Westfalia Separator AG

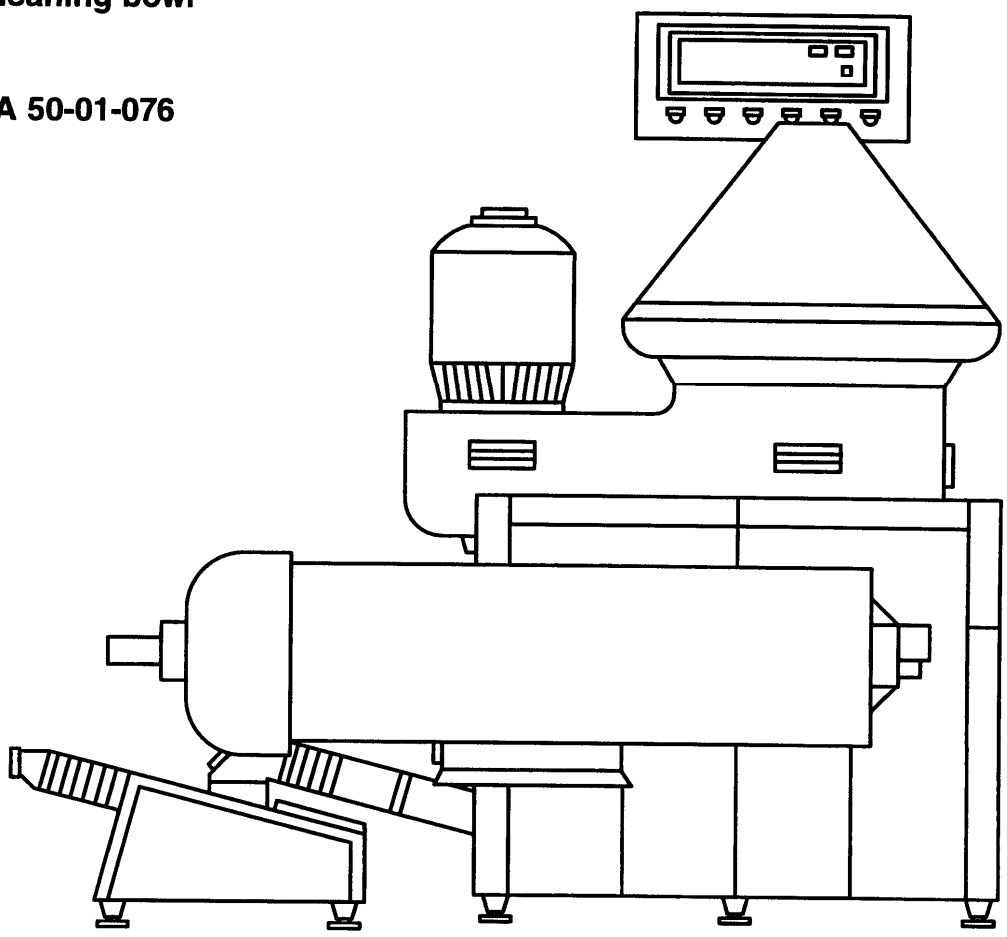
Instruction Manual and Parts List

No. 1055-9001-000

Edition 0997

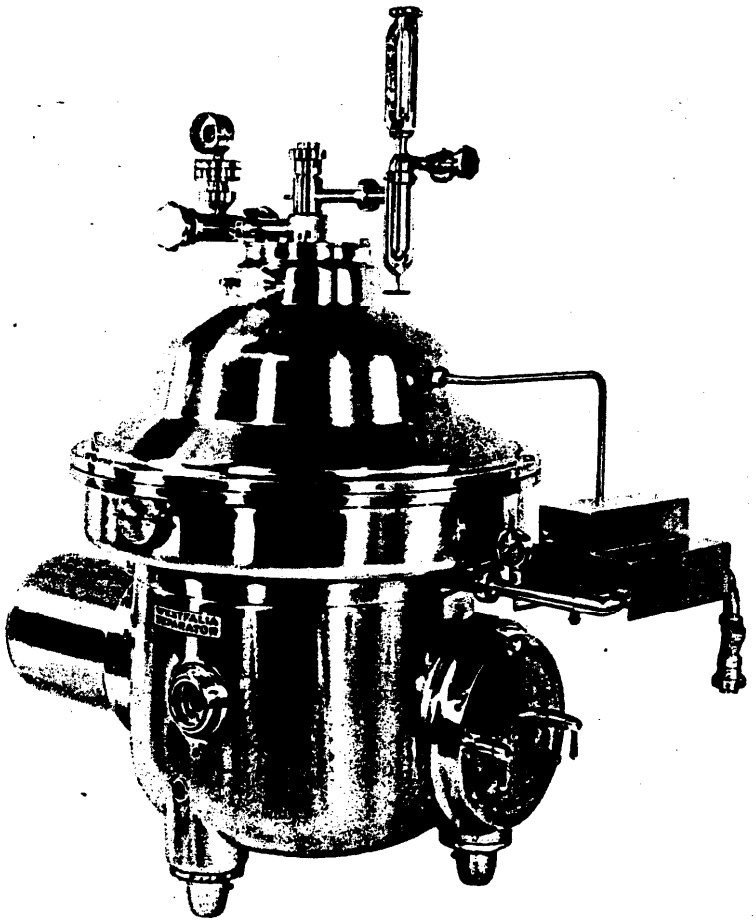
Milk Separator
with self-cleaning bowl

Model MSA 50-01-076



GEA

Process Technology Division



Westfalia Separator AG
D-59302 Oelde (F. R. Germany)

Type		No.	
built in		inner Ø of bowl mm	
Rpm of bowl			
Permissible density of product to be treated			
heavy liquid kg/dm^3		solids kg/dm^3	

For your safety

- **Strictly adhere to instructions marked with this symbol**

  This avoids damage to the machine and other units.

- **Take special care when carrying out operations marked with this symbol -**

  otherwise danger to life.

- **Observe accident prevention regulations**

  The local safety and accident prevention regulations apply unconditionally to the operation of the separator.

- **Instruction manual**

  Follow only the instructions given in this manual

- **Operate the separator only in accordance with agreed process and operating parameters**

- **Maintain the separator as specified -**

  in this manual

- **Carry out safety checks on the separator -**

  as described in chapter "Safety precautions" in this manual

- **Liability for the function of the machine passes to the owner**

  Liability for the function of the machine passes unconditionally to the owner or operator irrespective of existing warranty periods in so far as the machine is improperly maintained or serviced by persons other than Westfalia Separator service personnel or if the machine is not applied in accordance with the intended use.

  Westfalia Separator AG shall not be liable for damage which occurs as a result of non-observance of the above. Warranty and liability conditions in the Conditions of Sale and Delivery of Westfalia Separator AG are not extended by the above.

Note
Notes
Notizen
Anotaciones
Notizen
Notes
Note

CONTENTS

List of Parts

Correct usage

The separator is designed

- in accordance with the chemical and physical properties of the product specified by the customer and
- in accordance with the method of application of the separator agreed with Westfalia Separator AG.

In particular, products not conforming to the specifications the nameplate may not be used.

Any mode of operation deviating herefrom is not proper and correct.

Prior to any intended deviation from the agreed operating mode, it is therefore imperative to obtain the consent of Westfalia Separator AG.

Safety stickers on the machine

The following warnings must be attached to the machine as self-adhesive stickers. The stickers must always be in perfect condition.

- Clean dirty stickers.
- Replace damaged stickers.

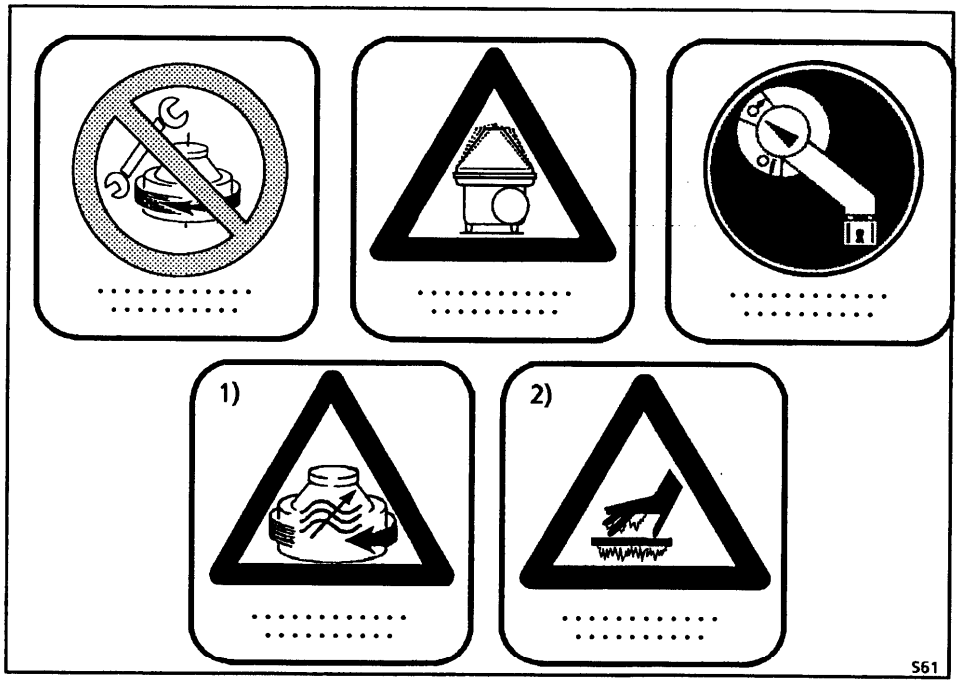


Fig. 1

1) Only in case of operation with frequency converter

2) Only in case of hot operation

Basic operating principles

Separators are used for the separation of liquid mixtures or for the separation of solids out of liquids or liquid mixtures.

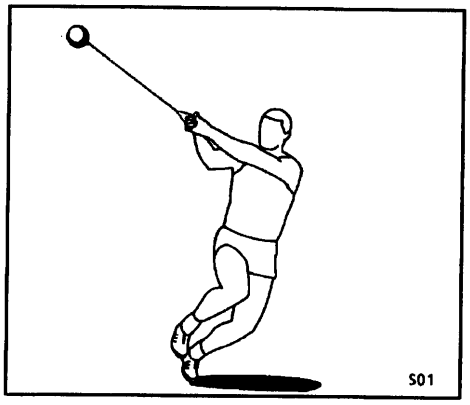


Fig. 2

High centrifugal forces are produced in the rotating bowl.

Under the influence of the centrifugal forces, separation of the liquid mixture and/or ejection of the solids particles takes place most rapidly.

The specifically heavier components are displaced to the bowl periphery, whereas the specifically lighter components are displaced towards the centre of the bowl.

The high centrifugal force is produced by very high bowl speeds. On the one hand, high bowl speeds signify high efficiency, while on the other hand, they signify high material stressing of the separator.

Bowl speed and product

The max. permissible bowl speed is an important parameter when rating the separator. It depends on the chemical and physical properties of the product such as

- temperature (if higher than 100 °C or lower than 0 °C),
- density of the fluid and solid components,
- aggressiveness of the product as regards corrosion and erosion (has influence on the selection of the bowl material).

The bowl speed is determined on the basis of these parameters allowing for an adequate safety margin.

Before using a product with properties different from those stated when placing the order, it is imperative to obtain the manufacturer's approval.

Operations on the separator

The separator works reliably, provided that it is operated and looked after in accordance with our operating Instructions.

Special attention must be given to:

- assembly
- starting
- shutting-down
- maintenance and servicing

Assembly

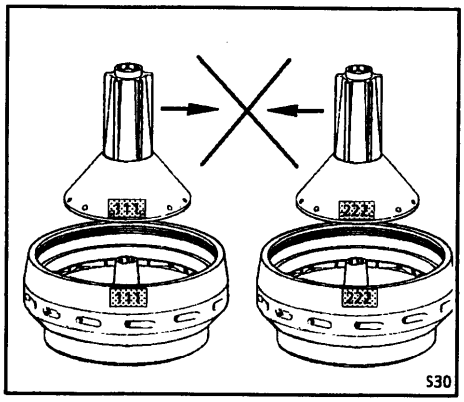


Fig. 3

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

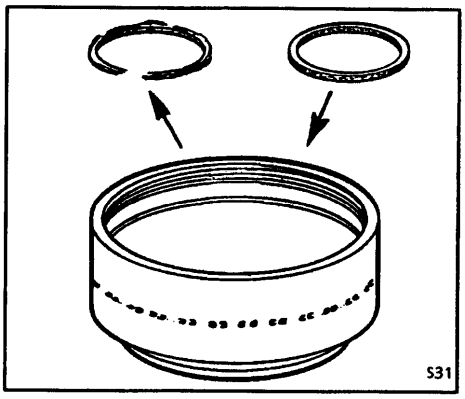


Fig. 4

- Damaged parts must be replaced immediately by new parts.

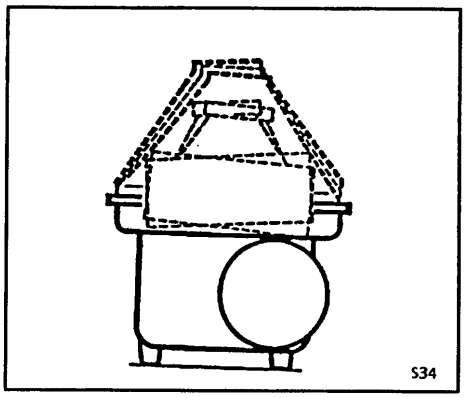


Fig. 5

- After installing spare bowl parts, the bowl must be re-balanced.

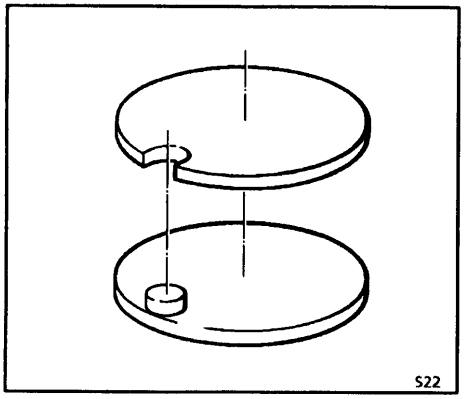


Fig. 6

- The bowl parts are arranged in fixed positions relative to one another.
- Locking devices and alignment marks must be in perfect condition.
  The bowl must not be operated if these locking devices and alignment marks are not in perfect condition.

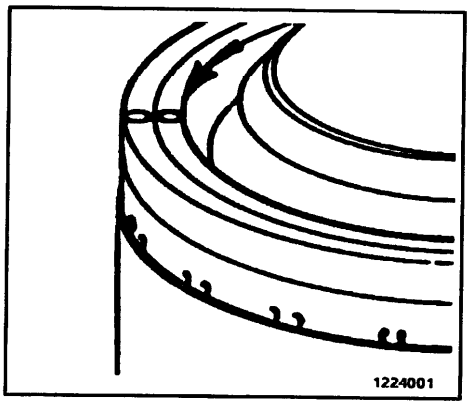


Fig. 7

- When assembling the bowl, be sure to strictly adhere to the instructions given in chapter "bowl", in order to avoid undue unbalance.
- Before starting the bowl, be dure to fit all parts.
- Tighten the bowl lock ring securely: the "O" marks on the bowl bottom or bowl top and on the lock ring must be in line with each other.

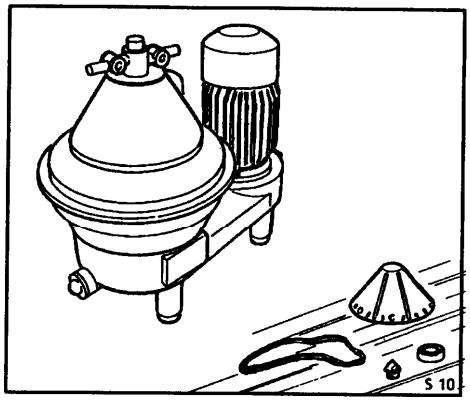


Fig. 8

- Check if the machine is completely assembled and properly installed.

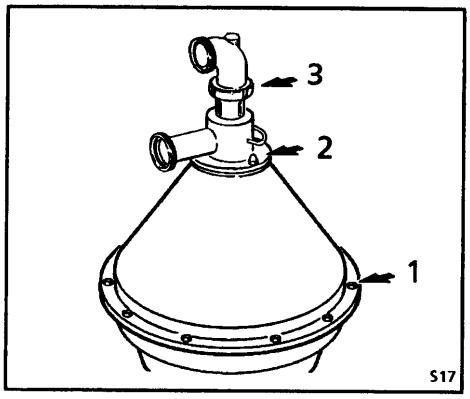


Fig. 9

- Carefully fasten hood 1, feed and discharge housing 2 and centripetal pump 3.

Electrical appliances

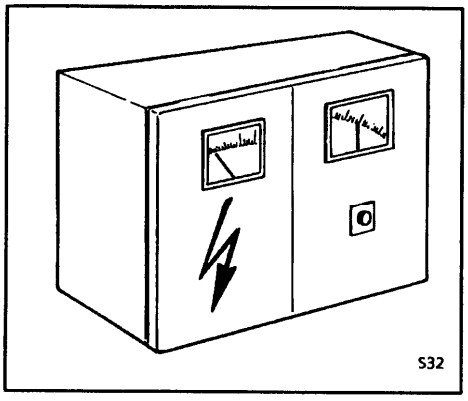


Fig. 10

- The governing accident prevention regulations apply for the electrical appliances and installations.
- The frequency and voltage of the power supply must correspond to the machine specifications.
- Carry out potential equalization.
- Observe legal regulations; e.g. in the EU:
  - Low-voltage guideline 73/23/EWG
  - Electro-magnetic compatibility 89/336/EWG.

Before start-up

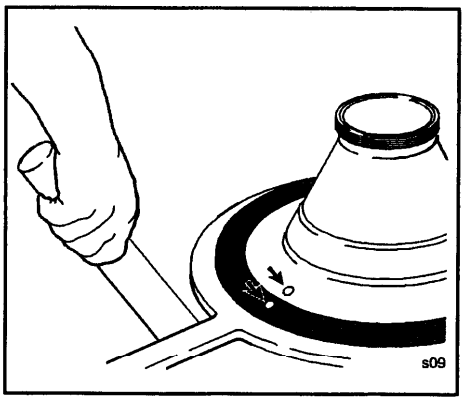


Fig. 11

- Check that the bowl lock ring has been firmly tightened.
- The "O" marks on bowl bottom or bowl top and on the lock ring must be aligned.

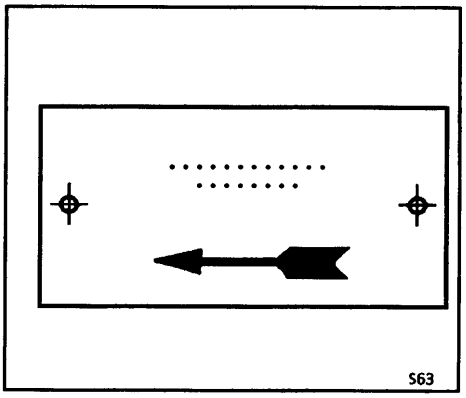


Fig. 12

- The bowl must rotate in clockwise direction (see arrow on frame or solids collector).

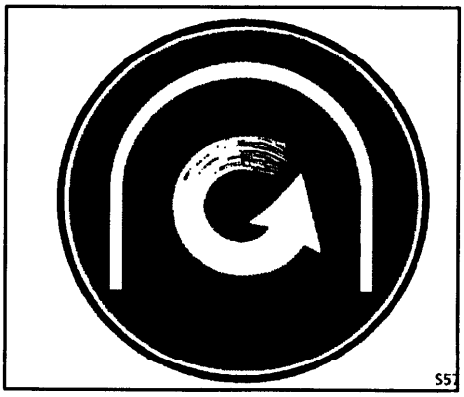


Fig. 13

- The separator may only be operated with protection devices conforming to EN 294.
  Equip solid and liquid discharges accordingly.

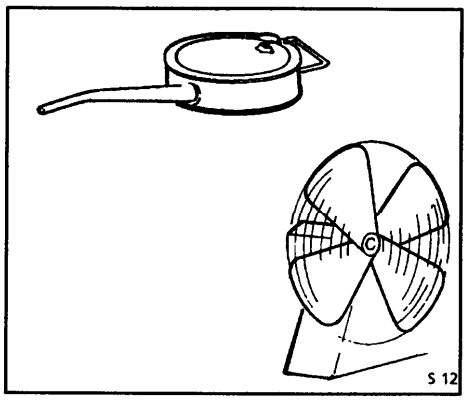


Fig. 14

- Check that the lubrication and cooling systems are serviceable.

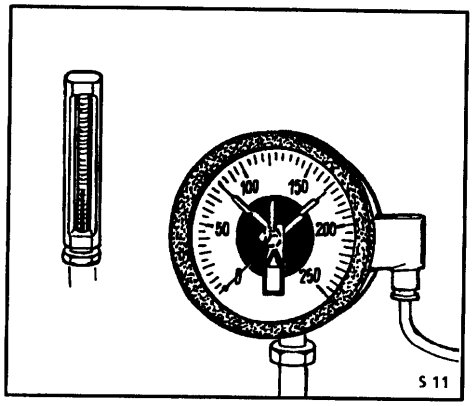


Fig. 15

- Check whether the supervisory equipment is operational and the correct limit values are adjusted.
- When hoods, concentrate collectors and vessels are pressurized, e.g. by
  - inert gas,
  - cooling,
  - steam sterilization etc.

  the pressures stated on the name-plate must not be exceeded.

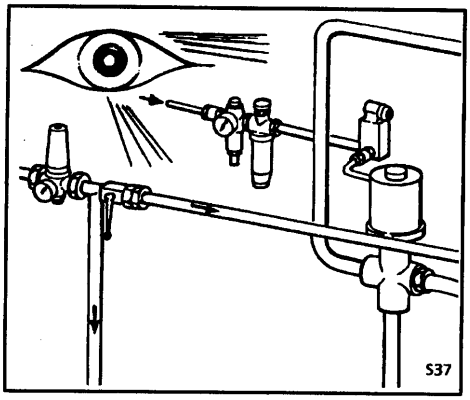


Fig. 16

- Check that the product lines are set to operation.
- Regularly check hoses for signs of ageing.
- Check sight glasses for mechanical damage.
- Replace damaged parts by parts which are as good as new.

Operation

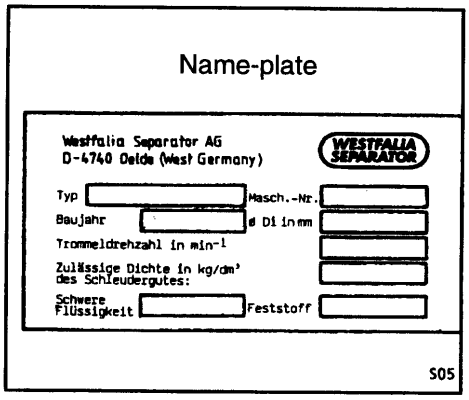


Fig. 17

- Refer to chapter »operation«.
- Note nameplate. The values for
  - bowl speed
  - density of the heavy liquid,
  - density of solids (centrifugally dry)

  are max. values and must not be exceeded.

Fig. 18

- Wear ear protection.

Fig. 19

In case of frequency converter operation:

- Do not under any circumstances manipulate the frequency converter to exceed the permissible bowl speed (see maker's nameplate).
- The separator may only be operated with an independent device for speed limiting.

Fig. 20

- Do not feed product which is categorised as explosive.
- The separator must not be used in areas where explosion protection is required.

Fig. 21

- When processing products harmful to persons, observe the pertinent safety regulations.
- Refer to the safety data sheet of the product.
- Wear protective clothing.

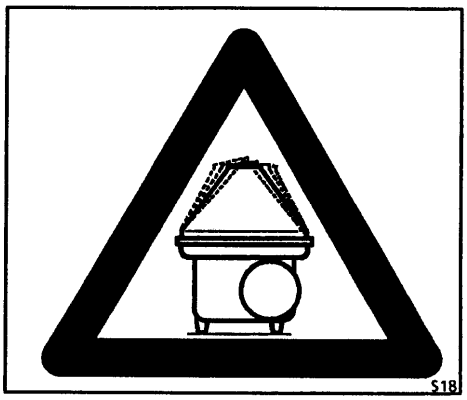


Fig. 22

- Stop the separator immediately if unusual noises or vibrations occur.

Fig. 23

Only in case of hot operation:

- Product-contacting parts such as
  - pipes and hoses,
  - hood,
  - solids collector

  reach temperatures over 80 °C.

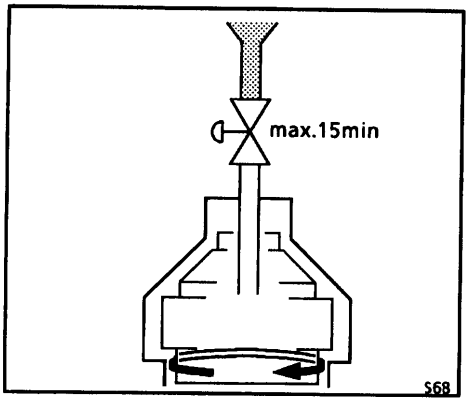


Fig. 24

- The bowl is not allowed to run without liquid supply for more than 15 minutes, as otherwise it would result in overheating of the bowl material.

Shut-down and »Emergency-Off«

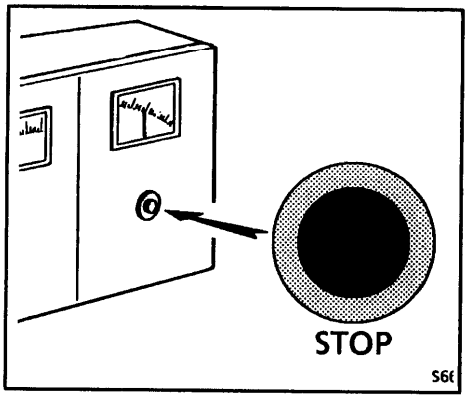


Fig. 25

- For shut-down refer to the chapter "operation".

Maintenance and repair

Unfavourable operating conditions may require shorter maintenance intervals. The factors listed below are unfavourable because they either attack the separator material directly or impair the lubrication/cooling system:

- aggressive product (chemical or physical)
- high product temperature
- product with grease decaying properties
- environment: temperature, dust and vapours

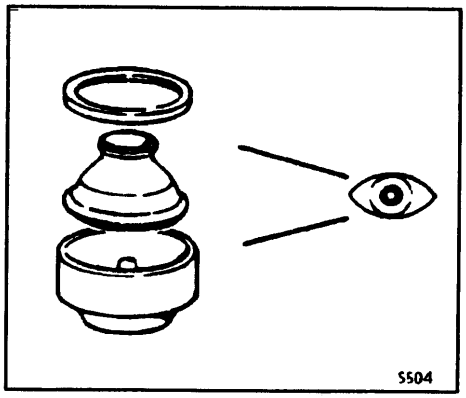


Fig. 26

Particularly stressed parts such as bearing hub, bowl hub and other bowl parts with a large outer diameter must be checked on a regular basis to ensure safe and efficient operation.

Timely maintenance and replacement of worn or damaged machine parts is essential for safe operation of the machine.

Maintenance and repair work may only be carried out by the customer to the extent as described in this instruction manual.

Maintenance and repair work not described in this manual may only be carried out by the manufacturer or by "repair shops" authorized by the manufacturer.

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

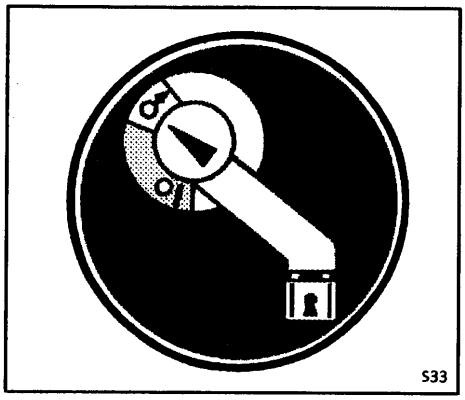


Fig. 27

Before maintenance and servicing:

- switch off all electrical appliances via the main switch,
- secure installation against unintended re-starting with locking devices.

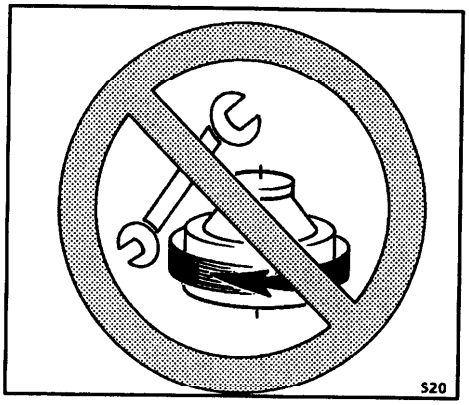


Fig. 28

- **Do not loosen any part before the bowl has come to a standstill.**
- For checking standstill refer to chapter "bowl".

Fig. 29

- Do not climb onto or stand on the machine or parts of the machine.
- Make provision for and use a sturdy working platform.

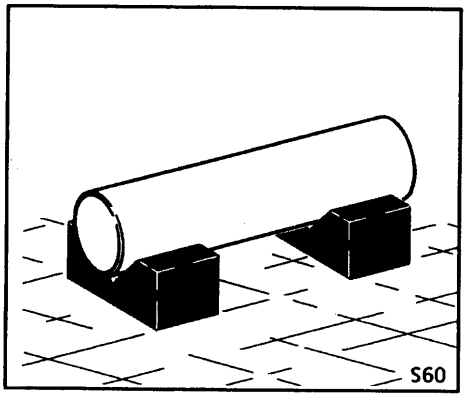


Fig. 30

- Place dismantled machine parts on a suitable base, e.g. rubber mat.
- Take steps to prevent machine parts from overturning and rolling away.

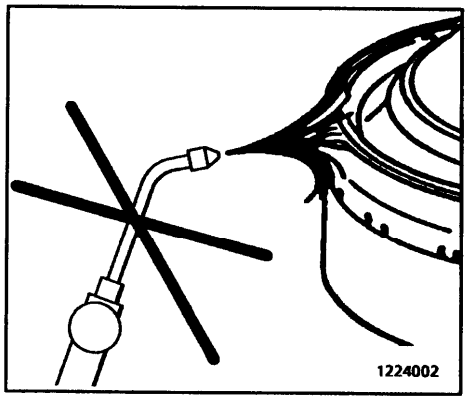


Fig. 31

- **Do not heat bowl parts with the naked flame.**
- **Bowl parts must never be welded. This also applies for hood and solids collector parts of steam-sterilizable separators.**
- Even during cleaning the bowl parts the temperature must not exceed 100 °C.

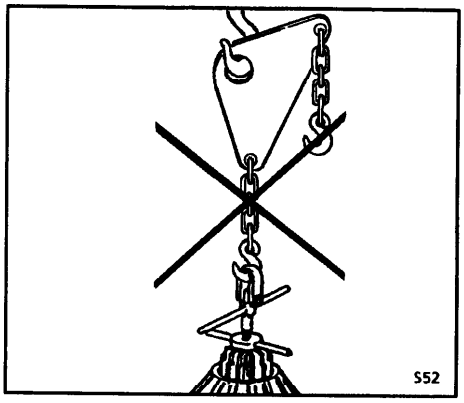


Fig. 32

- Load-carrying equipment such as lifting devices for
  - bowl or distributor,
  - chains etc.

  may only be used for work routines as described in this instruction manual.
- Do not use damaged or incomplete load carrying equipment.

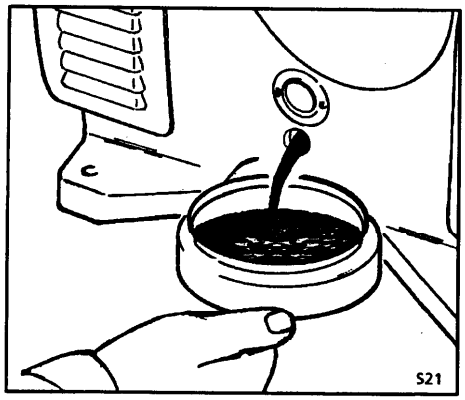


Fig. 33

- Collect dripping oil to prevent danger of slipping or product infection.
- When handling waste oils note:
  - They can be injurious to health, depending on their chemical composition.
  - Waste oil must be disposed of in accordance with local regulations.

Corrosion

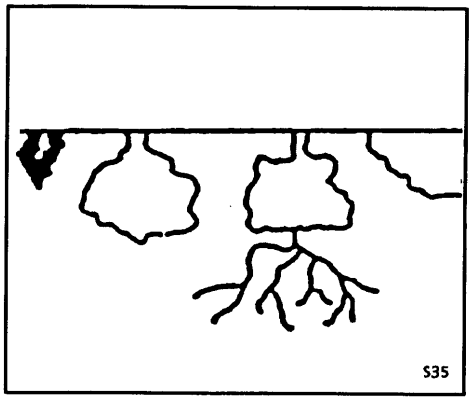
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

Corrosion on stainless steel bowl material should be examined thoroughly and documented.

Flat-spread corrosion can usually be measured (reduction of wall thickness)

Pit- or crack-shaped corrosion cannot be measured without the risk of damage. At the initial stage pit-shaped corrosion is generally caused by chlorine ions.

Depending on the stressing of the part, pit-shaped corrosion can result in crack-shaped corrosion.



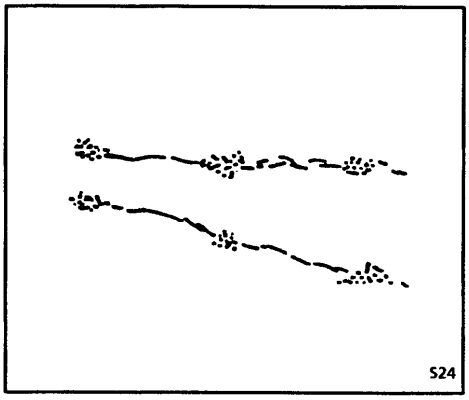
Possible formation of pit-shaped corrosion.

Fig. 34

Such pittings can only be investigated by a materials expert.

In case of crack-shaped corrosion attack with or without superposed flat-spread and pit-shaped corrosion on main bowl components, **the machine must be shut down immediately.**

Contact your nearest Westfalia Separator AG representative for a thorough examination.



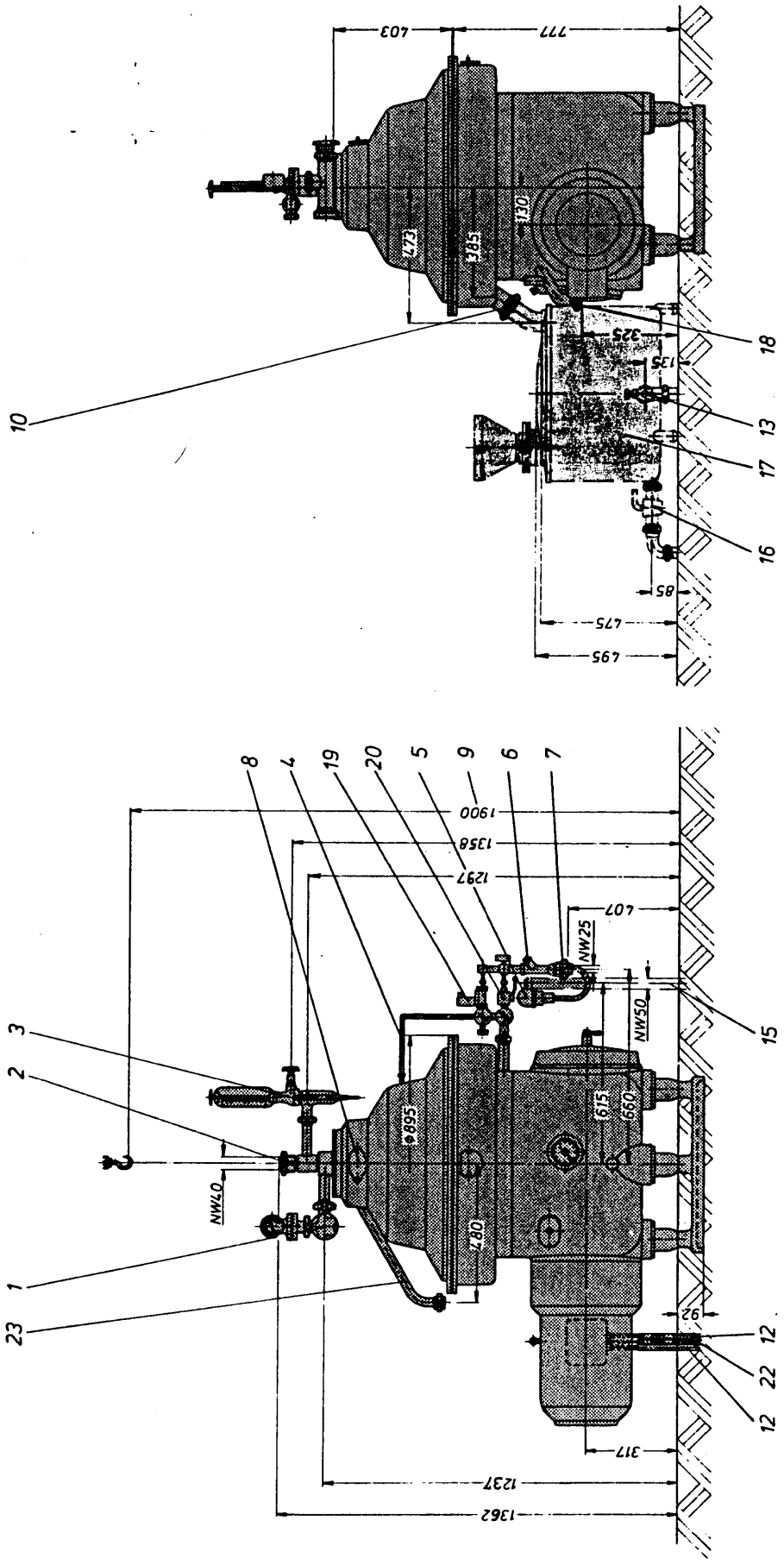
Pittings

Pittings which are close together or form a linear pattern can signify crack formation beneath the surface.

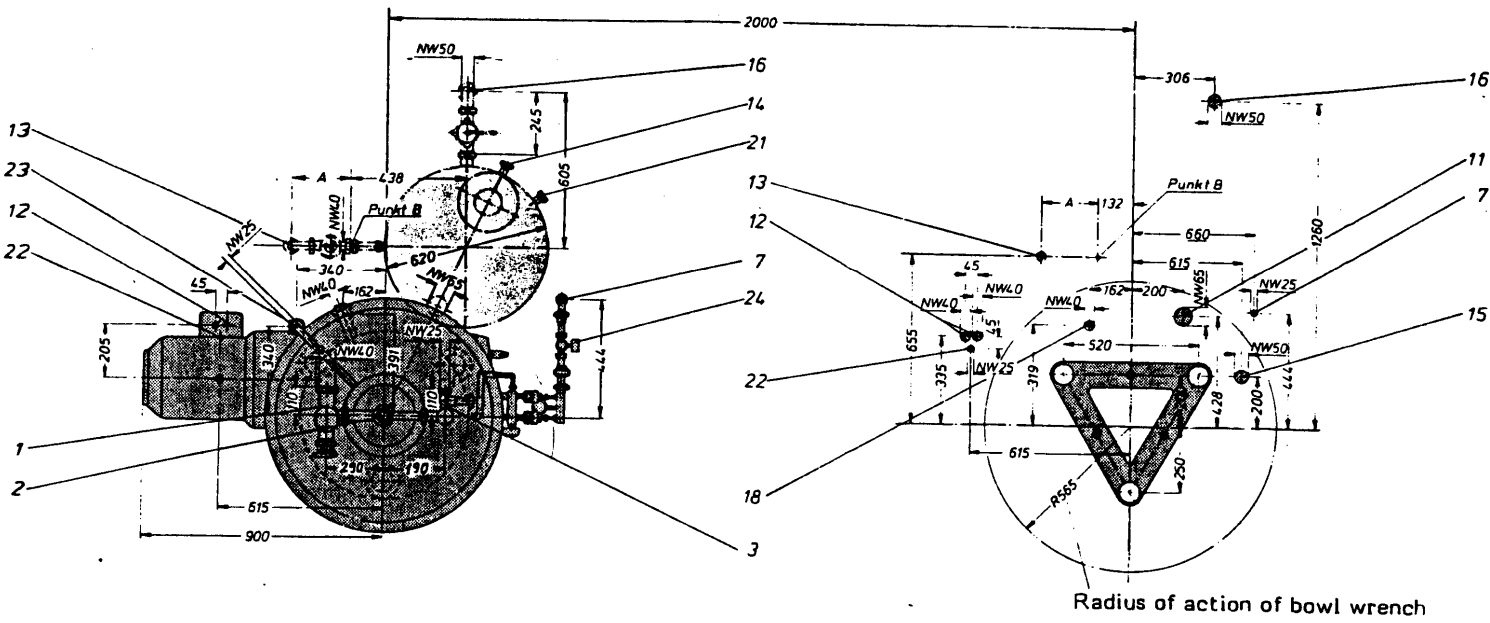
Such pittings should be investigated by a materials expert.

Fig. 35

Dimensioned drawing



Dimensioned drawing

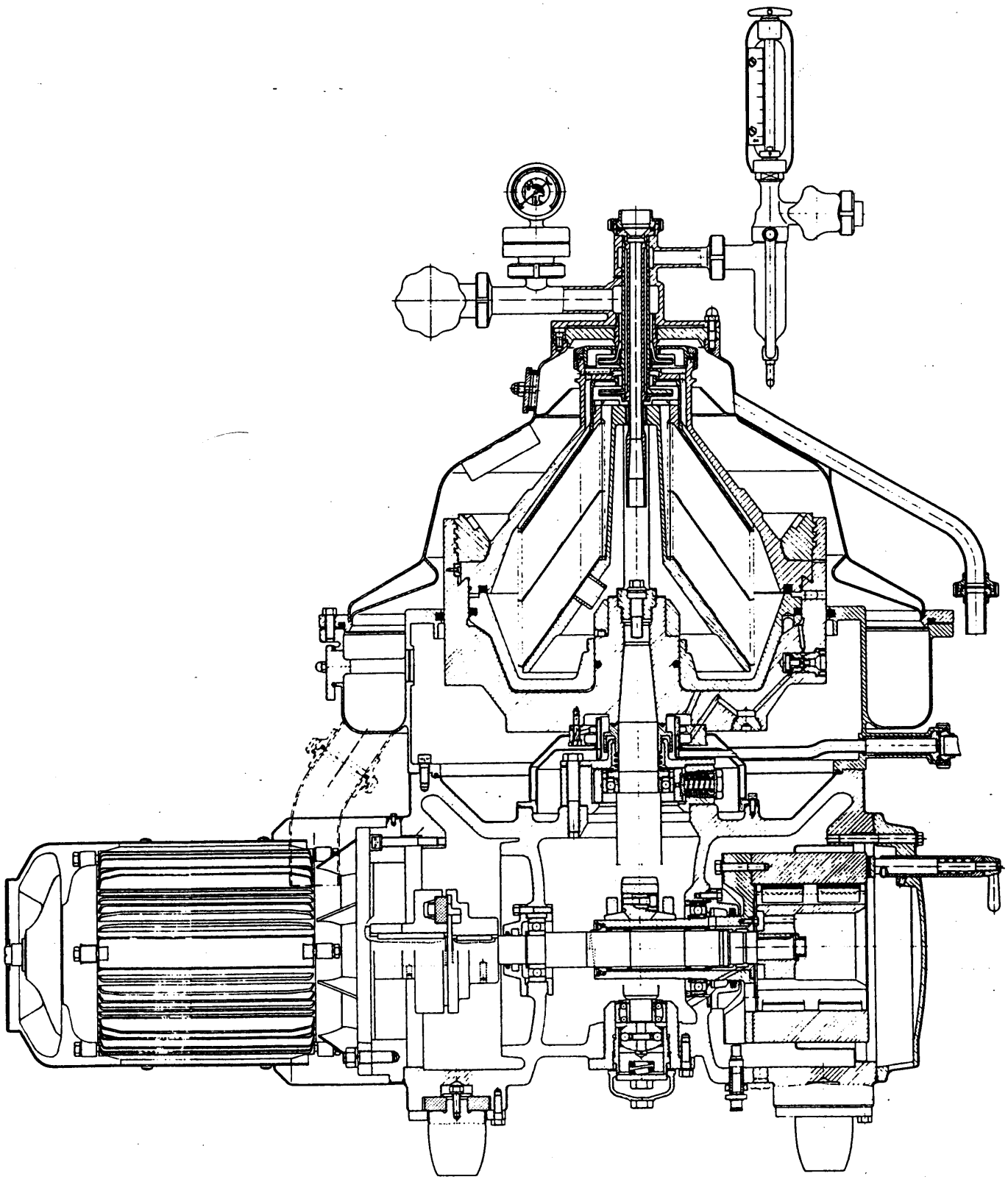


24	Water pressure reducer
23	Overflow
22	Connection for PTC resistors
21	Connection piece for temperature feelers
20	Rapid-closing valves
19	Solenoid valves
18	Operating-water discharge
17	Sterilizing vessel
16	Discharge (sterilizing vessel)
15	Power supply for solenoid valves and pressure switch
14	Thermometer (sterilizing vessel)
13	Steam supply (sterilizing vessel)
12	Power supply for motor
11	Sediment disposal through floor, if required
10	Sediment discharge
9	Minimum lifting height for hoist
8	Overflow inspection cover
7	Operating-water feed
6	Strainer
5	Pressure switch
4	Flush line
3	Cream discharge
2	Feed
1	Skim milk discharge

A The dimension depends on make and type of fittings used

Bowl speed	6,550 rpm
Total net weight of machine	1,200 kg
Minimum lifting capacity of hoist	250 kg
Skimming capacity	5,000 l/h
Motor power	15 kW, 50 Hz

Sectional view of the separator



Note
Notes
Notizen
Anotaciones
Notizen
Notes
Note

1 Installation

1.1 Transport

Suspend the separator as shown in Fig. 1/1. Never attach rope to eye bolt on motor. To prevent rope from slipping, wind it around the crane hook. When lowering the separator, make sure it touches down gently.

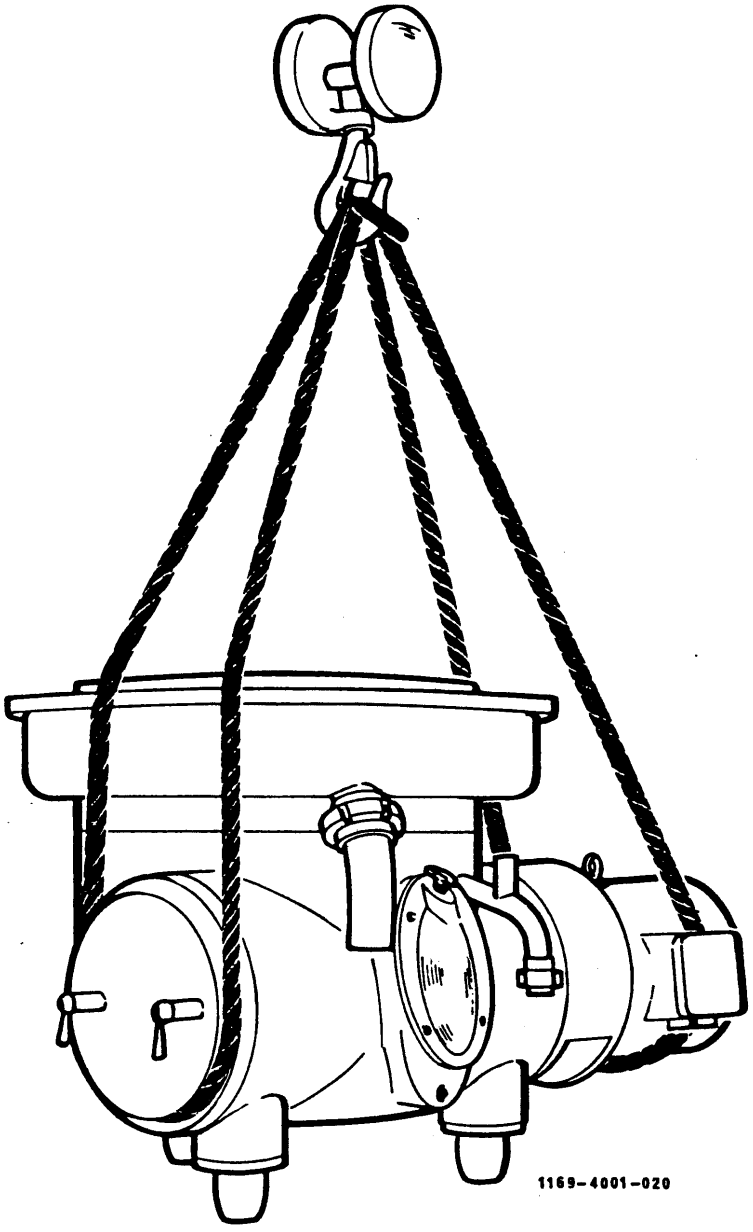


Fig. 1/1

Weight: 750 kg

1.2 Installation of the separator

When installing the separator, make sure that sufficient room is available (at least 300 mm) to mount and to remove the motor and to remove the horizontal drive shaft.

When installing several separators side by side be sure to keep a center-to-center distance of 2,0 m.

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

The supply line to the operating-water connection should have a 25 mm I.D. The operating-water pressure should be at least 1.5 bar. Pressure fluctuations must not exceed 0.5 bar. Operating water consumption 50 l/h (see also sect. 5.3).

For mounting and removing the bowl a 500 kg hoist is required. On request a swivel hoist can be supplied.

If possible use flexible tubes for connecting the feed and discharge lines of the separator to the permanent pipe lines so that vibrations occurring during start-up and slowing-down of the machine will be absorbed.

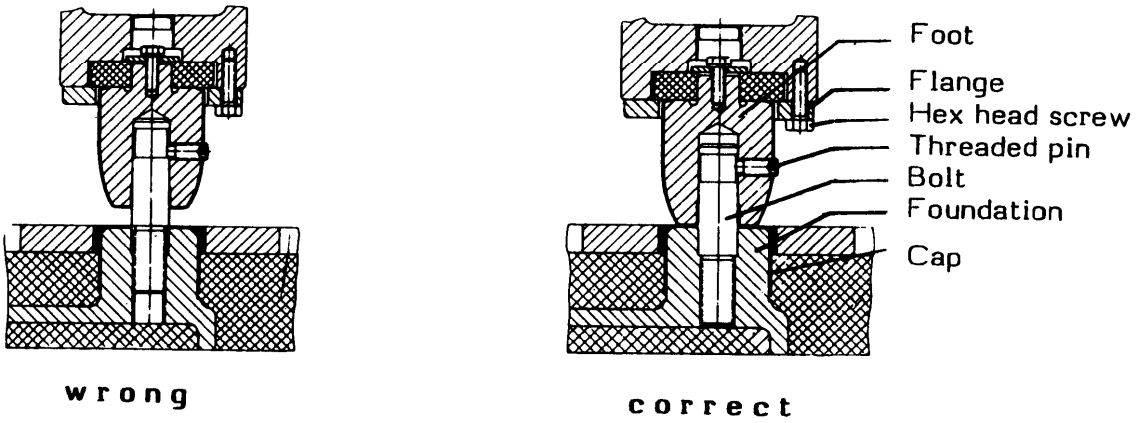


Fig. 1/1
Fastening the separator

Screw bolts into the three raised blocks of the foundation frame; **make sure they are screwed in all the way.** The foundation frame should be embedded in such a manner that the raised blocks protrude about 5 mm from the floor. Fill up the space below the frame with concrete. Make sure that the raised blocks on the foundation frame are **absolutely level** and grout the frame with cement, inside and outside. To accelerate setting of cement, commercial rapid binding agents may be used.

Fasten feet to separator frame by means of flanges and hex head screws. Then lift separator onto foundation frame, placing the feet onto the bolts. Then tighten threaded pins firmly, using a screwdriver.

2.1 Lubrication of bearings and gear parts

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

Oil level

Before the initial start-up of the separator fill gear chamber with oil through filling hole in gear chamber cover until the oil level is slightly above the middle of the sight glass. About 5.5 litres of oil are required for one filling. During operation the oil level must never be allowed to sink below the middle of the sight glass; refill oil when necessary.

Oil check

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

Oil change

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

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

Lubricating oil

As lubricating oil use only a gear oil designated

CLP 220 (according to DIN 51502)

or

CC 220 (according to ISO 3498).

The lubricating oil must meet the following requirements:

1) Viscosity: 220 $\pm$ 22 mm^2 /s (cSt) at 40^o C

2) Additives:

   a) Additives giving increased protection against corrosion and increased resistance to aging, - with properties preventing corrosion on steel according to DIN 51355/B, degree of corrosion 0. Corrosive effect on copper according to DIN 51759/100 A3, degree of corrosion 1.

   b) Additives for decreasing wear and increasing the load-carrying capacity. The "FZG" gear rig test according to DIN 51354 as well as the test according to A/16,6/90, load grade > 12 must have been passed.

3) Demulsifying behaviour according to DIN 51599: < 60 minutes.

The gear oil designated "Separator lubricating oil CLP 220" which we have subjected to extensive tests meets the above requirements and should preferably be used. For the order number refer to parts list on page 20/1.

Note: Do NOT use motor car oils as they have a bad smell.

2.2 Lubrication of threads and contact surfaces on bowl parts

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

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

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

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

Molykote G or Molykote G Rapid.

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

2.3 Lubrication of the motor bearings

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

3.1 Three-phase AC motor, 15 kW

The separator is driven by a flange type motor via a centrifugal clutch. The motor is started by means of an automatic star-delta switch. Switching over from star to delta connection takes place after approx. 4 seconds.

Motor protection is ensured by PTC resistor type temperature feelers incorporated in the winding of the motor. These temperature feelers have to be connected to an appropriate tripping device.

External voltage higher than 2.5 volts must not be applied to the terminals of the temperature feelers.
When testing for continuity, do **not** use a test lamp but only an ohmmeter.

The measuring circuit line (between tripping device and motor) has to be laid separate from other lines.

Dimensioning of switches, wiring and fuses must **not** be based on the rated current, but on the starting current which reaches approx. 1.8 times the value of the rated current.

3.2 Direction of rotation of the bowl

IMPORTANT: The bowl must rotate in clockwise direction when looked at from above.

The direction of rotation of the bowl is shown on the inspection cover of the hood.
If it turns in anti-clockwise direction (incorrect), two lead-in wires have to be interchanged.

3.3 Speed and starting time of the bowl

The bowl speed is 6,550 rpm. It is indicated by a tachometer or by a RPM meter (see 3.4).
The latter will be supplied on request.

Starting of the bowl takes about 6 - 8 minutes, depending on the condition of the clutch shoes.

3.4 RPM Meter (special design)

The RPM meter monitors the bowl speed. It consists of a proximity switch, a measuring instrument, and an indicating instrument with a limit value relay.

If the bowl speed drops below 6,450 rpm because the clutch is defective or the bowl has opened irregularly, an acoustical alarm will be given. The separating process must then be interrupted manually by the service personnel and the separator must be stopped.

If the bowl fails to reach the operating speed of 6,550 rpm within the pre-set starting time of 10 minutes, the RPM meter will trigger an acoustical signal and prevent starting of the milk pump.

Important Hints

The forces resulting from the high speed rotation of the bowl are likely to endanger the operating safety of the separator if the bowl has been improperly assembled or cleaned. When assembling the bowl, strictly adhere to the instructions given in this manual.
In addition, the following should be considered:

- Prior to assembling the bowl parts, carefully clean all contact surfaces and grease them according to the instructions given under 2.2. Also, lubricate threaded areas of bowl bottom and bowl lock ring as specified under 2.2.

- When installing the bowl parts, make sure that the "O" marks of the bowl parts are in line. "O" mark alignment will ensure that the parts are properly positioned and locked in place by arresting pins and guide ribs.

- To avoid damage to guide surfaces and arresting pins when installing or removing the bowl parts, make sure the hoist is in the correct position. The hoist is to be operated at the low lifting speed. Never use force when istalling or removing the bowl parts.

- Before inserting gaskets, check them for wear. Make sure that grooves for gaskets and gaskets are clean and that gaskets are in perfect condition. Be careful not to twist the gaskets while inserting them and check to be sure that they fit properly in their grooves.

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

- Place bowl parts on a rubber mat or wooden pallet, never on the stone floor.

- Handle bowl parts carefully.

Exploded view of the bowl

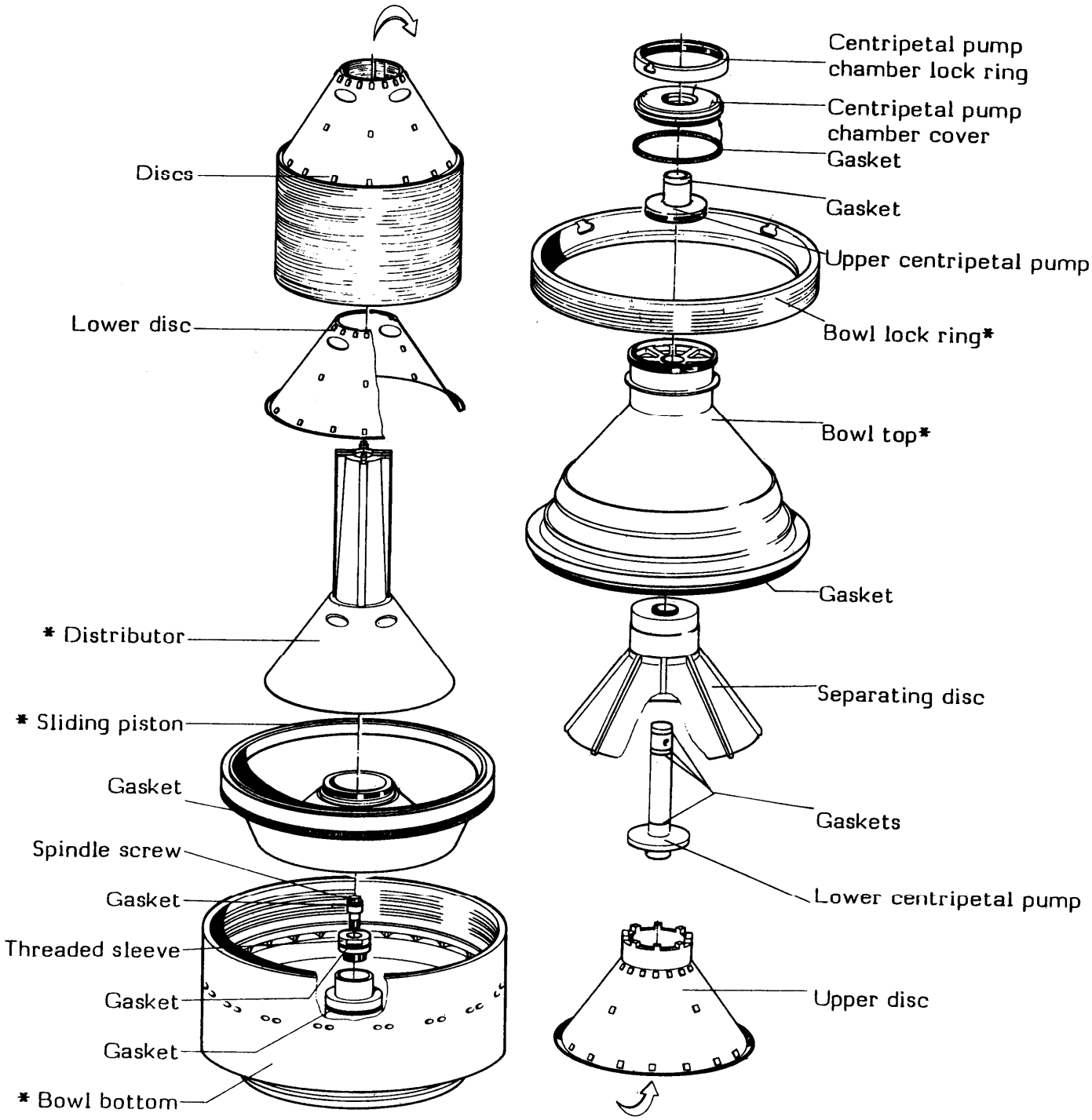
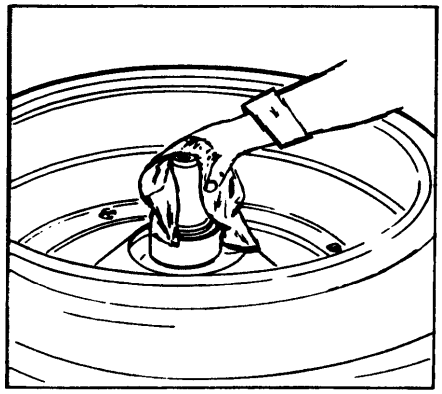


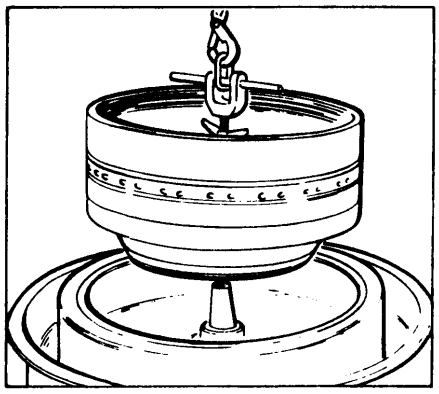
Fig. 4/2

*** IMPORTANT:** After replacing this part, the complete bowl must be re-balanced.

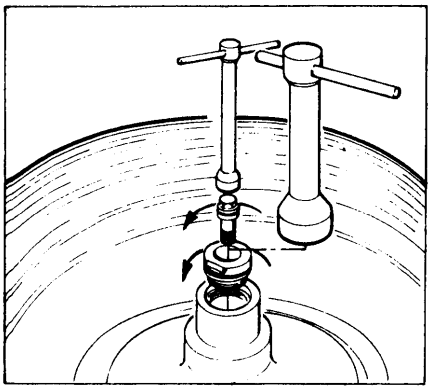
4.1 Assembling the bowl (for tools refer to page 20/2)



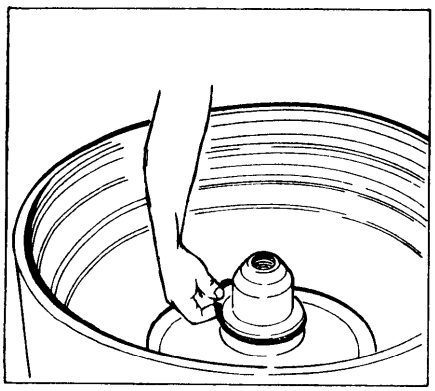
1) **Oil** the upper part of the spindle (thread, cone and cylindrical guide surface for the spindle cap). The spindle cap must be able to move freely up and down on the spindle. Then **clean and wipe dry the spindle with a smooth rag.** In addition, **clean the inside of the bowl hub thoroughly to ensure proper fitting.**



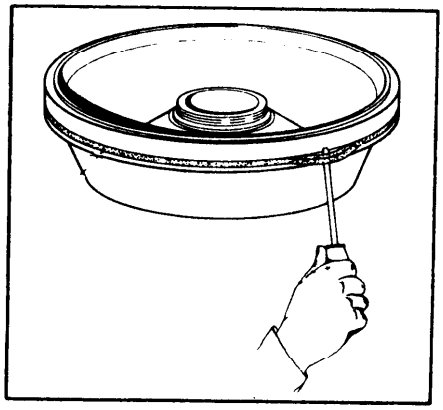
2) Place the bowl bottom onto the spindle using lifting device 436.



3) Screw threaded sleeve (with inserted gasket) tightly into bowl bottom, using wrench 410 **(left-hand thread).**
Then screw spindle screw (with inserted gasket) tightly into worm spindle **(left-hand thread).**



4) Insert gasket into groove of bowl bottom hub.

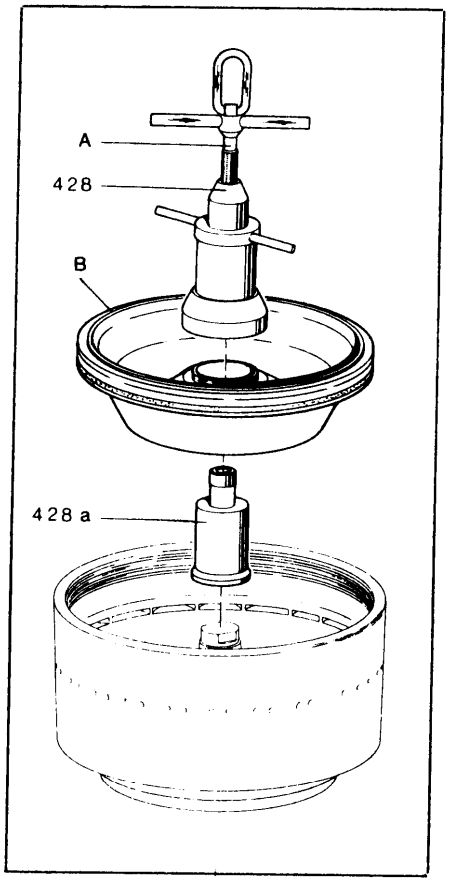


5) Thoroughly clean gasket groove in sliding piston and apply a **thin** film of grease.

If the gasket to be used is new, it must be stretched equally all the way around until its outer diameter almost corresponds to the outer diameter of the groove in the sliding piston.

Insert gasket into the groove of the sliding piston. Place a screwdriver under the gasket and lever it out of the groove. Then run the screwdriver around the sliding piston two or three times.

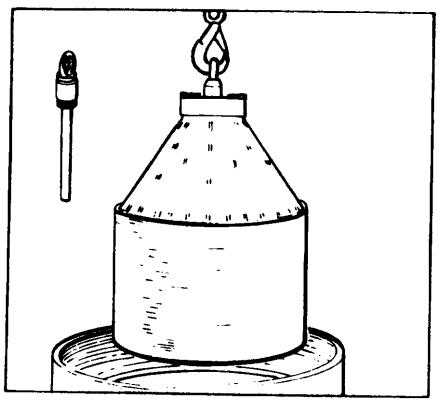
Tap the gasket back into the groove with a rubber hammer. The gasket is now uniformly stretched all the way around and thus ensures optimum sealing during operation.



6) Grease guide surfaces of the sliding piston and bowl bottom (see 2.2).

7) Place pressure piece 428a onto hub of bowl bottom. Make sure that arresting pins of bowl bottom fit into holes of pressure piece. Then install the sliding piston with the aid of jack 428. The "O" marks must be aligned. By turning jackscrew "A" counter-clockwise, lower the sliding piston slowly until the arresting pins of the bowl bottom catch into the holes of the sliding piston.

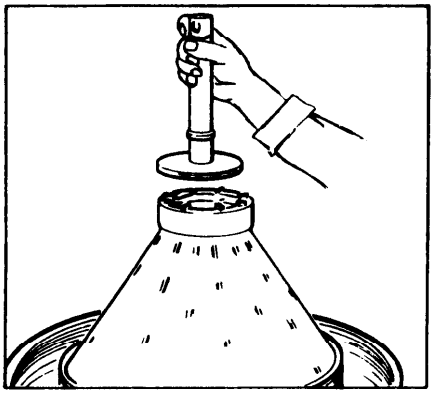
IMPORTANT! Be careful not to damage **sealing lip B** of the sliding piston.



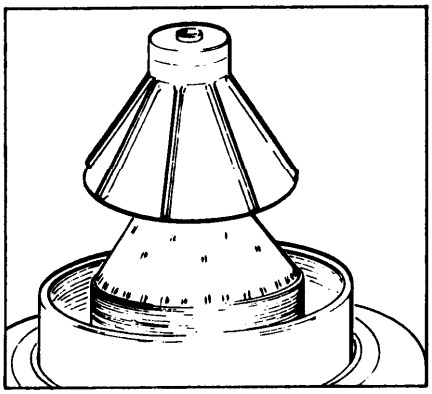
8) Stack the discs onto the neck of the distributor in numerical order, beginning with number 1.

Place the upper disc onto the neck of the distributor.

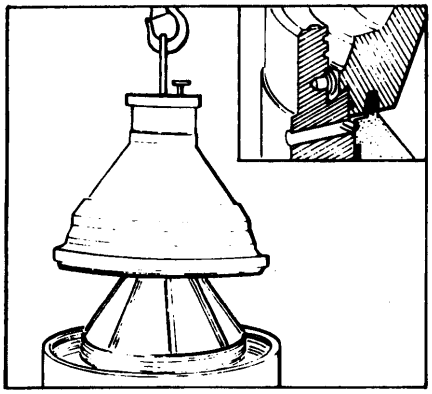
Install the distributor together with disc stack into the bowl bottom using tool 434. Make sure that the arresting pins of the bowl bottom catch into the recesses of the distributor. The "O" marks on both parts must be in line with each other.



9) Place lower centripetal pump (with inserted gaskets) onto the distributor.

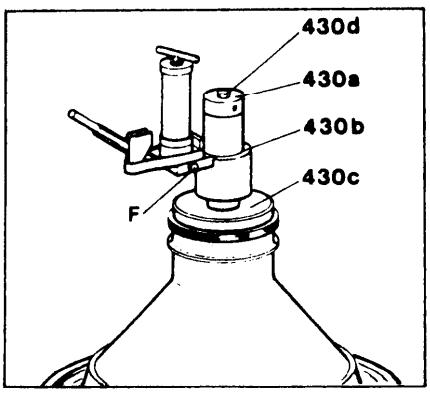


10) Mount separating disc. Make sure the "O" marks on separating disc and on bowl bottom are in line with each other.



11) Clean and grease guide and cone surfaces (see 2.2). Insert gasket into the groove of the bowl top. If the main bowl gasket must be replaced, refer to sect. 4.4.

Place the bowl top onto the bowl bottom using tool 427. Make sure that the arresting piece of the bowl bottom fits into the groove of the bowl top. The "O" marks of both parts must be in line with each other.



12) Before screwing in the bowl lock ring, compress the disc stack using compressing device 430 (refer also to sect. 4.6):

a) Place disc 430c onto the bowl top.

b) Screw bolt 430d as far as it will go into the distributor.

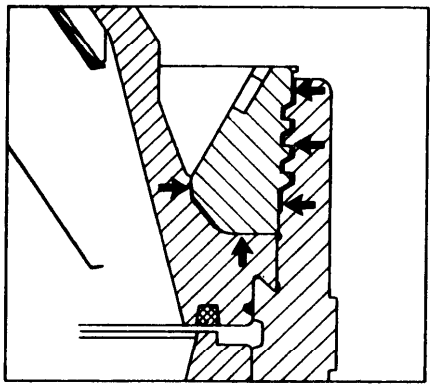
c) Insert hydraulic unit 430b into the centering recess of the disc.

d) Screw on threaded ring 430a until its upper edge is flush with end thread of bolt 430d.

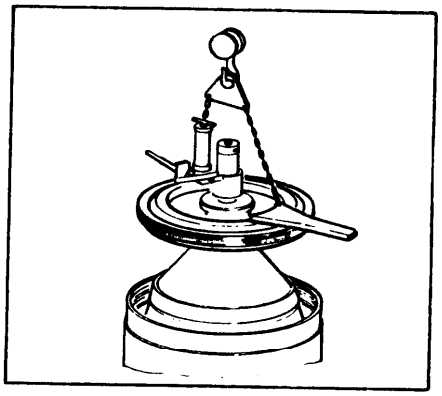
CAUTION: To avoid damage to the threads due to pressing, the threaded bolt must be screwed in and the threaded ring screwed on **all the way.** If the threaded ring cannot be screwed down completely, then the piston and the cylinder of the compressing device prove to be too far apart. To bring them back into their starting position, loosen screw "F" by two turns and move the pump lever to its lowest position. Now you can screw down the threaded ring, thereby bringing piston and cylinder into proper position.

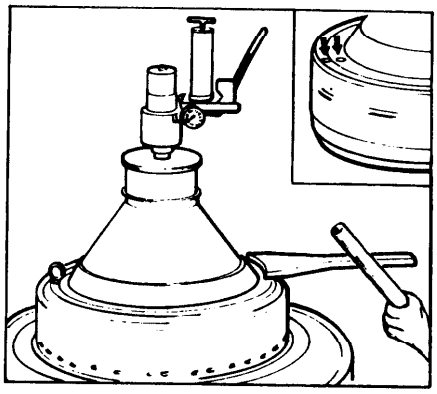
e) Check to be sure that all screw connections of the compressing device are tightened securely and that return duct of check valve is closed by means of screw "F".
Before the first use of the compressing device fill oil container of pump with oil and de-aerate the hydraulic chamber (see 4.6).

f) Actuate lever of piston pump until the pressure gauge indicates a pressure of 200 - 220 bar. If the maximum pressure is not attained and oil flows out of the stroke limiting hole, then bolt 430d has not been screwed far enough into the distributor. The compressing device is only ready for use again when bolt 430d and threaded ring 430a have been brought back into the position as described under 12a-d on page 4/5.
While compressing the disc stack make sure that arresting piece of bowl bottom snaps into groove of bowl top and that bowl top does not become tilted.



13) Check and grease threads, contact and guide surfaces (see arrows and refer to sect. 2.2).

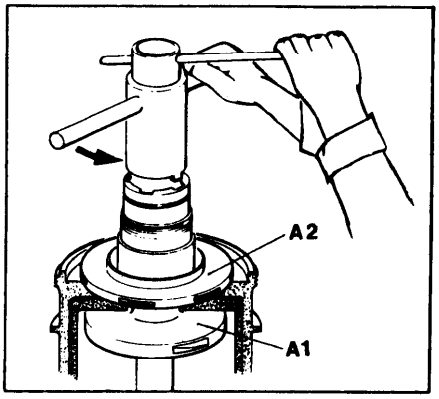




14) Use annular wrench 425 and lifting device 431 to place bowl lock ring onto bowl bottom. Screw in the lock ring **(left-hand thread)** with the aid of the annular wrench (without hitting the wrench handle with a mallet) until the "O" marks on ring and on bowl bottom are 3 to 5 cm apart.
Then hit wrench handle with mallet to obtain "O" mark alignment.

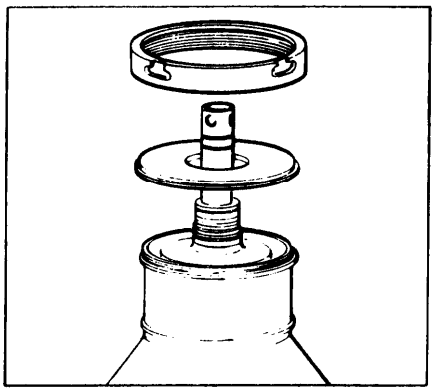
IMPORTANT: If the bowl lock ring can be tightened **by hand** with the aid of the annular wrench so that the distance between the two "O" marks is **less than 3 cm,** a spare disc has to be added because the pressure in the disc stack has slackened. If the distance between "O" marks is **more than 5 cm,** check if all bowl parts are properly locked in place. If the pressure in the disc stack is too high, it can be reduced by greasing the spacers of the discs (e. g. with cream).

15) Move pump lever down as far as it will go to prevent it from jumping back. Only then loosen screw "F" to enable the oil to return from the hydraulic cylinder into the oil container. The compressing device can now be removed from the bowl.



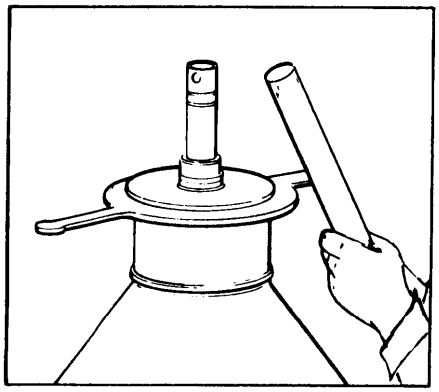
16) Screw the upper centripetal pump A2 (with inserted gasket) onto the lower centripetal pump A1 by hand **(left-hand thread).** Then tighten the upper centripetal pump as far as it will go using wrench 421. Simultaneously prevent the lower centripetal pump from turning by sticking a screwdriver through the holes of the centripetal pump shaft.

IMPORTANT! Do not use force. Do not hammer against the wrench handle.



17) Mount centripetal pump chamber cover (with inserted gasket). Watch for correct positioning.

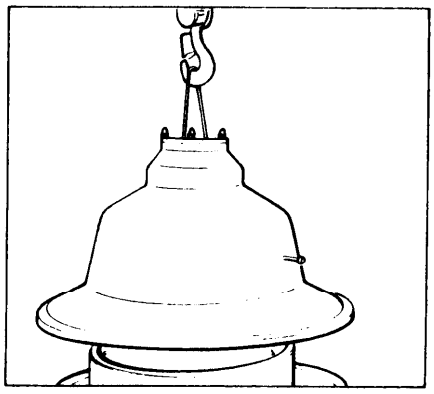
18) Screw on centripetal pump chamber lock ring by hand **(left-hand thread).**



19) Tighten centripetal pump chamber lock ring by tapping the handle of the annular wrench 426 **(left-hand thread).**

20) Check to see if the bowl can be turned by hand.

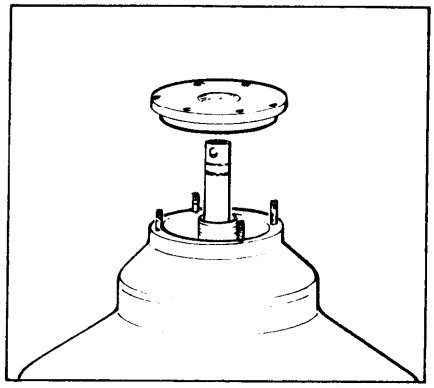
4.2 Assembling the feed and discharge connections



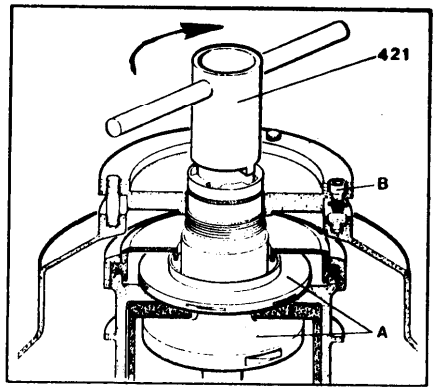
1) Fasten lifting device 435 onto the hood by means of cap nuts. Place the hood onto the sediment collector in such a way that the "O" marks on the sediment collector and on the hood are perfectly aligned.

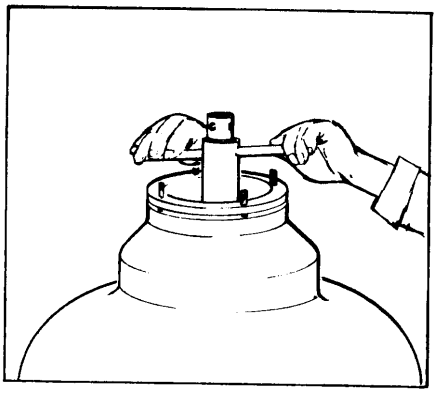
   Connect flush lines.

   Fasten hood to sediment collector by means of hex head screws.



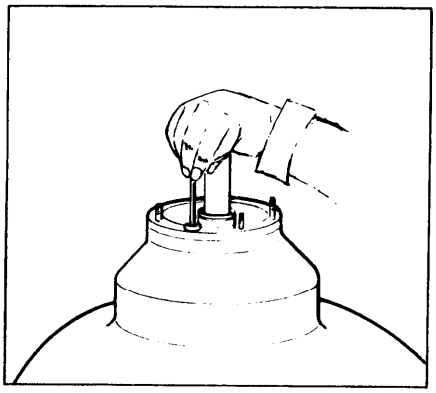
2) Place the disk onto the hood so that both Allen screws B are positioned over the respective tap holes in the hood.



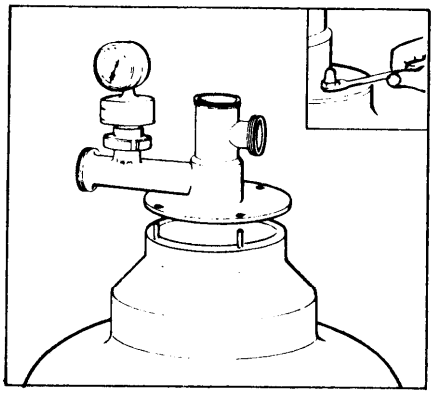


3) Screw centripetal pump A into the disk by hand in **clockwise** direction and tighten it with wrench 421 as far as it will go.

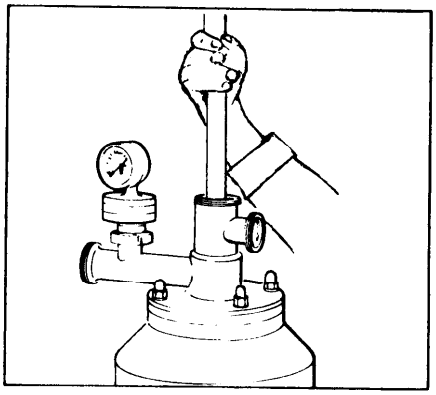
4) Before the initial start-up, after re-assembling the vertical gear parts or exchanging the bowl, check bowl for proper height (see 8.3).



5) Screw the two Allen screws B in the disk into the hood.



6) Install feed and discharge housing and fasten with cap nuts.



7) Install feed tube with inserted gaskets into feed and discharge housing until it hits stop.

8) Connect feed and discharge lines.

4.3 Removing the feed and discharge connections - Dismantling the bowl (for tools refer to page 20/2)

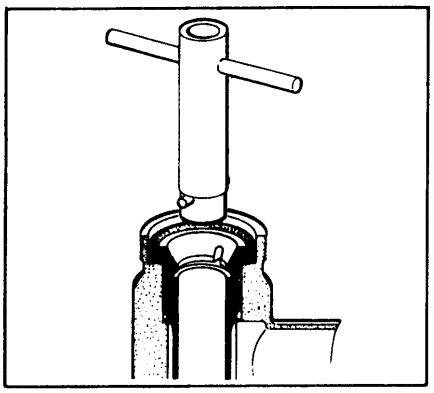
IMPORTANT! In order to avoid accidents, do not loosen any part before the bowl has stopped moving!

Only when the fan of the motor has stopped rotating is the bowl at a standstill.

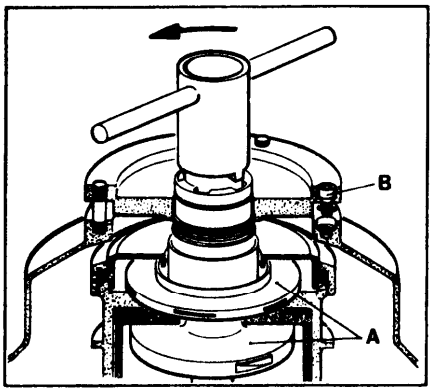
Proceed in reverse order of assembly (see 4.1 and 4.2). The following should be borne in mind:

Handle bowl parts with care. Replace worn gaskets immediately.

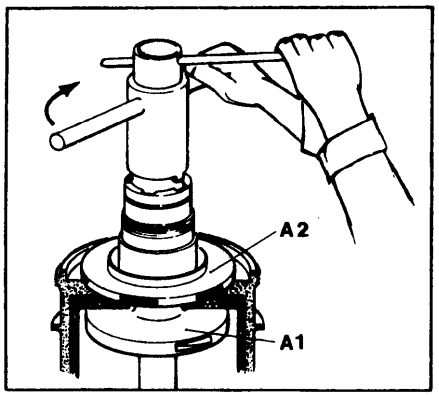
Before opening the bowl, release the brakes by turning the two handles clockwise.



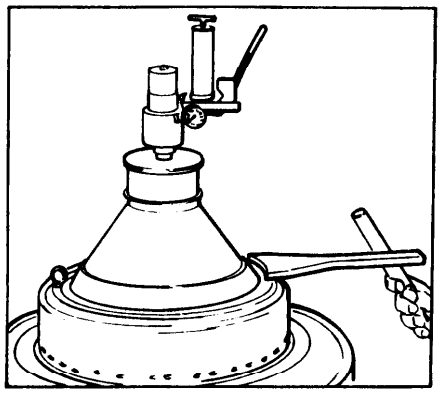
Remove the feed tube from the feed and discharge housing using wrench 429.



After removing the feed and discharge housing, loosen both Allen screws B in the disk. Then remove the double centripetal pump A by turning wrench 421 in **anti-clockwise** direction.
Lift off hood.

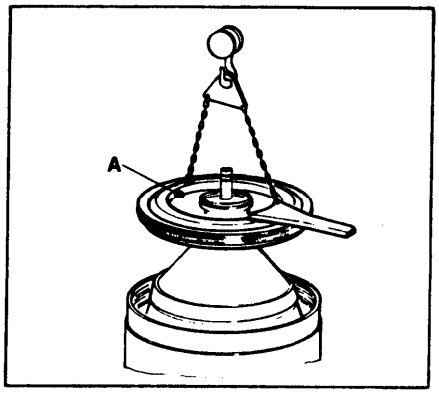


After unscrewing the small lock ring and removing the centripetal pump chamber cover, screw upper centripetal pump A2 off lower centripetal pump A1 using wrench 421 **(left-hand thread).** Simultaneously prevent the lower centripetal pump from turning by inserting a screwdriver through the holes in the centripetal pump shaft.

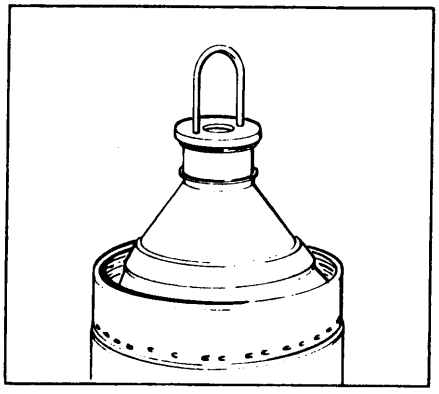


Then compress disc stack by means of the hydraulic compressing device, in order to facilitate loosening of the bowl lock ring (see 4.1, nos. 12a-f).

The bowl lock ring can now be removed easily by tapping the handle of the annular wrench 425 with mallet 405 **(left-hand thread).**
Remove hydraulic compressing device as described in sect. 4.1, no. 15.



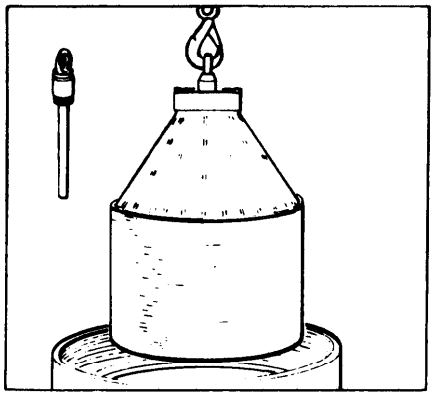
Lock annular wrench 425 by screwing hex head screw A into the groove of the bowl lock ring. Then lift off annular wrench and bowl lock ring with the aid of tool 431.



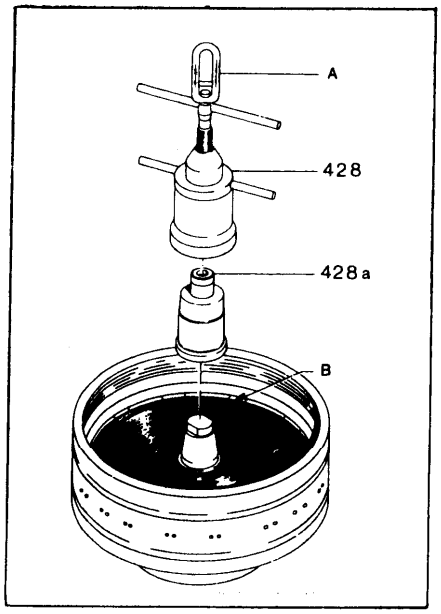
Lift bowl top from bowl bottom using tool 427.

If the separating disc is stuck to the bowl top, rap the bowl top with a copper or light metal hammer until the separating disc becomes loose. Do not let it drop onto the floor!

If the separating disc cannot be removed in this way, set down the bowl top. Pass a brass mandrel through the **outer** holes in the upper part of the bowl top and loosen the disc by gently tapping against the mandrel. Never place a mandrel on the inner rim of the separating disc.

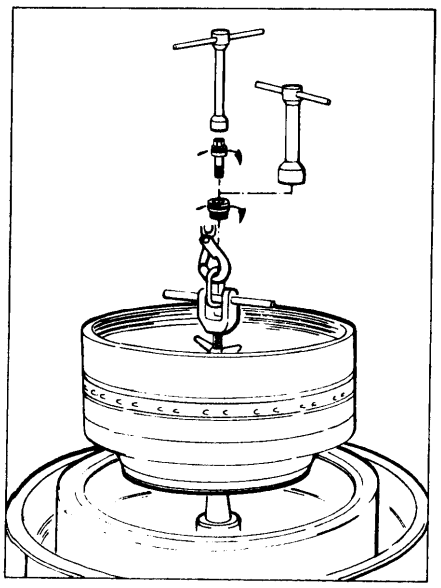


Lift out distributor together with disc stack by means of the lifting device 434.



Place pressure piece 428a on bowl bottom in such a manner that arresting pins of bowl bottom catch into holes of pressure piece. Screw jack 428 onto sliding piston. Turn jackscrew A in clockwise direction in order to pull the sliding piston off the bowl bottom.
Then lift out the sliding piston.

IMPORTANT! Make sure that sealing lip B of the sliding piston does not get damaged!

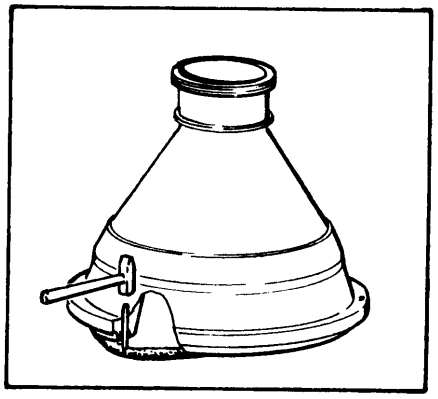


Unscrew spindle screw **(left-hand thread).**

Unscrew threaded sleeve from the bowl bottom, using wrench 410 **(left-hand thread).**

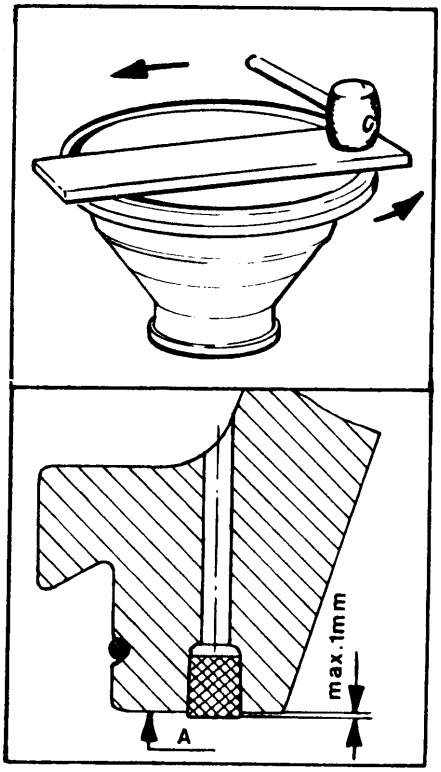
Remove bowl bottom from cone of the worm spindle with the aid of jack 436.

4.4 Removel and installation of the polyamid main bowl gasket



Removal

Drive out gasket from groove of bowl top with the aid of drift pin 432 which is supplied with the machine. To do this, insert the drift pin into the holes around the bowl top alternately and hammer onto the pin until the gasket becomes loose.



Installation

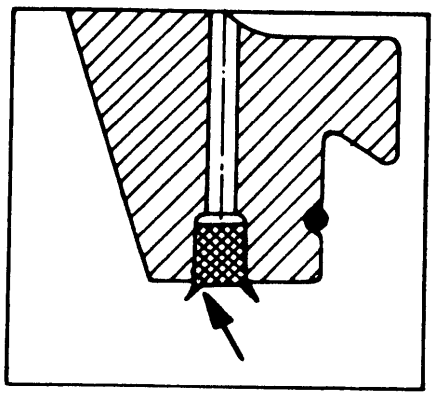
Insert gasket (with its narrow side facing the bowl top) into the clean groove of the bowl top. Using a **smooth** piece of hard wood, hammer the gasket evenly into the groove until its sealing surface protrudes from surface **A** by not more than 1 mm.

IMPORTANT! It is possible that a new gasket will be too small or too big (e. g. through the absorption of moisture).

If the gasket is too small, soak it for about 5 min. in a water bath at a temperature of 70 - 80° C (160 - 175° F).

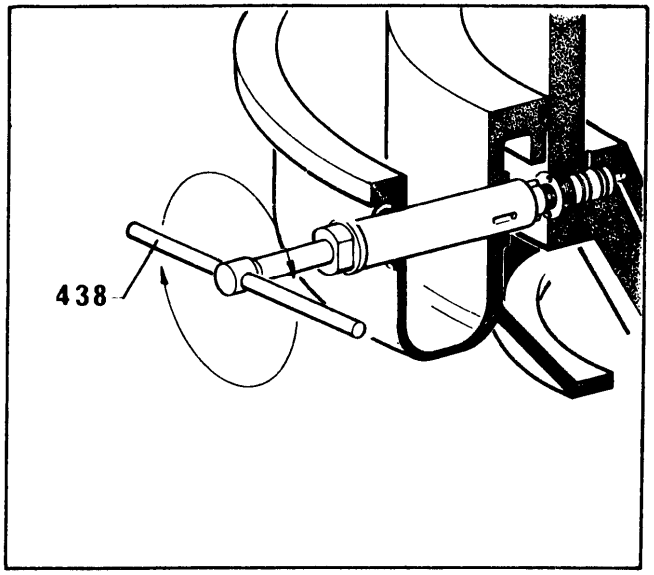
If the gasket is too big, it should be dried for a period of approx. 24 hours at a temp. of 80 - 90° C (175 - 195° F).

In both cases, the gasket will return to its original size.

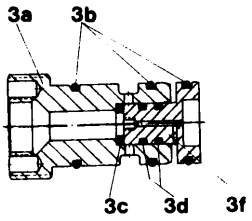


After using for the first time and after the main bowl gasket has been replaced, excess material must be trimmed off with a knife after 4 weeks operation. Excess material can cause extensive damage to the gasket, leading to bowl leakage.

4.5 Removing the piston valve

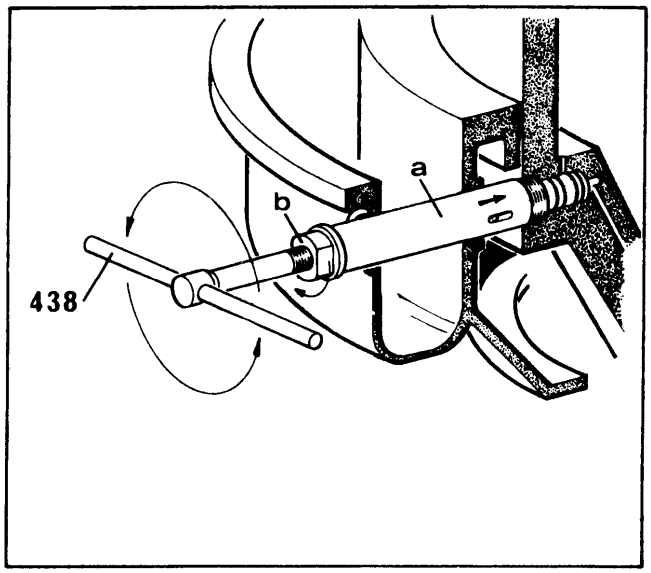


Remove the piston valve assembly 3a-f **once a month** for cleaning. At the same time, check the gaskets and replace them if necessary.

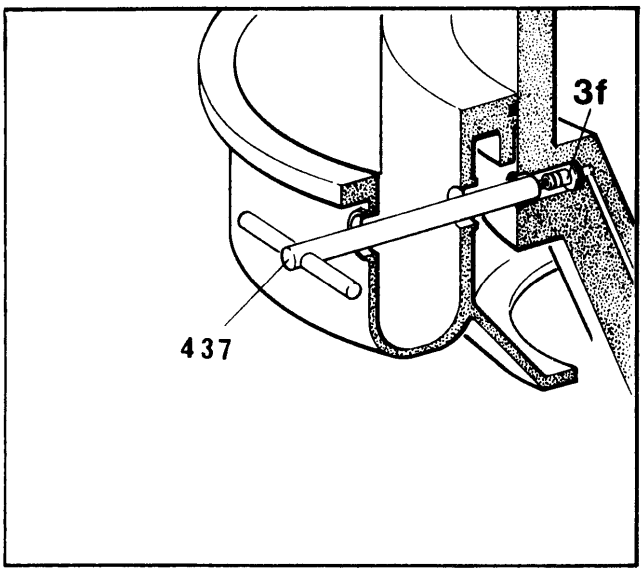


Piston valve

Screw wrench 438 into the piston valve.



Introduce pins of bush **a** of wrench 438 into boreholes of the piston valve.
Tighten nut **b.** Then unscrew piston valve from bowl bottom using wrench 438.



If the valve piston 3f should become stuck in the bowl bottom when removing the valve, screw wrench 437 into the valve piston and remove the valve piston together with the wrench from the bowl bottom.

Before re-installing the valve, moisten gaskets 3b and grease the thread. Then screw in the valve as far as it will go. However, do **not** screw it in **too tightly.**

IMPORTANT! If the piston valve is fitted correctly, the front face of the valve housing must be flush with the outer wall of the bowl bottom.

4.6 Hydraulic Disc Stack Compressing Device

4.6.1 Operating principle

By means of oil pump A oil is pumped under high pressure into hydraulic chamber B. Due to the increased pressure in this chamber, piston D is moved downwards. Cylinder C is held by threaded ring 430a, screwed onto bolt 430d. The lower end of the bolt is screwed into the distributor.
When the piston moves downwards, pressure is exerted on the bowl top, via disc 430c, resulting in compression of the disc stack.

4.6.2 Oil pump

Oil pump A is capable of producing a maximum pressure of 400 bar. It consists of oil container A2, pump head A1 and check valve A4. The holding capacity of the oil container is 350 cm^3.
Filling in oil: Before the first use of the compressing device, unscrew cover A3 and fill the container with oil. Then replace the cover and screw it on tightly.
De-aerate the pressure chamber B. To do this, loosen vent screw E and actuate the pump until oil escapes through the vent hole. Then re-tighten the vent screw.

4.6.3 Hydraulic fluid

As hydraulic fluid, the lubricating oil furnished with the separator and designated CLP 220 can be used.

4.6.4 Pressure gauge

The hydraulic pressure exerted upon the disc stack is indicated by pressure gauge G (indicating range 0 - 600 bar) attached to check valve A4.
The pressure required to compress the disc stack ranges between 200 - 220 bar. It may be higher than 220 bar, but must **not** be lower than 200 bar.
The maximum permissible pressure is 250 bar.

4.6.5 Stroke limiting hole

To prevent damage to the compressing device in the event of incorrect mounting the hydraulic unit is provided with a stroke limiting hole H. If bolt 430d and threaded ring 430a have not been screwed down properly (see sect. 4.1, no. 12a-d) the oil hydraulic chamber B will escape through this hole.

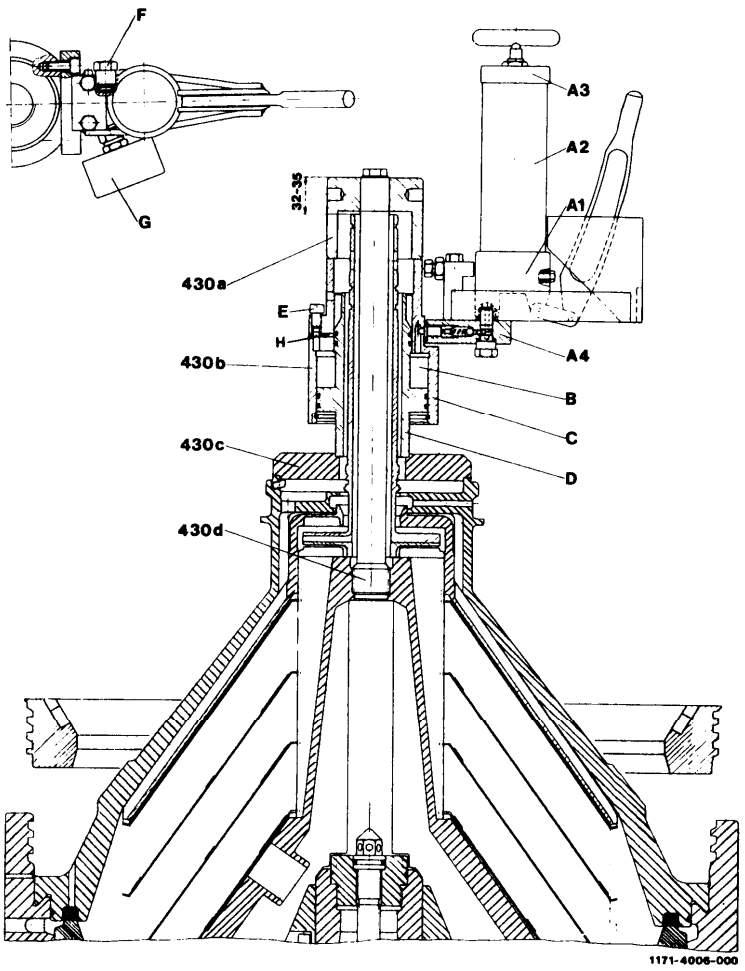


Fig. 4/14

430	Compressing device, compl.
430a	Threaded ring
430b	Hydraulic unit
430c	Disc
430d	Bolt
A	Oil pump
A1	Pump head
A2	Oil container
A3	Cover
A4	Check valve
B	Hydraulic chamber
C	Cylinder
D	Piston
E	Vent screw
F	Valve screw
G	Pressure gauge
H	Stroke limiting hole

5.1 Functioning of the hydraulic system of the bowl

The self-cleaning bowl is equipped for ejecting the sediment during operation. Dirt particles accumulate in the conical space 11 of the bowl from where are automatically discharged through ejection ports in the bowl bottom at pre-determined intervals.

The sliding piston 4 is hydraulically actuated to open and close the bowl ports. The water pressure created in the filled sealing chamber 3 keeps the bowl closed. When water drains out of the sealing chamber after opening of the opening-water valve, the product pressure above the piston pushes the piston down and opens the bowl ports.

Sealing of the bowl:

When the bowl has reached its rated speed, the timing unit is switched on whereupon the sealing-water valve opens for 60 seconds. The sealing water flows into sealing chamber 3 underneath the sliding piston. The water pressure in the sealing chamber pushes the sliding piston upwards and presses it against gasket 9, thus sealing the bowl.

The sealing chamber is sealed off by valve piston 7 which is pressed through centrifugal force against gasket 8 and thus seals water discharge channel 10.

To make up for sealing-water losses, sealing water is supplied every 60 seconds for a period of 1 second, controlled by an electronic impulse relay.

Opening of the bowl (sediment ejection):

When opening-water valve is opened for sediment ejection, water flows through channel 5 to valve 6. The water pressure pushes valve piston 7 inwards thus opening channel 10. The water contained in sealing chamber 3 can then flow off (Fig. 5/1c). As the liquid level recedes, the sealing pressure acting on the underside of the piston quickly decreases. As soon as it is smaller than the opening pressure acting on the upper side of the piston, the latter is pushed downwards, thus opening the ports in the bowl bottom for solids ejection.

Re-sealing of the bowl:

After sediment ejection the opening-water valve closes and the sealing-water valve opens. Valve piston 7 re-seals discharge channel 10 and sealing chamber 3 fills up with water. The liquid pressure in the sealing chamber exceeds the product pressure in the centrifugation room. The sliding piston is pushed upwards, thus re-sealing the centrifugation room.

The sediment ejections are initiated by the automatic timing unit (see sect. 5.2).

Sectional diagram illustrating sealing of the bowl and removal of the solid matter

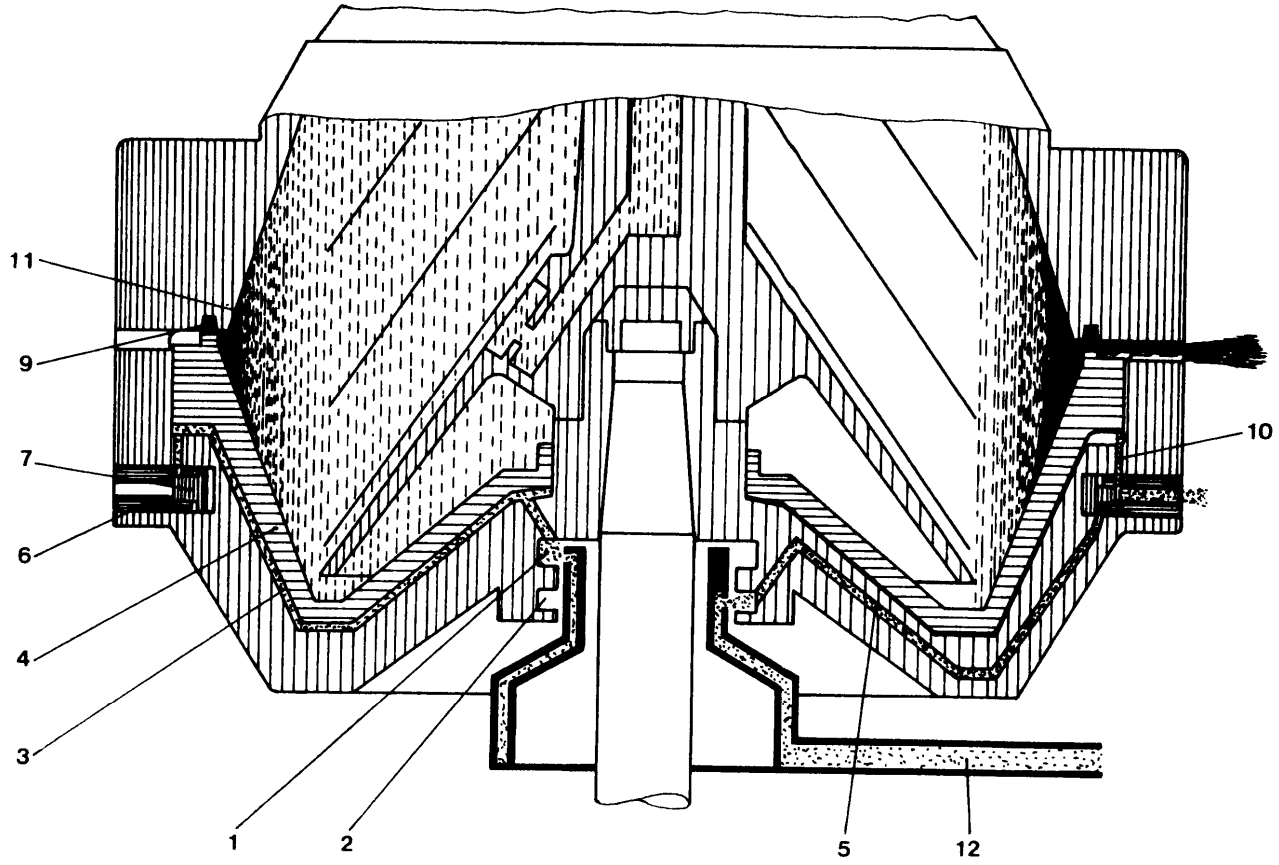


Fig. 5/1a

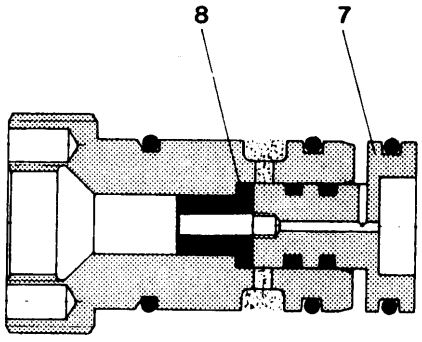


Fig. 5/1b
Functional diagram showing valve during separation

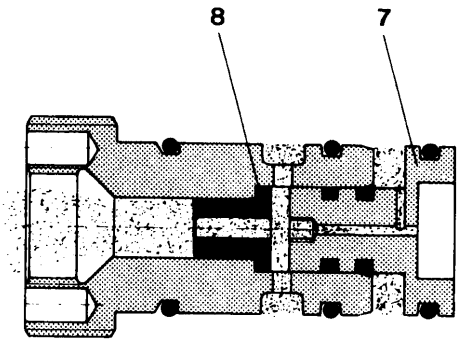


Fig. 5/1c
Functional diagram showing valve during solids ejection

1 Injection chamber for sealing water
2 Injection chamber for operating water
3 Sealing chamber
4 Sliding piston
5 Feed channel for opening water
6 Piston valve
7 Valve piston
8 Gasket
9 Bowl gasket
10 Discharge channel for sealing water
11 Sediment space
12 Operating-water feed

5.2 Timing unit

Partial sediment ejections during milk processing are initiated by the timing unit TVE 2-M in accordance with a pre-set programme. By pressing the button "Partial de-sludging", the programme in progress can be interrupted and a partial ejection can be initiated immediately.

Total ejections and hood flushings (bowl overflow) during cleaning-in-place are initiated manually on the timing unit or automatically from a separate CIP unit.

For further details refer to the instruction manual "Timing unit".

5.3 Operating-water connection

The inner diameter of the operating-water supply line should be 25 mm (1") and the pressure in the line should be at least 1.5 bar. **Important:** Pressure fluctuations must not exceed 0.5 bar. Operating-water consumption: 2,000 l/h.

The operating-water connection is provided with a water-pressure reducer K (Fig. 5/4) by means of which the line pressure is to be throttled to 1 bar. To adjust the water-pressure reducer, proceed as follows:

1) Open rapid-closing valve D (Fig. 5/4) all the way.
2) Adjust pressure with adjusting screw J so that pressure gauge on pressure reducer indicates 1 bar.
3) Close rapid-closing valve D again.

The operating water must be clean and should meet the following specifications:

Hardness:	$\leq$ 15° English hardness at separating temperatures of up to 55° C
	$\leq$ 7.5° English hardness at separating temperatures above 55° C
Chlorine ions:	$\leq$ 100 mg/l
pH value:	6.5 to 7.5

The strainer in filter G (Fig. 5/4) must be cleaned from time to time.

Pressure gauges M and N (Fig. 5/4) merely serve for checking the closing and opening operations.

5.3.1 Arrangement of the solenoid valves (Fig. 5/4), manual control of the separator

In addition to the automatic solenoid valves, the operating-water connection comprises two rapid-closing valves D and F connected in parallel with solenoid valves A and B, as well as two shut-off valves **a** and **b.**

This arrangement allows changing over to manual operation in the event of failure of solenoid valves A or B for opening or closing of the bowl or in the event of failure of the timing unit.

When changing over to manual operation, rapid-closing valve D is to be opened to the extent that sealing water flows out of the operating-water discharge (see no. 18 in dimensioned drawing on page 0/7) at a rate of approx. 50 l/h in order to assure continuance of the separating process.

If the solenoid valves are defective, close manually-operated valves **a** and **b.**

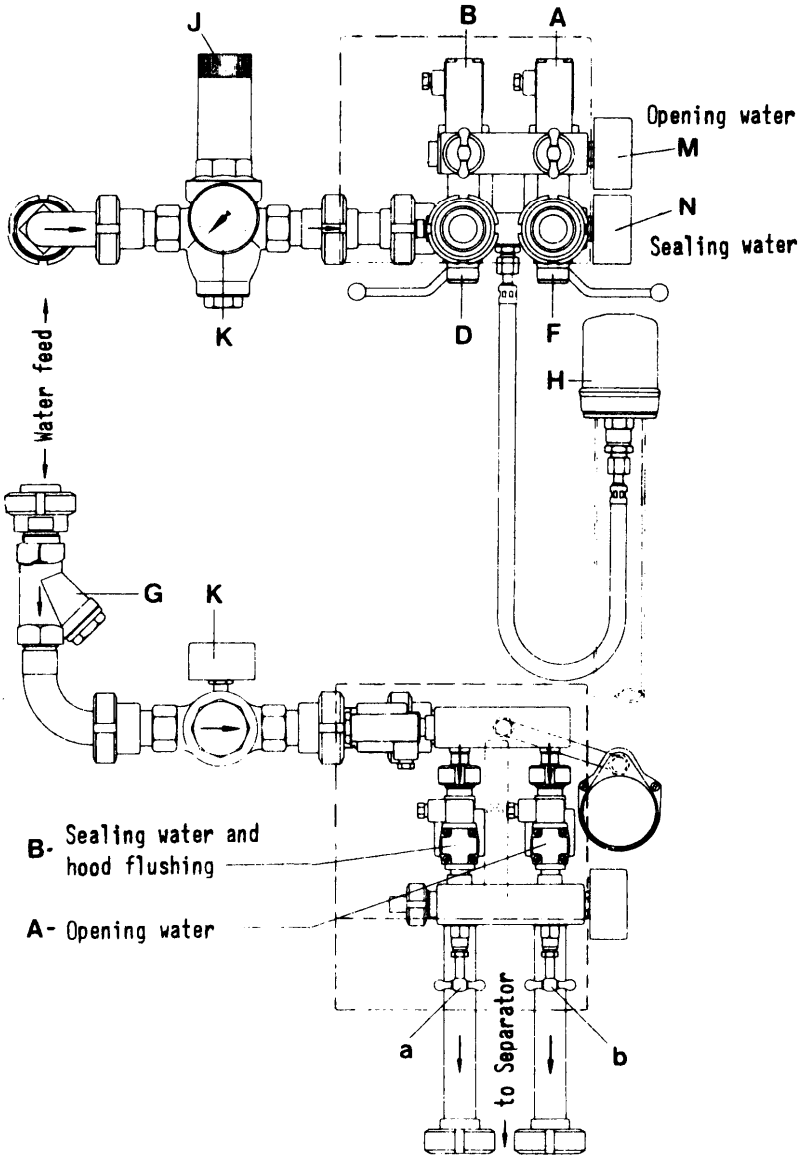


Fig. 5/4

Partial sediment ejection initiated manually

1) Open rapid-closing valve D all the way.

2) Open rapid-closing valve F in order to open the bowl. As soon as de-sludging noises can be heard, close rapid-closing valve F in order to close the bowl.

3) Throttle rapid-closing valve D so that sealing water flows out of the operating-water discharge at a rate of approx. 50 l/h.

Total sediment ejection initiated manually

1) Stop milk feed pump.

2) First open rapid-closing valve D, then open valve F.

3) When the de-sludging noises have stopped, close rapid-closing valve F and after about 5 seconds throttle rapid-closing valve D so that water will emerge from the operating-water discharge at the rate of 50 l/h.

5.3.2 Pressure switch

For proper functioning of the automatic control a pressure of at least 0.6 bar is required while closing-water valve D is open. At a lower pressure the bowl will either not open or not close. For this reason the operating-water line is provided with pressure switch H which signals pressure drop below the minimum value by giving an audible or visible alarm. If it is not possible to re-establish the required water pressure immediately, the switch "Separation" on the timing unit is to be opened and the milk supply is to be stopped. Partial de-sludgings will no longer take place, and pilot lamp "Separation" will go out.

5.3.3 Solenoid valves

The solenoid valves incorporated in the operating-water system are 2/2-way straight-flow diaphragm valves with internal piloting.
The solenoid coil is entirely embedded in Epoxy resin which ensures protection against moisture, good dissipation of heat, and perfect electrical insulation. The valves are fully tropicalized.

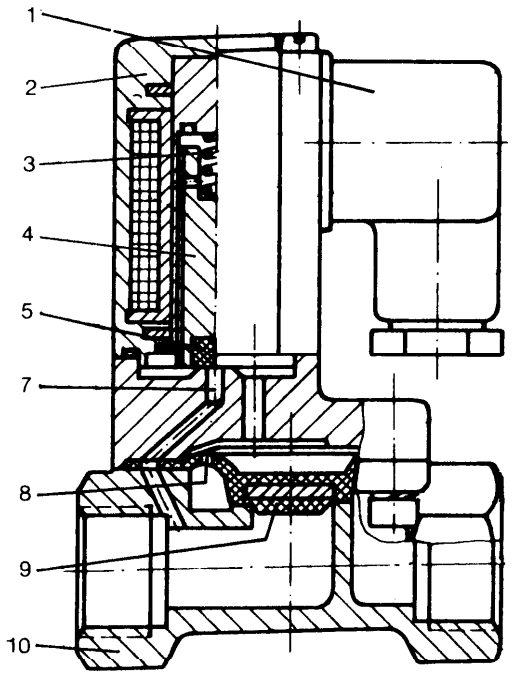


Fig. 5/5

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

Operating principles

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

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

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

Maintenance

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

Locating electric troubles

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

In the event of a defective solenoid coil, the solenoid head can be removed from the valve. To do this, remove first the coupler socket (loosen screw and pull out the socket), then loosen the fillister head screws. **Note:** Before doing so, shut off the main valve vor operating water.

Since the solenoid coil is entirely embedded in the solenoid head, the complete solenoid head (No. 0018-3710-800, see page 17/3) has to be replaced.

Technical data

Solenoid valve	Type	40 A / 121
Part - Number		0018-3711-600
Pipe connection	R	3/8"
Voltage	V	220 AC
Frequency	Hz	50/60
Optional voltages	V	24 AC, 115 AC 24 DC
Power consumption: pull-in	VA	approx. 20
(AC operation) operation	VA	approx. 16
(DC operation)	W	approx. 12
Duty cycle	%	100
Frequency of operations	/h	1,000
Type of enclosure	IP	65
Pressure range	bar	0.5 - 10
Temperature: medium	°C	+90
ambient	°C	+35
Cable entry	Pg	9

6.1 Starting the separator

1) Each time the separator is started check to be sure that:
   - the brakes are released by turning the handles clockwise,
   - the oil level in the gear-chamber is slightly above the middle of the sight glass,
   - hex head screws for fastening the hood and cap nuts for fastening the feed and discharge housing are tightened securely,
   - cream valve and skimmilk valve are open,
   - main valve in the operating-water line is open,
   - time function elements on the timing unit are set as specified in the instruction manual "Timing Unit".

2) Switch on main switch of timing unit.

3) Switch on the motor. After a delay time of 10 minutes closing water is supplied automatically; the bowl closes.

4) After another two minutes start the water circulation as it is commonly practised in dairies.

5) After switching over to milk processing, operate "separation" switch on the control cabinet. Then adjust operating discharge pressure and the cream flow rate as follows:

Operating pressure and cream flow rate

Throttle skimmilk valve and at the same time set the desired quantity of cream on the cream valve. Once the desired level of cream has been set, the skimmilk valve must be throttled until slight overflow occurs. To check the overflow, open inspection cover of hood a little. The pressure indicated by the pressure gauge at the moment of overflow is to be considered as maximum pressure. The skimmilk valve must now be opened until the pressure falls to 0.3 - 0.5 bar below this maximum figure.

If the separator is equipped with a constant-pressure valve, the operating pressure has to be adjusted by means of this valve (by adjusting the air pressure on the pressure reducer in the timing unit). Thus, daily adjustment is eliminated.

Separation temperature

The separation temperature should be 50 - 55 °C. If the milk tends to precipitate too much albumin, the separating temperature should under no circumstances exceed 55 °C.

Partial de-sludgings

The separation programme is controlled automatically by the timing unit (see sect. 6.2).

Separation time:	1 hour when separating milk 15 - 30 minutes when separating whey
Amount of ejected solids:	3 l when separating milk 5 l when separating whey

Sterilizing tank

Approx. 20 l of liquid flow into the sterilizing tank during each partial de-sludging cycle (3 l dirt and 17 l rinse water). The tank can hold the liquid from five de-sludging cycles. After the addition of 1 kg of alkaline cleaning agent, the liquid in the sterilizing tank is then steam-heated up to a temperature of 95^{0} C and maintained at this temperature for a period of ten minutes. It can then be discharged.

The separator in operation

For the maximum back-pressure in the process equipment connected downstream permissible for the centripetal pumps supplied, refer to page 18/1.

To fully utilize the discharge pressure of the cream pump, e. g. when the separator is used for milk clarification where cream and skim milk are re-combined after separation, adjust the skim milk valve to the highest possible discharge pressure.

When clarifying milk, it may happen that cream with too high a butterfat content is discharged from the separator although the cream valve is open and maximum pressure is prevailing in the skim milk line. This indicates that the back-pressure is too high for the cream pump. To overcome this difficulty, the back-pressure of the equipment downstream of the separator has to be reduced or a booster pump has to be installed.
It should be noted that cream with a very high butterfat content will cause the measuring rod in the cream flowmeter to rise due to the high viscosity of the cream, thus indicating a flow rate that is higher than the actual cream flow.

If there is overflow despite a low skim milk discharge pressure, check the gaskets in the centripetal pump chamber cover and on the pump shafts for damage.

In some cases, especially when using heaters with a low back-pressure, it is advisable to fit a throttle into the line upstream or downstream of the heater and to set it to about 1.5 bar in order to ensure foamfree operation of the separator.

Possible causes of inefficient separation

- Unfavourable pre-treatment of the milk (pumps, agitator, very high temperature, cold storage of raw milk over a long period).
- Variations in temperature, bowl speed, throughput capacity or skim milk pressure.
- Re-mixing of cream and skim milk after separation, e. g. caused by leaking cocks in pipe lines connected for drink milk production.
- Homogenized return milk or sweet cream buttermilk added to the raw milk.

Analysis of milk samples

Skim milk samples should always be taken at the screwed union of the skim milk discharge.

If the trouble cannot be found with the separator or with the equipment ahead of the separator, check condition of chemicals used to analyse the skim milk. To test this, fill water instead of skim milk into butyrometers.

6.2 De-sludging of the bowl (solids ejection)

6.2.1 Partial de-sludging

Partial sediment ejection during milk processing means partial emptying of the sediment space of the bowl. **The milk supply to the bowl is not interrupted during partial sediment ejection.**

To accomplish partial ejection, opening water is briefly fed to the bowl via solenoid valve A (Fig. 5/4). The duration of opening-water supply (= duration of partial ejection: 0.5 to 2 seconds) varies with the amount of ejected sediment and must, therefore, be determined by tests which can be carried out with water. During each partial ejection an additional amount of approx. 0.2 l/sec. of flush water flows off through the sediment discharge. This amount is to be deducted from the measured total volume.

When separating milk, adjust the duration of partial ejection so that approx. 3 litres will be ejected from the bowl.

When separating whey, adjust the duration of partial ejection so that approx. 5 litres will be ejected from the bowl.

Programme sequence, programme times

When the time adjusted at the time function element on the control cabinet has elapsed (milk separation: 1 hour, whey separation: 15 - 30 minutes) the first partial de-sludging cycle follows automatically and is repeated subsequently at regular intervals. Time element "pre-flushing" is to be set so as to ensure opening of solenoid valve B "sealing and flush water" (Fig. 5/4) 10 seconds before each partial ejection. Water is injected into the hood to prevent the sediment from adhering to the walls of the bowl. For solids ejection, solenoid valve A "opening water" opens for 0.5 - 2 seconds, which likewise is to be determined by adjusting the time function element "partial de-sludging" on the control cabinet. The sealing and flush-water valve B remains open throughout the de-sludging cycle and for 60 seconds after its completion. The period of time for which this valve is to remain open after sediment ejection (at least 60 seconds) can be adjusted by means of time function element "subsequent flushing".

By operating push button "partial sediment ejection", the separating process is interrupted and a partial sediment ejection is initiated immediately. When this enforced partial de-sludging cycle is finished, the programme automatically re-starts the separating process.

6.2.2 Total de-sludging

Total de-sludgings during cleaning-in-place can only be initiated manually with timing unit TVE 2-M. (For the automatic cleaning-in-place a separate CIP unit is required, see relevant brochure.)

The switch "Separation" on the control cabinet is to be kept switched on. To initiate the total ejection, push button "total de-sludging" has to be actuated.

Provided that the electrical installation has been carried out properly (see installation plan of timing unit) the feed pump(s) is (are) automatically switched off by pressing push button "total de-sludging" and re-started automatically approx. 1 minute after total ejection. Interruption of the liquid supply to the bowl by stopping the feed pump is necessary for the recovery of the bowl speed which drops slightly during total ejection.

After re-filling of the bowl (check increase of discharge pressure on separator), another total ejection can be initiated by again pressing push button "total de-sludging".

Should the feed pump(s) fail to stop automatically during total ejection, switch off pump(s) manually and re-start it (them) 1 minute after total ejection.

6.2.3 Manually controlled de-sludgings

In case of emergency (e. g. failure of the timing unit or of the solenoid valves), the bowl can also be emptied by opening and closing the by-pass valves associated to the solenoid valves (see 5.3.1). During sediment ejection, the bowl speed will drop slightly. Bear in mind that sediment ejection is allowed to be repeated only when the bowl has re-attained its operating speed.

6.3 Stopping the separator

1) **Flushing the plant with water** (not necessary if cleaning-in-place has been carried out after milk processing).

   a) Cut off milk supply to separator (stop feed pump).

   b) Displace remaining milk out of the bowl with water.

   c) Flush the plant with water thoroughly.

   d) Initiate total de-sludging by operating push button "total de-sludging" on control cabinet.

   e) Carry out 1 - 2 flush de-sludgings to ensure that no dirt remains in the bowl. Flush hood after each de-sludging by operating push button "overflow".

2) Switch off motor.

3) Apply brakes by turning both handles in anti-clockwise direction.
   IMPORTANT! Do not loosen any part before the bowl has stopped completely!
   Only when the fan of the motor has stopped rotating is the bowl at a standstill.

7.1 Cleaning-in-place

The separator is generally included in the CIP cycle of the pasteurizers. For cleaning the separator, the detergents used for cleaning the pasteurizers will be adequate. However, be sure that the last cleaning agent to be circulated is acid.

After milk processing, the residual milk is displaced and the whole equipment thoroughly flushed with water. Flushing is followed by two "total ejections" accomplished by pressing the push button "total ejection" on timing unit TVE 2-M.

The plant must be flushed with water and subsequent flush de-sludgings have to be performed even if the plant cannot be CIP-cleaned for some reason after milk processing.

The CIP-programme should comprise the following programme steps:

1) Flushing with caustic solution,
2) Flushing with water,
3) Flushing with acid solution,
4) Flushing with water.

IMPORTANT: Each of the programme steps 1 - 4 should be finished up with a total ejection.

During each programme step the spring-controlled constant-pressure valve incorporated in the skim milk line is to be throttled several times by actuating the snap closure (cover). This will cause flooding of the centripetal pump chamber of the separator, resulting in thorough flushing of hood and sediment collector. If the separator is not equipped with a constant-pressure valve, the valve in the skim milk line must be throttled several times by hand.

IMPORTANT: Bear in mind that bowl parts of stainless steel will be attacked by chlorine. Therefore, make sure that detergents are free from chlorine.

7.2 Cleaning the bowl

It is not normally necessary to dismantle and clean the self-cleaning bowl upon completion of the separation process, provided that cleaning-in-place has been adequately performed while the bowl was still moving. How often it is necessary to clean the bowl by hand is dependent on the nature of the product and can only be determined by tests.

However the bowl should be dismantled once a month for the purpose of checking and manual cleaning.

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

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

Carefully clean the small holes for feed and discharge of the operating water in bowl bottom as well as the piston valve to assure trouble-free performance of the solids ejection process.

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

Re-assemble bowl immediately after cleaning.

7.3 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 (see 4.3) place splash cover 406 over the spindle to prevent wash liquid from seeping into the drive and rendering the lubricating oil unserviceable.

Never aim a water jet directly at the separator for the purpose of cleaning. Clean it by hand with a sponge or cloth.

7.4 Cleaning the operating-water feeding system

The small holes in the operating-water feeding device should be cleaned every 3 - 6 months.

7.5 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.

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

Prior to a long-term shut-down, clean the separator thoroughly (see 7.2 and 7.3). The clean bowl parts and all unvarnished machine parts should be wiped dry and greased to avoid corrosion. The clean grease-coated bowl should be kept in a dry place.

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

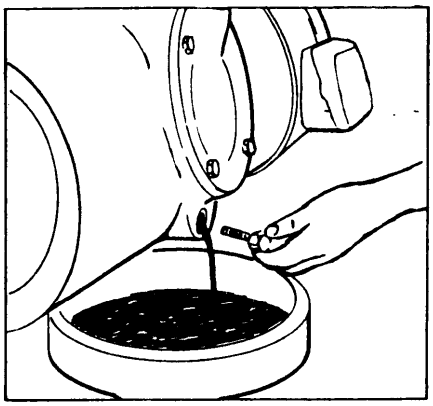
Drain the lubricating oil and fill gear chamber with corrosion-preventing oil, e. g. SHELL Ensis Oil 30. Oil level must be up to middle of sight glass. Let separator run without bowl for approx. 10 minutes to make sure that all gear parts are coated with the corrosion-preventing oil. Then drain the oil. Oil upper end of spindle by hand and protect it with splash cover 406.

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

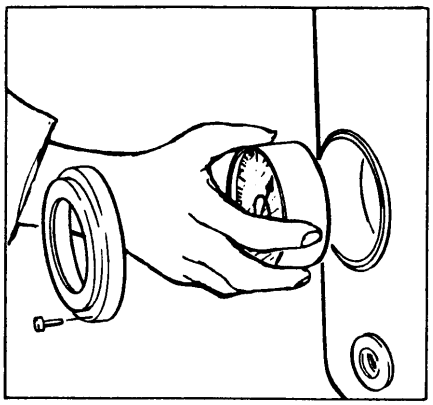
Stop operating-water supply at the branch point of the water mains to prevent inrush of water into the separator, caused by unintended opening of the shut-off valve.

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

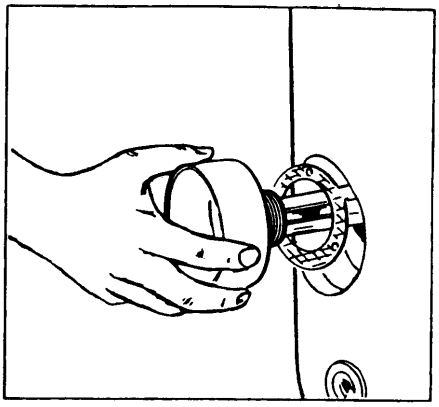
8.1 Dismantling the vertical gear parts (unfold page 14/2)



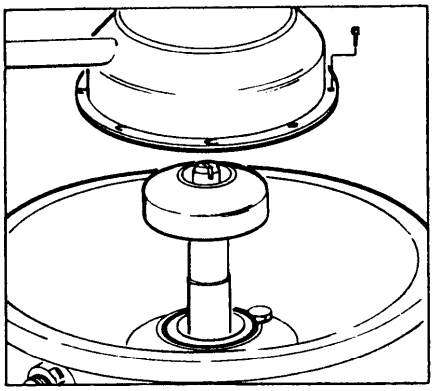
1) Remove oil drain screw. Drain off oil.



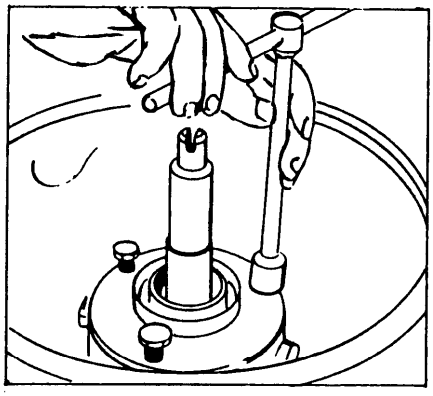
2) Remove cap. Screw out tachometer by hand.



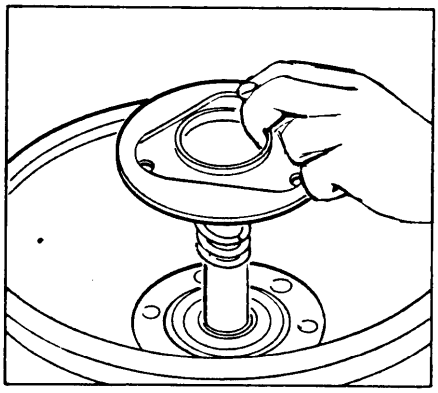
3) Remove screws. Withdraw tachometer drive. Remove gasket.



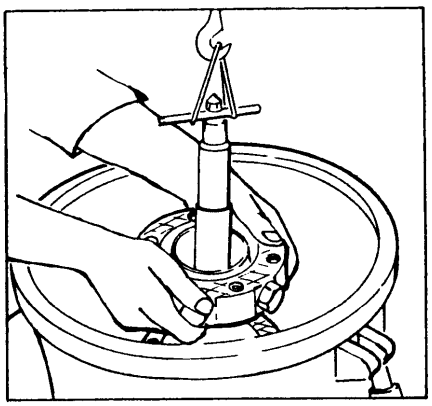
4) After removing the operating-water connection and bushes 22 and 38 (fig. 13/1) take off the operating-water feeding device and the spindle cap.



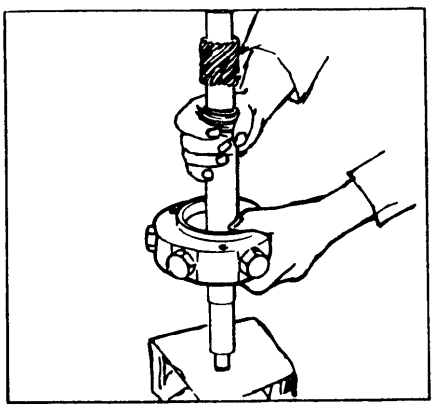
5) Remove screws.



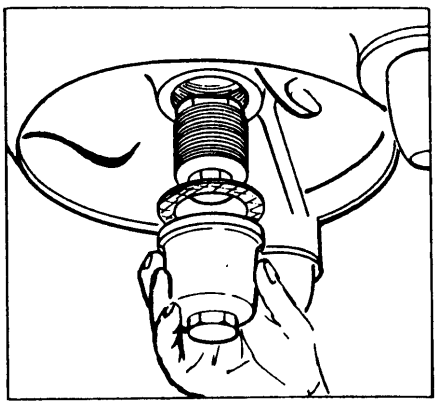
6) Remove neck bearing protection cap and spindle spring.



7) Fasten pipe 428 to worm spindle by means of spindle screw 12 (fig. 19). Then pull out worm spindle together with neck bearing bridge.



8) Invert the worm spindle. Remove the neck bearing bridge by tapping the end of the spindle against a wooden block.



9) After removing bottom bearing cap and gasket, unscrew bottom bearing threaded piece and remove it together with the bottom bearing.

8.2 Assembling the vertical gear parts

In order to assemble the vertical gear parts, proceed in the reverse order to that described in section 8.1. The instructions in sect. 8.2.1 and 8.2.3 must also be followed.

8.2.1 Important tips for assembly

- The gear chamber must be thoroughly cleaned every time before the vertical gear parts are re-installed (7.5).
- For safety reasons, the ball bearings of the worm spindle and the worm wheel shaft must be replaced every 5,000 operating hours.
- Check the ball bearings on the worm spindle before re-installation. N.B. Use only the precision ball bearings which are indicated in the spare parts list.
- Before the ball bearings and the ball bearing protection rings are placed over the spindle, they must be warmed in an oil bath to a temperature of approx. 80 ^{0}C.
- The assembled spindle must slide into position without having to be hit with a mallet. It must be possible to move the spindle assembly axially by hand. Should this not be possible, any burrs in the bottom bearing housing must be removed with fine emery cloth.
- When a new worm spindle 1a is installed, it is advisable to replace the entire worm wheel assembly with clamp plates 10 (see fig. 15). Otherwise the old unit might cause premature wear to the new worm spindle.
- Before the neck bearing protection cap is installed, check whether the cams on distance ring 6b are either aligned with or else lie only a small distance below (not more than 2 mm) the surface of the neck bearing pressure ring 6f. If this is not the case, proceed according to instructions in sect. 8.3.2, third paragraph from the end.
- When the complete neck bearing bridge assembly 6f-m is being installed, ensure that the gaskets 6d and 6n are not damaged.
- N.B. Whenever the vertical gear parts have been installed, the height of the bowl must be checked and re-adjusted if necessary (see 8.3).

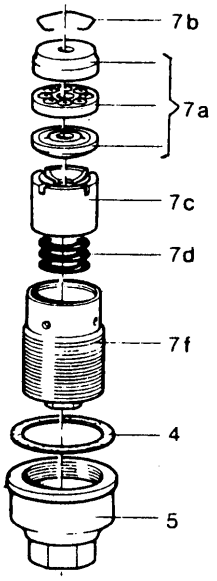


Fig. 8/2

8.2.2 Assembling the bottom bearing

Clean all parts of the complete bottom bearing (7a-f) thoroughly.

Place pressure spring 7d into bottom bearing pressure piece 7c and fit both into bottom bearing threaded piece 7f.

Place the complete set of bottom bearing running parts 7a into the bottom bearing threaded piece:

bottom bearing pressure disc,
ball cage,
bottom bearing running disc.

Place snap ring 7b into bottom bearing threaded piece.

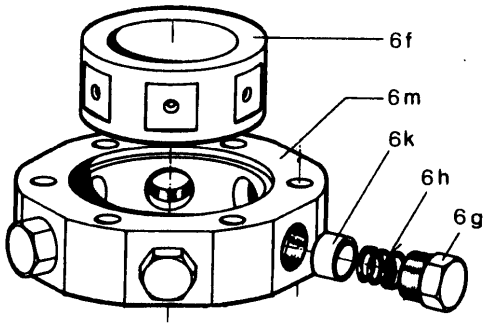


Fig. 8/3

8.2.3 Assembling the neck bearing bridge

The upper ball bearing on the spindle is contained in pressure ring 6f. The latter is held in place by six radially arranged equally distributed springs 6h.

Place pressure ring into neck bearing bridge 6m so that the six recesses on the pressure ring are aligned directly with the six holes in the neck bearing bridge.

Thoroughly grease spring pistons 6k. Place neck bearing springs 6h into spring pistons and insert both into threaded plugs 6g.

Screw threaded plugs together with inserted spring and piston into the six tapholes in the neck bearing bridge.

8.3 Bowl height

8.3.1 Checking the bowl height

IMPORTANT: The bowl height is adjusted at the factory before the separator is shipped. It must be checked for re-adjustment before the first start of the separator, after re-assembling the vertical gear parts, after exchanging the bowl or the centripetal pump, and as soon as the centripetal pump shows any grinding marks.

Prerequisite to correct bowl height adjustment is that

- the bowl is properly closed (the "O" marks on bowl lock ring and on bowl bottom must be in line with each other),
- the hood is properly seated on sediment collector and hex head screws are tightened **securely,**
- upper centripetal pump is screwed onto lower centripetal pump as far as it will go and that centripetal pump assembly is screwed all the way into the disc.

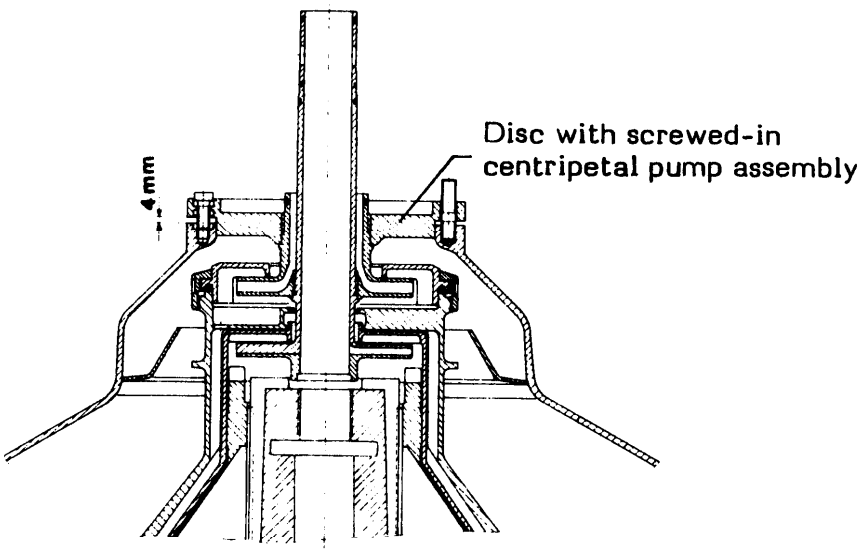


Fig. 8/4

The bowl height is correct when the disc with the screwed-in centripetal pumps can be raised by about 4 mm. Otherwise the bowl height has to be re-adjusted (see 8.3.2).

8.3.2 **Adjusting the height of the bowl** (unfold page 14/2)

To adjust the height of the bowl, proceed as follows:

Screw off bottom bearing cap 5. Adjust the bowl to its correct height (see fig. 8/4) by turning bottom bearing threaded piece 7f. One complete revolution of the bottom bearing threaded piece raises or lowers the bowl by 2 mm.

If the gap shown in fig. 8/4 is **greater than 4 mm,** the bowl is too high. Try first of all to press the bowl down, as it can happen that it has not fully settled under its own weight. If the gap is still greater than 4 mm, then the bottom bearing threaded piece must be turned **anti-clockwise** in order to lower the bowl.

If the gap shown in fig. 8/4 is **smaller than 4 mm,** the bowl is too low. The bottom bearing threaded piece must be turned **clockwise** in order to raise the bowl.

If the bowl has to be raised more than 1 mm, remove the bowl (see 4.3).
Remove operating-water connection and bushes 22 and 38 (see fig. 13/1). Undo screws 17 and remove operating-water feeding device 16 (fig. 13/1). Undo screws 6c and remove spindle cap 1b and neck bearing protection cap 6a. Then turn bottom bearing threaded piece 7f **clockwise** until bowl is adjusted to proper height.

Whenever the bowl has been lowered or raised, check whether the cams of distance ring 6b are in line with the surface of the neck bearing pressure ring 6f, or slightly below it (no more than 2 mm). In order to do so, it is necessary to remove the bowl, operating-water feeding device, spindle cap and neck bearing protection cap, if these parts have not already been removed before the bowl was raised (more than 1 mm). This check is not necessary if it was already carried out when the vertical gear parts were installed (see 8.2) and the bowl had not to be raised more than 1 mm.

If the cams of the distance ring protrude above the surface of the neck bearing pressure ring, they must be filed down. If they lie more than 2 mm below the surface of the neck bearing pressure ring, they must be raised by welding. If this is impossible, then a new distance ring with the correct cam height must be ordered from our factory.

After the gap between the distance ring and the neck bearing pressure ring has been checked, the parts which had been removed can be reassembled.

When re-installing the operating-water feeding device ensure that gaskets 21 (fig. 13/1) are in perfect condition.

Screw the bottom bearing cap 5, which serves as a lock nut for the bottom bearing threaded piece, back tightly into position with gasket 4.

8.4 The centrifugal clutch (unfold page 15/2)

8.4.1 General

The centrifugal clutch gradually accelerates the bowl to the desired speed. It reduces strain on the motor and gear to a minimum. The power from the motor is transferred to the clutch drum via eight (50 Hz) or five (60 Hz) clutch shoes, which are fitted in the slits of the clutch driver, and subsequently to the gear parts.

The condition of the clutch shoes must be checked every four weeks. The linings must be renewed before they wear down to the rivets, so that the latter do not damage the clutch drum. If the clutch drum is damaged then it would cause premature wear to the clutch linings. To ensure smooth running, the linings of all clutch shoes must be changed at the same time. Never replace the lining on just one clutch shoe. It is recommendable to replace the complete clutch shoes.

8.4.2 Removing the clutch shoes

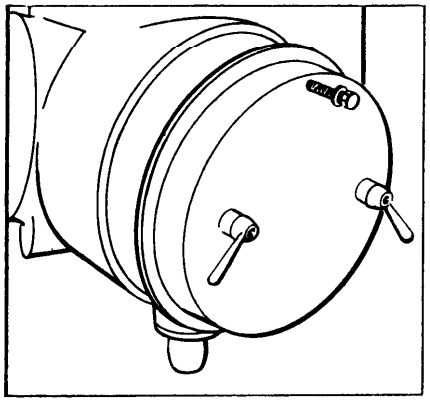


Fig. 8/6a

1) Undo screws. Take off washers and cover.

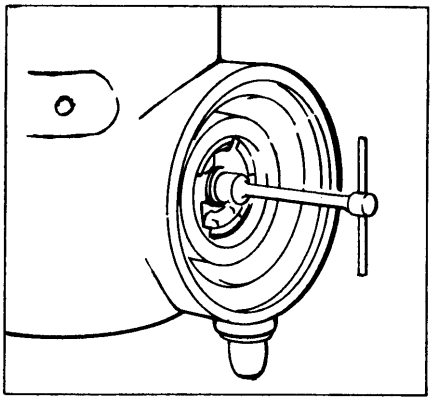


Fig. 8/6b

2) Undo nut with wrench 417. Hold worm wheel shaft.

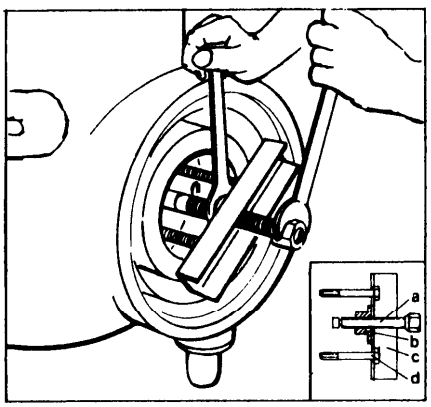


Fig. 8/6c

3) Use pulling device 423 to remove the clutch driver from the worm wheel shaft:

   a) Fasten device to clutch driver by means of screws **d** (M 12x110). Ensure that nut **b** is on the clutch side. (Refer to drawing opposite.)

   b) Screw in threaded spindle **a** by hand. Ensure that the point of the spindle presses into the centering hole on the worm wheel shaft.

   c) Remove the clutch driver together with the clutch shoes by turning the threaded spindle in clockwise direction and by holding the nut (SW 27) at the same time.

4) Remove the clutch shoes from the slits of the clutch driver.

8.4.3 Installation of the clutch shoes

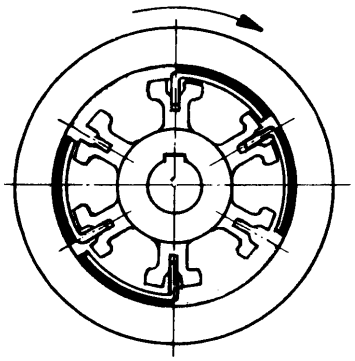


Fig. 8/7a
Clutch driver with eight clutch shoes

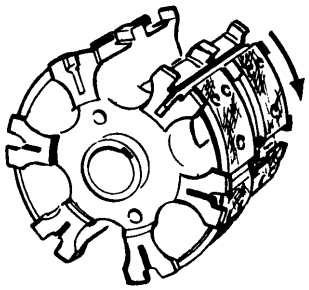


Fig. 8/7b
Clutch driver with clutch shoes

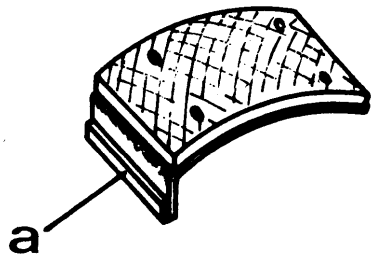


Fig. 8/7c
Clutch shoe

1) Insert the clutch shoes into the slits of the clutch driver in such a manner that they will be **pushed** by the driver and **not pulled** (see figs. 8/7a, 8/7b).
Make sure that the clutch shoes are loosely seated in the slits of the clutch driver.

2) Mount clutch driver by hand on the worm wheel shaft and push it against the shoulder of the shaft; if necessary, place a wooden block or the socket wrench 417 against the clutch driver and tap it gently with a hammer to facilitate mounting.

3) By means of the wrench screw the nut (fig. 8/6b) onto the worm wheel shaft. Tighten the nut by hitting against the handle of the wrench. Block the worm wheel shaft at the same time by putting a screwdriver through the clutch driver and the clutch drum up to the bearing cover.

4) Fasten the protecting cover (fig. 8/6a) with screws.

5) In case the centrifugal clutch emits disturbing noises during the acceleration period, apply a very thin film of grease to the lips "a" (fig. 8/7c) of the clutch shoes. If too much grease is applied, there is the chance that some might be thrown by centrifugal force on the friction surfaces, leading to clutch slippage.

Replacing the clutch shoe linings

When riveting on new linings, be sure not to damage the clutch shoes.

8.4.4 Removing the clutch drum

1) Remove the clutch shoes (see 8.4.2).

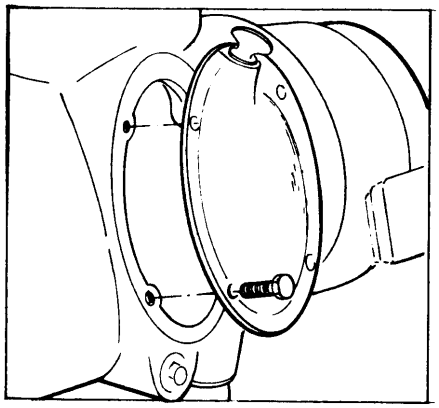


Fig. 8/8a

2) Remove gear chamber cover.

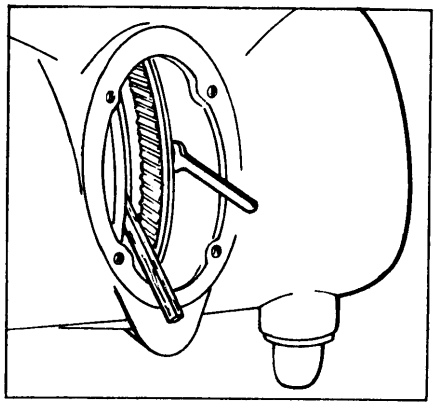


Fig. 8/8b

3) Undo long hex head screws in worm wheel and loosen clamp plates.

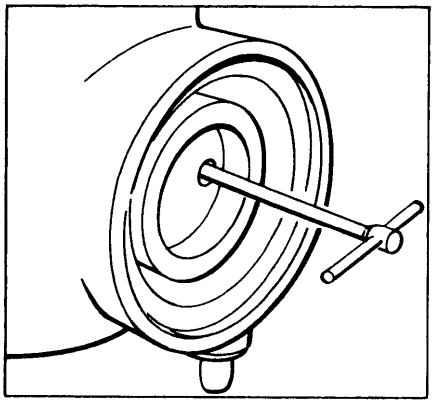


Fig. 8/8c

4) Use wrench 416 to remove the screws of the bearing cover through the holes in the clutch drum.

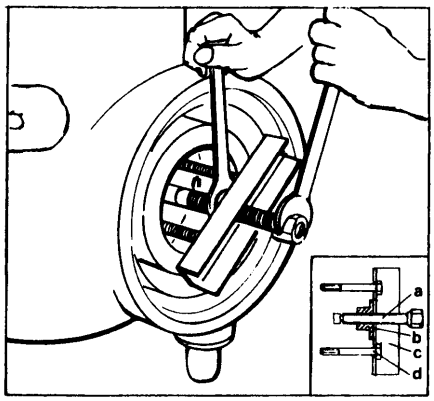


Fig. 8/8d

5) Use pulling device 423 to remove the clutch drum from the worm wheel shaft.

   a) Fasten device to clutch drum by means of screws **d** (M 12x140). Ensure that nut **b** is on the clutch side. (Refer to drawing opposite.)

   b) Screw in threaded spindle **a** by hand. Ensure that the point of the spindle presses into the centering hole on the worm wheel shaft.

   c) Remove the clutch drum by turning the threaded spindle in clockwise direction and by holding the nut (SW 27) at the same time.

6) Withdraw the bearing housing from the ball bearing.

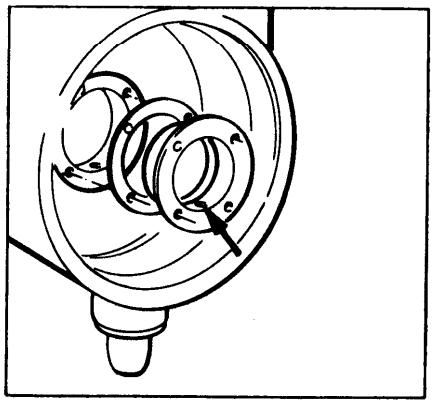


Fig. 8/9a

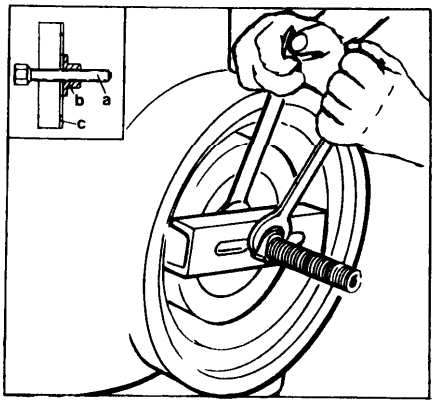


Fig. 8/9b

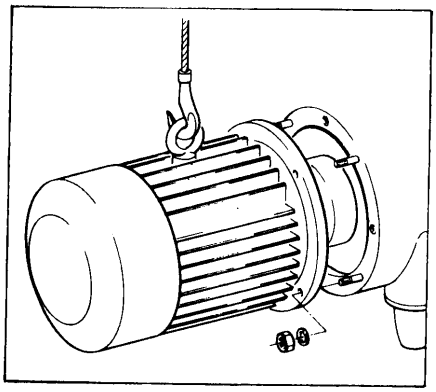


Fig. 8/9c

8.4.5 Installing the clutch drum

1) Install the bearing housing (with inserted gasket) in such a manner that the oil return groove is pointing downwards. Then align the bearing housing with the fastening screws so that the through-holes face the tapholes in the frame. Only then press the bearing housing into the frame.

2) Use device 423 to install the clutch drum:

   a) Assemble clutch drum, bearing cover and ball bearing and place carefully onto the worm wheel shaft.

   b) Attach device as shown in opposite drawing (nut **b** on the outside). Screw threaded spindle **a** onto worm wheel shaft.

   c) Hold threaded spindle (SW 27) and tighten nut **b** until the bearing which sits on the clutch drum is pressed into the bearing seat.

3) Proceed in opposite manner as detailed for removal: See 8.4.4, items 1 - 4. Before the screws for the bearing cover are screwed down, ensure that the oil return hole in bearing cover is pointing downwards.

8.5 Removal of the horizontal gear parts

8.5.1 Removing the motor

1) Remove lead-in wires from motor terminals.

2) Sling motor to hoist and tighten carrying rope.

3) Unscrew nuts and remove lock washers.

4) By means of hoist lift off the motor.

8.5.2 Removing the worm wheel shaft

1) Remove the motor (see 8.5.1).

2) Remove the clutch shoes (see 8.4.2).

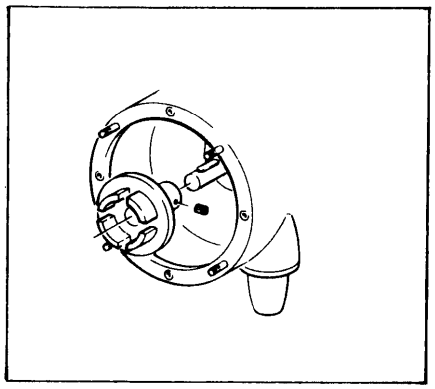


Fig. 8/10a

3) Loosen threaded pin. Pull off clutch hub.

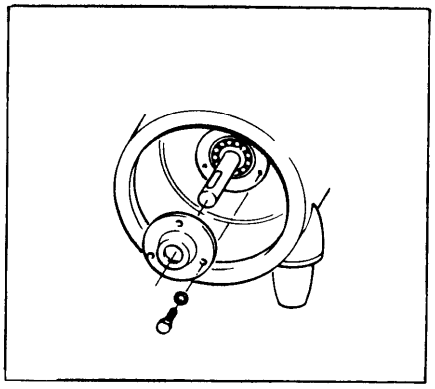


Fig. 8/10b

4) Unscrew screws holding the bearing cover.

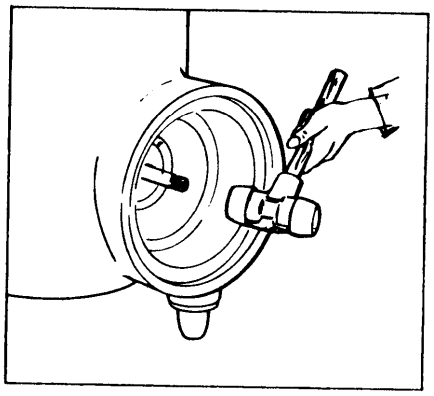


Fig. 8/10c

5) Drive out worm wheel shaft towards motor side by rapping with a rubber hammer on the shaft end. Then pull out the shaft by hand.

8.5.3 Removing the worm wheel

1) Remove the clutch drum (see 8.4.4).

2) Remove the worm wheel shaft (see 8.5.2). When the worm wheel shaft is being removed, keep hold of the worm wheel. Otherwise the teeth will be damaged.

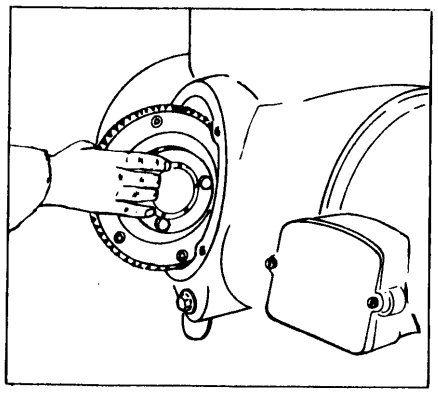


Fig. 8/10d

3) Remove the worm wheel from the gear chamber.

8.5.4 Removing the ball bearing on the motor side

1) Remove the worm wheel shaft (see 8.5.2).

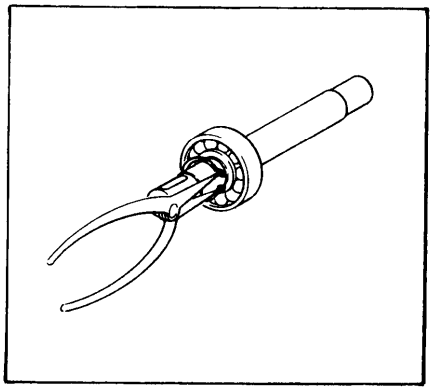


Fig. 8/11a

2) Use pliers 415 to remove securing ring from worm wheel shaft. Remove supporting disc.

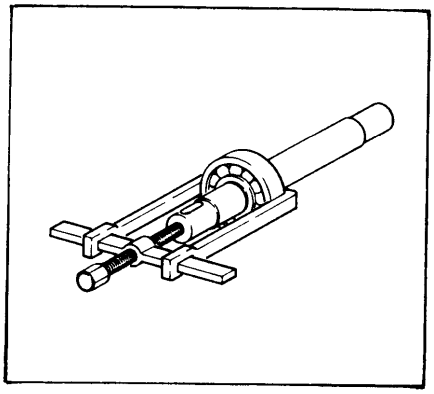


Fig. 8/11b

3) Remove ball bearing from worm wheel shaft.

8.5.5 Removing the ball bearing on the brake side

1) Remove the clutch drum (see 8.4.4).

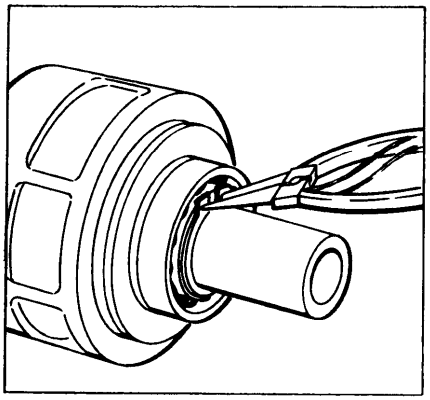


Fig. 8/11c

2) Use pliers 415 to remove securing ring from clutch drum.

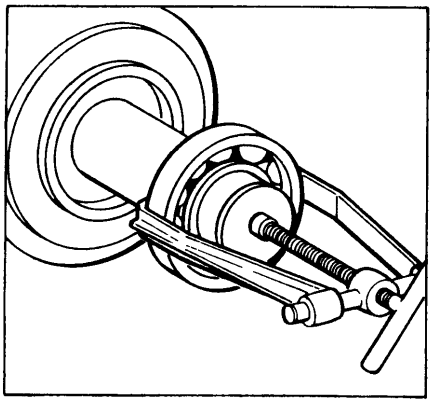


Fig. 8/11d

3) Pull ball bearing from hub of clutch drum.

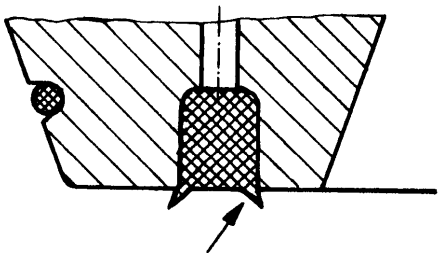
8.6 Installing the horizontal gear parts (unfold page 15/2)

Proceed in the opposite direction required for removing the horizontal gear parts (see 8.5). Bear in mind the following:

- For reasons of safety the bearings on the worm wheel shaft and the worm spindle must be replaced after every 5,000 operating hours.
- The complete worm wheel assembly 10, together with its clamp plates, has been balanced in our factory. In order to ensure smooth running, single parts should not be replaced individually. (This, however, does not apply to the clamp plates 10a and 10b).
- When the complete worm wheel assembly, together with its clamp plates, is being installed, push the worm wheel towards the clutch side until it rests against the shoulder of the clutch drum. This ensures correct positioning of the toothed rim with reference to the worm spindle.
- The worm wheel must be clamped securely to the hub of the clutch drum. This is done by tightening the screws in the two clamp plates crosswise. In order to facilitate this process, it is advisable to place the bowl bottom onto the spindle.
- **N.B.** When the toothed rim is being replaced, the complete worm wheel assembly 10, together with the clamp plates, must be replaced at the same time. The worm spindle 1a (fig. 14) should also be replaced, because it will also be worn and would cause premature damage to the new toothed rim.
- Once the new gear parts have been installed, the bowl can be lowered into place and set to the correct height (see sect. 8.3).
- Fill gear chamber to just above center of sight glass with oil indicated in sect. 2.
- Check spindle speed (see 3.3) and direction of bowl rotation (see 3.2).
- In order to run in the new gear parts (worm wheel and worm spindle), run the separator for about one hour **without the bowl.** During this running-in process, turn the motor on and off several times.

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 3.3).	Brakes are on.	Release brakes by turning handles clockwise.
	Motor is incorrectly connected.	See wiring diagram.
	Oil on surfaces of clutch shoes.	Wipe dry the surface of the clutch shoes. Do **not** use benzene, trichlorethylene or other solvents.
	Clutch shoe linings are worn.	Replace clutch shoes (8.4.2 and 8.4.3).
	Bowl is too high or too low and, therefore, rubs against centripetal pump.	Adjust to proper bowl height (see 8.3).
	Clamp plates are not tight enough; worm wheel slips on shaft.	Tighten long hex head screws on worm wheel evenly and **firmly.** Tighten crosswise, by single turns, with a torque of 45 Nm.
	Product feed valve is open.	Close product feed valve.
10.1.2 The bowl speed drops during operation.	Oil on surface of clutch shoes.	Wipe dry the surface of the clutch shoes. Do **not** use benzene, trichlorethylene or other solvents.
	Motor speed drops during operation.	Inspect motor and line voltage.
	Main bowl gasket 14 (Fig. 19) in bowl top is damaged.	Replace the gasket (see sect. 4.4).
	Gaskets in bowl valve 3 (Fig. 19) are damaged; the bowl loses sealing water.	Replace gaskets. The bowl can be kept closed temporarily by opening the rapid-closing valve D (Fig. 5/4) for sealing water.

Troubles	Causes	Remedies
10.1.3 Uneven run of the separator.	Incomplete solids ejection. The remaining solids have deposited unevenly in the bowl.	De-sludge the bowl several times (6.2.2). If this does not improve conditions, close the bowl and fill it with water to attenuate the increased vibrations occurring during slowing-down of the bowl.
		Stop the separator and apply brakes. If bowl is leaking, leave feed open. Clean bowl thoroughly. Remove protruding edges of bowl gasket with a knife (see sketch).
	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).
	Tension of disc stack has slackened.	Make sure bowl lock ring is screwed on tightly (see 4.1, item 14). Check disc count. If necessary, add spare disc or compensating disc.
	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.
	Neck bearing springs are weak or broken.	Replace all 6 neck bearing springs.
	Pressure spring in bottom bearing is broken, bowl is approx. 2 mm too low in the frame.	Put in new spring (see 8.2.2). Set bowl to correct height (see 8.3).
	Ball bearings are worn.	Replace worn bearings. **N.B.** Use only precision ball bearings (see spare parts list).

Troubles	Causes	Remedies
10.1.3 Uneven run of the separator (cont'd.)	Gear parts are in bad condition as a result of	Clean gear chamber thoroughly (see 7.5).
	1. normal wear,	Replace damaged gear parts (see 8.2.1 and 8.6).
	2. premature wear caused by: a) lack of oil b) oil of too low a viscosity, } in general, recognized by blue tempering colour of gear parts	Change oil (see chapt. 2). If necessary, change oil more often.
	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) infiltration of water because shut-off valves D and F (Fig. 5/4) for sealing water were open for a longer period during shut-down of the separator.	Regarding **infiltration of water,** the following should be kept in mind: During shut-down of the separator, the shut-off valves D and F must always be kept closed.
10.1.4 Bowl lock ring is difficult to loosen.	Bowl has not been dismantled at regular intervals (see 7.2).	Unscrewing of the bowl lock ring can be very much facilitated by blocking the bowl, which is accomplished by putting wedges between bowl bottom and sediment collector.

10.2 Bowl performance (Fig. 10)

Troubles	Causes	Remedies
10.2.1 The bowl does not close at all. **IMPORTANT:** In this case switch off feed pump inmediately.	The amount of sealing water fed to the bowl is insufficient because a) the water pressure in the supply line to the operating-water connection is too low (see 5.6). b) the water discharge holes in the top of the operating-water feed 11 are clogged with scale.	a) Check pressure in water supply line. The pressure should be at least 1.5 bar. The pressure reducer shall be adjusted to 1 bar (for adjustment refer to sect. 5.3). Check also if there is sufficient sealing-water coming in. The sealing-water valve opens for 60 seconds after the separator has reached its operating speed and after each solids ejection. During this time the amount of discharging sealing water should be measured at the operating-water discharge. The sealing-water must discharge at a rate of 550 l/h. Sealing water can be supplied as often as you like by switching on and off the main switch on the timing unit. b) Clean discharge holes.
	Gasket 12 has not been inserted or is damaged.	Install or replace gasket.
	Strainer G in operating-water line is clogged.	Clean strainer.
	Gaskets of piston valve 3 are damaged.	Remove valve (see 4.6) and install new gaskets.
	Solenoid valve A (Fig. 5/4) does not function properly, because the diaphragm has become brittle and, therefore, fails to seal properly.	Install a new diaphragm. Make sure that hole on outer rim of diaphragm lies over hole of valve housing.
	Rapid-closing valve F (Fig. 5/4) is damaged. There is a continuous flow of opening water to the bowl.	Install a new rapid-closing valve.
	Gasket 5 in sliding piston is damaged or its edges have been frayed through the up-and down movement of the piston.	Replace damaged gasket. If, however, only the edges of the gasket are frayed and the gasket is not damaged otherwise, it can be re-used after grinding it off with an emery wheel.
	The operating-water feed 11 is clogged.	Clean operating-water feed.

Troubles	Causes	Remedies
10.2.2 The bowl does not close and open properly.	Gasket 5 in sliding piston does not fit properly at all points of the guide surfaces, thus failing to seal properly.	If necessary, stretch gasket. Before installing the gasket, **lightly** grease groove in sliding piston.
	Gasket 7 in bowl top is damaged.	Replace gasket (see 4.4).
	Gasket 10 in bowl bottom has not been inserted or is damaged.	Insert gasket or replace it.
	Gasket 5 in sliding piston is uneven in height.	Replace gasket. The difference in height on a gasket must not exceed 0.25 mm.
	Sealing surface 8 of sliding piston is damaged.	Replace the sliding piston.
10.2.3 The bowl does not open at all or not completely.	Dirt or rubber particles have settled between sliding piston 1 and bowl bottom 4.	Clean bowl parts. Round off edges of gaskets. Replace damaged gaskets. Grease guide surfaces with the special lubricating paste supplied.
	Sealing chamber 2 between bowl bottom and sliding piston is soiled.	Remove sliding piston 1 and clean sealing chamber.
	The drill holes in bowl valve 3 are clogged.	Remove the valve (see 4.5) and clean it.

Diagram of bowl and operating-water feed system illustrating possible operating troubles

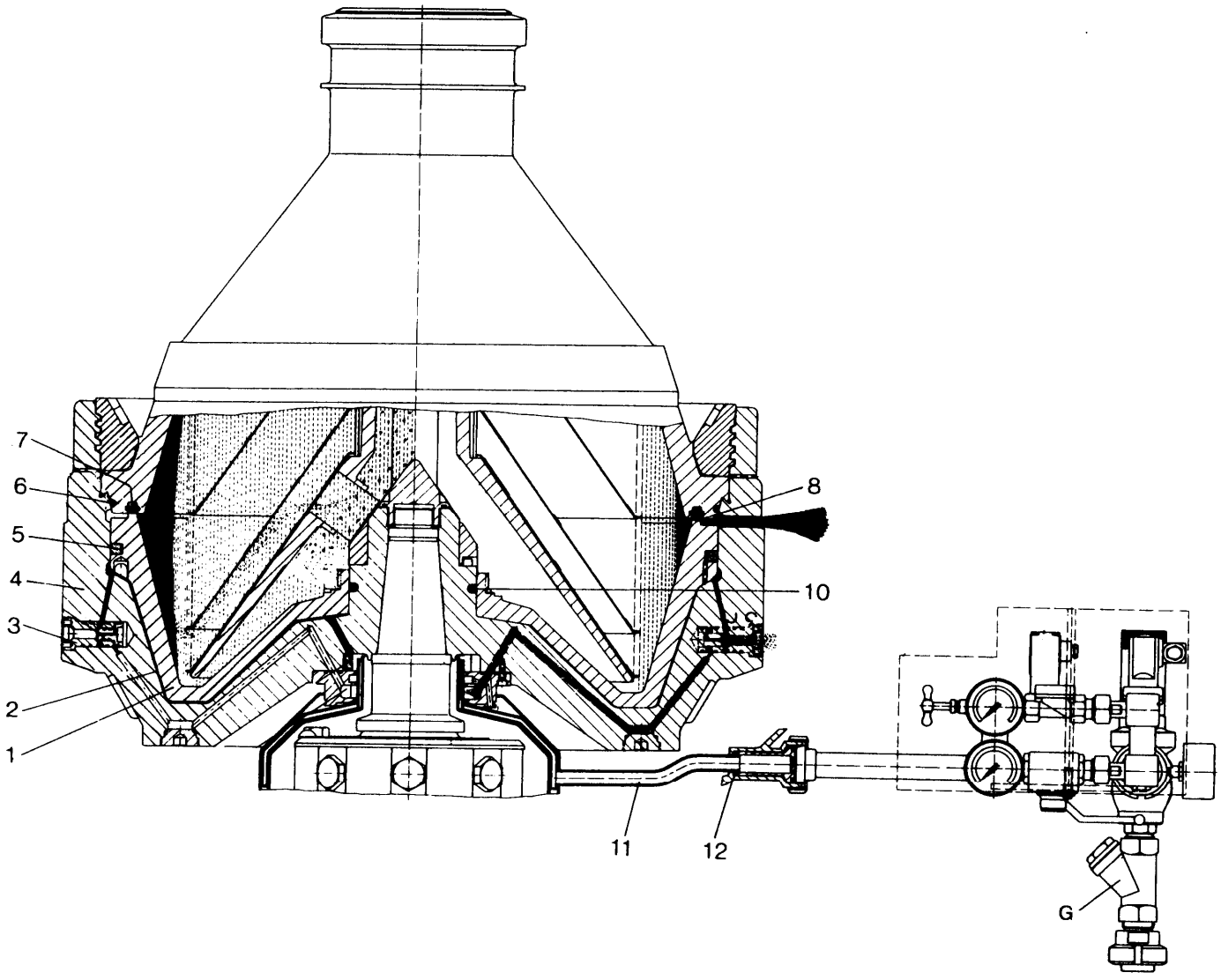


Fig. 10

		Operating hours							Maintenance	every				
	Lubricant	250	750	1500	2500	3000	5000	10000		week	3 months	6 months	1 year	2 years
Lubrication chart		▨							First oil change after initial start-up (see 2.1) and thorough cleaning of gear chamber.					
	O								Check oil level.	▨				
	O		▨						Oil change and thorough cleaning of gear chamber.			▨		
	O			▨					Lubrication of hand-operated parts such as brake bolt, valves, etc.			▨		
	MF	whenever disassembling							Grease bowl lock ring and guide and sliding surfaces of bowl parts.	whenever disassembling				
	F								Grease motor ball bearings according to manufacturer's instructions.					
Servicing program										▨				
	Cleaning		when necessary						Clean strainer in operating-water line.		when necessary			
				▨					Clean gear chamber (oil change).			▨		
						when necessary			Clean discharge holes in operating-water feeding system.			▨		
					▨				Remove bowl and clean interior of frame and sediment collector.			▨		
			product dependant						Dismantle the bowl and clean thoroughly bores and chambers of the hydraulic system.	product dependent				
	Inspection			▨					Check bowl gaskets.		▨			
				▨					Check starting time and rated speed.			▨		
				▨					Check neck bearing springs and spring pistons. Check brake linings.			▨		
						▨			After removing the gear sight glass, check gearing of worm wheel gear.				▨	
		product dependent							Check spaces between solids ejection holes.	product dependent				
							▨		Bowl inspection. Check threads of lock rings for erosion and corrosion.				▨	
	Replacement						▨		Replace ball bearings on spindle.					
							▨		Replace ball bearings on worm wheel shaft.					
							▨		Replace neck bearing springs.					

Abbreviations:

O = Lubricating oil

MF = Molykote D
Molykote DX
Klüber grease

F = Ball and roller bearing grease

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 sediment collector.
3) Description 4) Part-No.	of the part to be replaced: For details refer to 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-Numbers 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.**

No. in Fig.	Part - No. varnished	Part - No. st. st. clad	Qty.		Part Description
1	1169-1018-010	1169-1018-010	1		Solids collector
2	0007-2320-750	0007-2320-750	1		Gasket 45/55x5
3	0013-0404-400	0013-0404-400	2		Cap nut M8 DIN 1587
4	1169-1183-000	1169-1183-000	1		Plug
5	0007-2580-750	0007-2580-750	1		Gasket 42/2.5
6	0007-2212-750	0007-2212-750	1		Gasket G65 DIN 11851
7	0013-2846-300	0013-2846-300	1		Grooved coupling nut F65 DIN 11851
8	1169-1177-010	1169-1177-010	1		Bend
-	-	3182-3090-L	1	*	Motor with cover, complete (9a-d)
9a	-	0019-0205-300	1		Square-head bolt M 12x15 (on motor shaft)
9b	-	5990-7155-L	1		Motor type A 160 LA-4f B5, 17 kW, 50 Hz
9b	5990-4155-L	-	1		Motor type A 160 LA-4 B5, 17 kW, 50 Hz
9c	-	0019-2523-400	6		Lens head screw AM 8x15 DIN 85
9d	-	3182-1260-000	1		Cover
-	1055-1021-000	1169-1021-000	1		Flange assembly (10a-k)
10a	-	1169-1475-030	1		Cover
10b	0019-6175-150	0019-6175-150	6		Allen screw M 12x80 DIN 912
10c	0026-1328-190	0026-1328-190	6		Lock washer A12 DIN 127
10d	-	0019-6839-300	4		Hex head screw M 6x10 DIN 933
10f	0013-0282-400	0013-0282-400	4		Hexagon nut M 16 DIN 934
10g	0026-1330-190	0026-1330-190	4		Lock washer A16 DIN 127
10h	0019-7727-090	0019-7727-090	4		Stud M 16x45 DIN 939 - 5.6
10k	1055-1028-000	1089-1028-010	1		Flange
11	see page 13/4		1		Foot assembly (see fig. 13/3)
12	1055-1001-000	1169-1006-000	1		Lower section of frame
13	0019-6165-400	0019-6165-400	8		Allen screw M 12x30 DIN 912
14	0004-2286-400	0004-2286-400	8		Gasket 12.7x18x1.5
15	0007-2693-750	0007-2693-750	1		Gasket 562/572x5
16	1169-1219-010	1169-1219-010	1		Operating-water feeding device
17	0019-6124-400	0019-6124-400	8		Allen screw M 8x25 DIN 912
18	0004-2289-400	0004-2289-400	8		Gasket 9.3x13.3x1
19	0007-2623-750	0007-2623-750	1		Gasket 320/3
20	0007-2808-840	0007-2808-840	1		Gasket 545/563x9.8
21	0007-2521-750	0007-2521-750	2		Gasket G15 DIN 11851
22	1169-1074-000	1169-1074-000	1		Bush
23	0007-2208-750	0007-2208-750	2		Gasket G25 DIN 11851
24	0006-4115-160	0006-4115-160	3		Cylindrical pressure spring
25	0026-1371-400	0026-1371-400	3		Washer 13 DIN 125
26	0019-6985-300	0019-6985-300	3		Hex head screw M 12x110 DIN 933
-	1087-1043-010	1087-1043-010	2		Brake assembly (27a-h)
27a	0021-3536-300	0021-3536-300	2		Brake housing
27b	0004-1872-720	0004-1872-720	2		Gasket 13/25x2
27c	1087-1031-000	1087-1031-000	2		Brake bolt, complete
27d	0021-3515-300	0021-3515-300	2		Handle
27f	0006-4337-160	0006-4337-160	2		Cylindrical pressure spring
27g	0026-1086-030	0026-1086-030	2	**	Cylindrical pin 6h8x14 DIN 7
27h	0021-4101-880	0021-4101-880	2	**	Brake lining
-	0026-1262-550	0026-1262-550	8	**	Countersunk rivet 4x13 DIN 661 (for 27h)

* When ordering this part, please state also voltage and frequency.

** This part is included in brake bolt 27c, but it is also available as separate item.

No. in Fig.	Part - No. varnished	Part - No. st. st. clad	Qty.	Part Description
28	0019-3973-060	0019-3973-060	2	Threaded pin M 8x10 DIN 438
29	1055-1066-000	1169-1166-000	1	Cover
30	1159-1118-000	1159-1118-000	1	Baffle
31	0005-0964-000	0005-0964-000	1	Proximity switch NJ 2-11-SN-G
32	0013-3008-310	0013-3008-310	1	Nut M 14x1
33	1169-1154-000	1169-1154-000	1	Threaded piece
34	0013-3009-300	0013-3009-300	1	Nut M 20x1.5
35	0005-0202-630	0005-0202-630	1	Screw coupling
36	0007-2182-750	0007-2182-750	1	Gasket 20/26x3
37	0019-1439-300	0019-1439-300	1	Threaded plug M 20x1.5x10
38	1169-1074-010	1169-1074-010	1	Bush

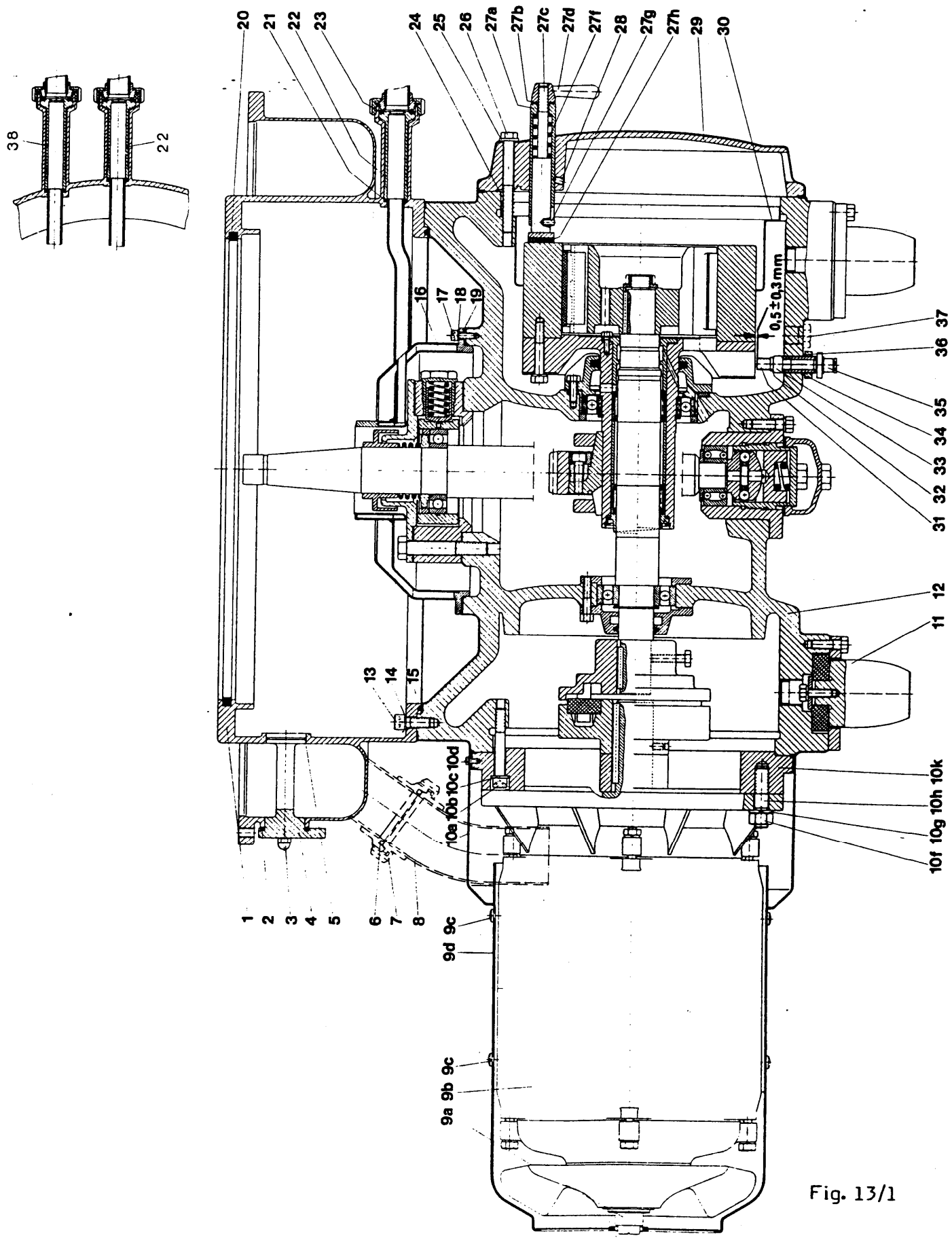

38
22
20
21
22
23
24
25
26
27a
27b
27c
27d
27f
28
27g
27h
29
30
16
17
18
19
0,5±0,3mm
37
36
35
34
33
32
31
12
11
13
14
15
10a
10b
10c
10d
10f
10g
10h
10k
1
2
3
4
5
6
7
8
9c
9d
9a
9b
9c

Fig. 13/1

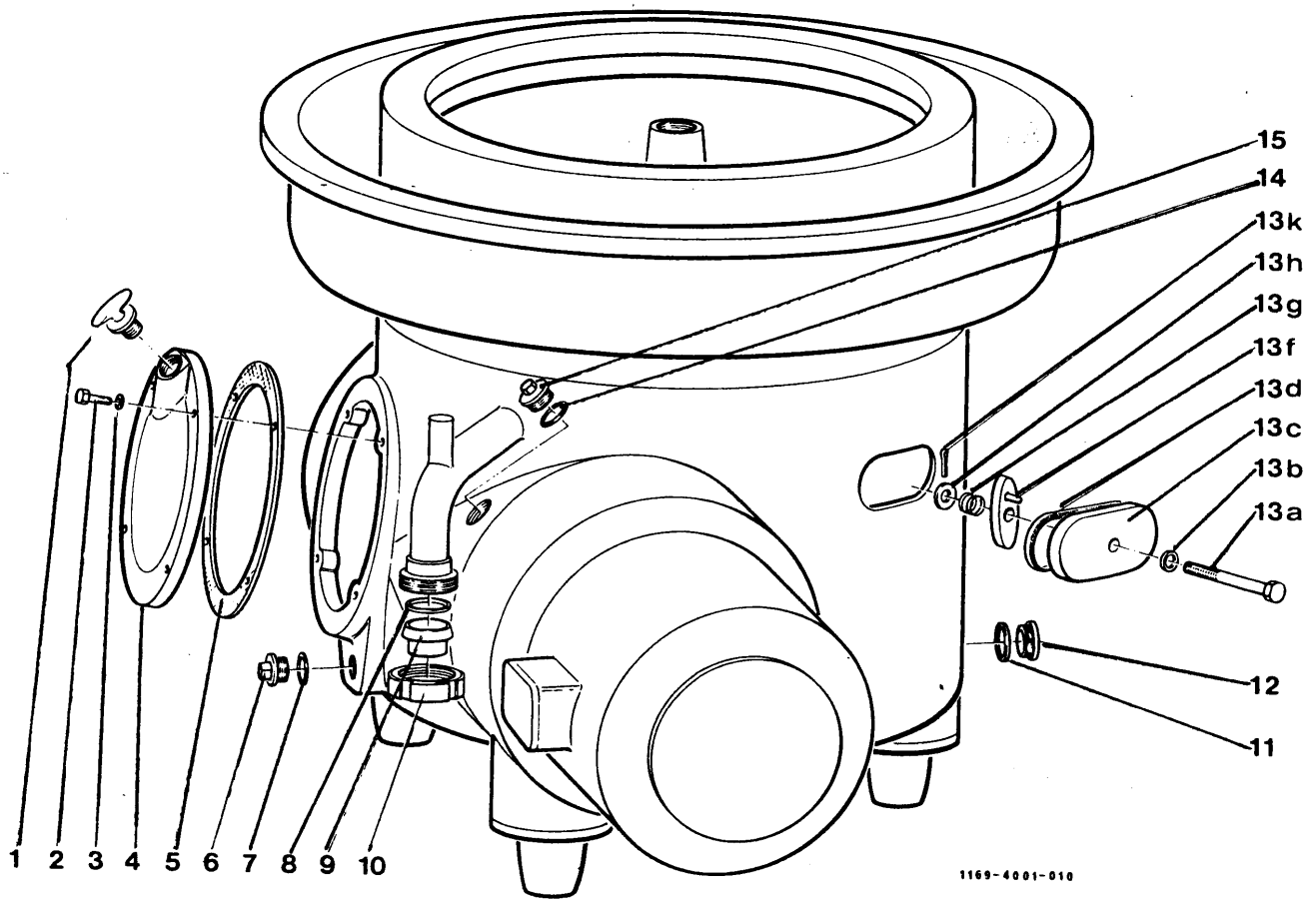


Fig. 13/2

No. in Fig.	Part - No. varnished	Part - No. st. st. clad	Qty.	Part Description
1	0019-1543-400	0019-1543-400	1	Oil fill screw
2	0019-6971-400	0019-6971-400	4	Hex head screw M 12x35 DIN 933
3	0026-1371-400	0026-1371-400	4	Washer 13 DIN 125
4	1087-1004-000	1087-1004-010	1	Gear chamber cover
5	0004-5631-700	0004-5631-700	1	Gasket 188x294x1
6	0019-1712-400	0019-1712-400	1	Oil drain screw
7	0004-5292-740	0004-5292-740	1	Gasket 24/36x2
8	0007-2210-750	0007-2210-750	1	Gasket G40 DIN 11851
9	0018-3949-300	0018-3949-300	1	Cone connection D40 DIN 11851
10	0013-2844-300	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
11	0004-5034-760	0004-5034-760	1	Gasket 35/44x1.5
12	0001-0006-640	0001-0006-640	1	Sight glass
-	1087-1060-000	1087-1060-010	1	Inspection cover, complete (13a-k)
13a	0019-0075-400	0019-0075-400	1	Hex head screw M 10x75
13b	0004-1868-710	0004-1868-710	1	Gasket 10/18x1
13c	1087-1061-000	1087-1061-010	1	Inspection cover
13d	0004-2360-918	0004-2360-918	1	Packing cord 5x5x335
13f	1087-1071-000	1087-1071-000	1	Locking bar
13g	0006-4112-160	0006-4112-160	1	Cylindrical pressure spring
13h	0026-1369-030	0026-1369-030	1	Washer
13k	0026-1003-000	0026-1003-000	1	Split pin
14	0007-2229-750	0007-2229-750	1	Gasket 40/48x5
15	0019-1748-400	0019-1748-400	1	Screw plug (EUPEX coupling)

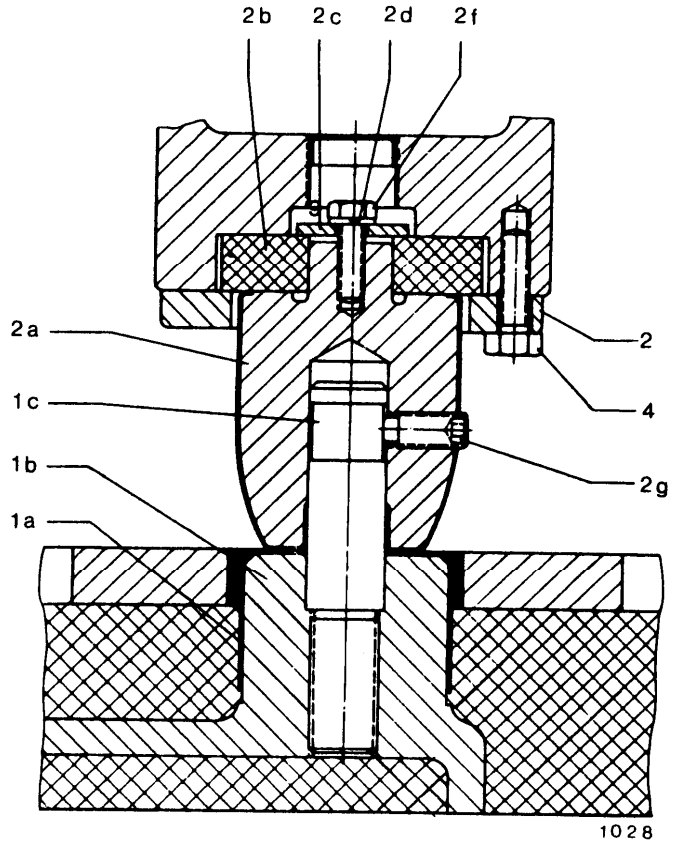


Fig. 13/3

No. in Fig.	Part - No.	Qty.	Part Description
-	1087-1020-000	1	Foundation frame assembly (1a-c)
1a	0026-2031-300	3	Cap
1b	1087-1003-000	1	Foundation frame
1c	1087-1033-000	3	Bolt
-	1087-1015-000	3	Foot assembly (2a-g)
2a	1087-1011-000	3	Foot, stainless steel coated
2b	0021-3018-750	3	Rubber cushion
2c	0026-5500-030	3	Washer 10
2d	0026-1337-190	3	Lock washer A10 DIN 127
2f	0019-6937-400	3	Hex head screw M 10x30 DIN 933
2g	0019-6387-400	3	Threaded pin AM 12x28 DIN 915
3	0001-0516-300	3	Flange
4	0019-6937-400	9	Hex head screw M 10x30 DIN 933

No. in Fig.	Part - No.	Qty.		Part Description
-	1169-3429-010	1		Worm spindle assembly **(50 Hz)** (1a-k)
1a	1169-3420-000	1	*	Worm spindle
1b	0008-5501-620	1		Spindle cap
1c	0006-4255-160	1		Cylindrical pressure spring
1d	0008-5508-050	1		Ball bearing protection ring 55
1f	0011-6211-110	1		Grooved ball bearing 6211 P6 DIN 625
1g	0008-3008-060	1		Ball bearing protection ring 30
1h	0011-2306-120	1		Pendulum ball bearing 2306 M/P6 DIN 630
1k	0007-2445-750	1		Gasket 63/73x3
2	1087-1112-000	1		Bottom bearing housing
3	0004-1830-770	1		Gasket 105/150x0.3
4	0004-5313-740	1		Gasket 72/92x2
5	0010-5803-200	1		Bottom bearing cap
-	0008-5500-040	1		Neck bearing bridge assembly with covering (6a-n)
6a	0008-5502-220	1		Neck bearing protection cap
6b	0008-5509-050	1		Distance ring
6c	0019-6616-150	3		Hex head screw M 16x100 DIN 931 - 8.8
6d	0004-5190-770	1		Gasket 135/218x0.3
-	0008-5510-090	1		Neck bearing bridge assembly (6f-m)
6f	0008-5507-090	1		Neck bearing pressure ring
6g	0019-1426-150	6		Threaded plug
6h	0006-4382-060	1		Set of neck bearing springs
6k	0026-5724-110	6		Spring piston
6m	0008-5506-080	1		Neck bearing bridge
6n	0004-5191-770	1		Gasket 148/218x0.3
-	0010-5800-030	1		Bottom bearing assembly (7a-f)
7a	0010-5810-040	1		Set of bottom bearing running parts
7b	0026-1480-170	1		Snap ring
7c	0010-5801-200	1		Bottom bearing pressure piece
7d	0006-4272-160	1		Cylindrical pressure spring
7f	0010-5802-020	1		Bottom bearing threaded piece
8	0026-1328-190	3		Lock washer A12 DIN 127
9	0019-6972-400	3		Hex head screw M 12x40 DIN 933

* When the worm spindle is worn and needs replacement, it is recommended that the entire worm wheel assembly with clamp plates 10 (fig. 14) be replaced at the same time. Otherwise it would cause premature wear to the new worm.

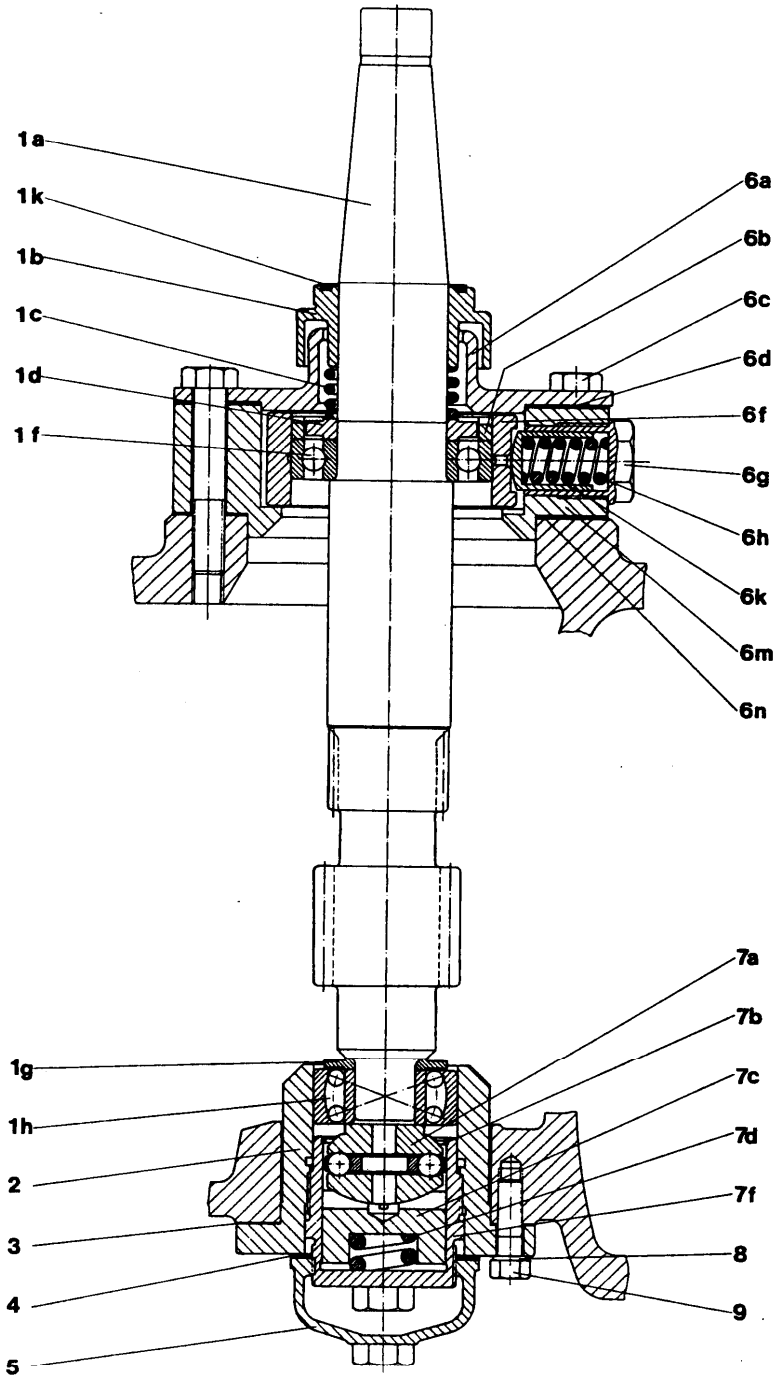

1a
1k
1b
1c
1d
1f
6a
6b
6c
6d
6f
6g
6h
6k
6m
6n
7a
7b
7c
7d
7f
8
9
1g
1h
2
3
4
5

Fig. 14

No. in Fig.	Part - No.	Qty.		Part Description
1	1169-3403-000	1		Distance ring
2	1169-3390-000	1		EUPEX coupling assembly
2a	2308-3393-010	1	*	Set of coupling links
3	0026-1741-160	2		Key
4	0004-1953-830	1		Felt ring 40/DIN 5419
5	1089-3375-000	1		Bearing cover
6	0019-6910-150	3		Hex head screw M 8x45 DIN 933 - 8.8
7	0004-2503-770	1		Gasket 91/129x0.3
8	0011-6308-000	1		Grooved ball bearing 6308 DIN 625
9	1089-3433-000	1		Pressure ring
10	1087-3449-060	1		Worm wheel assembly with clamp plates
10a	1087-3446-000	1	**	Clamp plate (without thread)
10b	1087-3447-000	1	**	Clamp plate (with thread)
10c	0019-6523-150	4	**	Hex head screw M 10x95 DIN 931 - 8.8
11	1087-3131-000	1		Bearing housing
12	0004-2662-770	1		Gasket 136/166x0.3
13	0004-1967-830	1		Felt ring 90/111x9.5
14	see page 16/2	1		Centrifugal clutch (see fig. 16/2)
15	0019-8974-150	1		Threaded pin AM 8x16 DIN 914
16	0019-8984-150	1		Threaded pin M 10x25 DIN 914 - 10.9
17	0026-5869-170	1		Securing ring 40x1.75 DIN 471
18	0026-2911-000	1		Supporting disc
19	1089-3400-000	1		Worm wheel shaft
20	0011-6017-110	1		Grooved ball bearing 6017 P6 DIN 625
21	0004-2660-740	1		Gasket 130/170x1
22	0019-6907-150	4		Hex head screw M 8x30 DIN 933 - 8.8
23	1087-3375-000	1		Bearing cover
24	0013-3135-110	1		Nut M 22x1.5 (SW 27)

* This part is contained in the EUPEX coupling 2, but it is also available as separate item.

** This part is included in the worm wheel assembly with clamp plates 10, but it is also available as separate item. When the worm wheel needs replacement, the worm spindle 1a (fig. 14) should also be replaced.

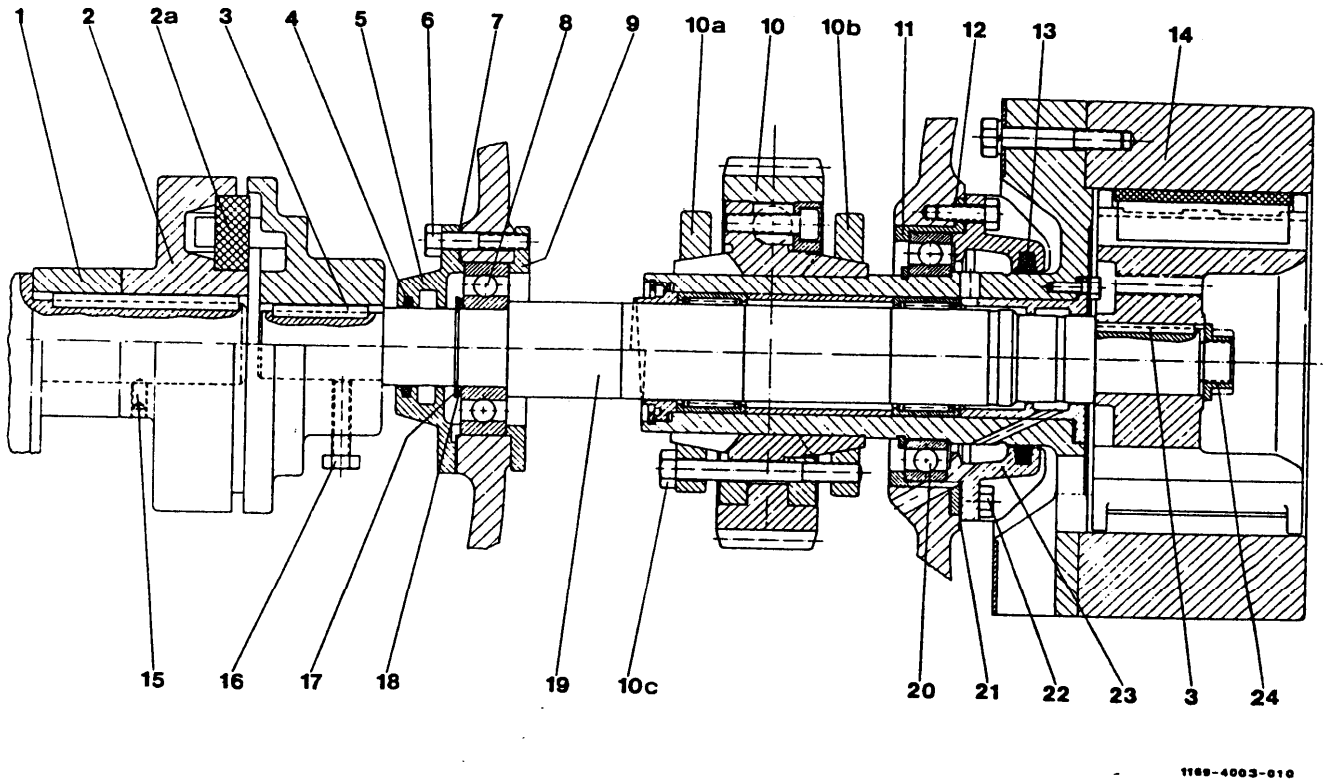

1
2
2a
3
4
5
6
7
8
9
10a
10
10b
11
12
13
14
15
16
17
18
19
10c
20
21
22
23
3
24
1169-4003-010

Fig. 15

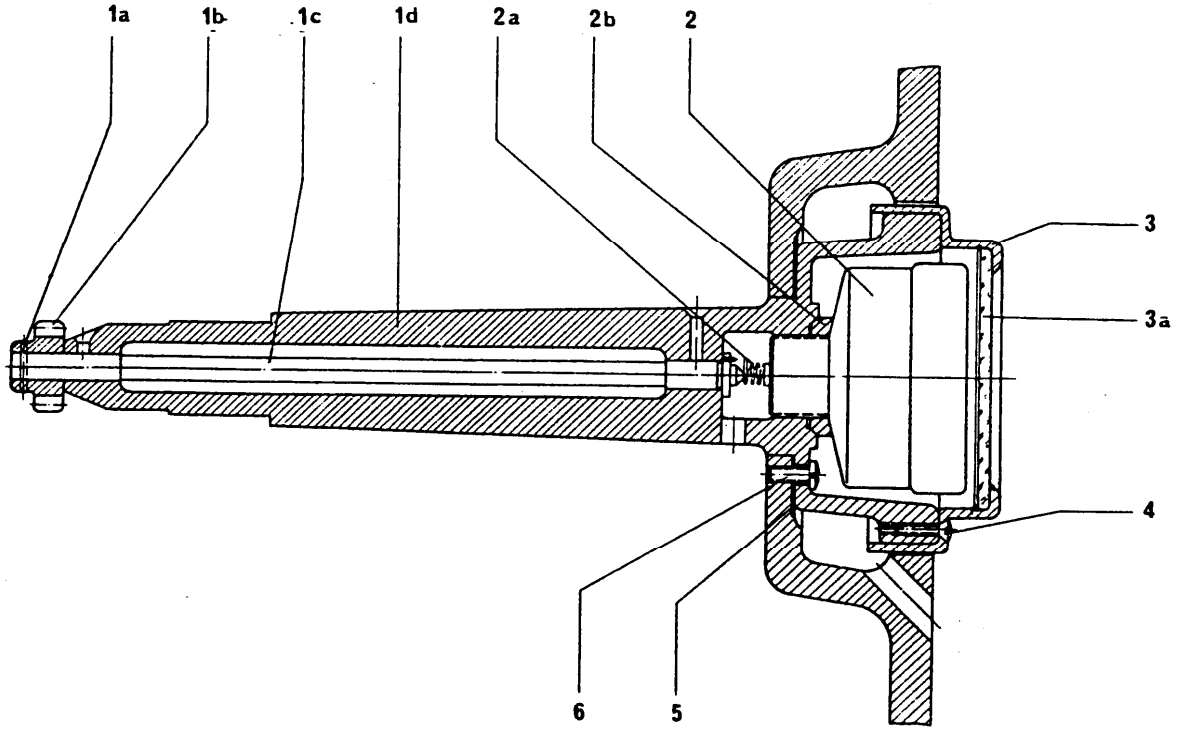


Fig. 16/1

No. in Fig.	Part - No.	Qty.		Part Description
1	1087-3490-000	1		Tachometer drive assembly (1a-d)
1a	0026-1561-150	1		Cylindrical notched pin 2.5x16 DIN 1473
1b	3037-3483-000	1		Toothed wheel
1c	1087-3485-000	1		Shaft
1d	1087-3493-000	1		Tachometer housing
2	8473-3000-050	1		Tachometer assembly
2a	0006-4013-160	1	*	Cylindrical pressure spring
2b	0004-1974-830	1	*	Felt ring 29/40x10
-	0001-0050-820	1	*	Sight glass
3	1087-3494-000	1		Cover
3a	0001-0058-800	1	*	Sight glass
4	0019-3220-630	3		Countersunk screw M 4x12 DIN 964
5	0004-5212-700	1		Gasket 58/82x1
6	0019-2250-030	3		Cheese head screw AM 6x18 DIN 84-4.6

* This part is supplied with the previous complete part, but can also be ordered separately.

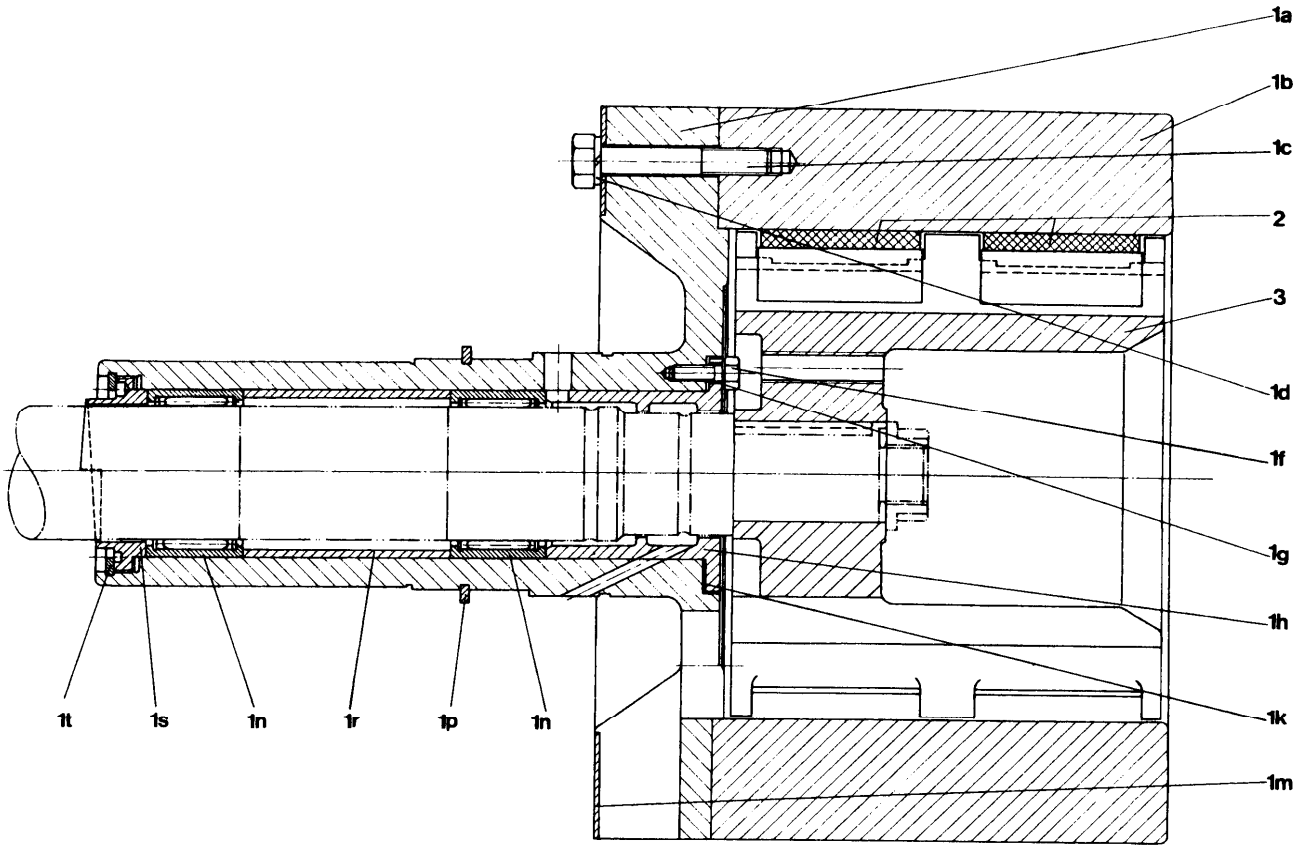


Fig. 16/2

No. in Fig.	Part - No.	Qty.		Part Description
-	1169-3385-000	1		Centrifugal clutch assembly (1a-3) (see also fig. 15, No. 14)
-	1169-3370-000	1		Clutch drum assembly (1a-t)
1a	-	1	*	Clutch drum
1b	-	1	*	Ring
1c	0019-6517-150	8		Hex head screw M 10x65 DIN 931 - 8.8
1d	0026-1337-190	8		Lock washer A10 DIN 127
1f	0019-6842-150	3		Hex head screw M 6x20 DIN 933 - 8.8
1g	0026-1324-190	3		Lock washer A6 DIN 127
1h	1087-3404-000	1		Bush
1k	0004-2461-700	1		Gasket 62.5/85.5x1
1m	-	1	*	Disk
1n	0011-5035-150	2		Needle bearing NK 50/35 P5
1p	0026-5878-170	1		Securing ring 85x3 DIN 471 (for ball bearing)
1r	0026-5995-060	1		Distance sleeve
1s	1087-3373-000	1		Threaded ring
1t	0026-5839-170	1		Securing ring 72x2.5 DIN 472
2	3313-3397-000	8		Clutch shoe, complete
-	0021-3162-860	8	**	Clutch shoe lining
-	0026-5591-550	24	**	Rivet C 5x10 DIN 7338
3	1169-3468-000	1		Clutch driver

* This part is not available individually, but only assembled with the parts 1a-t.

** This part is contained in clutch shoe 2, but it is also available as separate item.

No. in Fig.	Part - No.	Qty.		Part description
-	8134-2100-330	1		Operating-water connection with protecting case (1-27 and 36-41)
1	0013-2842-300	1		Grooved coupling nut F25 DIN 11851
2	0018-3939-300	1		Cone connection D25 DIN 11851
3	0007-2208-750	4		Gasket G25 DIN 11851
-	8134-2201-010	1		Pipe line, complete (4a-d)
4a	0018-4502-400	1		Threaded connection 25 / R 1"
4b	0018-2525-640	1		Strainer R 1"
4c	0018-1609-300	1		Bend
4d	0013-2842-300	1		Grooved coupling nut F25 DIN 11851
5	0018-4086-400	3		Threaded connection 25 / R 1"
6	0018-1741-000	1		Water pressure reducer, complete (6a-d)
6a		2	*	Gasket
6b		2	*	Threaded connection
6c		2	*	Coupling nut
6d	0001-0299-610	2	*	Pressure gauge
7	3014-2166-000	1		Connection pipe
8	0019-0137-300	1		Hex head screw R 1/4"x12
9	0004-5268-880	2		Gasket 13/19x1.5
10	8134-2195-000	1		Connection piece
11	0018-0961-300	2		Double nipple 3/8"
12	0018-3711-600	2		Solenoid valve 3/8"
15	0018-3854-300	4		Connection piece 10 / R 3/8"
16	0013-2818-400	4		Coupling nut R 3/4"
17	0007-2230-750	4		Gasket 15.5/21.5x4
18	0018-4645-300	2		Threaded connection R 3/4" / R 3/8"
19	0018-4646-300	2		Threaded connection R 3/4" / R 1/2"
20	0018-1709-640	2		Ball valve 13
21	0018-1788-300	2		Reducing nipple 1/2" / 3/8"
22	8134-2201-060	1		Pipe line
23	0007-2402-750	2		Gasket 17/23x3
24	0018-4645-300	1		Threaded connection R 3/4" / R 3/8"
25	8134-2193-120	1		Connection piece
26	0018-1299-640	2		Upper part of valve 1/2" DIN 3519, cpl.
26a	0004-5276-710	2	*	Gasket 22/26x1
27	0001-0299-610	2		Pressure gauge
-	8134-2355-020	1		Protecting case
-	0005-3355-630	1		Cable gland Pg 9
-	1165-2350-000	1		Pressure switch assembly (30-31)
30	0018-1870-000	1		Low-pressure hose, complete
30a	0018-3465-400	1	*	Screw coupling DL 8 DIN 2353 R 1/4"
30b	0018-3560-400	1	*	Screw coupling DL 8 R 3/8"
31	0005-0675-900	1		Pressure switch F 5
36	0005-3358-630	1		Cable gland Pg 9
37	0019-2376-630	2		Fillister head screw AM 4x16 DIN 84
38	0005-0862-900	1		Branch box
39	0005-0222-630	1		Plug Pg 9 DIN 46320
40	0005-0203-630	1		Cable gland C4 Pg 11x6-9 DIN 46320
41	0005-0772-608	1		Protecting hose

* This part is included in the preceding "complete" part, but it is also available as separate item.

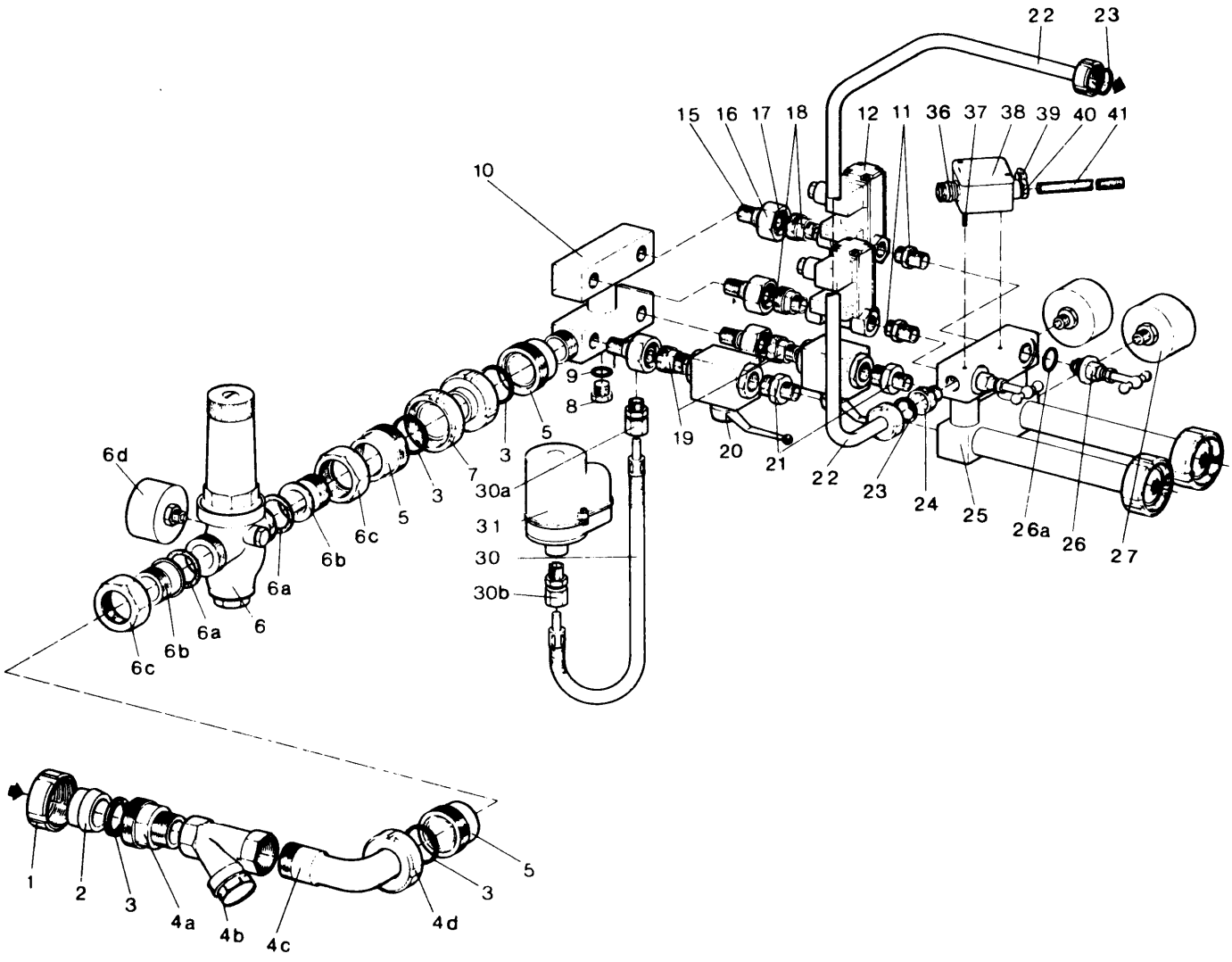

22
23
15
16
17
18
12
11
36
37
38
39
40
41
10
9
8
19
20
21
22
23
24
25
26a
26
27
6d
7
3
5
30a
31
30
30b
6c
6b
6a
6
1
2
3
4a
4b
4c
4d

Fig. 17/1

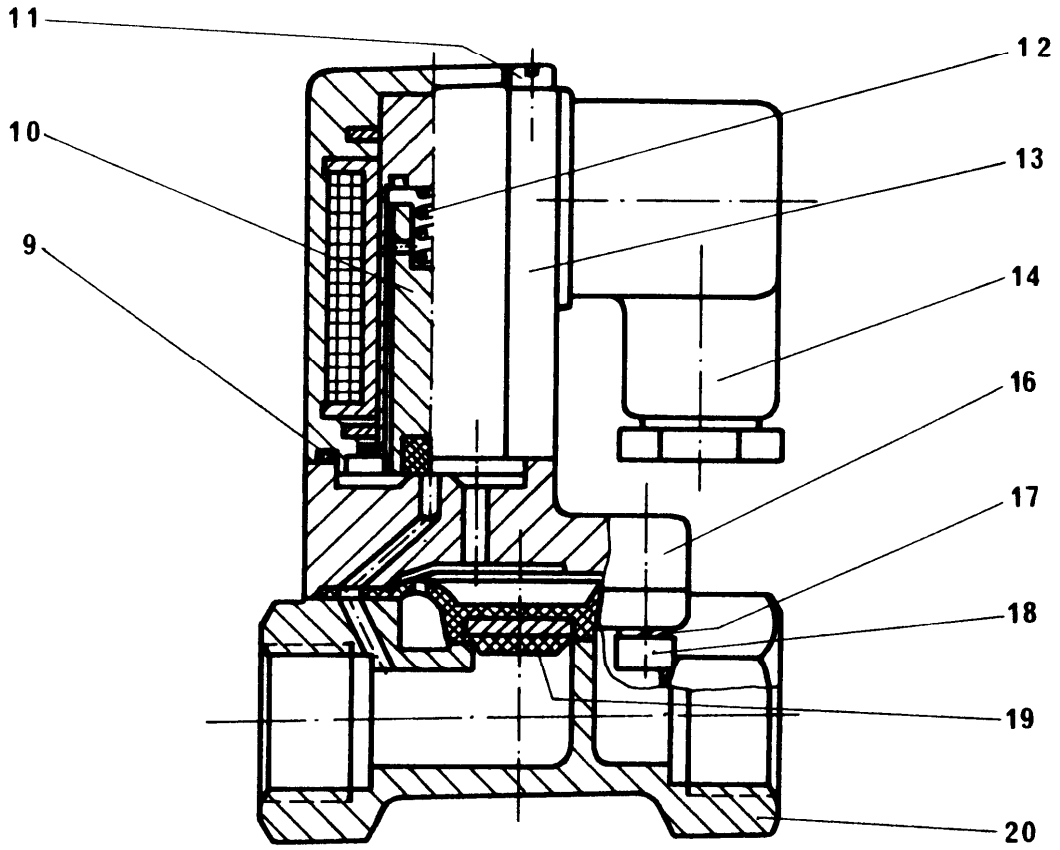


Fig. 17/2

No.in Fig.	Part - Number	Qty.	Part Description
-	0018-3711-600	1	Solenoid valve, complete (9-20)
9	0007-1946-750	1	Gasket 25x1.5
10	0018-3710-040	1	Solenoid core
11	0019-2387-030	4	Cylindrical screw AM 4x55 DIN 84 - 4.6
12	0006-4079-160	1	Pressure spring
13	0018-3710-800	1	Solenoid head 50/60 Hz
14	0018-3710-050	1	Coupler socket
15			
16	0018-3711-070	1	Valve cover
17	0026-1322-170	6	Lock washer A4 DIN 127
18	0019-6077-400	6	Allen screw M 4x10 DIN 912
19	0018-3711-750	1	Diaphragm
20	0018-3711-080	1	Valve housing

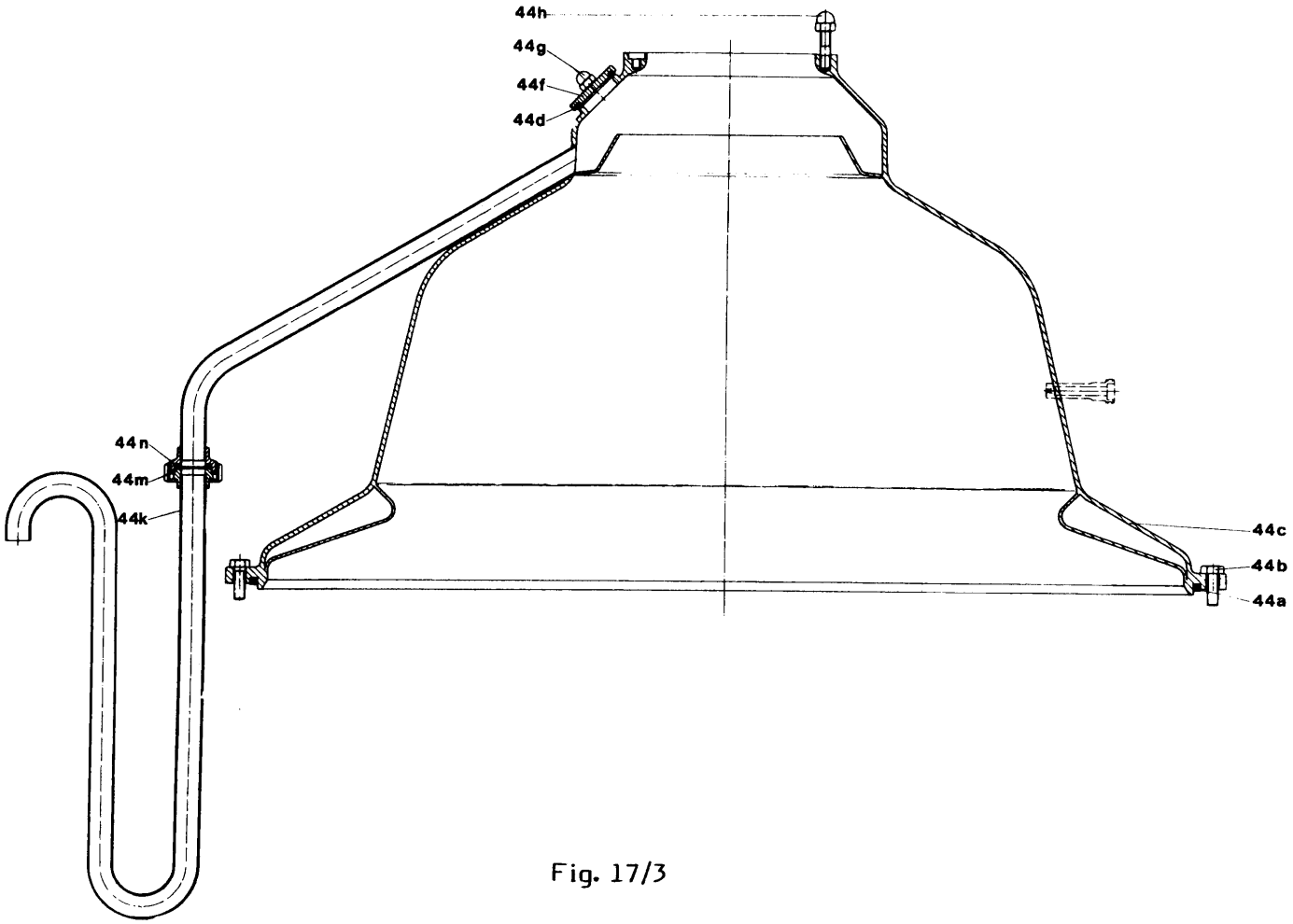


Fig. 17/3

No. in Fig.	Part - No.	Qty.	Part Description
-	1176-7759-000	1	Hood assembly (44a-n)
44a	0004-2364-758	1	Packing cord 8x8x2620
44b	0019-6971-400	8	Hex head screw M12x35 DIN 933
44c	1169-7765-000	1	Hood
44d	0007-2262-750	1	Gasket 45/57x6
44f	1165-1061-000	1	Inspection cover
44g	0013-0405-400	2	Hexagon cap nut DIN 1587-M10
44h	0013-2645-300	4	Cap nut M10
-	0026-1348-400	4	Washer 10.5 DIN 125 (for item 44h)
44k	1165-2775-000	1	Siphon
44m	0013-2842-300	1	Grooved coupling nut F25 DIN 11851
44n	0007-2208-750	1	Gasket G25 DIN 11851

Feed and Discharge Connections and Centripetal Pump

No. in Fig.	Part - No. Milk	Part - No. Whey	Qty.	Part Description
-	1176-2213-030	1176-2213-030	1	Double centripetal pump, cpl. (1a-k)
1a	1176-2246-000	1176-2246-000	1	Feed tube
1b	0007-2501-750	0007-2501-750	2	Gasket 23/3
1c	1176-2241-000	1176-2241-000	1	Lower centripetal pump dia. 105 (up to max. 5 bar)
1d	0007-2925-750	0007-2925-750	1	Gasket 36.2/3
1f	1176-2252-020	1176-2252-020	1	Upper centripetal pump dia. 105 (up to max. 5 bar)
1g	0007-2730-750	0007-2730-750	1	Gasket 46.2/3
1h	0007-1900-750	0007-1900-750	3	Gasket 31/2.5
1k	0007-2210-750	0007-2210-750	1	Gasket G40 DIN 11851
-	1176-2295-050	-	1	Feed and discharge connections, cpl. (2-6p) **(milk)**
-	-	1176-2296-060	1	Feed and discharge connections, cpl. (2-7m) **(whey)**
2	1176-2217-000	1176-2217-000	1	Disk
3	1176-2301-000	1176-2301-000	1	Feed and discharge housing
3a	0007-2208-750	0007-2208-750	1	Gasket G50 DIN 11851
3b	0007-2210-750	0007-2210-750	2	Gasket G40 DIN 11851
4	see page 18/3		1	Flowmeter
5	8918-2100-050	8918-2100-050	1	Pressure gauge
-	1176-2290-000	1176-2290-000	1	Valve assembly (6a-n)
6a	1176-2291-000	1176-2291-000	1	Valve housing
-	1182-2272-010	1182-2272-010	1	Valve cone assembly (6b-f)
6b	1182-2278-010	1182-2278-010	1	Valve cone
6c	0004-5720-870	0004-5720-870	1	Grooved ring 24/45x15
6d	1166-2268-010	1166-2268-010	1	Ring
6f	0026-2118-300	0026-2118-300	1	Snap ring
-	1166-2202-000	1166-2202-000	1	Adjusting screw assembly (6g-n)
6g	0026-0057-850	0026-0057-850	1	Washer
6h	0013-2844-300	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
6k	1166-2217-000	1166-2217-000	1	Guide ring
6m	0013-0085-300	0013-0085-300	1	Knurled nut M 18x1.5
6n	1166-2276-000	1166-2276-000	1	Adjusting screw
6p	0007-2211-750	0007-2211-750	1	Gasket G50 DIN 11851
-		1028-2280-010	1	Valve assembly (7a-m)
7a		0013-2646-300	1	Cap nut M10
7b		1022-2276-020	1	Adjusting screw
7c		0026-5979-840	1	Distance sleeve
7d		0004-5716-840	1	Grooved ring 13/24
7f		1022-2278-040	1	Valve cone
7g		1028-2281-010	1	Valve housing
7h		0007-2208-750	2	Gasket G25 DIN 11851
7k		0013-0274-300	1	Hexagon nut M4 DIN 934
7m		0019-2478-300	1	Cheese head screw M 4x8 DIN 85
8	0013-2842-300	0013-2842-300	1	Grooved coupling nut F25 DIN 11851
9	0018-3939-300	0018-3939-300	1	Cone connection D25 DIN 11851
10	0013-2845-300	0013-2845-300	1	Grooved coupling nut F50 DIN 11851
11	0018-3958-400	0018-3958-400	1	Reducing cone connection 50-40
12	0013-2844-300	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
13	0018-3949-300	0018-3949-300	1	Cone connection D40 DIN 11851

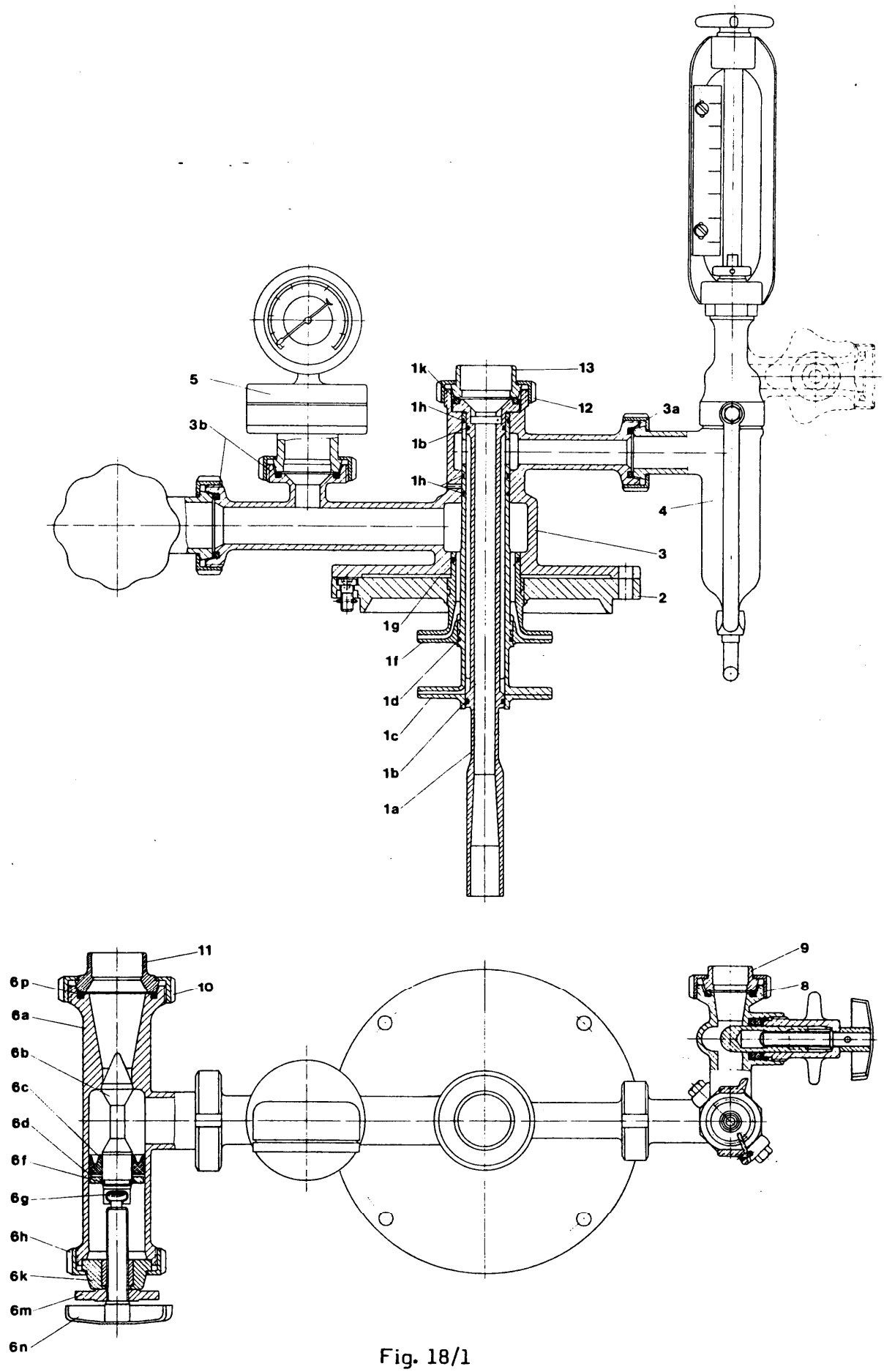

5
3b
1k
1h
1b
1h
13
12
3a
4
3
2
1g
1f
1d
1c
1b
1a
11
10
9
8
6p
6a
6b
6c
6d
6f
6g
6h
6k
6m
6n

Fig. 18/1

No. in Fig.	Part - No.		Qty.	Part Description
	Whey cream	Cream		
	Measuring range			
	0 - 100 l/h	200 - 1,400 l/h		
-	8020-2340-040	-	1	Flowmeter assembly (1-19)
-	-	8020-2240-010	1	Flowmeter assembly (1-24f)
1	0019-1732-400	0019-1732-400	1	Handle screw
2	0007-2298-750	0007-2298-750	2	Gasket 13.5/22x10
3	0001-0083-820	0001-0083-820	1	Cylindrical sight glass
4	0019-1380-300	0019-1380-300	1	Threaded sleeve
5	0026-1375-300	0026-1375-300	1	Washer
6	0013-3010-300	0013-3010-300	1	Nut M 35x1.5
7	8020-2003-140	8020-2003-170	1	Outlet pipe
8	0007-2209-750	0007-2209-750	1	Gasket G32 DIN 11851
9	8020-2001-110	8020-2001-110	1	Inlet cup
10	8020-2306-040	8020-2206-010	1	Measuring tube
11	8020-2312-010	8020-2012-000	1	Float
12	0019-0002-640	0019-0002-640	1	Handle screw
13	8020-2317-000	-	1	Scale 0 - 100 l/h
13	-	8020-2217-000	1	Scale 200 - 1400 l/h
14	0004-5261-720	0004-5261-720	2	Gasket 4.8/9x1
15	0019-2478-300	0019-2478-300	2	Cheese head screw M 4x8 DIN 85
16	8020-2002-000	8020-2002-000	1	Intermediate piece
18	0019-0170-400	0019-0170-400	2	Hex head screw M 12x17.5
19	8020-2004-000	8020-2004-000	1	Clamp
20		0007-2208-750	1	Gasket G25 DIN 11851
21		0007-2285-750	2	Gasket 22/32x5
22		0026-5508-300	1	Washer
23		0026-1445-300	1	Snap ring
-		1072-2273-020	1	Stuffing box assembly (24a-f)
24a		1072-2279-020	1	Round-slide valve
24b		0019-1590-610	1	Threaded bolt
24c		1072-2284-000	1	Stuffing box housing
24d		0026-1062-400	1	Cylindrical pin 4h8x30
24f		0021-3096-300	1	Star grip

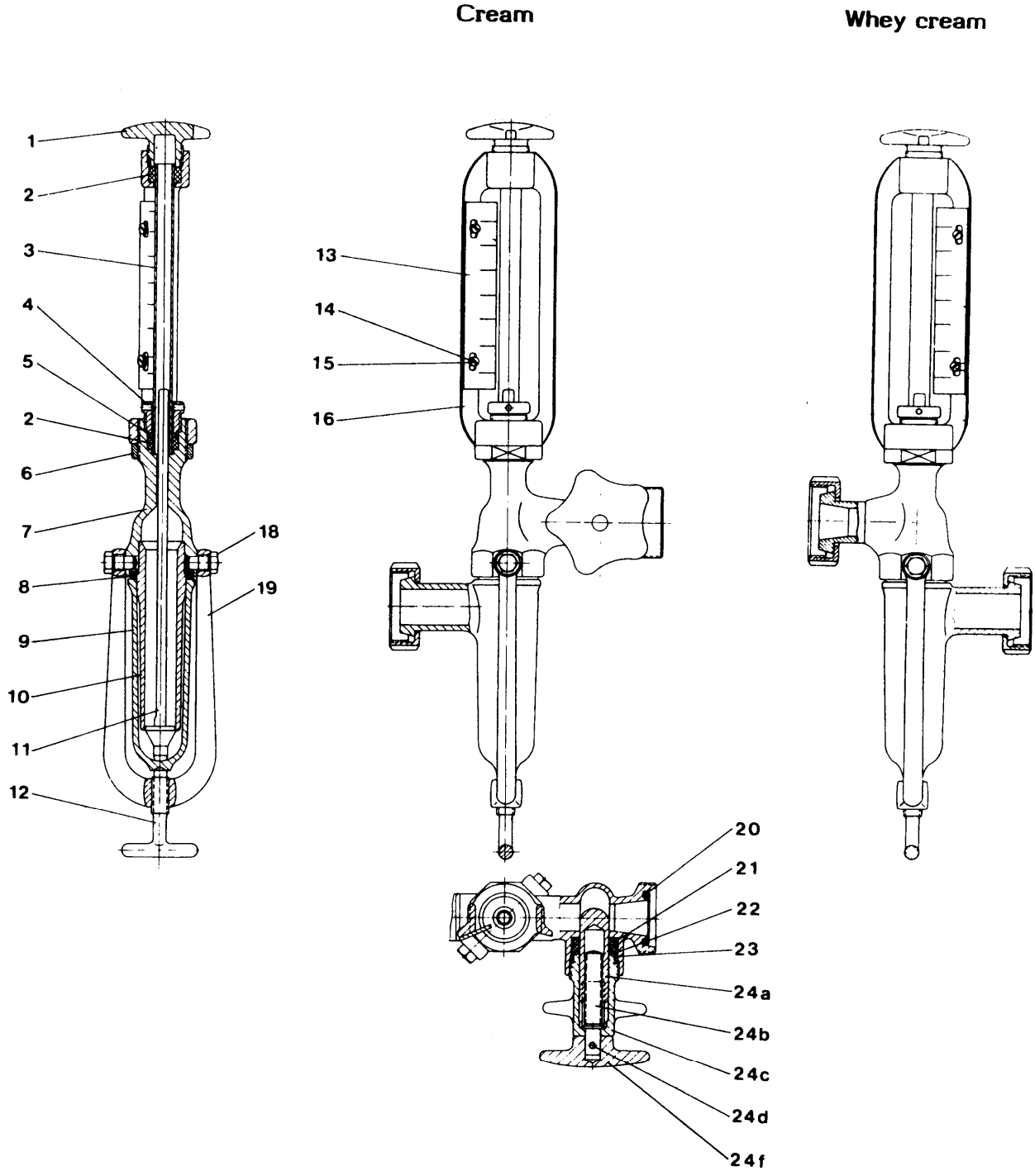

Cream
Whey cream
1
2
3
4
5
2
6
7
8
9
10
11
12
18
19
13
14
15
16
20
21
22
23
24a
24b
24c
24d
24f

Fig. 18/2

No. in Fig.	Part - No.	Qty.	Part Description
-	1055-2220-000	1	Clarifying and standardizing device, complete (1-5m)
-	1055-2270-000	1	Clarifying device, complete (1-4)
1	1055-2260-000	1	T-piece
1a	0007-2210-750	1	Gasket G40 DIN 11851
2	0007-2208-750	3	Gasket G25 DIN 11851
3	0018-3588-300	1	Transition piece
4	0018-3870-300	1	Three-way valve 25 DIN 11851
5	see page 18/7	1	Flowmeter
6	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
7	0018-3949-300	1	Cone connection D40 DIN 11851
8	0013-2842-300	1	Grooved coupling nut F25 DIN 11851
9	0018-3939-300	1	Cone connection D25 DIN 11851

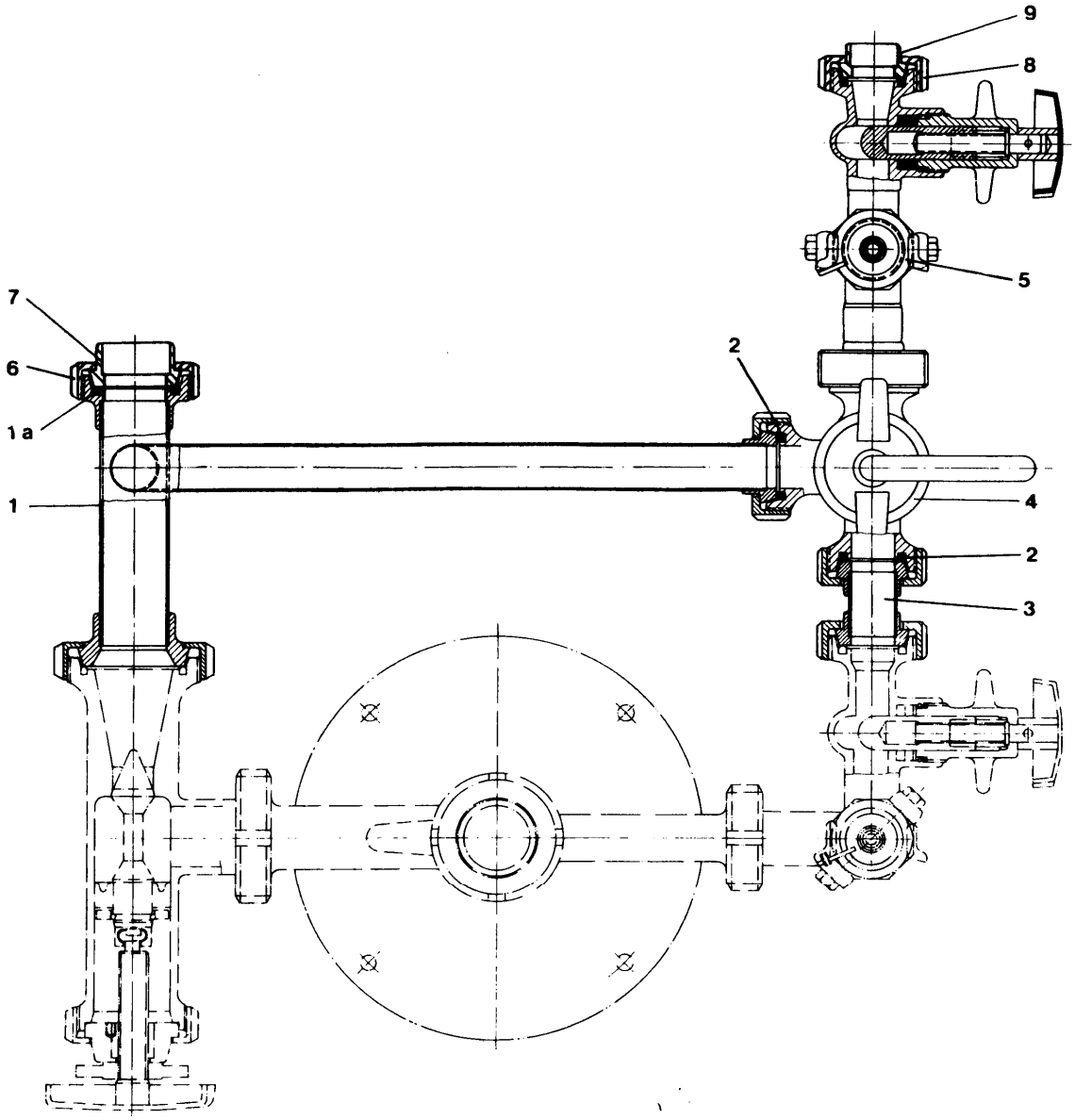
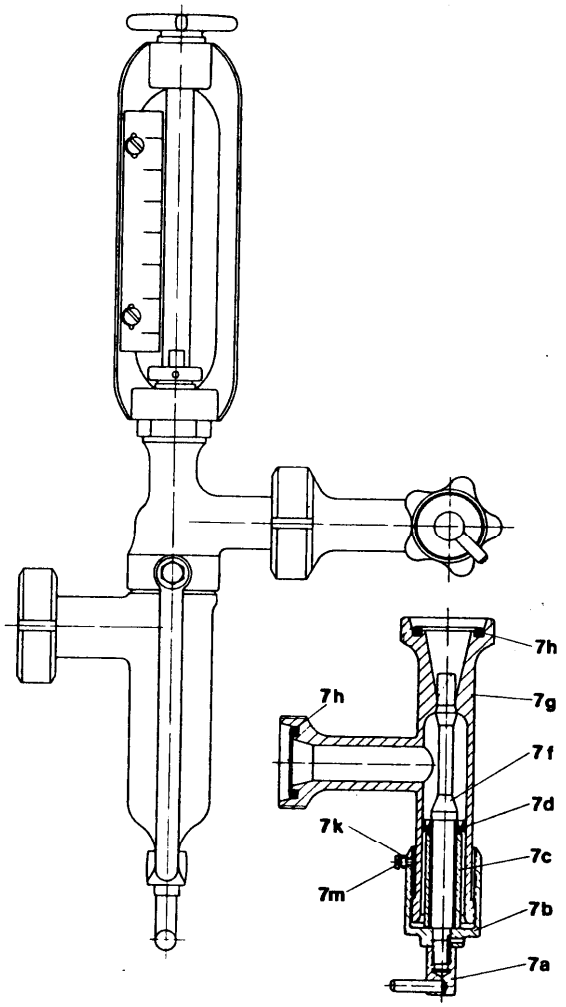


Fig. 18/3

Measuring range: 50 - 350 l/h

No. in Fig.	Part - No.	Qty.	Part Description
-	8020-2040-010	1	Flowmeter assembly (1-24f) (see also fig. 18/3, No. 5)
1	0019-1732-400	1	Handle screw
2	0007-2298-750	2	Gasket 13.5/22x10
3	0001-0083-820	1	Cylindrical sight glass
4	0019-1380-300	1	Threaded sleeve
5	0026-1375-300	1	Washer
6	0013-3010-300	1	Nut M 35x1.5
7	8020-2003-170	1	Outlet pipe
8	0007-2209-750	1	Gasket G32 DIN 11851
9	8020-2001-110	1	Inlet cup
10	8020-2006-010	1	Measuring tube
11	8020-2012-000	1	Float
12	0019-0002-640	1	Handle screw
13	8020-2017-000	1	Scale 50 - 350 l/h
14	0004-5261-720	2	Gasket 4.8/9x1
15	0019-2478-300	2	Cheese head screw M 4x8 DIN 85
16	8020-2002-000	1	Intermediate piece
18	0019-0170-400	2	Hex head screw M 12x17.5
19	8020-2004-000	1	Clamp
20	0007-2208-750	1	Gasket G25 DIN 11851
21	0007-2285-750	2	Gasket 22/32x5
22	0026-5508-300	1	Washer
23	0026-1445-300	1	Snap ring
-	1072-2273-020	1	Stuffing box assembly (24a-f)
24a	1072-2279-020	1	Round-slide valve
24b	0019-1590-610	1	Threaded bolt
24c	1072-2284-000	1	Stuffing box housing
24d	0026-1062-400	1	Cylindrical pin 4h8x30
24f	0021-3096-300	1	Star grip



Flowmeter
for whey cream

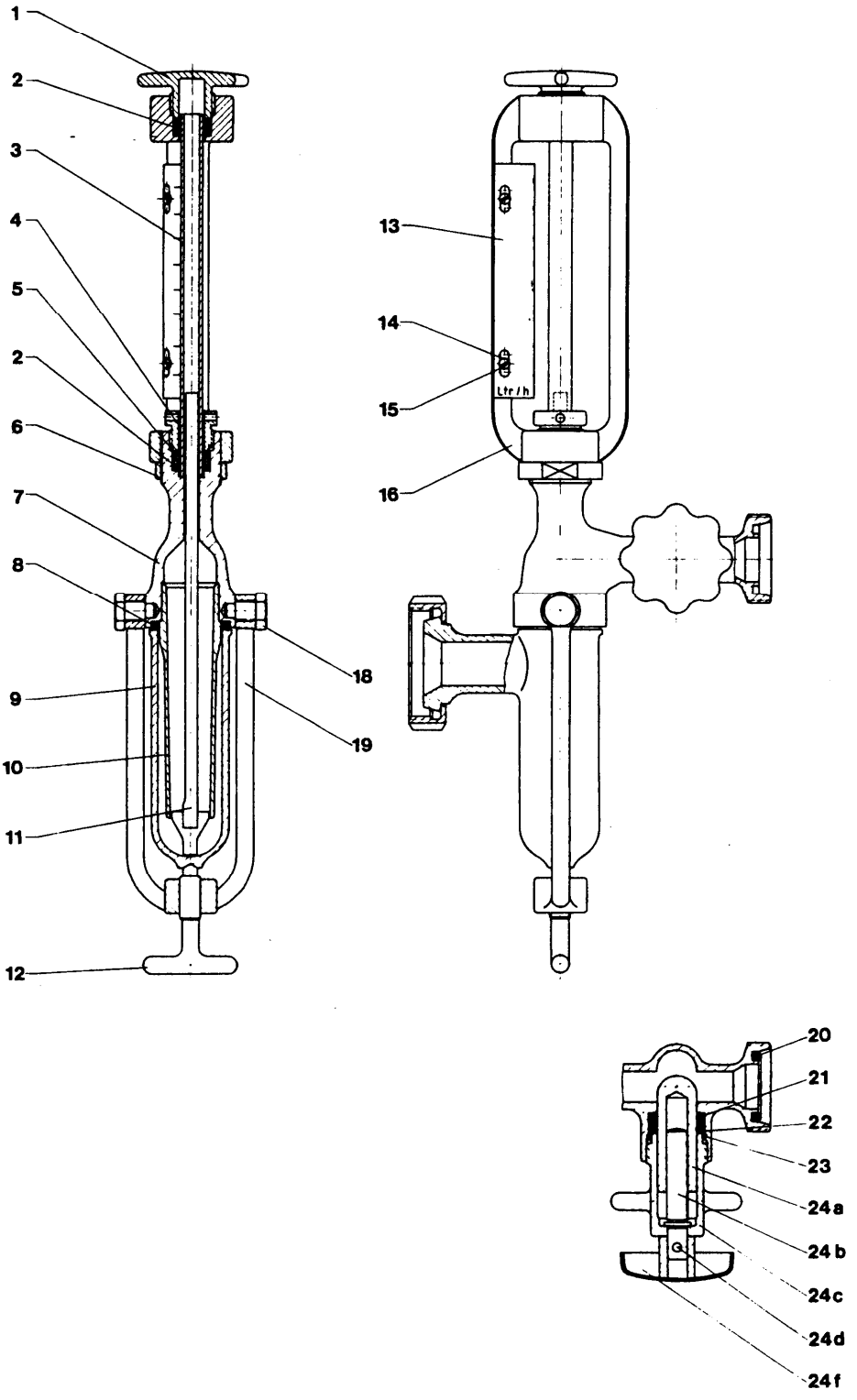

1
2
3
4
5
2
6
7
8
9
10
11
12
13
14
15
16
18
19
Ltr/h
20
21
22
23
24a
24b
24c
24d
24f

Fig. 18/4

No. in Fig.	Part - No.	Qty.		Part Description
-	1055-6600-000	1		Bowl, complete (1-24)
1	0019-1450-400	1		Threaded plug M42
2	0007-1970-840	1		Gasket 26.5/35x5.25
3	1169-6280-010	1		Valve assembly (3a-f)
3a	1169-6281-010	1		Valve housing
3b	0007-2920-750	3		Gasket 23.3/2.4
3c	0004-2341-840	1		Gasket 6/9.9x10.5
3d	0007-2923-750	2		Gasket 9.3/2.4
3f	1169-6276-000	1		Valve piston
4	1169-6501-000	1	*	Sliding piston
5	0007-2478-750	1		Gasket 445/465x10
6	1169-6604-030	1	*	Bowl bottom, complete
6a	3117-6609-010	1	**	Arresting piece
6b	0019-2233-400	1	**	Cheese head screw AM 5x12 DIN 84
7	1169-6631-010	1	*	Lock ring
-	1055-6660-010	1	*	Set of discs (8a-c)
8a	1169-6662-000	1		Bottom disc
8b	1169-6663-000	10		Disc
8c	1066-6663-060	80		Disc
9	0007-2079-750	1		Gasket 100/10
10	1169-6620-000	1	*	Distributor
11	0019-1685-300	1		Threaded sleeve
11a	0007-1944-750	1	**	Gasket 44.2/3
12	0019-0305-400	1		Spindle screw, complete
12a	0007-2392-750	1	**	Gasket 19.2/3
13	0007-2631-750	1		Gasket 440/4
14	0007-2967-840	1		Gasket 416,8x10
15	1169-6610-010	1	*	Bowl top
16	1033-6670-010	1		Upper disc
17	1033-6650-000	1		Separating disc
18	1176-6642-000	1		Centripetal pump chamber cover
19	0007-2133-750	1		Gasket 140/152x4
20	1072-6631-080	1		Lock ring
21	0019-6126-400	4		Allen screw M 8x35 DIN 912
22	1169-6597-000	1		Ring
23	0007-2640-750	1		Gasket 150/3
24	0007-2555-750	1		Gasket 179/3

* This part can only be replaced by one of our engineers or by a special repair shop authorized by us, because of special re-fitting to machine and possible re-balancing of bowl.

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

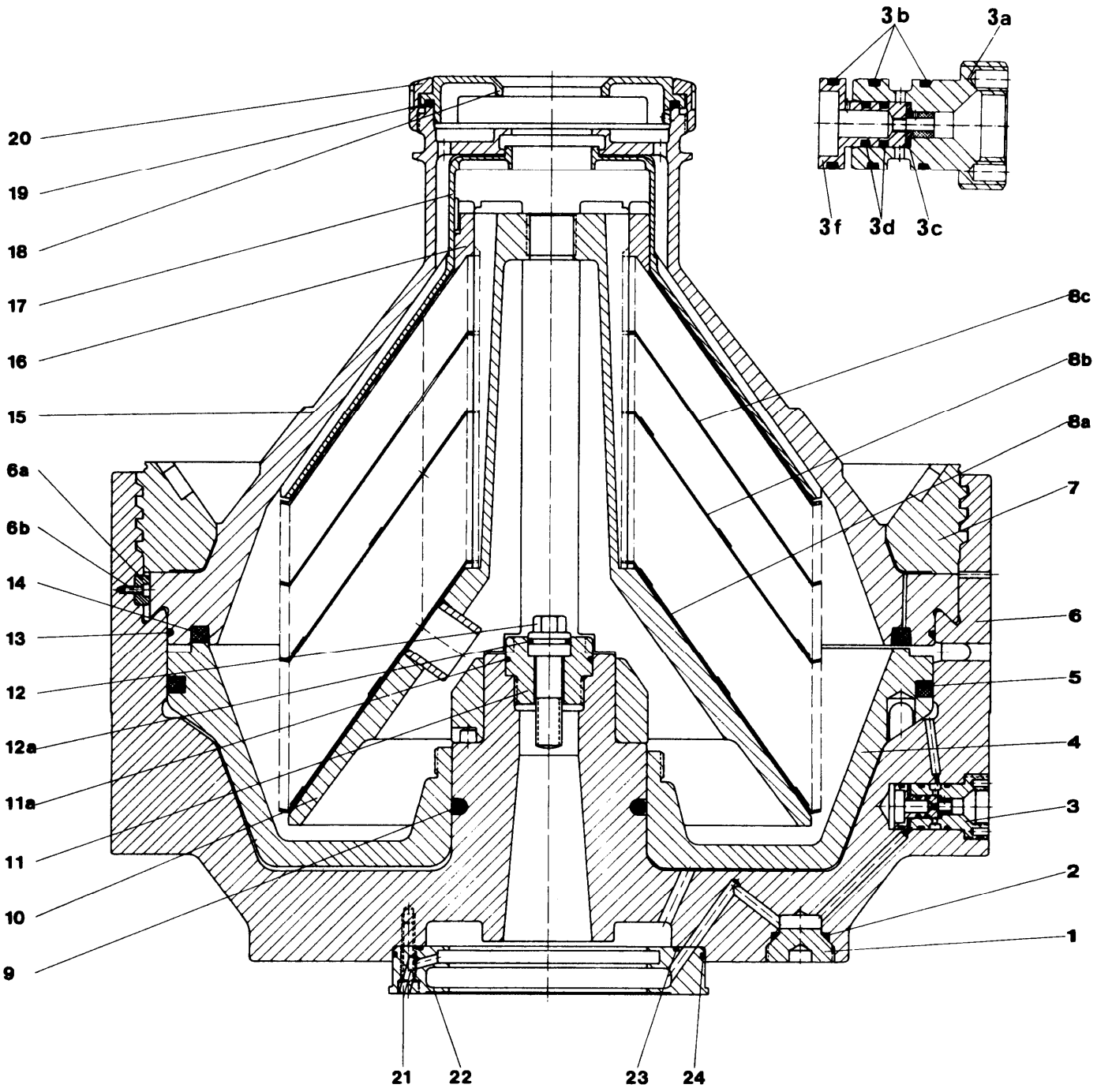

3b
3a
3f
3d
3c
20
19
18
17
16
15
6a
6b
14
13
12
12a
11a
11
10
9
8c
8b
8a
7
6
5
4
3
2
1
21
22
23
24

Fig. 19

Tools and Accessories

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

No. in Fig.	Part - No.	Qty.	Part Description
401	0003-3774-320	1	Allen wrench 4 DIN 911
-	0003-3775-320	1	Allen wrench 5 DIN 911
-	0003-3776-320	1	Allen wrench 6 DIN 911
-	0003-3777-320	1	Allen wrench 8 DIN 911
-	0003-3791-320	1	Allen wrench 8 DIN 6911
-	0003-3778-320	1	Allen wrench 10 DIN 911
-	0003-3780-320	1	Allen wrench 14 DIN 911
403	0003-4202-320	1	Double-ended wrench 10x13 DIN 3110
-	0003-4205-320	1	Double-ended wrench 17x19 DIN 3110
-	0003-4208-320	1	Double-ended wrench 22x27 DIN 3110
-	0003-4209-320	1	Double-ended wrench 24x30 DIN 3110
404	0003-3846-000	1	Pivoted hook wrench 90/155
405	0003-0200-000	1	Mallet
406	0003-0298-000	1	Splash cover
407	0003-0256-890	1	Oil gun
408	0003-0400-000	1	Oil funnel
409	0003-0277-800	1	Oil cup
410	0003-4173-030	1	Socket wrench 46.5 (for threaded sleeve in bowl bottom)
414	0003-3710-000	1	Pliers for securing rings J3 40-100
415	0003-3704-000	1	Pliers for securing rings DIN 5240 - A40
416	0003-4240-030	1	Hexagon socket wrench 13 DIN 3112
417	0003-4172-030	1	Socket wrench 27
418	0003-4585-000	1	Wrench (for sight glass)
420	0003-4636-050	1	Screwdriver 5x125
-	0003-4637-050	1	Screwdriver 8x150
421	0003-4534-100	1	Wrench (for centripetal pump)
423	1169-9910-000	1	Pulling device, complete (423a-d) (for clutch drum and clutch driver)
423a	0019-1841-090	1	Threaded spindle M 22x1.5x200
423b	0013-3135-060	1	Nut M 22x1.5 (SW 27)
423c	1087-9911-020	1	Pulling device
423d	0019-6556-400	2	Hex head screw M 12x190 DIN 601
424	1169-9886-000	1	Pipe (for lifting off the worm spindle)
425	0003-3003-000	1	Annular wrench (for large lock ring)
426	0003-3992-000	1	Annular wrench (for small lock ring)
427	1169-9840-000	1	Lifting device (for bowl top)
428	1169-9960-000	1	Jack (for sliding piston)
428a	1169-9805-000	1	Pressure piece (contained in item 428)
429	0003-4149-030	1	Wrench (for feed tube)
430	1176-9820-000	1	Disc stack compressing device, complete (430a-d)
430a	1176-9851-000	1	Threaded ring
430b	1167-9770-000	1	Hydraulic unit
430c	1176-9939-000	1	Disk
430d	1176-9877-000	1	Bolt
431	0003-0065-030	1	Lifting device (for annular wrench with lock ring)
432	0003-0575-000	1	Pin punch C5 DIN 6450
434	1169-9970-000	1	Lifting device
435	1175-9839-000	1	Lifting device (for hood)
436	1169-9930-010	1	Jack (for bowl bottom)
437	0003-3727-030	1	Wrench M4 (for valve piston)
438	1169-9895-000	1	Wrench (for bowl valve)
439	0003-3466-170	1	Lifting tongs 157
-	0015-0014-080	5	2.5-litre can of lubricating oil CLP 220
-	0015-0113-010	2	Tube of special grease (for bowl threads)
-	0015-0121-000	1	0.85-kg can of ball and roller bearing grease DIN 51825 K3k

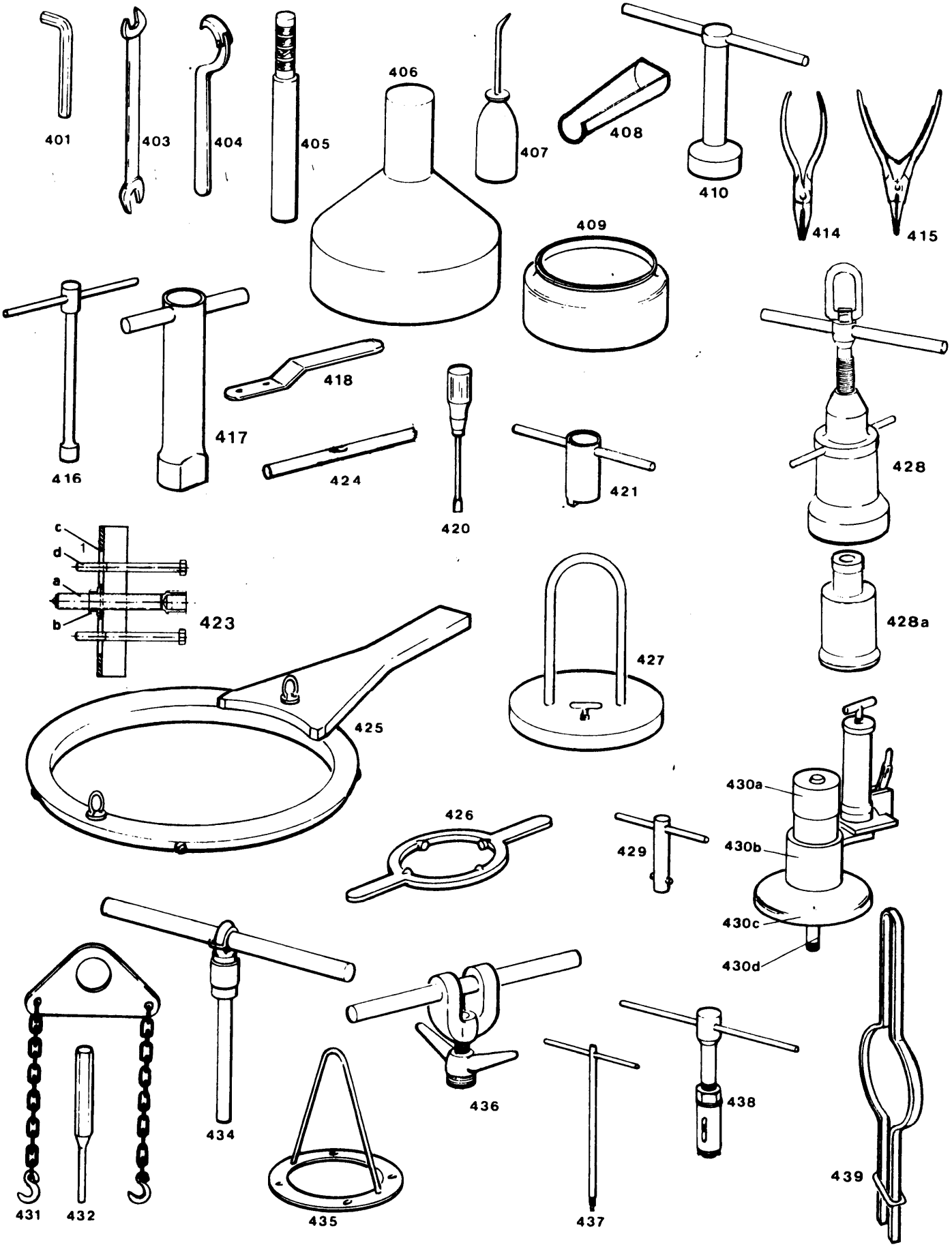

401
403
404
405
406
407
408
410
414
415
409
416
417
418
424
420
421
428
c
d
a
b
423
428a
427
425
426
429
430a
430b
430c
430d
434
436
438
439
431
432
435
437

Fig. 20

(on special order)

No.in Fig.	Part - No.	Qty.	Part Description
-	1169-9200-000	1	Sterilizing tank assembly (1-31)
1	0013-2845-300	1	Grooved coupling nut F50 DIN 11851
2	0018-3955-300	1	Cone connection D50 DIN 11851
3	0007-2211-750	1	Gasket G50 DIN 11851
4	0013-2842-300	2	Grooved coupling nut F25 DIN 11851
5	0018-4269-400	1	Cone connection R 1/2"
6	0007-2208-750	2	Gasket G25 DIN 11851
7	0001-0675-400	1	Angle thermometer
8	1165-9462-000	1	Bush
9	1169-9210-000	1	Sterilizing tank
10	0026-1102-400	6	Cylindrical pin
11	0019-1363-300	6	Hinge screw
12	0021-3128-300	6	Handle screw
13	0007-2121-750	1	Gasket 118/130x7
14	0007-2483-750	1	Gasket 65/10
15	0006-4081-400	1	Cylindrical pressure spring
16	1169-9698-000	1	Funnel
17	1169-9277-000	1	Cap
18	0019-6966-400	3	Hex head screw M 12x20 DIN 933
19	0026-2108-400	1	Cap
20	0019-2507-400	1	Lens head screw M 6x10 DIN 85
21	0026-1382-400	1	Washer 6.4 DIN 125
22	1169-9208-000	1	Cover
23	0007-2399-750	1	Gasket 68/82x8
24	0004-2364-758	1	Packing cord 8x8x2200
25	0001-0261-300	1	Blind cap
26	1169-9205-000	1	Flush pipe
27	0018-3949-300	1	Cone connection D40 DIN 11851
28	0007-2210-750	1	Gasket G40 DIN 11851
29	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
30	0007-2209-750	1	Gasket G32 DIN 11851
31	0021-3155-700	3	Foot

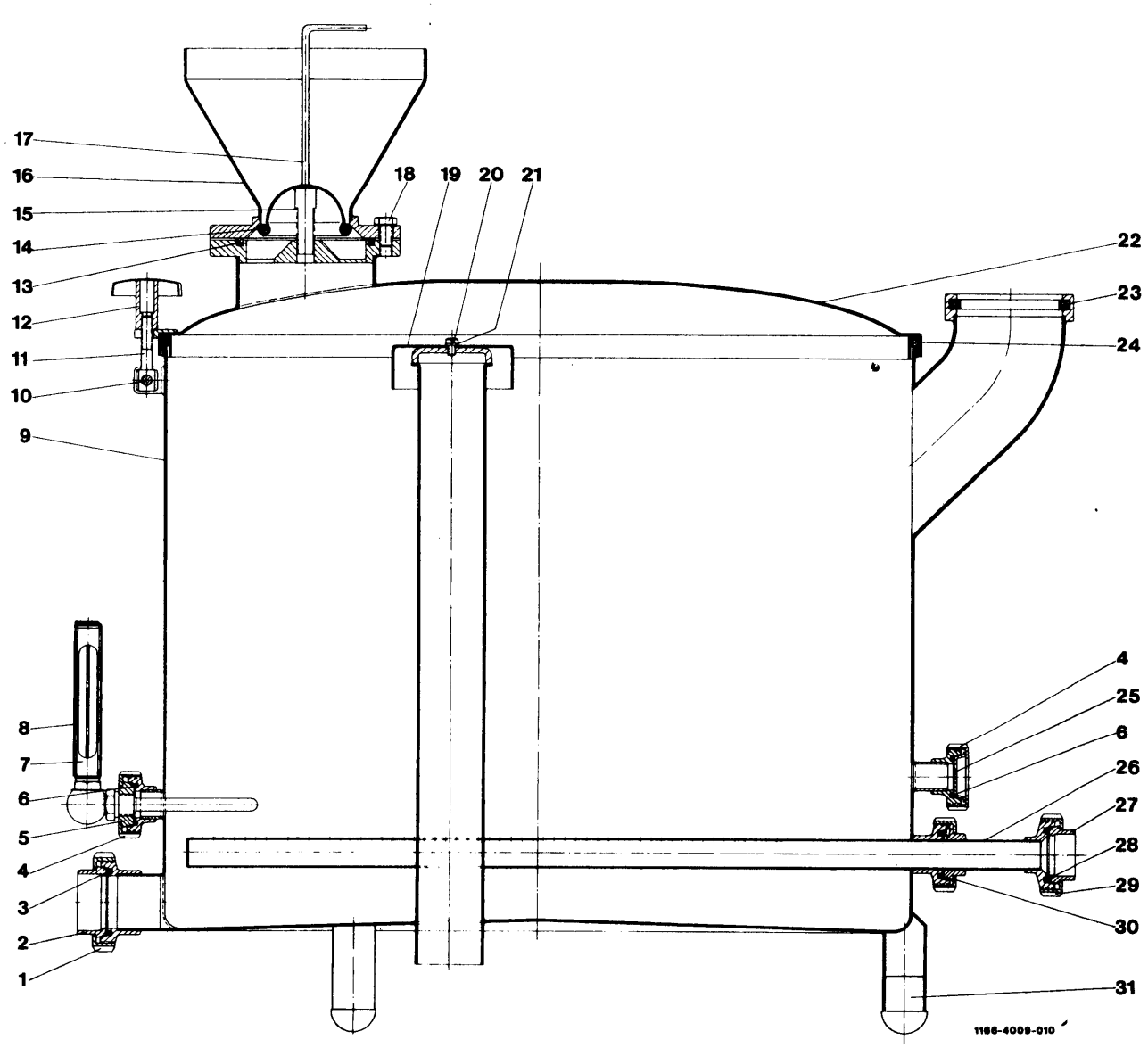

17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
18
19
20
21
22
23
24
4
25
6
26
27
28
29
30
31
1166-4009-010

Fig. 21

Maximum throughput rate: 5,000 l/h

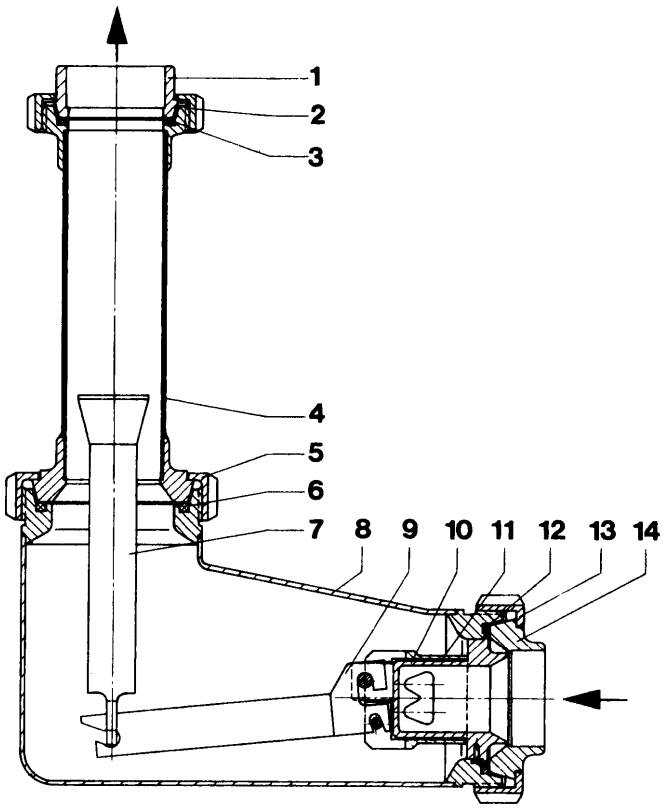
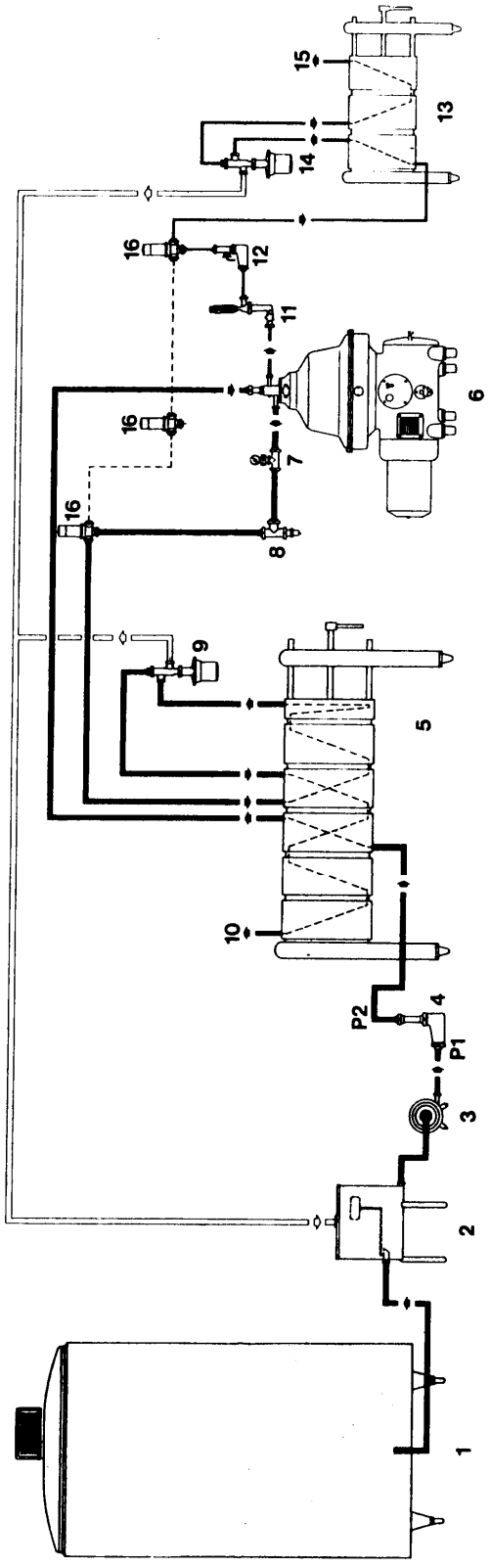


Fig. 22

NOTE: Be sure to install the flow constrictor in such a manner that the inlet is fitted to a horizontal piece of pipe and the control tube is directed vertically upwards.

No.in Fig.	Part - No.	Qty.		Part Description
-	8249-2050-080	1		Flow constrictor, complete (1-14)
1	0018-3949-300	1		Cone connection D 40 DIN 11851
2	0013-2844-300	1		Grooved coupling nut F 40 DIN 11851
3	0007-2210-750	1		Gasket G 40 DIN 11851
4	-	1	*	Control tube
5	0013-2846-300	1		Grooved coupling nut F 65 DIN 11851
6	0007-2211-750	1		Gasket G 50 DIN 11851
7	-	1	*	Float
8	-	1	*	Housing
9	-	1	*	Throttling lever
10	-	1	*	Throttling housing
11	-	1	*	Regulating piece
12	0007-2211-750	1		Gasket G 50 DIN 11851
13	0013-2845-300	1		Grooved coupling nut F 50 DIN 11851
14	0018-3958-400	1		Reducing cone connection 50/40

* This part can only be replaced by one of our factory engineers or by a special repair shop authorized by us, because its replacement requires re-adjustment of the flow constrictor. Therefore, when ordering this part, the flow constrictor must be returned to the factory.



1 Storage tank
2 Balance tank with float valve, approx. 200 litres
3 Milk pump (capacity slightly larger than rated capacity of separator)
4 Flow constrictor $P_1 - P_2 = 0.5$ bar min., 2.0 bar max.
5 Heater and cooler
6 Separator
7 Pressure gauge
8 Constant pressure valve for adjusting the operating pressure
9 Flow diversion valve
10 Line to tank
11 Flowmeter with hand valve
12 Adjustable flow constrictor
13 Cream heater and cooler
14 Flow diversion valve
15 Line to cream tank
16 3-way valve

Note:
When installing the flow constrictor make sure its cylindrical part is in upright position so that the milk flows through it from below.

Measuring range: 2,000 - 10,000 litres/h

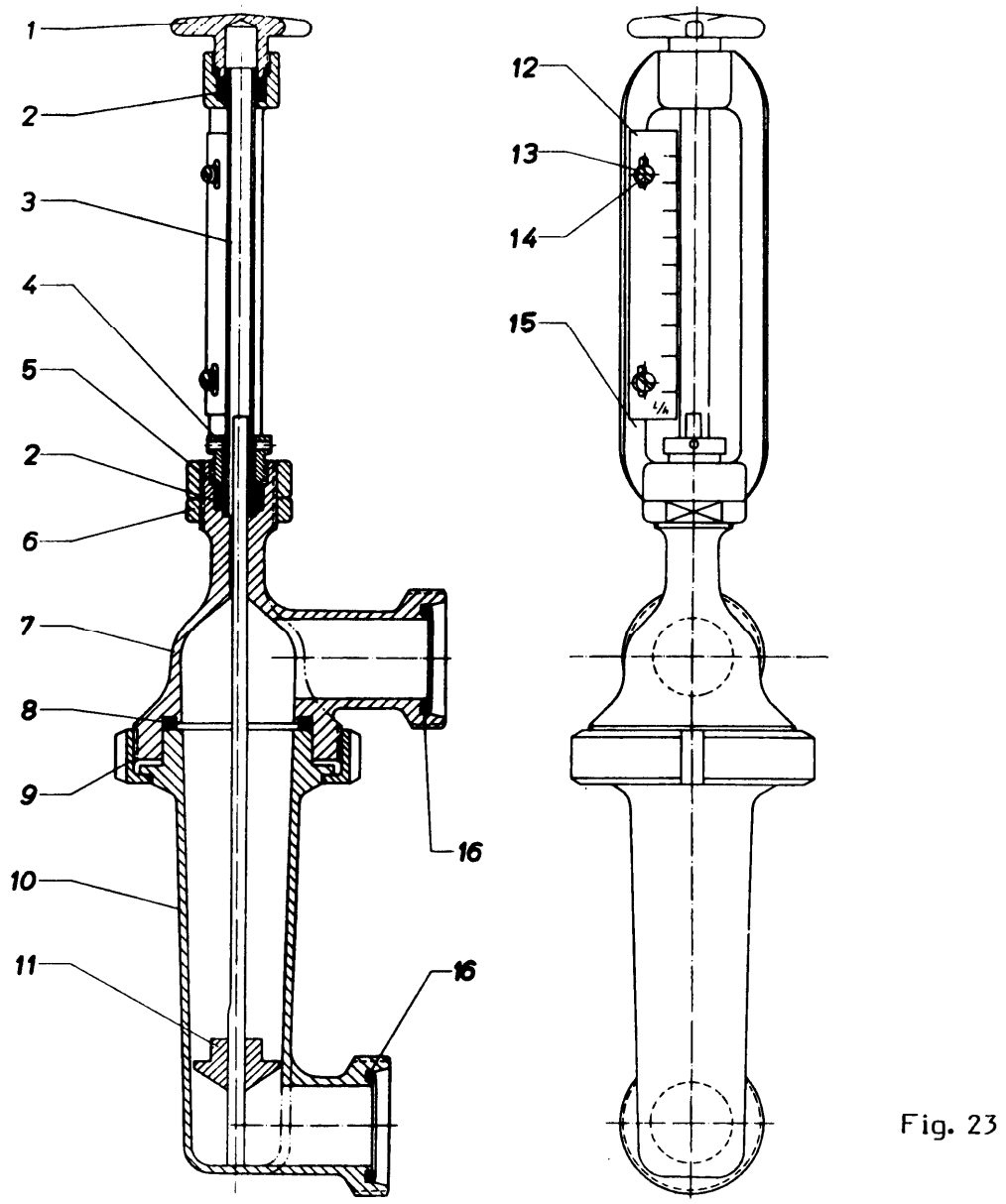


Fig. 23

No.in Fig.	Part - No.	Qty.	Part Description
-	8021-2100-090	1	Flowmeter, complete (1-16)
1	0019-1732-400	1	Handle screw
2	0007-2298-750	2	Gasket 13.5/22x10
3	0001-0083-820	1	Cylindrical sight glass
4	0019-1380-300	1	Threaded sleeve
5	0026-1375-300	1	Washer
6	0013-3010-300	1	Nut M 35x1.5
7	8022-2003-120	1	Outlet pipe
8	0007-2279-750	1	Gasket 56/68x6
9	0013-2846-300	1	Grooved coupling nut F65 DIN 11851
10	8021-2001-150	1	Inlet cup
11	8021-2112-000	1	Float
12	8021-2117-000	1	Scale 2,000 - 10,000 l/h
13	0004-5261-720	2	Gasket 4.5/9.0x1
14	0019-2478-300	2	Cheese head screw AM 4x8 DIN 85
15	8020-2002-000	1	Intermediate piece
16	0007-2210-750	2	Gasket G40 DIN 11851

GEA

Westfalia Separator AG

Unternehmensbereich
Prozeßtechnik

Werner-Habig-Str.1 • D-59302 Oelde • Telefon +49(0)2522/77-0 • Telefax: +49(0)2522/77-2488