Westfalia Separator AG

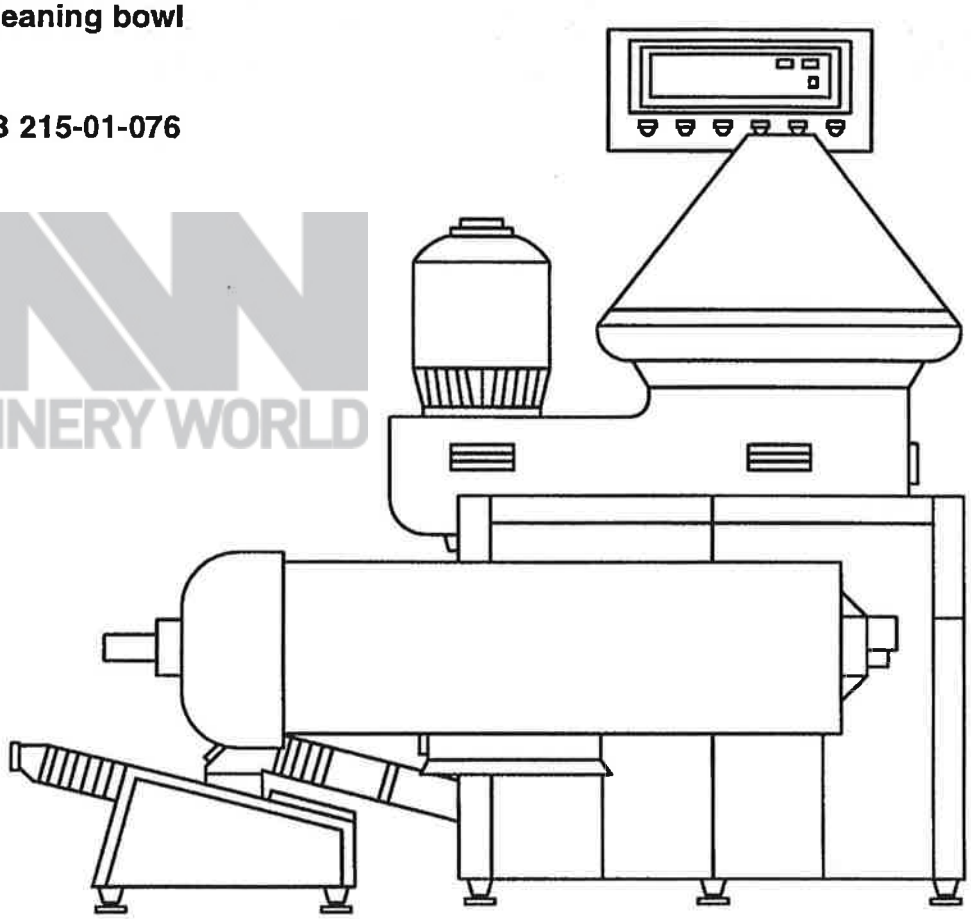
Instruction Manual and Parts List

No. 1201-9001-000

Edition 1081

Bacteria-removing centrifuge with self-cleaning bowl

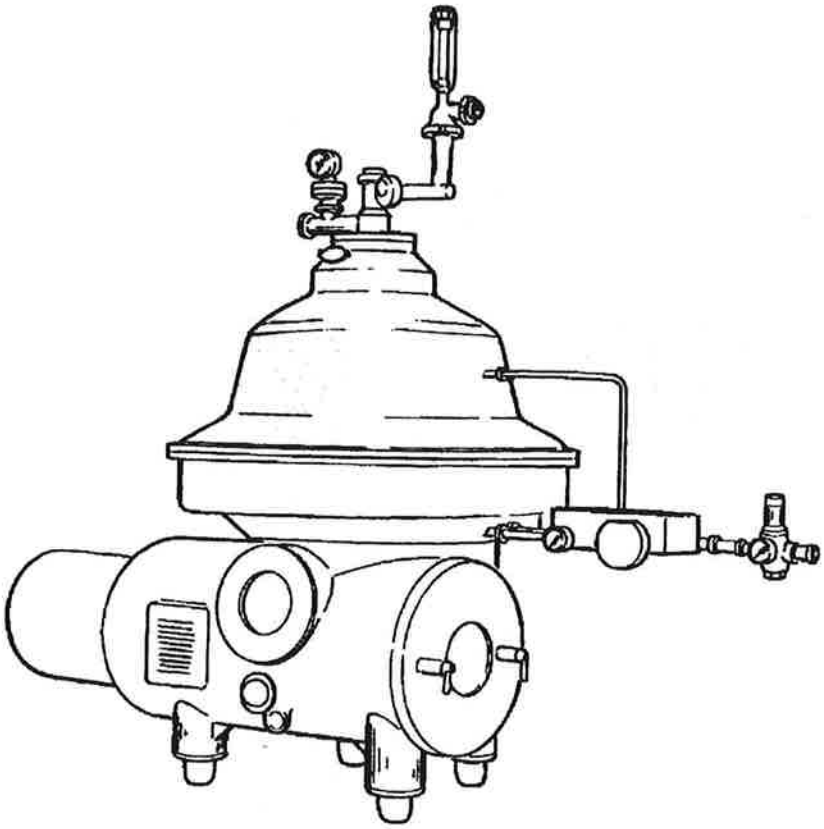
Model CNB 215-01-076



GEA

Process Technology Division

Subject to modification!



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/dm³		solids kg/dm³	

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

Safety precautions

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.

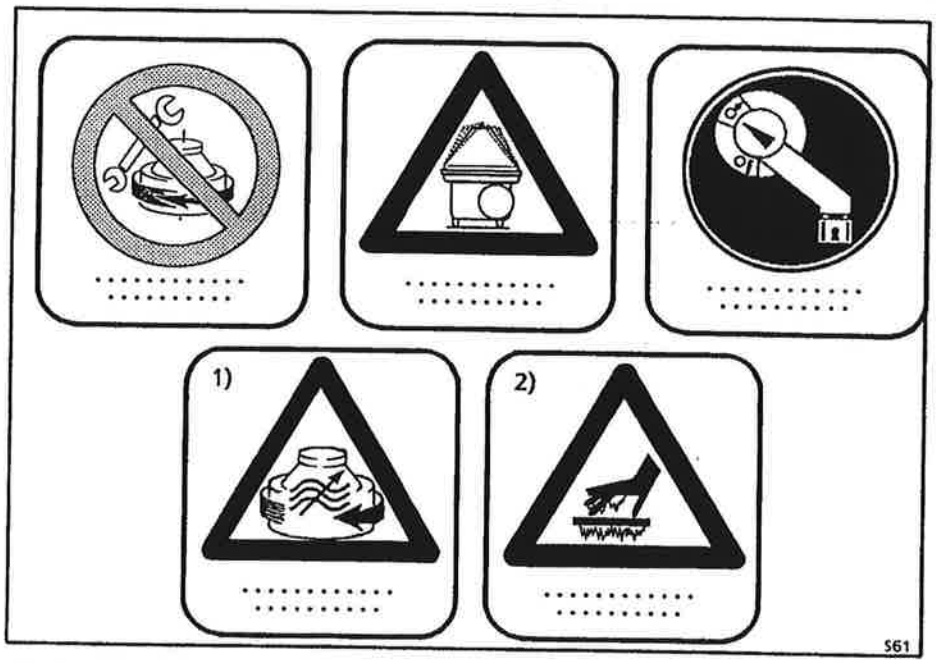


Fig.1

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.

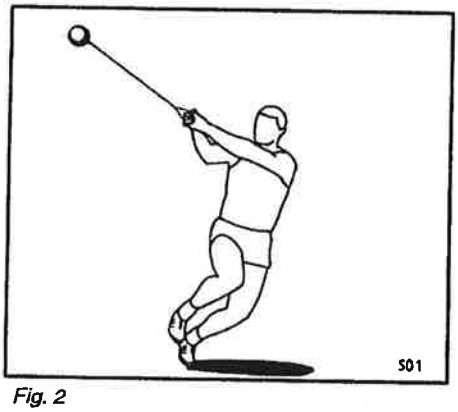


Fig. 2

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

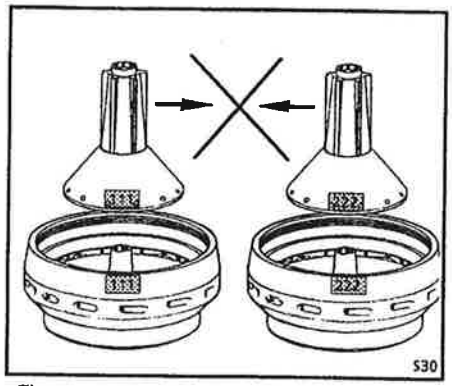


Fig. 3

- 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.

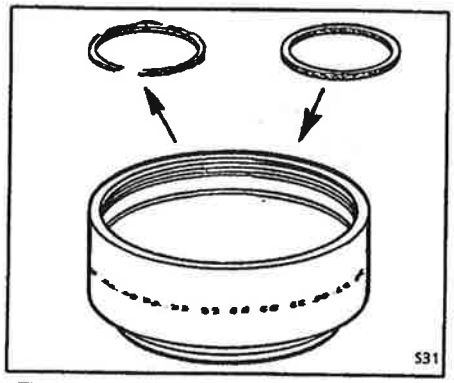


Fig. 4

- Damaged parts must be replaced immediately by new parts.

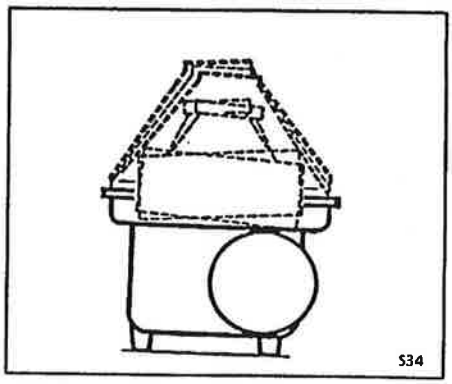


Fig. 5

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

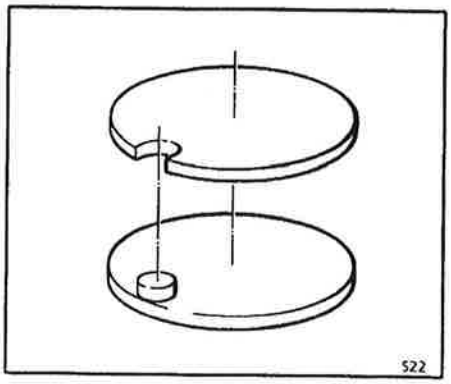


Fig. 6

- 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.

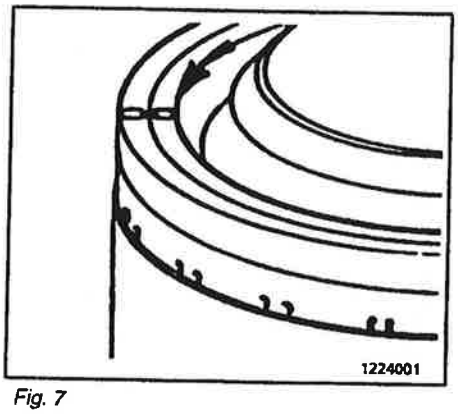


Fig. 7

- 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.

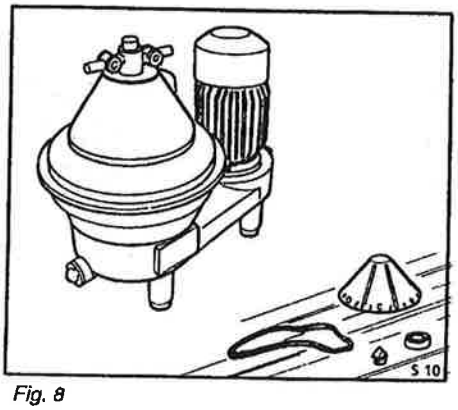


Fig. 8

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

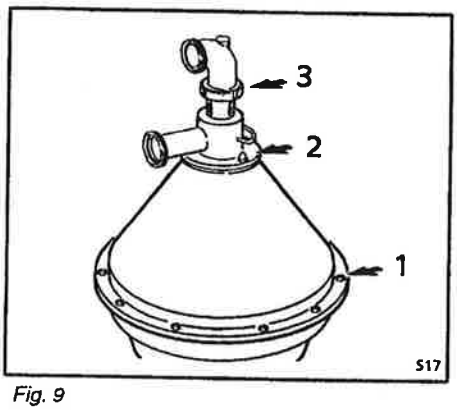


Fig. 9

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

Electrical appliances

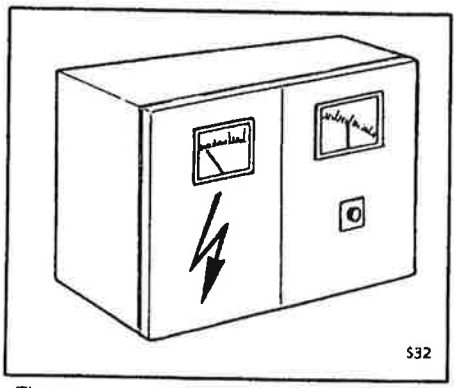


Fig. 10

- 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

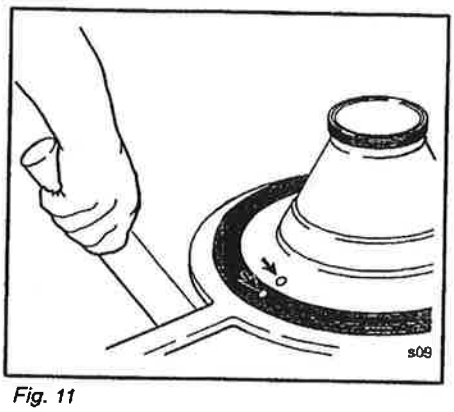


Fig. 11

- 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.

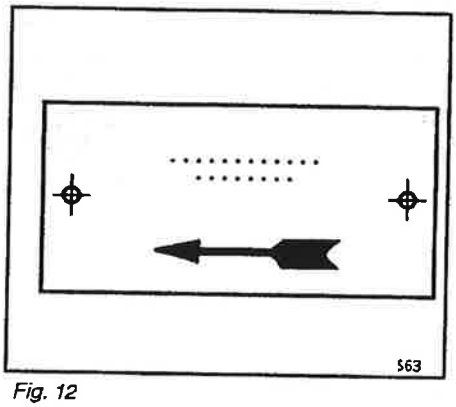


Fig. 12

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

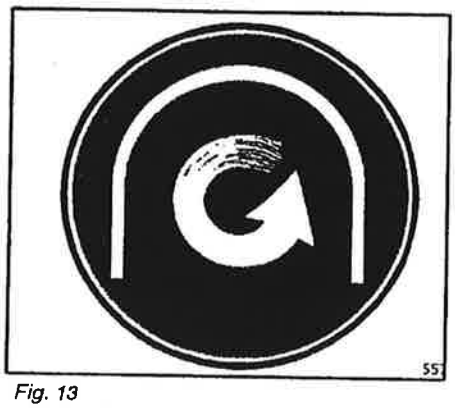


Fig. 13

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

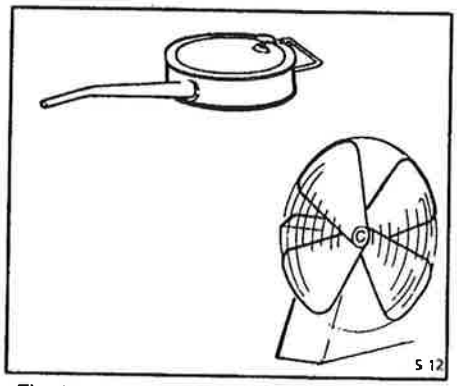


Fig. 14

- Check that the lubrication and cooling systems are serviceable.

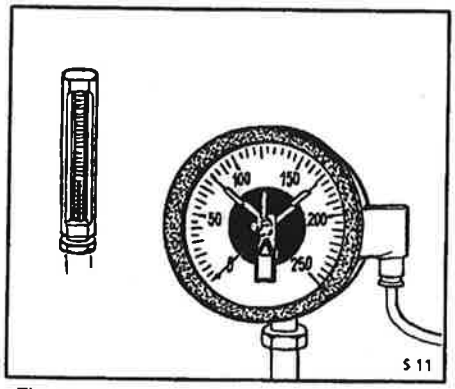


Fig. 15

- 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 nameplate must not be exceeded.

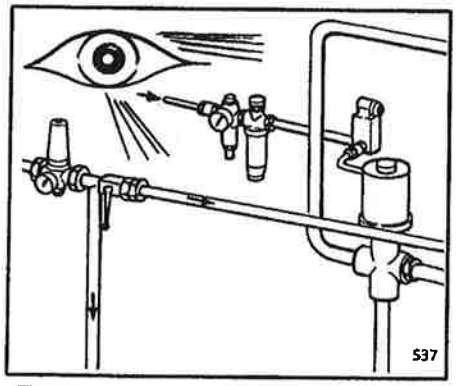


Fig. 16

- 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

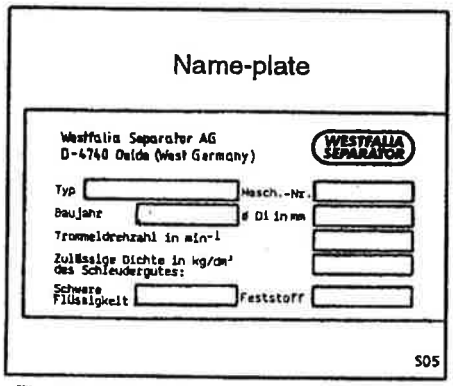


Fig. 17

- 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.

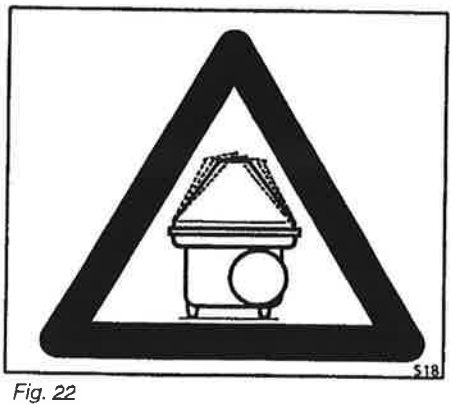


Fig. 22

- 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.

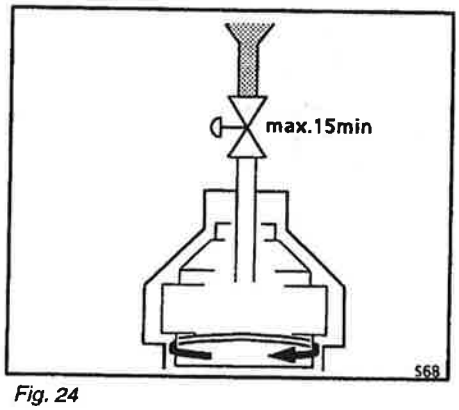


Fig. 24

- 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«

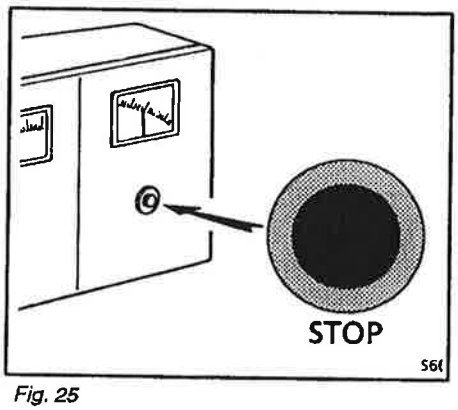


Fig. 25

- 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

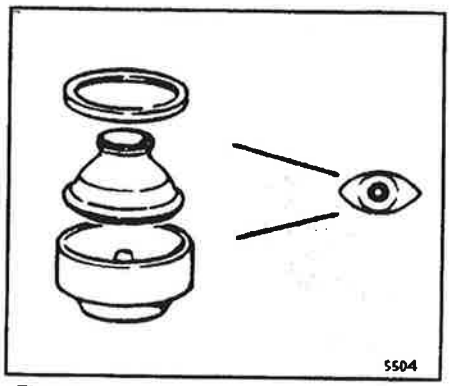


Fig. 26

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.

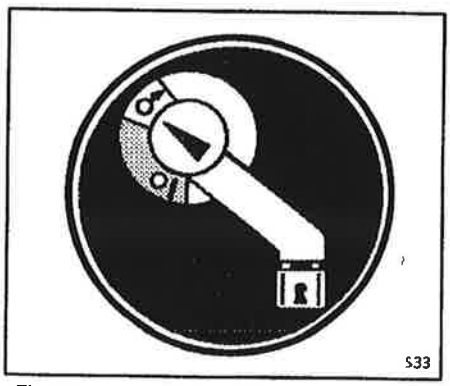


Fig. 27

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.

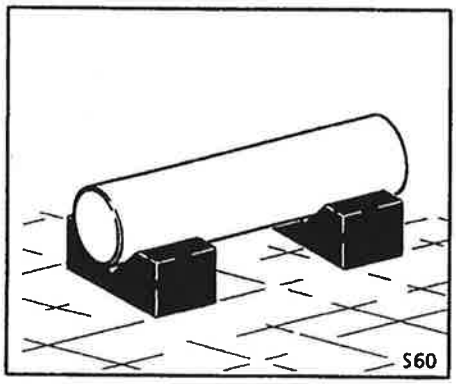


Fig. 30

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

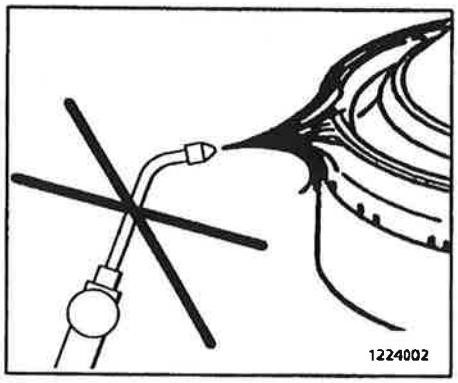


Fig. 31

- **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.

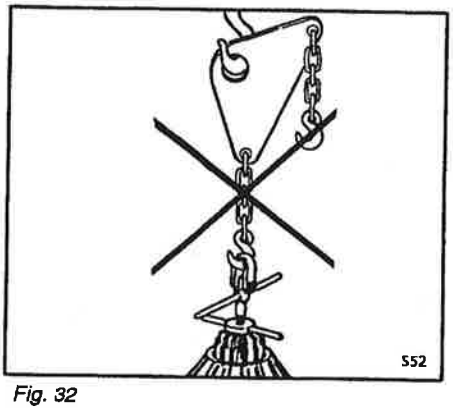


Fig. 32

- 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

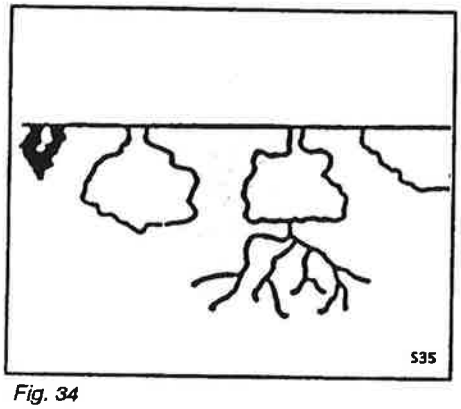
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

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.



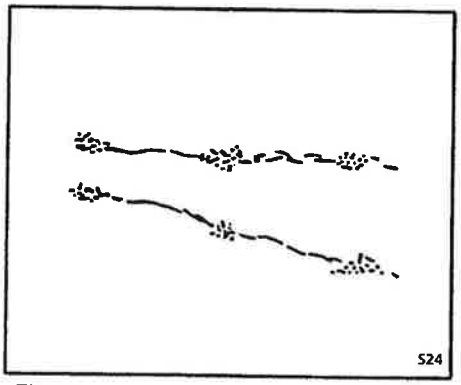
Possible formation of pit-shaped corrosion.

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

Erosion

Erosion is caused by solid particles in the process liquid.
These solid particles grind marks into the surfaces with which they come into contact.

The following factors favour the occurence of erosion:

- hard solids particles
- high throughput capacities

The first signs of erosion should be carefully observed and documented. Erosion can deepen rapidly, thereby weakening the bowl material.

Contact your nearest Westfalia Separator representative for a thorough examination. Information on the nature of the damage can be provided by photos, plaster casts or lead molds.

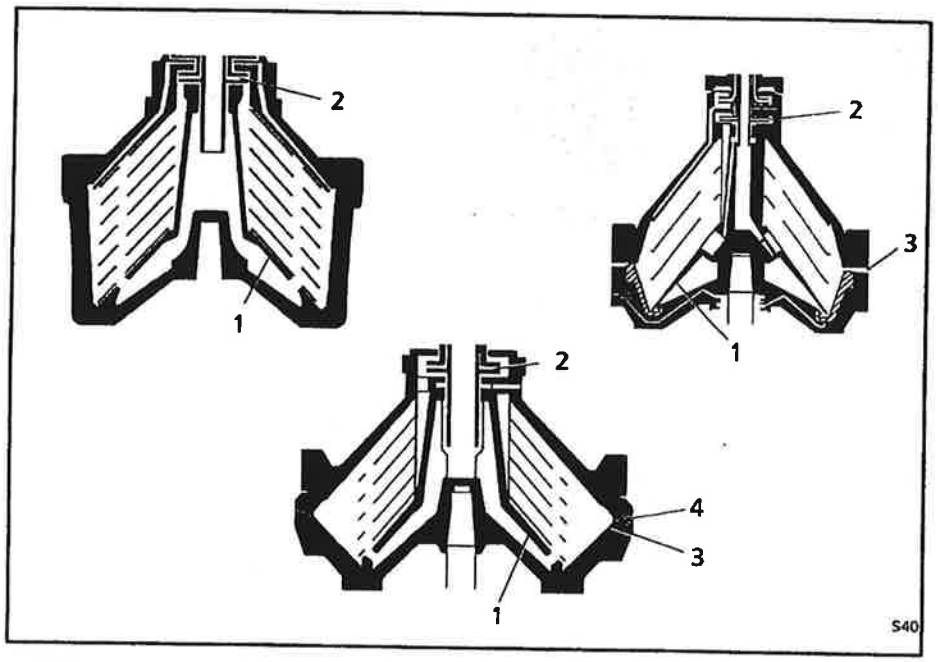


Fig.36

The surfaces most susceptible to erosion are:

1) the bottom of the distributor, the rising channels and the ribs,
2) the centripetal pump (cavitation),
3) all surfaces in the area of the solids discharge ports,
4) the nozzles.

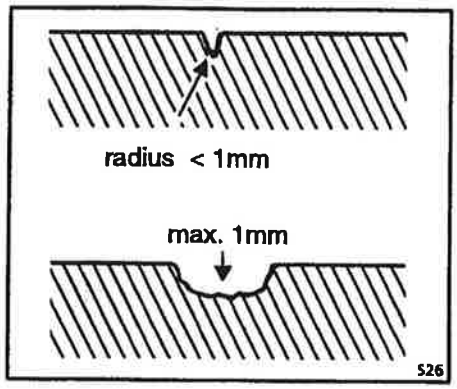
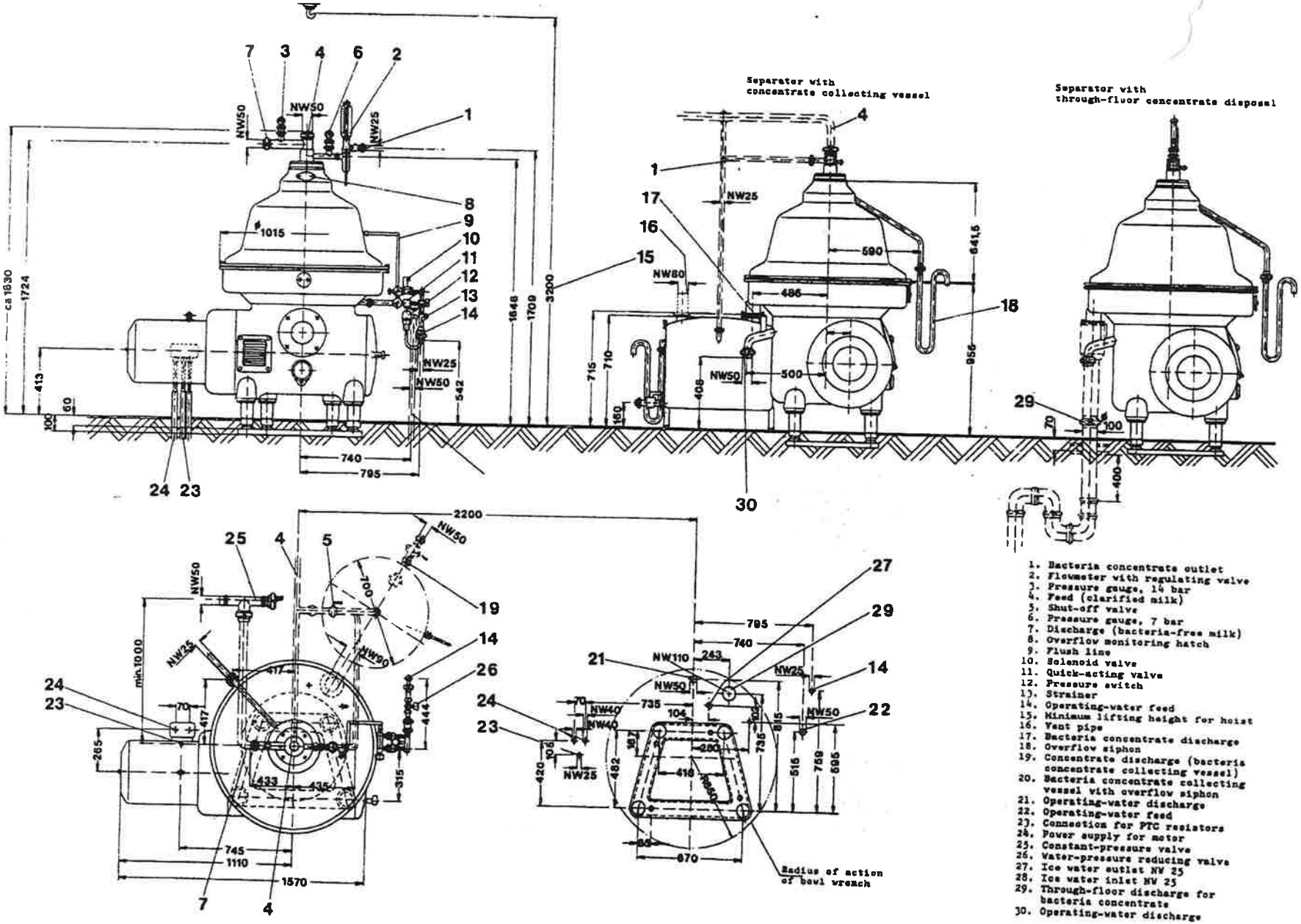


Fig. 37

Signs of erosion which you should immediately report to your nearest Westfalia Separator representative:

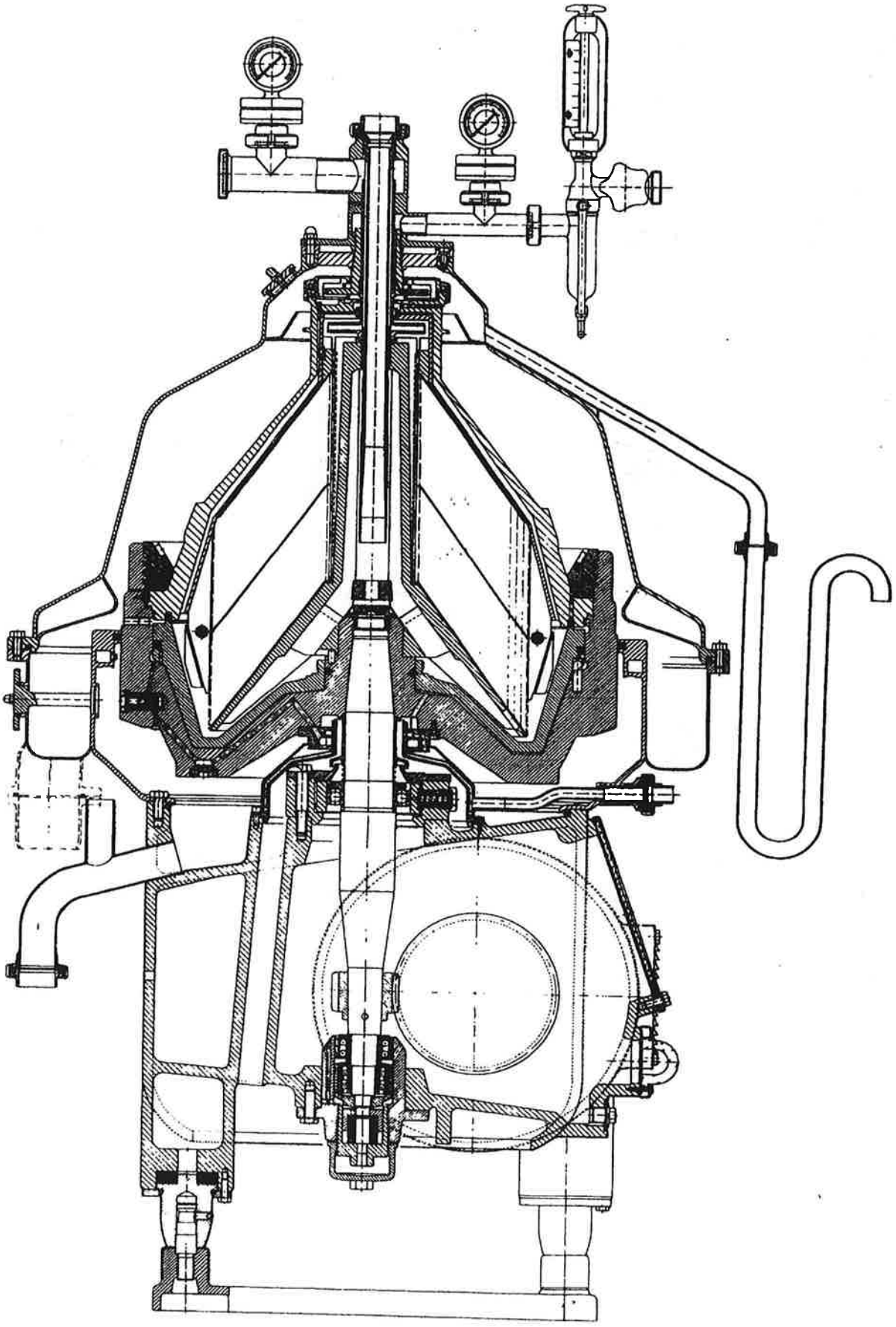
- The bottom of the erosion mark has a radius smaller than 1 mm (large notch effect).
- The depth of erosion mark exceeds 1 mm at the deepest point.



1. Bacteria concentrate outlet
2. Flowmeter with regulating valve
3. Pressure gauge, 14 bar
4. Feed (clarified milk)
5. Shut-off valve
6. Pressure gauge, 7 bar
7. Discharge (bacteria-free milk)
8. Overflow monitoring hatch
9. Flush line
10. Solenoid valve
11. Quick-acting valve
12. Pressure switch
13. Strainer
14. Operating-water feed
15. Minimum lifting height for hoist
16. Vent pipe
17. Bacteria concentrate discharge
18. Overflow siphon
19. Concentrate discharge (bacteria concentrate collecting vessel)
20. Bacteria concentrate collecting vessel with overflow siphon
21. Operating-water discharge
22. Operating-water feed
23. Connection for PTC resistors
24. Power supply for motor
25. Constant-pressure valve
26. Water-pressure reducing valve
27. Ice water outlet NW 25
28. Ice water inlet NW 25
29. Through-floor discharge for bacteria concentrate
30. Operating-water discharge

Bowl speed	4700 rpm
Total net weight of machine	2550 kg
Minimum lifting capacity of hoist	500 kg
Motor power	37 kW, 50Hz

Sectional View of the Separator



W O R K I N G I N S T R U C T I O N S

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.

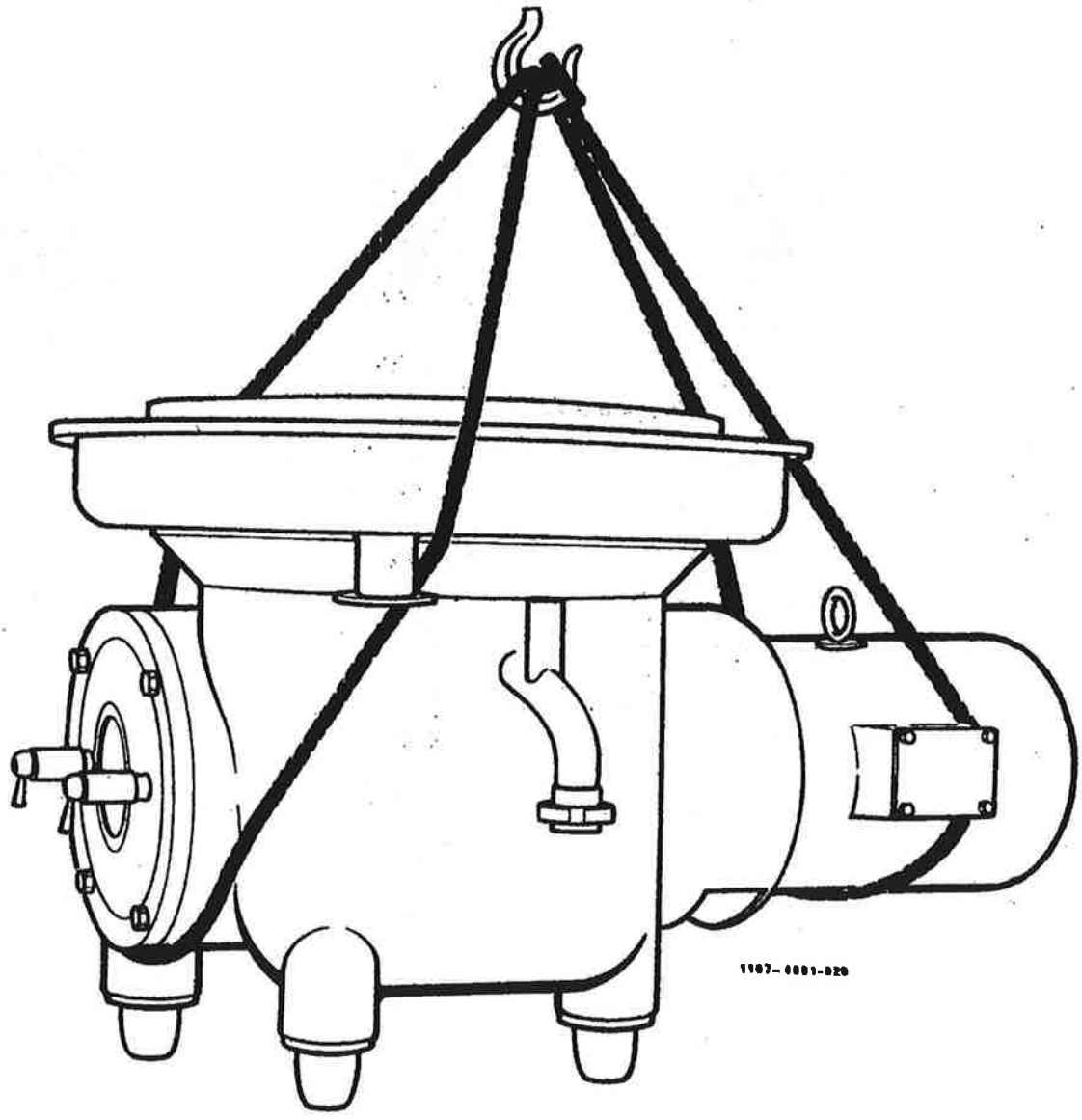


Fig. 1/1

Weight: 1000 kg

1.2. Installation

When installing the separator make sure that sufficient room is available (at least 300 mm) for mounting and removing the motor and for removing the horizonzal drive shaft which is to be pulled out towards the brake side.

Do NOT install a shut-off device in the line which will be connected to the operating-water discharge line 5a-c (fig. 13/1). The line should have 50 mm (2") I.D. It should have sufficient fall and must NOT be too long to allow the discharging operating water to flow off freely, since otherwise the water will rise and enter the upper section of the frame, resulting in slowing-down of the bowl.

The supply line to the operating-water connection should have 25 mm (1") I.D., the operating-water pressure should be at least 1.5 bar. The pressure must not fluctuate by more than 0.5 bar. Operating-water consumption: 50 litres/h.

For mounting and removing the bowl parts, a 500 kg hoist (minimum lifting height 3200 mm; see installation plan) will be indispensable). On request a WESTFALIA Swivel Hoist can be supplied.

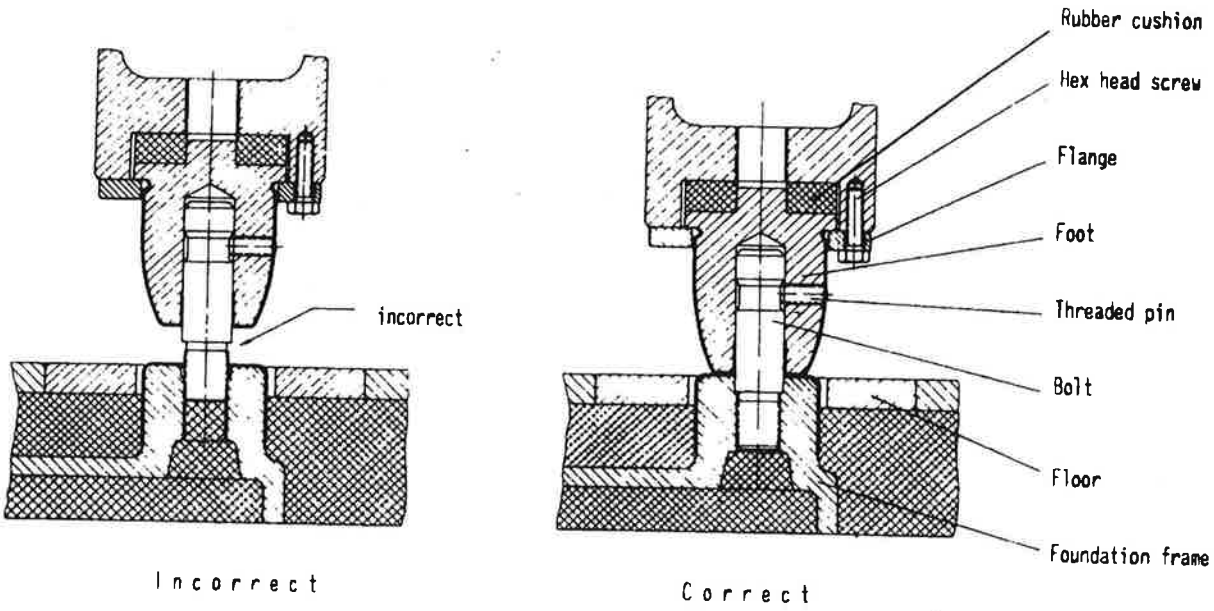


Fig. 1/2

Screw bolts into the four mounting blocks of foundation frame; make sure they are tight. Embed the foundation frame in the floor so that the mounting blocks of the frame protrude above the plane of the floor by about 5 mm. Fill up the space below the foundation frame with concrete. Make sure that the mounting blocks are absolutely level and grout the frame with concrete, inside and outside. To accelerate setting of cement, commercial rapid binding agents may be used.

By means of flanges and hex head screws fasten feet with fitted-on rubber cushions to separator frame. Then lift the separator frame with its feet onto the bolts of the foundation frame and tighten the threaded pins with a wrench.

2. Lubrication

2.1 Lubrication of bearings and gear parts

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

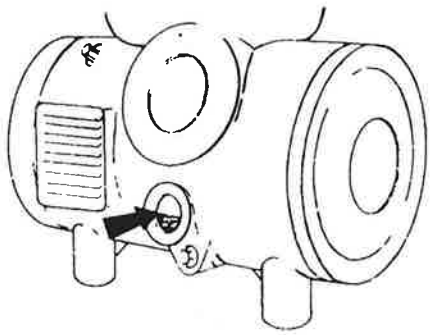


Fig. 2/1

OIL LEVEL

Before initial start-up of separator, fill gear chamber with oil. To do this, remove upper sight glass and fill in oil until oil level is slightly above middle of oil level sight glass. About 5.5 litres of oil are required for one filling. During operation oil level must never be allowed to sink below middle of oil level sight glass; refill oil when necessary.

OIL CHECK

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

OIL CHANGE

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

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

LUBRICATING OIL

As lubricating oil use only a gear oil designated

CLP 220 (according to DIN 51502)

or designated

CC 220 (according to ISO 3498).

The lubricating oil shall meet the following requirements:

1) Viscosity: 220 $\pm$ 22 mm^2/s (cSt) at 40 °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 has been extensively investigated by us meets the above requirements and should preferably be used. For the order number refer to page 20/1 of the parts list.

IMPORTANT! Do NOT use motor vehicle lubricating oils, since they are likely to emit disturbing odours.

2.2 Lubrication of the motor bearings

For lubrication of the motor bearings refer to the instructions of the motor manufacturer (see plate attached to the motor).

3. Motor connection

3.1. Three-phase AC motor, 37 kW

The separator is driven by a flange type motor via a fluid clutch. The motor has to be operated by means of a motor control unit including a star-delta starter. Switching over from star to delta connection takes place after 20 seconds. During this time the valve for the clutch cooling-water is opened automatically.

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

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

The measuring circuit line (between tripping unit and motor) should be laid separate from other lines.

The starting current of the motor can reach 1.8 times the value of the rated current. Dimensioning of switches, wiring, and fuses should, therefore, be based upon the starting current and not on the rated current.

3.2. Direction of rotation of the bowl

ATTENTION: The bowl must rotate in clockwise direction when looked at from above. The direction of rotation of the bowl is correct, when the square-head screw on motor shaft end rotates in direction of arrow. The direction of rotation is reversed by interchanging two lead-in wires.

3.3. Speed and starting time of the bowl

The bowl speed is 4700 rpm. It is indicated by the RPM meter (see sect. 3.4).

Starting of the bowl takes about 12 minutes.

3.4. RPM Meter

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 4600 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 4700 rpm within the pre-set starting time of 13 minutes, the RPM meter will trigger an acoustical signal and prevent starting of the milk pump.

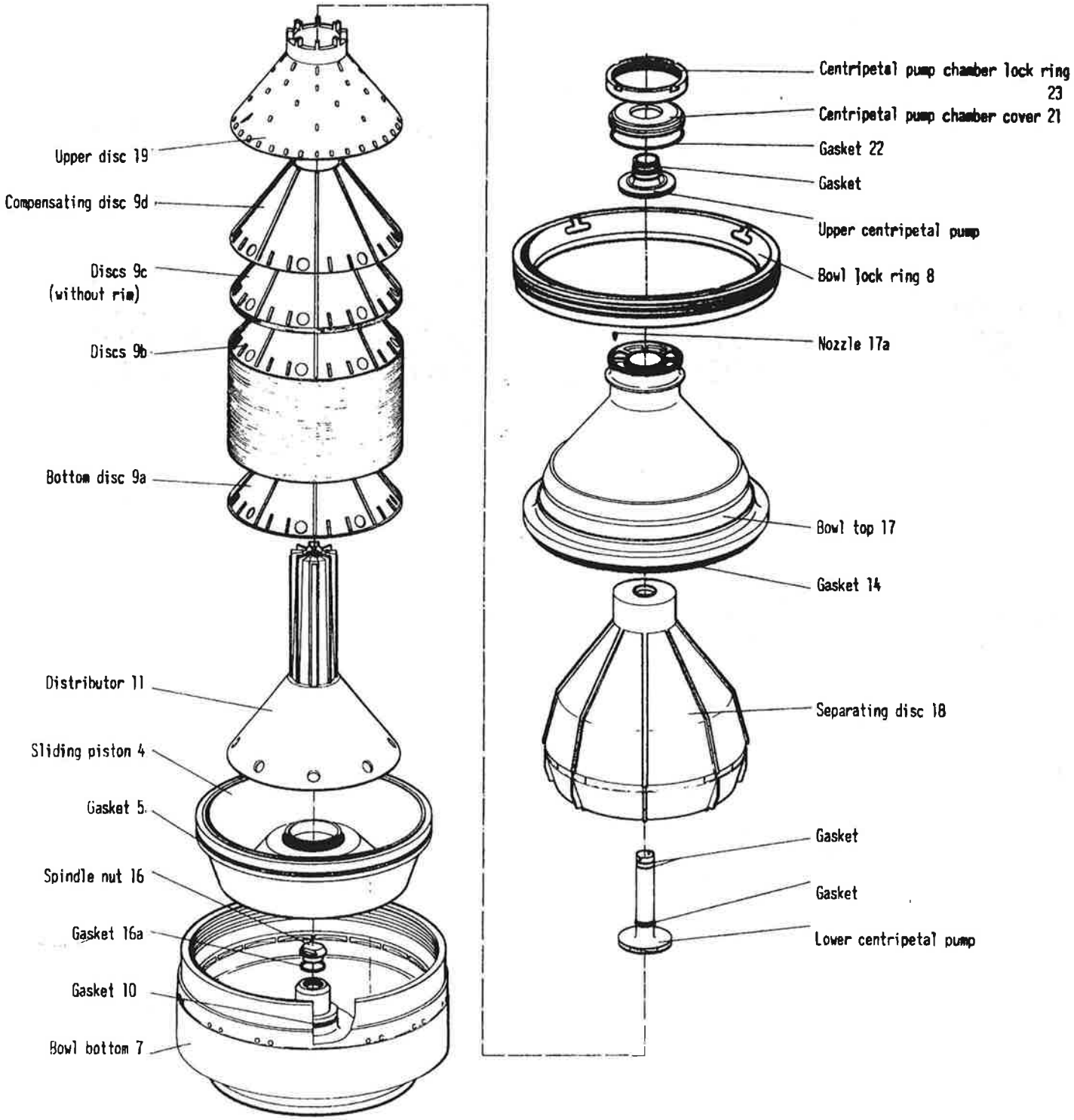


Fig. 4/1

Exploded view of the bowl

Important Hints

- Prior to assembling the bowl parts, carefully clean all contact surfaces and grease them.
- When installing the bowl parts, make sure that the "O" marks of the bowl parts are in line. "O" mark alignment will ensure that the parts are properly positioned and locked in place by arresting pins and guide ribs. To avoid damage to guide surfaces and arresting pins when installing or removing the bowl parts, make sure the hoist is in the correct position. The hoist is to be operated at the low lifting speed. Never use violence when istalling or removing the bowl parts.
- Before inserting the gaskets, check them for wear. Make sure that grooves 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.

4.1. Assembly of the bowl (for tools refer to page 20/2)

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

2) Use jack 436 to place bowl bottom 7 onto the spindle.

3) Insert gasket 16a in spindle nut 16.

4) Tightly screw on spindle nut **(left-hand thread),** using a wrench.

5) Insert gasket 10 in hub of bowl bottom.

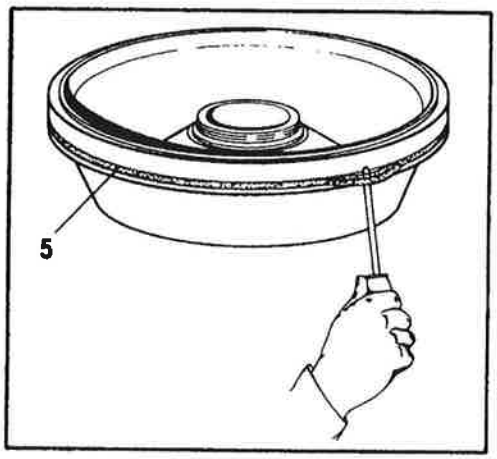


Fig. 4/2

6) Thoroughly clean groove in sliding piston 4 for gasket 5 and apply a thin film of grease.

   In case the gasket is new and a bit too tight, stretch it out equally all the way around until its outer diameter is almost equal to the outer diameter of the groove in the sliding piston.

   Then put the gasket into the groove of the sliding piston. Stick a screwdriver under the gasket and run it around the sliding piston two or three times (see fig. 4/2). Then tap the gasket back into its groove with a rubber hammer.

   The gasket is now equally stretched all the way around and assures best sealing effect during operation.

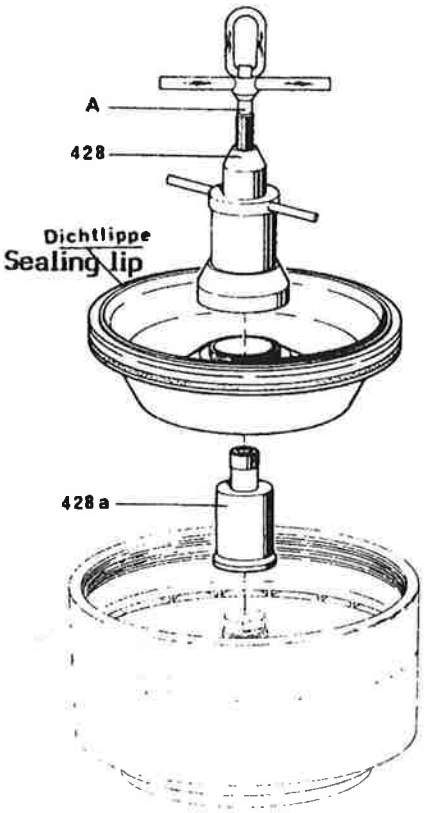


Fig. 4/3a

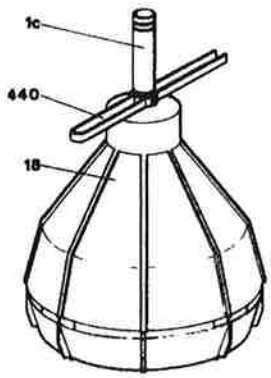


Fig. 4/3b

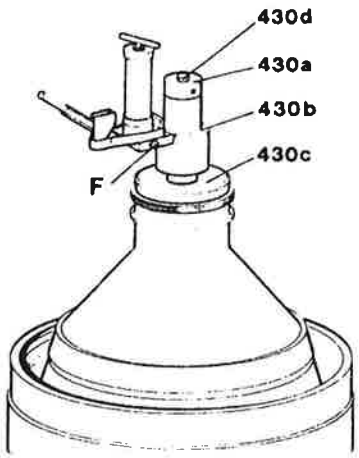


Fig. 4/3c

7) **Fig. 4/3a:** Lightly grease guide surfaces of sliding piston and of bowl bottom with the supplied lubricating paste. 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.

   CAUTION: Be careful not to damage sealing lip of sliding piston.

8) Place distributor 11 into bowl bottom, using mounting tool 434. Make sure that the three arresting pins of the bowl bottom fit into the recesses of the distributor. The "O" marks of both parts must be aligned.

9) Stack discs 9a-d onto the neck of the distributor in numerical order, beginning with No. 1.

10) Place on upper disc 19 (specially shaped).

11) **Fig. 4/3b:** Fit lower centripetal pump (with inserted gaskets) into separating disc 18 from below. Apply lifting tongs 440 to centripetal pump below the thread. Then install the separating disc including lower centripetal pump with the aid of the tongs.
    Ensure that the "O" marks of separating disc and bowl bottom are aligned.

12) Use device 427 to place bowl top 17 (with inserted gasket 14) onto the bowl bottom. Make sure 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.

13) Carefully clean, wipe dry and grease threaded areas of bowl bottom and of bowl lock ring 8 as well as the contact surfaces, to prevent seizing of the threads. For greasing use the supplied lubricating paste; apply a thin film only.

14) Before screwing in the bowl lock ring, compress the disc stack by means of compressing device 430 (fig. 4/3c) in the following manner (see also sect. 4.6):

    a) Place disc 430c onto the bowl top.

    b) Screw bolt 430d into the distributor all the way down.

    c) Insert hydraulic compressing device 430b in centering recess of disc 430c.

    d) Screw on threaded ring 430a and tighten it so that 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 330 - 360 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 14a-d on page 4/3.
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.

15) Use annular wrench 425 and lifting device 431 to place bowl lock ring onto bowl bottom (see fig. 4/6). 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 405 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 (see sect. 4.1, No. 9b). 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).

16) 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.

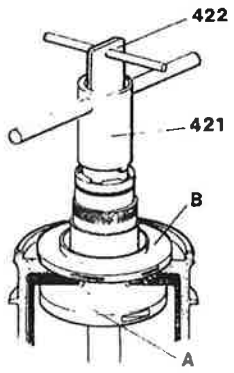


Fig. 4/4

17) Fit gasket onto upper centripetal pump. Screw this onto lower centripetal pump until it is hand-tight (N.B. **left-hand thread).** Use wrench 421 to tighten it further until it hits the stop. While doing so, hold lower centripetal pump with wrench 422.

18) Insert gasket 22 into centripetal pump chamber cover 21.

19) Install the centripetal pump chamber cover. Ensure that it is correctly aligned.

20) By lightly tapping against handle of annular wrench 426 **(left-hand thread)** tighten centripetal pump chamber lock ring 23.

21) Check if bowl can be turned by hand.

4.2. Assembling the feed and discharge connections

1) Fasten lifting device 435 (fig. 20) to the hood by means of cap nuts 41h. With the aid of a hoist place hood so onto sediment collector that the "O" marks on sediment collector and on hood are in line with each other. Connect flush lines. Fasten hood to sediment collector by means of hex head screws.

2) Place disc 2 onto hood. Screw centripetal pump A into disc and tighten it with wrench 421, turning fully counter-clockwise.

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

4) Fasten disc 2 to hood by means of the two Allen screws B.

5) Install feed and discharge housing 3 and fasten with cap nuts 41h.

6) Install feed tube 1a with inserted gaskets in feed and discharge housing.

7) Connect feed and discharge lines.

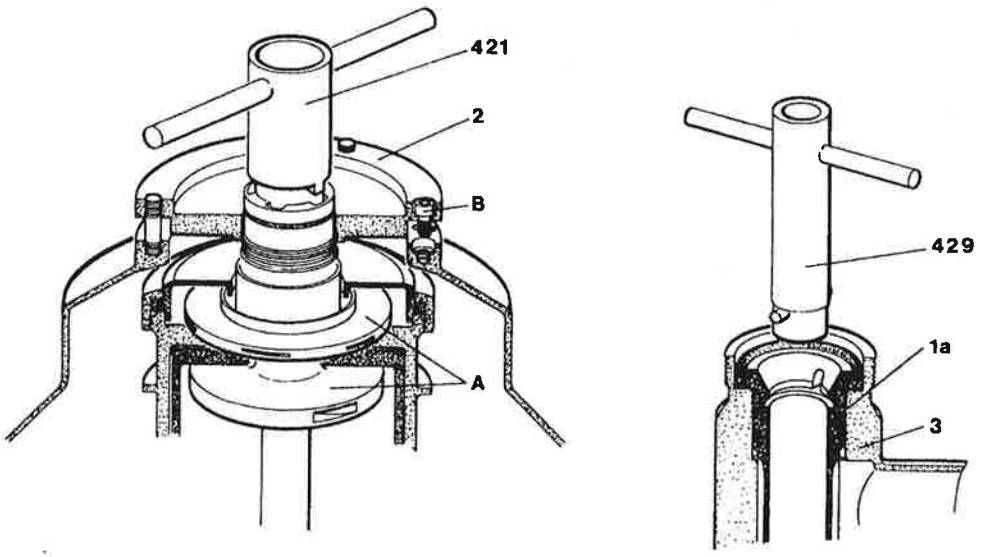


Fig. 4/5

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

CAUTION: To avoid accidents do NOT loosen any part of the separator or of the feed and discharge system before the bowl has stopped completely.

Note that the bowl has NOT stopped before the gear sight glass is clear and the worm wheel has ceased rotating.

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

Handle bowl parts with care. Be sure to replace worn gaskets.

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

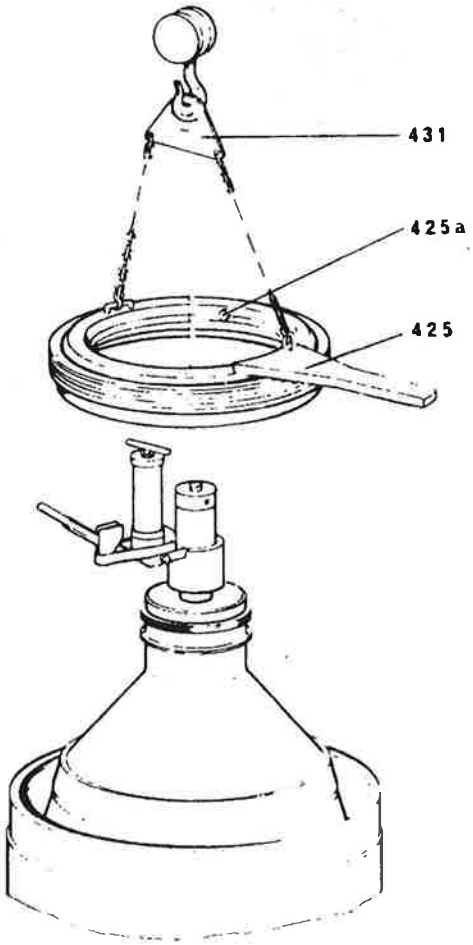


Fig. 4/6

Fig. 4/5: Use wrench 429 to remove feed tube from feed and discharge housing. After removing the housing, loosen screws B in ring 2. Then use wrench 421 to unscrew the double centripetal pump from the ring **(left-hand thread).** Remove the hood.

After unscrewing the small lock ring and removing the centripetal pump chamber cover, unscrew upper centripetal pump from lower centripetal pump (N.B. left-hand thread), using wrech 421. Hold lower centripetal pump with wrench 422.

Then compress disc stack by means of hydraulic compressing device in order to facilitate loosening of the bowl lock ring (see 4.1, No. 14a-f).
Now unscrew the bowl lock ring **(left-hand thread)** with the aid of annular wrench 425. Loosen the ring by lightly hitting against wrench handle with mallet 405.

Remove hydraulic compressing device as described in sect. 4.1 under No. 16.

Fig. 4/6

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

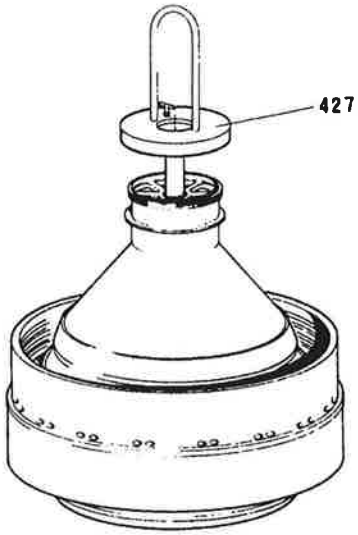


Fig. 4/7a

Fig. 4/7a:

Screw device 427 onto bowl top and, by means of a hoist, remove bowl top from bowl bottom.

If the separating disc is stuck in the bowl top, rap bowl top with a copper or light metal hammer until the separating disc comes loose. Do **not** let it drop on the floor.

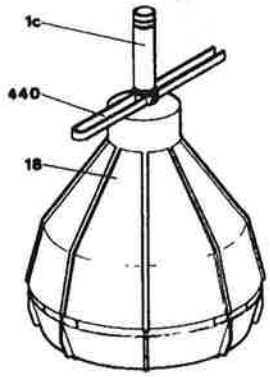


Fig. 4/7b

Fig. 4/7b:

With the aid of lifting tongs 440, which have to be applied below the centripetal pump thread, remove the separating disc and lower centripetal pump.
Do **not** drop the centripetal pump on the floor when removing the lifting tongs.

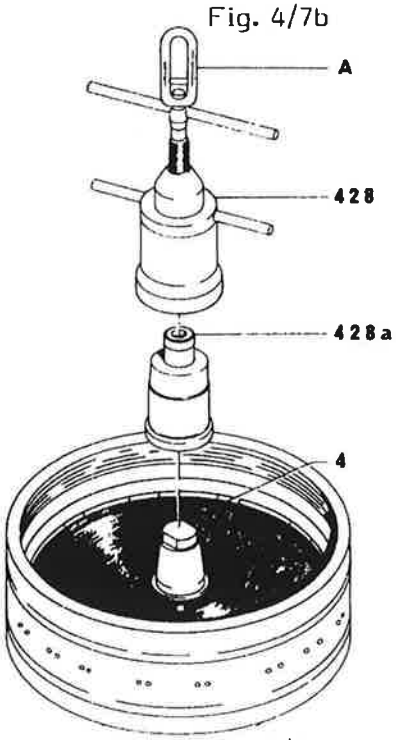


Fig. 4/7c

Fig. 4/7c:

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 in clockwise direction in order to pull the sliding piston off the bowl bottom. Then lift out the sliding piston.

4.4. Removal and installation of Polyamid gasket 15 (fig. 19)

4.4.1. Removing the Polyamid gasket from the bowl top

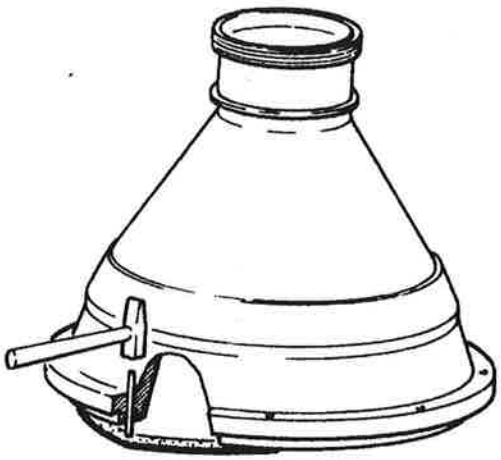


Fig. 4/8a

Remove Polyamid gasket from groove of bowl top with the aid of the drift pin supplied with the machine: Introduce the drift pin into the holes which are equally distributed around the bowl top and hammer on to the pin until the gasket becomes loose.

4.4.2. Installing the Polyamid gasket into the bowl top

Fig. 4/8b

Fig. 4/8c

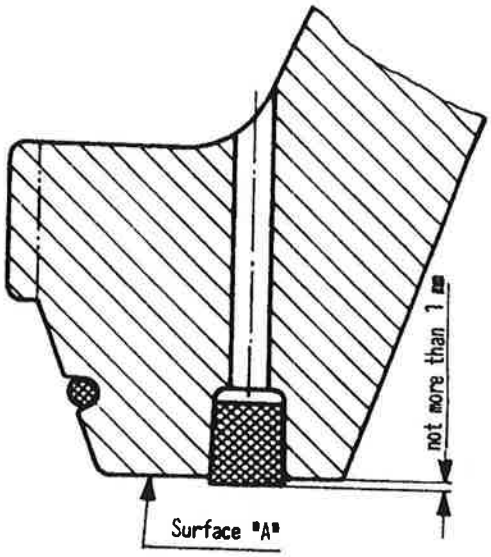


Fig. 4/8d

1) Keep gasket for about 5 minutes in approx. 80°C hot water to warm it up.
2) Wipe gasket dry.
3) Insert gasket (with its narrow side facing the bowl top) into the clean groove of bowl top. Place a piece of hard wood (fig. 4/8b) or a piece of the old Polyamid gasket (fig. 4/8c) on the new gasket and hammer the gasket evenly into the groove until its sealing surface protrudes from surface "A" of bowl top by not more than 1 mm (fig. 4/8d).

4.5. Removing the piston valve

Remove piston valve assembly 3a-f once a month for cleaning. On this occasion check the gaskets and replace them, if necessary.

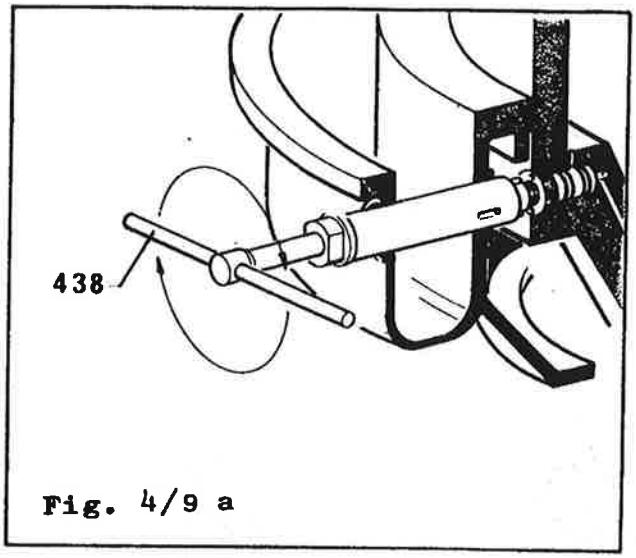
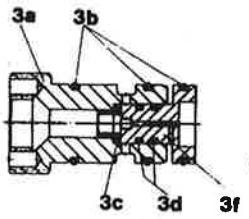


Fig. 4/9 a



Screw wrench 438 into piston valve.

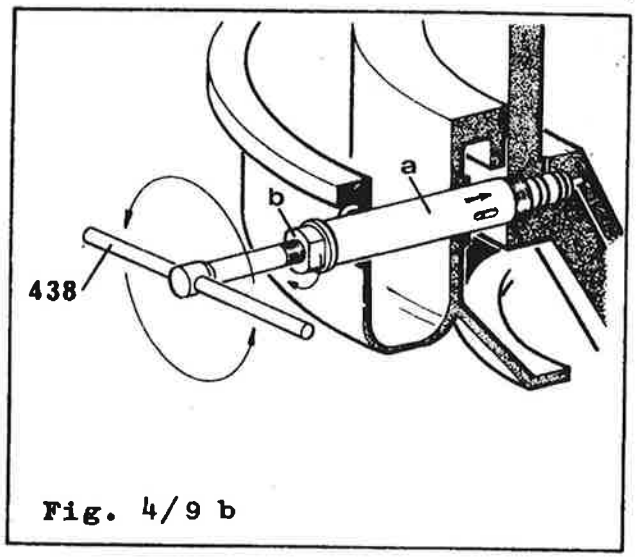


Fig. 4/9 b

Introduce pins of bush a of wrench 438 into boreholes of valve. Tighten nut b. Then unscrew piston valve by means of wrench 438.

Before installing the valve, moisten gaskets 3b and grease threaded area. Then screw in valve as far as it will go. However, be sure not to screw it in too tightly.

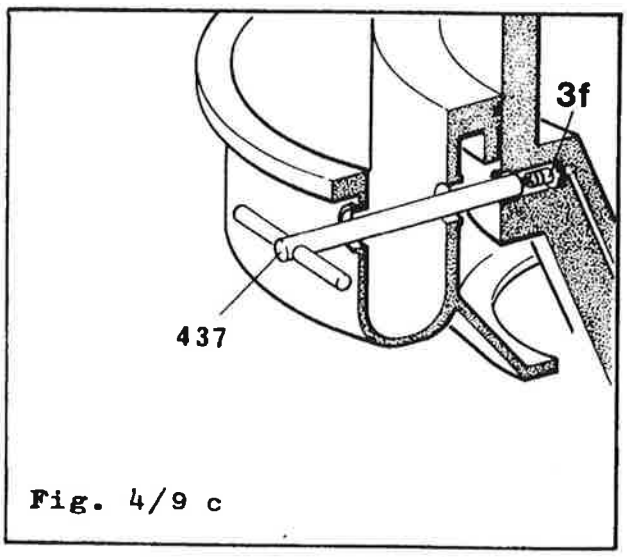


Fig. 4/9 c

Screw wrench 437 into valve piston 3f and withdraw piston from 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.

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 330 - 360 bar.
It may be higher than 360 bar, but must **not** be lower than 330 bar.
The maximum permissible pressure is 390 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. 14a-d) the oil hydraulic chamber B will escape through this hole.

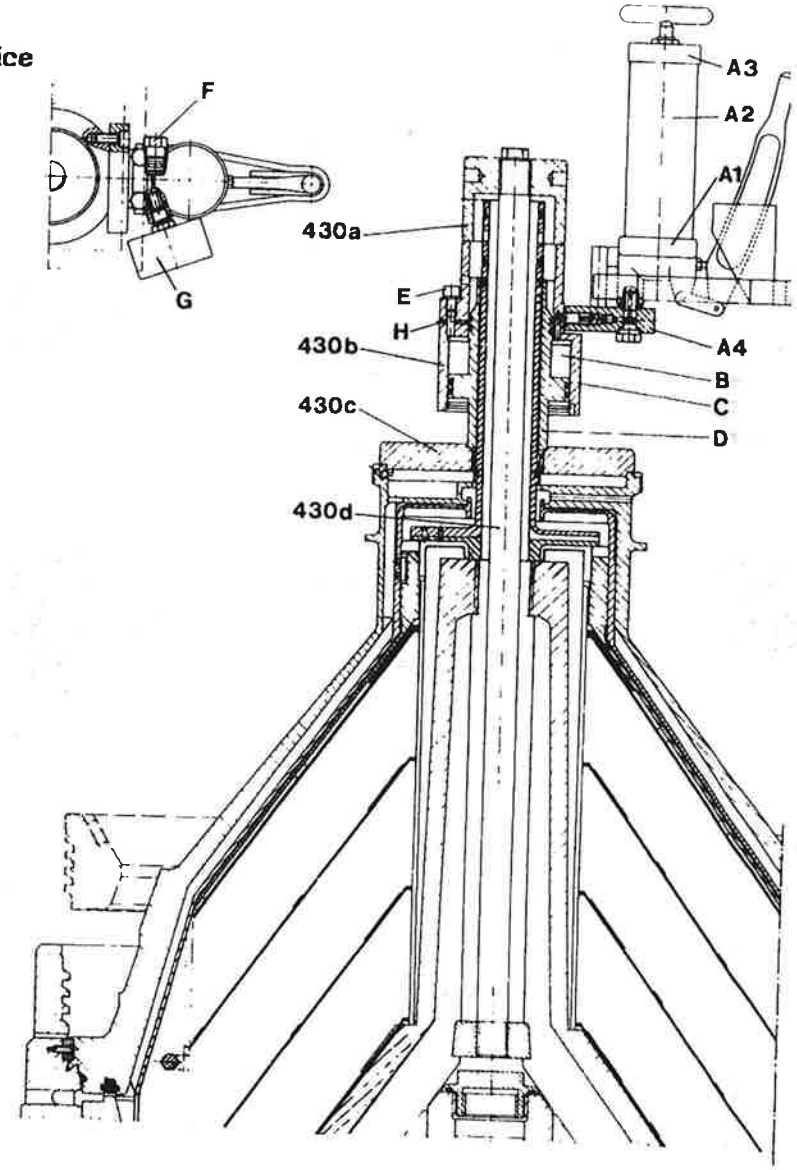


Fig. 4/10

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. Technical Information

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 they 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.

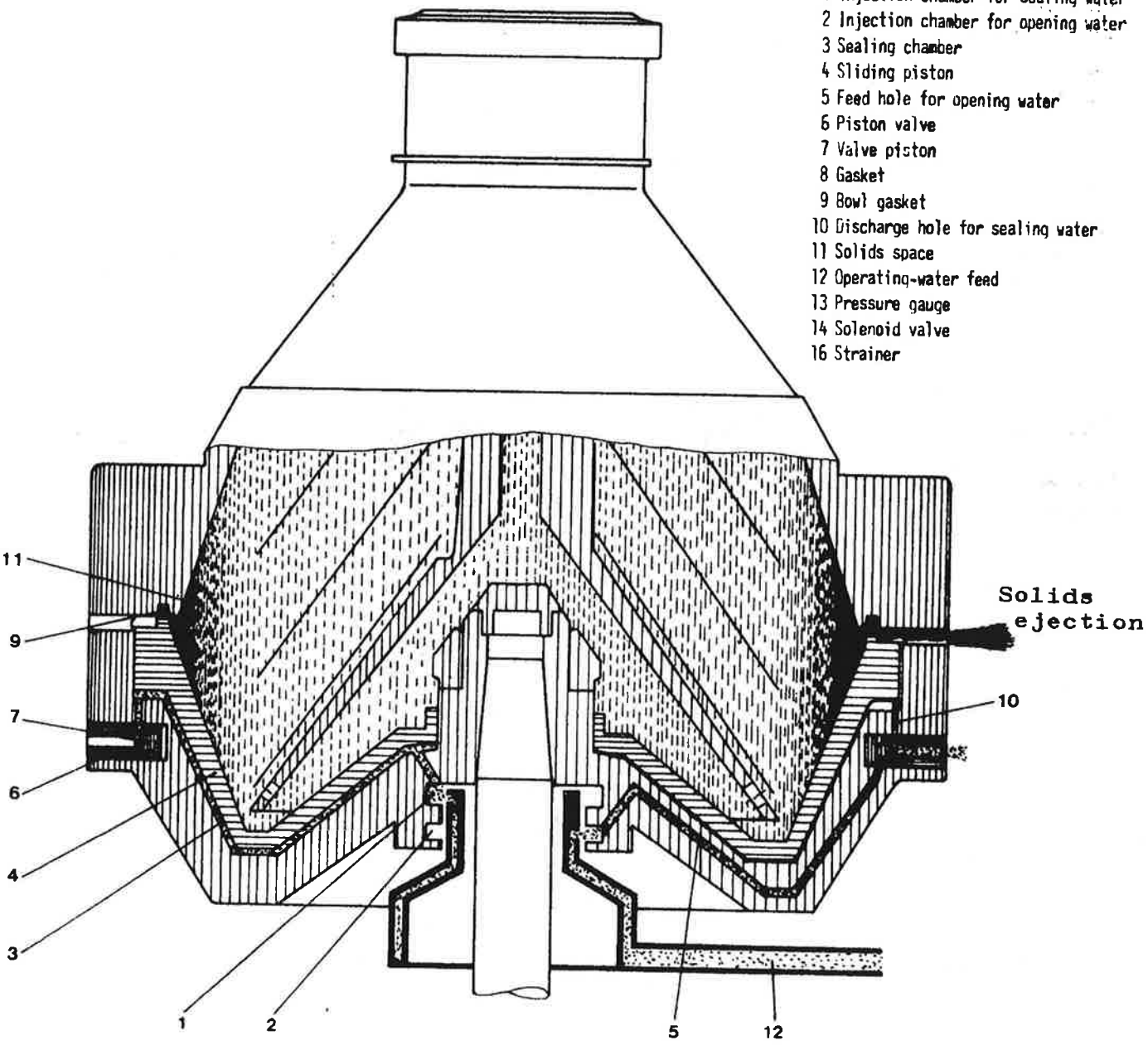
Re-sealing of the bowl:

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).

Cross section of the self-emptying bowl illustrating the hydraulic system of the sliding piston

1 Injection chamber for sealing water
2 Injection chamber for opening water
3 Sealing chamber
4 Sliding piston
5 Feed hole for opening water
6 Piston valve
7 Valve piston
8 Gasket
9 Bowl gasket
10 Discharge hole for sealing water
11 Solids space
12 Operating-water feed
13 Pressure gauge
14 Solenoid valve
16 Strainer



Bowl, closed Bowl, open

Fig. 5/1a

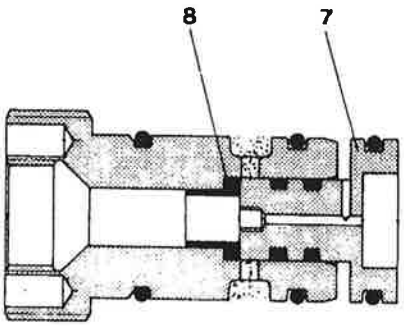


Fig. 5/1b
Piston valve during separation

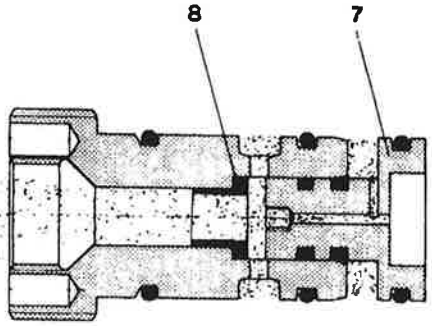


Fig. 5/1c
Piston valve during ejection

5.2. Timing unit

Partial sediment ejections during milk processing are programmed by the timing unit TVA 2-M. By pressing the button "Partial de-sludging", the program in action can be interrupted and a partial ejection process can be initiated immediately.

Total ejections during cleaning-in-place are initiated manually, by pressing the button "Total de-sludging" on the timing unit.

For details, refer to the instruction manual "WESTFALIA Timing Unit".

5.3. Operating-water connection

The inner diameter of the operating-water supply line shall be 25 mm (1") and the pressure in this line shall be at least 1.5 bar.
Important: Pressure fluctuations must not exceed 0.5 bar.
Operating-water consumption: 2000 l/h.

The operating-water connection is provided with a water-pressure reducer K (fig. 5/3) 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. 5/3) 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: $\leq 15^{\circ}$ English hardness at separating temperatures of up to $55^{\circ}C$
$\leq 7.5^{\circ}$ English hardness at separating temperatures exceeding $55^{\circ}C$

Chlorine ions: ≤ 100 mg/l

pH value: 6.5 to 7.5

The strainer in filter G has to be cleaned from time to time.

Pressure gauges M and N (fig. 5/3) merely serve for checking the closing and opening operations.

5.3.1. Arrangement of the solenoid valves

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. 30 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.

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 csn 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 litres/h.

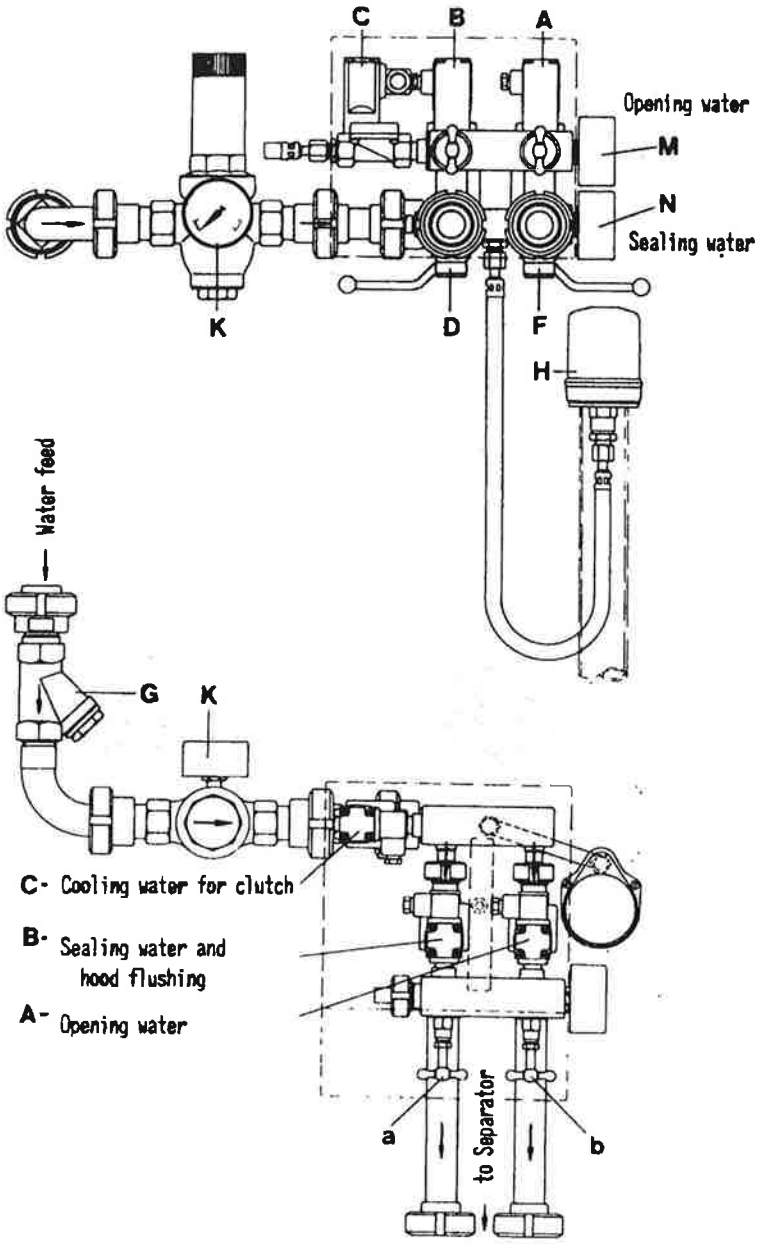


Fig. 5/3

Complete 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 hav stopped, close rapid-closing valve F and after about 5 secon throttle rapid-closing valve D so that water will emerge from the operating-water discharge at the rate of approx. 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 sealing-water valve D is open. At a lower pressure the bowl will 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 switched off 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 for operating water, flush water for hood, and clutch cooling-water (fig. 17/2)

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

Operating principles

In the normal, i.e. closed condition of the valve (de-energized) the water flowing into the valve from the feed side is unable to escape. It flows through a bore into the chamber above the diaphragm where a pressure equal to the water line pressure builds up. However, since the area exposed to water pressure on the upper side of the diaphragm is larger than the area exposed to the same pressure on the underside, the diaphragm is kept pressed against the valve seating.

Upon energizing of the magnet head, the core is pulled upwards so that the integrally vulcanized sealing element of the pilot valve is lifted from the valve seating, thus enabling the water to escape towards the discharge side of the valve. Since the diameter of the outlet opening of the chamber above the diaphragm is larger than the diameter of the inlet opening, the water flows out more quickly than it flows in and, consequently, the pressure acting upon the upper surface of the diaphragm decreases. As soon as it has become smaller than the pressure acting on the underside of the diaphragm (required pressure difference at least 0,5 bar), the diaphragm is lifted off its seat, thus opening the valve.

When current supply is cut off, the spring pushes down the magnet core, thus closing the pilot valve: liquid pressure builds up again above the diaphragm, and the solenoid valve closes.

Maintenance

The solenoid valves are maintenance-free. However, care should be taken that the coupler sockets are always screwed tightly to the magnet heads to ensure perfect sealing action of the gaskets.

Electric troubles

If it has been found that the timing unit functions properly and that voltage is present at the valve terminals of the terminal strip while the associated 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.

If the solenoid coil has proved to be defective, remove the magnet head after having withdrawn the coupler socket (to do this, loosen holding screw) and after having loosened the Allen screws.

The solenoid coil is cast integral with the magnet head. Therefore, if the coil needs replacement, the complete assembly (magnet head, part-no. 0018-3710-800, see page 17/3) will have to be exchanged.

Technical data

Solenoid valve		Type:	40 A / 121
Part - no.			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: (AC operation)	pull-in	VA	approx. 20
	operation	VA	approx. 16
(DC operation)		W	approx. 12
Duty cycle		%	100
Frequency of operations		/h	1000
Type of enclosure		IP	65
Pressure range		bar	0.5 - 10
Temperature:	medium	°C	+90
	ambient	°C	+35
Cable entry		Pg	9

6. Operation

6.1 Starting the separator

1) Check if
   a) brakes are released by turning handles clockwise,
   b) oil level is slightly above middle of sight glass,
   c) hex head screws for fastening the hood and cap nuts for fastening the feed and discharge housing are tightened securely,
   d) concentrate valve is open,
   e) main valve in operating-water line is open.
2) Switch on the motor.
3) Wait until the bowl has reached its operating speed which is after about 10 minutes. Only then may the main switch on timing unit be turned on; the bowl closes.
4) After further 2 minutes the water circulation may be carried through in the way usually practised in dairies.
5) Open valve in cooling-water line for upper frame part. Feed rate is approx. 500 l/h.
6) After switching over to milk processing proceed as follows: Turn on switch "Separation" on timing unit. After opening the milk feed adjust throughput and discharge pressures.

Throughput:	15 000 l/h - 20 000 l/h. The throughput capacity depends on the bacterial properties and on the temperature of the raw milk. Separator plants provided with a flow constrictor need not be adjusted manually every day.
Bacterial removal temperature:	40 - 60 °C, depending on type of cheese
Discharge pressure of milk pump:	up to 4 bar. By means of constant-pressure valve throttle pressure in discharge line of treated milk until slight overflow occurs in the bowl. To check the overflow open inspection cover on hood slightly. The pressure indicated by the pressure gauge the moment when overflow occurs is the maximum pressure. Now open constant-pressure valve until the pressure gauge indicates a pressure which is 0.5 bar lower than the maximum pressure. The discharge pressure must be re-set when the throughput rate has been changed.
Discharge pressure of concentrate pump:	up to 2 bar Throttle pressure in concentrate discharge line by means of regulating valve on flowmeter until the desired amount of concentrate is obtained. <u>Important</u>: If the amount of concentrate is still too high (up to 4 % of the throughput), even after the pressure has been set to its maximum level, then the nozzles fitted in the upper bowl top are too large and must be replaced by smaller ones.

Partial ejection:	The separation programme is automatically performed by the timing unit (see sect. 6.2). The intervals between partial ejections should be between 5 - 15 minutes, depending on the quality of the raw milk (clarified or not). The amount of concentrate discharged during each partial ejection should be about 5 - 8 litres.
Concentrate collecting vessel:	The concentrate discharged during partial ejection as well as the concentrate discharged by the centripetal pump flows under gravity into a collecting vessel from where it is pumped off continuously. In order to stop the milk flowing back into the concentrate catcher of the separator the collecting vessel should have an open air vent (DN 80) and a siphon (see dimensioned drawing on page 0/7 and fig. 21).
Milk testing:	Special aseptic valves must be built in the feed and discharge lines directly on the separator in order to take off milk samples for testing. Usual regulations for taking milk samples for bacteriological tests must be observed.

If the bowl overflows during operation, then the pressure in the downstream equipment must be reduced or an additional extra pump must be installed to increase the pressure.

If the bowl overflows even when the milk pressure is low, check wether the gaskets on the centripetal pump shafts are damaged.

In some cases - particularly when heat exchangers with low counter-pressure are used - it is advisable to install a throttle valve downstream of the exchanger and to set it to about 1.5 bar. This ensures that the milk is conveyed foamfree to the cheese milk tank.

The bacteria-removing separator can also be used for milk clarification by using a by-pass line. The appropriate shut-off and leakage valves must be installed in the by-pass line.

When the milk is being treated, the valves in the by-pass line must be set so that, if the shut-off valves leak, the milk cannot flow back into the system.

For milk clarification the concentrate nozzles (0.8 mm dia.) in the bowl top can be replaced by larger nozzles or even removed completely, depending upon the pressure of the downstream equipment.

Insufficient bacterial removal can be caused by the following:

1) Change in raw milk quality, separating temperature, bowl speed or throughput capacity.
2) Clogging of nozzles in upper bowl top or concentrate space on separating disc. This results in a lower concentrate output.
3) Concentrate entering the milk after treatment caused through wrong positioning of leakage valve in the by-pass line (see last sect. but one).
4) Separating disc is not sealed properly.

6.2 Solids ejection of bowl

6.2.1 Partial solids ejection

Partial bowl emptying during milk processing means the partial ejection of solids from the bowl. During the partial emptying process the milk supply is not interrupted.

In order to initiate the partial emptying process (this lasts about 0.5 - 2 seconds), the solenoid valve A (fig. 5/3) feeds opening water to the bowl. The length of time that opening water is fed depends upon the amount of solids which must be ejected. It must be ascertained by trial and error. In order to determine the length of time required for emptying, the bowl can be fed with water. During each partial emptying process, an additional 0.2 litres / sec. (approx.) of flush water are discharged from the solids outlet. This must be deducted from the total volume.

The partial ejection time must be adjusted so that approx. 5 - 8 litres are ejected from the bowl.

Automatic partial ejections are controlled by the timing unit (see 5.2) according to a pre-set programme or by some other means.

The setting on the "separating" timer (5 - 15 minutes, depending on the raw milk quality) initiates the first partial emptying automatically; succeeding partial emptyings follow at regular intervals. Ten seconds before each partial emptying - this time can be set on the"pre-flushing"timer - solenoid valve B (fig. 5/3) "Sealing and flush water" opens. Water is injected into the hood to prevent the solids to be ejected from sticking to the walls. In order to allow the solids to be ejected, solenoid valve A "Opening water" opens for a short time - this time can be adjusted on the "partial emptying" timer. During the emptying process and for 60 seconds thereafter, the "Sealing and flush water" valve B remains open. The time that this valve remains open after the emptying process can be set on the "Subsequent flushing" timer. It should remain open for at least 60 seconds.

By pressing the "partial emptying" button, the separating process is interrupted and a partial emptying process immediately induced. Once this manually induced partial emptying process has finished, the control programme automatically reverts to separation.

6.2.2 Total ejection

Timing unit TVA 2-M only allows manual total emptyings during the cleaning-in-place process. Automatic in-place-cleaning requires a special control system (see appropriate instruction manual).

Switch "**Separation**" on the timing unit remains in the "ON" position. In order to induce a total emptying process, the button "Total emptying" must be pushed. If the feed pump is correctly interlocked with the timing unit (see circuit diagram of timing unit) the feed pump is automatically switched off when the"total emptying"button is pushed. It is turned on again automatically about 1 minute after the total emptying process has finished.
(The feed to the bowl must be interrupted by switching off the feed pump so that the bowl speed, which drops slightly during a total emptying process, can re-adjust itself).

Once the bowl has re-filled (cf. pressure in discharge line from the separator) a further total emptying process can be initiated by pressing the "Total emptying" button again.

If the feed pump does not switch off automatically during total emptying process, turn off the pump manually and do not turn on again until 1 minute after the total emptying process has finished.

6.2.3 Manually initiated solids ejection

In an emergency, for instance if the timing unit or the solenoid valves fail, the bowl can also be emptied by opening and closing the by-pass valves for the solenoid valves (cf. 5.3.1). During the emptying process the bowl loses speed slightly. Only when the bowl has reached its full operating speed again may the emptying process be repeated.

7. Cleaning

7.1 Cleaning-in-place

The separator is generally included in the C-I-P 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 TVA 2-M.

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

The C-I-P programme should comprise the following:

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 finish with a total ejection.

During each programme step the constant-pressure valve incorporated in the milk line is to be throttled several times by pressing the "overflow" push button. This will cause flooding of the centripetal pump chamber of the separator, resulting in thorough flushing of hood and concentrate catcher. If the separator is not equipped with a constant-pressure valve, the valve in the milk line must be throttled several times by hand.

If a by-pass line is present (for milk clarification) then the valves in this line must be set so that the liquid flows from the milk side to the concentrate side. At the same time cleaning liquid must be fed to the concentrate collecting vessel via a connecting pipe (approx. 3000 - 4000 l/h). The cleaning liquid should be fed in via a spray ball situated in the cover of the collecting vessel.

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

7.2. Manual cleaning

In spite of cleaning-in-place, the bowl should be dismantled for check-up and manual cleaning once a month (see 4.3). On this occasion, guide surfaces and threads should be cleaned and wiped dry and lightly greased with the special lubricating paste furnished with the machine. After removal of sliding piston 4 (fig. 5/1a), sealing chamber 3 should be cleaned with special care.

8. The Gear

8.1. Removing the vertical gear parts

After dismantling the bowl, loosen oil drain screw and let oil drain into oil cup. Then remove upper sight glass.

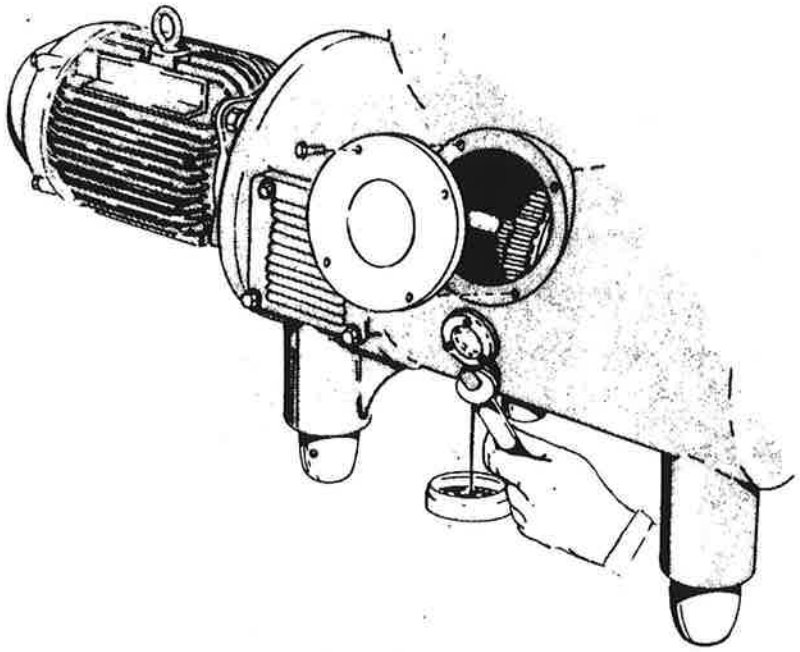


Fig. 8/1a

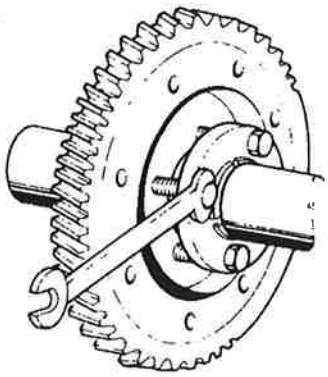


Fig. 8/1b

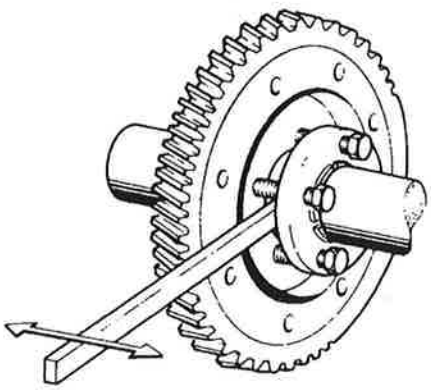


Fig. 8/1c

Loosen hex head screws in clamp plates of worm wheel (fig. 8/1b). Then slacken clamp plates until worm wheel can be moved on worm wheel shaft (fig. 8/1c). Push worm wheel to the left.

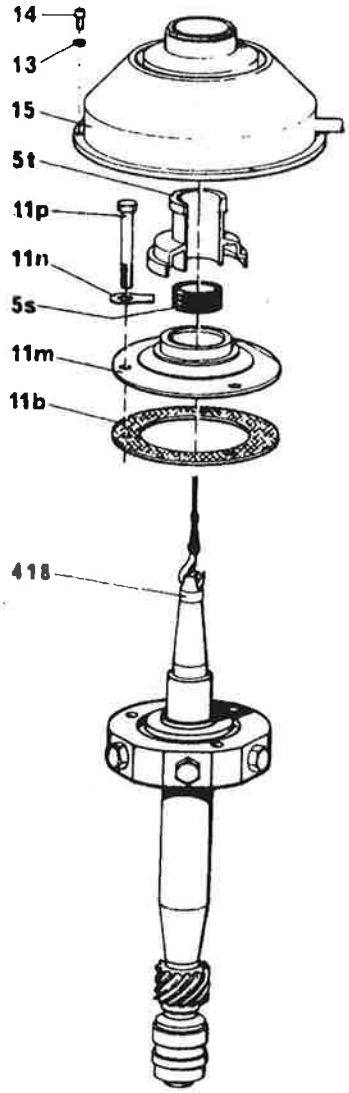


Fig. 8/2a

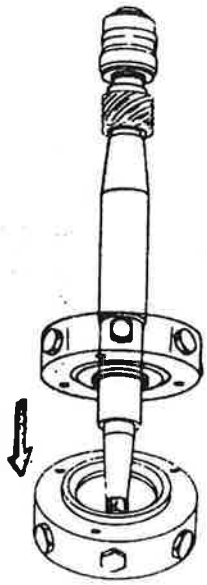


Fig. 8/2b

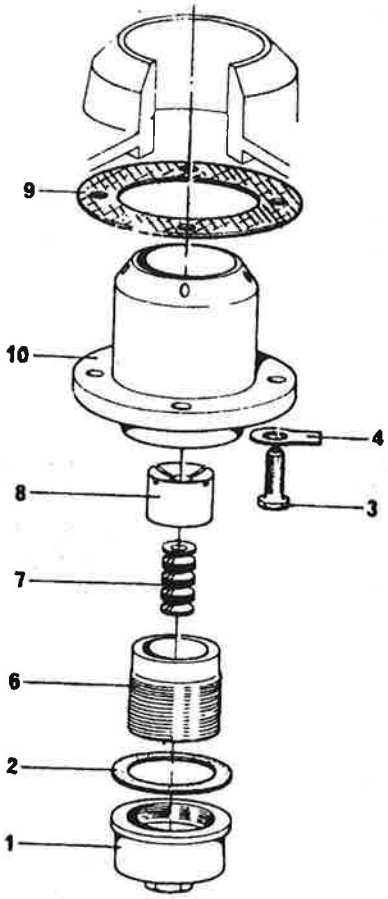


Fig. 8/2c

Fig. 8/2a:

Take off operating-water connection and remove bushes 37 and 39 (fig. 13/1).
Undo screws 14 and remove operating-water feed 15 and spindle cap 5t. Straighten tab washers 11n and unscrew hex head screws 11p. Take off protection cap 11m and spindle spring 5s.

Screw tool 418 onto worm spindle and lift out spindle together with neck bearing bridge.

Fig. 8/2b:

To remove neck bearing bridge, hold spindle in inverted position, upper end down, and tap lightly against a wooden surface. Neck bearing bridge will then slide off.

Fig. 8/2c:

Unscrew bottom bearing cap 1 and remove gasket 2. Unscrew bottom bearing threaded piece 6, and remove it together with spring column 7 and bottom bearing pressure piece 8.

Should the case arise that bottom bearing housing 10 has to be replaced, then proceed as follows: Straighten tab washers 4 and undo hex head screws 3. Take two of these screws and thread them into the tapholes of the bottom bearing housing. By doing so, the bottom bearing housing will be pressed out of the frame.

8.2. Re-assembly of vertical gear parts (fig. 14)

For re-assembly proceed in reverse order of removal (see 8.1) and according to instructions given in sect. 8.2.1 - 8.2.3.

8.2.1. Important hints for re-assembly

1) Before re-assembling the vertical gear parts, clean gear chamber thoroughly.

2) Check condition of ball bearings before re-fitting them onto worm spindle.
   IMPORTANT: Use only high-speed precision ball bearings as per List of Parts.
   For reasons of safety, replace ball bearings of worm spindle and worm wheel shaft every 5,000 running hours.

3) Before fitting ball bearings, ball bearing protection rings 5d and 5g, and ring 5n onto spindle, heat these parts in oil to approx. 80°C.

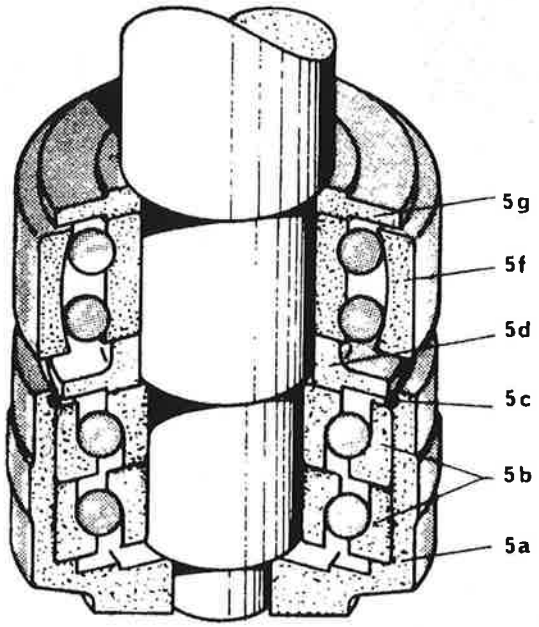


Fig. 8/3

4) If one of the angular contact ball bearings 5b needs replacement, be sure to replace both of them. Note that the angular contact ball bearings may be loaded axially in one direction only. They must be installed as shown in fig. 8/3. The narrow rim of the outer ring of each ball bearing must be on top. Faulty mounting will inevitably result in damage to bearings.
   For assembly proceed as follows:
   Slide the warmed-up angular contact ball bearings onto the spindle, slide snap ring 5c over ball bearings and let ball bearings cool down. Then fit bottom bearing pressure housing 5a over ball bearings and press snap ring 5c into groove of bottom bearing pressure housing.

5) It must be possible to install the worm spindle, with ball bearings attached, without having to hit on the upper spindle end, and to move the built-in spindle axially by hand. If this is not the case, remove burrs from the bottom bearing housing, using a very fine emery cloth.

6) When worm is worn and needs replacement, the worm wheel assembly with clamp plates 10 (fig. 15) shall be replaced at the same time, since this part, being worn down as well, would cause premature wear to the new worm.

7) When installing neck bearing bridge assembly 11c-h, make sure that gaskets 11b and 11k are in good condition. Be sure to insert distance ring 11a.

8) Before installing the neck bearing protection cap, check to be sure that there is a clearance of 2.5 - 3 mm between cams of distance ring 11a (fig. 8/6) and neck bearing bridge 11d. If not, proceed as per instructions of sect. 8.3.2.

9) IMPORTANT: After re-assembling the vertical gear parts, check bowl height for possible re-adjustment (see 8.3).

8.2.2. Assembling the neck bearing bridge

The upper ball bearing of the spindle is contained in pressure ring 11c which is held by nine radially arranged, evenly distributed springs 11g

1) Insertpressure ring 11c in neck bearing bridge 11d in such a manner that the nine recesses of the pressure ring face the nine tapholes of the neck bearing bridge.

2) Grease spring pistons 11h thoroughly. Fit neck bearing springs 11g into the nine spring pistons. Then put the spring pistons into threaded plugs 11f.

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

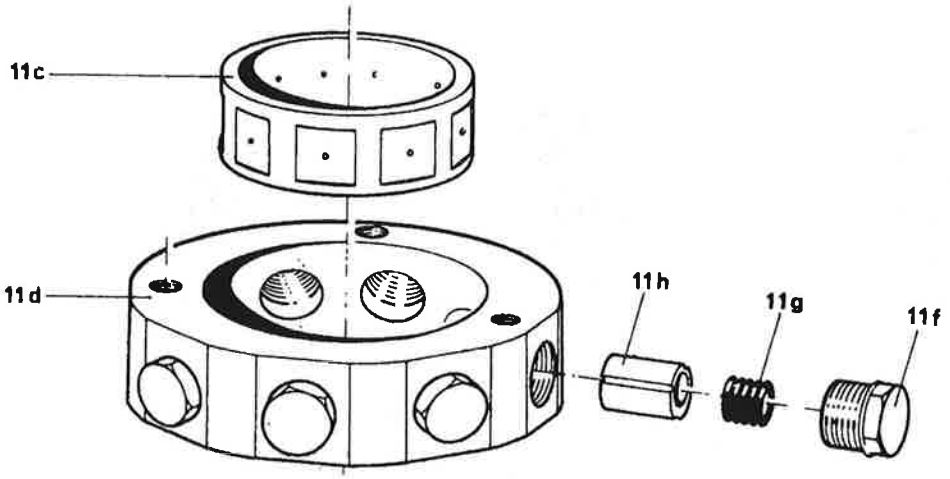


Fig. 8/4a

8.2.3. Installing spring column into bottom bearing

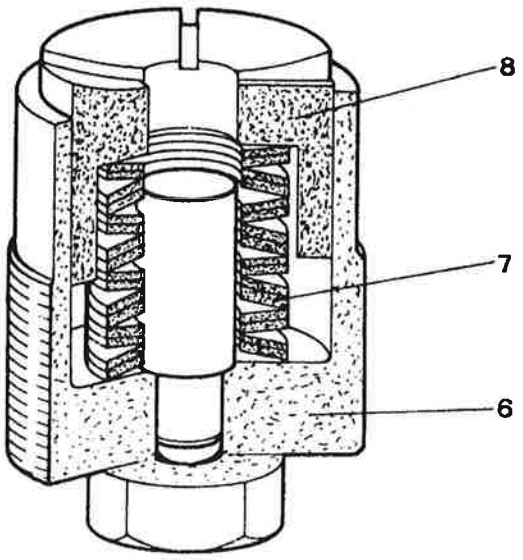


Fig. 8/4b

1) Slide cup springs 7 on bolt of bottom bearing threaded piece 6 as illustrated in fig. 8/4b.

2) Slip bottom bearing pressure piece 8 over spring column.

8.3. Bowl height

8.3.1. Checking the bowl height

NOTE: The bowl height has been adjusted at the factory before shipment of the separator. It must be checked for possible 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

a) bowl is properly closed ("0" marks on bowl lock ring and on bowl bottom must be in line with each other),

b) hood is properly seated on sediment collector and hex head screws are tightened securely,

c) 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.

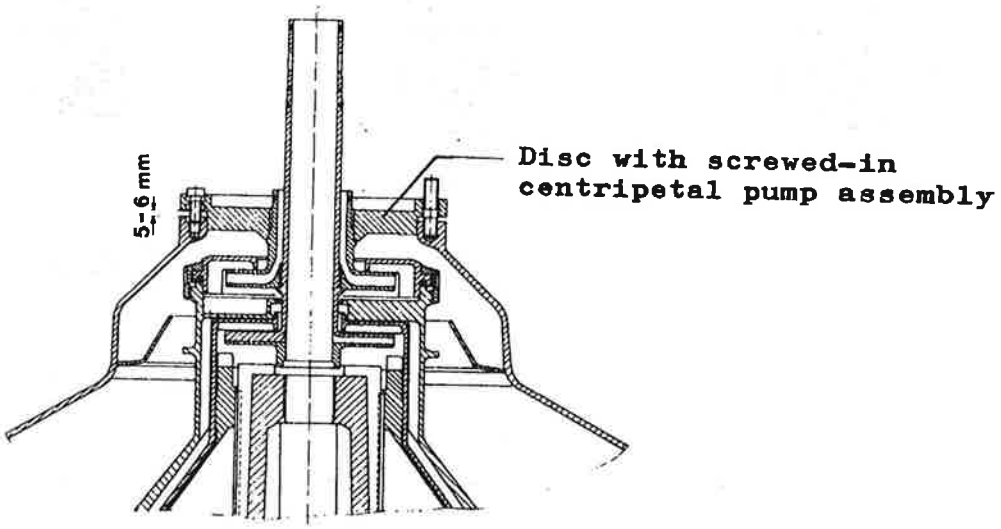


Fig. 8/5

The bowl height is correct when the disc can be raised by about 5-6 mm. Otherwise the bowl height has to be re-adjusted (see 8.3.2).

8.3.2. Re-adjusting the bowl height

For re-adjustment of the bowl height proceed as follows:

Unscrew bottom bearing cap 1 (fig. 14). Adjust bowl height (refer to fig. 8/5) by turning bottom bearing threaded piece 6. A full turn of the bottom bearing threaded piece to your Right or to your Left raises or lowers the bowl by 2 mm.

If the distance shown in fig. 8/5 is greater than 4 mm, the bowl is too high. Lower the bowl by turning the bottom bearing threaded piece in counter-clockwise direction.

If the distance shown in fig. 8/5 is less than 4 mm, the bowl is too low. Raise the bowl by turning the bottom bearing threaded piece in clockwise direction.

If the bowl has to be raised by more than 1 mm, it has to be removed (see 4.3). Remove operating-water connection and take out bushes 37 and 39 (fig. 13/1). Undo screws 14 and remove operating-water feed 15. Take off spindle cap 5t (fig. 14). Undo screws 11p and remove neck bearing protection cap 11m. Then turn bottom bearing threaded piece in clockwise direction until proper height is adjusted.

Each time the bowl has been lowered or raised, check if there is a clearance of 2.5 to 3 mm between cams of distance ring 11a (fig. 8/6) and neck bearing bridge 11d. In order to be able to check this clearance, remove bowl, operating-water connection, bushes 37 and 39 (fig. 13/1), operating-water feed, spindle cap and neck bearing protection cap, unless these parts have already been removed before raising the bowl by more than 1 mm. This check is not required if it has been made after re-assembling the vertical gear parts (see 8.2.1 No. 8) and the bowl had not to be raised by more than 1 mm.

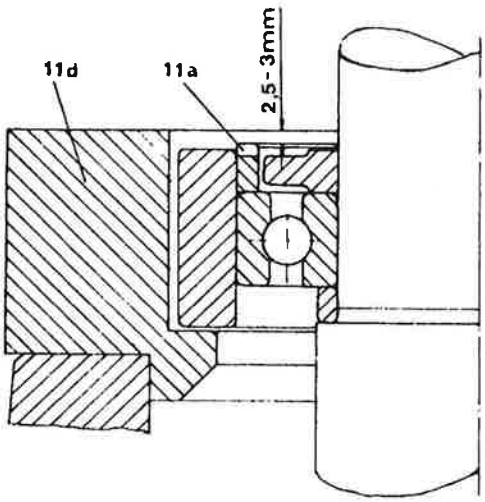


Fig. 8/6

If the clearance between the cams of the distance ring and the neck bearing bridge is smaller than 2.5 mm, the cams have to be filed to proper dimension. If the distance is greater than 3 mm, increase height of cams by welding or check with the factory for a new distance ring with properly sized cams.

After checking the clearance between distance ring and neck bearing bridge, re-install the above-mentioned parts. When installing the operating-water feed, check to be sure that gasket 38 (fig. 13/1) is in good condition.

Replace bottom bearing cap including gasket 2 (fig. 14) and close tightly.

Bear in mind that after fastening the neck bearing protection cap, the distance ring and, hence, the ball bearing 5p (fig. 14) will be under pressure until the spring column 7 in the bottom bearing is compressed by the weight of the bowl.

8.4. Removal of the horizontal gear parts

8.4.1. Removing the motor

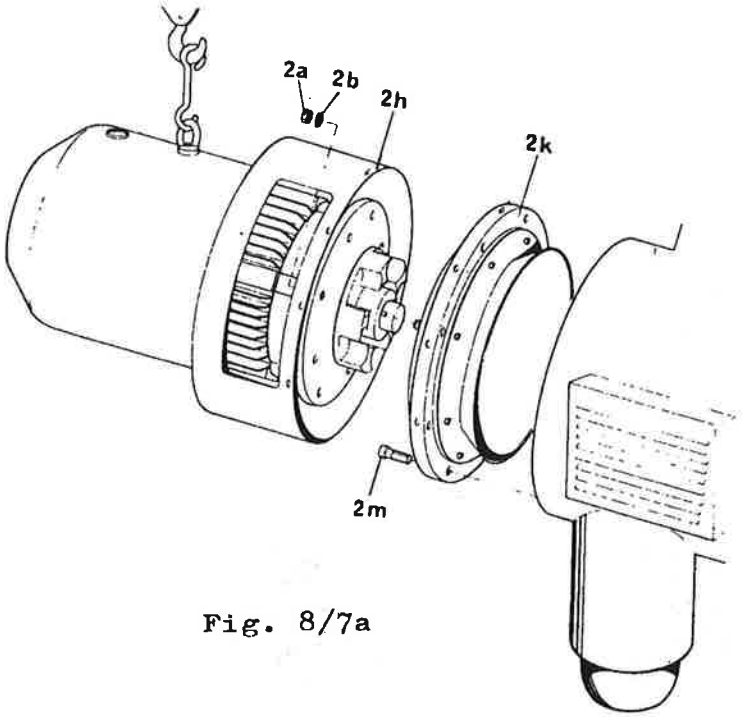


Fig. 8/7a

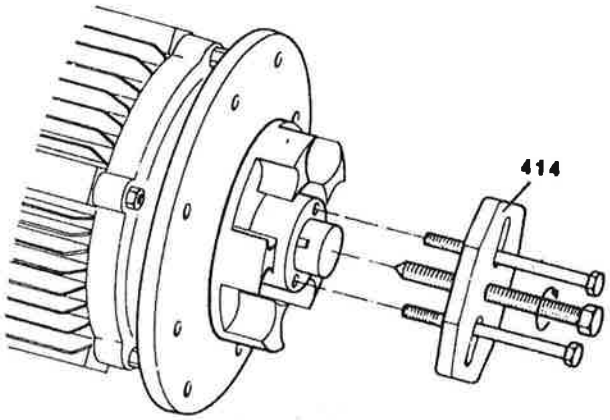


Fig. 8/7b

Remove lead-in wires from motor terminals. Unscrew hex head screws 2g and move cover 2h sidewards. Sling motor to hoist and tighten carrying rope. Then unscrew hexagon nuts 2a through opening of cover which can be turned on the flange. Take off lock washers 2b.
Use hoist to lift off motor together with cam hub (see fig. 8/7a).

For removing cam hub from motor shaft end use puller 414 (fig. 8/7b).

8.4.2. Removal of the fluid clutch

After removing the motor, undo Allen screws 2m and take off flange 2k (see fig. 8/7a).

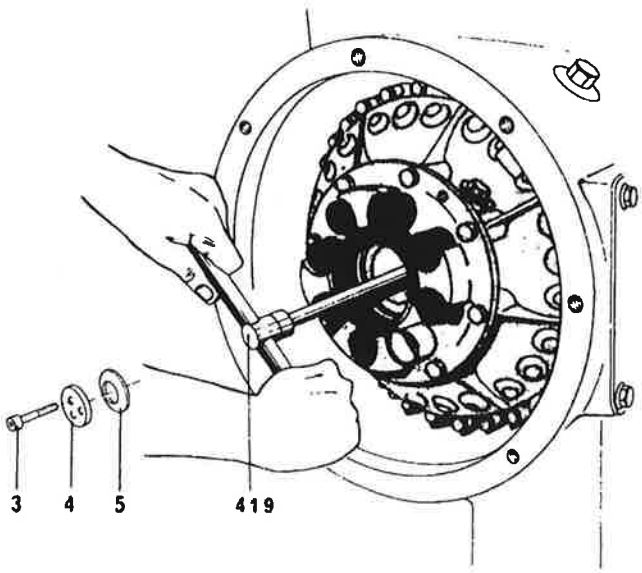


Fig. 8/7c

Loosen Allen screws 3 (fig. 8/7c) with torque-indicating wrench 416 (fig. 20) by consecutively giving each screw a quarter of a turn until tension of cup spring 5 slackens. Then screw out Allen screws all the way and remove washer 4 and cup spring 5.

It may happen that one of the three Allen screws can only be loosened by applying great force. In this case re-tighten the two remaining screws so that all three screws are equally tight. Then start loosening again as described above.

Be sure the socket of the wrench 416 is not worn!

To remove fluid clutch from cone of worm wheel shaft use pulling device 419.

8.4.3. Removing the worm wheel shaft

Remove fluid clutch (see sect. 8.4.2).

Loosen oil drain screw and let oil drain into oil cup. Remove upper sight glass (see fig. 8/1a).

Loosen hex head screws in clamp plates of worm wheel. Slacken clamp plates and push worm wheel to the left (fig. 8/1b, 8/1c).

Undo hex head screws 18 and remove cover 17.

Use wrench 416 to unscrew Allen screws 13. Remove disc 12.

By means of tool 419, pull brake pulley assembly 11a-d off the cone of worm wheel shaft.

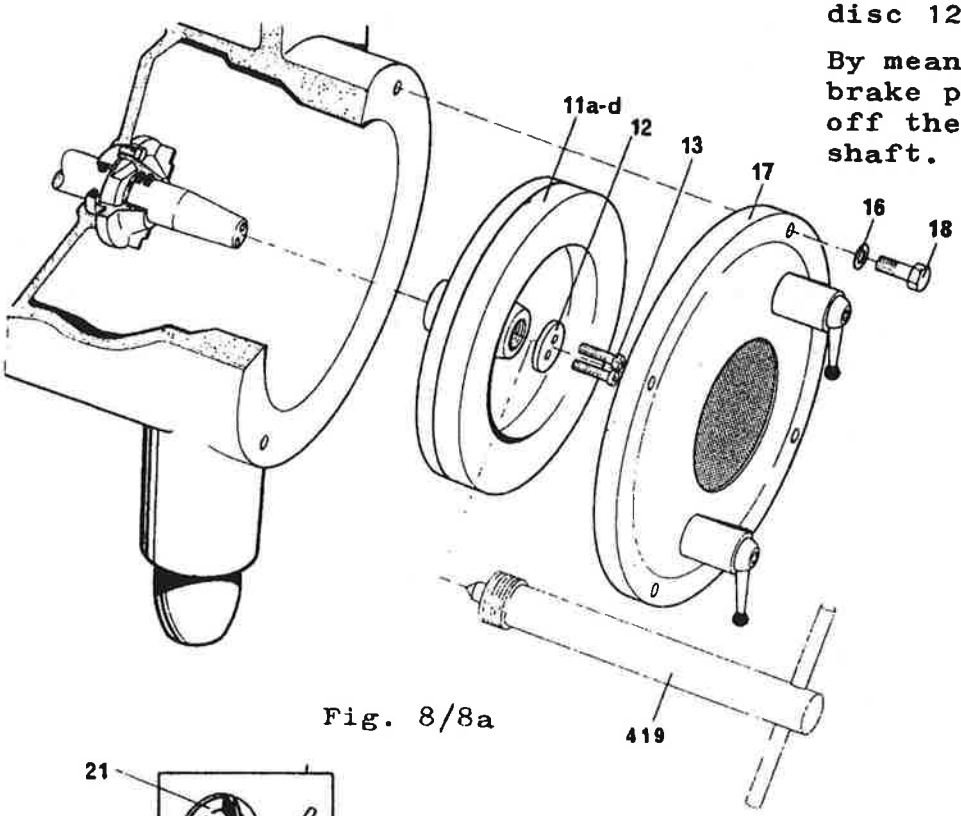
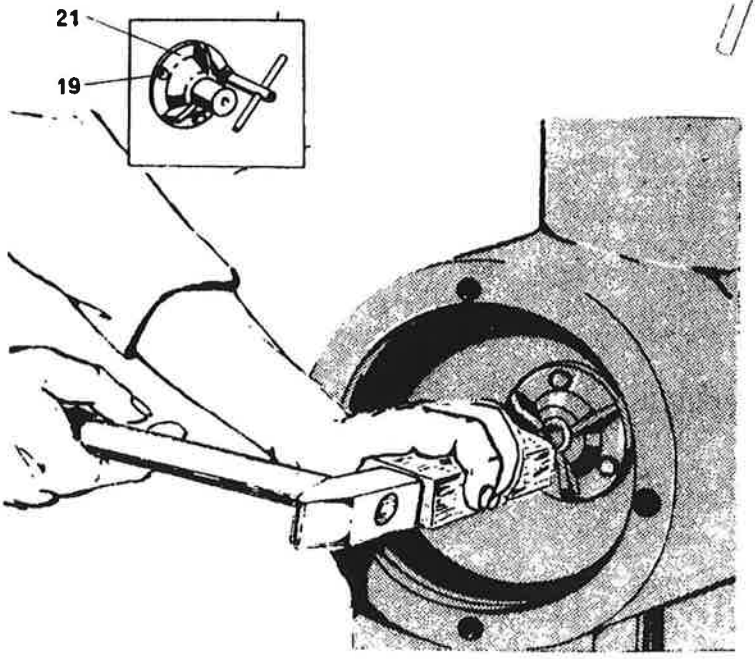


Fig. 8/8a



Remove hex head screws 19 from bearing cover 21 on the brake side (fig. 8/8b). Place a hard wood block against worm wheel shaft end, on motor side and rap gently with a hammer to drive the shaft, along with ball bearing, nut, and bearing cover, towards the brake side. When shaft has completed loosened from ball bearing on motor side, pull it out by hand. While doing so, hold worm wheel to prevent damage to gear teeth. Then take worm wheel assembly with clamp plates out of gear chamber.

Fig. 8/8b

8.5. Re-assembling the horizontal gear parts (fig. 15)

For re-assembly proceed in reverse order of removal (see sect. 8.4) and according to the following instructions:

1) The worm wheel with clamp plates (item 10 in fig. 15) has been balanced in the factory as complete assembly. To avoid unbalance, do NOT exchange component parts separately.

2) When mounting the worm wheel assembly with clamp plates, be sure to push it towards the brake side until it rests against the shoulder of the worm wheel shaft 25. This will ensure correct positioning of the toothed rim with reference to the worm.

3) The worm wheel must be firmly clamped to the worm wheel shaft, - accomplished by tightening screws 10c in the two clamp plates. Tighten the screws crosswise, by single turns, to make sure clamp plates are drawn together evenly.

4) IMPORTANT: When the toothed rim is worn, the entire worm wheel assembly with clamp plates has to be replaced. The worm 5k (fig.14) shall be replaced at the same time, since this part, being worn down as well, would cause premature wear to the new worm wheel.

5) Re-adjust proximity switch 40 with the aid of adjusting ring 439 (fig. 8/9).

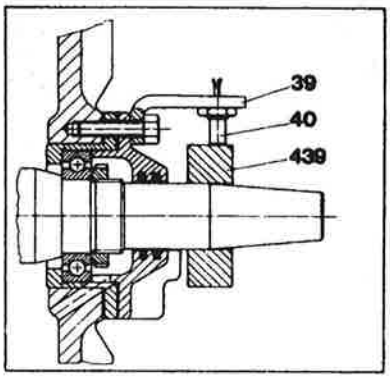


Fig. 8/9

6) Before installing the fluid clutch and the brake drum, apply a thin film of grease to the tapered ends of the worm wheel shaft. Then clean and wipe dry the tapered ends with a rag. Clean also inside of hubs of fluid clutch and brake drum very carefully, to assure proper fitting.

7) The fluid clutch and the brake drum must be firmly clamped to the worm wheel shaft. This is accomplished by tightening Allen screws with torque wrench 416 (fig. 20). Tighten the screws consecutively, by single turns. Give the final tightening at 4 - 4.1 mkp on the torque scale. When installing the fluid clutch, be sure to place cup spring 5 under washer. For correct arrangement refer to fig. 15.

8) When installing the motor, make sure that there is a clearance of 4 mm between cam hub 31 and fluid clutch (fig. 15 or 16). The distance has to be checked after exchanging the motor, the cam hub, the fluid clutch or the worm wheel shaft. If necessary, adjust the distance by displacing the cam hub on the motor shaft and drilling a new hole into the motor shaft for threaded pin 30.

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

10) To run in new gear parts (worm wheel and worm) let the separator run - without bowl - for about one hour. During this time, switch motor several times on and off.

11) For reasons of safety, replace ball bearings of worm wheel shaft and of worm spindle every 5,000 running hours.

9. The Fluid Clutch

9.1. General

The fluid clutch (Turbo Clutch) gradually brings the bowl to its rated speed, eliminating premature wear on gear parts and on motor. The motor power is transmitted by means of a closed oil circuit between a primary wheel driven by the motor shaft and a secondary wheel driving the worm wheel shaft of the separator.

The oil level in the fluid clutch must be up to the mark of the oil level indicator plate, to ensure that the bowl comes up to its rated speed within its starting time (see sect. 3.3).

When less oil is filled in, slippage in the clutch will be too great and starting time of the bowl too long. If the clutch contains too much oil, the starting time of the bowl will be too short, resulting in overload of motor and gear.

The oil in the clutch has to be changed every 5,000 working hours. It should be changed when the ball bearings of the worm spindle and of the worm wheel shaft are being replaced.

The clutch requires

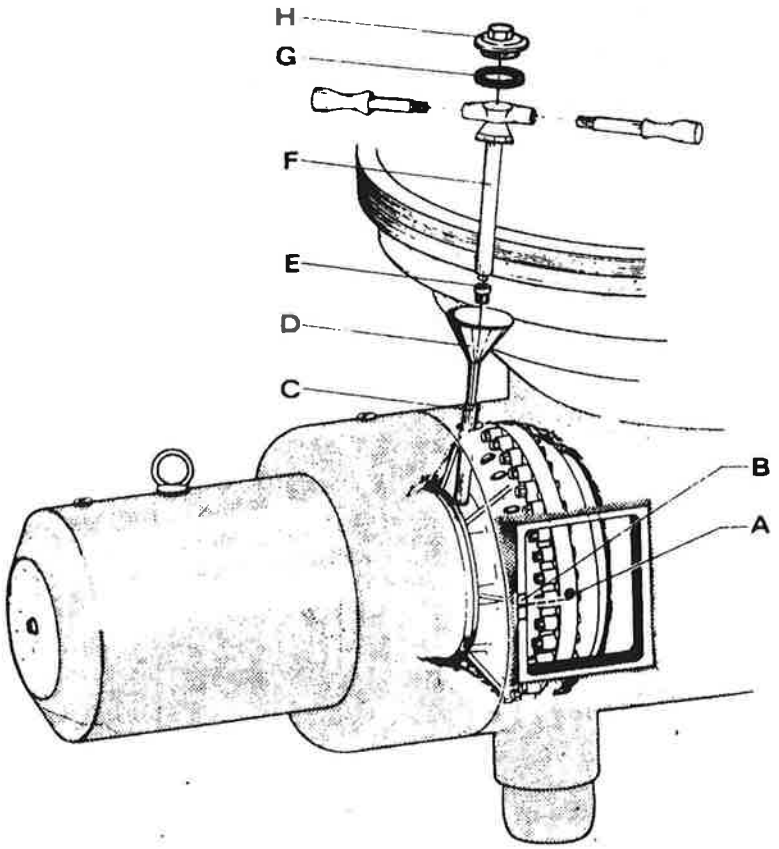
approx. 7 litres of oil when using a 1455 rpm motor,

Be sure to use only the type of oil specified in sect. 9.4.

9.2. Checking the oil level

The oil level has to be checked before the initial start-up of the separator and every time after re-filling of oil. Furthermore, the oil level should be checked once a month since in the course of time small oil losses may occur.

Before checking the oil level, make sure oil has cooled down.



Checking the oil level:

Mark on oil level indicator plate B must be in line with lower edge of taphole A. Oil level must be up to the lower edge of taphole A.

Fig. 9/1

For checking the oil level, proceed as follows:
Remove the ventilation grid so that the oil level indicator plate can be seen. Bring the clutch into such a position that threaded plug A (fig. 9/1) can be removed without oil flowing out. Unscrew threaded plug with a wrench. Then turn clutch until lower edge of taphole is in line with mark on oil level indicator plate (fig. 9/1). In this position, the oil level in the clutch must be up to the lower edge of the taphole, so that the oil begins to overflow. If this is not the case, refill oil (see 9.3).

9.3. Re-filling of oil (fig. 9/1)

Remove threaded plug H. Loosen oil fill screw E with wrench F. Then take off the handles from the wrench and continue unscrewing the oil fill screw until it comes off. Now thread oil fill pipe C into the oil fill hole, introduce funnel D and pour in oil. Then check oil level (see 9.2) before replacing oil fill screw including gasket. Use wrench F to firmly tighten the oil fill screw.

9.4. Type of oil

For filling the clutch, use only steam turbine oil

Shell Turbo Oil T32

which has proved satisfactory in operation by meeting requirements as regards viscosity, flash point, lubricating properties, compatibility with metals and gaskets, aging, etc.

Two cans, each containing 5 litres of Turbo T32 oil, are furnished with the separator.

If this type of oil is not readily available, steam turbine oils which comply with the following specifications, may be used, however, temporariliy only.

Designation:	Lubricating oil TDL 32 (according to DIN 51515) (steam turbine oil with additives giving increased protection against corrosion and increased resistance to aging).
Kinemat. viscosity:	32 ± 3.2 mm^2/s (cSt) / 40 °C
Density / 15 °C :	max. 0.900 g/ml
Pour point:	≦ -6 °C
Corrosive effect on copper:	degree of corrosion 2 - 100 A 3 (according to DIN 51759)
steel:	degree of corrosion 0 - A (according to DIN 51585)
Aging characteristics:	Increase of the neutralization number after 1000 h : max. 2.0 mg KOH/g oil (according to DIN 51587)
Contrary to DIN 51515:	Open flash point according to Cleveland: approx. 220 °C

9.5. Dismantling the fluid clutch (fig. 16)

The fluid clutch should not be dismantled in the site. If damage occurs, the clutch should be returned to the manufacturer for repair to assure correct fitting of the spare parts and, hence, proper functioning of the clutch. In the meantime, a spare clutch can be placed at your disposal.

If however, you decide to remove leakage of the clutch in the site, we recommend to check first sealing 17 because it is more easily accessible than sealing ring 4.
After taking the clutch out of the frame (see 8.4.2) remove screws 19 and lock washers and take off cover 18. Now check sealing ring 17 and replace it when its sealing lip is no more soft and elastic.

If, however, sealing ring 4 or the ball bearings have to be replaced, the clutch has to be dismantled in the following manner:

1) Loosen screw 24 and let oil drain.
2) Undo hexagon nuts 11 and remove them with lock washers 10. Then remove screws 7.
3) Press primary wheel off the clutch casing 8 by threading two of the screws 7 into the tapholes of primary wheel 12.
   IMPORTANT: Bear in mind that the fluid clutch has been balanced in the factory. Therefore, be sure to mark both primary wheel 12 and clutch casing 8 before taking them apart, so that, when being re-assembled, these parts will be brought back into their original position.
4) Press ball bearing 15 out of primary wheel 12.
5) Undo screws 2 and remove cam flange 1.
6) Force secondary hub with secondary wheel 16 out of the clutch casing. Be sure not to damage running surfaces for the sealing rings. See also 9.6. no.6.
7) Screw screws 26 out of the clutch casing and remove oil control ring 25.
8) Press ball bearing 6 and sealing ring 4 out of the clutch casing.

9.6. Re-assembling the fluid clutch (fig. 16)

1) Moisten sealing rings. Press sealing ring 4 into the clutch casing by applying the tool shown in fig. 9/3 and then lightly hitting against bolt B. In order to be able to use the tool for pressing sealing ring 17 into cover 18, screw the bolt B into the other side of the disc. Then proceed in the same way as for sealing ring 4. The tool consisting of disc (part no. 3158-9939-000) and bolt (part no. 3170-9877-010) is supplied on special order only.

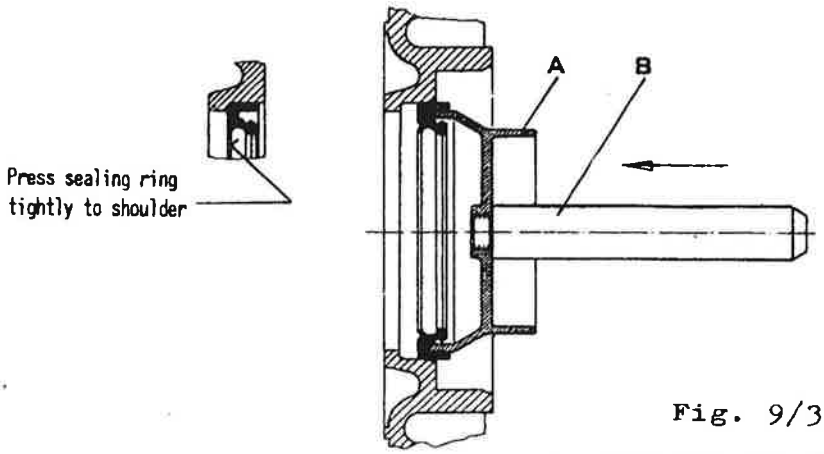


Fig. 9/3

Pressing the sealing ring into clutch casing.

2) Insert spacer ring 5 in clutch casing and spacer ring 13 in primary wheel (fig. 9/4a). The bevelled edge of each ring must snap into the groove of the bearing neck (fig. 9/4b). This will ensure that the spacer rings cannot move axially.

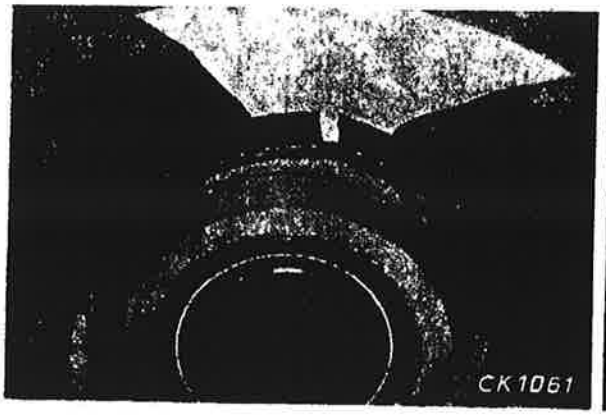


Fig. 9/4a

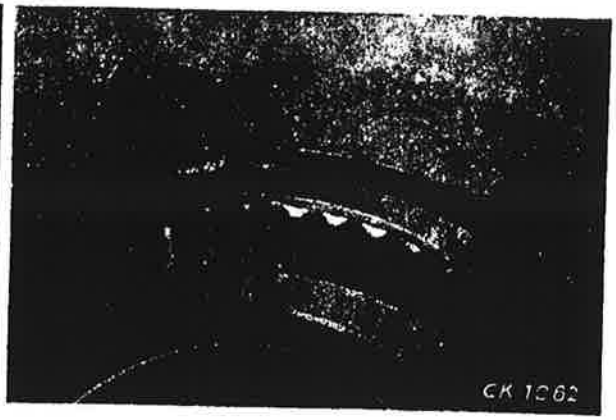


Fig. 9/4b

3) Press ball bearing 6 into clutch casing and ball bearing 15 into primary wheel. Check if the ball bearings pressed into the spacer rings have an absolutely tight fit. If this is not the case, the spacer rings have to be replaced. If necessary, return the clutch to the factory for repair.

4) Apply some oil-resistant sealing compound to oil control ring 25. Then fasten ring to clutch casing with screws 26. Be sure to fit lock washers.

5) Insert gasket 14 in groove of primary wheel. Then fasten cover 18 to primary wheel with screws 19. Be sure to fit spring washers.

6) Press secondary hub with secondary wheel, 16, into clutch casing. IMPORTANT: The surfaces contacting the sealing rings 4 and 17 must be perfectly smooth to ensure oil-tightness of the fluid clutch. If necessary, re-polish contact surfaces.

7) Fasten cam flange 1 to clutch casing with screws 2. Be sure to fit spring washers.

Fig. 9/4c

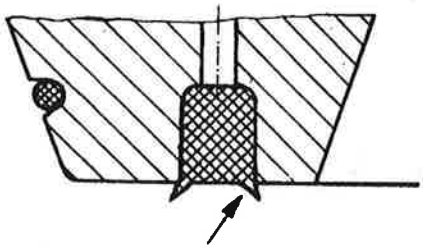
8) Place Teflon packing cord 9 on sealing surface of clutch casing as shown in fig. 9/4c. Make sure cord ends are crossed. To keep the cord in its place coat it with grease. Sealing surfaces of primary wheel and clutch casing must be in perfect condition; they must not be coated with a sealing compound.

9) Press primary wheel on secondary hub so that the marks on primary wheel and on clutch casing are in line (see sect. 9.5. no. 3). Then screw primary wheel and clutch casing together.

10. Trouble Shooting

10.1. General

Troubles	Causes	Remedies
10.1.1. The bowl does not come up to rated speed or takes too long to do so (see 3.3).	1) Brakes are on.	Release brakes by turning handles in clockwise direction.
	2) Motor is incorrectly connected.	Check connection.
	3) Oil level in fluid clutch is too low or clutch is leaking.	Re-fill oil (see 9.3). Re-tighten nuts 11 of screws 7 (fig. 16) on clutch. If sealing rings 4 and 17 do not seal properly, ask for a reconditioned clutch in exchange for your clutch.
	4) Bowl is placed too high or too low and rubs against centripetal pump.	Adjust to correct bowl height (see 8.3).
	5) 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.
	6) Feed line is open.	Close feed line.
10.1.2. The bowl speed drops during operation.	1) Oil level in fluid clutch is too low.	Re-fill oil (see 9.3).
	2) Motor speed drops during operation.	Check line voltage and inspect motor.
	3) Main bowl gasket 15 (fig. 19) in bowl top is damaged.	Replace the gasket (see sect. 4.4).
	4) Gaskets in bowl valve 3 (fig. 19) are damaged; the bowl loses sealing water.	Replace the gaskets. For the time being the bowl can be kept closed by opening rapid-closing valve D for sealing water (fig. 5/3).
10.1.3. The bowl comes up to rated speed too quickly (in less than 10 minutes). Motor pulls too high a starting current.	The clutch contains too much oil.	Check oil level (see 9.2). Drain surplus oil.

Troubles	Causes	Remedies
10.1.4. Uneven run of the separator.	1) 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 gaskets with a knife (see sketch).
	2) Bowl is incorrectly assembled or if the plant has several separators, parts of different bowls may have been interchanged.	Check and assemble bowl properly (see 4.1).
	3) Pressure in disc stack has slackened.	Check if bowl lock ring is screwed in tightly (see sect. 4.1, No. 15). Check disc count. If necessary, add spare disc.
	4) Bowl is damaged and, therefore, out of balance.	Send bowl to factory or authorized factory repair shop. Do NOT attempt to make your own repairs. Never weld or solder. Bowl is made of heat-treated steels.
	5) Neck bearing springs are weak or broken.	Replace all nine neck bearing springs.
	6) Ball bearings are worn.	Replace damaged bearings. IMPORTANT: As spindle bearings use only ball bearings with increased accuracy of running (see Parts List).

Troubles	Causes	Remedies
10.1.4. Uneven run of the separator (cont'd.).	7) Gear parts are in bad condition as a result of 1. normal wear, 2. premature wear caused by a) lack of oil, (in general recognizable by blue tempering colour of gear parts) b) oil of too low a viscosity, c) metal abrasives present in the 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. 5/3) for sealing water were open for a longer period during shut-down of the separator.	Clean gear chamber thoroughly. Replace damaged gear parts: see 8.2, No.6 and 8.5, No. 4. Change the oil (see sect. 2). If necessary, change oil more often. Regarding <u>infiltration of water</u>, 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.
10.1.5. Bowl lock ring is difficult to loosen.	Bowl has not been dismantled at regular intervals (see page 0/3, No.10).	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

Troubles	Causes	Remedies
10.2.1. The bowl does not close at all. IMPORTANT: In this case switch off feed pump immediately.	1) 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 5.3) b) the water discharge holes in the top of the operating-water feed 15 (fig.13/1) are clogged with scale.	a) Check water pressure in the supply line which should be 1.5 bar. The pressure reducer shall be adjusted to 1 bar (for adjustment refer to sect. 5.3). After switching on the timing unit and after each de-sludging procedure the sealing-water valve is open for 60 seconds. 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. Opening of the sealing-water valve for measuring can be repeated by operating the main switch of the timing unit. b) Clean discharge holes.
	2) Gasket 38 (fig. 13/1) is damaged or not inserted.	Replace or insert gasket.
	3) Strainer G (fig. 5/3) is dirty.	Clean strainer.
	4) Gaskets of piston valve 3 (fig. 19) are damaged.	Remove valve (see 4.5) and install new gaskets.
	5) Solenoid valve A (fig. 5/3) 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.
	6) Rapid-closing valve F (fig. 5/3) is damaged. There is a continuous flow of opening water to the bowl.	Install a new rapid-closing valve.
	7) Gasket 5 (fig. 19) 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.
	8) The operating-water feed is clogged.	Clean operating-water feed.

Troubles	Causes	Remedies
10.2.2. The bowl does not close and open properly.	1) Gasket 5 (fig. 19) 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 (see 4.1, No. 6).
	2) Gasket 15 (fig. 19) in bowl top is damaged.	Replace gasket (see 4.4).
	3) Gasket 10 (fig. 19) has not been inserted into hub of bowl bottom.	Insert gasket.
	4) Gasket 5 (fig. 19) in sliding piston is uneven in height.	Replace gasket. The difference in height on a gasket must not exceed 0.25 mm.
	5) The sealing surface of the sliding piston 4 (fig. 19) is damaged.	Exchange the sliding piston.
10.2.3. The bowl does not open at all or not completely.	1) Dirt or rubber particles have settled between sliding piston and bowl bottom.	Clean bowl parts. Round off edges of gaskets. Replace damaged gaskets. Grease guide surfaces with the special lubricating paste supplied.
	2) Sealing chamber 3 (fig. 5/1a) is soiled.	Remove sliding piston 4 and clean sealing chamber.
	3) The boreholes in piston valve are clogged.	Remove the valve (see 4.5) and clean it.

LIST OF PARTS

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.**

Frame and Hood

No. in Fig.	Part - No.	Qty.	Part Description
-	3170-1020-010	1	Foundation frame assembly (1a-c)
1a	3170-1003-010	1	Foundation frame
1b	0026-2031-300	4	Cap
1c	3157-1033-000	4	Bolt
-	2315-1015-010	4	Foot assembly (2a-c)
2a	2315-1011-000	4	Foot, stainless steel coated
2b	0019-6387-400	4	Threaded pin M 12x28 DIN 915
2c	0021-3018-750	4	Rubber cushion
3	0001-0516-300	4	Flange
4	0019-6937-400	12	Hex head screw M 10x30 DIN 933
5	1166-1006-030	1	Lower section of frame
5a	0018-3955-300	1	Cone connection D50 DIN 11851
5b	0013-2845-300	1	Grooved coupling nut F50 DIN 11851
5c	0007-2211-750	1	Gasket G50 DIN 11851
6	0007-2954-750	1	Gasket 590/4
7	0019-7036-400	8	Hex head screw M 16x35 DIN 933
8	0004-2290-400	8	Gasket 16,7/24x1,5
9	0007-2113-750	1	Gasket 94/104x6
10	1167-1045-000	1	Pipe connection
11	0019-6968-300	3	Hex head screw M 12x25 DIN 933
12	0007-2571-750	1	Gasket 297/4
13	0026-1325-300	8	Lock washer B8 DIN 127
14	0019-6122-400	8	Allen screw M8x20 DIN 912
15	1168-1219-000	1	Operating-water feeding device
16	1201-1018-000	1	Sediment collector
17	0007-2580-750	1	Gasket 42/2.5
18	1165-1183-000	1	Plug
19	0013-0404-400	2	Cap nut M8 DIN 1587
20	0007-2320-750	1	Gasket 45/55x5
21	0007-2803-840	1	Gasket 770/788x9.8
22	0019-0840-400	1	Oil drain screw
23	0004-5037-710	1	Gasket 38/50x1.5
24	0001-0022-400	1	Sight glass frame
25	0019-6845-400	3	Hex head screw M 6x25 DIN 933
26	0001-0027-830	1	Sight glass
26a	0004-5406-750	1	Gasket 110x3
26b	0004-5056-740	1	Gasket 70/80x2
27	0026-1371-400	4	Washer 13 DIN 125
28	0019-6970-400	4	Hex head screw M 12x30 DIN 933
29	3050-1085-010	1	Ventilation grid
30	0019-6966-400	4	Hex head screw M 12x20 DIN 933
31	0026-1375-300	4	Washer
32a	0001-0925-870	1	Sight glass
32b	1166-1157-020	1	Ring
33	0007-2229-750	1	Gasket 40/48x5
34	0019-1748-400	1	Plug
35	0004-5762-700	2	Gasket 273/322x2
36	0007-2208-750	2	Gasket G 25 DIN 11851
37	1167-1074-000	1	Bush
38	0007-2521-750	2	Gasket G15 DIN 11851
39	1201-1074-000	1	Bush
-	1166-7759-010	1	Hood assembly (41a-41n)
41a	0004-2364-758	1	Packing cord 8x8x3300
41b	0019-6972-400	8	Hex head screw
-	0026-0165-400	4	Washer 13 DIN 433
41c	1166-7765-010	1	Hood
41d	0007-2262-750	1	Gasket 45/57x6
41f	1165-1061-000	1	Inspection cover
41g	0013-0405-400	2	Cap nut M10 DIN 1587
41h	0013-0406-400	4	Cap nut M12 DIN 1587
41k	1165-2775-000	1	Siphon
41m	0013-2842-300	1	Grooved coupling nut F25 DIN 11851
41n	0007-2208-750	1	Gasket G 25 DIN 11851

Frame and Hood

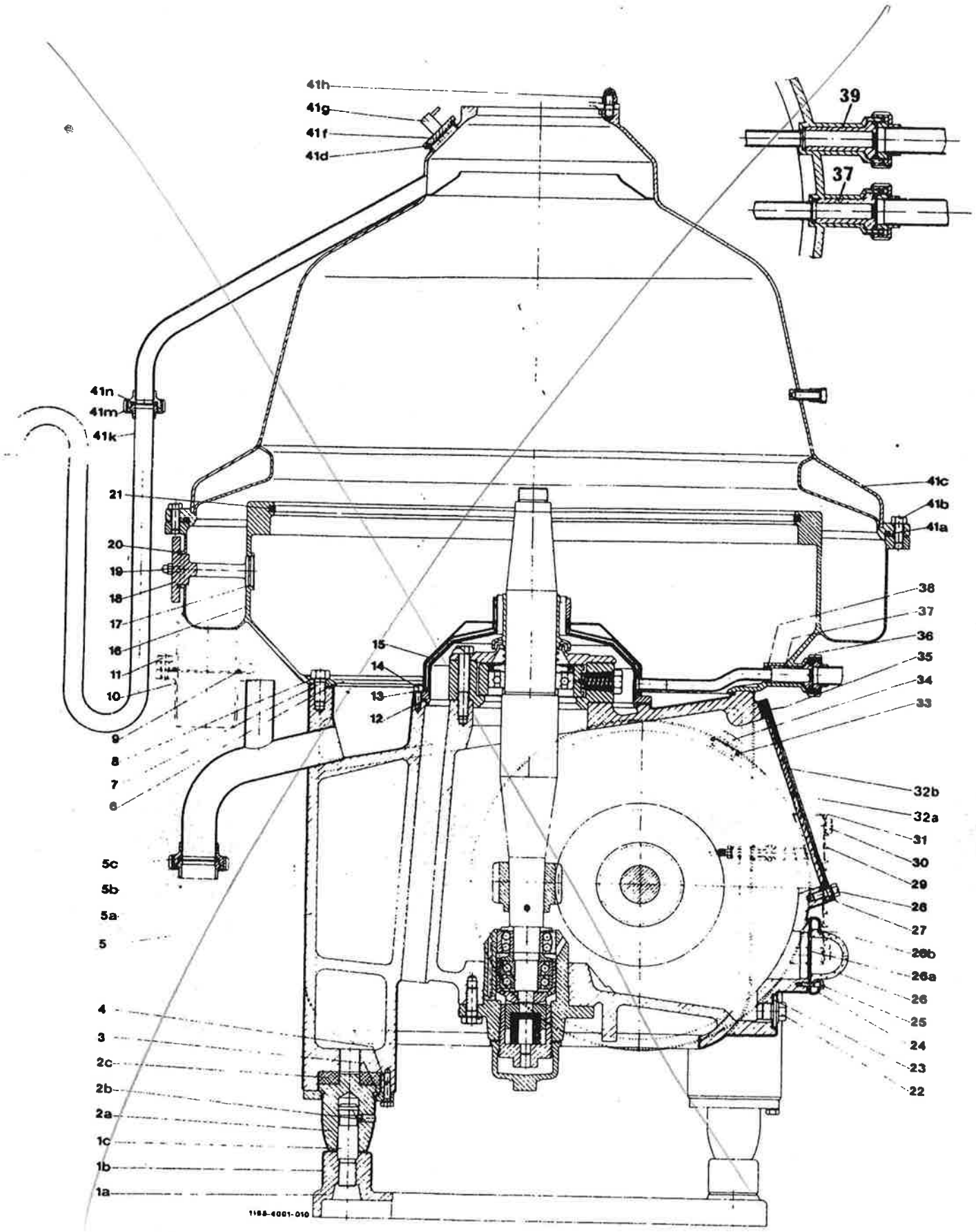


Fig. 13/1

Vertical Gear Parts

(for 50 Hz)

No.in Fig.	* Part - Number	Qty.	Part Description
1	0010-8003-210	1	Bottom bearing cap
2	0004-2221-740	1	Gasket 80/108x2
3	0019-7038-150	4	Hex head screw M 16x45 DIN 933 - 8.8
4	0026-5894-600	4	Tab washer 17 DIN 93
-	1166-3429-030	1	Worm spindle assembly (5a-t)
5a	0010-8012-020	1	Bottom bearing pressure housing
5b	0011-7307-100	2	Angular contact ball bearing 7307 BGM/P6 DIN 628
5c	0026-2109-170	1	Snap ring
5d	0008-4008-030	1	Ball bearing protection ring
5f	0011-2308-120	1	Pendulum ball bearing 2308 M/P6 DIN 630
5g	0008-4008-020	1	Ball bearing protection ring
5h	0026-1563-120	1	Cylindrical notched pin 10x70 DIN 1473 - 6.8
5k	1166-3423-000	1 *	Worm
5m	1166-3410-000	1	Spindle
5n	0008-7512-010	1	Ring
5p	0011-6215-110	1	Grooved ball bearing 6215 / P 6 DIN 625
5r	0008-7508-000	1	Ball bearing protection ring
5s	0006-4311-160	1	Cylindrical pressure spring
5t	0008-7501-640	1	Spindle cap
6	0010-8002-040	1	Bottom bearing threaded piece
7	0006-4440-160	1	Spring column
8	0010-8001-200	1	Bottom bearing pressure piece
9	0004-5793-770	1	Gasket 130/204x0.3
10	3050-1112-020	1	Bottom bearing housing
-	0008-7500-010	1	Neck bearing bridge assembly with covering (11a-p)
11a	0008-7509-000	1	Distance ring
11b	0004-5851-770	1	Gasket 176/235 x 0.3
-	0008-7510-000	1	Neck bearing bridge assembly (11c-h)
11c	0008-7507-020	1	Pressure ring
11d	0008-7506-030	1	Neck bearing bridge
11f	0019-1423-030	9	Threaded plug
11g	0006-4380-090	1	Set of neck bearing springs
11h	0026-2220-110	9	Spring piston
11k	0004-5854-770	1	Gasket 205/250 x 0.3
11m	0008-7502-050	1	Protection cap
11n	0026-5897-600	3	Washer 17 DIN 463
11p	0019-6616-150	3	Hex head screw M 16x100 DIN 931 - 8.8

* It is advisable to replace the worm wheel assembly with clamp plates 10 (fig. 15) at the same time as the worm, as it has also been subjected to wear and would otherwise cause premature wear to the new worm.

A1168-012

Vertical Gear Parts

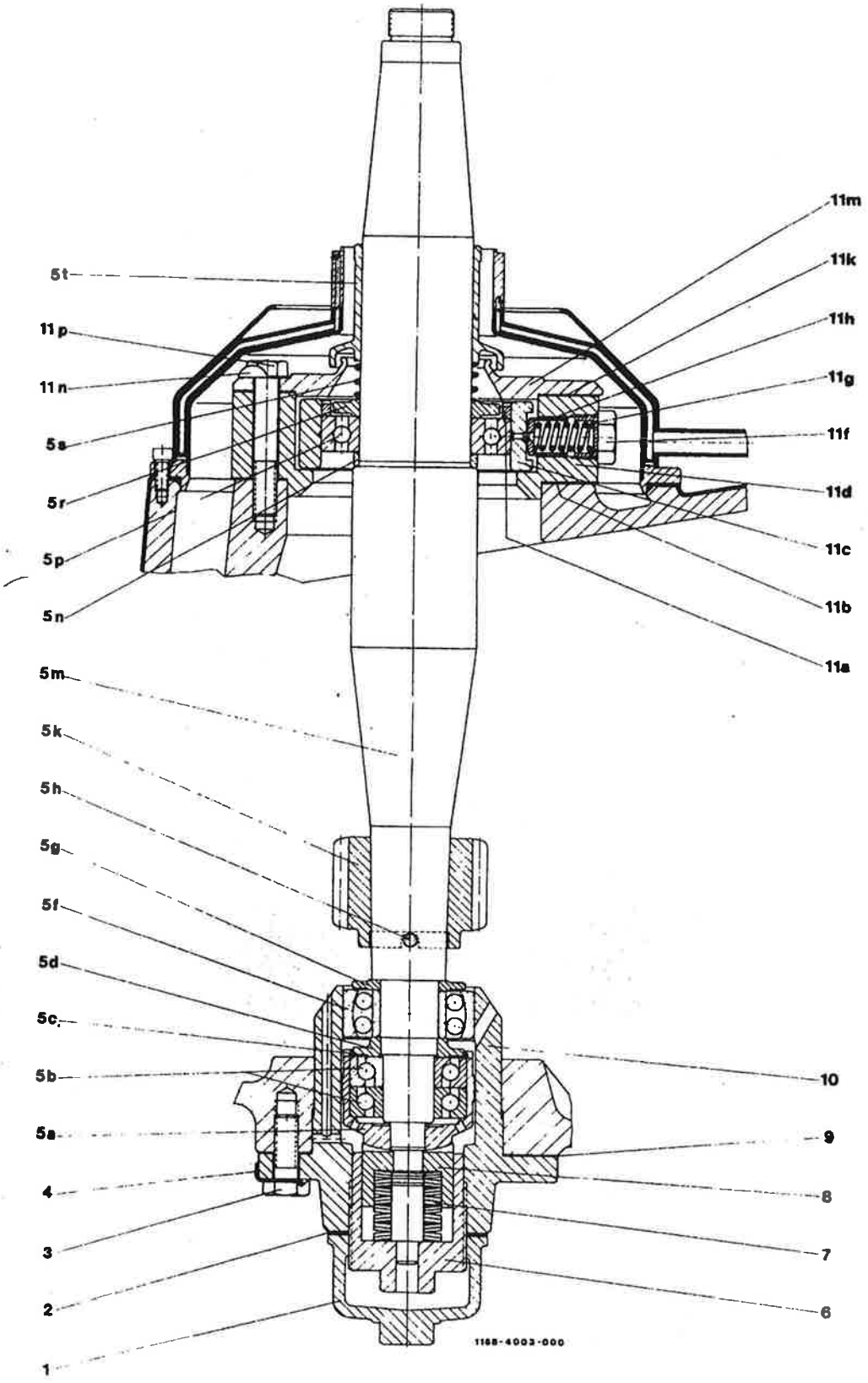


Fig. 14

Horizontal Gear Parts (f = 50 cycles)

No. in Fig.	Part - No.	Qty.	Part Description
1	5970-L	1	*Motor
-	1166-1021- L	1	Flange assembly (2a-m)
2a	0013-0282-400	8	Hexagon nut M 16 DIN 934
2b	0026-1330-190	8	Lock washer A 16 DIN 127
2c	0007-2501-750	2	Gasket 23/3
2d	0005-0226-300	2	Plug Pg 21
2f	0019-7727-090	8	Stud M 16x45 DIN 939
2g	0019-6839-300	8	Hex head screw M 6x10 DIN 933
2h	1166-1475-030	1	Cover
2k	1166-1028- L	1	Flange
2m	0019-6202-150	8	Allen screw M 16x45 DIN 912
3	0019-6150-150	3	Allen screw M 10x55 DIN 912
4	0026-1640-030	1	Centering disc
5	0006-4404-010	1	Cup spring
6	3050-3375-010	1	Bearing cover
7	0019-6938-150	3	Hex head screw M 10x35 DIN 933
8	0004-1850-740	2	Gasket 99/140x1
9	1166-3131-000	2	Bearing housing
10	1166-3449-020	1	Worm wheel assembly with clamp plates
10a	1166-3447-000	1 **	Clamp plate with toothing
10b	1166-3446-000	1 **	Clamp plate
10c	0019-6525-150	4 **	Hex head screw M 10x110 DIN 931
-	1166-3368-020	1	Brake drum assembly (11a-d)
11a	0019-6144-150	6	Allen screw M 10x25 DIN 912
11b	0026-1337-190	6	Lock washer A10 DIN 127
11c	1166-3371-030	1	Brake drum
11d	3170-3371-000	1	Brake ring
12	0026-0405-030	1	Washer
13	0019-6150-150	2	Allen screw M 10x55 DIN 912
14	0019-8974-150	2	Threaded pin AM 8x15 DIN 914
-	3170-1043-000	2	Brake assembly (15a-f)
15a	0021-3514-300	2	Brake handle
15b	3170-1031-000	2	Brake bolt (with brake lining)
15c	0021-3537-300	2	Brake housing
15d	0006-4208-160	2	Cylindrical pressure spring
15f	0021-4096-850	2	Brake lining
-	0026-1263-500	8	Countersunk rivet
16	0026-1353-400	4	Washer
17	3170-1065-010	1	Cover
18	0019-6608-400	4	Hex head screw M 16x60 DIN 931
19	0019-6512-150	3	Hex head screw M 10x40 DIN 931 - 8.8
20	0004-1956-830	2	Felt ring 45 DIN 5419
21	3170-3375-000	1	Bearing cover
22	0004-1822-740	1	Gasket 90/140 x 1
23	0013-0448-090	1	Grooved nut M50x1.5 SKF/KM10
24	0011-6210-000	1	Grooved ball bearing 6210 DIN 625
25	1166-3400-000	1	Worm wheel shaft
26	0011-6210-000	1	Grooved ball bearing 6210 DIN 625
27	0004-1822-740	1	Gasket 90/140 x 1
29	see page 16/1	1	Fluid clutch (see fig. 16)
30	0019-8984-150	1	Threaded pin M 10x25 DIN 914
31	3158-3389- L	1	Cam hub
32	3158-3282-000	1	Cam ring
33	0019-2507-400	1	Lens head screw AM 6x10 DIN 85
34	0018-1276-400	1	Pipe clamp
35	0018-0585-848	1	Pipe
36	1166-3710-000	1	Nozzle
37	0026-1369-030	2	Washer
38	0004-1957-830	2	Felt ring 50 DIN 5419
39	1168-1192-000	1	Angular bracket
40	0005-0964-000	1	Proximity switch

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

** This part is included in worm wheel assembly with clamp plates 10, but it is also available as separate item. When worm wheel is worn and needs replacement, it is recommended to replace the worm 5k (fig. 14) at the same time (see sect. 8.5, No. 4).

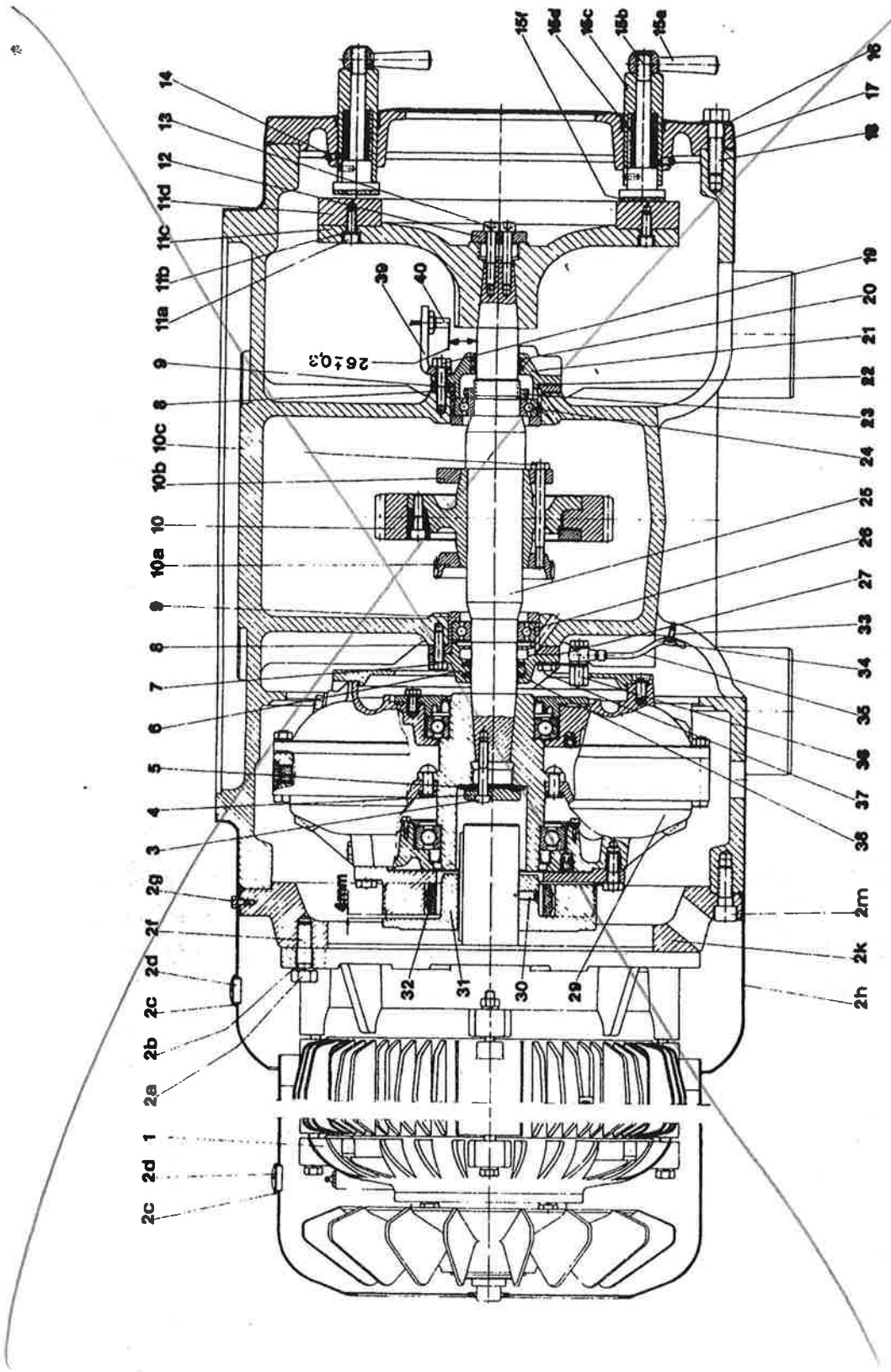

15f
15d
15c
15b
15a
16
17
18
14
13
12
11d
11c
11b
11a
39
40
19
20
21
22
23
24
25
26
27
33
34
35
36
37
38
9
8
10c
10b
10
10a
9
8
7
6
5
4
3
2g
2f
2d
2c
2b
2a
1
2d
2c
4mm
32
31
30
29
2m
2k
2h

Fig. 15

Pneumatic Brake

(on special order only)

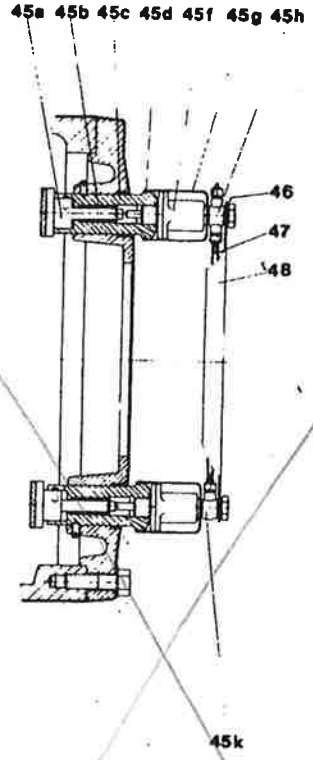


Fig. 15/1

No. in Fig.	Part - No.	Qty.	Part Description
45a	1166-1031-000	2	Brake bolt (with lining), complete
-	0021-4096-850	2	* Brake lining
-	0026-1263-550	8	* Countersunk rivet
45b	0006-4120-300	2	Cylindrical pressure spring
45c	0021-3555-300	2	Brake housing
45d	0007-2580-750	2	Gasket 42/2.5
45f	0021-3690-010	2	Compressed-air cylinder
45g	0026-2144-400	2	Cap
45h	0018-3740-640	1	T-type hose connection R 1,
45k	0018-3730-640	1	Angular hose connection R
46	0004-2245-770	2	Gasket 15/21x0.25
47	0018-0585-848	1	Pipe
48	1166-1044-000	1	Protecting sheet

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

Cooling Pipes

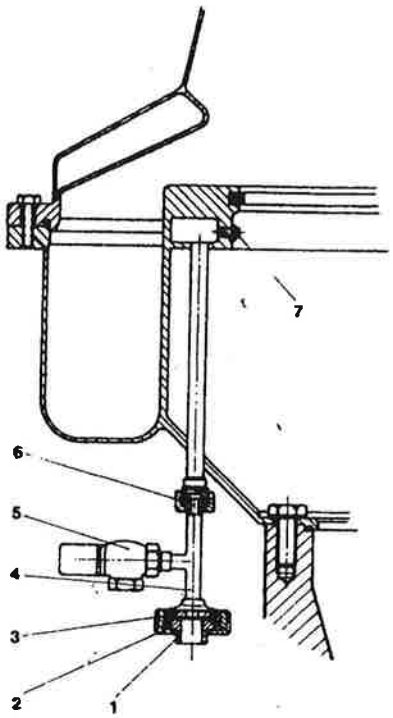


Fig. 15/2

No. in Fig.	Part - No.	Qty.		Part Description
1	0018-3939-300	2		Cone connection D25 DIN 11851
2	0013-2842-300	2		Grooved coupling nut F25 DIN 11851
3	0007-2208-750	2		Gasket NW 25
4	1199-1370-010	1		Cooling pipe (coolant discharge)
5	0018-1365-690	1	*	Pressure relief valve 1/2"
-	1199-1370-000	1		Cooling pipe (coolant feed)
6	0007-2402-750	2		Gasket 17/23x3
7	3118-6710-000	3		Nozzle

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

Fluid Clutch

No. in Fig.	Part - No.	Qty.		Part Description
-	1166-3280-020	1		Fluid clutch assembly (1-32) (see also fig. 15, No. 29)
1	-	1	*	Cam flange
2	0019-6971-150	8		Hex head screw M 12x35 DIN 931
3	0026-0777-170	8		Spring washer B 12 DIN 137
4	0004-2913-830	1		Sealing ring 105x130x13
5	0026-0182-170	1		Spacer ring ANS 160x26
6	0011-6021-400	1		Grooved ball bearing 6021 M /C4 DIN 625
7	0019-6518-150	36		Hex head screw M 10x70 DIN 931
8	-	1	*	Clutch casing 470 Ø
9	0004-2385-858	1		Packing cord 1 mm Ø, 1400 long
10	0026-0771-170	36		Spring washer B 10 DIN 137
11	0013-0279-150	36		Hexagon nut M 10 DIN 934
12	-	1	*	Primary wheel 470 Ø
13	0026-0180-170	1		Spacer ring AN 140x24
14	0007-2944-830	1		Gasket 140/3 Ø
15	0011-6018-400	1		Grooved ball bearing 6018 M/C4 DIN 625
16	-	1	*	Secondary hub with secondary wheel 425 Ø
17	0004-2912-830	1		Sealing ring 90x110x13
18	-	1	**	Sealing ring cover
19	0019-6903-150	8		Hex head screw M 8x20 DIN 933
20	0026-0770-170	8		Spring washer B 8 DIN 137
21	0004-2144-280	2		Gasket 22/29 Ø x 1,5
22	-	1	**	Lock screw M 22x1,5x20
23	0004-2131-280	1		Gasket 18/24 Ø x 1,5
24	0019-1490-000	1		Threaded plug M 18x1,5x15
25	3158-3287-010	1		Oil control ring 119/192 Ø x 4,5
26	0019-2234-030	8		Cylindrical screw AM 5x15 DIN 84
27	0026-0750-170	8		Lock washer 5 DIN 7980
29	0019-1551-090	1		Oil fill screw M 22x1,5
30	0019-8440-150	4		Cylindrical screw M 12x25 DIN 7984
31	0007-2035-750	1		Gasket 280/3
32	1166-3367-000	1		Ring

* If this part needs replacement, the complete clutch must be returned to the factory for repair. Instead of part-number state item-number (see first column).

** Instead of part-number state item-number (see first column).

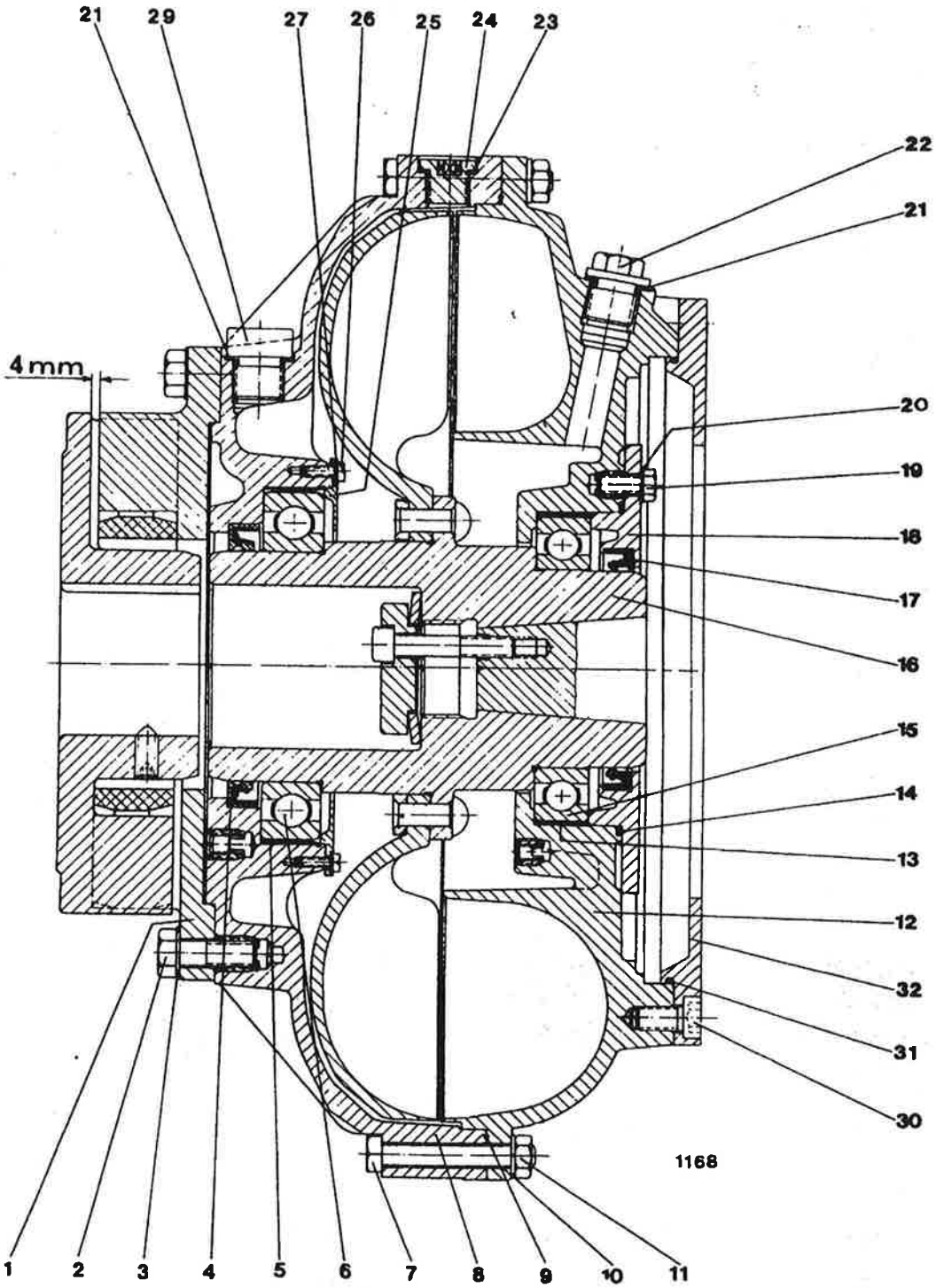

21
29
27
26
25
24
23
22
21
4 mm
20
19
18
17
16
15
14
13
12
32
31
30
1168
1
2
3
4
5
6
7
8
9
10
11

Fig. 16

Operating-water connection

No. in Fig.	Part - No.	Qty.		Part Description
-	8134-2100-280	1		Operating-water connection with protecting case (1-27, 36-41)
1	0013-2842-300	1		Grooved coupling nut F 25 DIN 11851
2	0018-3939-300	1		Cone connection D 25 DIN 11851
3	0007-2208-750	4		Gasket G 25 DIN 11851
-	8134-2201-010	1		Pipe line assembly (4a-d)
4a	0018-4502-300	1		Threaded connection 25/R1"
4b	0018-2525-640	1		Strainer R 1"
4c	0018-1609-300	1		Bend
4d	0013-2842-300	1		Grooved coupling nut
5	0018-4086-400	3		Threaded connection 25/R 1"
6	0018-1741-000	1		Pressure-reducing valve, complete
6a		2	*	Gasket
6b		2	*	Threaded connection
6c		2	*	Coupling nut
6d	0001-0299-640	2	*	Pressure gauge
7	3014-2166-000	1		Connection pipe
8	0019-0137-300	1		Hex head screw R 1/4" x 12
9	0004-5268-880	2		Gasket 13/19x1.5
10	8134-2195-000	1		Connection piece
11	0018-0961-300	3		Double nipple 3/8"
12	0018-3711-600	3		Solenoid valve 3/8"
13	0018-3465-400	2		Screw coupling DL 8 DIN 2353
14	0018-1870-010	1		Low-pressure hose
15	0018-3854-300	4		Connection piece 10/R3/8"
16	0013-2818-400	4		Hexagon 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 1/2"
21	0018-1788-300	2		Reducing nipple 1/2" / 3/8"
22	8134-2201-040	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	8134-2193-110	1		Connection piece
26	0018-1299-640	2		Upper part of valve 1/2" DIN 3519, complete
26a	0004-5276-710	2	*	Gasket 22/26x1
27	0001-0299-640	2		Pressure gauge
-	8134-2355-020	1		Protecting case
-	0005-3355-630	1		Spiral hose coupling Pg 9
-	1165-2350-000	1		Pressure switch, complete (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 F5
32	1166-3308-000	1		Threaded piece
33	0007-2184-750	1		Gasket 15/22x3
34	0013-1023-250	1		Nut 3/8" - P4 DIN 2950
35	0018-3725-600	1		Hose coupling R 1/4" / 4x6
36	0005-3358-630	1		Spiral hose coupling Pg 9
37	0019-2376-630	2		Fillister head screw AM 4x16 DIN 84
38	0005-0862-900	1		Junction box
39	0005-0222-630	1		Plug Pg9
40	0005-0203-630	1		Cable gland C4 Pg 11x6-9 DIN 46320
41	0005-0772-608	1		Protective hose

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

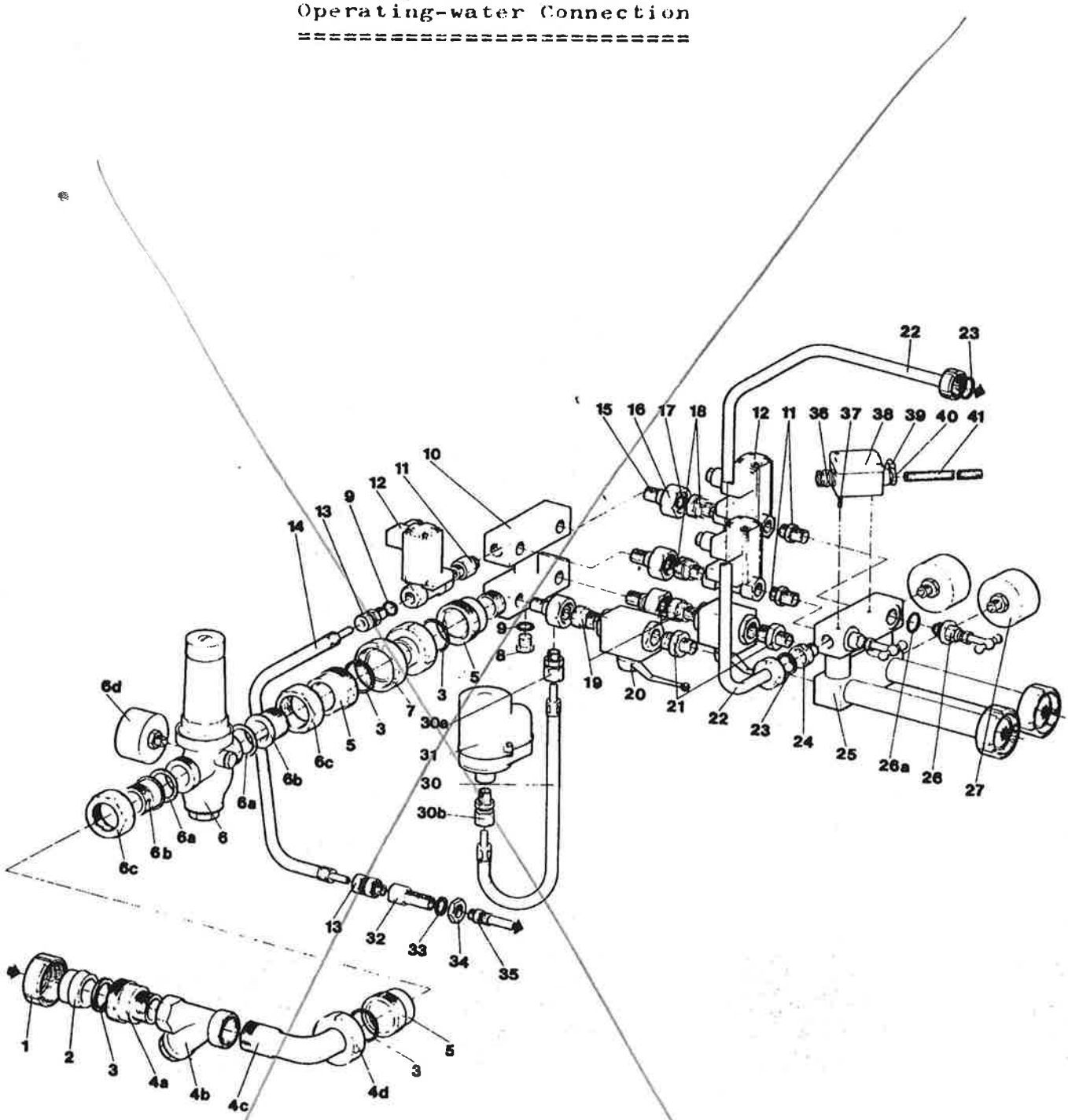

22
23
15
16
17
18
12
11
36
37
38
39
40
41
10
11
12
9
13
14
9
8
3
5
7
3
5
6d
6c
6b
6a
6
6c
6b
6a
6
30a
31
30
30b
19
20
21
22
23
24
25
26a
26
27
13
32
33
34
35
1
2
3
4a
4b
4c
4d
3
5

Fig. 17/1

Solenoid Valve R 3/8"

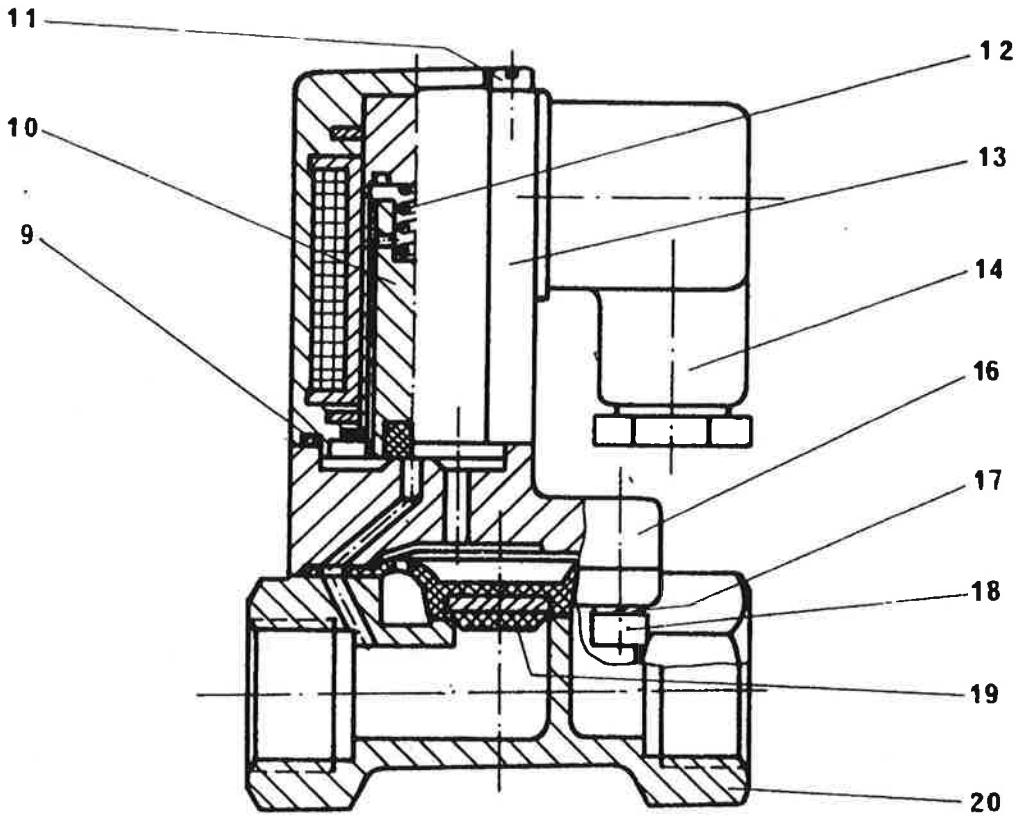


Fig. 17/2

No. in Fig.	Part - No.	Qty.	Part Description
-	0018-3711-600	1	Solenoid valve, complete (9-20)
9	0007-1946-750	1	Gasket 25/1.5
10	0018-3710-040	1	Solenoid core
11	0019-2387-400	4	Cylindrical screw M 4x55 DIN 84
12	0006-4079-300	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	4	Lock washer A4 DIN 127
18	0019-6077-400	4	Allen screw M 4x10 DIN 912
19	0018-3711-750	1	Diaphragm
20	0018-3711-080	1	Valve housing

Feed and discharge connections and centripetal pump

No. in Fig.	Part - No.	Qty.	Part Description
-	1201-2213-010	1	Double centripetal pump, complete (1a-k)
1a	1201-2246-010	1	Feed tube
1b	0007-2925-750	1	Gasket 36.2/3
1c	1201-2241-010	1	Lower centripetal pump (up to 4 bar max.)
1d	0007-1944-750	1	Gasket 44.2/3
1f	1201-2252-010	1	Upper centripetal pump (up to 2 bar max.)
1g	0007-2929-750	1	Gasket 55.2/3
1h	0007-2580-750	3	Gasket 42/2.5
1k	0007-2211-750	1	Gasket G50 DIN 11851
-	1201-2296-010	1	Feed and discharge connections, complete (2-10f)
2	1175-2217-000	1	Ring
3	1201-2301-010	1	Feed and discharge housing
4	0007-2208-750	1	Gasket G25 DIN 11851
5	0007-2210-750	2	Gasket G40 DIN 11851
6	8918-2100-040	1	Pressure gauge, 7 bar
7	8918-2100-050	1	Pressure gauge, 14 bar
8	0007-2211-750	1	Gasket G50 DIN 11851
-	8020-2240-010	1	Flowmeter assembly (9a-10f)
9a	0019-1732-400	1	Handle screw
9b	0007-2298-750	2	Gasket 13.5/22x10
9c	0019-2478-300	2	Countersunk screw M 4x8 DIN 85
9d	0004-5261-720	2	Gasket 4.8/9.0x1
9e	8020-2217-000	1	Scale, 200 - 1,400 l/h
9f	8020-2002-000	1	Intermediate piece
9g	0001-0083-820	1	Cylindrical sight glass
9h	0019-1380-300	1	Threaded bush
9k	0026-1375-300	1	Washer
9m	0013-3010-300	1	Nut M 35x1.5
9n	8020-2003-170	1	Outlet pipe
9p	0019-0170-400	2	Hex head screw M 12x17.5
9q	0007-2209-750	1	Gasket G32 DIN 11851
9r	8020-2001-110	1	Inlet cup
9s	8020-2206-010	1	Measuring tube
9t	8020-2012-000	1	Float
9u	8020-2004-000	1	Clamp
9v	0019-0002-640	1	Handle screw
9w	0007-2208-750	1	Gasket G25 DIN 11851
9x	0007-2285-750	2	Gasket 22/32x5
9y	0026-5508-300	1	Washer
9z	0026-1445-300	1	Snap ring
-	1072-2273-020	1	Stuffing box, complete (10a-f)
10a	1072-2279-020	1	Round-slide valve
10b	0019-1590-610	1	Threaded bolt
10c	1072-2284-000	1	Stuffing box housing
10d	0026-1062-400	1	Cylindrical pin
10f	0021-3096-300	1	Handle
11	0018-3939-300	1	Cone connection D25 DIN 11851
12	0013-2842-300	1	Grooved coupling nut F25 DIN 11851
13	0013-2845-300	2	Grooved coupling nut F50 DIN 11851
14	0018-3955-300	2	Cone connection D50 DIN 11851

Feed and discharge connections and centripetal pump

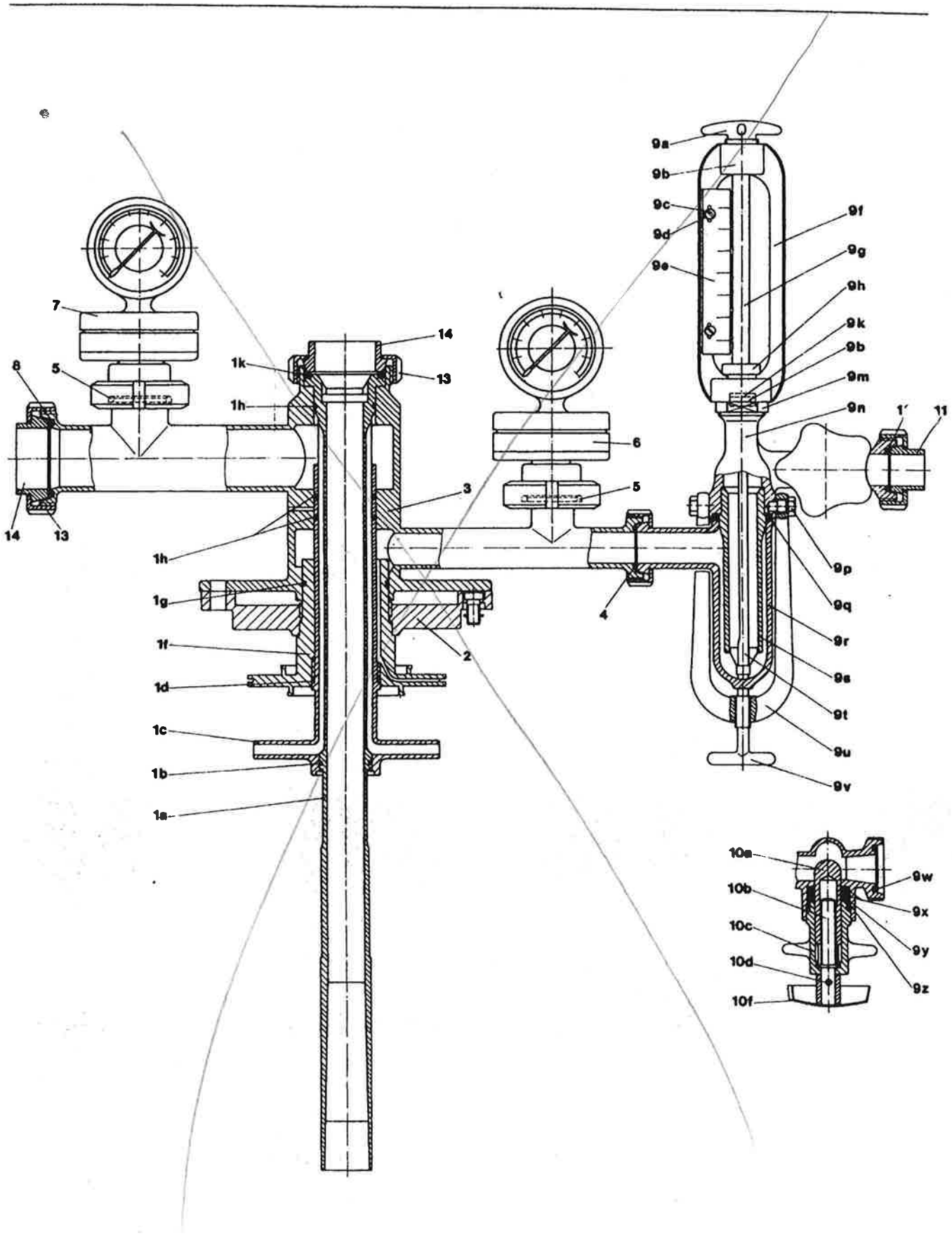


Fig. 18

No. in Fig.	Part - No.	Qty.		Part Description
-	1201-6600-000	1		Bowl, complete (1-27)
1	0019-1450-400	1		Threaded plug
2	0007-1970-690	1		Gasket 26.5/35x5.25
3	3159-6280-000	1		Valve assembly (3a-f)
3a	3159-6281-000	1		Valve housing
3b	0007-2920-750	4		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	3159-6276-000	1		Valve piston
4	1168-6501-010	1	*	Sliding piston
5	0007-2964-750	1		Gasket 636/660x12
7	1168-6604-020	1	*	Bowl bottom, complete
7a	3117-6609-010	1	**	Arresting piece
7b	0019-2233-400	1	**	Cheese head screw AM 5x12 DIN 84
7c	0019-6105-400	1	**	Allen screw M 6x12 DIN 912
7d	0004-2288-400	1	**	Gasket 7.3x10.2x1
8	1168-6631-000	1	*	Lock ring
-	1201-6660-000	1	*	Set of discs (9a-d)
9a	1196-6662-000	1		Bottom disc
9b	1196-6663-000	216		Disc
9c	1201-6663-000	18		Disc
9d	1201-6666-000	1		Compensating disc
10	0007-2647-750	1		Gasket 119/10
11	1201-6620-000	1	*	Distributor, complete
-	0028-7885-400	4	**	Guide bar
-	0019-0350-400	28	**	Countersunk screw M 6x17
14	0007-2546-750	1		Gasket 600/5
15	0007-2466-840	1		Gasket 607x12.5
16	0013-3076-400	1		Spindle nut, complete
16a	0007-2382-850	1	**	Gasket 60/70x4
17	1201-6610-000	1	*	Bowl top
17a	1199-6709-020	8		Nozzle 0.8
-	1199-6709-030	8		Nozzle 0.9
-	1199-6709-040	8		Nozzle 1.0
-	1199-6707-000	8		Plug
18	1201-6650-000	1		Separating disc
19	1201-6670-000	1		Upper disc
21	1201-6645-000	1		Centripetal pump chamber cover
22	0007-2854-750	1		Gasket 190x6
23	1165-6631-010	1		Lock ring
24	0007-2640-750	1		Gasket 150/3
25	1168-6597-010	1		Ring
26	0007-2704-750	1		Gasket 182/2
27	0019-6108-400	4		Allen screw M6x20 DIN 912

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

** This part is included in the previous complete unit, but can also be ordered separately.

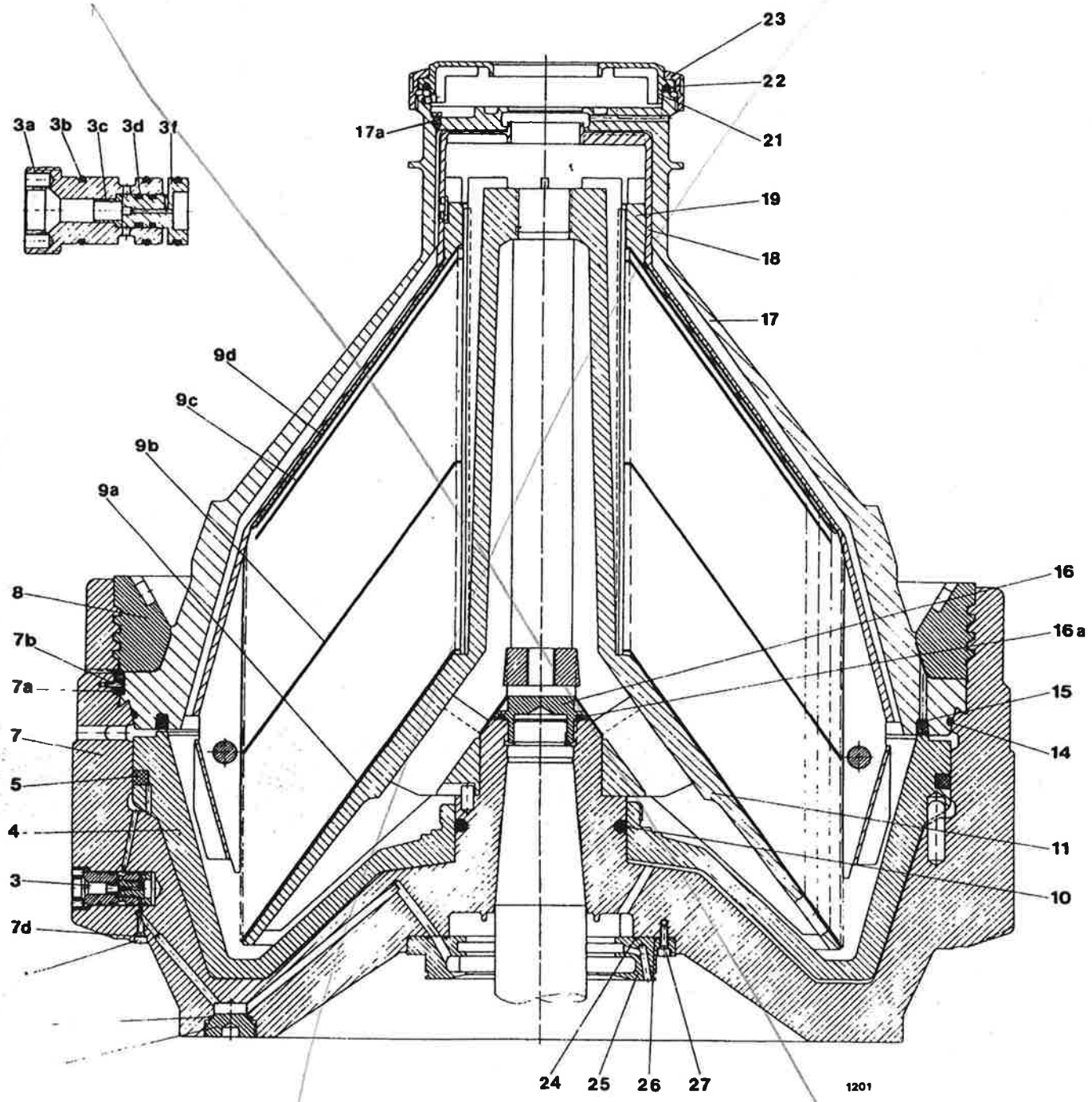

3a
3b
3c
3d
3f
17a
23
22
21
19
18
17
9d
9c
9b
9a
8
7b
7a
7
5
4
3
7d
16
16a
15
14
11
10
24
25
26
27
1201

Fig. 19

Tools and Accessories

All the parts mentioned in the packing list furnished 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
-	0003-3778-320	1	Allen wrench 10 DIN 911
-	0003-3780-320	1	Allen wrench 14 DIN 911
402	0003-3720-000	1	Wrench 55 (for spindle nut)
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
-	0003-4211-320	1	Double-ended wrench 27x32 DIN 3110
-	0003-4222-320	1	Double-ended wrench 36x41 DIN 3110
404	0003-3846-000	1	Pivoted hook wrench 90/155
405	0003-0200-000	1	Mallet
406	0003-0303-000	1	Splash cover
407	0003-0256-890	1	Oil gun
408	0003-0168-890	1	Funnel
409	0003-0277-800	1	Oil cup
410	0003-4695-960	1	Brush 70x100x500
411	0003-4667-800	1	Rotary brush 41/26x213
412	0003-4690-960	1	Brush 35x125x285
413	0003-4540-960	4	Cylindrical brush 10x40x160
-	0003-4544-960	4	Cylindrical brush 15x85x285
-	0003-4551-800	1	Cylindrical brush 20x100x800
-	0003-4552-960	1	Cylindrical brush 45x110x270
414	1087-9910-010	1	Pulling device (for cam hub, fluid clutch)
415	0018-3430-030	1	Pipe M 22x1.5x200 (for fluid clutch)
416	0003-0590-000	1	Torque wrench 20 - 150 Nm
416a	0003-0615-000	1	Extension
417	0003-0601-320	1	Socket 8
418	1166-9972-000	1	Lifting device for spindle
419	1166-9910-010	1	Puller (for fluid clutch and brake pulley)
420	0003-4636-050	1	Screwdriver 4.5x125
-	0003-4637-050	1	Screwdriver 8x150
421	0003-4533-100	1	Wrench (for centripetal pump)
422	0003-0137-000	1	Wrench 38/50/70 (for centripetal pump)
423	0003-0420-000	1	Needle holder
-	3157-9818-000	1	Package of nozzle needles
424	0003-4176-110	1	Nozzle wrench
425	0003-0345-000	1	Annular wrench (for large lock ring)
426	0003-4002-000	1	Annular wrench (for small lock ring)
427	1166-9840-000	1	Lifting device (for bowl top)
428	1166-9960-000	1	Jack (for sliding piston)
428a	1166-9805-000	1	Pressure piece (included in No. 428)
429	0003-4146-030	1	Wrench (for feed tube)
430	1175-9820-000	1	Disc stack compressing device (430a-d)
430a	1175-9851-000	1	Threaded ring
430b	1167-9770-000	1	Hydraulic unit
430c	1167-9939-000	1	Disc
430d	1175-9877-000	1	Bolt
431	2301-9970-000	1	Lifting device (for annular wrench with lock ring)
432	0003-0575-000	1	Pin punch C5 DIN 6450
434	1168-9970-010	1	Mounting tool
435	1175-9839-000	1	Lifting device (for hood)
436	3050-9930-000	1	Jack (for bowl bottom)
437	0003-3727-030	1	Wrench M4 (for valve piston)
438	1165-9895-010	1	Wrench (for bowl bottom)

439	1168-9823-000	1	Adjusting ring (feeler for speed monitoring)
440	0003-3546-170	1	Lifting tongs (for separating disc with lower centripetal pump)
-	0015-0014-080	5	2.5-litre can of separator lubricating oil CLP 220
-	0015-0050-090	2	5-litre can of clutch oil TDL 32 DIN 51515
-	0015-0113-000	2	75-gram tube of special type grease (for threads of bowl)
-	0015-0121-000	1	0.85-kg can of ball and roller bearing grease K-L3k DIN 51825

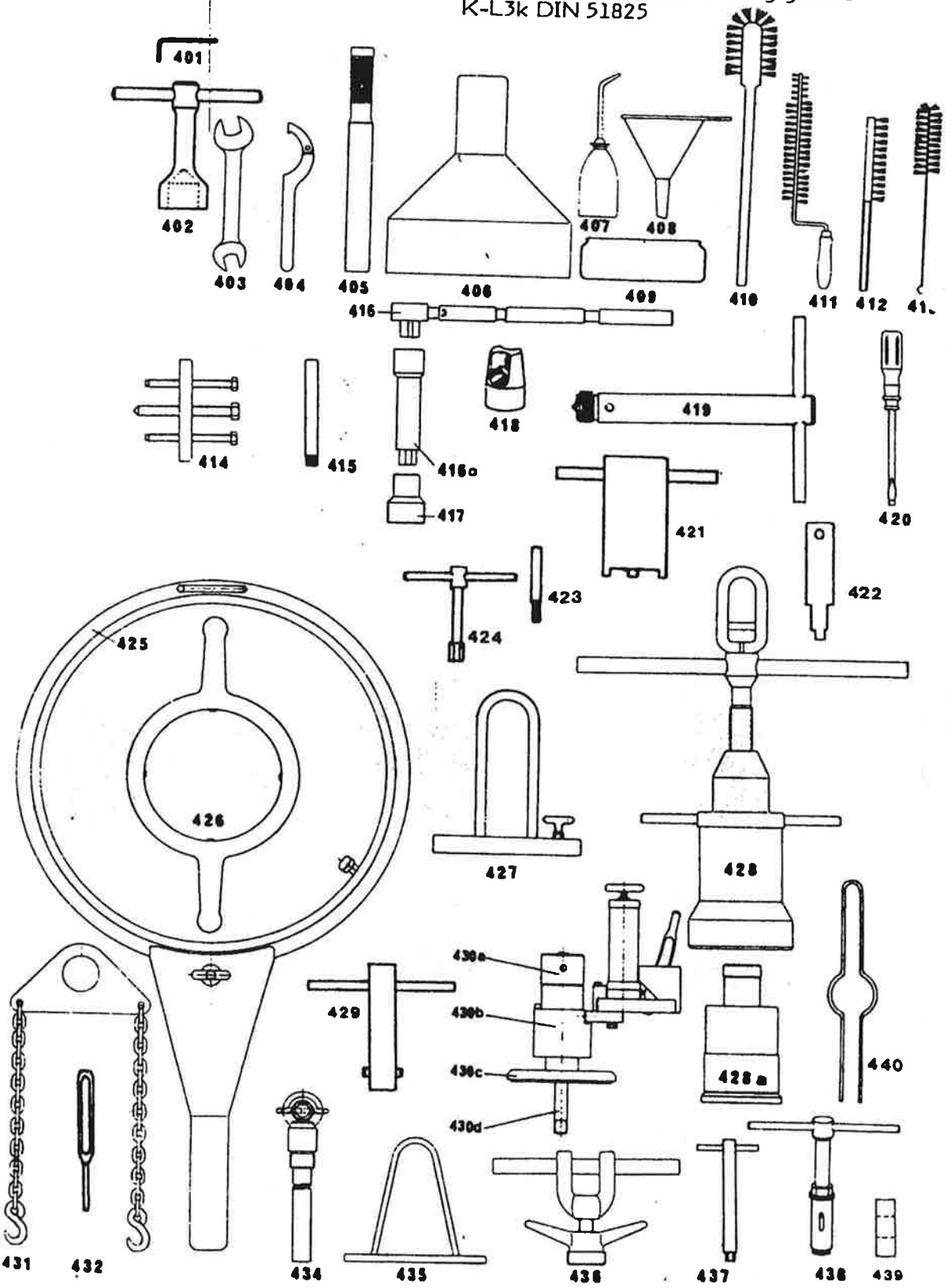


Fig. 20

Concentrate collecting vessel

(on special order)

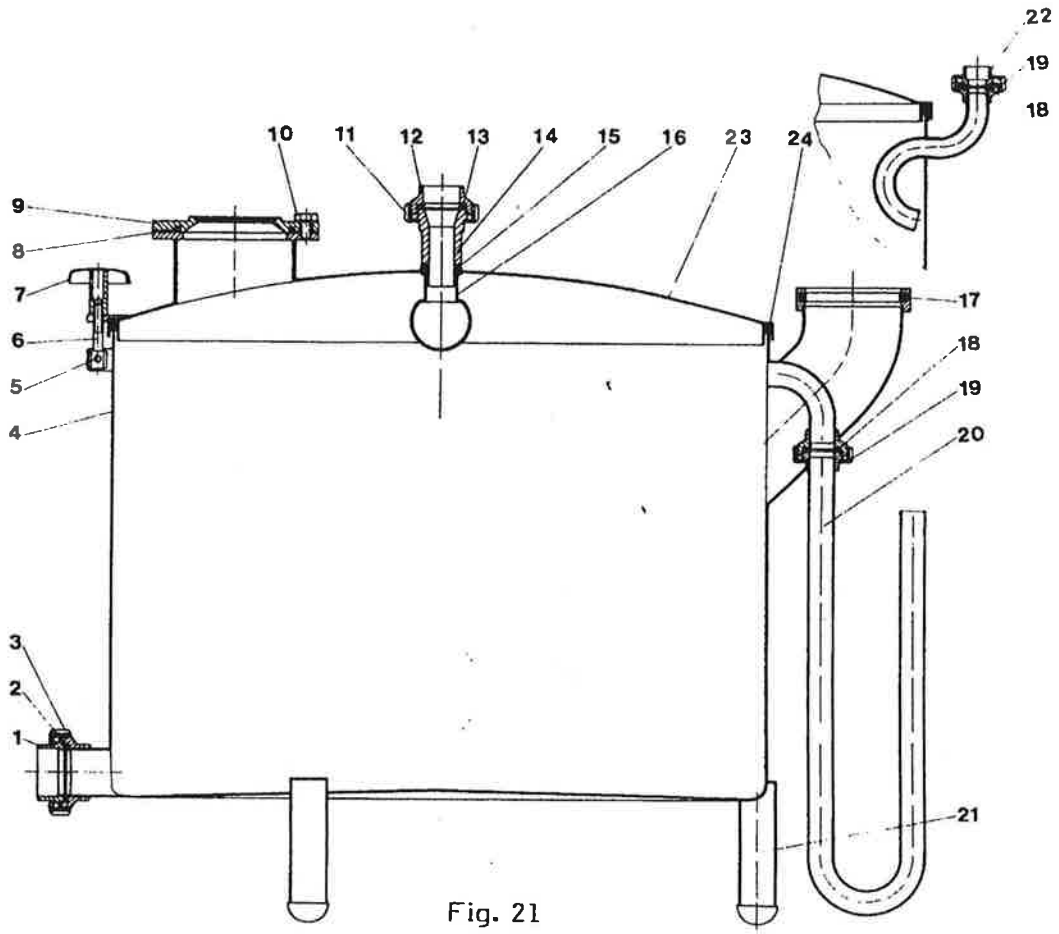


Fig. 21

No. in Fig.	Part - No.	Qty.	Part Description
-	1199-9200-000	1	Collecting vessel, complete (1-24)
1	0018-3955-300	1	Cone connection D50 DIN 11851
2	0007-2211-750	1	Gasket G50 DIN 11851
3	0013-2845-300	1	Grooved coupling nut F50 DIN 11851
4	1199-9210-000	1	Collecting vessel
5	0026-1102-400	6	Cylindrical pin
6	0019-1363-300	6	Eye bolt
7	0021-3128-300	6	Handle
8	0007-2121-750	1	Gasket 118/130x7
9	1169-9458-010	1	Flange
10	0019-6966-400	3	Hex head screw M12x20 DIN 933
11	0013-2844-300	1	Grooved coupling nut F40 DIN 11851
12	0018-4114-300	1	Threaded connection C40 DIN 11851
13	0007-2210-750	1	Gasket G40 DIN 11851
14	8122-7718-020	1	Connection piece
15	0007-2342-750	1	Gasket 32/40x4
16	0018-4490-300	1	Spray ball
17	0007-2309-750	1	Gasket 92/112x10
18	0007-2208-750	2	Gasket G25 DIN 11851
19	0013-2842-300	2	Grooved coupling nut F25 DIN 11851
20	1165-2775-000	1	Siphon
21	0021-3155-700	3	Foot
22	0018-3939-300	1	Cone connection D25 DIN 11851
23	1196-9208-000	1	Cover
24	0004-2364-758	1	Packing cord 8x8x2200

Maximum throughput rate: 25,000 l/h

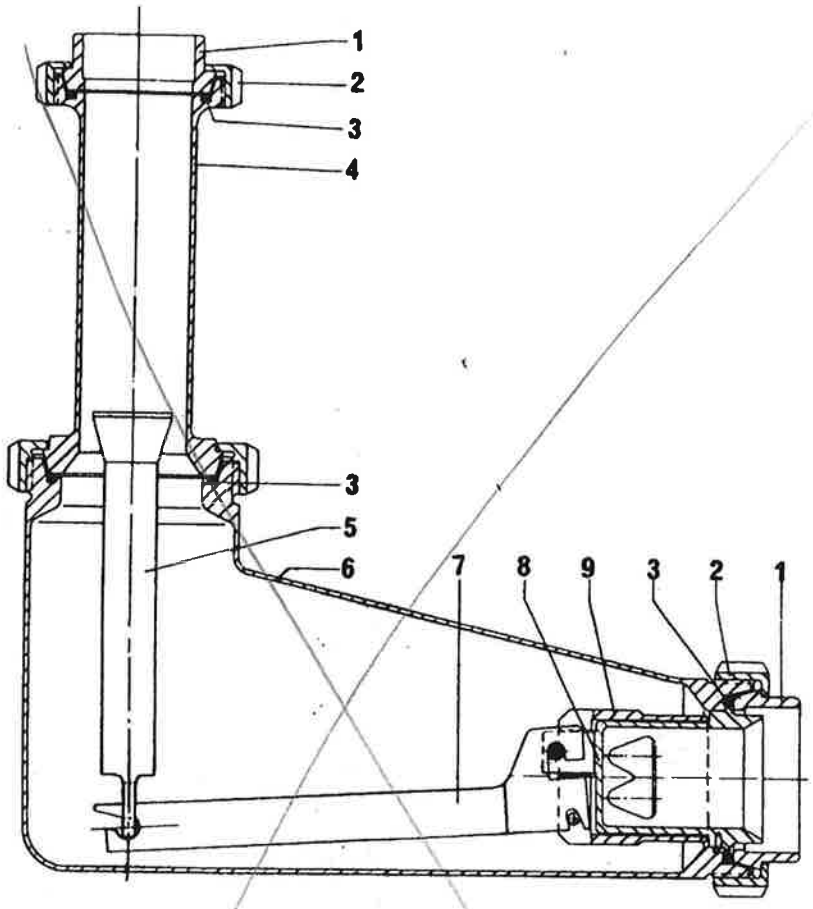


Fig. 22

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 4 is directed vertically upwards.

No.in Fig.	Part - No.	Qty.		Part Description
-	8251-2250-050	1		Flow constrictor, complete (1-9)
1	0018-4261-300	1		Cone connection D65 DIN 11851
2	0013-2846-300	1		Grooved coupling nut
3	0007-2212-750	3		Gasket G65 DIN 11851
4	-	1	*	Control tube
5	-	1	*	Float
6	-	1	*	Housing
7	-	1	*	Throttling lever
8	-	1	*	Throttling housing
9	-	1	*	Regulating piece

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

F l o w m e t e r (on special order)

Measuring range: 6,000 - 30,000 litres/h

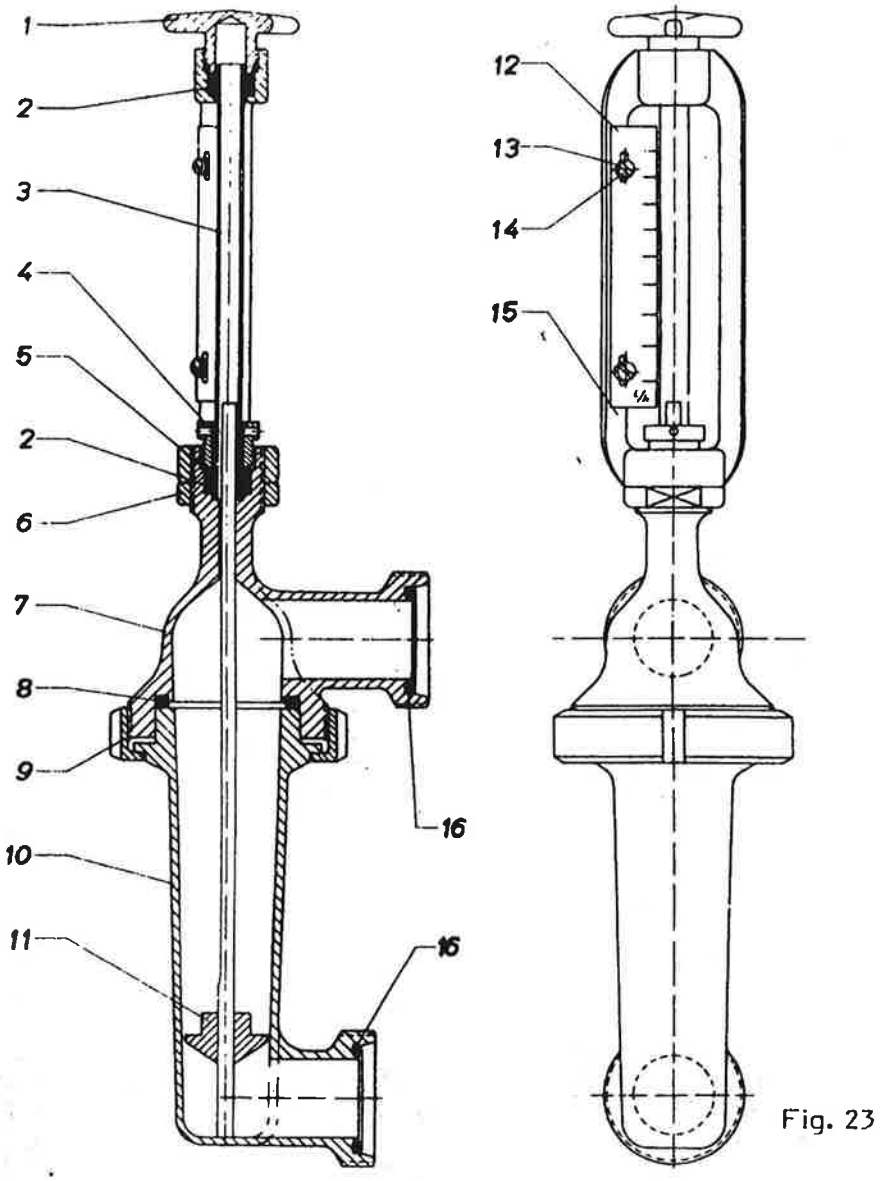


Fig. 23

No.in Fig.	Part - No.	Qty.	Part Description
-	8022-2100-080	1	Flowmeter, complete (1-16)
1	0019-1732-400	1	Handle screw
2	0007-2298-750	2	Gasket 13.5/22x10
3	0001-0082-820	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	8022-2003-080	1	Outlet pipe
8	0007-2341-750	1	Gasket 85/95x6
9	0013-2847-300	1	Grooved coupling nut F90 DIN 11851
10	8022-2001-110	1	Inlet cup
11	8022-2112-000	1	Float
12	8022-2117-000	1	Scale 6,000-30,000 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	8022-2002-000	1	Intermediate piece
16	0007-2211-750	2	Gasket G50 DIN 11851

Continuous bacteria removal line

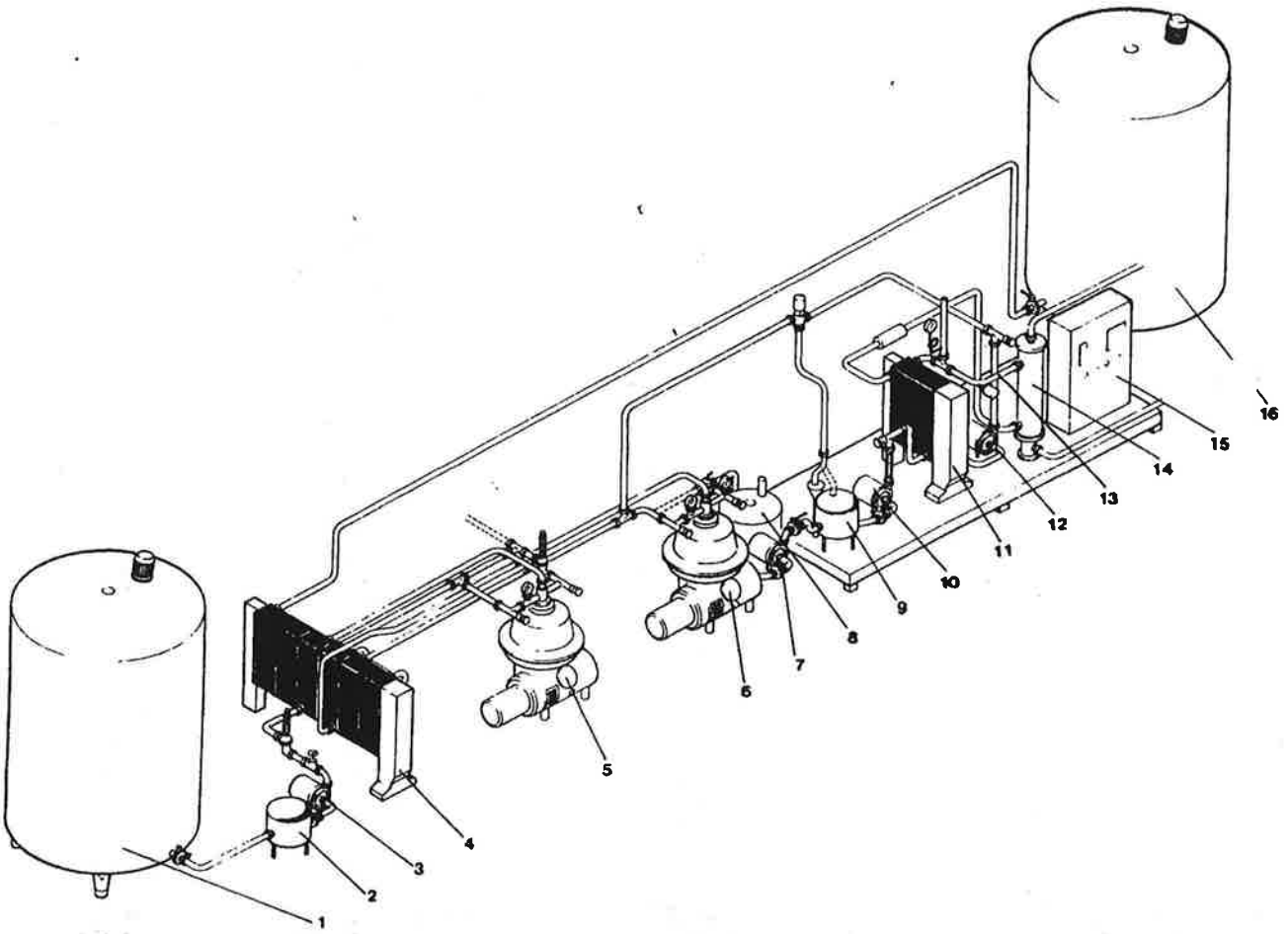


Fig. 24

1 Raw milk tank
2 Balance tank
3 Centrifugal pump
4 Plate-type heat exchanger
5 Milk separator
6 Bacteria-removing separator
7 Feed pump
8 Bacteria concentrate collecting vessel
9 Balance tank
10 Feed pump
11 Plate-type heat exchanger
12 Booster pump
13 UHT head with timing tube
14 Tubular cooler
15 Control cabinet for package unit (items 9 - 15)
16 Cheese milk tank

GEA
Unternehmensbereich
Prozeßtechnik

Westfalia Separator AG

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