Westfalia Separator AG

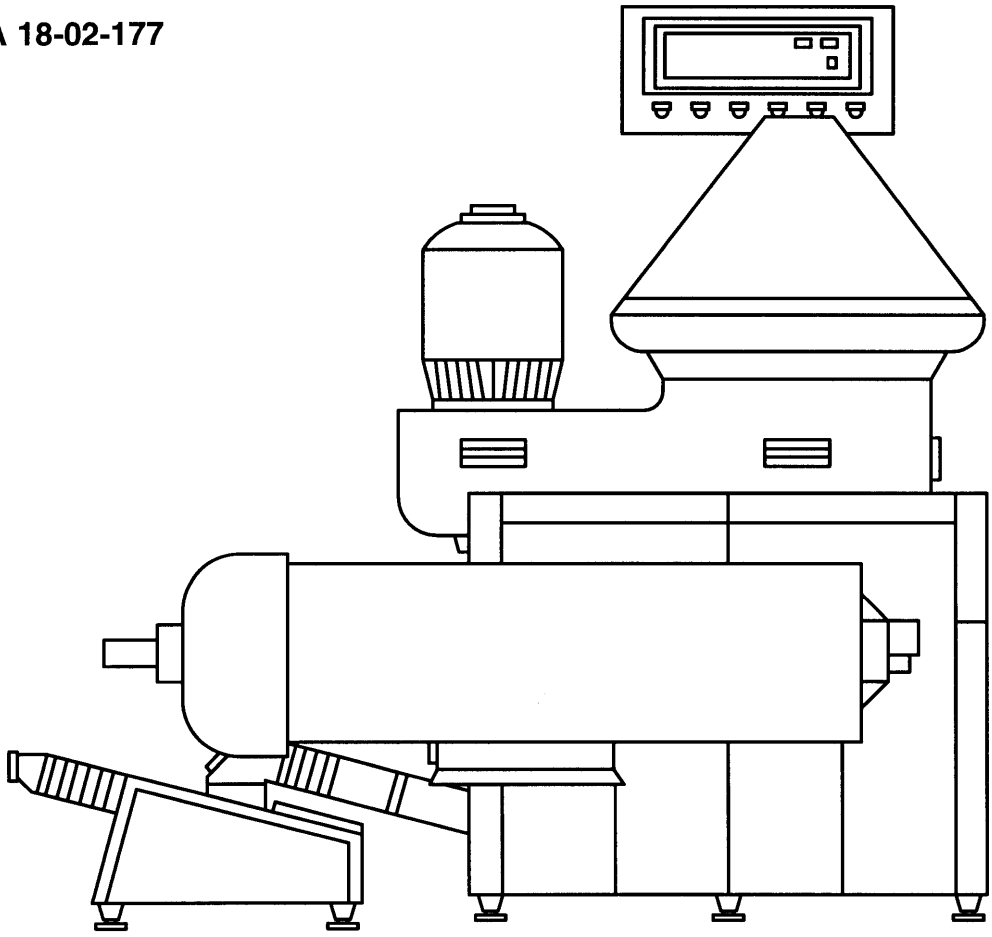
Instruction Manual and Parts List

No. 1184-9001-001

Edition 0998

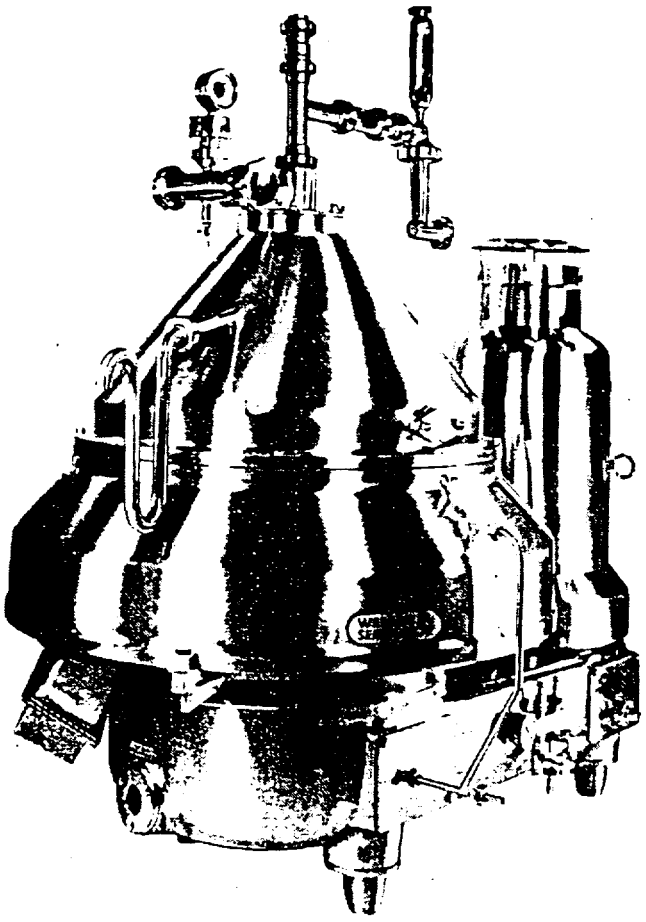
Quark separator

Model KDA 18-02-177



GEA

Mechanical Separation Division



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

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

For your safety

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

  This avoids damage to the machine and other units.

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

  otherwise danger to life.

- **Observe accident prevention regulations**

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

- **Instruction manual**

  Follow only the instructions given in this manual

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

- **Maintain the separator as specified -**

  in this manual

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

  as described in chapter "Safety precautions" in this manual

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

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

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

CONTENTS

Working Instructions

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List of Parts

Additional Equipment

Moisture meter, make "Brabender": refer to special instruction manual

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.

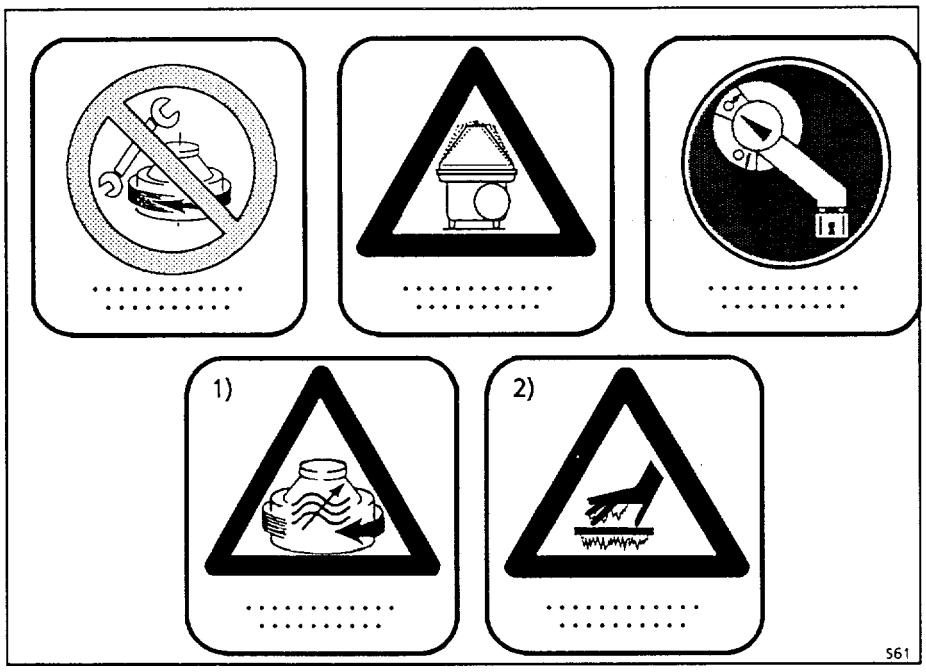


Fig.1

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.

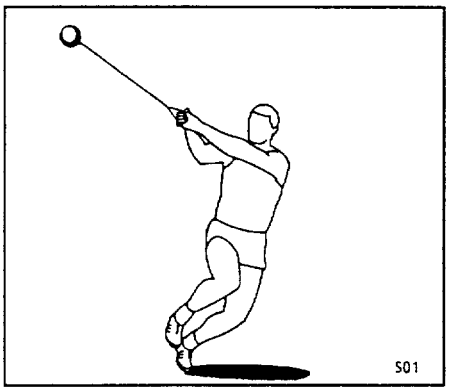


Fig. 2

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

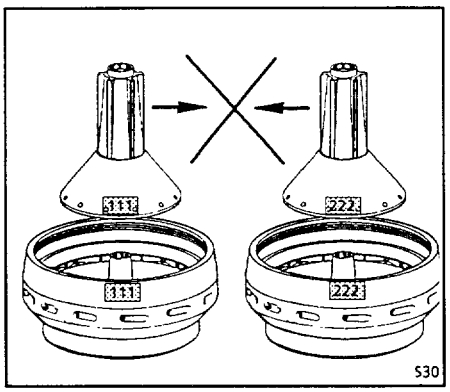


Fig. 3

- 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.

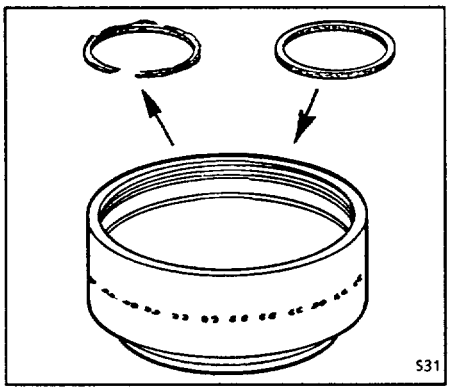


Fig. 4

- Damaged parts must be replaced immediately by new parts.

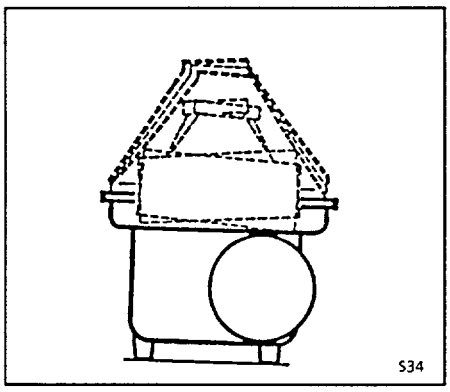


Fig. 5

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

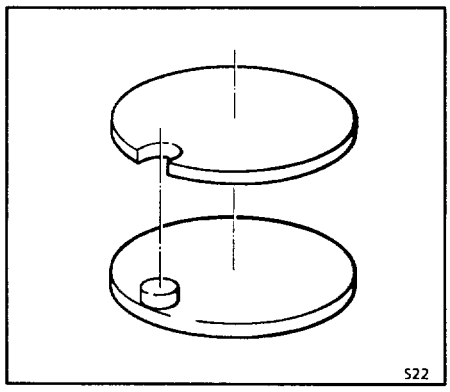


Fig. 6

- 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.

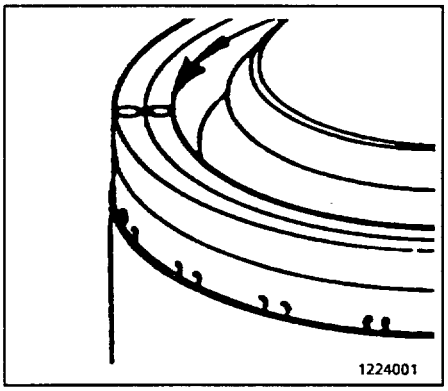


Fig. 7

- 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.

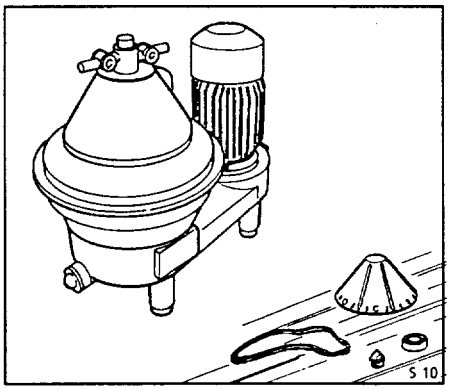


Fig. 8

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

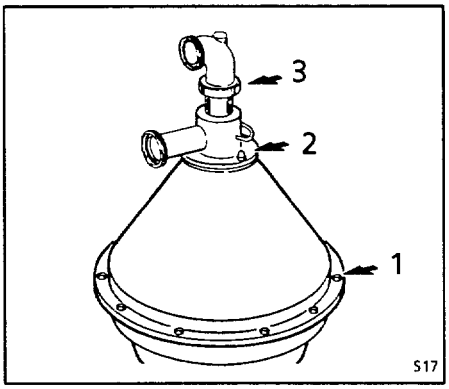


Fig. 9

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

Electrical appliances

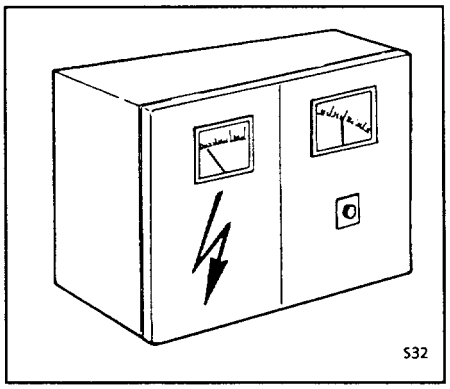


Fig. 10

- 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

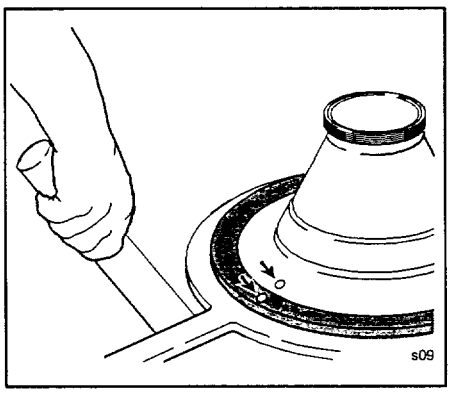


Fig. 11

- 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.

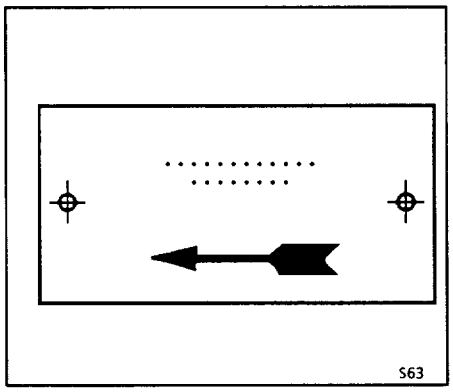


Fig. 12

- 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.

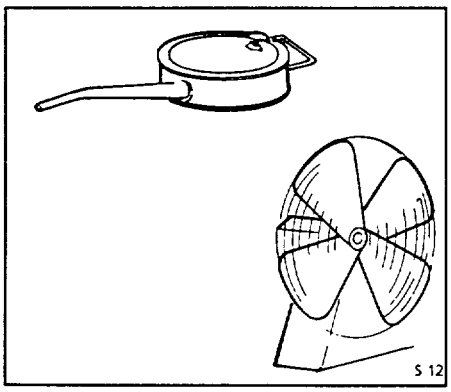


Fig. 14

- Check that the lubrication and cooling systems are serviceable.

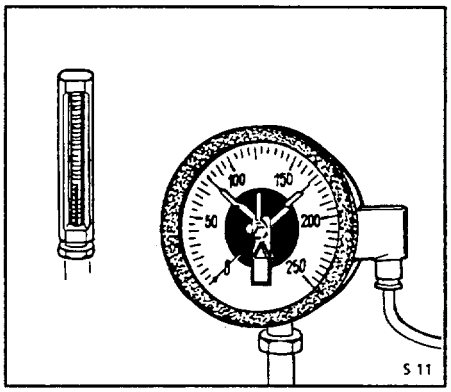


Fig. 15

- 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.

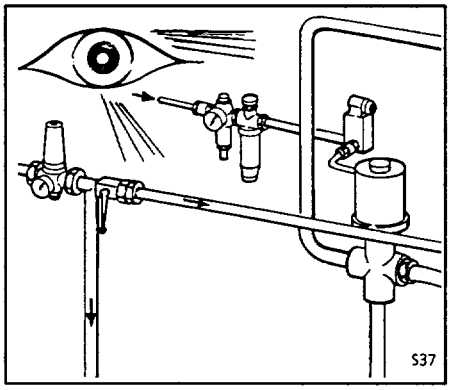


Fig. 16

- 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

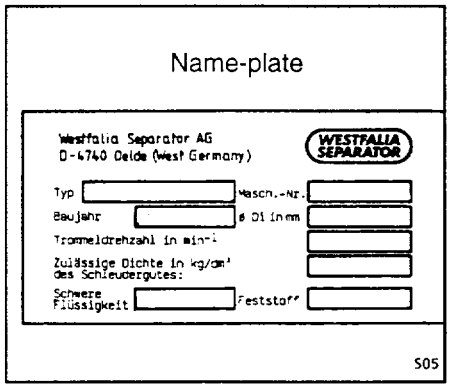


Fig. 17

- 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.

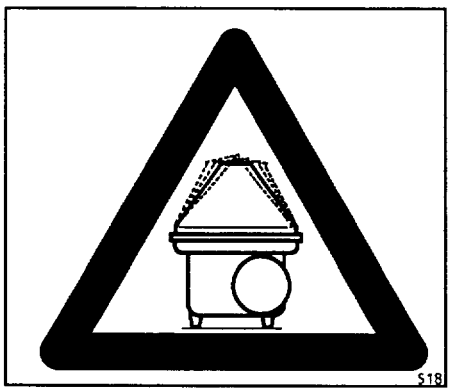


Fig. 22

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

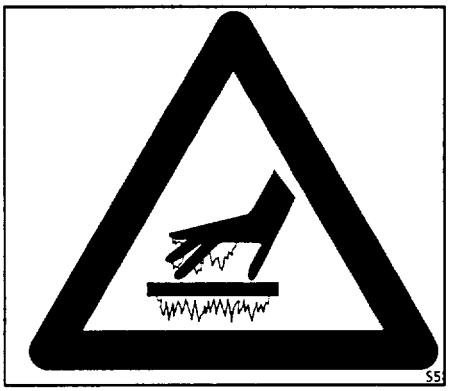


Fig. 23

Only in case of hot operation:

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

  reach temperatures over 80 °C.

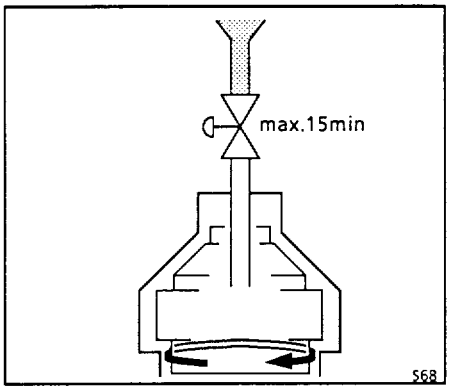


Fig. 24

- 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«

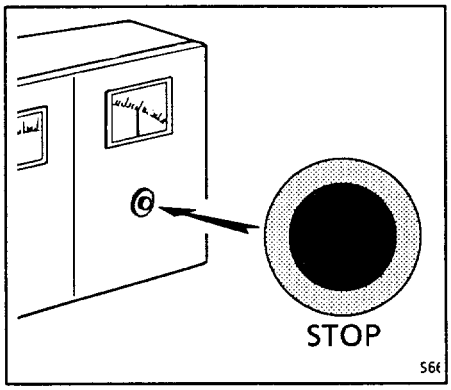


Fig. 25

- 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

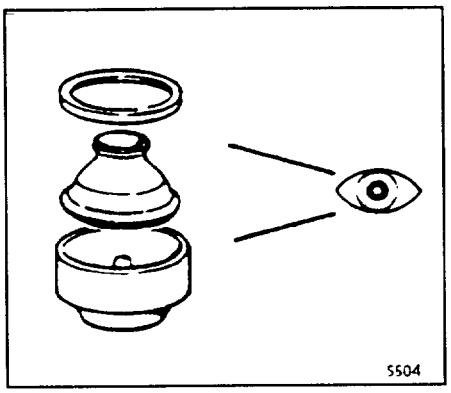


Fig. 26

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.

Stop

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.

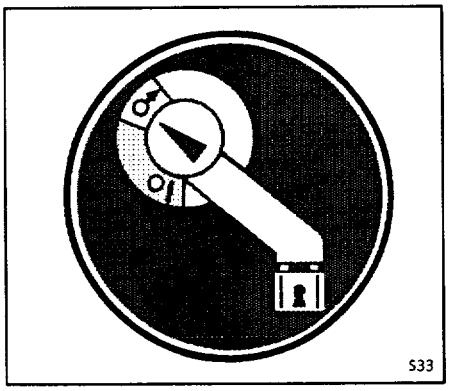


Fig. 27

Before maintenance and servicing:

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

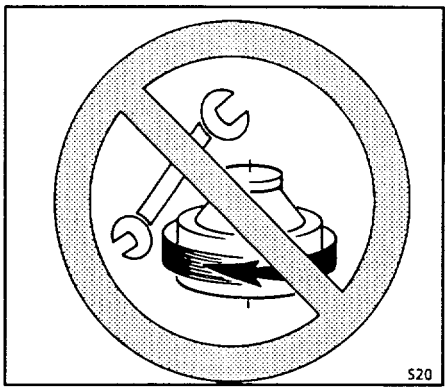


Fig. 28

- **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.

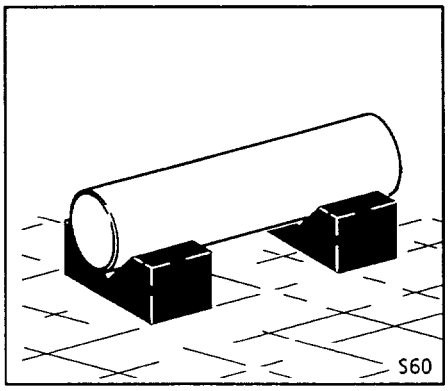


Fig. 30

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

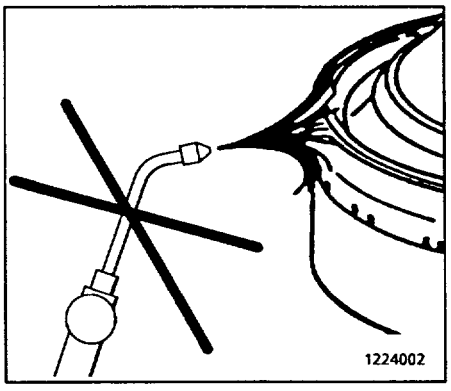


Fig. 31

- **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.

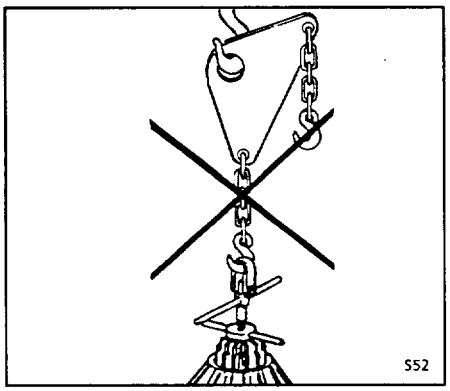


Fig. 32

- 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.

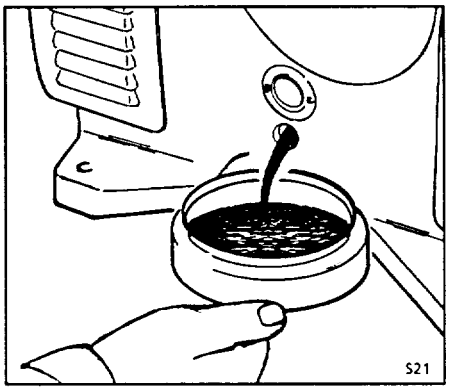


Fig. 33

- 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

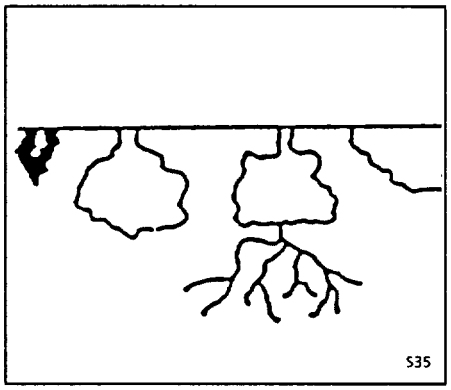
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

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.



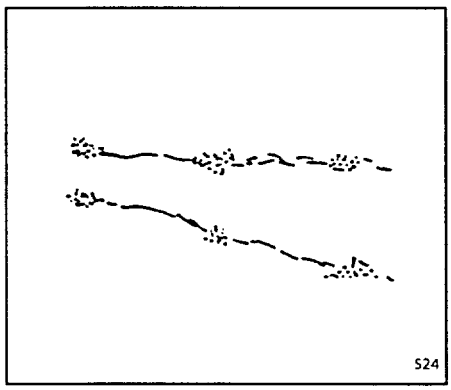
Possible formation of pit-shaped corrosion.

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.

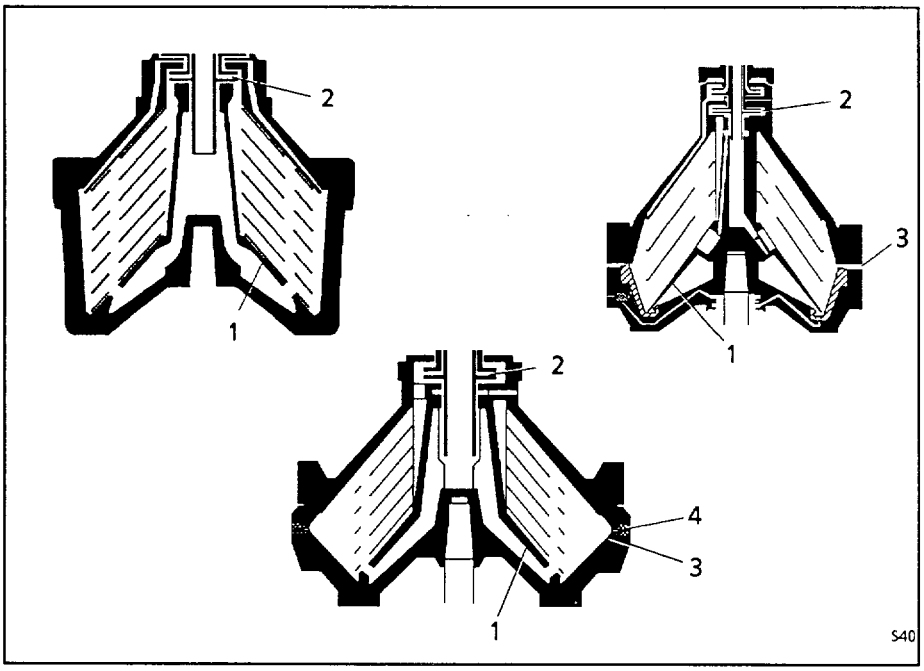


Fig.36

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.

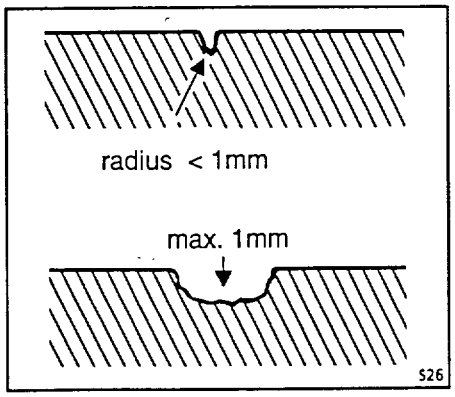


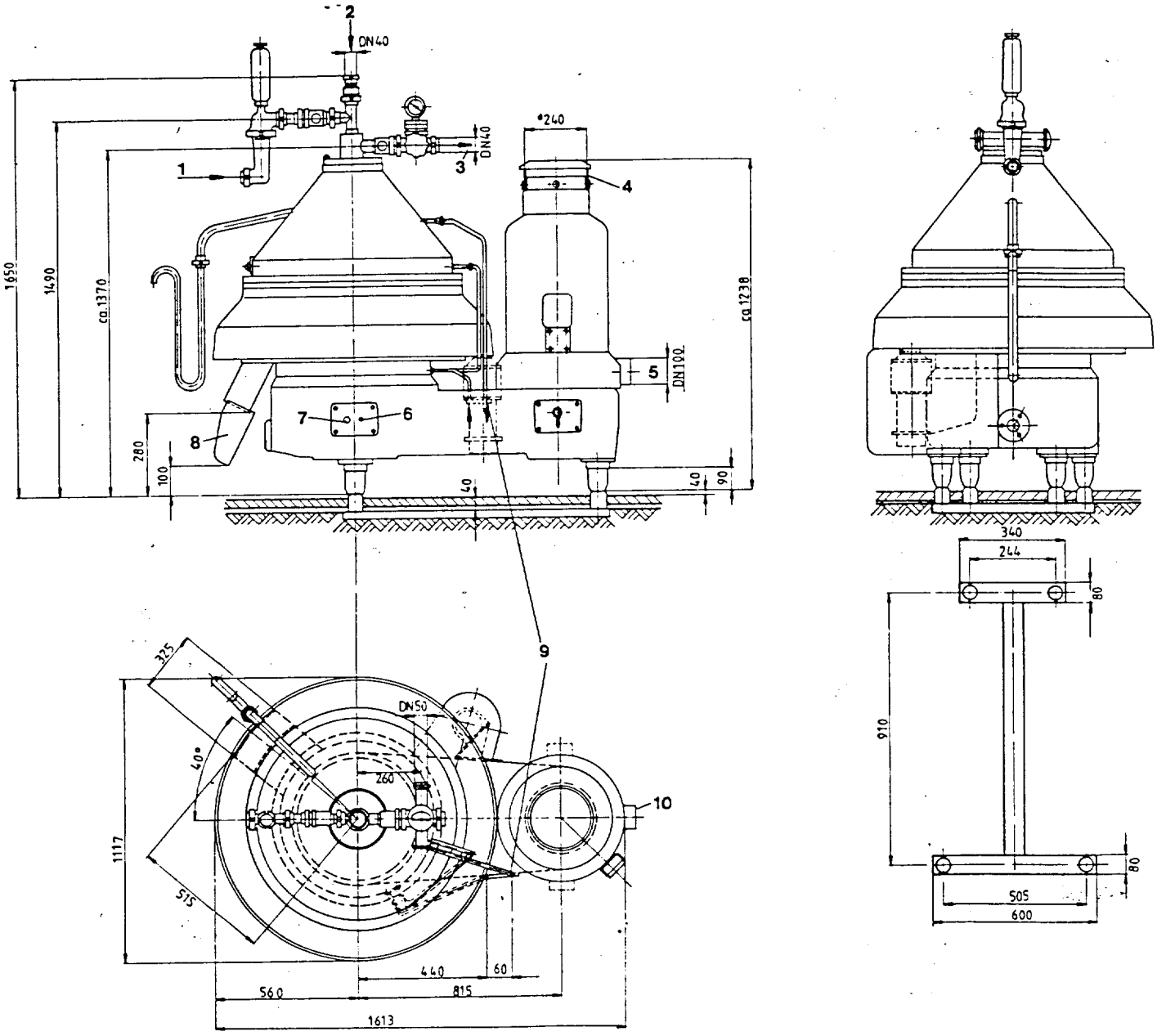
Fig. 37

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.

Dimensioned drawing

Version I: Concentrate collector with scraper blade equipment. Air-cooled motor.

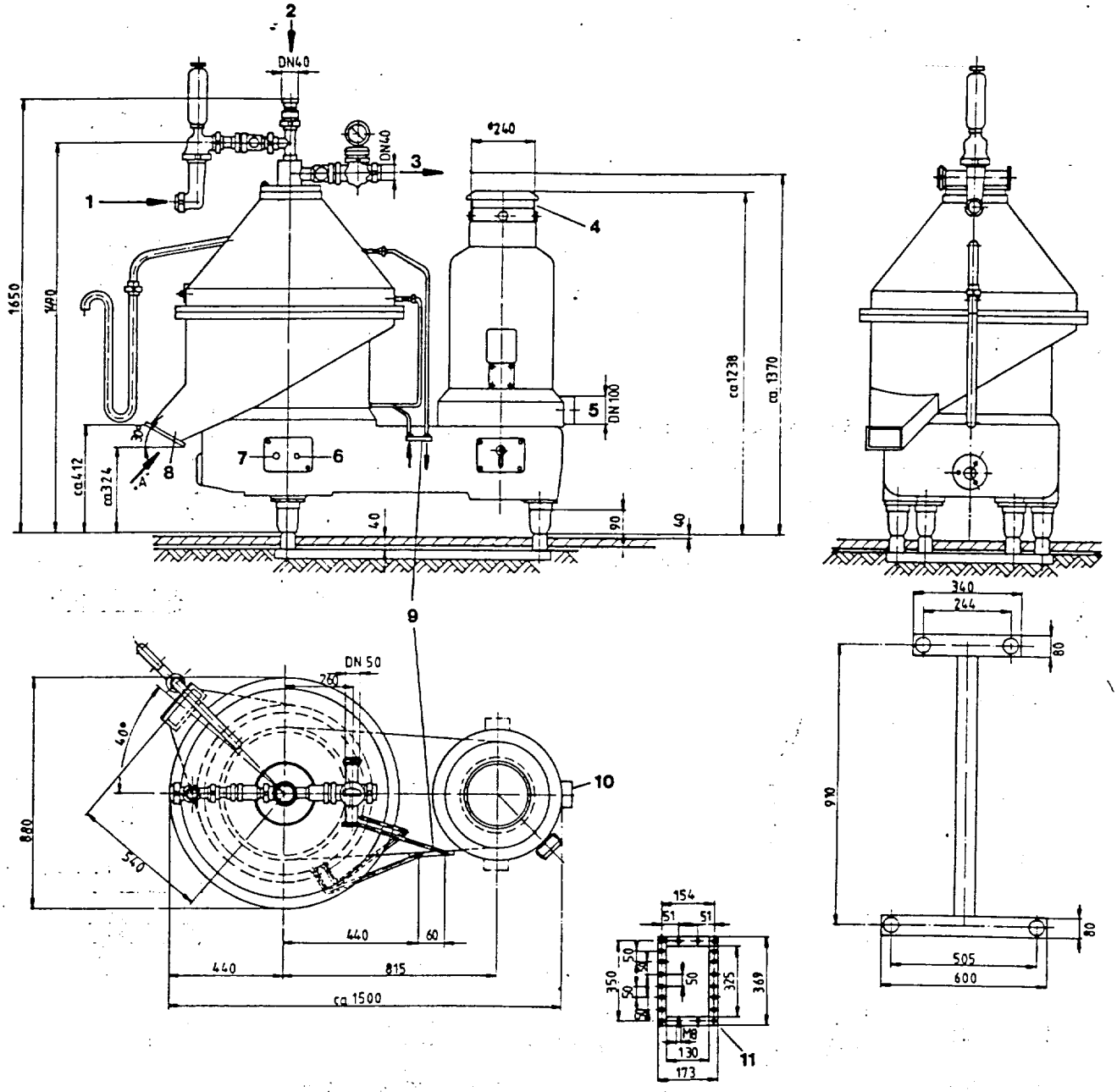


1 Product supply
2 Water supply
3 Whey discharge
4 Air supply to motor (possibly from outside)
5 Exhaust air from motor
6 Sterile-air connection R 1/4"
7 Connection for caustic supply R 3/4"
8 Concentrate discharge
9 Cooling-water connection for brake ring and hood, R 1/2", 2 bar, 900 litres/h
10 Air outlet, adjustable at 90° intervals

Technical data

Motor power:	15 kW
Power consumption:	13 kW (7,000 l/h)
Motor speed:	3,000 rpm (50 Hz)
Bowl speed:	5,500 rpm
Total weight (with motor and bowl):	1,470 kg

Dimensioned drawing
Version II: Concentrate collector with steep chute. Air-cooled motor.



1 Product supply
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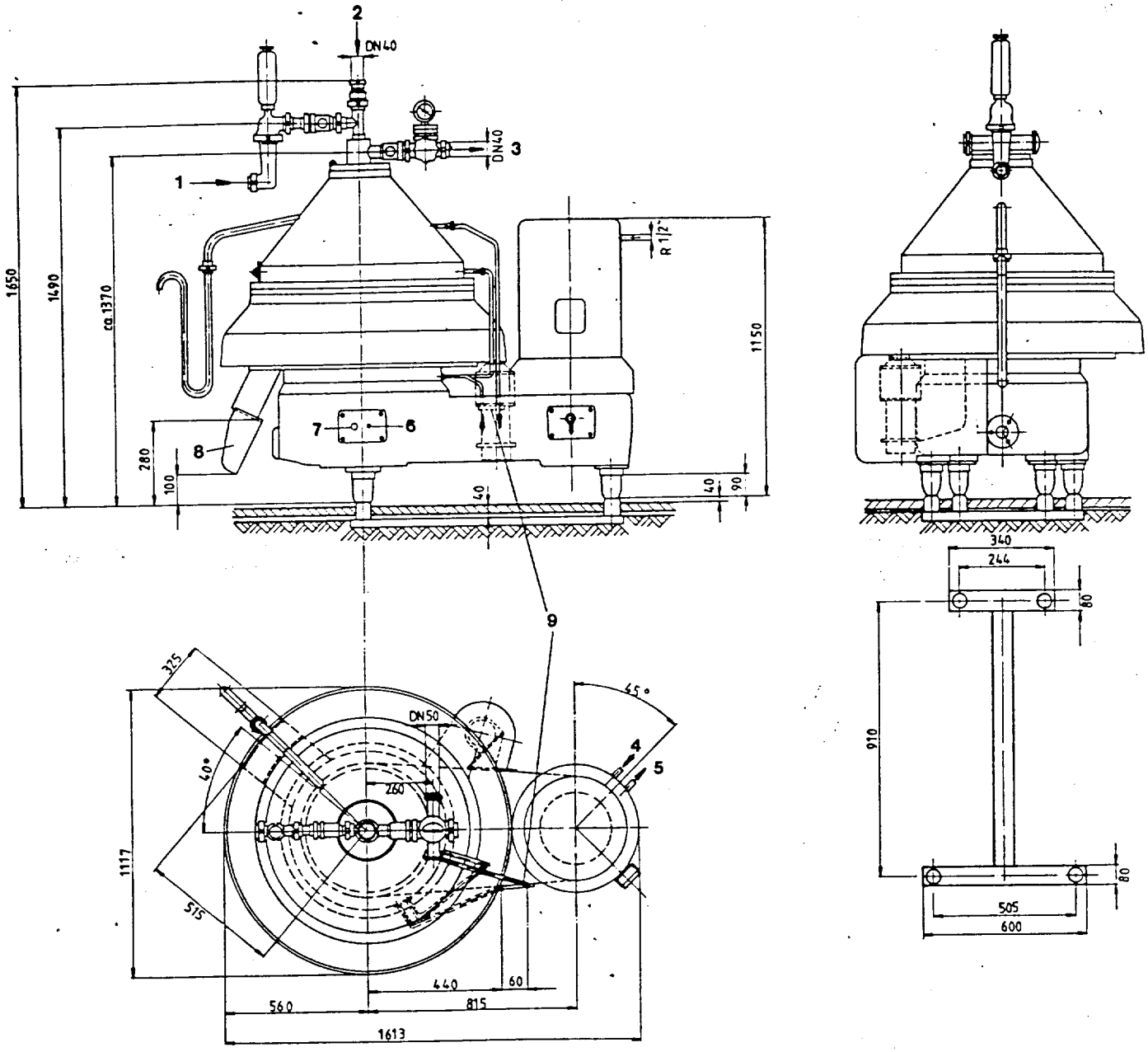
8 Concentrate discharge
9 Cooling-water connection for brake ring and hood R 1/2", 2 bar, 900 l/h
10 Air outlet, adjustable at 90° intervals
11 View "A"

Technical data

Motor power:	15 kW
Power consumption:	13 kW (7,000 l/h)
Motor speed:	3,000 rpm (50 Hz)
Bowl speed:	5,500 rpm
Total weight (with motor and bowl):	1,470 kg

Dimensioned drawing

Version I: Concentrate collector with scraper blade equipment. Water-cooled motor.



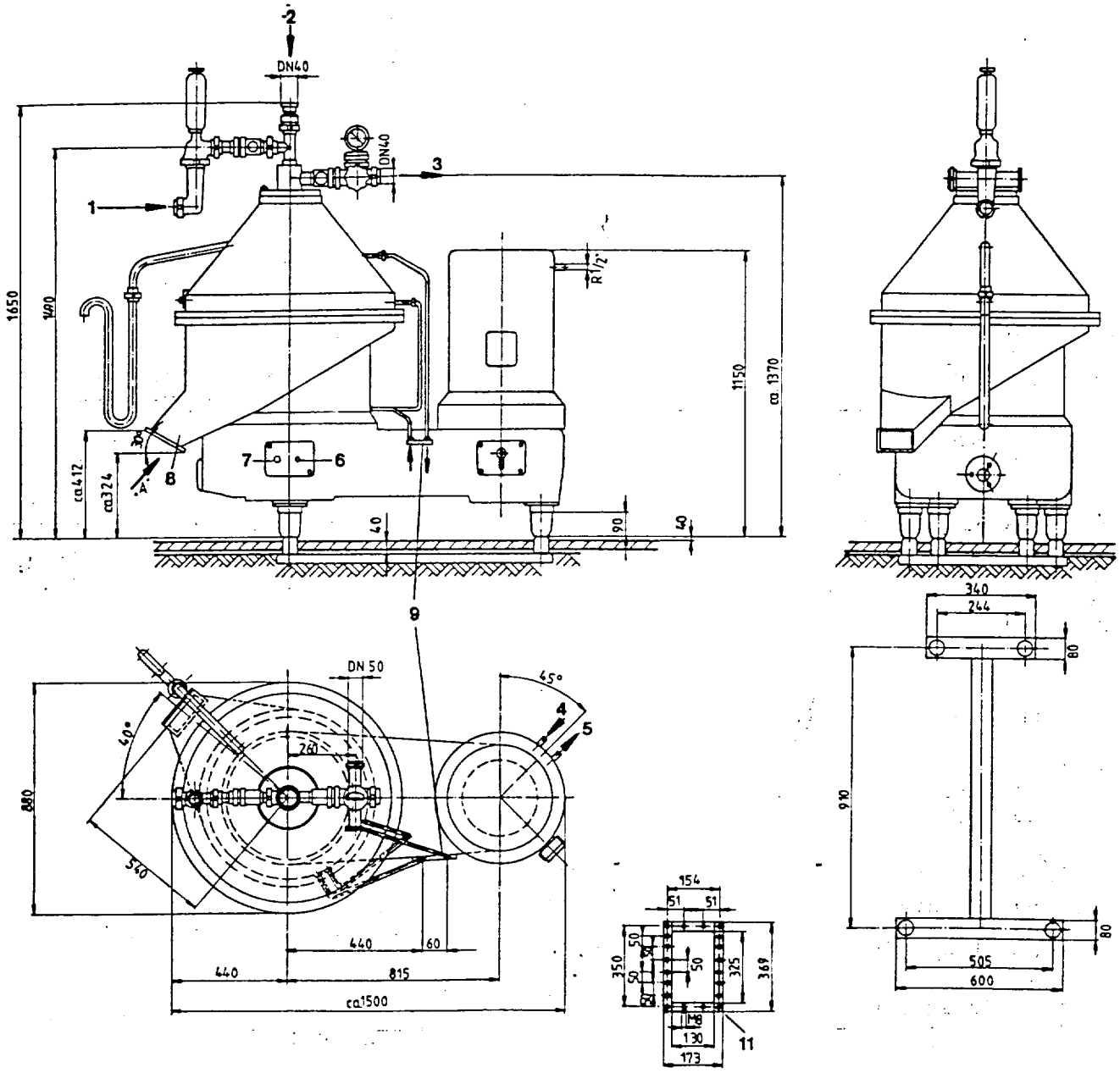
1 Product supply
2 Water supply
3 Whey discharge
4 Cooling-water supply to motor 150 l/h at 13 - 15 °C
5 Discharge of motor cooling water
6 Sterile-air connection R 1/4"
7 Connection for caustic supply R 3/4"
8 Concentrate discharge
9 Cooling-water connection for brake ring and hood R 1/2", 2 bar, 900 l/h

Technical data

Motor power:	15 kW
Power consumption:	13 kW (7,000 l/h)
Motor speed:	3,000 rpm (50 Hz)
Bowl speed:	5,500 rpm
Total weight (with motor and bowl):	1,470 kg

Dimensioned drawing

Version II: Concentrate collector with steep chute. Water-cooled motor.



1 Product supply
2 Water supply
3 Whey discharge
4 Cooling-water supply to motor 150 l/h at 13 - 15 °C
5 Discharge of motor cooling water
6 Sterile-air connection R 1/4"
7 Connection for caustic supply R 3/4"
8 Concentrate discharge
9 Cooling-water connection for brake ring and hood R 1/2", 2 bar, 900 l/h
11 View "A"

Technical data

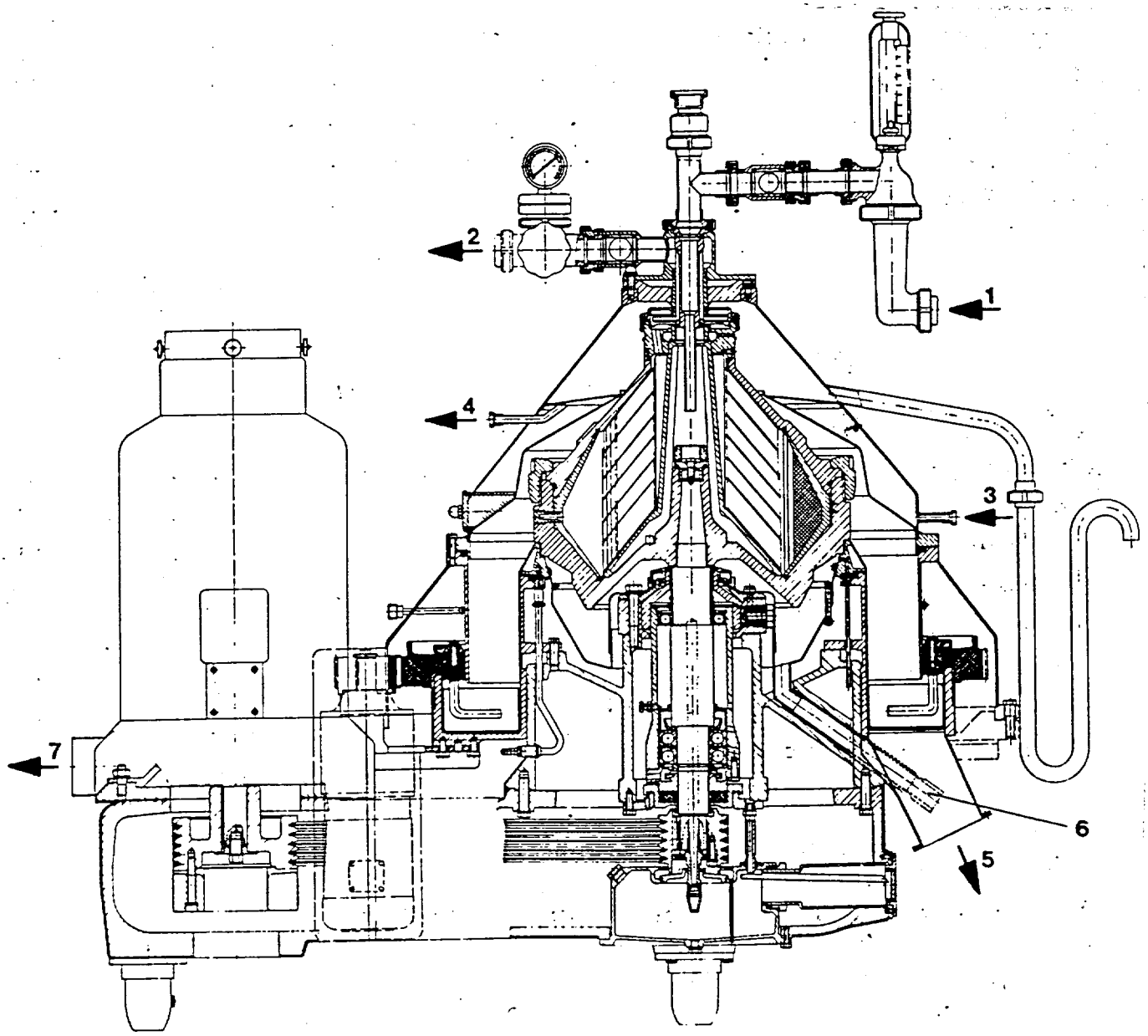
Motor power:	15 kW
Power consumption:	13 kW (7,000 l/h)
Motor speed:	3,000 rpm (50 Hz)
Bowl speed:	5,500 rpm
Total weight (with motor and bowl):	1,470 kg

Sectional view of the separator

Version I: Concentrate collector with scraper blade equipment. Air-cooled motor.

Application:

Continuous production of fresh cheese (quark) by conventional processes. Dry substance of the quark up to 24 % atro.



1 Feed
2 Whey discharge
3 Ice-water feed
4 Ice-water discharge
5 Quark outlet
6 Sterile-air connection
7 Air outlet

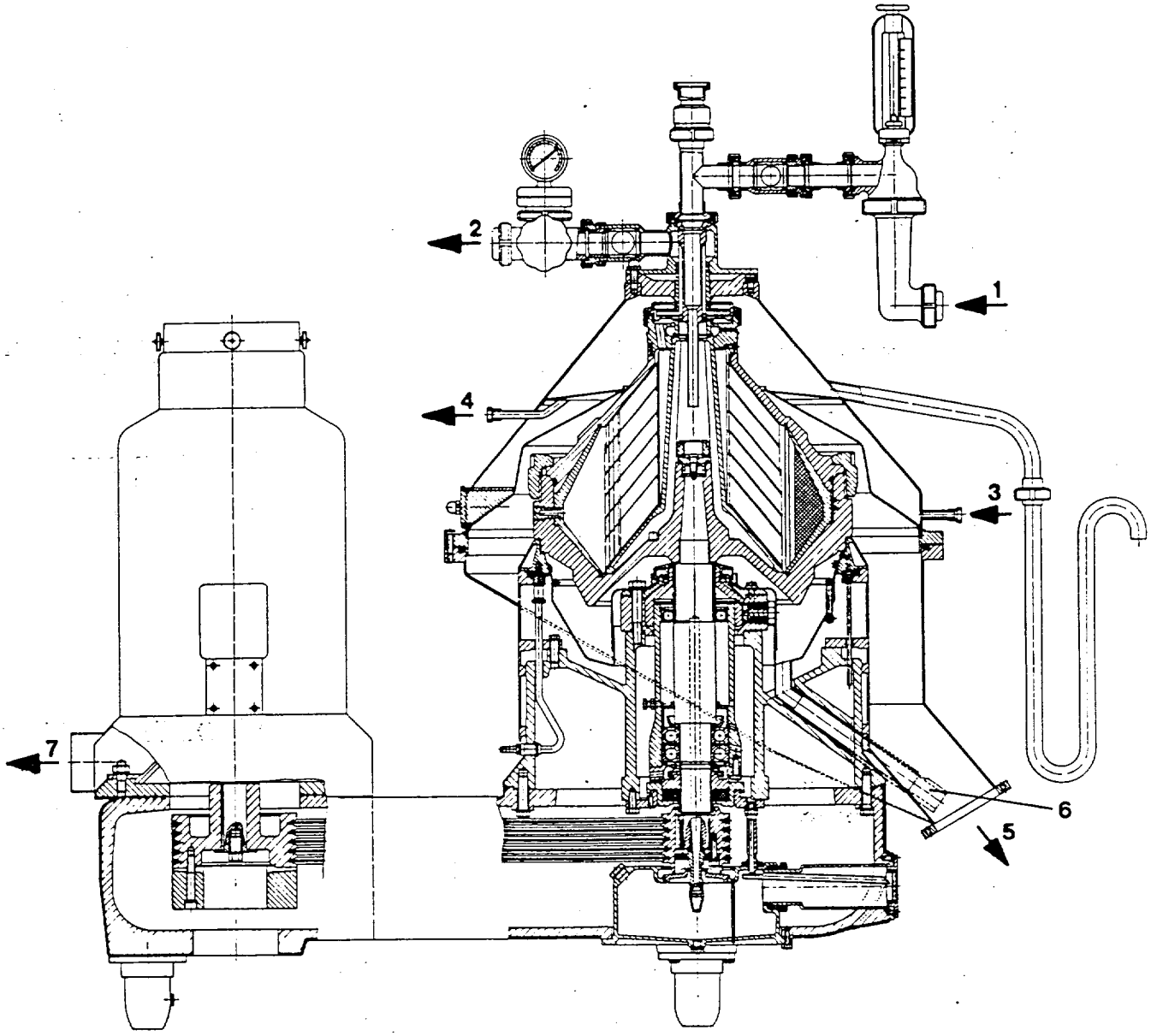
Sectional view of the separator
Version II: Concentrate collector with steep chute. Air-cooled motor.

Application

Continuous production of fresh cheese (quark)

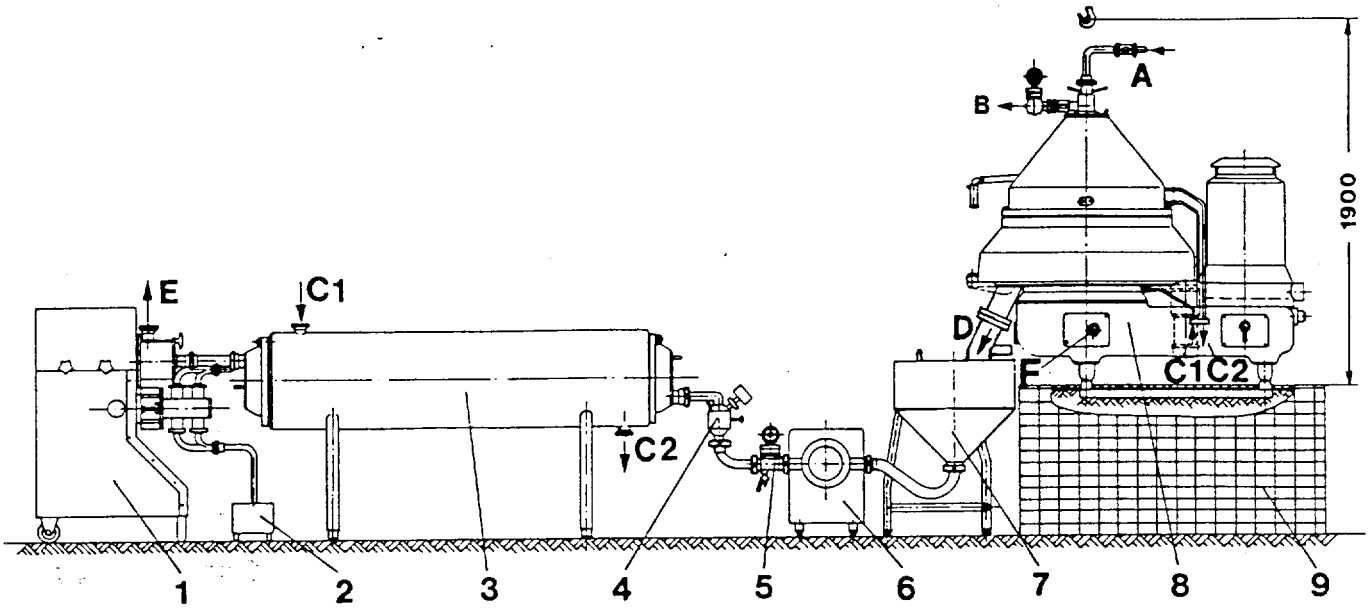
a) by the Thermo-quark process

b) by conventional processes. Dry substance in the quark up to 17.5 % atro.



1 Feed
2 Whey discharge
3 Ice-water feed
4 Ice-water discharge
5 Quark outlet
6 Sterile-air connection
7 Air outlet

Quark production line



1 Quark mixer

2 Cream tank

3 Quark cooler

4 Moisture meter
Make: Brabender

5 Pressure gauge

6 Positive displacement pump

7 Quark funnel

8 Quark separator

9 Concrete foundation
(approx. 720 mm high)

A Feed

B Whey discharge

C1 Ice-water inlet

C2 Ice-water outlet

D Quark outlet

E to packing machine

F Sterile-air connection

1 Installation

1.1 Transport

Suspend the separator as shown below: Remove two opposite hex head screws M10 from neck bearing bridge. Then screw eye bolts 409 into tap holes M16 and hook lifting device 425 into eye bolts.

To prevent the rope from slipping, wind it around the crane hook. When lowering the separator make sure it touches down gently.

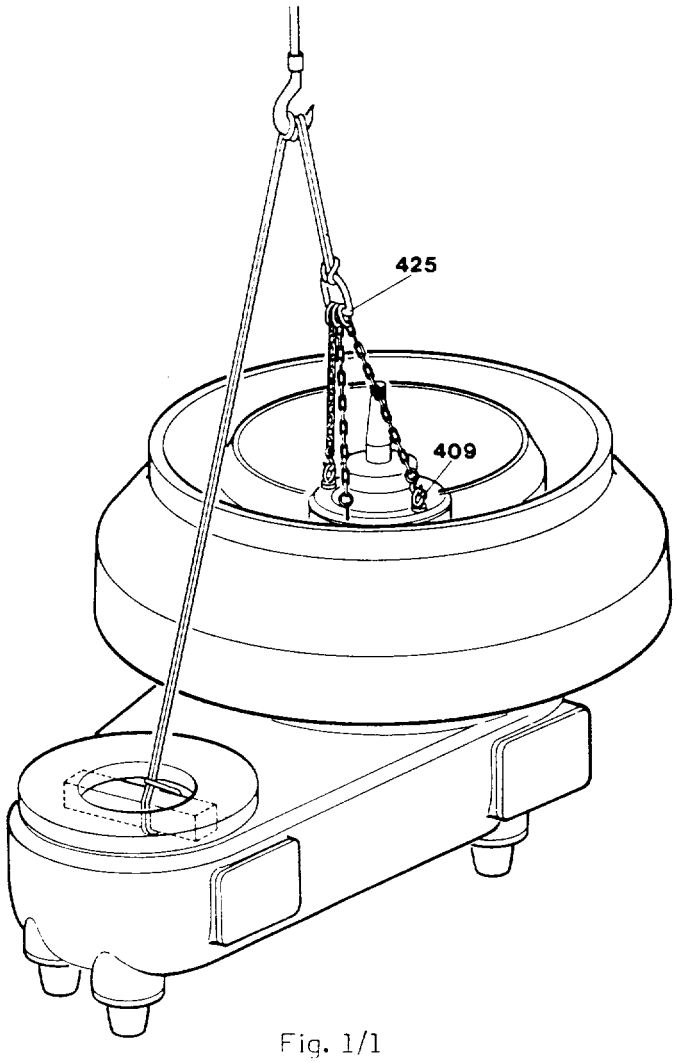
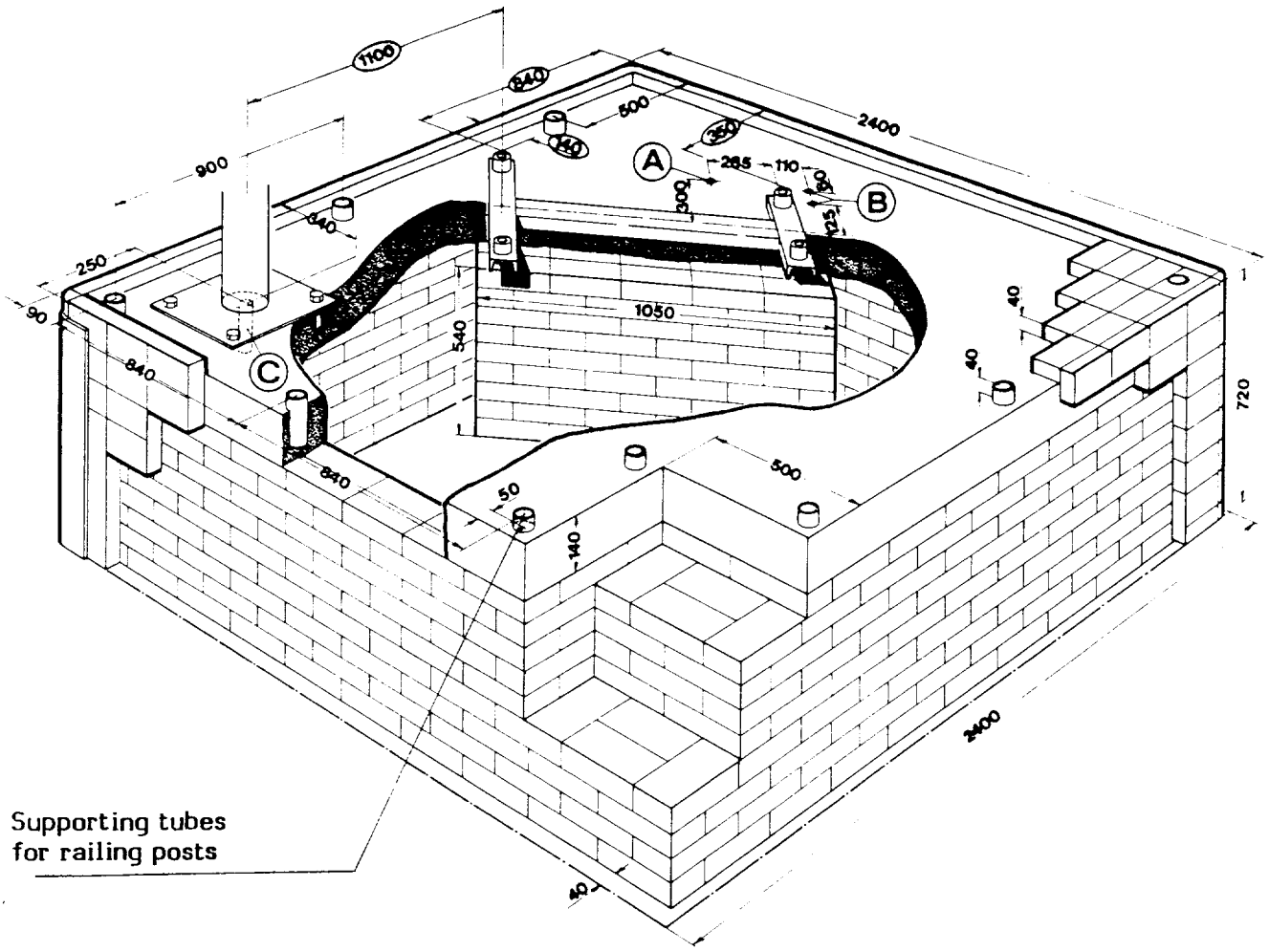


Fig. 1/1

Weight: 1,000 kg

Foundation Plan



For cable passages **"A"** and **"C"** use a 26/28 mm dia. pipe

For cable passages **"B"** use a 32/34 mm dia. pipe

For ice-water connection **"D"** use two pipes R 1/4"

IMPORTANT: The stated dimensions are standard dimensions except for the encircled ones. When building the foundation for your separator refer to the foundation plan especially designed for your requirements.

1.2 Installation

For dimensions of separator refer to page 0/7 and for dimensions of foundation refer to foundation plan on opposite page.

In accordance with the dimensions of the foundation plan, a frame of sand-lime brick has to be built on solid ground and, in addition, a supporting wall for the separator. The interior of the frame must be filled with ash or similar material. Then cover the frame with a concrete slab which has to be provided with recesses for subsequent installation of the foundation frame of the separator and the rotary crane.

The dimensions which determine the position of the foundation frame of the separator and of the rotary crane are encircled in the plan and have to be kept strictly. The cable passages in the concrete slab are marked with letters A, B and C, the connections for the ice-water are marked with the letter D.

Embedding the separator foundation frame in the concrete slab (fig. 1/3)

Screw bolts 1c **all the way down** into the four raised mounting blocks of foundation frame 1a. Embed the foundation frame into the concrete slab so that the mounting blocks of the frame protrude from the floor by about 40 mm. Make sure that the mounting blocks are absolutely level, then grout the frame with poured concrete.

NOTE: The foundation frame must be absolutely level, because the separator cannot be levelled during installation.

Fastening the separator on the foundation frame (fig. 1/3)

By means of flanges 3 and screws 2 fasten feet 4b with fitted-on rubber cushions 4c to separator frame. Then lift separator onto bolts of foundation frame and tighten threaded pins 4a with a wrench.

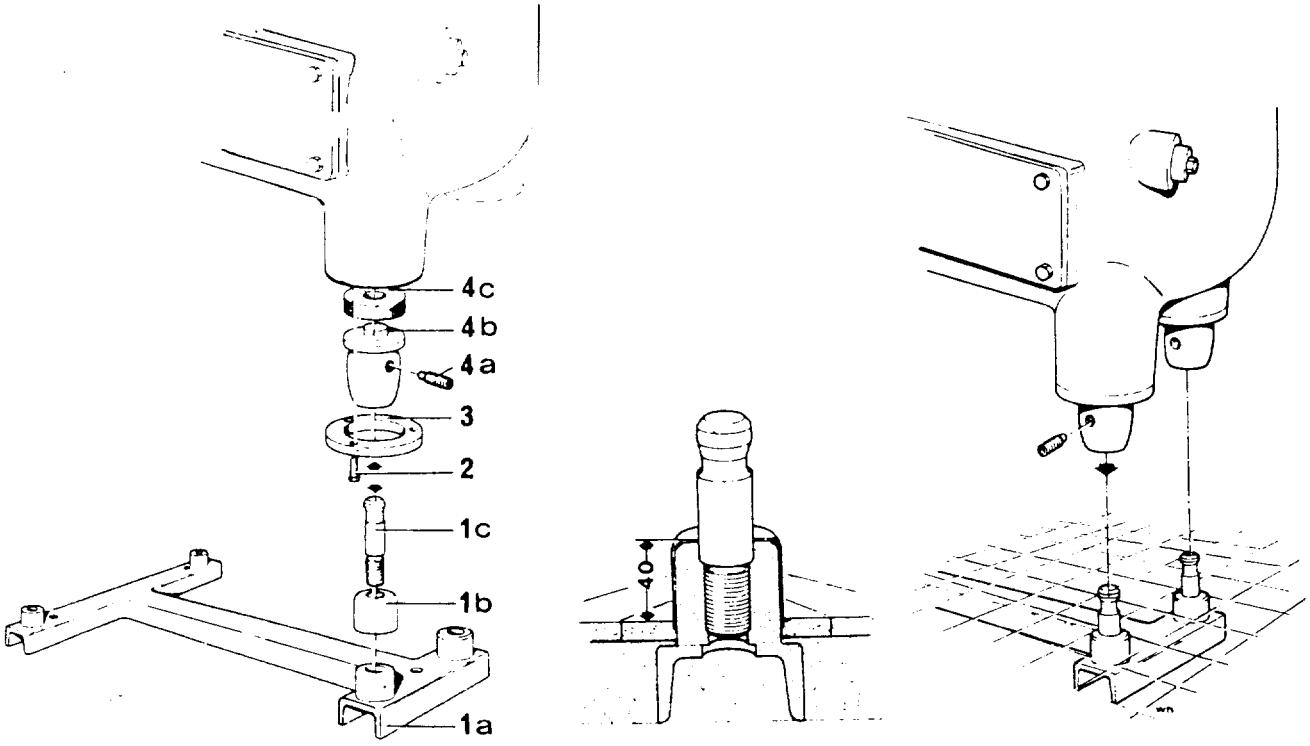


Fig. 1/3

2.1 Lubrication of the separator bearings

All bearings, except those of the motor, are automatically lubricated from a central oil bath. The oil flow is illustrated in fig. 2/1. The oil is sucked in through the central hole in the drive spindle and directed to the upper and lower bearings. The return of oil can be observed through sight glass A.

OIL LEVEL

Before the initial start-up of the separator, remove screw C and use funnel 411 to fill oil pan with oil. Oil level must be slightly **below** middle of sight glass. About 5 litres of oil are required for one filling. In case of oil loss, refill inmediately.

Before the first start and after an extended shut-down of the separator, let the separator run - without bowl on spindle - for one minute to make sure that the oil is evenly distributed in the bearings. Turn off the motor as soon as oil flows out of the return pipe (to be observed through sight glass A). Note that this is the only time that the separator is allowed to run without bowl on spindle. When rotating without bowl, the spindle will be raised by the centrifugal force acting on the balls of the angular contact ball bearing which, in turn, might cause damage to the bearing.

OIL CHECK

Check oil level and oil flow daily through sight glass. Also, check from time to time for water in oil. To do this, loosen oil drain screw B and allow a small amount of oil to drain.
An immediate oil change becomes necessary when the oil in the sight glass shows a milky colouring (emulsification).
As soon as the oil flow decreases, the drive parts have to be removed for cleaning (see 7.4). The holes in suction pipe D and in spindle E should be cleaned with special care.

OIL CHANGE

Make first oil change after about 250 operating hours, then change oil when conditions require, that is in general after 1,000 operating hours. However, be sure not to wait longer than 6 months to change the oil.

After several oil changes or when an additional oil change becomes necessary because water or dirt has infiltrated into the oil, the oil pan must be cleaned (see 7.4).

TYPE OF OIL

For lubrication use only high-grade solvent-refined mineral oils with additives "L" (giving increased protection against corrosion and increased resistance to aging).

Designation: CL 46 or HL 46 (according to DIN 51502) or
CB 46 or HL 46 (according to ISO 3498)

Viscosity: $46 \pm 4.6\ mm^2/s$ (cSt) at $40\ ^{o}C$

The lubricating oil must meet the requirements of the "FZG" gear rig test A/8.3/90, load grade > 12.

NOTE: Never use oils which have a penetrating smell, for instance gear oils or engine oils for automobiles.

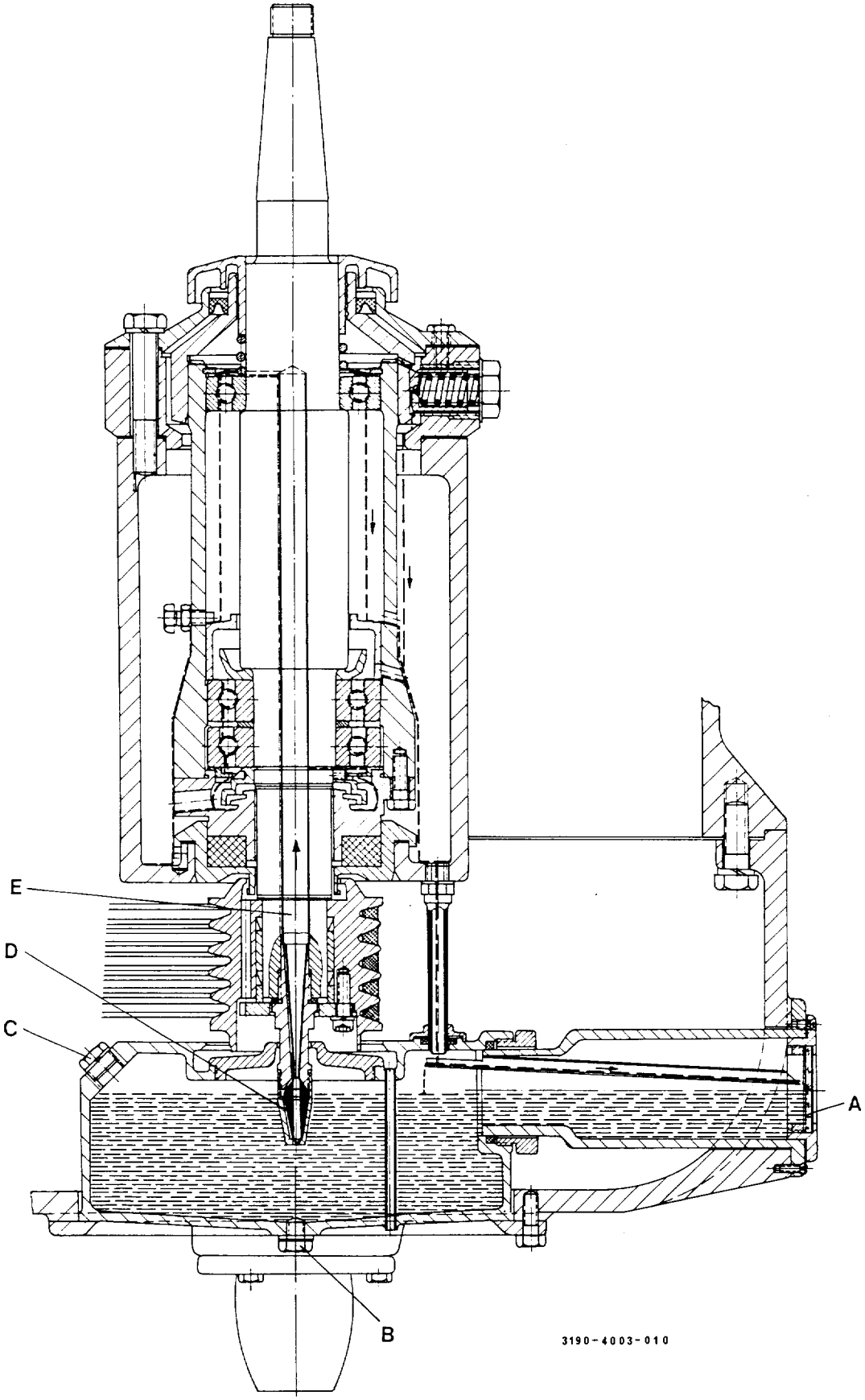


Fig. 2/1

2.2 Lubrication of threads and contact surfaces on bowl parts

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

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

Molykote D (white paste; apply sparingly),

Molykote DX (white paste; may be used in excess),

Klüber Grease KSB 8 (may be used in excess).

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

Molykote G or Molykote G Rapid.

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

2.3 Lubrication of the motor bearings

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

3.1 Three-phase AC special-duty motor

The separator is driven by a three-phase AC special-duty motor designed for star-delta connection and slow acceleration starting. It has been rated so as stand up to the conditions during starting and actual operation. The winding of the motor is insulated as per class of insulation F.

The starting time in star connection is approx. 7 minutes. Only after this time may switching-over from star to delta connection be made. The starting current amounts to approximately twice the value of the rated current. This value is to be considered when choosing the switches, wirings and fuses.

When the motor has been started up cold. a second start may he made immediately after the bowl has stopped rotating. However, when the motor is under hot runnig conditions another start is only permitted after 60 minutes.

The three-phase AC special-duty motor requires a motor control for star-delta connection.

The motor is protected against overloading

a) during operation by a thermal overload release,

b) during start-up and operation by a motor protection tripping device of type CALOMAT C 21 or C 24.

The winding of the motor is provided with NTC resistor type temperature feelers which are to be connected to the motor proctection tripping device in the motor control via selector S6 in the terminal box.

NOTE: When connecting this protection device refer to the circuit diagram of the motor control and to the description of the motor protection tripping device.

3.2 Direction of rotation of the bowl

The bowl must rotate clockwise when looked at from above. When it turns in wrong direction (anti-clockwise) reverse direction of rotation by interchanging two-lead-in wires.

3.3 Bowl speed

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

The bowl speed and the maximum permissible densities are stated on the name-plate of the separator. For higher densities than those specified on the name-plate the bowl speed must be reduced by mounting other V-belt pulleys. In this case, be sure to check with the factory.

Before the initial start-up of the separator and after changing the V-belt pulleys check the number of revolutions of the spindle (rpm of bowl) with a hand tachometer before installing the bowl. Variations in speed of up to 3 % are permissible.

Make sure that the bowl comes up to its rated speed within the starting time and that this speed is maintained during operation.

3.4 Three-phase AC motor for drive ring

The drive ring is driven by a 7.5 kW motor, which is started across-the-line.

Exploded view of the bowl

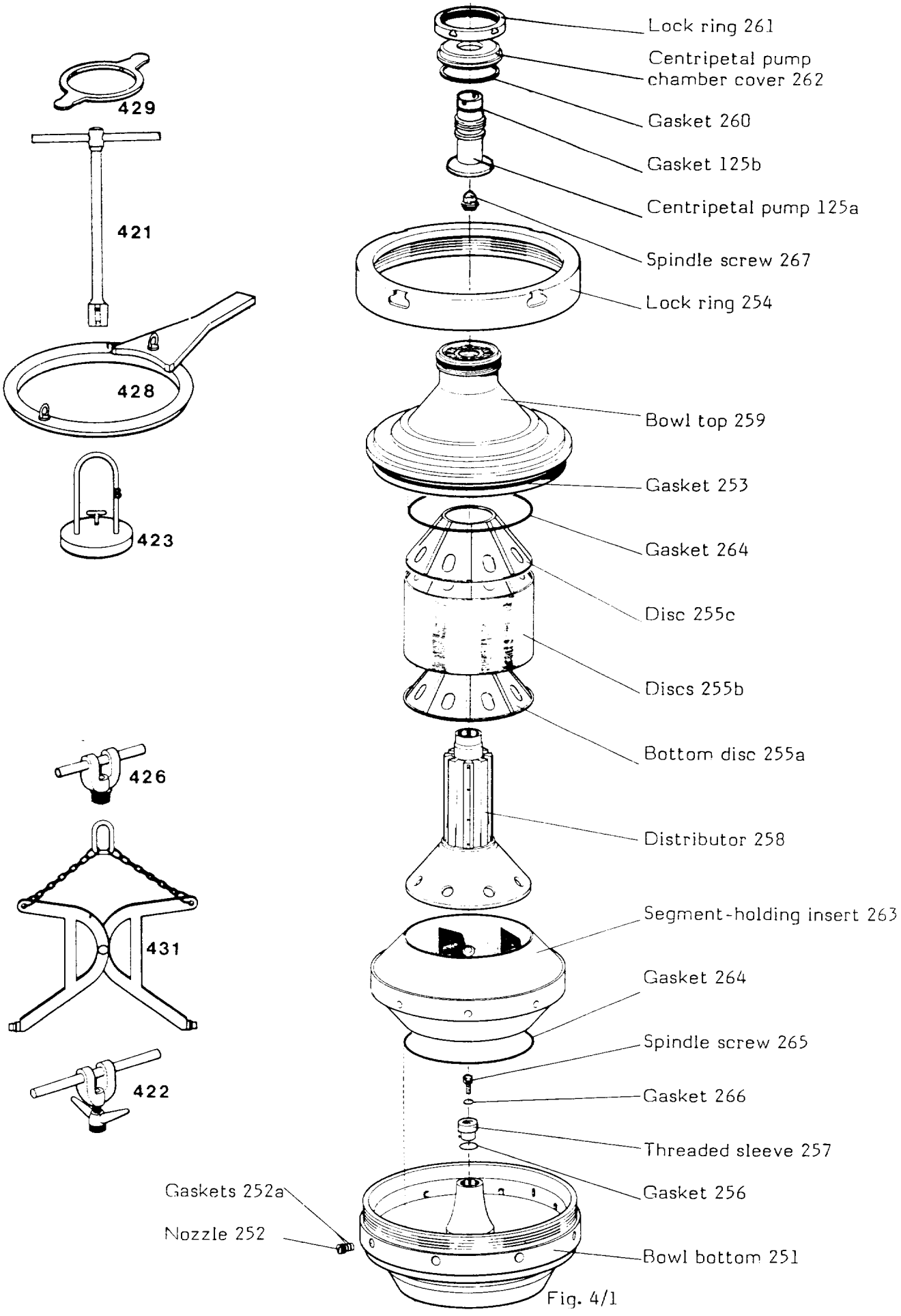


Fig. 4/1

Important Hints

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

- Prior to assembling the bowl parts, carefully clean all contact surfaces and grease them according to the instructions given under 2.2. Also, lubricate threaded areas of bowl bottom and bowl lock ring as specified under 2.2.
- When installing the bowl parts, make sure that the "O" marks of the bowl parts are in line. "O" mark alignment will ensure that the parts are properly positioned and locked in place by arresting pins and guide ribs.
- To avoid damage to guide surfaces and arresting pins when installing or removing the bowl parts, make sure the hoist is in the correct position. The hoist is to be operated at the low lifting speed. Never use force when istalling or removing the bowl parts.
- Before inserting gaskets, check them for wear. Make sure that grooves for gaskets and gaskets are clean and that gaskets are in perfect condition. Be careful not to twist the gaskets while inserting them and check to be sure that they fit properly in their grooves.
- If the plant has several separators, be careful not to interchange parts of different bowls since each bowl has been balanced with its component parts. The parts of a bowl are marked with the serial-number of the separator or with the last three digits of the serial-number.
- Place bowl parts on a rubber mat or wooden pallet, never on the stone floor.
- Handle bowl parts carefully.

4.1 Assembly of the bowl

1) **Oil** the upper part of the 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) With the aid of jack 422 place bowl bottom 251 onto the spindle and **tightly** screw threaded sleeve 257 (with inserted gasket 256) into the bowl bottom.

3) **Tightly** screw spindle screw 265 (with inserted gasket 266) into the spindle using wrench 405.

4) Insert gasket 264 in groove of bowl bottom. Before inserting the gasket be sure to thoroughly wipe dry the gasket groove.

5) Use lifting device 431 to place segment-holding insert 263 into the bowl bottom. Watch for proper location.

6) Place bottom disc 255a onto neck of distributor, then stack on discs 255b-c in numerical order, beginning with no. 1.

7) Use jack 426 to place distributor 258 together with stacked-on discs into bowl bottom. Make sure that arresting cams of distributor fit into grooves of bowl bottom. The "O" marks of both parts must be aligned.

8) Insert gaskets 253 and 264 in grooves of bowl top 259.

9) Use lifting device 423 to place bowl top 259 onto bowl bottom. Make sure that the arresting cams of bowl bottom catch into the grooves of the bowl top. The "O" marks of both parts must be in line with each other.

10) Thoroughly clean and wipe dry threads of bowl bottom and bowl lock ring 254 as well as the contact surfaces. Then apply some grease (see sect. 2.2) to prevent seizing of the threads.

Screw bowl lock ring **(left-hand thread)** onto bowl bottom, by hand, then tighten it lightly with annular wrench 428.

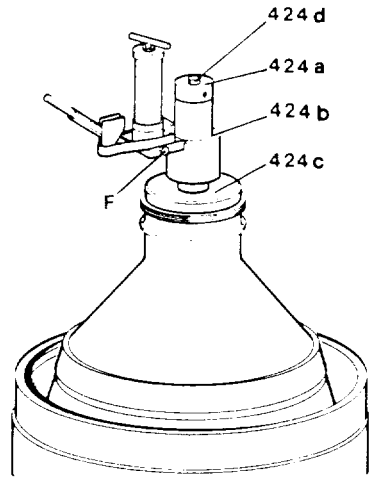


Fig. 4/3
Disc stack compressing device

11) Before tightening the bowl lock ring, compress the disc stack by means of device 424 (see also sect. 4.6) in the following manner:

a) Screw bolt 424d **(left-hand thread)** into threaded sleeve 257 of the bowl bottom until it hits stop.

b) Place disc 424c onto bowl top.

c) Put hydraulic compressing device 424b onto disc.

d) Screw threaded ring 424a onto bolt 424d until the square end of the bolt protrudes entirely from the threaded ring.

CAUTION: To avoid damage to the threads due to pressing, bolt 424d must be screwed in and threaded ring 424a screwed on **all the way.** If the threaded ring cannot be screwed on 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 valve screw "F" by two turns and shift the pump lever away from the oil container as far as it will go. The device can now be compressed by tightening the threaded ring.

e) Check 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 sect. 4.6).

f) Actuate lever of piston pump until the pressure gauge indicates a pressure of 250 bar. If the maximum pressure is not attained and oil flows out of the stroke limiting hole, then bolt 242d has not been screwed far enough into the distributor. The compressing device is only ready for use again when bolt 424d and threaded ring 424a are in the position as described under 11a-d (see above).
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 while being lowered.

12) Screw on the bowl lock ring with the aid of annular wrench 428 (without hitting the wrench handle with a mallet) until the "O" marks on the lock ring and the bowl bottom are 2 - 3 cm apart. Then hit the wrench handle with mallet 420 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 2 cm, then the pressure in the disc stack has slackened and a compensating disc (to be obtained from the factory) has to be added. If the distance between the "O" marks is more than 3 cm, check if all bowl parts are properly locked in place.

13) **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.

14) Tightly screw spindle screw 267 into the threaded sleeve 257 using wrench 421.

15) Place centripetal pump 125a (with inserted gasket 125b) onto bowl top.

16) Insert gasket 260 in groove of centripetal pump chamber cover 262.

17) Place the centripetal pump chamber cover onto the bowl top. The "O" marks of both parts must be in line with each other.

18) Clean, wipe dry and grease (see sect. 2.2) threads of bowl top and lock ring 261. Tighten lock ring **(left-hand thread)** by lightly hitting handle of annular wrench 429.

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

4.2 Installation of nozzles 252

1) Before installing the nozzles, make sure that the bowl is absolutely clean. For this purpose let the separator run for 1 minute and feed clean water to bowl. Then brake the bowl by turning handles 9g anti-clockwise. For flushing the bowl, the hood must be mounted.

2) Check that the nozzle bores are open and nozzle gaskets 252a are in good condition.

3) With the aid of wrench 402 screw the nozzles into the bowl bottom until the front surface of the nozzles is flush with the outer wall of the bowl bottom. The nozzles are properly mounted when the slots are in vertical position and the discharge openings directed backwards (related to the direction of rotation).

   NOTE: The nozzles must never be screwed in any further than described above since that would cause damage to the nozzle seating in the bowl bottom and, besides that, the misled stream would cause atomisation of the quark.

4) Before starting the separator, the bowl should be filled with water in order to see if all nozzles discharge the water in solid jets. If not, the nozzles are clogged or damaged and must be cleaned or replaced.

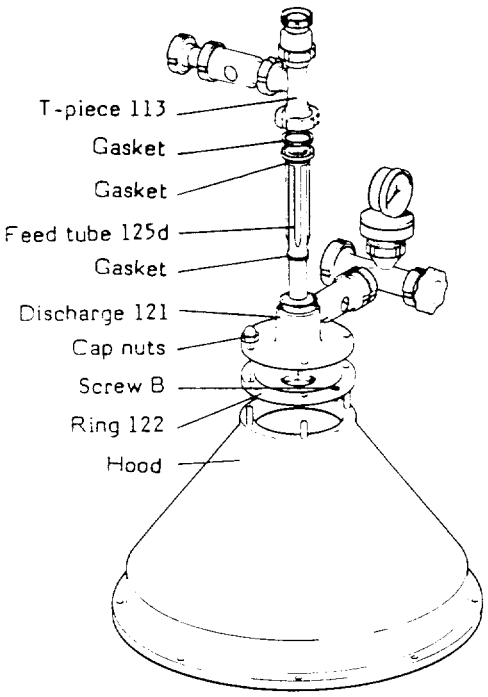


Fig. 4/5a

4.3 Assembling the feed and discharge connections

1) Place on hood and screw in fastening screws tightly.
   Connect the ice-water line.

2) Slide ring 122 over pump shaft and place it so onto the hood that the two screws B are above the respective tapholes of the hood.

3) Screw centripetal pump A **clockwise** into ring 122, by hand. Use wrench 432 to tighten it until it hits stop (fig. 4/5b).

4) Screw the two screws B in ring 122 into the hood.

5) Place on discharge 121 and fasten it with cap nuts.

6) Put feed tube 125d (with inserted gaskets) into the discharge until it hits stop.

7) Screw T-piece 113 with fitted-on non-return valve onto the discharge.

8) Connect feed and discharge lines. Tighten grooved nuts.

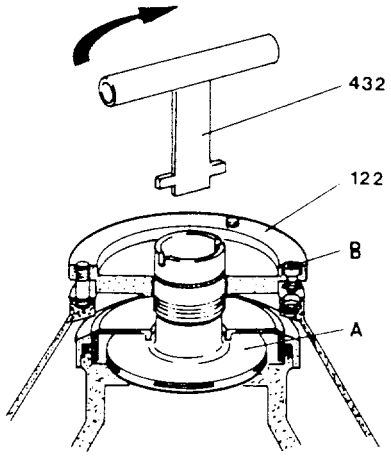


Fig. 4/5b

4.4 Removing the feed and discharge connections, - Dismantling the bowl

ATTENTION: To avoid accidents, do NOT loosen any parts of the separator or of the feed and discharge connections before the bowl has stopped completely.

For dismantling proceed in reverse order of assembly (see 4.1 and 4.3).

The following should be kept in mind:

Place the bowl parts on a rubber mat or wooden grating.

Replace gaskets when worn.

Before opening the bowl, release the brakes by turning the two handles 9g (fig. 13) clockwise and unscrew the nozzles from the bowl bottom.

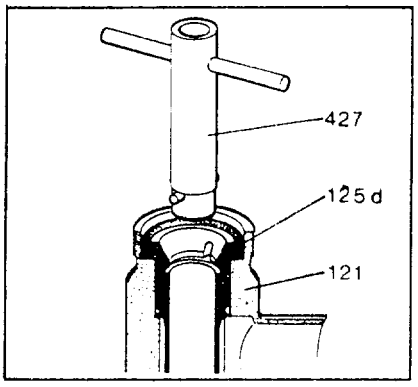


Fig. 4/6a

Use wrench 427 to pull feed tube 125d out of discharge 121.

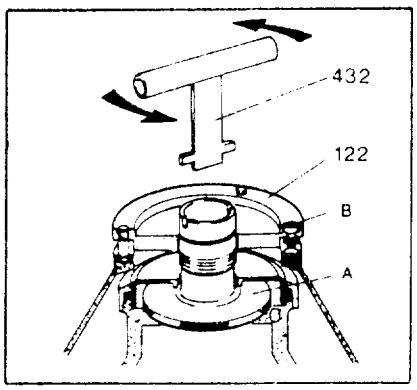


Fig. 4/6b

After removing the discharge, loosen the two Allen screws B. Then take wrench 432 and unscrew centripetal pump from the ring **(anti-clockwise).** Remove the hood.

After removing the centripetal pump and unscrewing the spindle screw (use wrench 421), compress disc stack with device 424 as described under pos. 11a-f in sect. 4.1 in order to facilitate loosening of the lock ring. The lock ring **(left-hand thread)** can then be easily loosened by merely giving the handle of annular wrench 428 a few blows with the mallet. Finally remove the compressing device (see sect. 4.1, pos. 13).

After unscrewing spindle screw 265 and threaded sleeve 257, remove bowl bottom from spindle cone, using jack 422.

4.5 Replacing the nozzles while the hood is closed

1) Loosen cap nuts 99 and take plugs 98 out of the hood.
2) Use wrench 402 to screw nozzles 252 out of the bowl bottom. By turning the wrench the nozzle is screwed into the sleeve of the wrench and can then be removed from the bowl bottom.

4.6 Hydraulic disc stack compressing device (fig. 4/7)

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 424a, screwed onto bolt 424d. The lower end of the bolt is screwed into the spindle nut. When the piston moves downwards, pressure is exerted on the bowl top, via disc 424c, 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.

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 hydraulic 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

The lubricating oil CLP 220 can be used as hydraulic fluid. Viscosity: 220 $\pm$ 22 mm^2/s (cSt) at 40 ^{o}C.

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 is 250 bar.
The maximum permissible pressure is 300 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 424d and threaded ring 424a have not been screwed down properly (see sect. 4.1, no. 11a-d) the oil in hydraulic chamber B will escape through this hole.

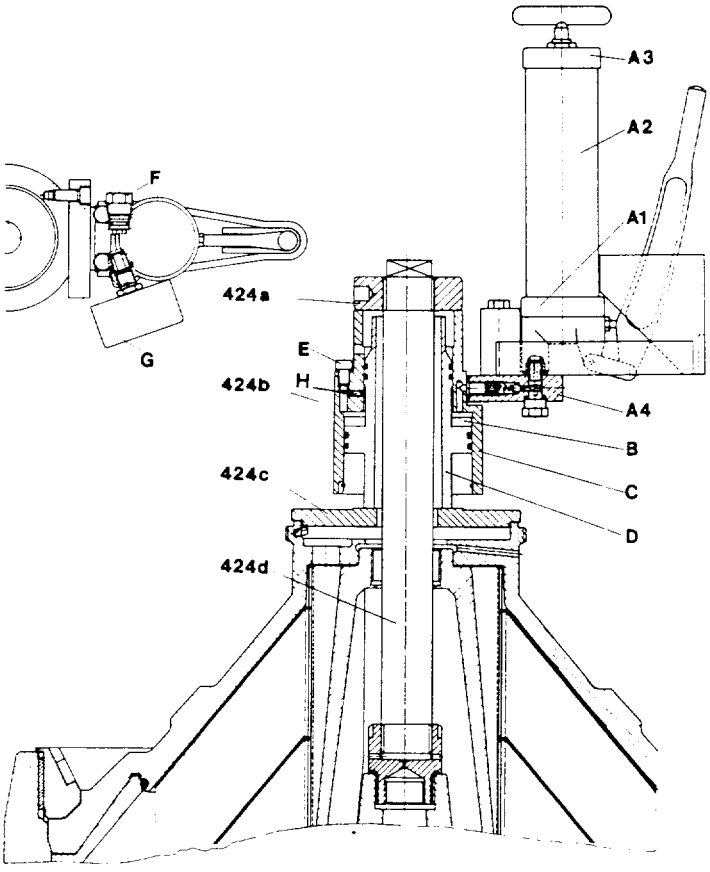


Fig. 4/7

424	Compressing device, compl.
424a	Threaded ring
424b	Hydraulic unit
424c	Disc
424d	Bolt
A	Oil pump
A1	Pump head
A2	Oil container
A3	Cover
A4	Check valve
B	Hydraulic chamber
C	Cylinder
D	Piston
E	Vent screw
F	Valve screw
G	Pressure gauge
H	Stroke limiting hole

5.1 Set-up of a quark line

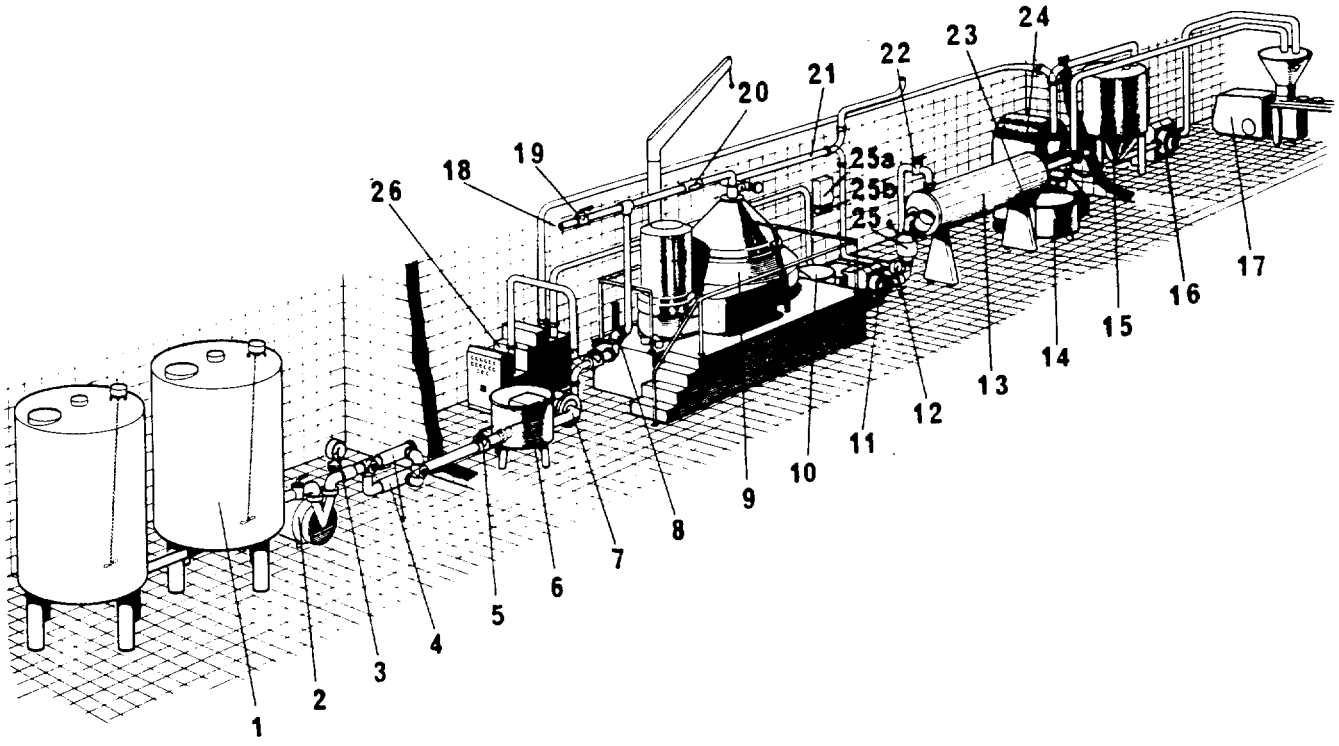


Fig. 5/1
Continuous fresh cheese (quark) production line

1	Renneting tank with low-speed agitator, contents 10,000 litres
*2	Centrifugal pump, self-priming
3	Pressure gauge
4	Tubular strainer
5	Micrometer adjustment valve
6	Float-controlled balance tank
*7	Centrifugal pump
8	Flowmeter
9	Quark separator
10	Quark funnel
11	Positive displacement pump
12	Pressure gauge with vent cock
13	Quark cooler
14	Cream vat
15	Quark silo, contents 2,500 kg
16	Positive displacement pump
17	Packing machine
18	Water supply
19	Shut-off valve
20	Sight glass
21	Whey discharge with sight glass, micrometer adjustment valve, pressure gauge and sampling cock
22	Ice-water supply
23	Ice-water discharge
24	Quark mixer
25	Moisture meter
25a	Recorder
25b	Signalling box
26	CIP control unit

* When the pipe lines between renneting tanks and separator are short, a positive displacement pump can be installed instead of the centrifugal pumps 2 and 7. In this case, the balance tank 6 need not be installed and the micrometer adjustment valve is to be installed in the suction line of the positive displacement pump.

5.2 Processing

5.2.1 Preparing the skim milk

a) in a standard quark production line

The renneting tanks are to be filled with pasteurized milk. Make sure that during a short-time pasteurization (40 seconds) the temperature does not exceed 74 °C since otherwise the whey discharging from the separator will contain albumin.

A good quality quark can only be obtained from a properly treated skim milk. For renneting, the skim milk should have a temperature of at least 30 °C.

Normally

0.5 - 1 % starter and 1 cm^3 of liquid rennet (concentration 1 : 10,000) are added per 100 litres of skim milk

or

0.5 - 1 % starter and 1 gramme of dry rennet dissolved in 0.25 litre of water (concentration 1 : 100,000) per 1,000 litres of skim milk.

After 16 to 18 hours, when the desired coagulation has taken place, the acidity of the whey will be 25 - 28° SH which corresponds to a pH-value of 4.5 - 4.4. About 15 minutes before beginning of separation the coagulated skim milk is efficiently stirred by means of an agitator. During separation, the agitators in the tanks must be kept working to ensure that the content of dry matter in the quark remains constant.

The separating temperature should be at least 28 - 30 °C.

b) in a thermo-process production line

In the thermo process the skim milk is heated to approx. 80 - 83 °C and held at this temperature for a while. Then it is cooled down to coagulation temperature of 27 - 30 °C and fed to renneting tanks.

Normally are added:

0.5 - 1 % special culture and 1 - 1.5 cm^3 liquid rennet per 100 litres of skim milk (concentration 1 : 10,000)

or

0,5 - 1 % special culture and 1 - 1.5 g of dry rennet dissolved in 0.25 litre of water (concentration 1 : 100,000) per 100 litres of skim milk.

When a pH value of 4.5 is obtained, the coagulated skim milk is heated to 60 - 63 °C, held at temperature and then cooled to separating temperature of 40 - 45 °C.

With the thermo process a higher quark yield is obtained than with the standard process. Because of the heat treatment and the temperature holding time the whey proteins are denatured and precipitated with the casein during coagulation of the milk. During subsequent separation these proteins discharge with the quark, thereby increasing the yield.

It is advisable to get in touch with us before producing quark by this process.

5.2.2 Calculation of the quark yield

According to the well known formula which is used to determine the cream volume when separating milk, the percentage of quark with reference to the coagulated skim milk can be found out as follows:

$$Q = \frac{100\,(T_{MM} - T_{MO})}{T_{MQ} - T_{MO}}$$

T_{MM} = dry matter of coagulated skim milk (%)

T_{MO} = dry matter in discharging whey (%)

T_{MQ} = dry matter in low-fat quark (%)

Example:

When T_{MM} = 8.6 %, T_{MO} = 6.1 %, T_{MQ} = 18 %, 100 litres of skim milk will yield the following amount of quark:

$$Q = 100\,\frac{8.6 - 6.1}{18 - 6.1} = 20.95\ \%$$

If 100 litres of skim milk are required to obtain 20.95 kg of quark with 18 % of dry matter then $\frac{100}{20.95}$ = 4.77 kg of skim milk are necessary to produce 1 kg of quark with 18 % of dry matter.

The actual percentage of dry matter depends on the conditions prevailing in each dairy. Therefore, **the above example cannot be set as a rule.**

Amount of skim milk required to produce 1 kg of quark

based on the percentage of dry matter in the quark

Percentage of dry substance in the quark	Amount of skim milk (kg) necessary to produce 1 kg of quark Standard Process	Amount of skim milk (kg) necessary to produce 1 kg of quark Thermo Process
17.0	4.19	3.79
17.5	4.38	3.98
18.0	4.77	4.37
18.5	4.85	4.45
19.0	5.05	4.65
19.5	5.23	4.83
20.0	5.43	5.03
20.5	5.62	5.22
21.0	5.80	5.40
21.5	6.02	5.62
22.0	6.20	5.80
22.5	6.38	5.98
23.0	6.57	6.17
23.5	6.76	6.36
24.0	6.98	6.58

The values in the above table show that the skim milk consumption per 1 kg of quark depends on the content of dry matter in the quark.

In addition to determining the yield theoretically, the actual amount of coagulated skim milk and the actual amount of the quark produced should be measured percisely. Approximation of theoretically and practically obtained values will only be achieved by high accuracy of measurement.

5.3 Operating principles of the bowl

The coagulated skim milk enters the bowl through inlet A, flows into the distributor space then through holes in the distributor base into the rising channels of disc stack D where it is equally distributed in the spaces between the discs. In the disc spaces the coagulated skim milk is separated into whey and quark due to centrifugal force.

The whey flows towards the center of the bowl from where it is discharged through outlet B, foamfree and under pressure, by means of centripetal pump C.

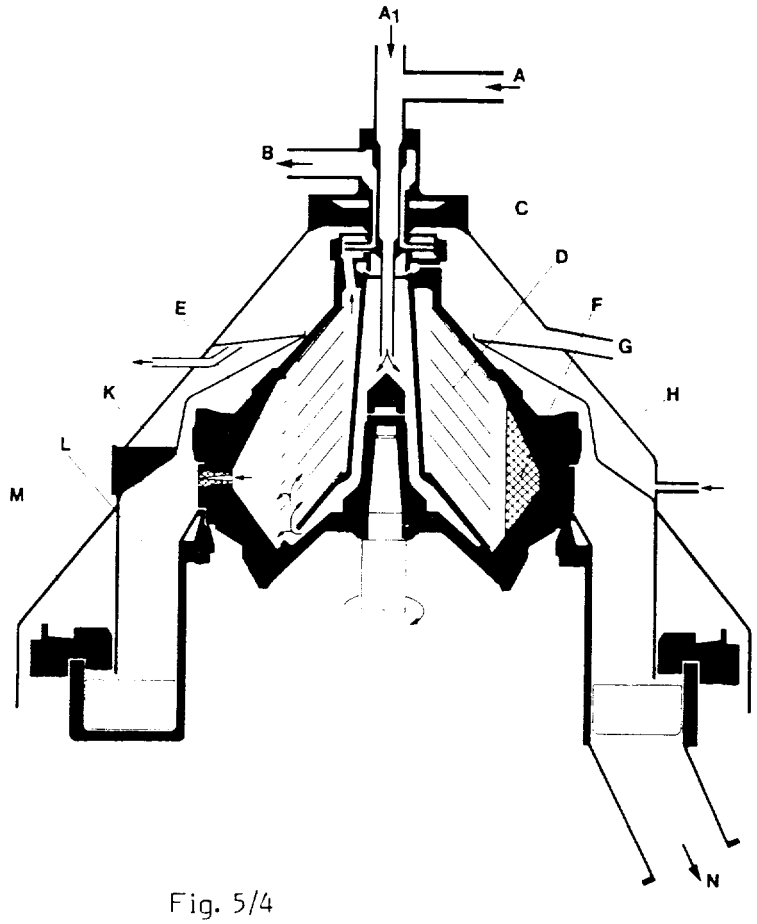
The quark accumulates in sediment holding space E from where it is continuously discharged through nozzles K into the concentrate collector.

In **version I** scraper blades fastened to a slowly rotating drive ring M move the quark continuously to quark outlet N from which it slides into funnel 10 (fig. 5/1).

In **version II** the quark is discharged via a steep chute into the funnel.

Positive displacement pump 11 (fig. 5/1) draws the quark from the funnel and pumps it through tubular cooler 13 to mixer 24. If desired, the quark can be pumped to packing machine 17 or delivered into quark silos 15 for intermediate storage.

It is recommended that a moisture meter 25 be installed in the feed line of the cooler. This continuously operating instrument measures and indicates the moisture content of the quark.



A Feed
A1 Water feed
B Whey discharge
C Centripetal pump
D Discs
E Solids space
F Segmental-holding insert
G Overflow
H Hood, cooled
K Nozzles
L Concentrate collector
M Drive ring with scraper blades
N Quark outlet

Fig. 5/4

Version I: Concentrate collector with scraper blade equipment

5.4 Determining the size and number of nozzles

The quark concentrated in the bowl is continuously discharged through 8 nozzles with a diameter of 0.7 - 0.8 mm.

The diameter and number of nozzles to be fitted depend on the feed rate (i. e. amount of liquid supplied per unit of time), on the percentage of dry matter in the coagulated skim milk and on the desired percentage of dry matter in the low-fat quark.
A homogenous quark can only be obtained when the feed rate and the solids content in the feed liquid remain constant.

If the concentrate is too thin, increase the feed rate; if necessary, use nozzles with a smaller diameter.

If the concentrate is too thick and the discharging whey looks turbid, reduce the feed rate. If the whey then still contains separable albumin, nozzles with a smaller diameter will have to be installed.

The following table is based on quark with a solids content of 18 % (dry substance).

Table of nozzle outputs

Feed rate litres/h	Nozzle output (quark) kg/h	Nozzle diameter mm
8,500	1,700	8 nozzles x 0.7
9,100	1,820	6 nozzles x 0.7 2 nozzles x 0.8
9,800	1,950	4 nozzles x 0.7 4 nozzles x 0.8
10,000	2,070	2 nozzles x 0.7 6 nozzles x 0.8

Depending on local conditions, slight variations from the above mentioned values can occur, since the feed rate - quark output ratio depends on the solids content of the coagulated skim milk and on the desired solids content of the quark.

IMPORTANT: Make sure that the nozzles are equally distributed in the bowl. Nozzles with the same diameter must always be arranged opposite each other. Likewise, the plugs (blind nozzles) must be arranged opposite each other.

5.4.1 Pre-straining of the feed liquid

To avoid nozzle clogging, strainers have to be installed ahead of the separator:

for product supply use a tubular strainer 50 mesh/1",
for water supply use a tubular strainer 70 mesh/1".

5.5 Sterile air supply

The inspection cover 10 of the frame is provided with a sterile-air connection. By feeding approx. 8 Nm^3/h of sterile air (air inlet pressure approx. 0.3 bar above atmospheric pressure) to the separator, atmospheric air is prevented from getting into contact with the quark in the concentrate collector, thus precluding re-infection of the quark.

5.6 Ice water quality

Cooling

The hood and concentrate collector are cooled with ice water to stop the soft cheese (quark) from burning onto the walls.

Ice water quality specifications:

- Suspended matter: max. 10 mg/l
- Chlorine ions: ≤ 100 mg/l
- pH value: 6.5 – 7.5

6.1 General

To avoid nozzle clogging and uneven run of the bowl, feed water to bowl during starting and braking period and in case of interrupted milk supply.

When clogged nozzles have caused uneven accumulation of solids in the bowl, strong vibrations are likely to occur if the bowl is not completely filled with liquid. The vibrations will be attenuated by keeping the bowl filled with liquid during the braking period.

6.2 Before starting the separator

Before starting the separator check that

- all nozzles are open (see sect. 4.2, pos. 4),
- oil level is slightly below middle of sight glass,
- brakes are released by turning the two handles clockwise,
- separator is correctly assembled, especially hex head screws on hood and cap nuts on discharge are tightened securely,
- on version with scraper-blade equipment
  fastening screws on scraper blades are tightened securely (before initial start-up and after a long-term shut-down).

6.3 Starting the separator

- Open flap in discharge chute of quark funnel.
- Open water valve.
- Start the motor as soon as water discharges from the concentrate outlet.
- Increase water supply until water discharges from the whey outlet.
- Wait approx. 7 minutes until the bowl has reached its operating speed.
- Check oil circulation through sight glass. If no oil flows out of the return pipe by the time the bowl has reached its operating speed, the lubrication system must be cleaned (see 7.4).
- Before feeding coagulated skimmilk, disinfect the pipe lines between tank and separator and flush them with water.
- Feed approx. 900 l/h of ice-water to cooling chamber of hood. The feed pressure should be approx. 2 bar before connection piece 53.
- Start the motor of scraper blade equipment (applies for version I only).
- Open sterile-air supply line and feed approx. 8 Nm^3/h sterile air to the separator.
- Switch on feed pump. Simultaneously close water valve. Close flap in quark funnel as soon as quark discharges from the separator.

- **Adjust discharge pressure:**

  Throttle the valve in the whey discharge line until slight overflow occurs at the overflow pipe of the hood. The pressure indicated by the pressure gauge at the moment that overflow occurs is considered as maximum pressure. Now re-open whey valve to obtain a pressure which is 0.3 - 0.5 bar lower than the maximum pressure. This discharge pressure has to be kept during the separating process.

  The discharging whey must be clear and not contain undissolved albumin. Should it still contain albumin, the hourly capacity has to be reduced.

- During operation check the discharging quark from time to time: If the concentrate is too thin, increase the feed rate or install nozzles with a smaller diameter. If the concentrate is too thick and the discharging whey is turbid, reduce the feed rate or install nozzles with a larger diameter.
  Sudden increase in concentration indicates that one or several nozzles are clogged. In such a case avoid CIP-cleaning after the separating process. The separator must be stopped (see sect. 6.5) and cleaned manually (see sect. 7.1).

6.4 Cleaning-in-Place

After separation open water-supply line. To avoid nozzle clogging the bowl must be continuously fed with liquid.

Open flap in discharge chute of quark funnel.

After the quark funnel has been emptied, set up the separator for the C-I-P program (be sure to close flap in discharge chute of quark funnel) and start the C-I-P cycle (see instruction manual 8291-9001-000 for C-I-P unit type 200).

NOTE: Use only the recommended detergents.
Never use agents containing chlorine as they will attack the bowl parts of stainless steel, resulting in impaired operating safety.

6.5 Stopping the separator

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

- Close sterile-air supply. Open water valve and switch off feed pump simultaneously. Open flap in discharge chute of quark funnel.
- Stop the separator motor. Adjust water supply so that water discharges from the concentrate and whey outlets while the machine is slowing down.
- Apply brakes by turning the handles anti-clockwise.
  It is recommended that the brakes be applied, since less water will be used during a shorter slowing-down time and in addition the time will be shorter in which unbalances can occur at the critical speed.
- To avoid nozzle clogging and uneven run of the bowl, stop the water supply only after the bowl has come to rest.
- Switch off the motor for the scraper blade equipment (applies only for version I).
- **IMPORTANT:** If the separator is put out of operation for several days, the residual liquid in the bowl must be spun out in order to avoid deposits and possible corrosion. For this purpose unscrew the nozzles (see 4.5) and switch on the motor of the separator for about 1 minute.

7.1 Cleaning the bowl, the concentrate collector, and the drive ring

The bowl has to be dismantled for manual cleaning when nozzles have become clogged during separation, for instance as a result of insufficient pre-straining of the feed material.

For reasons of safety, the bowl should also be dismantled at least every four weeks for routine inspection of bowl threads and gaskets.

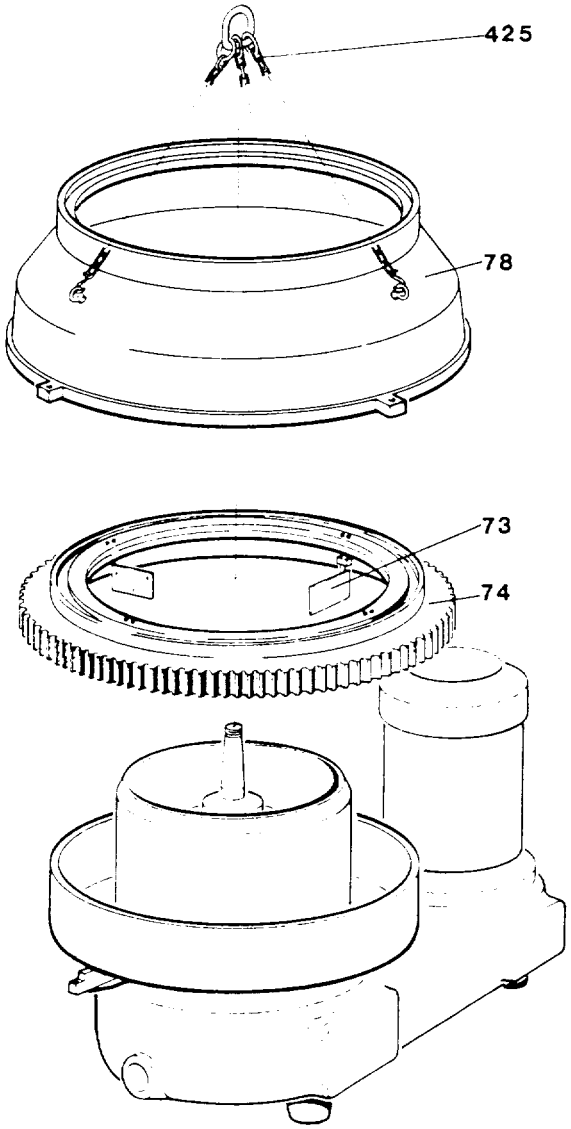


Fig. 7/1

Before cleaning, remove all gaskets from the bowl parts and clean grooves and gaskets. Renew damaged or **very** swollen gaskets.
Keep swollen gaskets at a warm place where they can regain their original dimensions so that they can be used again.

Thoroughly clean the individual discs and bowl parts, using the scrapers and brushes furnished with the separator.

Do NOT use metal scrapers or metal brushes!

Thoroughly clean and wipe dry threads on bowl bottom and bowl lock ring as well as the contact surfaces, and apply some grease (see 2.2).

To prevent clogging of nozzles when re-starting the separator, check to be sure that all nozzles are open and no solid particles are left in the bowl.

After having cleaned the bowl, check the concentrate collector and clean it, if necessary. In the case of design I (concentrate collector with scraper-blade equipment), blades 73 have to be cleaned as well. To do this, loosen fastening screws and remove lower hood 78 with the aid of lifting device 425, then remove drive ring 74 with the aid of device 425 (Fig. 7/1).

7.2 Cleaning the motor cooling ribs

To assure good cooling of the motor, the cooling ribs have to be cleaned every six months. For this purpose remove motor cowling.

7.3 Cleaning the upper section of the frame

From time to time, the inside of the upper section of the frame has to be cleaned in the area below the bowl. After removing the bowl (see 4.4) place splash cover 413 over the spindle to prevent wash liquid from seeping into the drive and rendering the lubricating oil unserviceable.

7.4 Cleaning the oil pan, the spindle, and the suction pipe

The oil pan must be cleaned after several oil changes, - in any case after 5,000 operating hours when changing the ball bearings. Besides that, cleaning of the oil pan becomes necessary when the oil has to be changed because water or dirt has seeped into the drive, or when there is a decrease in the oil circulation (to be seen through sight glass 38c). In the latter case, the drive has to be cleaned as well.

After revomal of the bowl (see 4.4) and of the drive (see 8.2) undo screw 26 and let the oil drain.

Remove sight glass 38a-d and clean oil return housing 34.

Remove cover 5. Use wrench 408 to unscrew cover 19 from oil pan. Clean oil pan with kerosene or trichlorethylene. Do **not** use fluffy cloths or cotton waste! After cleaning, flush oil pan with light oil.

Replace screw 26 with gasket and cover 19 with gasket, and tighten. Re-install sight glass 38a-d. Before re-installing the drive, check the holes in suction pipe 151a-b and spindle 151q on cleanliness. If the holes need to be cleaned, use the brushes furnished with the separator.

Assemble the drive as per instructions given in sect. 8.3, and install it in the separator frame. Then fill in new lubricating oil (see sect. 2).

7.5 Cleaning before a long-term shut-down of the separator

Clean the separator thoroughly (see 7.1). The clean bowl parts and all unvarnished machine parts should be wiped dry and greased to avoid corrosion. The clean bowl should be kept in a dry place.

The gaskets should be kept in a cool, dark and dry room to prevent them from getting brittle.

Slacken V-belts (see sect. 8.1.2, para. 2 - 3).

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

8.1 The V-belts

8.1.1 General

The V-belts are supplied as a bundled set. If any of the V-belts needs replacement be sure to replace the whole set, since all belts of a set have exactly the same length.

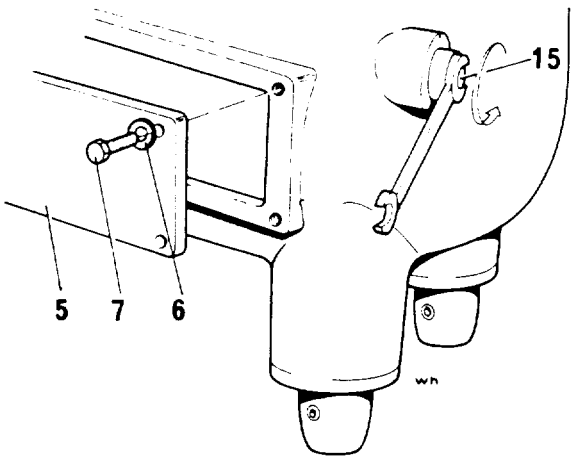


Fig. 8/1

8.1.2 Removing the V-belts

Undo screws 7 and remove ventilation grid 5.

Slacken back screw 15 (Fig. 8/1) until it is possible to push the motor towards separator frame.

Push back motor until it hits stop.

Remove V-belts from the V-belt pulleys.

Remove spindle (8.2.1) and take the V-belts out of the frame. It is also possible to take out the V-belts without having to remove the spindle. However, in this case the oil pan has to be removed.

To do this proceed as follows:

Undo screw 26 (Fig. 13) and let oil drain.

Undo screws 36 and remove sight glass 38a-d.

Remove countersunk screws 35.

Use wrench 407 to loosen threaded sleeve 29. Then pull out oil return housing 34.

Undo screws 23 and remove oil pan 24.

8.1.3 Re-fitting the V-belts

To re-fit V-belts proceed in reverse order of removal.

To prevent the V-belts from slipping, pre-tension them by turning screw 15 clockwise. It must be possible to push the belts inwards with your thumb by approx. 25 mm.

Slight expansion of the V-belts is compensated by a spring. Nevertheless re-adjusting the tension of the V-belts will have to be done after the first day of operation.

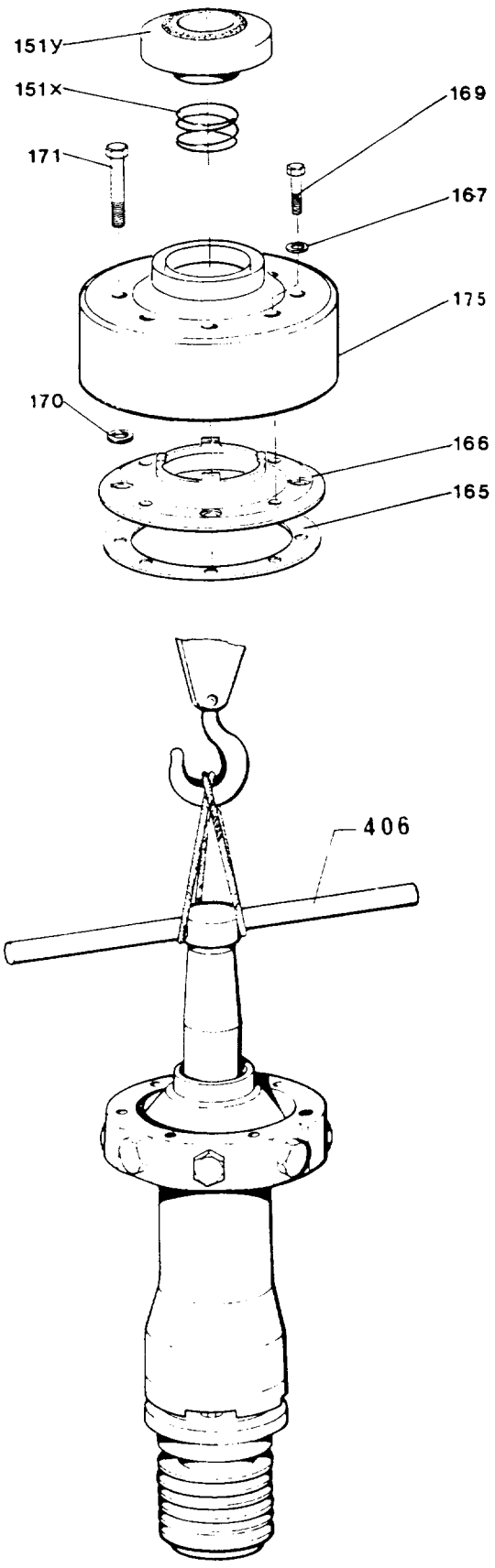


Fig. 8/2

8.2 Removing the drive parts

8.2.1 Removing the spindle

- Remove the bowl (4.4).
- Remove V-belts from V-belt pulleys (see 8.1.2).
- Take spindle cap 151y off the spindle.
- Unscrew hex head screws 171 and 169. Remove casing 175 and neck bearing protection cap 166.
- Screw lifting device 406 onto spindle. **Carefully** lift the complete drive unit together with the neck bearing out of the frame, using a hoist.
  NB: Before lifting out the drive unit, ensure that all V-belts have been removed from the spindle pulley.
- If it proves difficult to loosen the neck bearing bridge in the upper section of the frame, use screws 169 to press the bridge off the frame. They must be screwed in crosswise without washers 167.

8.2.2 Removing the V-belt pulley from the spindle

- Remove the spindle (see 8.2.1).
- Use Allen wrench to loosen Allen screws 152. Then slacken clamp disc 154.
- Rap with a rubber hammer against V-belt pulley until conical clamp rings 156 come off the spindle.

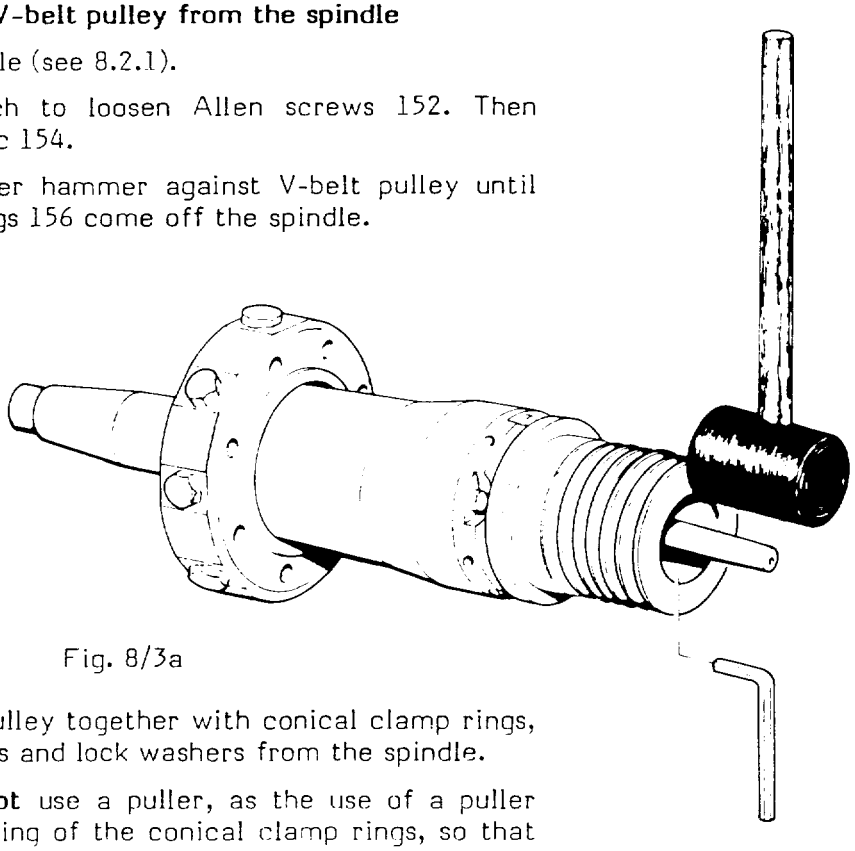


Fig. 8/3a

- Remove V-belt pulley together with conical clamp rings, clamp disc, screws and lock washers from the spindle.

  CAUTION: Do **not** use a puller, as the use of a puller will lead to jamming of the conical clamp rings, so that damage is bound to occur when removing the V-belt pulley.

8.2.3 Dismantling the spindle

- Remove the spindle and detach V-belt pulley from the spindle (see 8.2.1 and 8.2.2).
- Screw suction pipe 151a-b out of the spindle and remove gasket 151c.
- With the aid of screwdrivers force pressure ring 160 off the spindle. Then remove pressure ring together with rubber cushion 161.

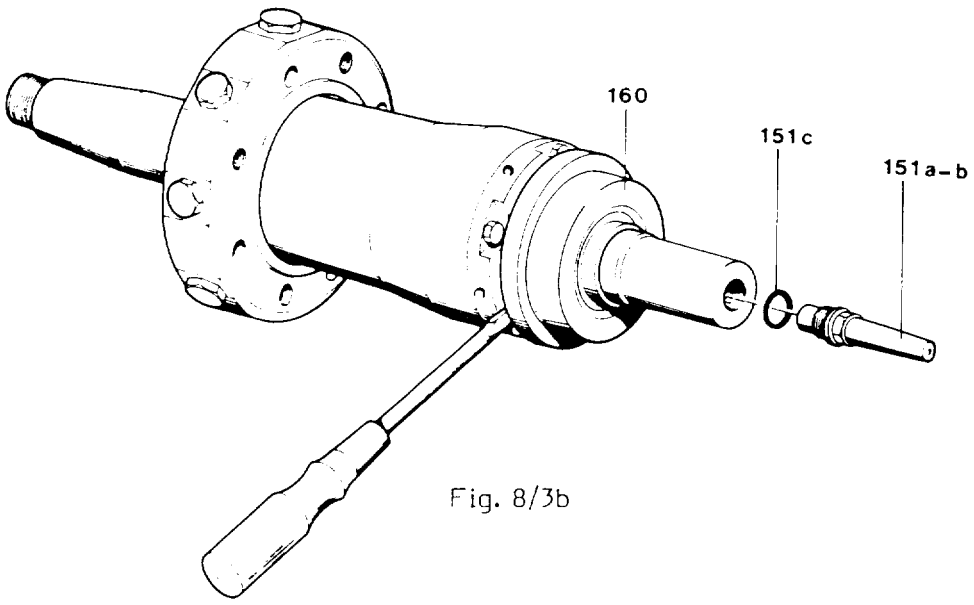


Fig. 8/3b

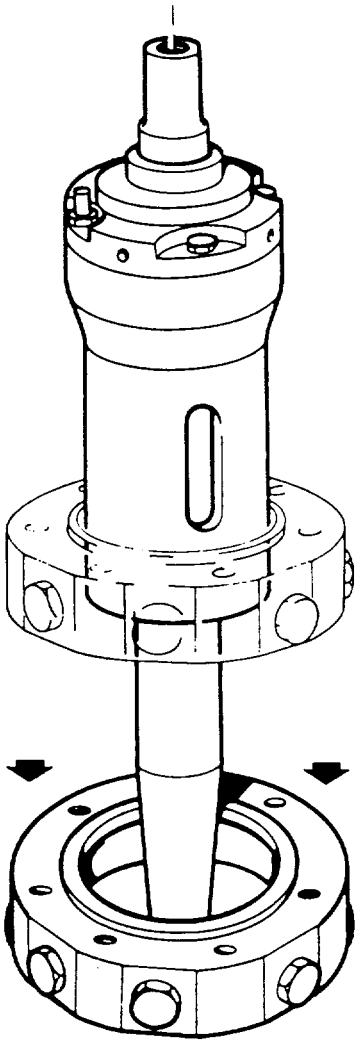


Fig. 8/4a

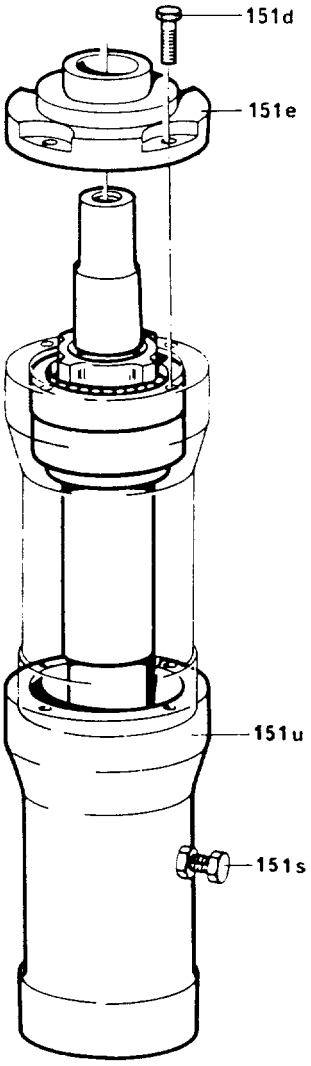


Fig. 8/4b

Fig. 8/4a: To remove neck bearing bridge, hold spindle in inverted position, upper end down, and tap spindle lightly against a wooden surface.
Removal can be facilitated by alternately rapping with a rubber hammer on two opposite sides of the rim of the neck bearing bridge.

Fig. 8/4b: Undo screws 151d from the bearing housing and remove bearing cover 151e. Unscrew hex head screw 151s. Then hold spindle in inverted position, upper end down, and tap it lightly against a wooden surface. The bearing housing 151u will then come loose. Remove the spindle, with the remaining parts attached to it, from the bearing housing.

Loosen threaded pin 151g and screw threaded ring 151f (fig. 17) off the spindle. Then remove bearing from the spindle.

8.3 Assembly of the drive parts (fig. 16)

8.3.1 General

For assembly of the drive proceed in reverse order of disassembly (8.2) and bear in mind the following:

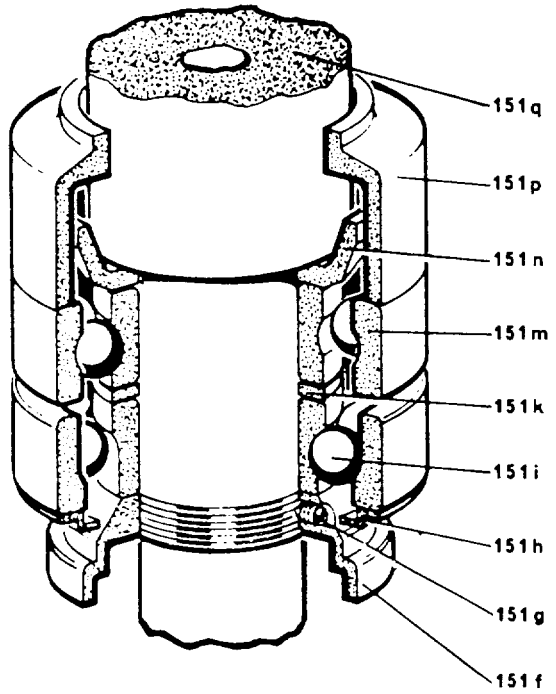


Fig. 8/5a
Installation of angular contact ball bearing

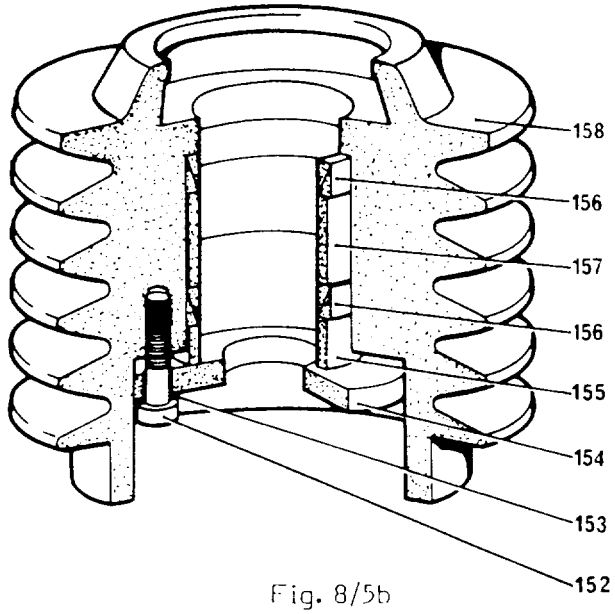


Fig. 8/5b
Installation of conical clamp rings

- Make sure holes in spindle 151q and in suction pipe 151a-b are clean.
- Check condition of bearings before re-installation. If they show the slightest damage, they must be replaced. In any case, they have to be replaced every 5,000 working hours.

  IMPORTANT: Use only bearings which are precision tested for high speed as those in our List of Parts.
- Before mounting, heat up grooved ball bearings 151r and 151m as well as angular contact ball bearing 151i in 80 ^{o}C oil.
- For installing the lower group of bearings refer to fig. 8/5a. Be sure not to interchange the two bearings 151m and 151i. The **upper** bearing is a grooved ball bearing, whereas the **lower** bearing is an angular contact ball bearing.

  The angular contact ball bearing 151i may be loaded axially in one direction only. It must be mounted in such a manner that the **large** rim of the **inner** ring faces ring 151k. Faulty mounting will inevitably result in damage to the angular contact ball bearing.
- The conical clamp rings 156 that hold the V-belt pulley 158 on the spindle must be installed in the following order (see fig. 8/5b):
  The inner ring of each set must be fitted in first, then the outer ring. Wrong installation of the inner and outer rings will lead to damage when removing the V-belt pulley.
- The V-belt pulley must rest against the shoulder of spindle and it must be firmly tightened to the spindle.
  This is accomplished by tightening screws 152 in clamp disc 154 alternately and evenly.
- Be sure to screw in suction pipe 151a-b with inserted gasket.

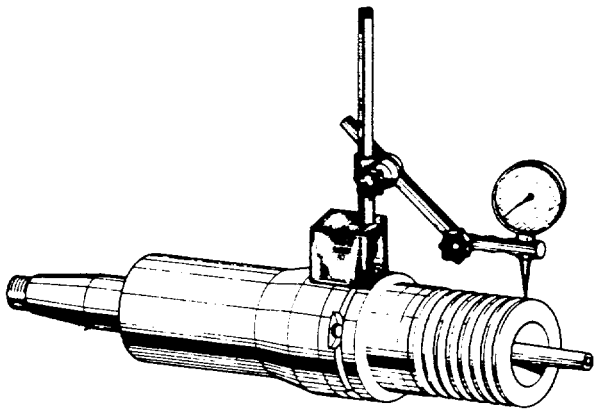


Fig. 8/6

Checking the V-belt pulley with a micrometer clock-gauge

- Use a micrometer clock-gauge to check V-belt pulley 158 for centric run (Fig. 8/6).

  Tolerance of deviation: 3/100 mm.

- When installing the neck bearing bridge assembly 163a-f, check to be sure that gaskets 162 and 165 are in perfect condition.

  Install the neck bearing bridge into upper section of frame by slipping it over the bearing housing. Be sure arresting pin of upper section of frame catches into the hole of the neck bearing bridge. For assembly of neck bearing bridge refer to sect. 8.3.2.

- Check to be sure that the V-belts are properly tensioned (see 8.1.3).

- **IMPORTANT:** After re-installation of the drive parts, the bowl height has to be checked for possible re-adjustment (see 8.4).

8.3.2 Assembly of the neck bearing bridge

The top of the bearing housing is contained in neck bearing pressure ring 163a which is held by eight radially arranged, equally distributed springs 163d.

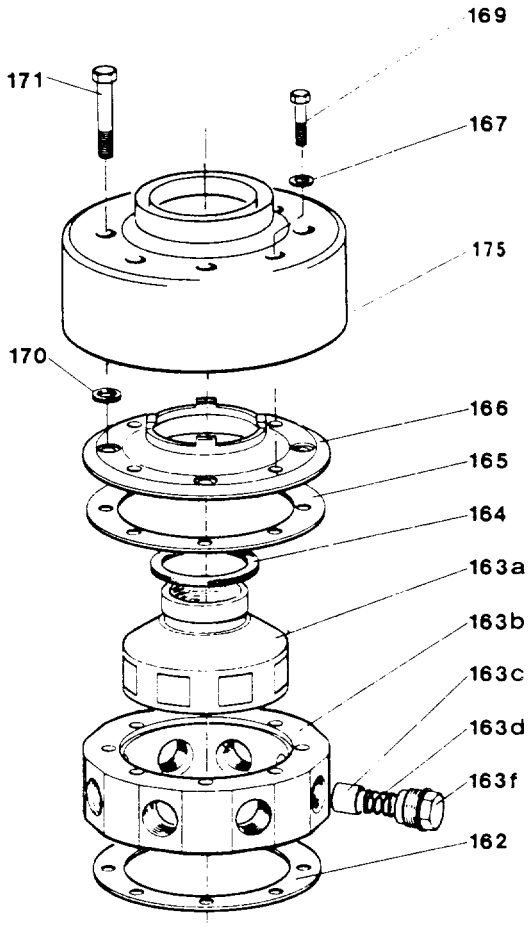


Fig. 8/7

- Insert neck bearing pressure ring 163a in neck bearing bridge 163b in such a manner that the recesses of the pressure ring face the tapholes of the neck bearing bridge.

- Grease spring pistons 163c thoroughly. Insert neck bearing springs 163d in the spring pistons and put spring pistons into threaded plugs 163f.

- Screw threaded plugs with neck bearing springs and spring pistons into the eight tapholes of the neck bearing bridge. Then tighten threaded plugs.

- Slip neck bearing bridge over bearing housing and fit it into upper section of frame. Make sure that gaskets 162 and 165 are in good condition.

- Fit sealing ring 164 on neck bearing pressure ring with sealing lips pointing downwards.

- Place on neck bearing protection cap 166 (with inserted gaskets 170) and casing 175; then screw in screws 171 and 169. Be sure to fit washers 167.

8.4 Re-adjustment of bowl height

The bowl height is adjusted at the factory before the separator is shipped. It must be checked for re-adjustment after re-installing the drive parts and after exchanging the bowl.

After installing the bowl, the distance between lower edge of bowl bottom and upper edge of brake ring 69 must be 1.5 - 2.0 mm at the narrowest point while the V-belts are tight (see fig. 8/8).

Measure the distance with a feeler gauge.

If the distance is less than 1.5 mm, place a shim of the proper size under the surface "a" of pressure ring 160 (see fig. 8/8) in order to adjust bowl to correct height. For this purpose, the following shims can be supplied with the separator:

Shim 157/139 Ø x 0.6, Part-Number 0026-0646-000

Shim 157/139 Ø x 1.0, Part-Number 0026-0647-000

If the distance is more than 2 mm, the surface "a" of pressure ring 160 has to be machined to proper dimension.

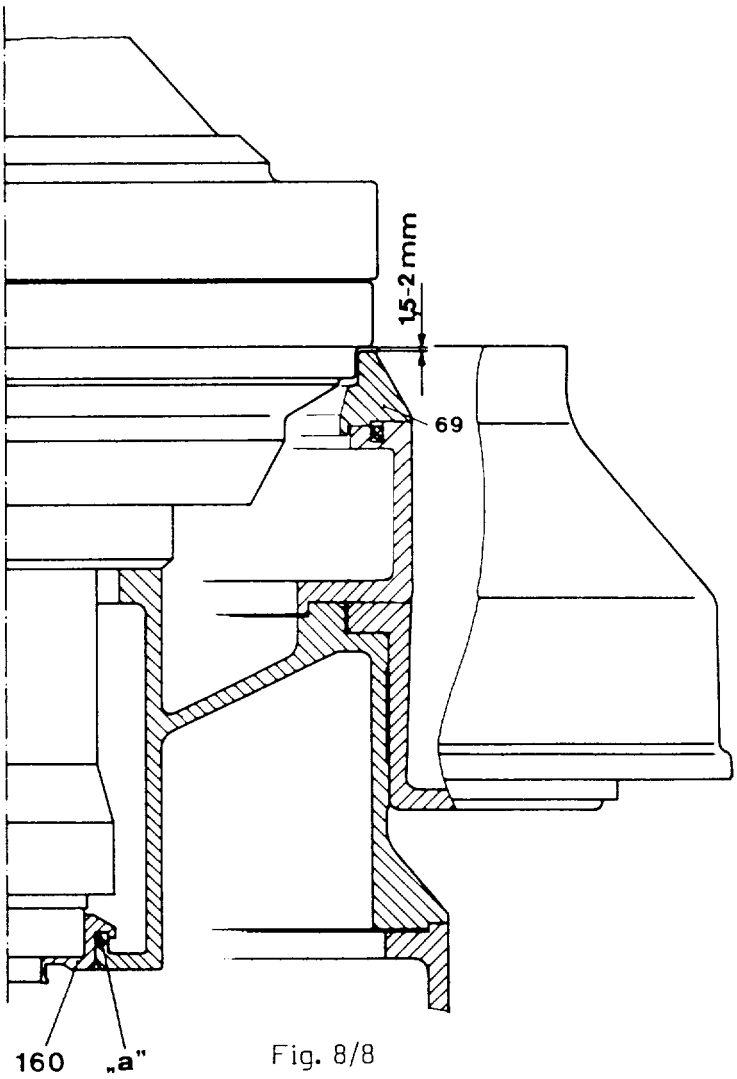


Fig. 8/8

		After operating hours						MAINTENANCE	every				
	Lubricant	250	1,000	1,500	2,500	3,000	3,500		week	3 months	6 months	1 year	2 years
Lubrication chart		●						First oil change after initial start-up (see 2.1).					
	O							Check oil level and oil circulation.	●				
	O		●					Oil change.			●		
	O			●				Lubrication of parts such as valves, brakes, tools, etc.			●		
	MF		whenever dismantling					Grease bowl lock ring and contact surfaces of bowl parts.	whenever dismantling				
	F							Grease motor ball bearings according to manufacturer's instructions.					
Servicing program	Cleaning						●	Clean oil pan (see 7.4).			●		
							●	Clean holes in spindle and suction pipe (see 7.4).			●		
								Remove bowl. Clean inside of frame.	4 weeks				
								Dismantle bowl and clean thoroughly.	4 weeks				
	Inspection							Bowl inspection. Check threads of lock rings for erosion and corrosion.				●	
				●				Check bowl gaskets. After cleaning check grooves for corrosion.					
				●				Check tension and condition of V-belts. Retighten new V-belts after the first day of operation (8.1.3).		●			
				●				Check neck bearing springs, spring pistons, threaded plugs and neck bearing pressure ring.			●		
				●				Check thickness of brake linings.			●		
	Replacement						●	Ball bearings on spindle.					
							●	Neck bearing springs, spring pistons, threaded plugs and neck bearing pressure ring.					

Key:

O = Lubricating oil

MF = Grease containing MoS_2

F = Ball and roller bearing grease

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).	Brakes are on.	Release brakes by turning handles clockwise.
	Motor is incorrectly connected.	See wiring diagram.
	The bowl is placed too low and rubs against concentrate collector.	Adjust bowl to proper height (see sect. 8.4).
	The bowl is placed too high. Liquid seeps through too big a gap between bowl bottom and concentrate collector and flows into upper section of frame, resulting in slowing-down of the bowl.	Adjust bowl to proper height. Clean upper section of frame (see 7.3).
	Frame drain is clogged. Liquid or quark has collected in the upper section of frame, resulting in slowing-down of the bowl.	Clean frame drain and upper section of frame.
	Clamp disc 154 is not tight enough: V-belt pulley slips on spindle.	Remove spindle (see 8.2.1) and tighten screws in clamp disc evenly and **firmly** (see 8.3.1).
	V-belts slip because they are oily or have lengthened.	Exchange V-belts (see 8.1) or re-tighten them.
10.1.2 The bowl speed drops during operation.	Motor speed drops during operation.	Inspect motor and line voltage.
	Nozzle bores are worn out, or nozzles are leaky due to damaged gaskets.	Install new nozzles. Replace the gaskets.
10.1.3 Uneven run of the separator.	One or several nozzles are clogged. The separated solids have deposited unevenly in the bowl.	Close liquid supply valve and, at the same time, open water-supply valve **all the way** in order to attenuate the increased vibrations occurring during slowing-down of the bowl. Stop separator, apply brake, and clean bowl thoroughly.
	Bowl is not properly assembled or, if plant has several separators, parts of different bowls may have been interchanged.	Assemble bowl properly (see 4.1).

Troubles	Causes	Remedies
10.1.3 Uneven run of the separator (cont'd.)	Tension of disc stack has slackened.	Make sure bowl lock ring is screwed on tightly (see 4.1, item 12). Check disc count. If necessary, add spare disc or compensating disc.
	Bowl is damaged and, therefore, out of balance.	Send bowl to factory or authorized factory repair shop. Do **not** attempt to make your own repairs. Never weld or solder. Bowl is made of heat-treated steels.
	Neck bearing springs are weak or broken.	Replace all 8 neck bearing springs.
	V-belt pulley is not centered.	Center V-belt pulley. Use micrometer clock gauge (see 8.3.1).
	Angular contact ball bearing or grooved ball bearings are worn.	Replace damaged bearings. **IMPORTANT:** Use only bearings which are precision tested for high speed (see List of Parts).
	Angular contact ball bearings or grooved ball bearings have become damaged due to insufficient lubrication which may be caused by:	Replace damaged bearings. Clean lubrication system. Clean upper section of frame.
	a) Clogging of the frame drain, which resulted in liquid collecting in upper section of frame and seeping through neck bearing into the lubrication system. b) Clogging of suction pipe 151a.	
	Guide surface of bearing cover 151e has become rough. Cover jams in pressure ring 160.	Smooth the surfaces and apply a thin film of molybdenum disulfide paste. If necessary, replace bearing cover and pressure ring.

10.2 Possible causes for inefficient separation

Troubles	Causes
Insufficient concentration	1) Temperature of coagulated skim milk too low. 2) Acidity degree too low. 3) Skim milk has not been renneted. 4) Feed rate too low. 5) Nozzle diameter too large. 6) Nozzle gaskets 252a are damaged. 7) Gaskets 264 of the segment-holding insert are damaged.
Whey is not pure	1) Feed rate too high. 2) Nozzles are clogged: solids content of quark increases. 3) Rising channels in disc stack are clogged. 4) Vat milk: a) separating temperature too low, b) rennet concentration too low, c) acidity degree too low or too high, d) pasteurization temperature too high, e) skim milk heated for too long.

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.**

Lower Frame Parts

No. in Fig.	Part - No.	Qty.	Part Description
-	3157-1020-000	1	Foundation frame assembly (1a-c)
1a	3157-1003-000	1	Foundation frame
1b	0026-2034-300	4	Cap
1c	3157-1033-000	4	Bolt
2	0019-6937-400	12	Hex head screw DIN 933 - M 10x30
3	0001-0516-300	4	Flange
-	2315-1015-010	4	Foot assembly (4a-c)
4a	0019-6387-400	4	Threaded pin DIN 915 - AM 12x28
4b	2315-1011-000	4	Foot, stainless steel coated
4c	0021-3018-750	4	Rubber cushion
5	1079-1044-000	1	Cover
-	1079-1004-010	1	Cover
6	0026-1348-400	8	Washer DIN 125 - 10.5
7	0019-6937-400	8	Hex head screw DIN 933 - M 10x30
8	0019-1088-300	2	Threaded bush
-	1079-1043-010	2	Brake assembly (9a-g)
-	1079-1031-000	2	Brake bolt assembly (9a-c)
9a	1079-1032-000	2	Brake shoe
9b	0026-5700-090	2	Cylindrical pin
9c	0026-0346-090	2	Brake bolt 10h11x35 - DIN 1434
-	0021-4110-880	2	Brake lining
-	0026-1262-550	4	Countersunk rivet DIN 661 - 4x12
9d	0006-4354-160	2	Cylindrical pressure spring
9f	0021-3538-300	2	Brake housing
9g	0021-3514-300	2	Handle
9h	0019-8974-150	2	Threaded pin DIN 914 - AM 8x15 - 10.9
10	1182-1061-000	1	Cover (for sterile-air and caustic connection)
10a	0007-2184-750	2	Gasket 15/22x3
10b	0013-2818-400	2	Hexagon coupling nut R 3/4" } for item 10
10c	0018-1843-400	2	Hose outlet 10
-	1079-1004-020	1	Cover
11	2315-1309-010	1	Guide bolt
12	0006-4363-160	1	Cylindrical pressure spring
13	2315-1355-000	1	Guide bush
14	2315-3466-030	1	Washer
15	0019-1110-400	1	Hex head screw M 16x255
-	3190-1021-L	1	Flange assembly (16a-h)
16a	2315-1209-010	1	Bolt
16b	0026-1105-030	2	Cylindrical pin
16c	2315-1104-010	1	Bolt
16d	3190-1028-L	1	Flange
16f	0019-7725-090	8	Stud DIN 939 - M 16x35 - 5.6
16g	0026-1330-190	8	Lock washer DIN 127 - A 16
16h	0013-0282-150	8	Hexagon nut DIN 934 - M 16 - 8
17	0026-1985-030	1	Washer
18	0019-6970-150	1	Hex head screw DIN 933 - M 12x30 - 8.8
19	2315-1125-010	1	Cover
20	0004-5074-700	1	Gasket 110.6/124.2x1
21	0019-1442-030	1	Threaded plug
22	0004-5276-710	1	Gasket 22/26x1.5
23	0019-6937-150	4	Hex head screw DIN 933 - M 10x30 - 8.8
24	2315-1041-000	1	Oil pan
25	0004-1872-720	1	Gasket 13/25x2
26	0019-0133-040	1	Hex head screw M 12x15 - 4.6
27	0007-2163-750	1	Gasket 63/75x6
28	0026-5800-500	1	Washer
29	0019-1180-500	1	Threaded sleeve
30	0004-5716-840	1	Grooved ring 13/24x6

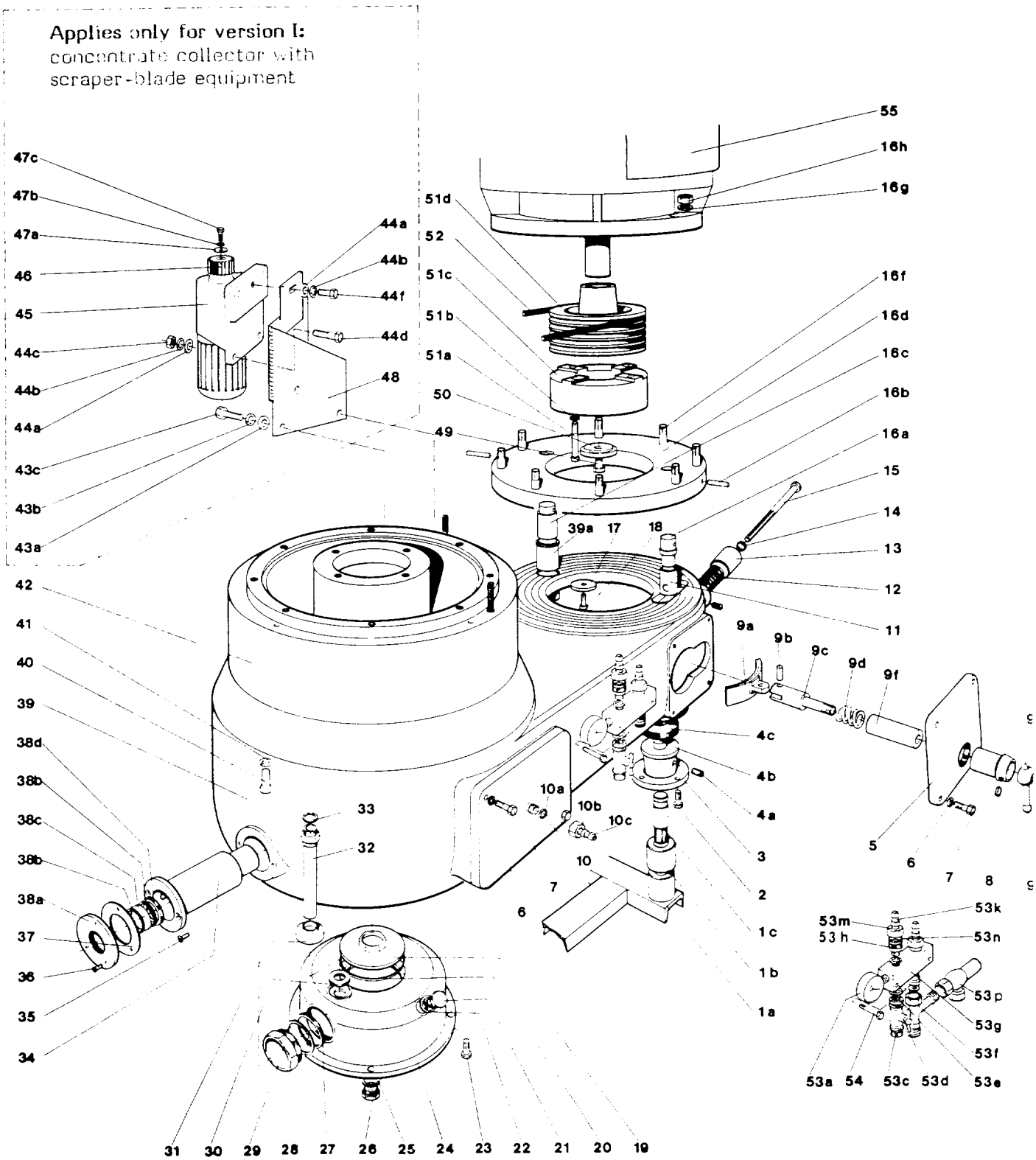

Applies only for version I:
concentrate collector with
scraper-blade equipment
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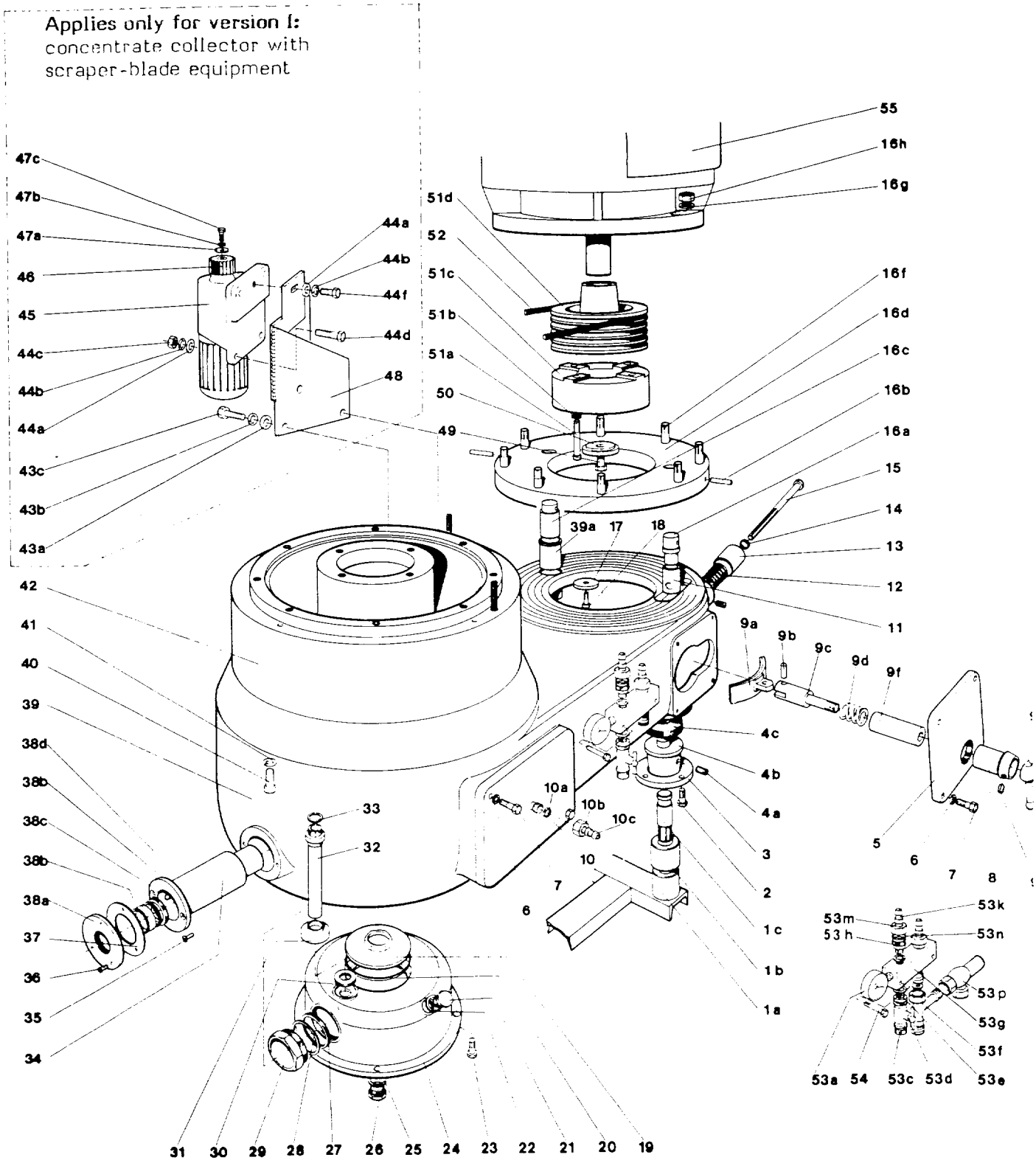
Fig. 13

No. in Fig.	Part - No.	Qty.	Part Description
31	2315-3347-000	1	Cap
32	2315-1122-000	1	Return pipe
33	0007-2502-750	1	Gasket 12/3
34	2315-1348-000	1	Oil return housing
35	0019-2112-300	2	Countersunk screw DIN 963 - M 8x16
36	0019-3249-300	3	Countersunk oval-head screw DIN 964 - M 6x12
37	0004-5346-740	1	Gasket 70/110x1
-	0001-0007-300	1	Sight glass assembly (38a-d)
38a	0001-0021-300	1	Sight glass frame
38b	0004-5041-740	2	Gasket 48/57x1
38c	0001-0046-820	1	Sight glass
38d	0019-1620-300	1	Threaded ring
39	3190-1006-000	1	Lower section of frame, complete
39a	2315-3377-000	1	Bearing bush (contained in pos. 39)
40	0019-6610-150	8	Hex head screw DIN 931 - M 16x70 - 8.8
41	0026-1330-190	8	Lock washer DIN 127 - A 16
42	1182-1005-000	1	Upper section of frame
-	1182-1124-000	1	Flange
-	0004-2449-770	1	Gasket 198/246x0.3
-	0019-6971-150	8	Hex head screw DIN 933 - M 12x35 - 8.8
-	0019-1329-000	1	Threaded pin M 10x24 - 4.6
43a	0026-1348-400	3	Washer DIN 125 - 10.5
43b	0026-1337-300	3	Lock washer DIN 127 - B10
43c	0019-6937-400	3	Hex head screw DIN 933 - M 10x30
44a	0026-1371-030	5	Washer DIN 127 - 13
44b	0026-1328-190	3	Lock washer DIN 127 - A12
44c	0013-0280-150	2	Hexagon nut DIN 934 - M12 - 8
44d	0019-6536-150	2	Hex head screw DIN 931 - M 12x50 - 8.8
44f	0019-6966-150	1	Hex head screw DIN 933 - M 12x20 - 8.8
45	5970-4010-000	1	Geared motor
46	1182-3498-000	1	Toothed wheel
47a	0026-5500-400	1	Washer
47b	0026-1337-300	1	Lock washer DIN 127 - B 10
47c	0019-6929-400	1	Hex head screw DIN 933 - M 10x10
48	1182-1029-010	1	Bracket
49	0019-7103-150	1	Hex head screw DIN 933 - M 20x35 - 8.8
50	0026-1667-030	1	Centering disc
-	1079-3355-000	1	V-belt pulley assembly (51a-d)
51a	0019-6175-150	4	Allen screw DIN 912 - M 12x80 - 8.8
51b	0026-1328-190	4	Lock washer DIN 127 - A 12
51c	1079-3371-000	1	Brake pulley
51d	1079-3354-000	1	V-belt pulley
52	0021-4492-800	1	Set of V-belts DIN 7753 - SPA 2150, 5 V-belts
-	1182-1204-010	1	Connection piece, complete (53a-n)
53a	0001-0292-400	1	Pressure gauge
53c	0018-4646-300	1	Threaded connection R 3/4" / R 1/2"
53d	0018-1312-640	1	Straight-way valve DIN 3512 - 1/2"
53e	0018-1788-300	1	Reducing nipple 1/2"/3/8"
53f	1182-2260-000	1	T-piece
53g	1182-1203-000	1	Connection piece
53h	0018-4645-300	3	Threaded connection R3/4" / R3/8"
53k	0018-1843-400	2	Hose connection 10
53m	0013-2818-400	2	Hexagon coupling nut R 3/4"
53n	0007-2184-750	3	Gasket 15/22x3
53p	0018-1365-690	1	Relief pressure valve 1/2"
54	0019-2272-400	2	Cheese-head screw DIN 84 - AM 8x45
55	1182-1159-000	1	Cowling

for item no. 42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concentrate collector with
scraper-blade equipment
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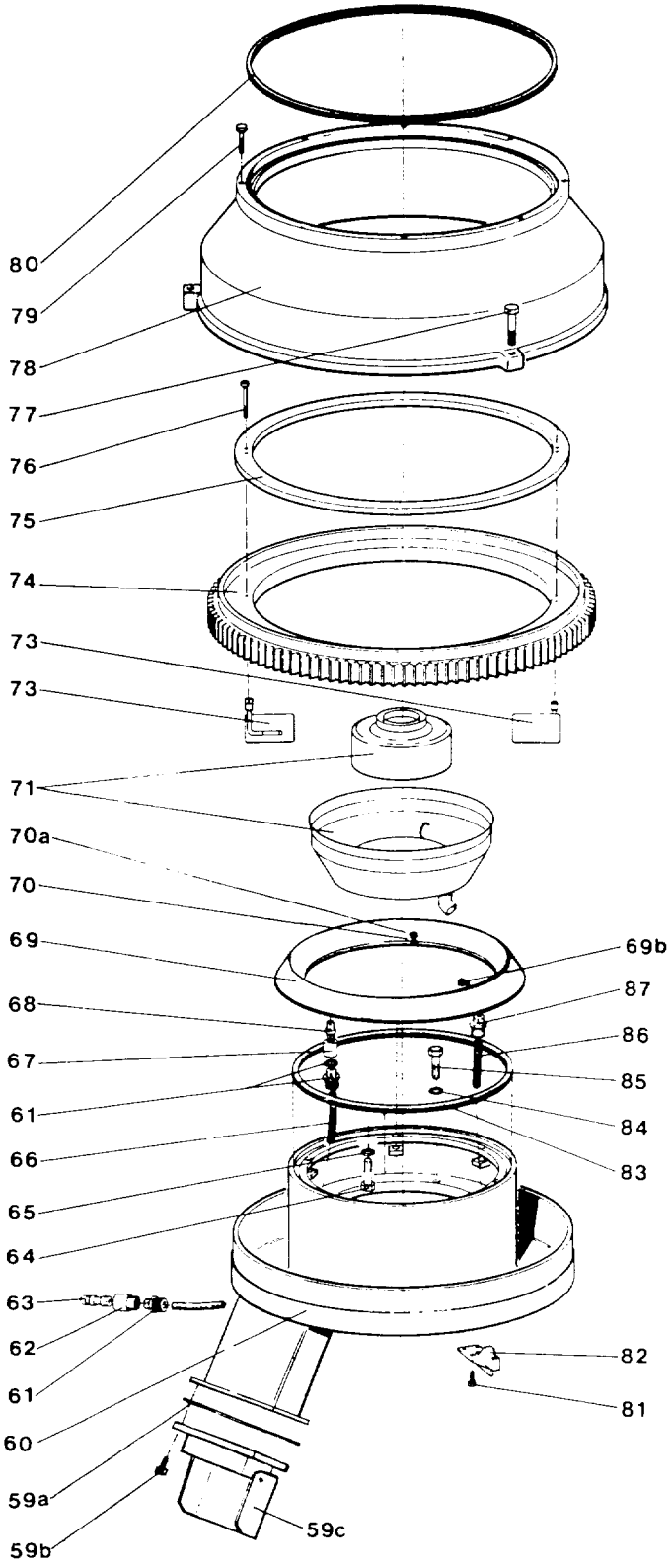
Fig. 13

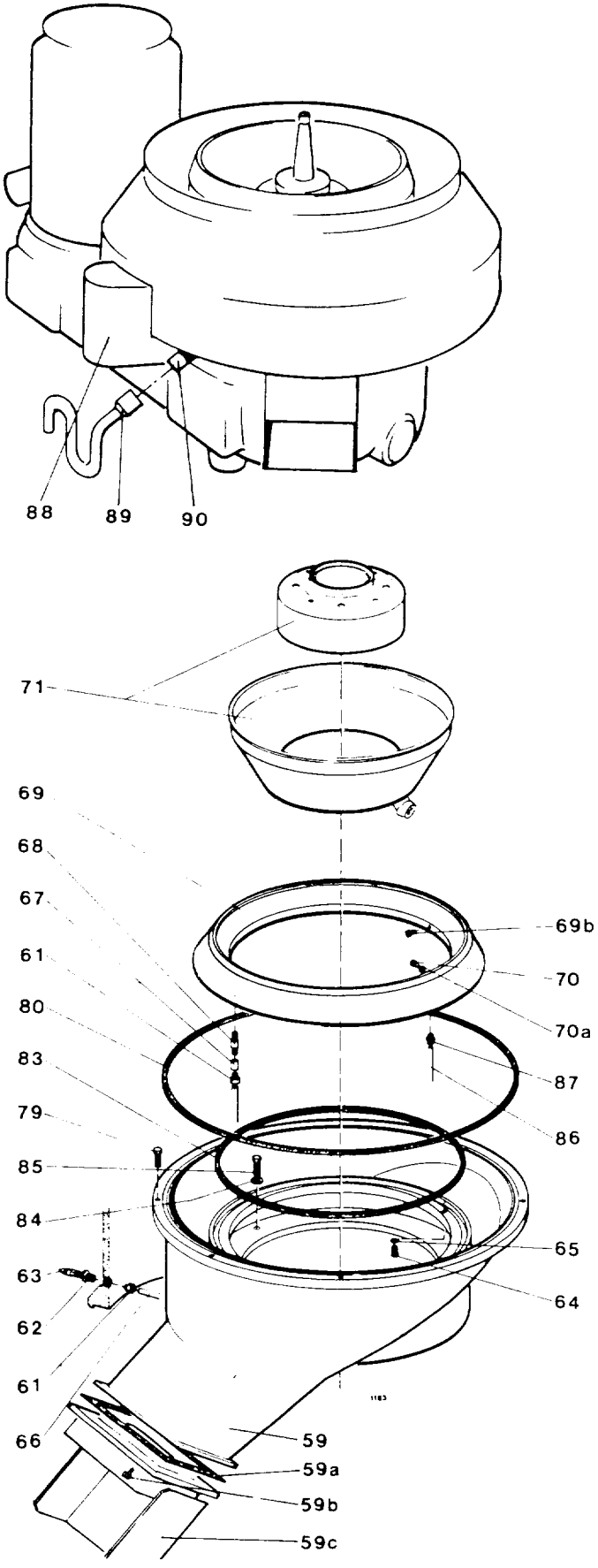
No. in Fig.	Part - No. Design I Concentrate collector with scraper-blade equipment	Part - No. Design II Concentrate collector with steep chute	Qty.	Part Description
59	-	1183-1018-000	1	Concentrate collector
59a	0004-2865-840	0004-2865-840	1	Gasket 174x369x2
59b	0019-6901-400	0019-6901-400	20	Hex head screw DIN 933 - M 8x16
59c	1182-1226-000	1182-1226-000	1	Chute
60	1182-1018-030	-	1	Concentrate collector
61	0018-4236-600	0018-4236-600	4	Threaded connection R 1/4"
62	0018-0839-300	0018-0839-300	2	Reducing coupling R 3/8" - R 1/2"
63	0018-1805-400	0018-1805-400	2	Hose connection R 3/8"
64	0019-6537-150	0019-6537-150	6	Hex head screw DIN 933 - M 10x30 - 8.8
65	0026-1337-300	0026-1337-300	6	Lock washer DIN 127 - B 10
66	0018-0380-848	0018-0380-848	1	Pipe 8x1x1.0 m long
67	0018-0793-300	0018-0793-300	2	Reducing coupling 1/4" / M 12x1.5
68	0018-1779-300	0018-1779-300	2	Reducing nipple M 12x1.5 / M 10x1
69	1182-1068-010	1182-1068-010	1	Brake ring
69b	0019-6837-400	0019-6837-400	8	Hex head screw DIN 933 - M 6x8
70	3118-6710-070	3118-6710-070	1	Nozzle
70a	0004-5262-830	0004-5262-830	1	Gasket 6/10x2
71	1182-1496-000	1182-1496-000	1	Casing
73	1182-1245-000	-	4	Scraper blade
74	1182-1237-010	-	1	Drive ring
75	1182-1157-020	-	1	Ring
76	0019-6497-400	-	8	Hex head screw DIN 931 - M 8x55
77	0019-7039-400	-	3	Hex head screw DIN 933 - M 16x50
78	1182-8808-020	-	1	Lower hood
79	0019-6938-400	0019-6938-400	8	Hex head screw DIN 933 - M 10x35
80	0004-2365-758	0004-2365-758	1	Packing cord 10x10x2620
81	0019-6935-400	-	12	Hex head screw DIN 933 - M 10x25
82	1182-1145-000	-	3	Holder
83	0004-2365-758	0004-2365-758	1	Packing cord 10x10x1850
84	0026-1330-190	0026-1330-190	4	Lock washer DIN 127 - A16
85	0019-7038-150	0019-7038-150	4	Hex head screw DIN 933 - M 16x45
86	0018-0585-848	0018-0585-848	1	Pipe 6x1x600
87	0018-3724-880	0018-3724-880	2	Hose coupling R 1/8" /4x6
88	1182-1191-010	-	1	Protecting cover
-	0019-6841-400	-	4	Hex head screw DIN 933 - M 6x16 (for item 88)
89	1182-2776-000	1182-2776-000	1	Siphon
90	1182-1448-010	1182-1448-010	1	Pipe



Design I

Concentrate collector with scraper-blade equipment

Fig. 14/1a



Design II

Concentrate collector with steep chute

Fig. 14/1b

No. in Fig.	Part - No.	Qty.		Part Description
-	1182-7759-020	1		Hood, complete (91-100b)
91	0013-2818-400	2		Coupling nut R 3/4"
92	0018-1843-400	2		Hose connection
93	0007-2184-750	2		Gasket 15/22x3
94	1182-7765-020	1		Hood
95	0019-7328-400	4		Stud DIN 938 - M12x20
96	0013-0406-400	4		Cap nut DIN 1587 - M12
97	0007-2220-750	1		Gasket 66/74x4
98	1182-7213-000	1		Cover
99	0013-0405-400	2		Cap nut DIN 1587 - M10
100	3190-2775-000	1		Siphon, complete
100a	0013-2570-300	1	*	Blind nut
100b	0004-5048-740	1	*	Gasket 55/70x2
100c	0007-2211-750	1		Gasket DIN 11851 - G50

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

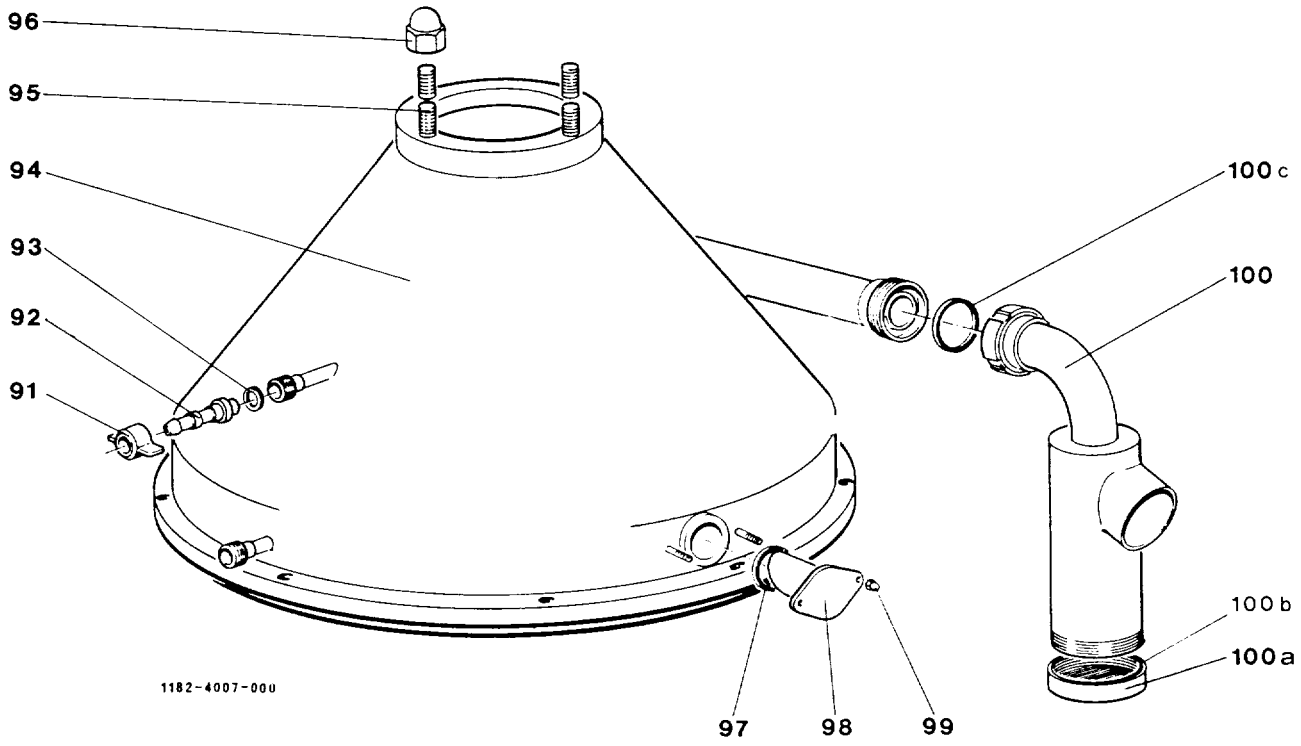


Fig. 14/2

No. in Fig.	Part - No.	Qty.	Part Description
101	0013-2844-300	1	Grooved coupling nut DIN 11851 - F 40
102	0018-3949-300	1	Cone connection DIN 11851 - D40
-	1184-2296-000	1	Feed and discharge connections (103-122)
103	0007-2210-750	3	Gasket DIN 11851 - G40
104	8021-2100-090	1	Flowmeter (for components refer to page 15/3)
105	0018-3613-400	1	Transition piece 50/40
106	0007-2211-750	4	Gasket DIN 11851 - G50
107	0001-0658-370	2	Ring
108	0007-1903-750	4	Gasket 40/5
109	0001-0096-820	2	Cylindrical sight glass
110	0001-0658-380	2	Sleeve
111	0001-0658-390	1	Cylindrical sight glass housing
112	0018-4547-300	1	Non-return valve 40
113	0018-4242-300	1	T-piece 50/40
114	0013-2845-300	1	Grooved coupling nut DIN 11851 - F50
115	0018-3955-300	1	Cone connection DIN 11851 - D50
116	8918-2100-040	1	Pressure gauge
-	1182-2290-000	1	Valve assembly (117-119d)
117	1182-2291-000	1	Valve housing
-	1182-2272-000	1	Valve cone assembly (118a-d)
118a	1182-2278-000	1	Valve cone
118b	0004-5720-840	1	Grooved ring 24/25
118c	1166-2268-000	1	Disk
118d	0026-2118-300	1	Snap ring
-	1166-2202-000	1	Adjusting screw assembly (119a-d)
119a	1166-2217-000	1	Guide ring
119b	0013-2844-300	1	Grooved coupling nut DIN 11851 - F40
119c	0013-0085-300	1	Knurled nut M 18x1.5
119d	1166-2276-000	1	Adjusting screw
-	0026-0057-850	1	Washer
-	0018-4675-400	1	Straight-way cock } for pos. 117
-	0007-2182-850	1	Gasket 20/26x3 } for pos. 117
120	0018-0513-300	1	Transition piece DIN 11890 - A 40 x B 50
121	1184-2285-000	1	Discharge
122	1170-2217-000	1	Ring
-	1184-2213-000	1	Single centripetal pump (125a-g)
125a	1184-2241-000	1	Lower centripetal pump
125b	0007-2929-750	1	Gasket 55.2/3
125c	0007-1943-750	1	Gasket 32.2/3
125d	1184-2246-000	1	Feed tube
125f	0007-2730-750	1	Gasket 46.2/3
125g	0007-2211-750	1	Gasket DIN 11851 - G50

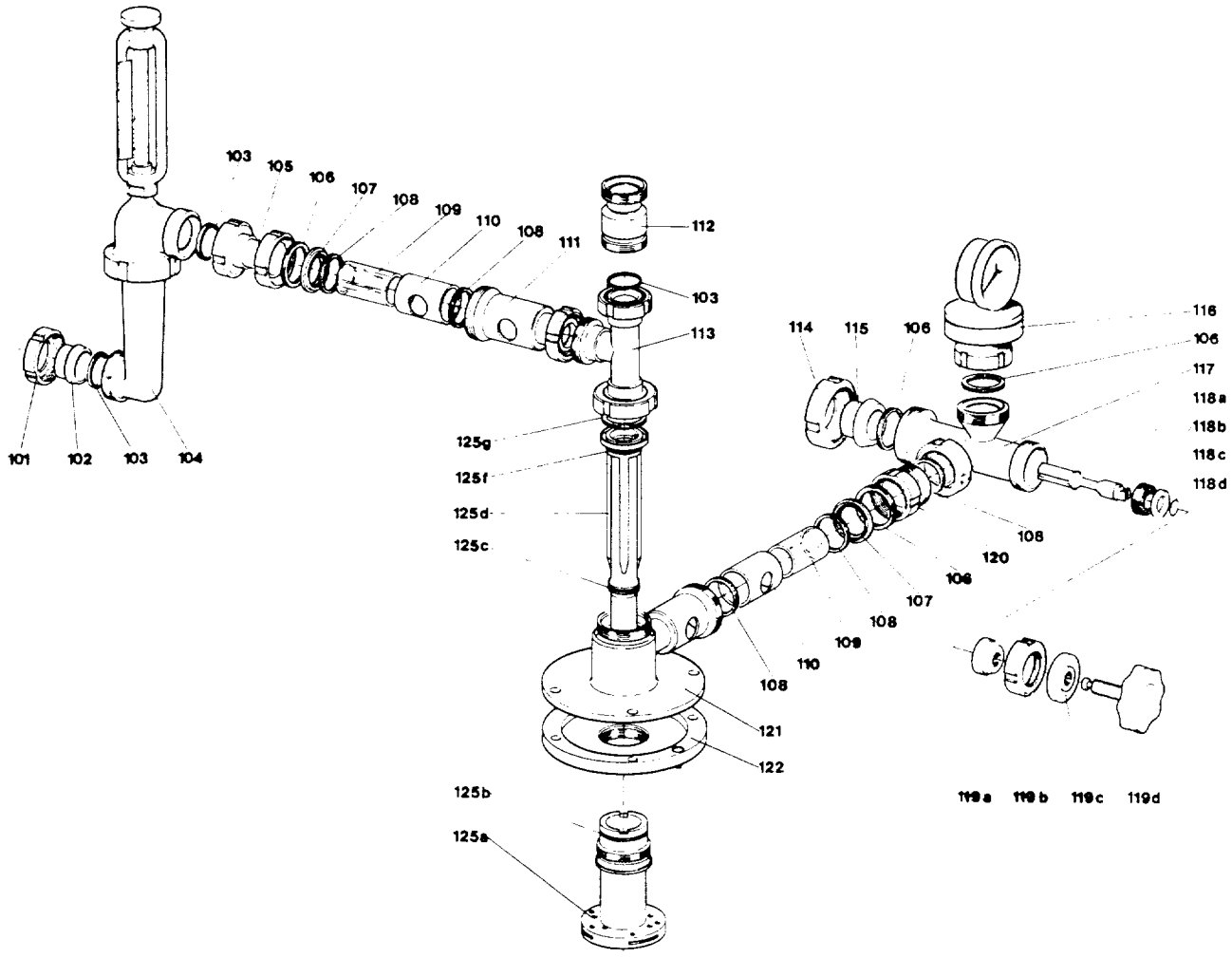

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Fig. 15/1

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

No. in Fig.	Part - No.	Qty.	Part Description
-	8021-2100-090	1	Flowmeter assembly (131a-u)
131a	0007-2210-750	2	Gasket 42/52x5
131b	0013-2846-300	1	Grooved coupling nut DIN 11851 - F65
131c	8021-2001-150	1	Inlet cup
131d	8021-2112-010	1	Float cone
131e	0007-2279-750	1	Gasket 56/68x6
131f	8021-2003-120	1	Outlet pipe
131g	0007-2298-750	2	Gasket 13.5/22x10
131h	0026-1375-300	1	Washer
131k	0013-3010-300	1	Nut M 35x1.5
131m	0019-1380-300	1	Threaded sleeve
131n	8020-2002-000	1	Intermediate piece
131p	0001-0083-820	1	Cylindrical sight glass
131r	0019-1732-400	1	Handle screw
131s	0019-2478-300	2	Cheese head screw DIN 85 - M 4x8
131t	0004-5261-720	2	Gasket 4.8/9x1
131u	8021-2117-000	1	Scale 2,000 - 10,000 litres/h

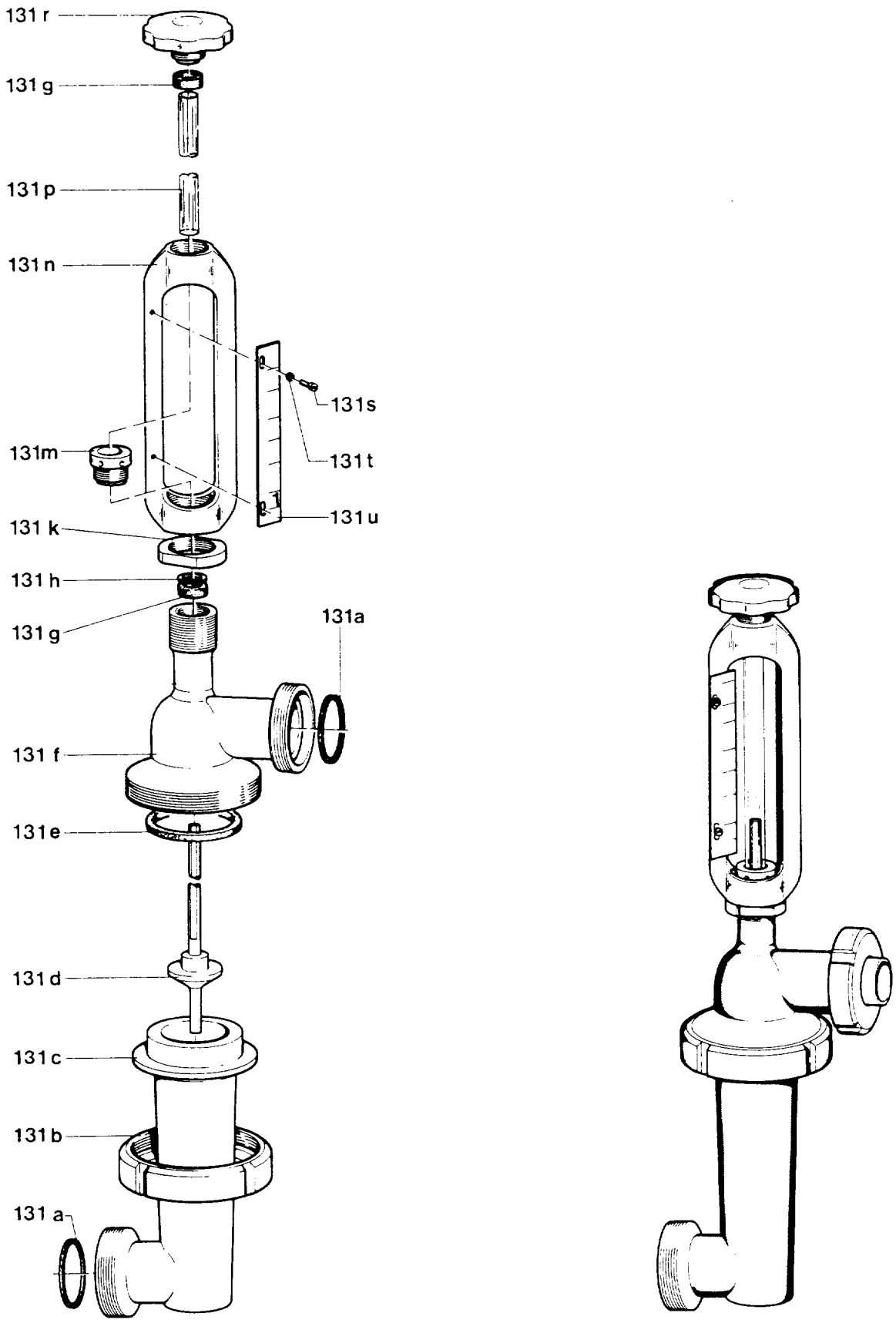
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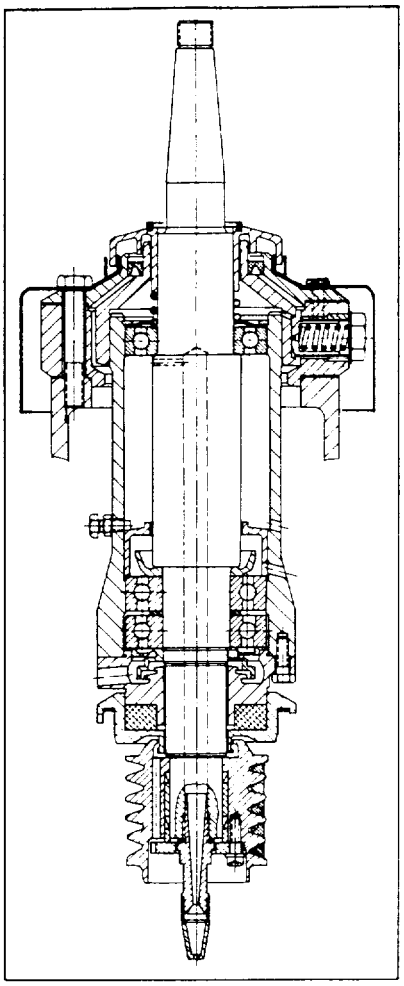
Fig. 15/2

No. in Fig.	Part - No.	Qty.	Part Description
-	3190-3429-000	1	Spindle assembly (151a-z)
151a	3190-3427-010	1	Lower part of suction pipe
151b	3157-3422-000	1	Upper part of suction pipe
151c	0004-1877-750	1	Gasket 22/29x3
151d	0019-6937-150	4	Hex head screw DIN 933 - M 10x30 - 8.8
151e	3157-3375-000	1	Bearing cover
151f	3157-3308-000	1	Threaded ring
151g	0019-8965-150	1	Threaded pin DIN 914 - AM 6x10 - 10.9
151h	3157-3419-000	1	Oil control ring
151i	0011-7311-100	1	Angular contact ball bearing DIN 628 - 7311/BM/P6
151k	0026-5801-000	1	Washer
151m	0011-6311-180	1	Grooved ball bearing DIN 625 - 6311 M/P63
151n	0008-6511-040	1	Oil slinger ring
151p	3157-3419-020	1	Ring
151q	3190-3411-000	1	Spindle
151r	0011-6213-180	1	Grooved ball bearing DIN 625 - 6213 MA/P63
151s	0019-5196-150	1	Hex head screw DIN 561 - AM 10x30 - 8.8
151t	0013-0279-150	1	Hexagon nut DIN 934 - M10 - 8
151u	3190-3131-000	1	Bearing housing
151w	0026-5845-170	1	Securing ring DIN 472 - 120x4
151x	0006-4309-160	1	Cylindrical pressure spring
151y	0008-6501-570	1	Spindle cap
151z	0007-2451-750	1	Gasket 68/74x3.5
152	0019-6146-150	3	Allen screw DIN 912 - M 10x35 - 8.8
153	0026-1337-190	3	Lock washer DIN 127 - A10
154	0026-2062-060	1	Clamp disc
155	0026-5971-060	1	Distance sleeve
156	0026-5983-060	2	Set of conical clamp rings
157	0026-5972-060	1	Distance sleeve
158	2315-3352-060	1	V-belt pulley
159	0004-5100-710	1	Gasket 138/157x1
160	1182-3435-000	1	Pressure ring
161	0021-3020-750	1	Rubber cushion
-	0008-6520-000	1	Neck bearing bridge assembly with covering (162-171)
162	0004-5478-770	1	Gasket 175/240x0.3
-	0008-6510-000	1	Neck bearing bridge assembly (163a-f)
163a	0008-6507-050	1	Neck bearing pressure ring
163b	0008-6506-050	1	Neck bearing bridge
163c	0026-5724-110	8	Spring piston
163d	0006-4240-080	1	Set of neck bearing springs
163f	0019-1426-150	8	Threaded plug
164	0004-2522-830	1	Sealing ring A 90x115x12
165	0004-5479-770	1	Gasket 185/260x0.3
166	0008-6502-050	1	Neck bearing protection cap
167	0016-5723-030	4	Washer
169	0019-6519-400	4	Hex head screw DIN 931 - M 10x75
170	0004-5925-800	4	Gasket M16
171	0019-6616-400	4	Hex head screw DIN 931 - M 16x100
175	see item 71, page 14/1	1	Casing



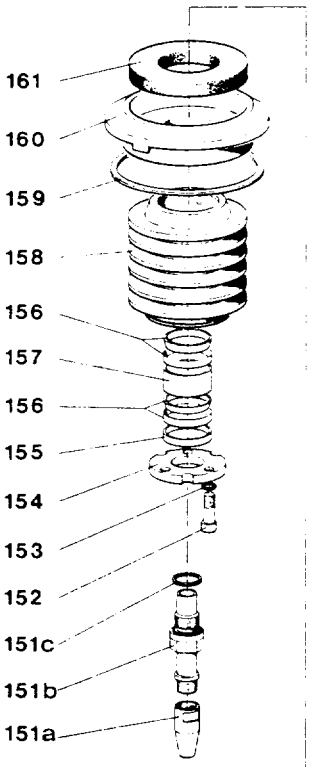

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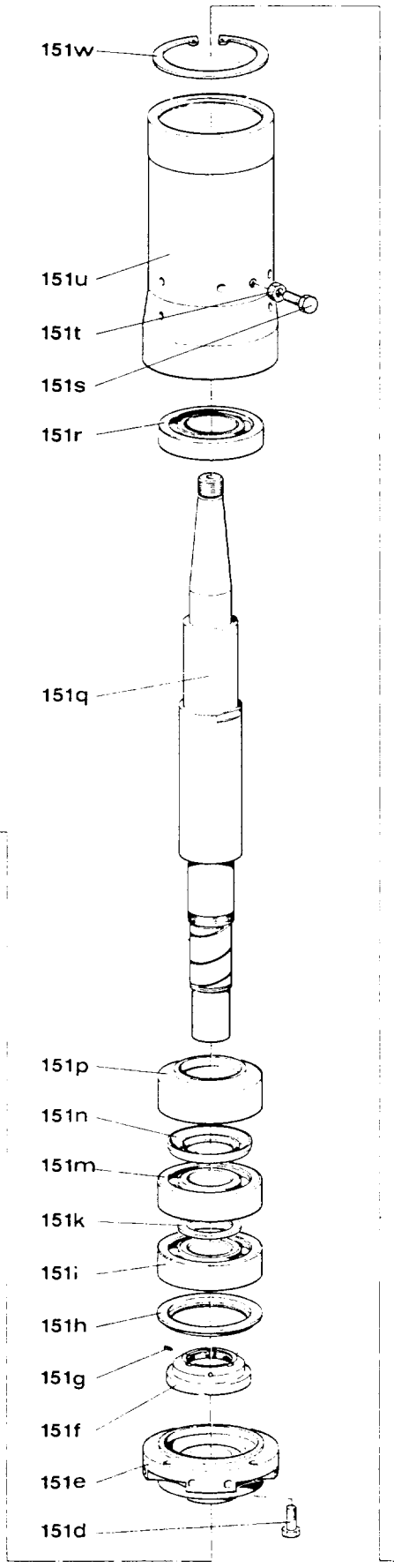
Fig. 17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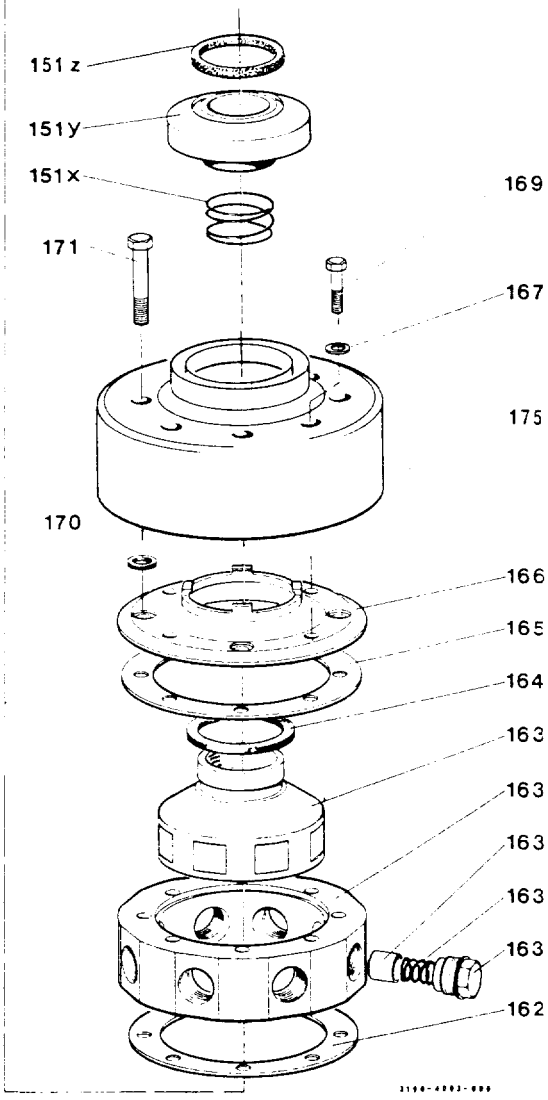
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No. in Fig.	Part - No.	Qty.		Part Description
-	1184-6600-000	1		Bowl, complete (251-267)
251	1184-6604-000	1	*	Bowl bottom, complete
251a	0028-7366-400	1	+)	Guide bar
251b	0019-0347-400	2	+)	Countersunk screw M 4.5x8
252	1182-6710-L	8		Nozzle, complete (state diameter)
252a	0007-2505-750	24	+)	Gasket 13.3/2.4
253	0007-2194-750	1		Gasket 465/9
254	3122-6631-020	1	*	Lock ring
-	1182-6660-050	1		Set of discs (255a-c)
255a	3190-6662-030	1		Bottom disc
255b	3190-6663-020	58		Disc
-	1182-6663-010	3		Compensating disc (1,5 mm spacers)
255c	3190-6663-000	5		Disc (without rim)
256	0007-1905-830	1		Gasket 45/4
257	0019-0743-400	1		Threaded sleeve
258	1182-6620-000	1	*	Distributor
259	1184-6610-000	1	*	Bowl top
260	0007-2133-750	1		Gasket 140/152x4
261	1072-6631-070	1		Lock ring
262	1184-6642-000	1		Centripetal pump chamber cover
263	1184-6715-000	1	*	Segment-holding insert
264	0007-2846-700	2		Gasket 312x8
265	0019-1346-300	1		Spindle screw
266	0007-2152-830	1		Gasket 12/18x3
267	0019-0378-300	1		Spindle screw

For thermo quark production:

-	1182-6660-040	1		Set of discs (255a-c)
255a	3190-6662-030	1		Bottom disc
255b	3190-6663-020	30		Disc (punched)
-	3190-6663-030	30		Disc (slotted)
255c	3190-6663-000	5		Disc (without rim)

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

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

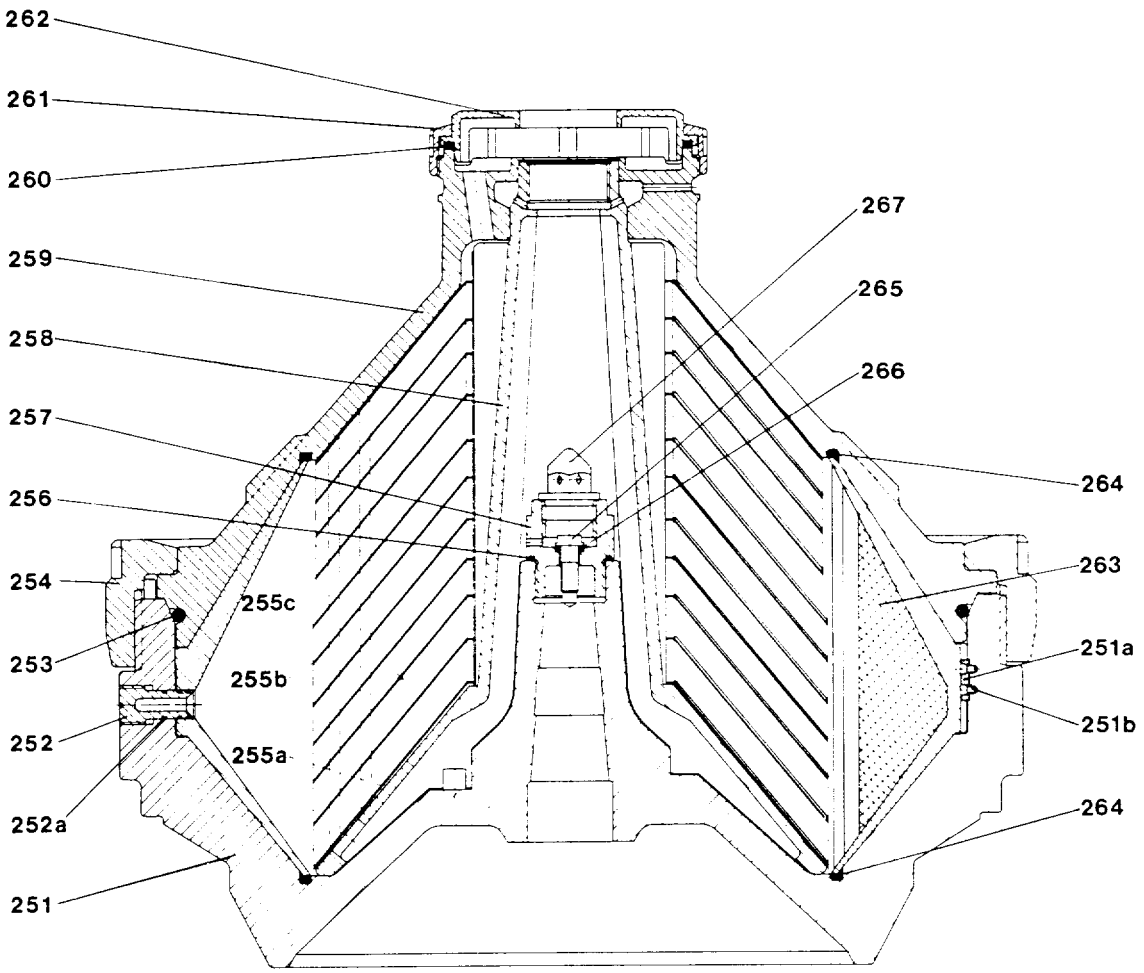
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Fig. 19

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	0003-4202-320	1	Double-ended wrench DIN 3110 - 10x13
-	0003-4205-320	1	Double-ended wrench DIN 3110 - 17x19
-	0003-4208-320	1	Double-ended wrench DIN 3110 - 22x27
-	0003-4209-320	1	Double-ended wrench DIN 3110 - 24x30
402	0003-4189-000	1	Nozzle wrench
403	0003-3776-320	1	Allen wrench DIN 911 - 6
-	0003-3778-320	1	Allen wrench DIN 911 - 10
404	0004-0420-000	1	Needle holder (1 package of needles for nozzles, 3157-9818-000)
405	0003-4171-030	1	Socket wrench 16 (for spindle screw)
406	3157-9862-000	1	Lifting device for spindle
407	0003-4215-110	1	Single-ended wrench 48.3
-	0003-4225-110	1	Single-ended wrench DIN 894 - 75
408	0003-4296-110	1	Wrench 41
409	0019-5384-000	4	Eye bolt DIN 580 - M16 (for transport)
411	0003-0161-010	1	Oil funnel
412	0003-0277-800	1	Oil cup
413	0003-0296-000	1	Splash cover
414	0003-0210-950	1	Scraper 25
415	0003-0211-950	1	Scraper 70
416	0003-4636-050	1	Screwdriver 5x125
-	0003-4637-050	1	Screwdriver 8x150
417	0003-4544-960	1	Cylindrical brush 15x85x285
-	0003-4551-800	1	Cylindrical brush 20x100x800
-	0003-4681-960	1	Cylindrical brush 40x120x500
-	0003-4552-960	1	Cylindrical brush 45x110x270
418	0003-4690-960	1	Brush 35x125x285
419	0003-4695-960	1	Brush 70x100x500
420	0003-0200-000	1	Mallet
421	0003-4195-030	1	Wrench (for spindle screw)
422	3190-9930-010	1	Jack (for bowl bottom)
423	1088-9840-020	1	Jack (for bowl top)
424	1184-9820-000	1	Hydraulic disc stack compressing device (424a-d)
424a	1183-9851-000	1	Threaded ring
424b	1167-9770-000	1	Hydraulic unit
424c	1183-9939-000	1	Disc
424d	1184-9877-000	1	Bolt
425	3230-9985-010	1	Lifting device (for lower hood)
426	3121-9970-000	1	Jack (for distributor)
427	0003-4137-030	1	Wrench (for feed tube)
428	0003-4064-030	1	Annular wrench (for large lock ring)
429	0003-3992-000	1	Annular wrench (for small lock ring)
430	1165-9840-010	1	Lifting device (for hood)
431	3190-9985-000	1	Lifting device (for segment-holding insert)
432	0003-0145-000	1	Wrench (for centripetal pump)
-	0018-3816-300	6	Hose clamp 8 - 22
-	0018-4230-400	1	Connecting piece 50
-	7028-2865-038	3	Hose 13/21x3000
-	0015-0080-000	4	2.5-litre can of lubricating oil CL 46 or HL 46
-	0015-0113-010	1	75-gramme tube of special lubricating paste
-	0018-3908-300	1	Throttle valve (for product feed)
-	0007-2927-750	1	Gasket 50.2/3 (for throttle valve)

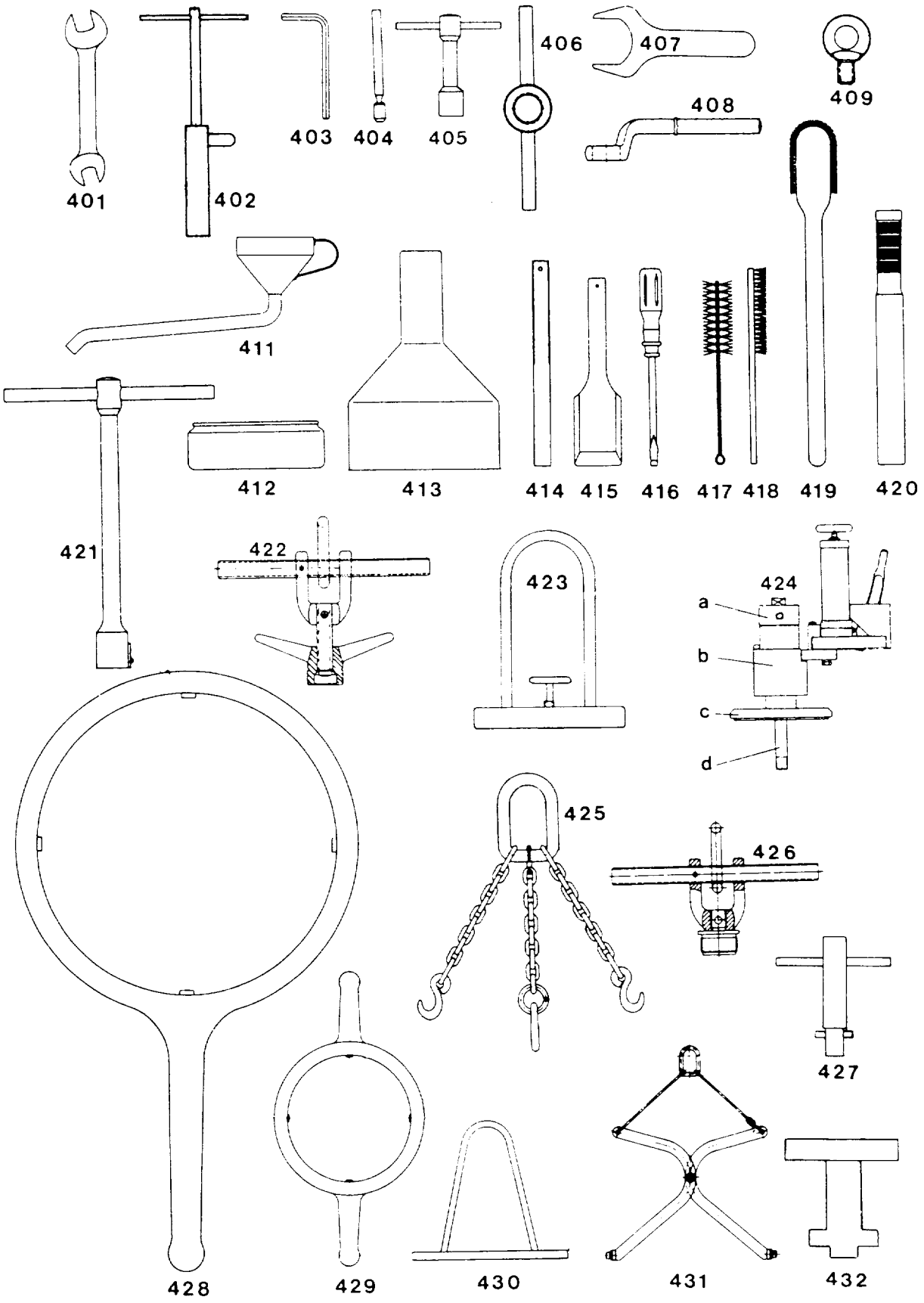
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Fig. 20

ADDITIONAL EQUIPMENT

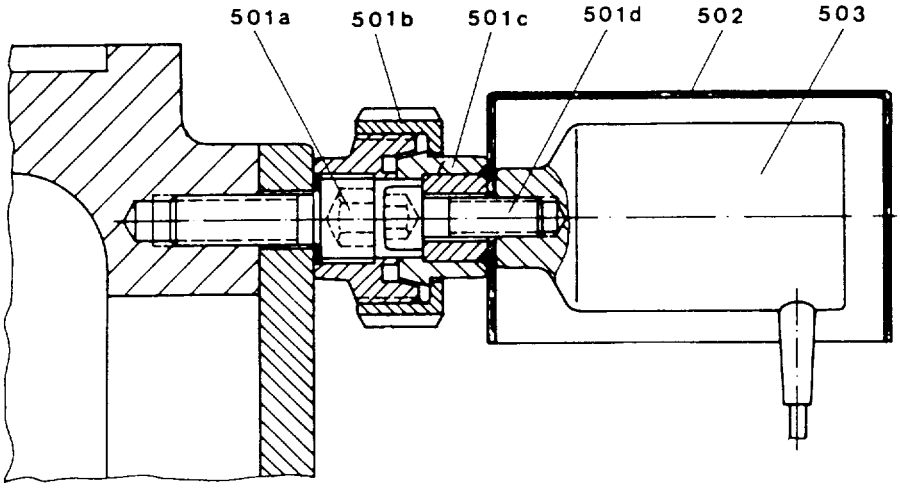


Fig. 21

No. in Fig.	Part - No.	Qty.	Part Description
-	8290-2165-010	1	Connection piece, complete (501a-d)
501a	8290-2164-000	1	Connection piece
501b	0013-2840-400	1	Grooved coupling nut DIN 11851 - M 15
501c	0018-4177-300	1	Cone connection 15
501d	0019-6124-400	1	Allen screw DIN 912 - M 8x25
502	8290-2191-020	1	Protecting sheet
503	0005-3412-000	1	Vibration pick-up

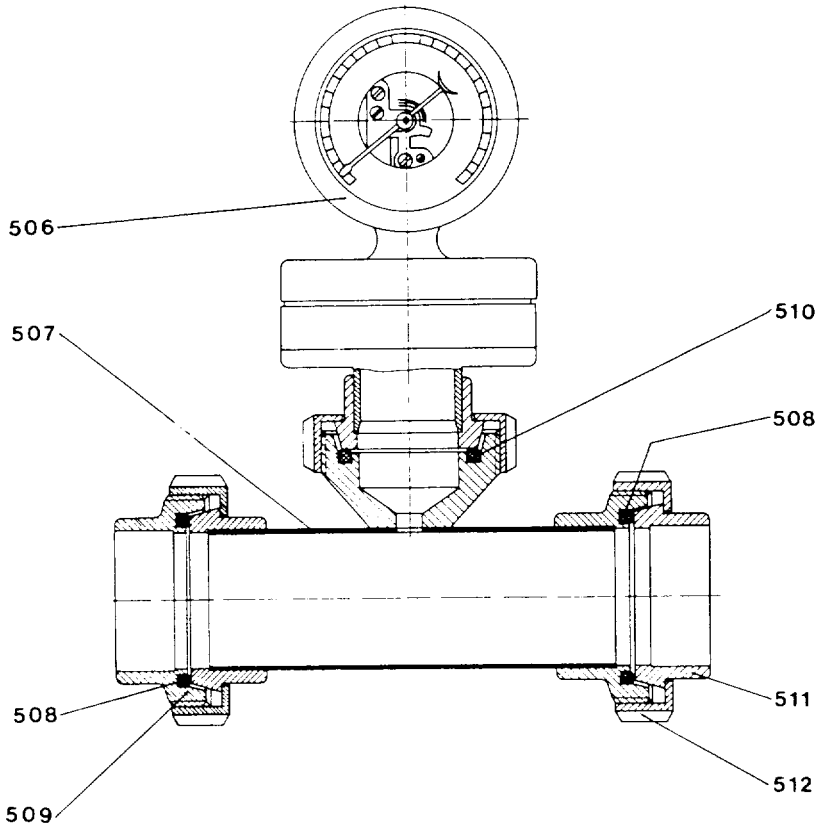
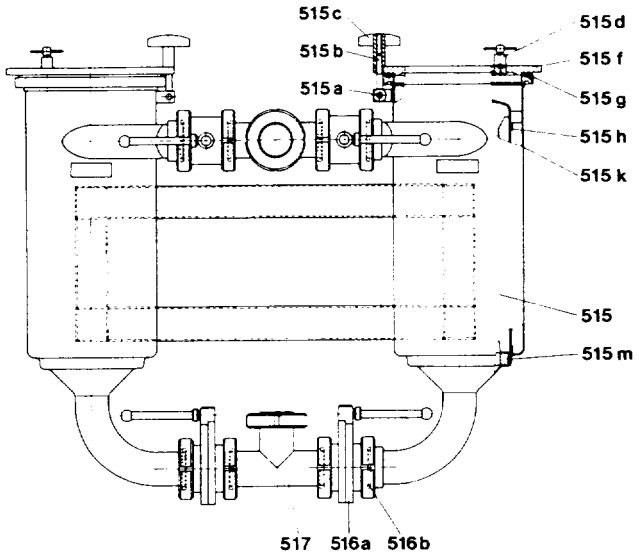


Fig. 22

No. in Fig.	Part - No.	Qty.	Part Description
506	8918-2100-040	1	Pressure gauge (7 bar)
507	0018-4230-400	1	Connecting pipe
508	0007-2211-750	2	Gasket DIN 11851 - G 50
509	0018-4119-400	1	Threaded connection DIN 11851 - C 50
510	0007-2210-750	1	Gasket DIN 11851 - G 40
511	0018-3955-400	1	Cone connection DIN 11851 - D 50
512	0013-2845-400	1	Grooved coupling nut DIN 11851 - F 50



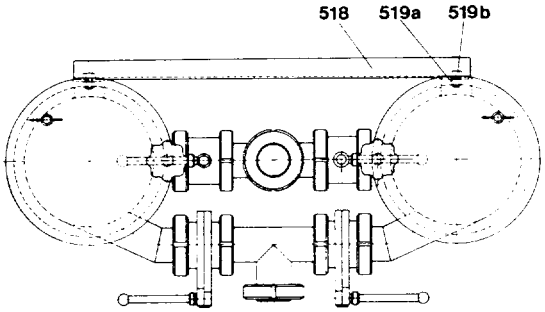


Fig. 23a

No. in Fig.	Part - No.	Qty.		Part Description
-	8200-7000-090	1		Double strainer, complete (515-519b)
515	8200-7700-140	1		Strainer, cpl., **right-hand side**
-	8200-7700-130	1		Strainer, cpl., **left-hand side**
515a	0026-1102-400	8	*	Cylindrical pin
515b	0019-1363-300	8	*	Eye bolt
515c	0021-3092-300	8	*	Handle
515d	0019-1301-400	2	*	Handle screw
515f	8200-7773-020	2	*	Cover
515g	0007-2457-750	2	*	Gasket 200/216x8
515h	8200-7720-060	1	*	Screen insert
515k	8200-7740-070	1	*	Strainer, **right-hand side**
-	8200-7740-060	1	*	Strainer, **left-hand side**
515m	0007-2080-750	2	*	Gasket 130/7
516a	0018-2827-400	4		Butterfly valve 50
516b	0007-2211-750	8		Gasket DIN 11851 - G50
517	0018-4252-400	2		T-piece DIN 11852 - SG50
518	8200-7013-010	2		Bracket
519a	0013-0280-400	4		Hexagon nut DIN 934 - M12
519b	0019-6968-300	4		Hex head screw DIN 933 - M 12x25

* This part is included in strainer 515 (right-hand and left-hand side), but it is also available as separate item.

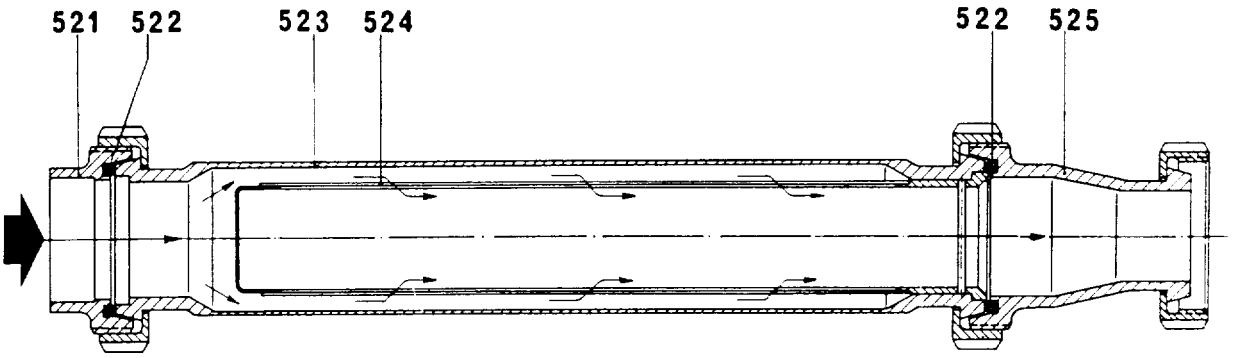


Fig. 23b

No. in Fig.	Part - No.			Qty.	Part Description
	30 meshes/1"	50 meshes/1"	70 meshes/1"		
-	3157-2330-000	3157-2330-010	3157-2330-030	1	Tubular strainer, complete (521-525)
521	0018-4119-300	0018-4119-300	0018-4119-300	1	Threaded connection DIN 11851 - C50
522	0007-2211-750	0007-2211-750	0007-2211-750	2	Gasket DIN 11851 - G50
523	3157-2331-000	3157-2331-000	3157-2331-000	1	Housing
524	3157-2332-010	3157-2332-020	3157-2332-030	1	Strainer
525	0018-0515-300	0018-0515-300	0018-0515-300	1	Reducing socket DIN 11890 - A 50x40

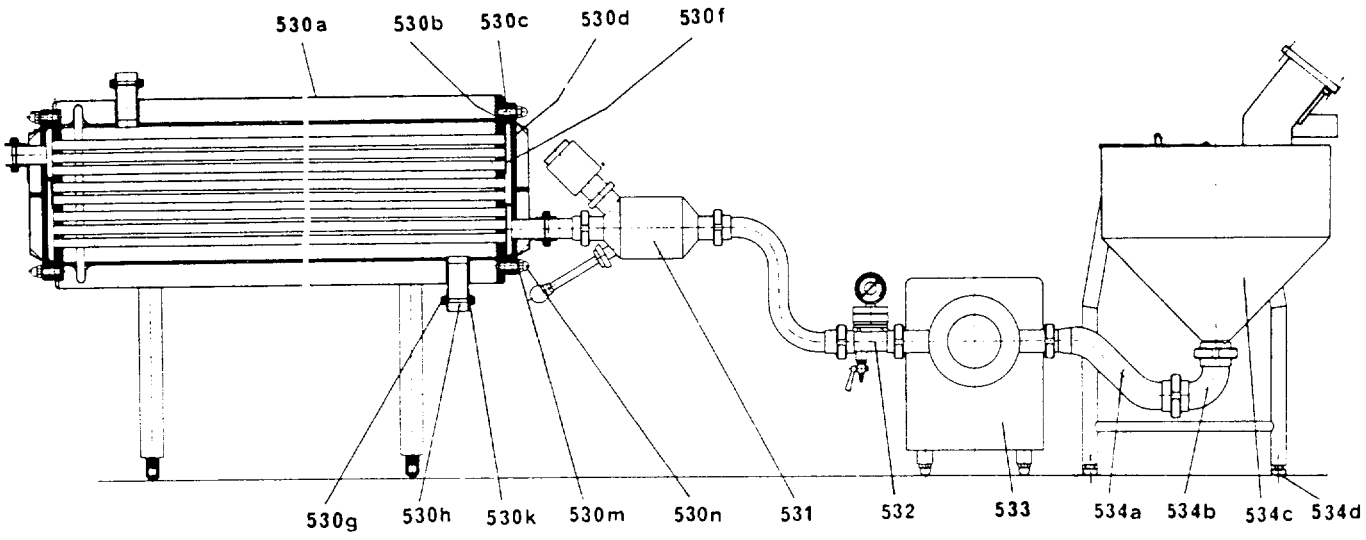


Fig. 24

No. in Fig.	Part - No.	Qty.	Part Description
-	8244-2100-010	1	Quark cooler, complete (530a-n)
530a	8244-2110-000	1	Quark cooler
530b	0004-5170-840	2	Gasket 342/366x6
530c	0019-7727-400	28	Stud M16x45
530d	8244-2354-000	2	Cover
530f	8244-2504-L	1	Perforated plate
530g	0013-2845-300	4	Grooved coupling nut DIN 11851 - F50
530h	0018-3955-300	4	Cone connection DIN 11851 - D50
530k	0007-2211-750	4	Gasket DIN 11851 - G50
530m	0026-2382-400	28	Washer 16.5x29.5x4
530n	0013-0408-400	28	Cap nut DIN 1587 - M16
-	0019-4936-400	8	Threaded pin DIN 551 - M 16x20
-	0013-0276-400	8	Hexagon nut DIN 934 - M6
531	8230-2100-L	1	Moisture meter
532	see page 25	1	Feed line
533		1	Positive displacement pump (depending on order)
-	1182-1703-000	1	Quark funnel, complete (534a-d)
534a	8235-2196-040	1	Bend
534b	8235-2196-020	1	Bend
534c	1182-1702-000	1	Quark funnel
-	0007-2212-750	2	Gasket DIN 11851 - G65
-	1182-1160-000	1	Flap
-	1182-1061-020	1	Cover
-	0004-5623-840	1	Gasket 134x314x3
-	1182-1094-000	1	Connecting piece
-	0026-1005-300	2	Splint DIN 94 - 3.2x16
-	1182-1061-010	1	Cover
534d	8222-1106-000	3	Threaded bolt

IMPORTANT: The pipe connections to the suction side of the positive displacement pump must be free of stress and the unions must be absolutely tight, otherwise air might be sucked in, resulting in improper conveying of the quark (see also instruction manual for positive displacement pump).

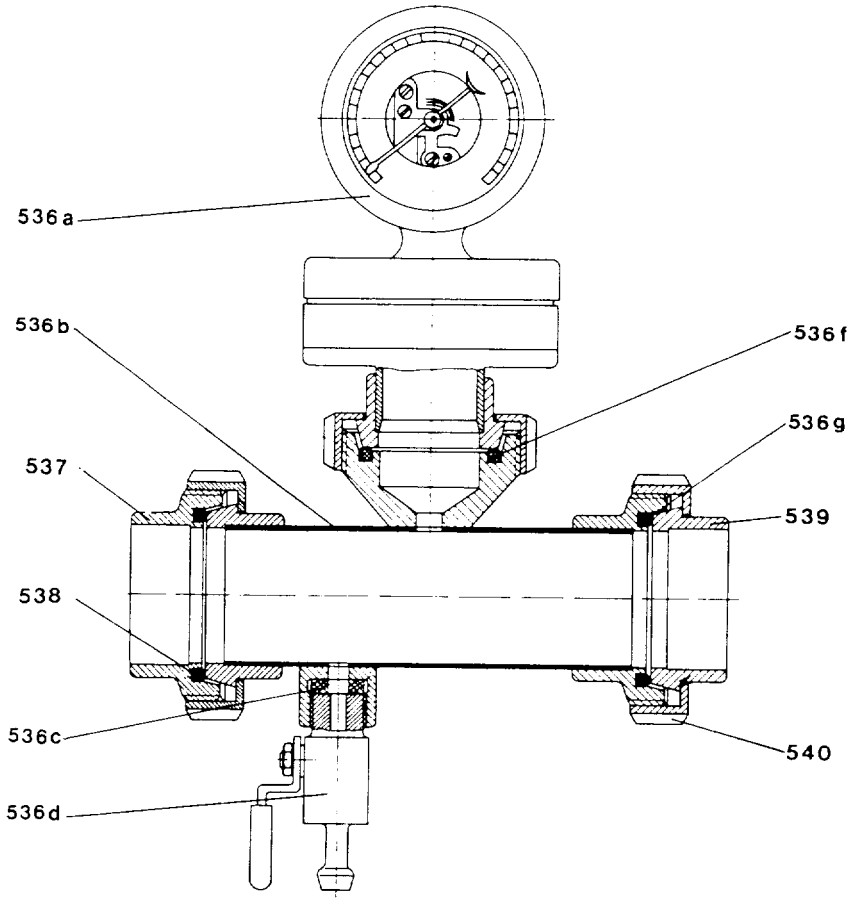


Fig. 25

No. in Fig.	Part - No.	Qty.	Part Description
-	8244-2215-000	1	Feed line, complete (536a-g)
536a	8918-2100-050	1	Pressure gauge (14 bar)
536b	0018-4231-400	1	Connecting pipe
536c	0004-5277-850	1	Gasket 19/26x1
536d	0018-1526-400	1	Hose cock
536f	0007-2210-750	1	Gasket DIN 11851 - G40
536g	0007-2211-750	1	Gasket DIN 11851 - G50
537	0018-4119-400	1	Threaded connection DIN 11851 - C50
538	0007-2211-750	1	Gasket DIN 11851 - G50
539	0018-3955-400	1	Cone connection DIN 11851 - D50
540	0013-2845-400	1	Grooved coupling nut DIN 11851 - F50

Air Gun and Deflector Cover for Cleaning the Quark Cooler

Maximum pressure of de-oiled compressed air: 8 bar

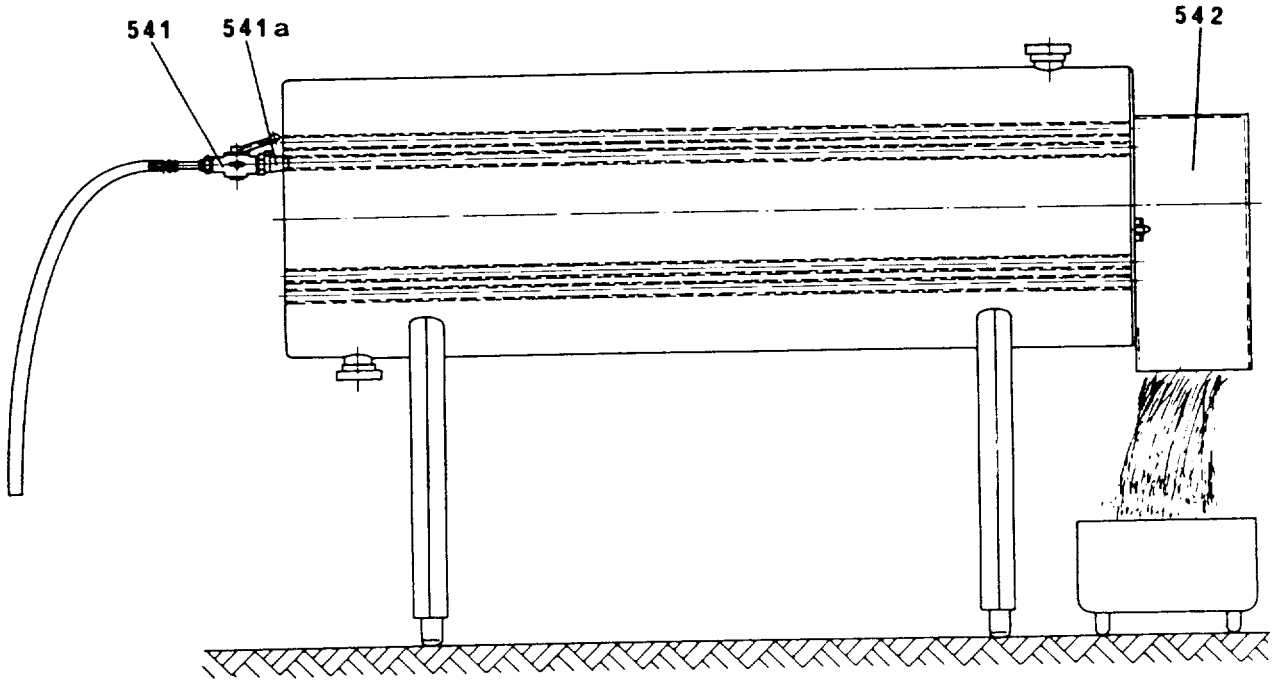


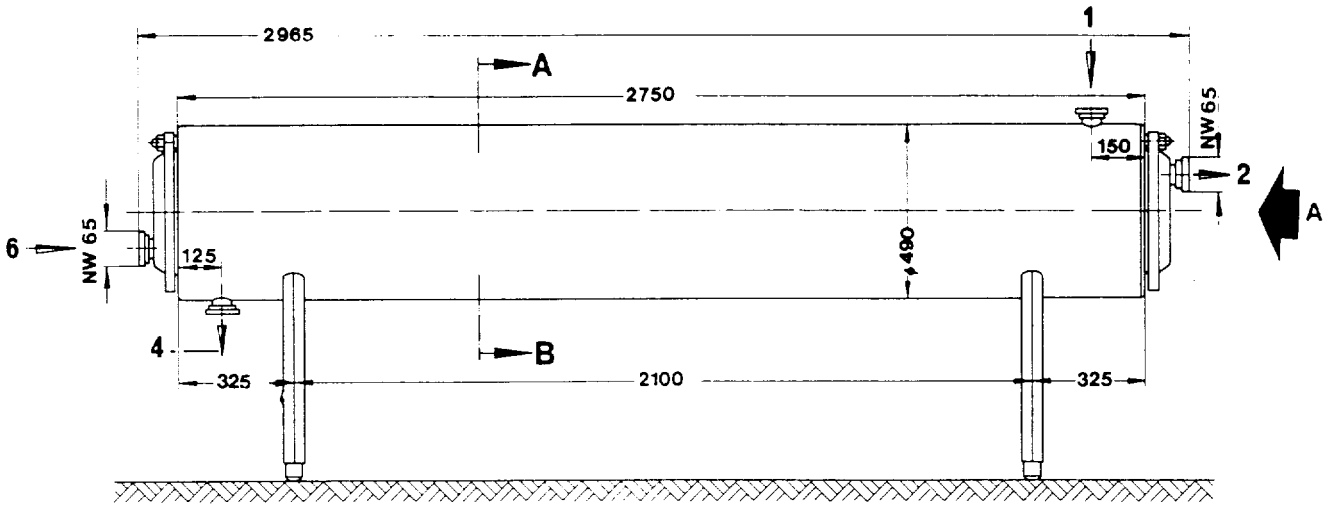
Fig. 26

No. in Fig.	Part - No.	Qty.		Part Description
541	8239-2200-000	1		Air gun, complete
541a	0003-3654-750	1	*	Rubber cone 24/20x45
542	8239-7765-000	1		Deflector cover

* This part is included in air gun No. 541, but it is also available as separate item.

Dimensioned Drawing for Quark Cooler,

type C 2000-3 and type C 2500-3

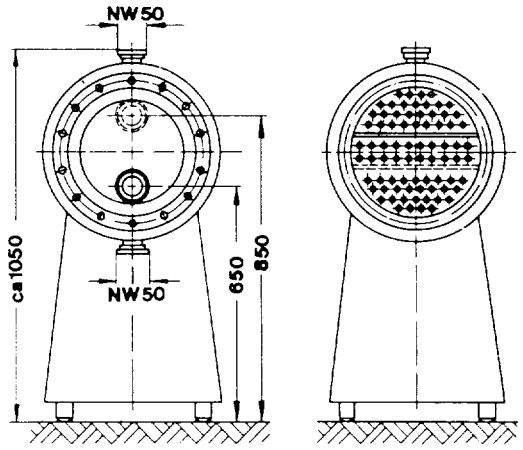


1 **Ice-water inlet**

2 **Quark outlet**

4 **Ice-water outlet**

6 **Quark inlet**



View A

Section A - B

Cooler (for CIP)	C 2000-3	C 2500-3
Coolant	Ice-water	Ice-water
Ice-water throughput	30,000 l/h	40,000 l/h
Ice-water temperature	+ 0.5 up to + 1 °C	+ 0.5 up to + 1 °C
Quark capacity	1,500 kg/h	2,200 kg/h
Flow resistance	6 - 8 bar	8 - 9 bar
Quark holding capacity	ca. 82 kg	ca. 76 kg
Length of cooling pipe	2,750 mm	2,750 mm
Number of pipes	76	138
Diameter of pipes	23/25 mm	16/18 mm
Insulating cover: Polyurethan	60 - 70 mm	60 - 70 mm
Net weight of cooler	558 kg	558 kg
Throughput of cleaning agent	at least 11,000 l/h	at least 11,000 l/h
Cooling surface	14 m^2	20 m^2
Cooling capacity	from 38 °C down to 6 - 8 °C	from 38 °C down to 6 - 8 °C

GEA

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