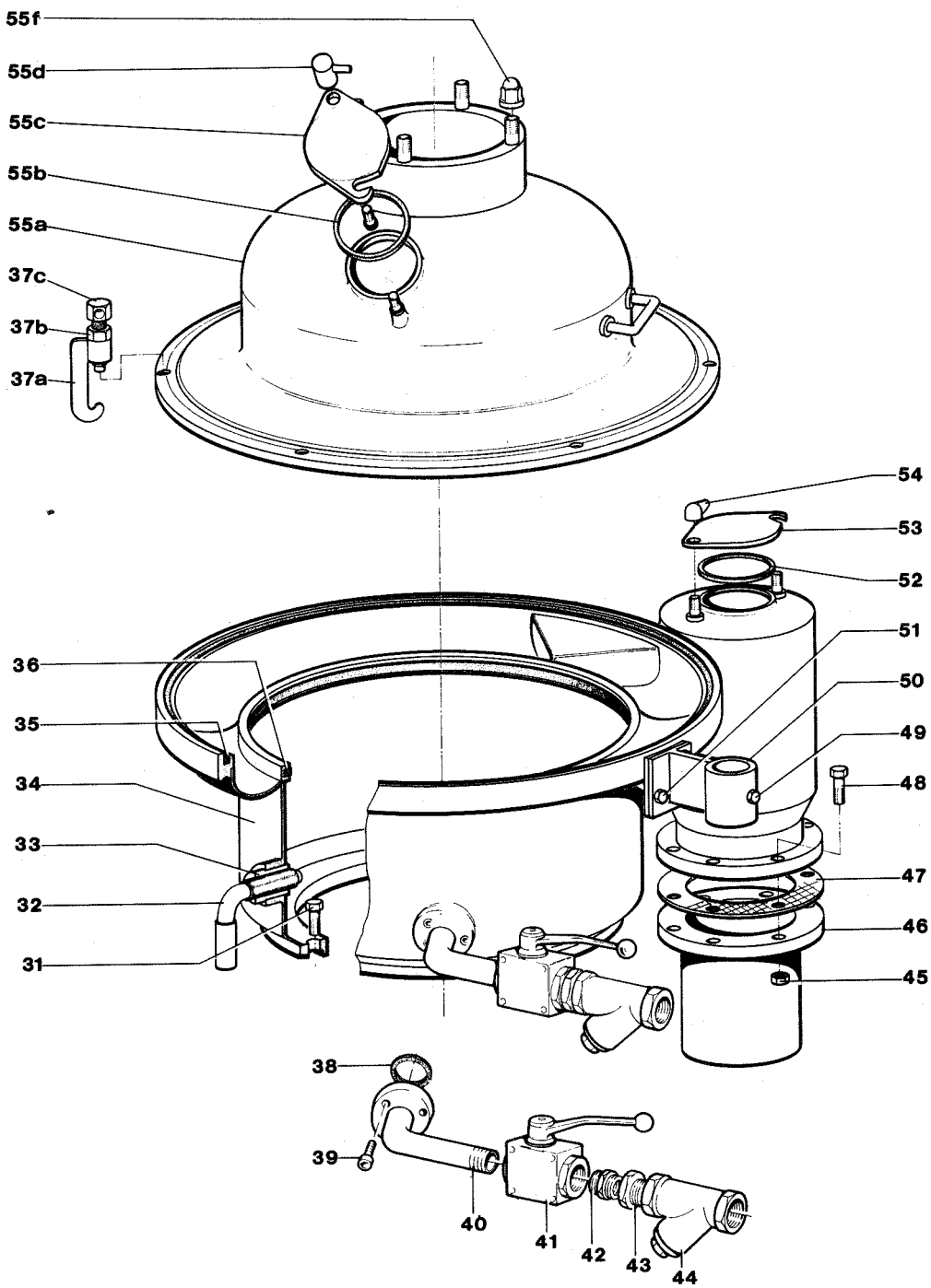


Fig. 14

Feed and Discharge Connections and Centripetal Pump

No. in Fig.	Part - No.	Qty.	Part Description
-	3163-2213-L	1	Centripetal pump assembly (60a-b)
60a	3036-2242-L	1	⌜Upper part of centripetal pump
60b	3163-2243-L	1	⌞Lower part of centripetal pump
-	3163-2296-050	1	Feed and discharge connections, complete (61a-73t)
-	3163-2171-030	1	⌜Discharge line assembly (61a-68b)
-	3163-2295-030	1	⌜Discharge assembly (61a-62f)
61a	0007-2245-750	1	⌜Gasket 40/50x5
61b	3163-2285-060	1	Discharge
61c	0007-2288-750	1	Gasket 35/47x6
61d	0026-5522-400	1	Washer
61f	0026-1462-500	1	Snap ring
61g	0007-2299-750	2	Gasket 25,5/33,5x4
61h	0001-0090-820	1	Cylindrical sight glass
61k	0013-3060-540	1	Hexagon nut
61m	0007-2210-750	1	Gasket G 40 DIN 11851
61n	3036-2288-010	1	Valve connection
61p	0007-2102-750	1	Gasket 10,5/18x5
61r	0018-1526-400	1	Hose cock 1/2"
61s	0007-2285-750	2	Gasket 22/32x5
61t	0026-5508-300	1	Washer
61u	0026-1445-500	1	Snap ring
-	1072-2273-020	1	Stuffing box assembly (62a-f)
62a	1072-2279-020	1	⌜Round-slide valve
62b	0019-1590-610	1	Threaded bolt M 12x53
62c	1072-2284-000	1	Stuffing box
62d	0026-1062-400	1	Cylindrical pin 4h8x30
62f	0021-3096-300	1	⌞Handle
63	0007-2243-750	1	Gasket 27/35x4
64	3163-2196-010	1	Bend
65	0007-2209-750	2	Gasket G 32 DIN 11851
66	3163-2131-000	1	Connecting piece
67	0019-6937-400	1	Hex head screw M 10x30 DIN 933
-	0018-2803-800	1	Adjusting sleeve assembly (68a-b)
68a	0018-2803-810	1	⌜Adjusting sleeve
68b	0019-2265-300	1	⌞Cylindrical screw AM 8x20 DIN 84
69	0018-4007-300	1	Support
70	8918-2000-230	1	Pressure gauge
71	3036-2190-000	1	Handle connection piece
72	0007-2209-750	1	Gasket G 32 DIN 11851
-	3163-2215-010	1	Feed line assembly (73a-t)
73a	3163-2196-020	1	⌜Bend
73b	0007-2299-750	2	Gasket 25,5/33,5x4
73c	0001-0090-820	1	Cylindrical sight glass
73d	3163-2196-000	1	Bend
73f	0007-2209-750	5	Gasket G 32 DIN 11851
73g	0019-6937-400	1	Hex head screw M 10x30 DIN 933
73h	0018-2105-400	1	Cock connection
73k	0018-3981-400	2	Ball cock
73m	3163-2196-030	1	Bend
73n	0007-2208-750	1	Gasket G 25 DIN 11851
73p	0013-2842-300	1	Grooved coupling nut F 25 DIN 11851
-	0018-2803-800	1	Adjusting sleeve assembly (73s-t)
73s	0018-2803-810	1	⌜Adjusting sleeve
73t	0019-2265-300	1	⌞Cylindrical screw AM 8x20 DIN 84
74	3163-2166-000	1	Connecting piece
75	0007-2210-750	2	Gasket
76	see page 15/3	1	Flowmeter
77	0013-2844-300	1	Grooved coupling nut F 40 DIN 11851
78	0018-1820-400	1	Reducing hose connection 40/25
79	0018-1819-400	1	Reducing hose connection 32/25
80	0018-1812-400	1	Hose connection 25

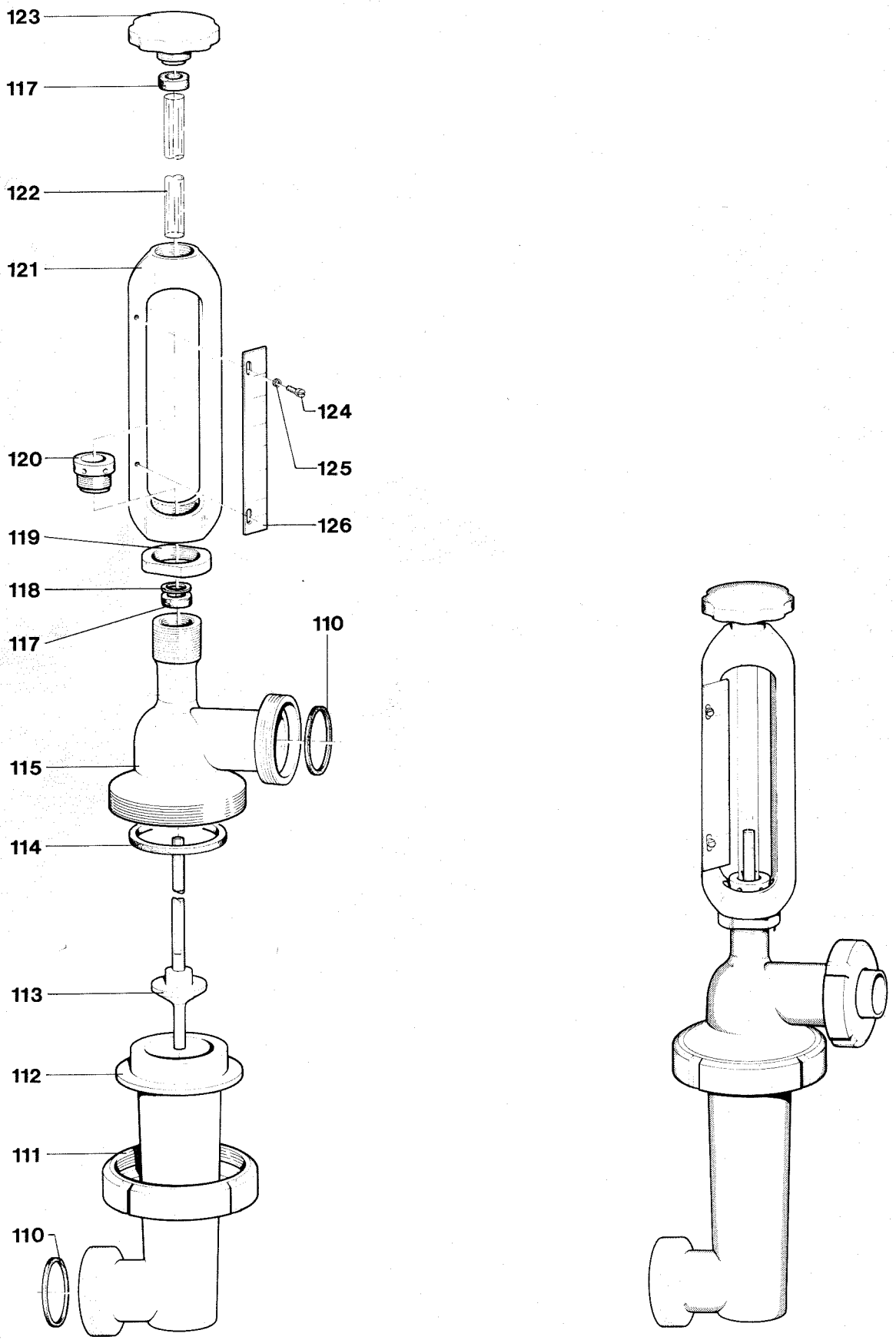

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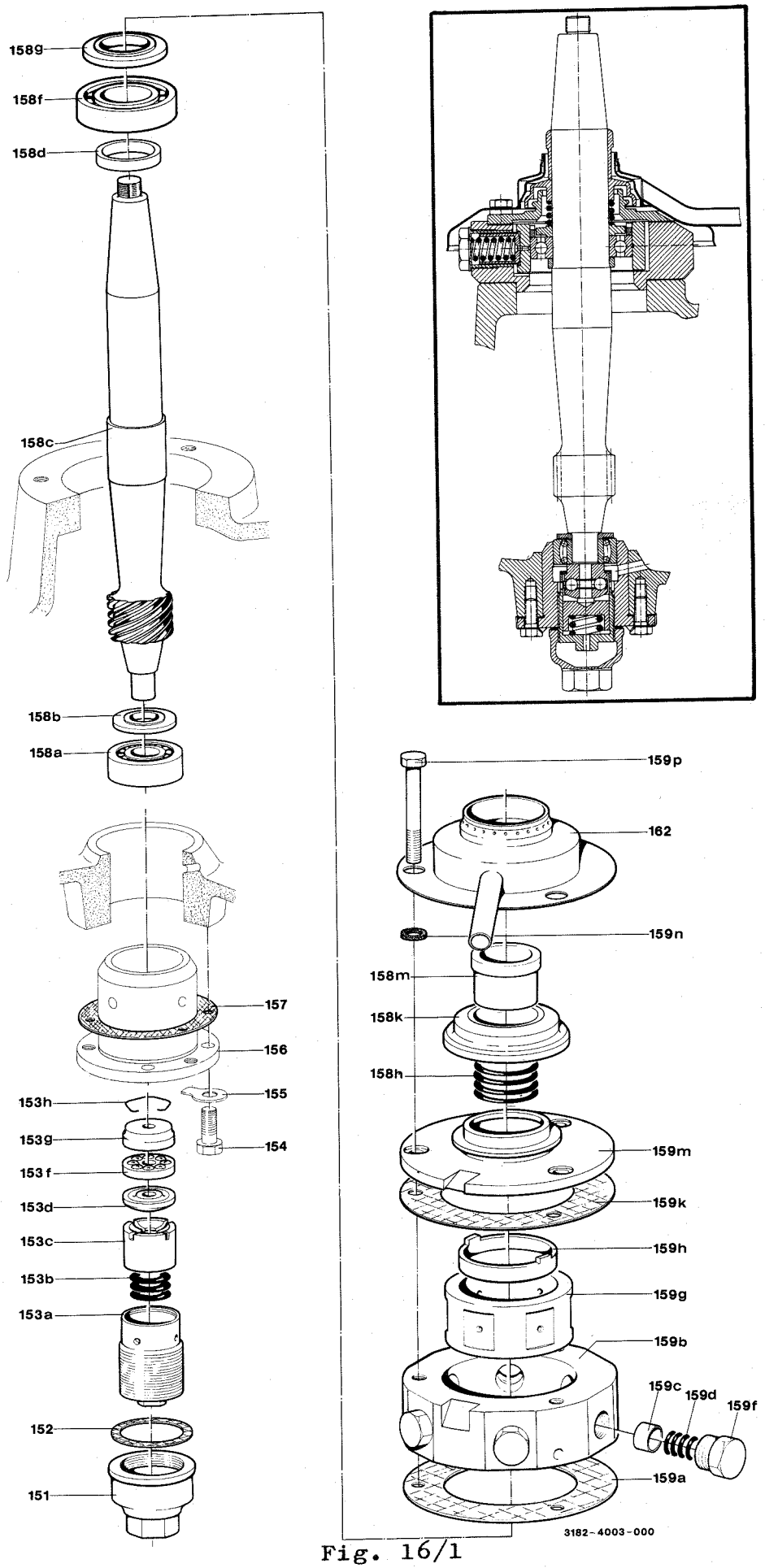
Fig. 15/2

Vertical Gear Parts

No. in Fig.	Part - No.	Qty.		Part Description
151	0010-4203-200	1		Bottom bearing cap
152	0004-5048-740	1		Gasket 55/70x2
153	0010-4200-010	1		Bottom bearing assembly (153a-h)
153a	0010-4202-000	1		Bottom bearing threaded piece
153b	0006-4272-160	1		Cylindrical pressure spring
153c	0010-4201-200	1		Bottom bearing pressure piece
-	0010-4210-000	1		Set of bottom bearing running parts (153d-g)
153d	-	1	*	Bottom bearing pressure disc
153f	-	1	*	Ball cage
153g	-	1	*	Bottom bearing running disc
153h	0026-1482-170	1		Snap ring
154	0019-6970-150	4		Hex head screw M 12x30 DIN 933
155	0026-5892-600	4		Safety washer 13
156	3036-1112-010	1		Bottom bearing housing
157	0004-5252-770	1		Gasket 85/135 x 0,3
158	see page 18/1	1	***	Worm spindle assembly (158a-m)
158a	0011-2305-030	1		Pendulum ball bearing 2305 M/P62 DIN 630
158b	0008-2508-010	1		Ball bearing protection ring
158c	see page 18/1	1	***	Worm spindle
158d	0008-5505-000	1		Ring
158f	0011-6211-110	1		Grooved ball bearing 6211/P6 DIN 625
158g	0008-5508-050	1		Ball bearing protection ring
158h	0006-4255-160	1		Spindle spring
158k	0008-5501-670	1		Spindle cap
158m	0008-5504-650	1		Sleeve
-	0008-5500-020	1		Neck bearing bridge assembly with covering (159a-p)
159a	0004-5017-770	1		Gasket 129/182 x 0,5
-	0008-5510-030	1		Neck bearing bridge assembly (159b-g)
159b	0008-5506-000	1		Neck bearing bridge
159c	0026-5724-110	6		Spring piston
159d	0006-4240-060	1		Set of neck bearing springs
159f	0019-1426-150	6		Threaded plug
159g	0008-5507-090	1		Pressure ring
159h	0008-5509-050	1		Distance ring
159k	0004-2540-770	1		Gasket 133/182 x 0,5
159m	0008-5502-000	1		Neck bearing protection cap
159n	0004-5923-800	3		Gasket M12
159p	0019-6545-150	3		Hex head screw M 12x95 DIN 931
162	3163-1219-020	1		Operating-water feed assembly

* This part is not available as separate item, but only assembled with parts 153d-g.

*** The design of this part and hence, the part number depends on the motor speed as well as on the bowl speed given on the name-plate of the separator. For correct part number refer to list on page 18/1.
In case of reduced bowl speed be sure to refer to sect. 3.5!
IMPORTANT: When replacing this part, worm wheel 208 should also be replaced.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159h
159g
159b
159c
159d
159f
159a
3182-4003-000

Fig. 16/1

Vertical Gear Parts (gas-tight)

No. in Fig.	Part - No.	Qty.		Part Description
151	0010-4203-200	1		Bottom bearing cap
152	0004-5048-740	1		Gasket 55/70 x 2
153	0010-4200-010	1		Bottom bearing assembly (153a-h)
153a	0010-4202-000	1		⌈Bottom bearing threaded piece
153b	0006-4272-160	1		| Cylindrical pressure spring
153c	0010-4201-200	1		| Bottom bearing pressure piece
-	0010-4210-000	1		| Set of bottom bearing running parts (153d-g)
153d	-	1	*	| ⌈Bottom bearing pressure disc
153f	-	1	*	| | Ball cage
153g	-	1	*	| ⌊Bottom bearing running disc
153h	0026-1482-170	1		⌊Snap ring
154	0019-6970-150	4		Hex head screw M 12x30 DIN 933
155	0026-5892-600	4		Safety washer 13
156	3036-1112-010	1		Bottom bearing housing
157	0004-5252-770	1		Gasket 85/135 x 0,3
158	see page 18/1	1	***	Worm spindle assembly (158a-p)
158a	0011-2305-030	1		⌈Pendulum ball bearing 2305 M/P62 DIN 630
158b	0008-2508-010	1		| Ball bearing protection ring
158c	see page 18/1	1	***	| Worm spindle
158d	0008-5505-000	1		| Ring
158f	0011-6211-110	1		| Grooved ball bearing 6211/P6 DIN 625
158n	0008-5551-650	1		| Spindle cap
158p	0019-6307-150	1		⌊Threaded pin AM 6x8 DIN 913
-	0008-5520-020	1		Neck bearing bridge assembly with covering (161a-r)
161a	0004-5017-770	1		⌈Gasket 129/182 x 0,5
-	0008-5510-120	1		| Neck bearing bridge assembly (161b-g)
161b	0008-5506-000	1		| ⌈Neck bearing bridge
161c	0026-5724-110	6		| | Spring piston
161d	0006-4240-060	1		| | Set of neck bearing springs
161f	0019-1426-150	6		| | Threaded plug
161g	0008-5507-130	1		| ⌊Neck bearing pressure ring
161h	0004-5563-750	1		| Sealing ring A 65x90x10
161k	0004-5749-840	1		| Grooved ring 75/95 x 10
161m	0004-2540-770	1		| Gasket 133/182 x 0,3
161n	0008-5502-040	1		| Neck bearing protection cap
161p	0004-5923-800	3		| Gasket M 12
161r	0019-6544-400	3		⌊Hex head screw M 12x90 DIN 931
162	3163-1219-020	1		Operating-water feed assembly

* This part is not available as separate item, but only assembled with parts 153d-g.

*** The design of this part and,hence, the part-number depends on the motor speed as well as on the bowl speed given on the name-plate of the separator. For correct part-number refer to the list on page 18/1.
In case of reduced bowl speed be sure to refer to sect. 3.5!
IMPORTANT: When replacing this part, worm wheel 208 should also be replaced.

Vertical Gear Parts (gas-tight)

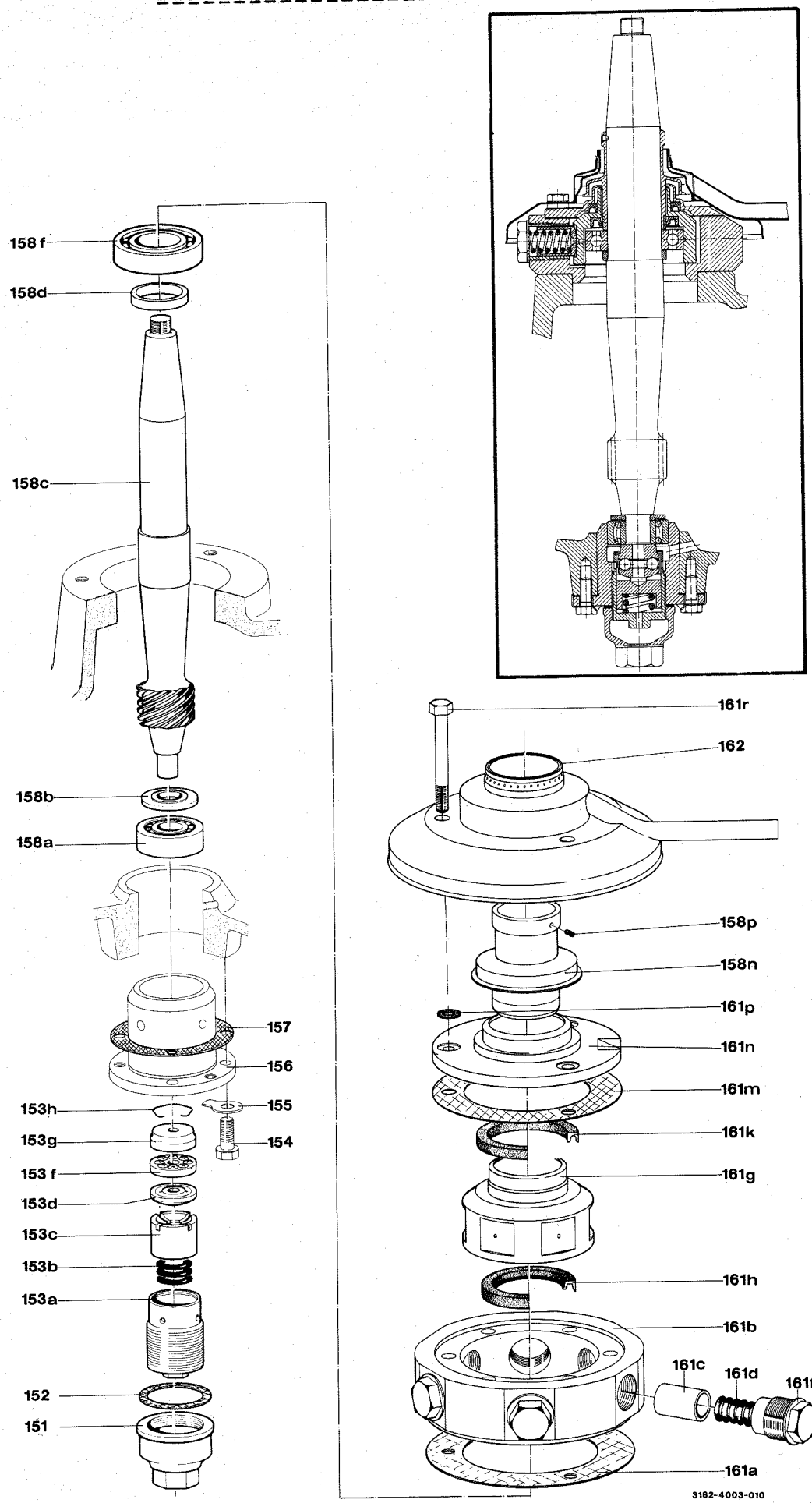


Fig. 16/2

Horizontal Gear Parts

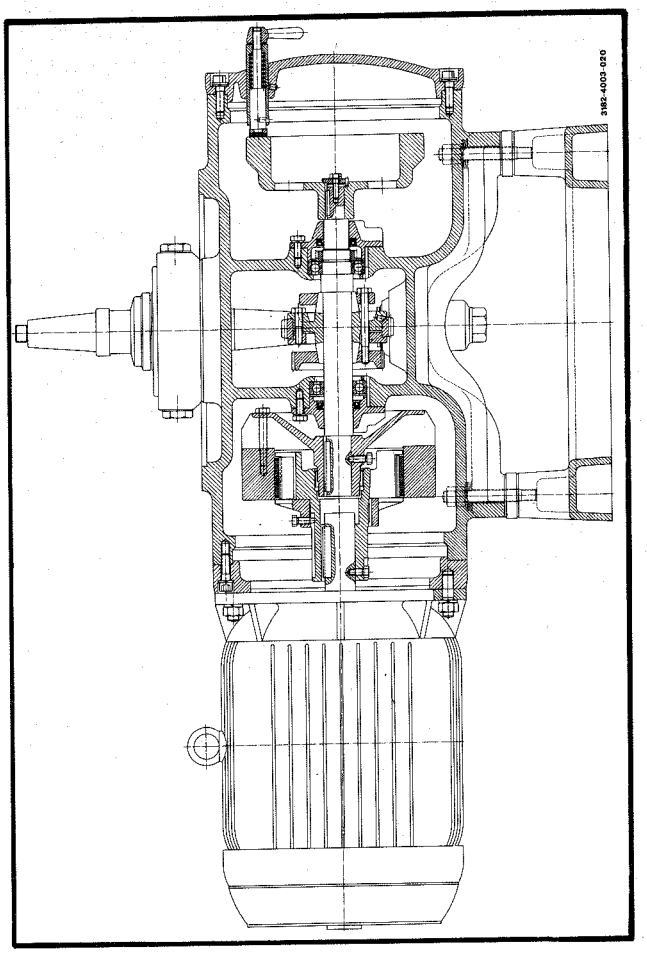
No. in Fig.	Part - No.	Qty.		Part Description
-	3037-3385-000	1		Centrifugal clutch assembly (201a-m)
201a	0019-5195-030	1		Hex head screw AM 10x25 DIN 561
201b	3037-3479-010	1		Clutch cover
201c	3313-3397-000		+)	Clutch shoe
201d	3037-3468-L	1	*	Clutch driver (depending on size of motor)
201f	0019-0167-030	1		Hex head screw M 10x15
-	3037-3370-000	1		Clutch drum assembly (201g-m)
201g	3037-3366-000	1		Ring
201h	3037-3365-000	1		Clutch drum
201k	0019-6519-150	4		Hex head screw M 10x75 DIN 931
201m	0019-5195-030	1		Hex head screw AM 10x25 DIN 561
202	0019-6935-150	3		Hex head screw M 10x25 DIN 933
203	0026-1337-170	3		Lock washer A 10 DIN 127
204	3163-3375-010	1		Bearing cover
205	0004-5548-760	1		Sealing ring C 40x60x10
206	0004-2500-770	1		Gasket 80/130x0,2
207	0011-6208-000	1		Grooved ball bearing 6208 DIN 625
208	see page 18/1	1	***	Worm wheel assembly with clamp plates (208a-h)
208a	not available individually	1	**	Clamp plate with toothing
208b		1	**	Pressure ring
208c		1	**	Toothed rim
208d		1	**	Wheel body
208f	0019-6513-150	4		Hex head screw M 10x45 DIN 931
208g	not available individually	1	**	Clamp plate
208h	0019-6524-150	4		Hex head screw M 10x100 DIN 931
209	0026-1765-160	2		Key A 10x8x70 DIN 6885
210	3037-3400-020	1		Worm wheel shaft
211	0026-1744-160	1		Key A 6x6x35 DIN 6885
212	0011-6208-000	1		Grooved ball bearing 6208 DIN 625
213	0013-3137-060	1		Nut M 40x1,5
214	0004-5546-760	1		Sealing ring C 35x56x10
215	0004-2500-770	1		Gasket 80/130 x 0,2
216	3163-3375-020	1		Bearing cover
217	0026-1337-170	3		Lock washer A 10 DIN 127
218	0019-6935-150	3		Hex head screw M 10x25 DIN 933
219	3163-3371-000	1		Brake drum
220	0026-1658-030	1		Centering disc
221	0026-5890-600	1		Safety washer 8,4 DIN 93
222	0019-6492-150	1		Hex head screw M 8x30 DIN 931

+) The number of clutch shoes to be used (2 or 3 or 4 or 6 shoes) depends on the motor size and on the motor speed.

* When ordering this part, please state also diameter of motor shaft end and width of key.

** This part is not available as separate item, but only assembled with parts 208a-h.

*** The design of this part and, hence, the part-number depends on the motor speed as well as on the bowl speed given on the name-plate of the separator. For correct part-number refer to the list on page 18/1.
In case of reduced bowl speed be sure to refer to sect. 3.5!
IMPORTANT: When replacing this part, the worm spindle 158c should be replaced at the same time.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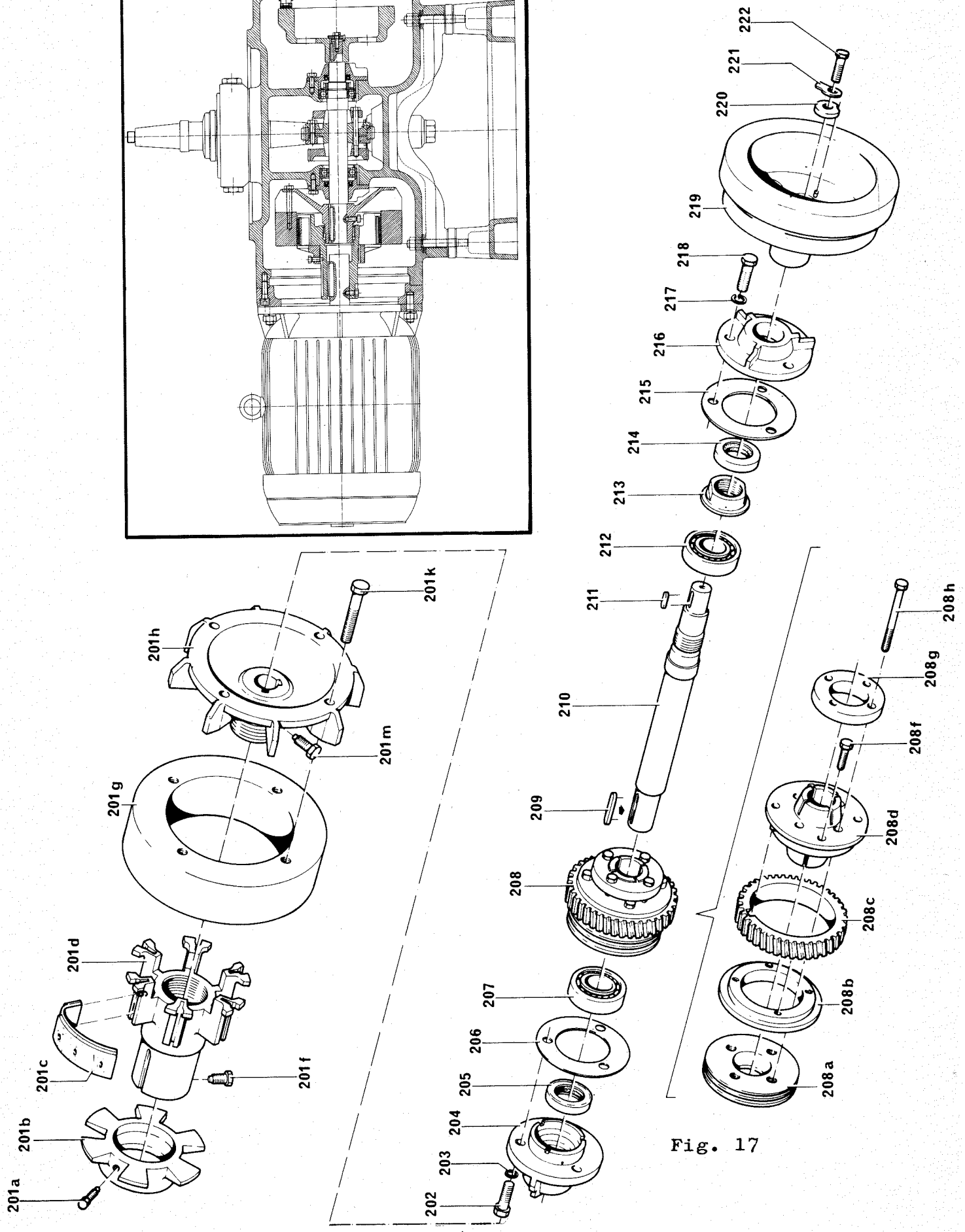
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202

Fig. 17

Available Gear Parts

No. in Fig.	Fig.	Part Description	Motor speed n = 1455 rpm (50 cycles)		Motor speed n = 1745 rpm (60 cycles)	
			Part - No.		Part - No.	
			Bowl speed		Bowl speed	
			n = 5900 rpm	n = 6500 rpm	n = 5900 rpm	n = 6500 rpm
-		*** Gear assembly	3163-3300-050	3163-3300-020	3163-3300-040	3163-3300-030
-		*** Worm spindle assy.	3163-3429-030	3163-3429-010	3163-3429-130	3163-3429-110
158c	16	*** Worm spindle	3163-3420-070	3107-3420-020	3163-3420-060	3163-3420-050
208	17	*** Worm wheel assy.	2163-3449-010	3107-3449-000	3163-3449-010	3163-3449-000
Gas-tight Design:						
-		*** Gear assembly	3163-3300-090	3163-3300-070	3163-3300-080	3163-3300-060
-		*** Worm spindle assy.	3163-3429-070	3163-3429-050	3163-3429-140	3163-3429-120
158c	16	*** Worm spindle	3163-3420-070	3107-3420-020	3163-3420-060	3163-3420-050
208	17	*** Worm wheel assy.	2163-3449-010	3107-3449-000	3163-3449-010	3163-3449-000

*** The design of this part and, hence, the part-number depends on the motor speed as well as on the bowl speed given on the name-plate of the separator. In case of reduced bowl speed, be sure to refer to sect. 3.5!
IMPORTANT: Worm spindle 158c and worm wheel 208 should always be replaced at the same time (see 8.2 no. 5 and 8.6 no.4).

Bowl

No. in Fig.	Part - No.	Qty.		Part Description
-	3182-6600-L	1		Bowl, complete (251-271c)
251	3107-6501-L	1		Sliding piston
252	3107-6492-020	1		Wear liner
253	0007-2438-750	1		Gasket 385/405x10
254	0007-2695-760	1		Gasket 407/415x4
255	0007-2902-760	1		Gasket 385/407x8 (made of rubber)
255	0007-1960-840	1		Gasket 390/410x11 (made of plastic)
256	0007-2636-750	1		Gasket 410/3
257	3163-6604-L	1	*	Bowl bottom
257a	0019-2233-400	1		Cylindrical screw AM 5x12 DIN 84
257b	3163-6609-000	1		Arresting piece
258	3182-6611-L	1	*	Bowl top
258a	0004-1921-720	2		Gasket 6,5/10x1
258b	0019-2493-400	2		Lens head screw AM 5x12 DIN 85
259	0007-2590-750	1		Gasket 70/8
260	3182-6620-L	1	*	Distributor
260a	0026-0990-400	1		Cylindrical pin
262	0007-2415-750	2		Gasket 366/380x7
263	3163-6508-020	1		Retaining ring
265	3182-6631-000	1	*	Bowl lock ring
266	0007-2013-750	1		Gasket 108/5,3
267	0013-2958-400	1		Spindle nut
268	3182-6645-000	1		Centripetal pump chamber cover
269	0007-2133-750	1		Gasket 140/152x4
270	1072-6631-070	1		Lock ring
-	3163-6660-L	1		Set of discs (271a-c)
271a	3163-6662-L	1		Bottom disc
271b	3163-6663-L	-	+)	Disc
271c	0823-6666-L	2		Compensating disc

* This part can only be replaced by a WESTFALIA service engineer or by a special repair shop authorized by WESTFALIA , because of special re-fitting to machine and possible re-balancing of bowl.

+) The number of discs depends on the intended use of the separator and on the thickness of the spacers.

Bowl
======

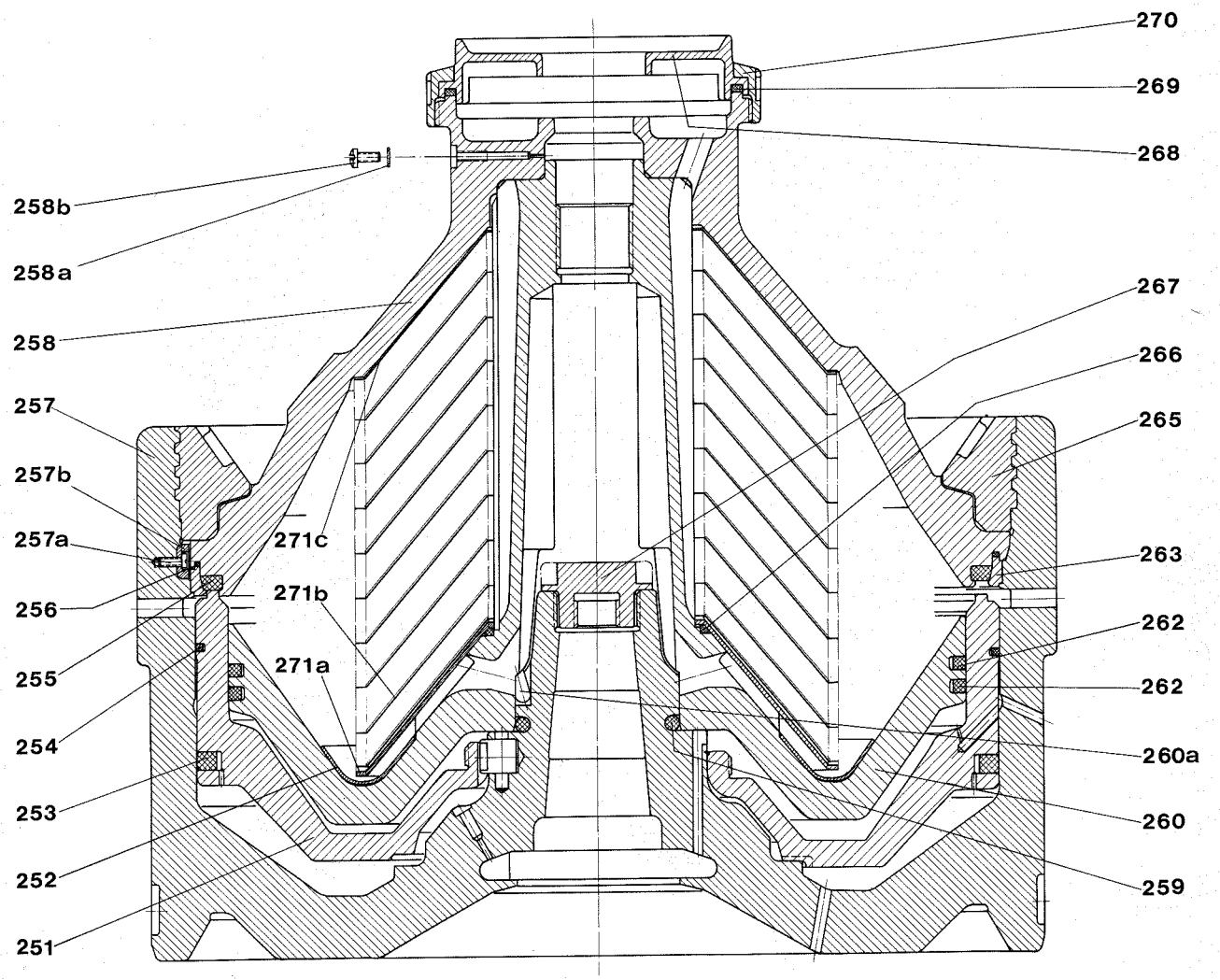
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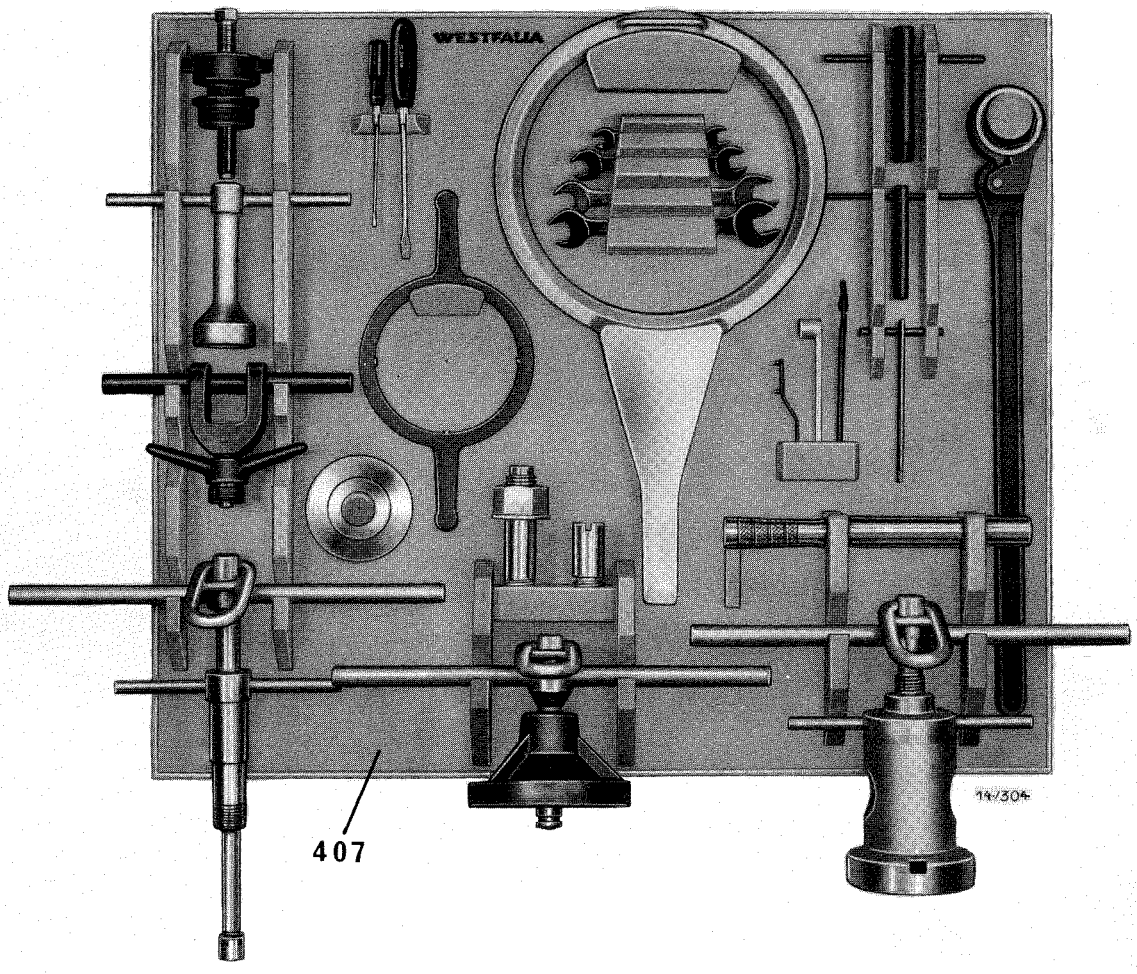
Fig. 19

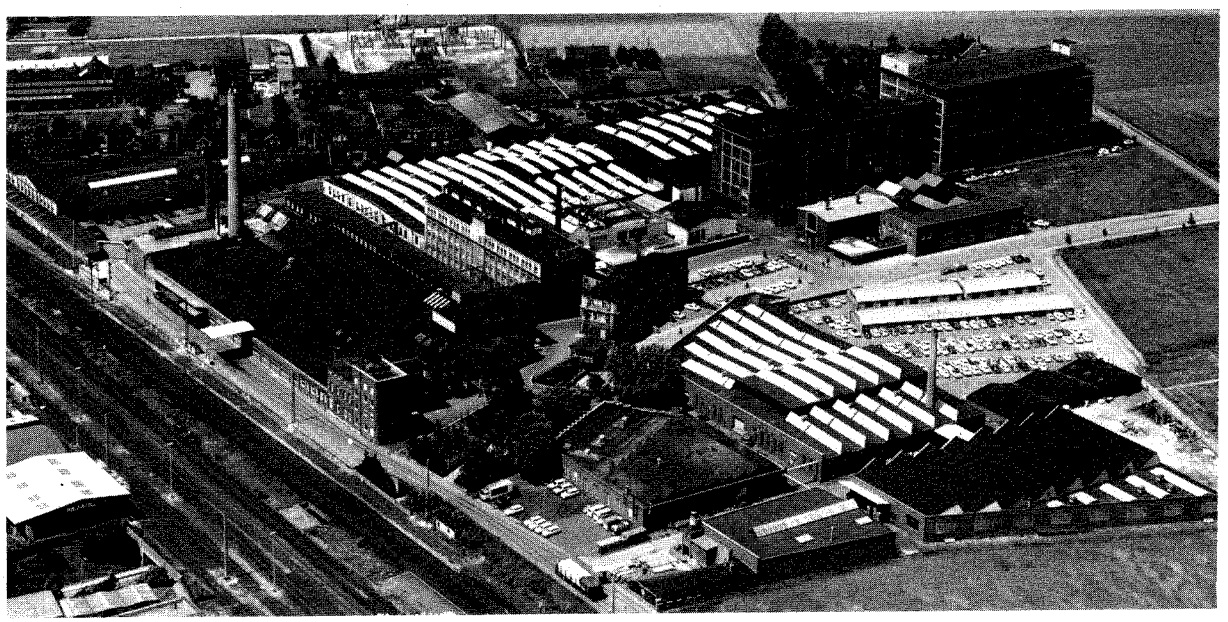
Tools and Accessories

All the parts mentioned in the packing list furnished with the separator should be found in the packing case.



List of Parts shown in Fig. 20

No. in Fig.	Part - No.	Qty.	Part Description
401	0003-4253-150	1	Hexagon socket wrench B 17x19 DIN 896
402	0003-4227-030	1	Hexagon socket wrench 13 DIN 659
403	0003-0126-000	1	Wrench (for centripetal pump)
404	3313-9910-000	1	Puller (for clutch)
405	0003-0450-030	1	Triangular socket wrench M 12
406	0003-4585-000	1	Wrench (for sight glass)
407	3182-9920-000	1	Tool board



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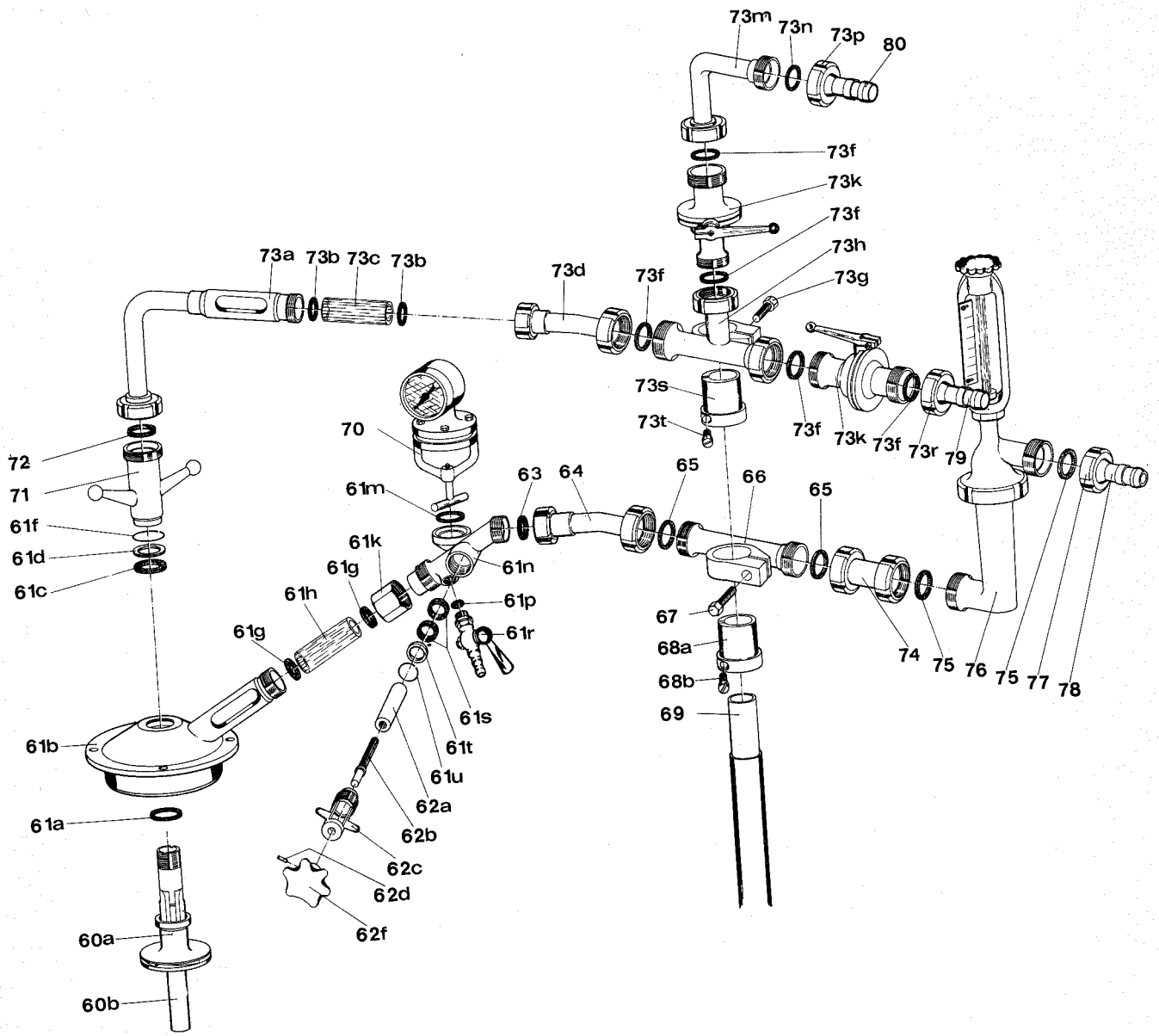
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Fig. 15/1

Troubles	Causes	Remedies
10.2.5. The bowl does not de-sludge completely. Part of the sludge remains in the bowl.	1) The bowl has been closed too soon. Solid particles which could not be ejected have gradually accumulated and hardened through the long time of centrifugation.	Clean bowl (see 7.1). Leave shut-off valve for operating-liquid open for about 10 seconds. If necessary, finish up by flush de-sludgings (see 6.2.2, para. 4).
	2) Nozzle 4 in sliding piston, which discharges the water from the opening chamber, has been enlarged (through cleaning or erosion). The sliding piston moves downwards too slowly. Part of the sludge remains in the bowl.	Reduce diameter of nozzle bore to 1.2 mm. This is done by drilling up the nozzle bore to 4 mm, then closing it by driving in a pin and reboring it to proper diameter; or reduce diameter of nozzle bore by beating.
10.2.6. Gasket 3 in bowl top shows premature wear.	The bowl has been closed prematurely. Solid particles have become lodged between top of sliding piston and gasket in bowl top.	When de-sludging, leave shut-off valve for operating-liquid open for at least 10 seconds.
10.2.7. The bowl does not close or open properly after a long-term shut-down of the separator.	The bowl has not been cleaned thoroughly prior to the long-term shut-down of the separator (see 7.5). Scale has formed between distributor and sliding piston or between sliding piston and bowl bottom.	Prior to removing distributor and sliding piston, dissolve the scale with citric acid or formic acid. Then disassemble bowl and clean it thoroughly (see 7.1).
10.2.8. Overflow of bowl.	1) Discharge pressure is too high.	Reduce discharge pressure.
	2) Impurities with high specific gravity (such as rust from tanks and pipe lines) have deposited in distributor neck. Feed to bowl is thus hindered, resulting in overflow.	Clean distributor neck.

Bowl and Operating-Water Feed Assembly
shown with regard to possible operating troubles
(refer to sect. 10.2)

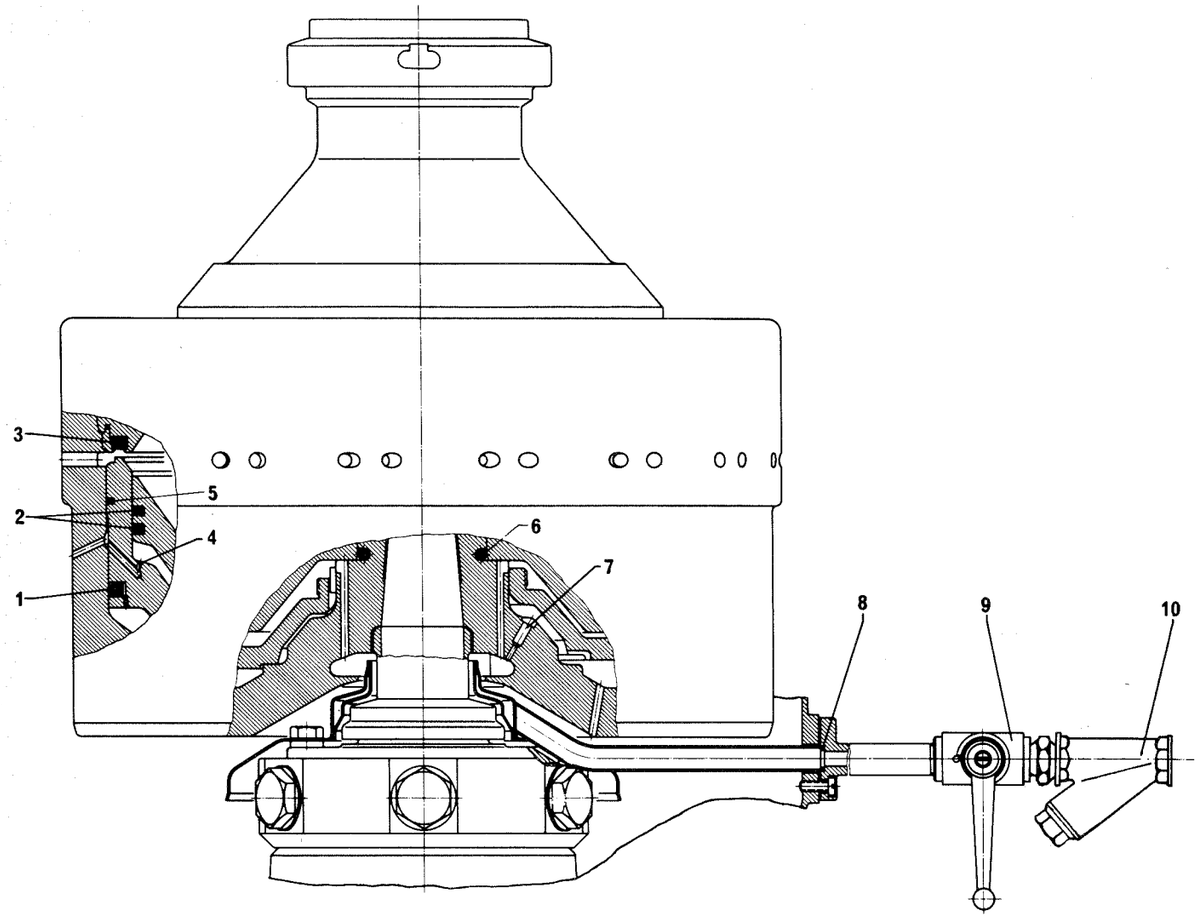


Fig. 10/1

Operating-water pressure should be at least 28 psi and not more than 43 psi.

If pressure exceeds 43 psi, install reducing valve R 3/4", 0018-1740-650, with pressure gauge No. 0001-0310-600.

For partial de-sludgings, be sure to maintain equal operating-water pressure. Fluctuations up to 3 psi are permissible.

I.D. of operating-water line:

1/2" when up to 10 ft long,
3/4" when longer than 10 ft.

Feed and Discharge Connections and Centripetal Pump

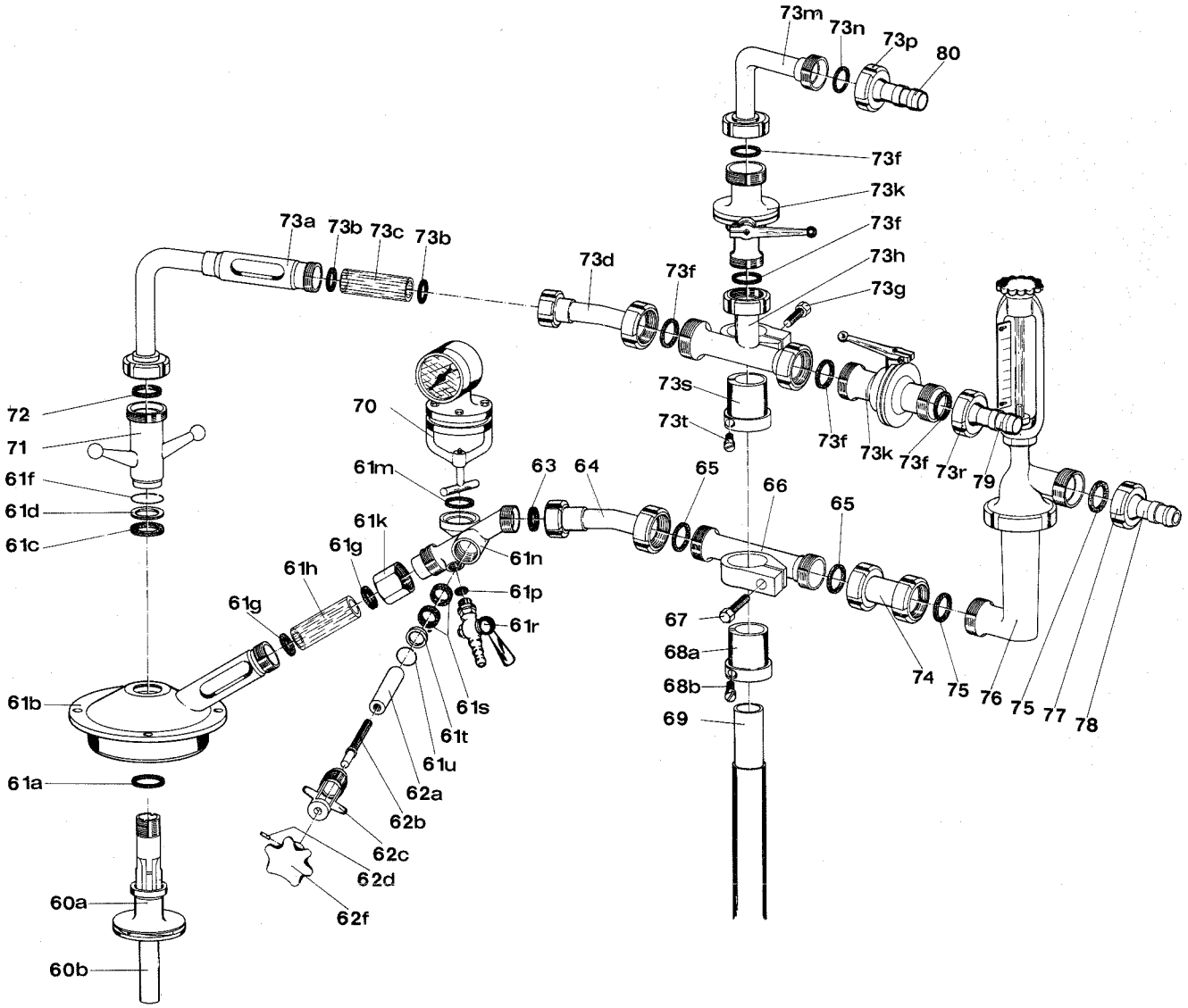


Fig. 15/1

Centripetal Pump, Feed and Discharge Connections SAMR 5036
(Dairy Design)

List of Parts shown in Fig.86a

Item #	Part Description	Number of Pieces	Part - #
-	Centripetal pump assembly (101a-b)	1	3163-2213-070
101a	Lower part of centripetal pump	1	3163-2245-070
101b	Upper part of centripetal pump	1	3163-2253-050
-	Discharge line assembly (102a-103c)	1	3182-2299-010
-	Discharge assembly (102a-u)	1	3182-2295-020
102a	Gasket 40/48Ø x 5	1	0007-2229-750
102b	Discharge with valve housing	1	3182-2385-010
102c	Gasket 35/47Ø x 6	1	0007-2288-750
102d	Washer 35/46,9Ø x 5	1	0026-5653-300
102f	Snap ring 46/2Ø	1	0026-1462-300
-	Valve cone assembly (102g-n)	1	1073-2272-030
102g	Cap nut	1	0013-2852-640
102h	Adjusting screw	1	1033-2276-000
102k	Distance sleeve	1	0026-5998-840
102m	Grooved ring 18/30Ø x 6	1	0004-5718-840
102n	Valve cone	1	1073-2278-000
102p	Gasket 54/64Ø x 5	1	0007-2211-750
102r	Grooved coupling nut	1	0013-2845-300
102s	Cone connection	1	0018-3955-300
102t	Washer 43/51Ø x 1	1	0026-5538-300
102u	Gasket 42/52Ø x 5	1	0007-2210-750
-	Pressure gauge with clamp (103a-c)	1	8918-2000-230
103a	Clamp screw	1	0019-0002-640
103b	Clamp	1	8918-2831-000
103c	Pressure gauge	1	8918-2050-230
-	Enclosed feed assembly (104a-d)	1	0809-2297-020
104a	Handle connection piece	1	0809-2190-020
104b	Gasket 42/52Ø x 5	1	0007-2210-750
104c	Grooved coupling nut	1	0013-2844-300
104d	Cone connection	1	0018-3949-300

Centripetal Pump, Feed and Discharge Connections
SAMR 5036 (Dairy Design)

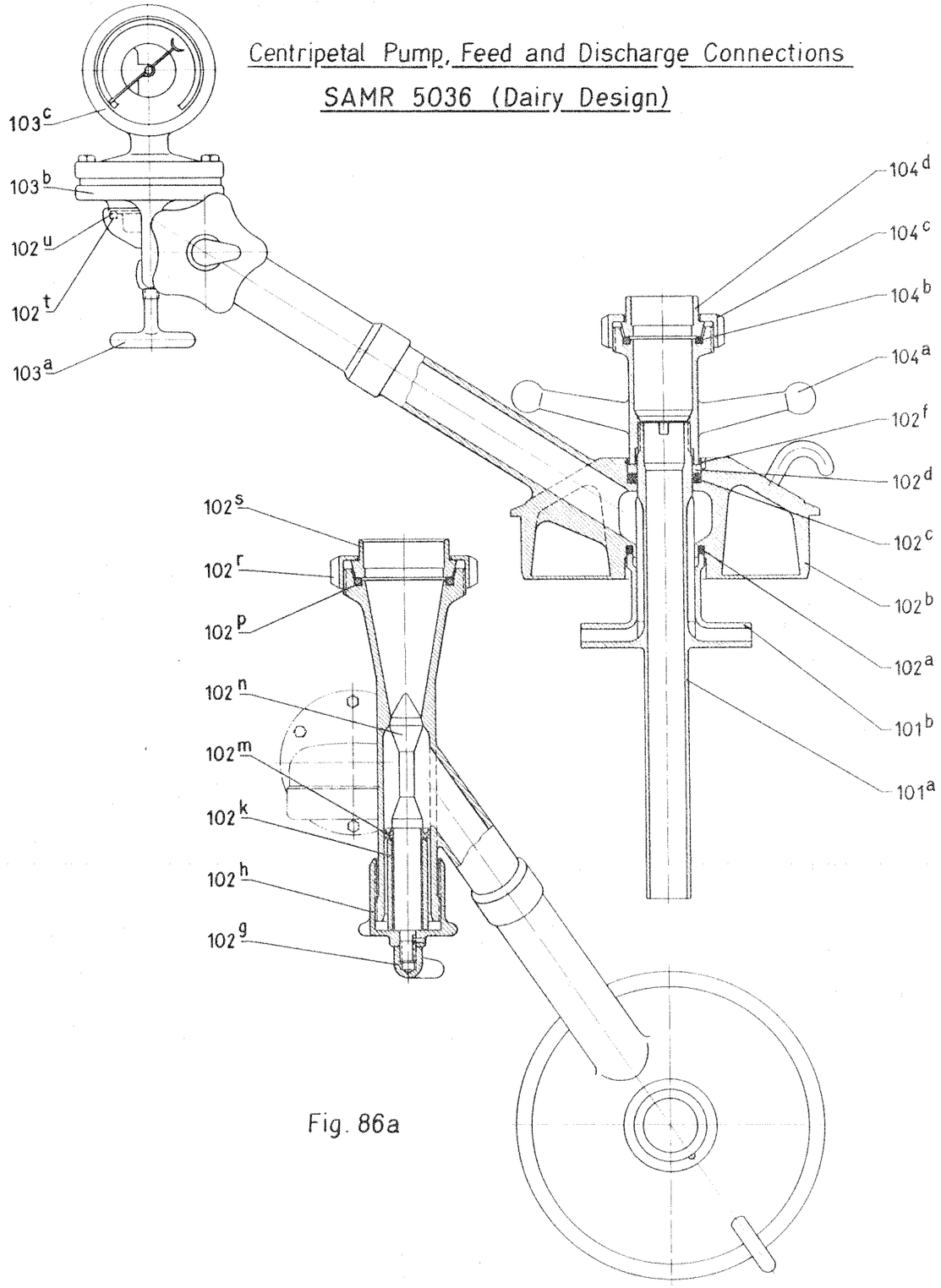


Fig. 86a

Feed and Discharge Connections and Centripetal Pump

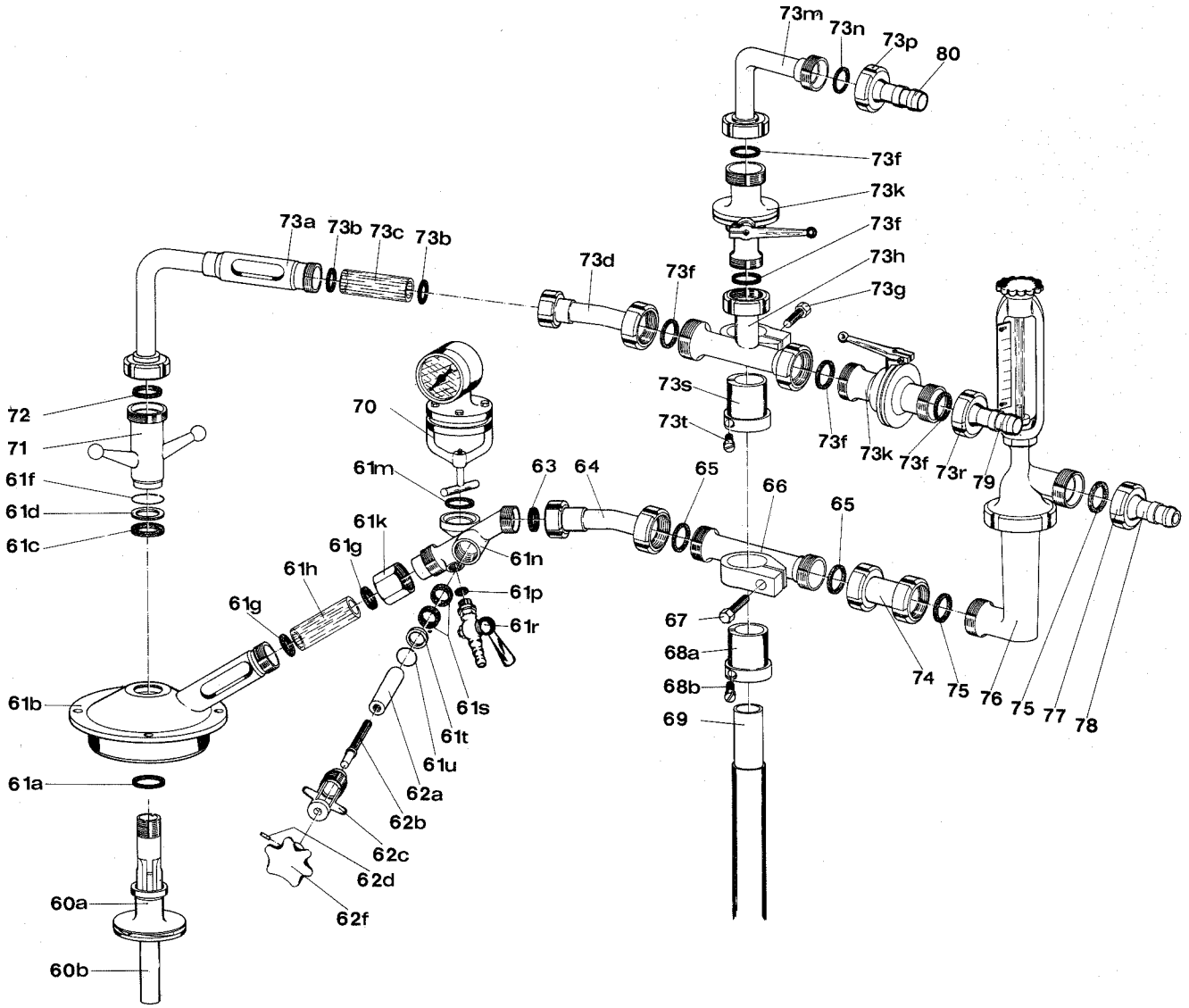
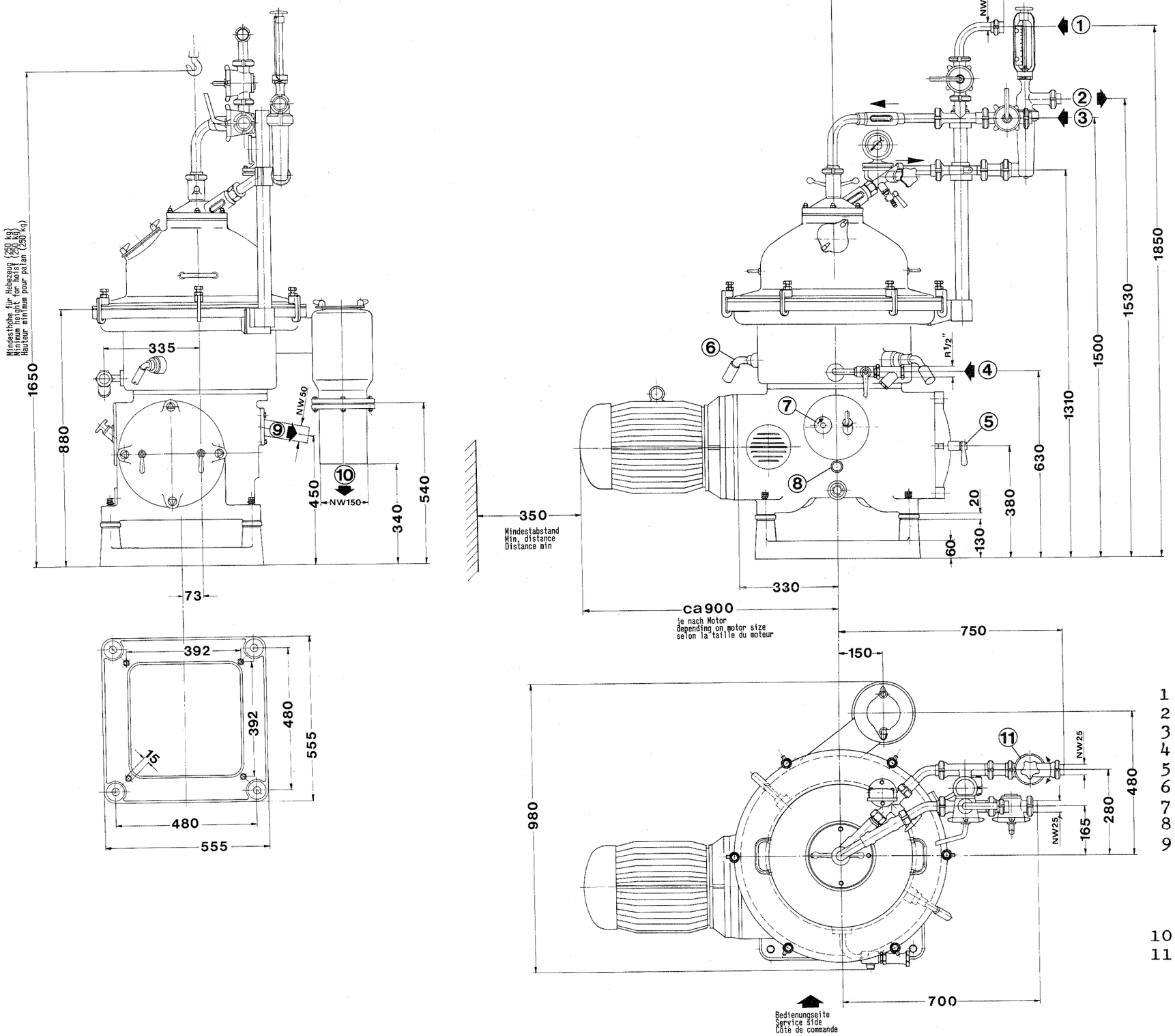
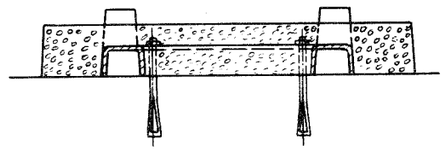


Fig. 15/1

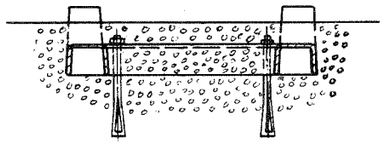
Installation Plan



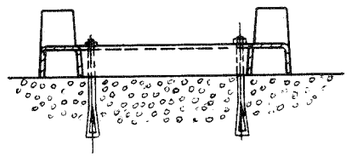
Fundamentbefestigungsausführungen
Different possibilities of installing the foundation frame
Possibilités de fixation du cadre de fondation



Fundamentrahmen in erhöhtem Betonsockel eingelassen.
Foundation frame embedded in a raised concrete base.
Cadre de fondation encastré dans un socle de béton élevé.



Fundamentrahmen im Boden eingelassen.
Foundation frame embedded in the floor.
Cadre de fondation encastré dans le sol.



Fundamentrahmen mit Steinschrauben auf dem Boden befestigt.
Foundation frame fastened to the floor with anchor bolts.
Cadre de fondation fixé au sol à l'aide de boulons de scellement.

1 Flush- or displacement liquid
2 Discharge
3 Feed
4 Operating-water feed
5 Brake
6 Lock screw
7 Revolution indicator
8 Oil sight glass
9 Operating-water discharge
(Do NOT connect to a piping system.
Operating water must be able to
discharge freely into sewer or
sludge tank, e.g. via a funnel.)
10 Solids discharge
11 Flowmeter.
The upper part of flowmeter is turnable.