ALFA-LAVAL

Instruction book

Separator

(S) 2081 - 2181 MRT

In letters, telegrams, telex messages and calls state type and manufacturing No. of the machine.

Unless the manufacturing No. has been filled in on this page, the book serves purposes of general information only and neither part Nos. nor operating instructions are unreservedly applicable.

Manufacturing number: S 2181 M

2909263

Book No.: S89800E

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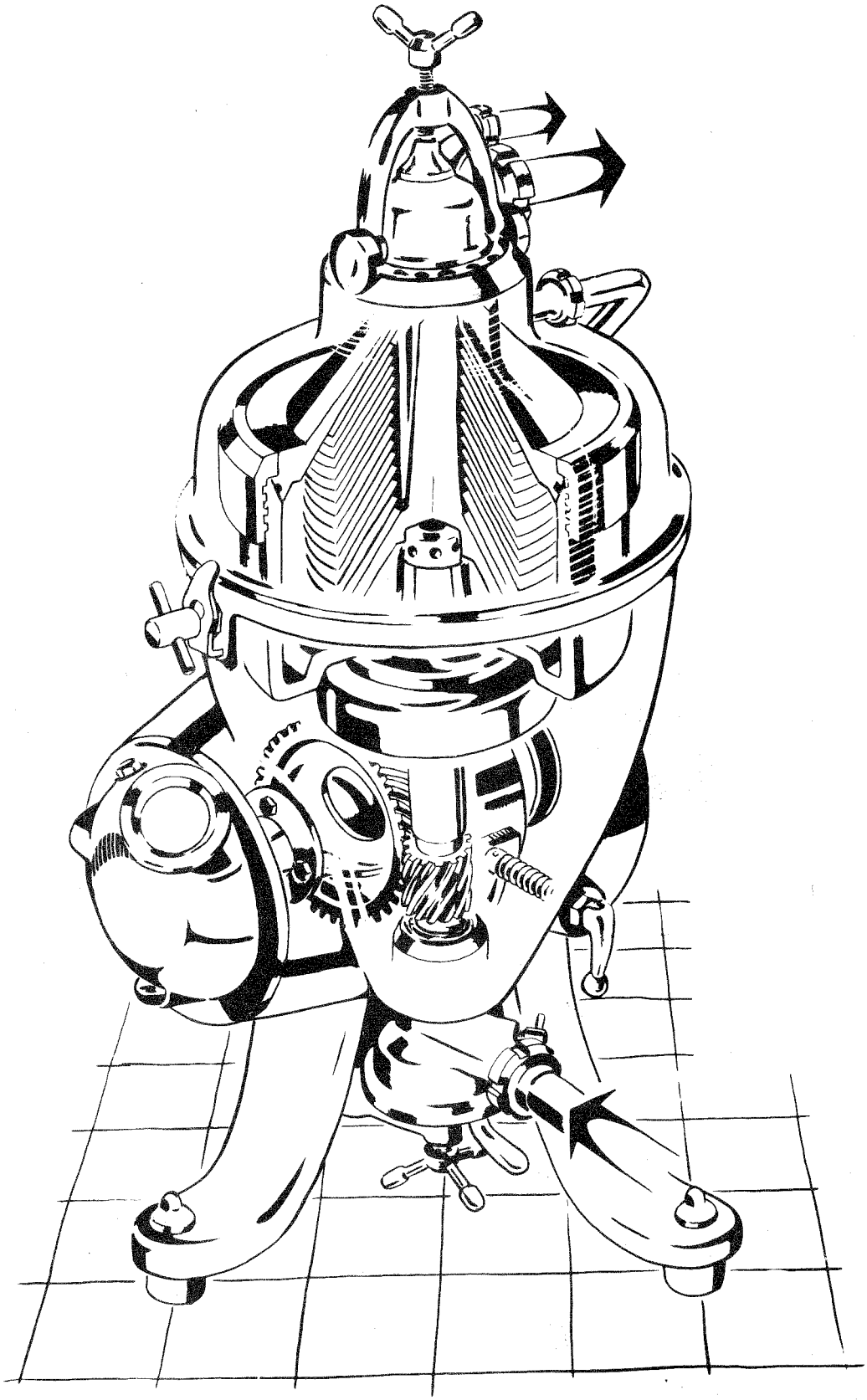
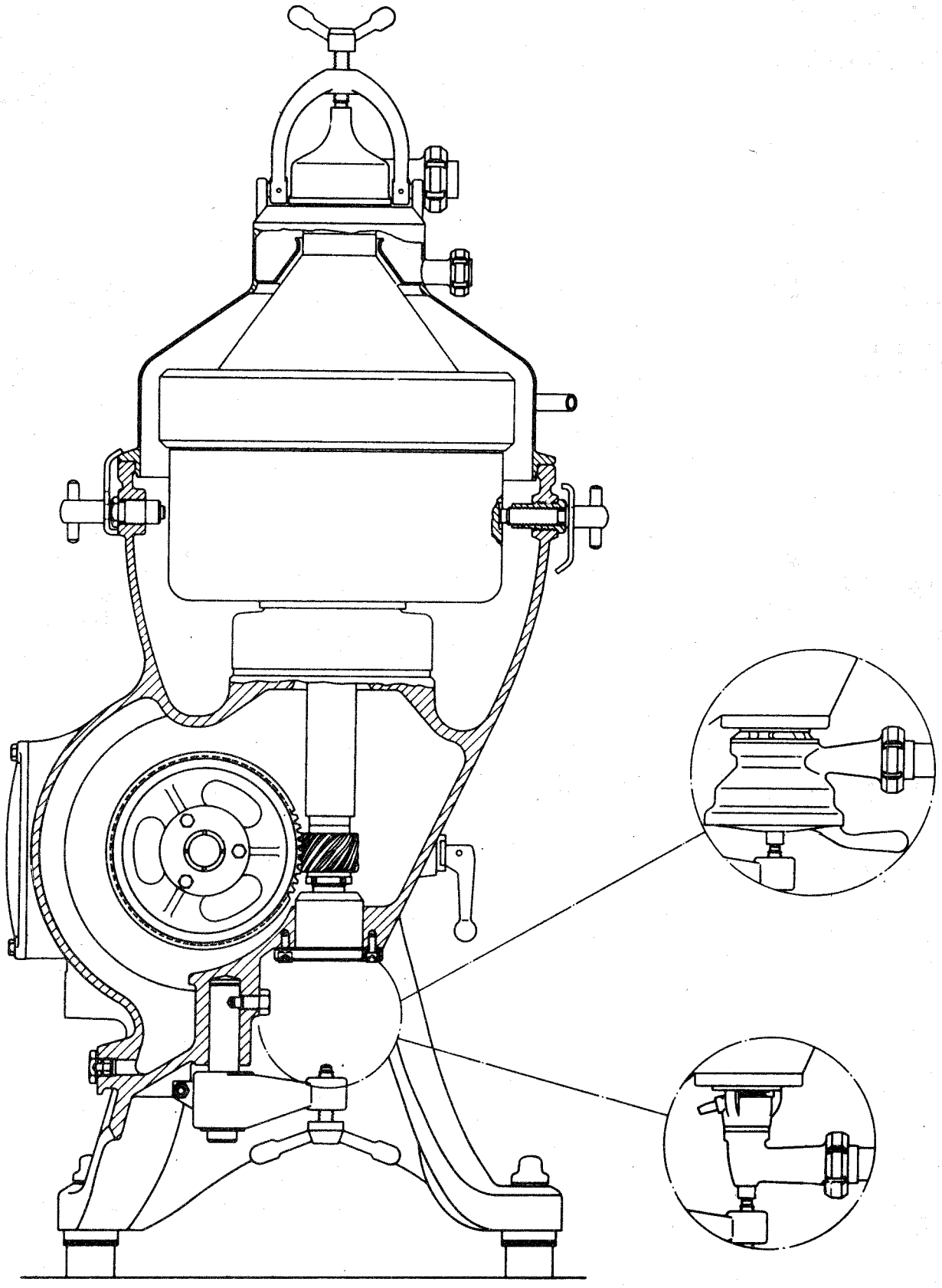
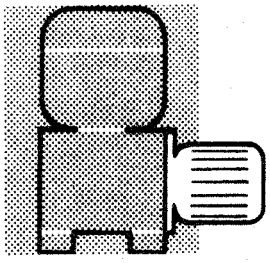
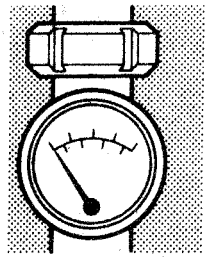
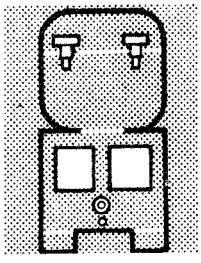
ALFA-LAVAL

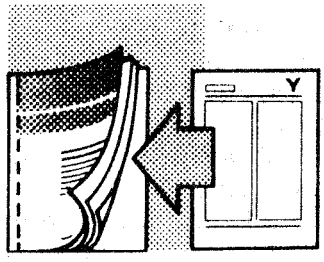








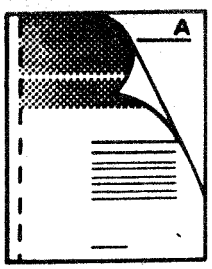




ALPHABETIC REGISTER

ALPHABETIC REGISTER

(Some of the keywords in the register may be missing in the text. If so, this is because one and the same register is used in the Instruction books for several closely related machine types.)



GENERAL INFORMATION

Contents - Disposition - Supplement - Type Denomination.
Manufacturing Number - Safety Regulations - Lubrication.
Cleaning - Special Tools - Abbreviations - Ordering Routine.

Correct installation, suitable treatment of the liquid before and after the passage through the machine, correct operation and handling of the machine according to the directions given in this book, cleanliness, carefulness and methodical overhaul are factors of the greatest importance for ensuring the best machine function and intended results.

CONTENTS

As appears from the table of contents, the Instruction Book contains instructions concerning installation and operation, dismantling and assembly as well as cleaning and overhaul. Since practically all machine parts have been identified by a part number, the Instruction Book serves also as a PART NUMBER LIST (SPARE PARTS LIST).

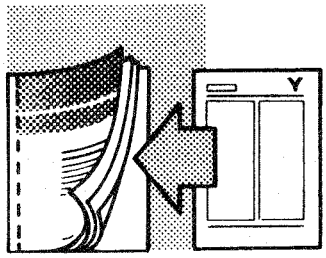
The Instruction Book deals not only with parts and devices included in the standard design, but also with special and alternative equipment. Parts incorporated in the deal are specified in the packing list accompanying the shipment.

The constructional particulars given in the Instruction Book are not binding. We reserve the right to make alterations without previous notice. Reconstructions made after delivery are not followed by new Instruction Books.

DISPOSITION

Every chapter of this book has its own reference letter which is placed in the right-hand top corner of each page. The chapters are arranged in alphabetical order. Whenever reference is made to a page of the Instruction Book in any form of communication with us, please state the reference letter and the heading of the chapter in question as well as the reference number appearing, preceded by the letter "S", at the bottom of the page. Illustrated pages also carry the drawing number at their bottom.

SUPPLEMENT



If the Instruction Book is intended for a machine made to special order, supplementary instructions are often given in chapter Y - please check this before placing the machine in service. Supplementary data (on treatment of liquid, weights etc.) are often found also in the technical information submitted in connection with the purchase.
The ALFA-LAVAL/DE LAVAL representative is always glad to provide advice and information beyond the contents of this Instruction Book.

TYPE DENOMINATION
MANUFACTURING No.

It may occur that the type denomination on the type plate of the machine and on the title page of the Instruction Book are not exactly identical. In such cases the manufacturing No. of the machine is determining; the correct Instruction Book is always marked with the manufacturing number appearing on the type plate. Always state the type denomination indicated on the type plate when ordering spares.

SAFETY REGULATIONS

Chapter K contains a survey of the safety regulations which must ABSOLUTELY be observed when the machine is to be used.
The electric installation must be done by an experienced electrician with knowledge of the local safety stipulations.
It should be noted that, as a rule, the instruction book contains no safety regulations necessitated by any special properties of the process liquid, such as inflammability, toxicity or corrosiveness.

LUBRICATION
CLEANING

As a rule, the mounting instructions are mentioning only what part or parts should be lubricated or cleaned. All information on lubricants and cleaning agents to be used is given in chapters H and L.

SPECIAL TOOLS

The design of the special tools appear from chapter F.

ORDERING ROUTINE

When ordering spare parts always state the PART NUMBER and NAME as well as the TYPE DENOMINATION and MANUFACTURING NUMBER of the machine as indicated on the type plate.
Always base the spare parts order on an Instruction Book having the manufacturing number of the actual machine stamped on its title page.

Model order form

Name of part	Part number	Quantity	Remarks
mnmnmnmnmn	mnmn	m	
mnmnmnmn	mnmnm	m	
mnmnmnmnmn	mnmn	mn	
mnmnmnmn	mnmnm	mn	

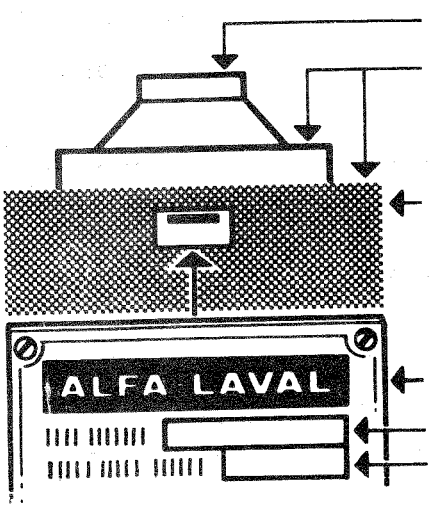
Correct ordering = Correct delivery in shortest time.

Delivery

It may occur that the part number of a delivered part differs from that stated in the Instruction Book. In such cases, the new part is at least equivalent to and fully interchangeable with the old one.

P.t.o.

(Ordering Routine, page 2)

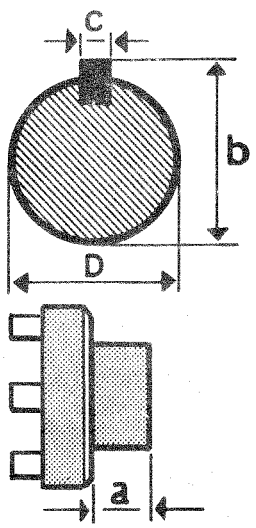


If the machine has been rebuilt after delivery, if the part number is not inserted in the Instruction Book, or when in doubt about the correct part number for other reasons, mention this in the order. In such cases correct statement of the TYPE DENOMINATION and the MANUFACTURING NUMBER indicated on the TYPE PLATE is particularly valuable.

Several manufacturing numbers

If the manufacturing numbers indicated on the bowl and on the type plate (frame) differ from each other, state both of them.

Coupling pulley.
Belt pulley



Besides part number and name (see chapter R) also state the dimensions b, c and D of the motor shaft. When ordering a coupling pulley also state the suitable nave length a.

ABBREVIATIONS

h = hour

r.p.m. = revolutions per minute

c/s = Hz = cycles per second

ϕ = diameter

SAE-class = indication of oil viscosity according to Society of Automotive Engineers

SSU = Saybolt Seconds Universal: indication of oil viscosity

E^{o} = degree Engler: indication of oil viscosity

EP = Extreme Pressure: lubricants made capable of resisting high contact pressures through admixture of additives.

ASTM = American Society for Testing Materials.

NLGI-classes = classification of lubricating grease by means of penetration after processing according to National Lubricating Grease Institute, USA.

ISO = standards of processing according to International Organization for Standardizing.

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LENGTH

from \ to	mm	m *	inch	ft
mm	----	0,001	0,03937	0,00328
m	1000	----	39,3701	3,28084
inch	25,4	0,0254	----	0,08333
ft	304,8	0,3048	12	----

* 1 μm = 1 x 10^{-6} m

AREA

from \ to	cm^2	m^2	$inch^2$	ft^2
cm^2	----	0,0001	0,155	0,00108
m^2	10 000	----	1550	10,7639
$inch^2$	6,4516	6,45x10^{-4}	----	0,00694
ft^2	929,03	0,0929	144	----

WEIGHT

from \ to	g	kg	tonne 1)	lb	ton (US) 2)	ton (UK) 3)
g	----	0,001	1 x 10^{-6}	0,0022	1,10 x 10^{-6}	9,84 x 10^{-7}
kg	1 000	----	0,001	2,20462	0,00110	9,84 x 10^{-4}
tonne	1 x 10^6	1 000	----	2204,62	1,10231	0,98421
lb	453,592	0,45359	4,54 x 10^{-4}	----	0,0005	4,46 x 10^{-4}
ton (US)	9,07 x 10^5	907,185	0,90718	2 000	----	0,89286
ton (UK)	1,02 x 10^6	1016,05	1,01605	2 240	1,12	----

1) also named metric ton. 2) also named short ton. 3) also named long ton

VOLUME

from \ to	dm^3 *	m^3	gal (US)	gal (UK)	bbl (US, oil)	bbl (US, liq)
dm^3	----	0,001	0,26417	0,21997	0,00629	0,00839
m^3	1 000	----	264,172	219,969	6,28981	8,38641
gal (US)	3,78541	0,00379	----	0,83267	0,02381	0,03175
gal (UK)	4,54609	0,00455	1,20095	----	0,02859	0,03813
bbl (US, oil)	158,987	0,15899	42	34,9723	----	1,3333
bbl (US, liq)	119,240	0,11924	31,5	26,2292	0,75	----

* also named litre (l) 1 fl oz (US) = 1.04084 fl oz (UK), 1 fl oz (UK) = 0,960760 fl oz (US)

PRESSURE

from \ to	mm Hg	inch Hg	inch H_2O	atm	psi 1)	kg/cm^2 2)
mm Hg	----	0,03937	0,53524	0,00132	0,01934	0,00136
inch Hg	25,4	----	13,5951	0,03342	0,49115	0,03453
inch H_2O	1,86832	0,07356	----	0,00246	0,03613	0,00254
atm	760	29,9213	406,782	----	14,6959	1,03323
psi	51,7149	2,03602	27,6799	0,06805	----	0,07031
kg/cm^2	735,559	28,9590	393,701	0,96784	14,2233	----

1) the symbol lbf/in^2 is also widely used, 2) the symbols kp/cm^2 or at are also widely used

1 bar = 1 x 10^6 dyn/cm^2 = 0,98692 atm, 1 kg/cm^2 = 0,98066 bar

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POWER

from \ to	BTU/s	kcal/s	hk	HP	kW
BTU/s	----	0,251996	1,43466	1,41502	1,05518
kcal/s	3,9683	----	5,6932	5,61532	4,18605
hk	0,697027	0,17564	----	0,986320	0,7355
HP	0,706695	0,178084	1,01387	----	0,7457
kW	0,94799	0,2388	1,36	1,34142	----

ELECTRICAL DATA

D.C.

$$kW = \frac{I \times U}{1\,000}; \quad HP = \frac{I \times U}{746}; \quad hk = \frac{I \times U}{735,5}$$

A.C. -- Three Phase

$$kW = \frac{I \times U \times \cos\varphi \times 1,73}{1\,000}; \quad HP = \frac{I \times U \times \cos\varphi \times 1,73}{746}; \quad hk = \frac{I \times U \times \cos\varphi \times 1,73}{735,5}$$

Synchronous Speed -- A.C. motors

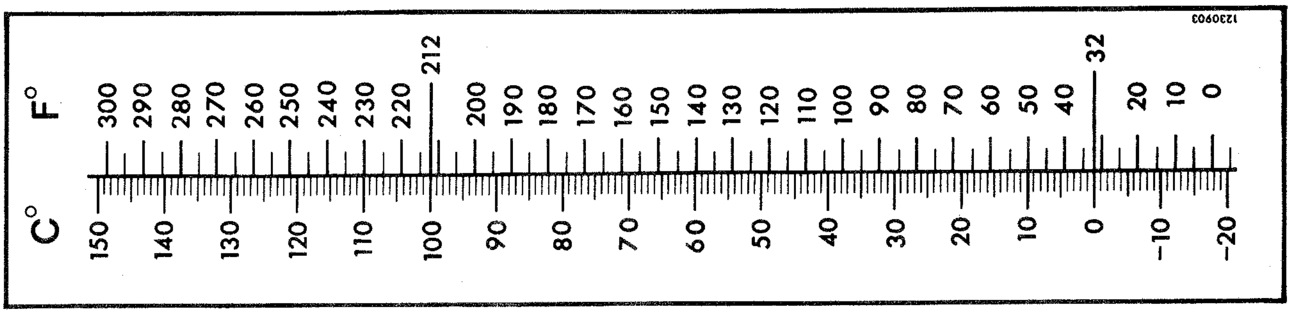
$$r.p.m. = \frac{120 \times \text{number of cycles}}{\text{number of poles of motor}}$$

I = ampere
U = volt
kW = kilowatt
$\cos\varphi$ = power factor

FRACTIONAL SUB-DIVISIONS OF AN INCH. CONVERSION INTO DECIMALS OF AN INCH

Fraction	64ths	Decimal
	1/64	0.015625
1/32	2/64	0.03125
	3/64	0.046875
1/16	4/64	0.0625
	5/64	0.078125
3/32	6/64	0.09375
	7/64	0.109375
1/8	8/64	0.125
	9/64	0.140625
5/32	10/64	0.15625
	11/64	0.171875
3/16	12/64	0.1875
	13/64	0.203125
7/32	14/64	0.21875
	15/64	0.234375
1/4	16/64	0.25
	17/64	0.265625
9/32	18/64	0.28125
	19/64	0.296875
5/16	20/64	0.3125
	21/64	0.328125
11/32	22/64	0.34375
	23/64	0.359375
3/8	24/64	0.375
	25/64	0.390625
13/32	26/64	0.40625
	27/64	0.421875
7/16	28/64	0.4375
	29/64	0.453125
15/32	30/64	0.46875
	31/64	0.484375
1/2	32/64	0.5
	33/64	0.515625
17/32	34/64	0.53125
	35/64	0.546875
9/16	36/64	0.5625
	37/64	0.578125
19/32	38/64	0.59375
	39/64	0.609375
5/8	40/64	0.625
	41/64	0.640625
21/32	42/64	0.65625
	43/64	0.671875
11/16	44/64	0.6875
	45/64	0.703125
23/32	46/64	0.71875
	47/64	0.734375
3/4	48/64	0.75
	49/64	0.765625
25/32	50/64	0.78125
	51/64	0.796875
13/16	52/64	0.8125
	53/64	0.828125
27/32	54/64	0.84375
	55/64	0.859375
7/8	56/64	0.875
	57/64	0.890625
29/32	58/64	0.90625
	59/64	0.921875
15/16	60/64	0.9375
	61/64	0.953125
31/32	62/64	0.96875
	63/64	0.984375
1	64/64	1

TEMPERATURE CONVERSION NOMOGRAM



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Function - Definitions - Factors influencing the Process - Processing Methods - Sludge - Discharge - Automatic Control - Choice between various Possibilities of Adjustment - Special Recommendations.
Information on for instance the treatment of the process liquid is contained also in the technical information sent to you in connection with the purchase of the machine.

FUNCTION

The purpose of the operation is either to liberate a liquid from strange particles, or to separate two intermixed liquids.

DEFINITIONS

Throughput

This means the quantity of liquid supplied per unit time. The throughput is given in cu.m/h or l/h (Imp. galls/h).

Reception ability

This means the largest liquid quantity that the bowl can treat per unit time, expressed in cu.m/h or l/h (Imp. galls/h).

Purification

A liquid - liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

Clarification

A liquid - sludge separation in which the machine is used to separate particles, normally solid ones, from a liquid having a lower specific gravity than that of the particles.

Concentration

A liquid - liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities, the heavier liquid constituting the major part of the mixture. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

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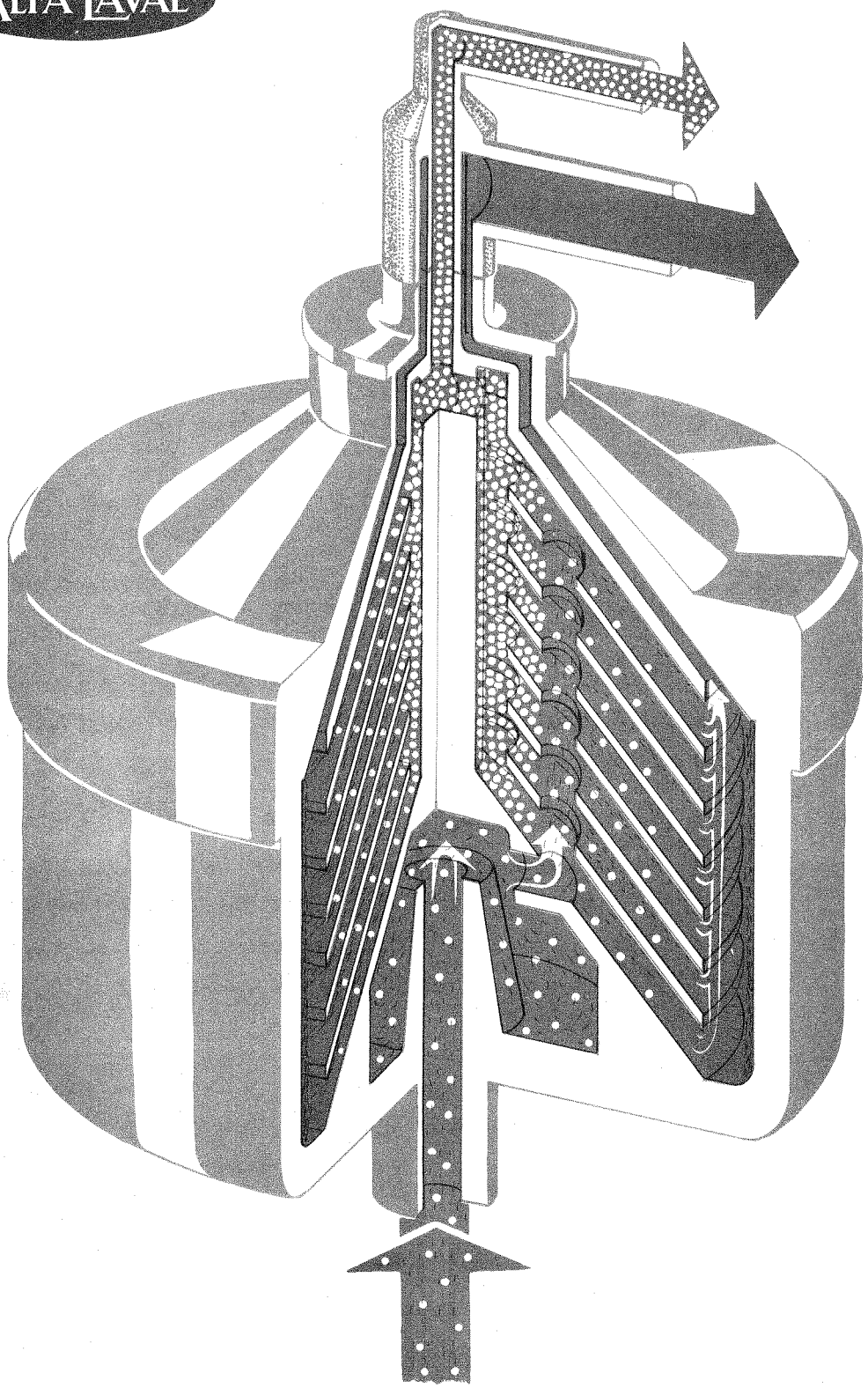

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Working principle of bowl

The functioning of the bowl appears from the adjoining principle sketch. The milk flows through the distributor to the distribution holes of the discs. The separation takes place in the spaces between the discs. That part which is discharged as cream is pressed towards the bowl centre along the top sides of the discs and flows out through the wear sleeve in the top disc - "internal way". The part discharged as skim milk flows along the lower sides of the discs and out to the bowl periphery where the solid impurities settle in the sludge space. The skim milk flows along the upper side of top disc and leaves the bowl via the outlet sleeve (and the discharge pump) - "external way".

Factors influencing the separation

- Specific gravity difference
- Size and shape of particles
- Viscosity
- Throughput
- Cream content

Specific gravity difference

The centrifugal force acts on all particles proportionally to their specific gravity. This applies to solid particles as well as to fluid particles. The greater the difference in specific gravity, the easier the separation.

Particle size and shape

The milk fat (the dispersed phase) has the shape of microscopically small globules of a diameter varying between 0.01 and 0.0001 mm. The larger the globules are, the more easily they will be separated off. The smallest of them, e.g. globules with a diameter of 0.001 - 0.0001 mm are not separated off - the cleanskimming varies with the size. In this respect milk from different breed of cow may vary. The content of fat globules of a smaller diameter than 0.001 mm increases somewhat in number towards the end of the lactation period and when passing from stall-feeding to pasturage. Therefore, the cleanskimming result varies for natural reasons with the breed of cow and the season.

If the milk is exposed to unsuitable treatment, e.g. in a pump, it may occur that the larger (separable) fat globules are split up and the number of small fat globules increases.

A modern centrifugal pump has no unfavourable influence on the milk as long as it runs filled. If the feed pipe is insufficiently dimensioned or is throttled in some way or other a vacuum may be formed or air be sucked into the pump, which would have a splitting effect on the fat globules in the milk. Therefore, do not attempt any regulation of the throughput in the feed pipe of the pump.

Viscosity

The more fluid a liquid is, the quicker is the separating process and the better the separation - in other words, low viscosity improves the separation result. The viscosity can in many cases be reduced by heating, but this must not be done by feeding steam into the milk. High viscosity will reduce the reception ability.

Throughput

As the throughput is directly dependent of the back pressure in the cream and skim milk outlets (the resistance caused by subsequent apparatuses and pipes as well as the height difference between the outlet and the collecting tank), a check and, if necessary, an adjustment must be made after installation. This may involve certain modification of the machine.

The throughput and thus the outlet pressures are regulated primarily:

- by exchanging the nozzle in the feed pump
- by changing the feed pressure.

Note, however, that the feed pressure must never sink below the value stated in chapter C.

The table in chapter C states the excess pressure (i.e. the pressure that is at disposal for transportation) that is obtained in the skim milk outlet at various throughputs by means of different nozzles.

If the feed pressure is increased, the excess pressure will rise correspondingly.

If the resistance in the skim milk pipe is small, the discharge pump may be removed. In consequence the excess pressure will decrease - see chapter C.

To avoid unneccesary wear on the packing collars, the discharge pressure should not be higher than necessary.

The throughput and thus the discharge pressures are regulated secondarily:

- by fitting a pump wheel with larger diameter, or smaller diameter respectively, in the feed pump.

This will normally not be necessary - consult an authorized ALFA-LAVAL/DE LAVAL representative.

If a wheel with larger diameter is used, the excess pressure will increase, and vice versa.

(cont.)

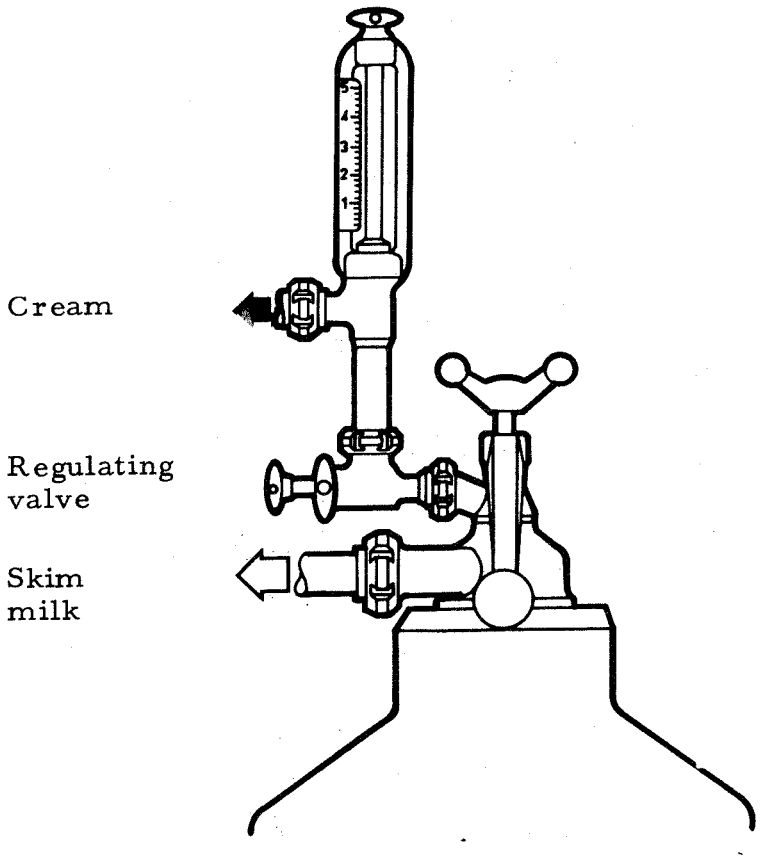
The pressures need not be measured. If the back pressure in the skim milk outlet differs from the excess pressure stated for a certain nozzle and pump wheel, a higher or lower throughput will be the result. If so, the throughput can be

increased either by fitting a larger nozzle or by increasing the feed pressure. If the effect obtained is insufficient, a larger pump wheel must be used.

reduced by fitting a smaller nozzle.

Cream fat content

The illustration below shows in principle how the discharge pipes with cream regulating means should be mounted - see also chapter X.



The amount of cream and thus the fat content of the cream can be regulated by changing the pressure in the cream outlet. The adjustment is effected by means of the cream flow meter and its regulating valve.

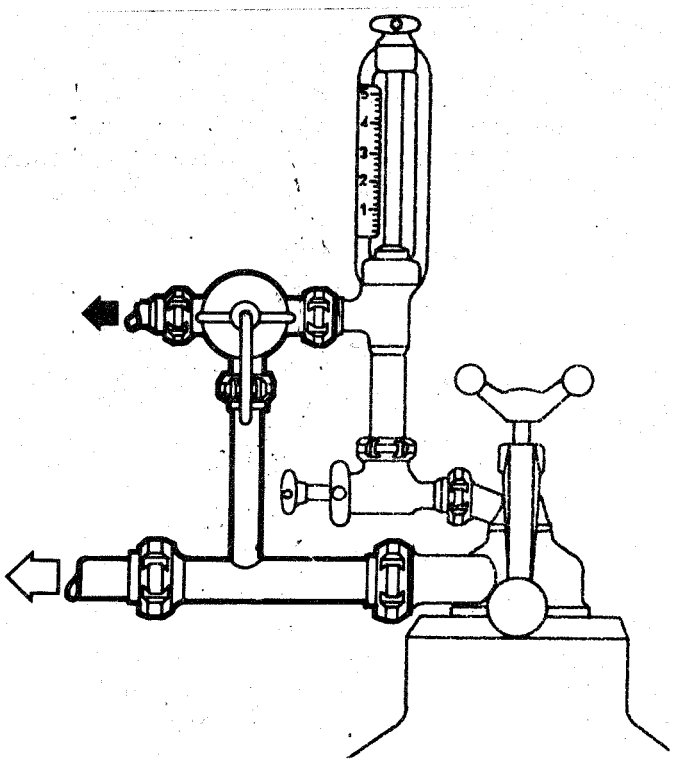
The amount of cream is determined by the difference in pressure between the skim milk outlet and the cream outlet (not the excess pressure).

(cont.)

If the cream is not thin enough although the valve is completely unscrewed (insufficient pressure difference), the skim milk pressure must be increased by throttling, using a valve or the like.
If the pressure difference increases, for instance because the regulating valve is screwed in, the cream quantity will be reduced but the cream become fatter, and vice versa.
The cream must not be made so fat (pressure difference too great) as to involve risk of cream blockage.
To facilitate regulation the pressure in the skim milk outlet should be kept as constant as possible.
Of course a constant cream fat content can be obtained only provided that throughput, milk fat content and temperature are kept at least approximately constant.
The discharge pressures need to be measured - only adjust the regulating valve so that the desired cream is obtained.
If the resistance in the skim milk line changes, by way of example when the skim milk is conveyed to a tank placed on a higher level, the cream fat content will change, i.e. a higher back pressure in the skim milk line will result in thinner cream, and vice versa.
In such cases the pressure in the skim milk outlet must be restored to the original value (by means of the skim milk valve). If necessary, a final adjustment can be made by means of the cream regulating valve.
When the variation of the cream fat content is caused by resistance variations in the cream outlet, adjust by means of the cream regulating valve.

MILK CLARIFICATION

The clarification of the milk is carried out by first separating the milk components into skim milk and cream. Through the remixing device the cream is returned to the skim milk to give kettle milk or consumption milk.
To allow remixing the pressure in the cream outlet must exceed the pressure in the skim milk outlet - see chapter C "Discharge Pressure Difference".



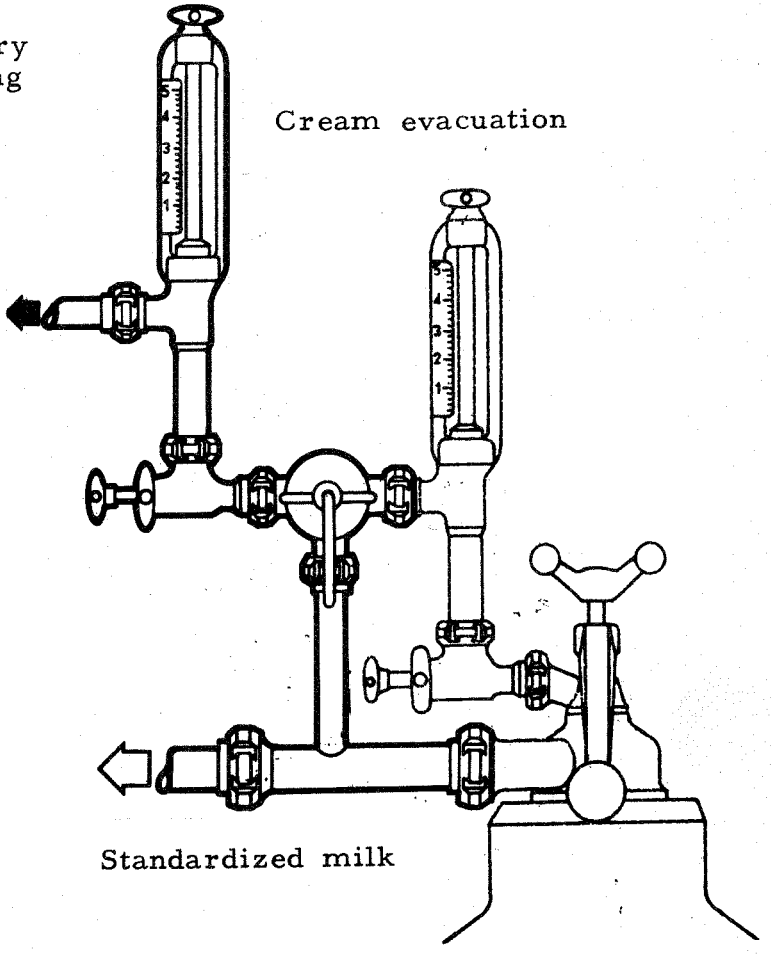
The illustration shows a supplementary device for milk clarification consisting of a three-way valve and a T-piece.

STANDARDIZATION

The standardization procedure implies skimming of the milk and subsequent remixing of sufficient cream to obtain the desired fat content in the milk.

Note. To allow return of the cream, the pressure in the cream outlet must exceed the pressure in the skim milk outlet - see chapter C "Discharge Pressure Difference".

The illustration shows a supplementary device for standardization of milk to lower fat content.



(cont.)

(Standardization, page 2)

The device consists of a three-way cock, a T-piece of special design, and a cream flow meter, the standardizing meter, which looks exactly like the cream flow meter that belongs to the regular equipment (see "Cream Fat Content"). The meters or their indicator rods must not be confused. Note that the standardizing meter and its indicator rod carry, besides the number, the letters "St" stamped on them.

Regulating the milk fat content

The fat content in the milk is regulated by means of the valves in the two cream flow meters. The total cream quantity is checked on the regular cream flow meter and the cream quantity to be evacuated on the standardizing cream flow meter.

The scales of the two flow meters are equally graduated, and are not indicating the cream quantity in percent or l/h. Due to the influence of the viscosity, such a graduation would apply only to a certain temperature and fat content of the cream. With constant quantity per unit time, the indicator rod will rise the higher the fatter and cooler the cream is. The temperature should not be lower than 67°F (20°C).

As a rule, a certain and constant fat content is stipulated for the cream to be drawn off. If no such stipulations are made, it is preferable to keep the fat content as low as possible. The thinner the cream, the more exact the regulation. This applies particularly when the cream quantity to be evacuated is but small. However, always try to keep the fat content of the cream as constant as possible. Fat contents above 40-42% are not convenient.

To obtain correct setting of the flow meters and thus the desired fat content in cream and milk, the fat content in the ingoing milk and the throughput must be known. It is best to collect the milk in a tank with stirrers so that the fat content of the whole quantity to be standardized can be established. Flow regulator or flow meter should be used for checking the throughput.

(cont.)

(Standardization, page 3)

To begin with, experiments must be made to find out the correct setting of the flow meters in the conditions (fat content, temperature, throughput) prevailing in each special case. This is done by altering the setting of the regular meter until the desired fat content in the cream is obtained, and of the standardizing meter until the correct quantity is discharged. If the throughput and the fat content of the milk are then kept fairly constant, correct standardizing will always be obtained by setting the meters to these established positions.

Setting of cream flow meters

The setting of the cream flow meters can be approximately determined by means of the following formula and diagram.

$$G_1 = \frac{f}{F} \cdot Q \text{ l/h}$$

$$g = \frac{f - f_1}{F - f_1} \cdot 100\%$$

$$G_{II} = \frac{g}{100} \cdot Q \text{ l/h}$$

In formula and examples the following symbols are used:

- Q = milk throughput in l/h
- F = fat content of cream in percent
- f = fat content of milk in percent
- f_1 = standardizing to certain fat content in percent
- G_1 = cream quantity in l/h through regular flow meter I
- G_{II} = cream quantity in l/h through standardizing flow meter II
- g = evacuated cream quantity in percent of milk throughput

To simplify the calculation the table gives values of g for various values of $f - f_1$ and $F - f_1$ respectively. With the quantities G_I and G_{II} calculated, set the meters so as to obtain these quantities. As already mentioned, this must be done by way of experiments. A certain guidance is given by the diagram, which shows the approximate relation between the scale graduation and the cream quantity. The diagram also shows approximately the largest and smallest quantities that can be measured by the meters.

(cont.)

EXAMPLE

Throughput	$Q = 4000$ l/h
Fat content of milk	$f = 3.7$ %
Standardizing to	$f_1 = 3.0$ %
Fat content of cream	$F = 35$ %

Standard meter

Through flow meter I:

$$G_I = \frac{3.7}{35} \cdot 4000 = 423 \text{ l/h}$$

The diagram gives correct setting for flow meter of standard equipment.

Standardizing device meter

Through flow meter II:

$f - f_1 = 0.7$

$F - f_1 = 32$

according to table $g = 2.19$ and thus

$$G_{II} = \frac{2.19}{100} \cdot 4000 = 88 \text{ l/h}$$

According to diagram correct setting for standardizing flow meter is approximately 2 graduations below "2" in this case.

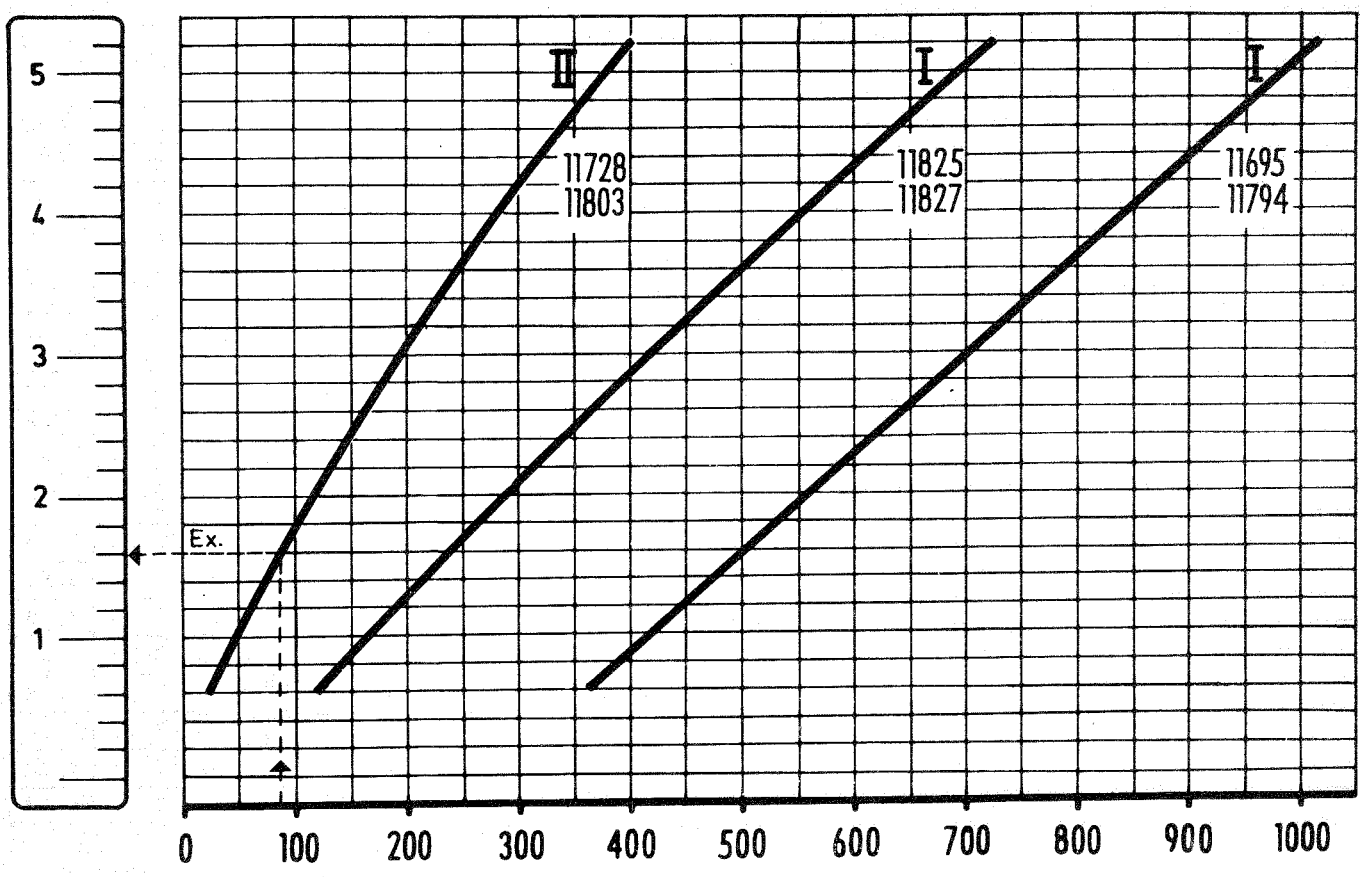
If the fat content of the cream should be high and the fat content of the ingoing milk is low, only a small amount passes through the standardizing meter. If so, it is more difficult to set and read this meter. A fairly good control is obtained by measuring now and then the time it takes to fill for instance a litre measure. The time for 1 litre is $\frac{3600}{G_{II}}$ seconds (in the example thus about 41 seconds.
Of course the fat content of the cream should be checked from time to time.

$f\% - f_1\%$

$F\% - f_1\%$	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0	1,1	1,2
20	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,50	5,00	5,50	6,00
21	0,95	1,43	1,90	2,38	2,86	3,33	3,81	4,28	4,76	5,24	5,71
22	0,91	1,36	1,82	2,27	2,73	3,18	3,64	4,09	4,55	5,00	5,45
23	0,87	1,30	1,74	2,17	2,61	3,04	3,48	3,91	4,35	4,78	5,22
24	0,83	1,25	1,67	2,08	2,50	2,92	3,33	3,75	4,17	4,58	5,0
25	0,80	1,20	1,60	2,0	2,40	2,80	3,20	3,60	4,00	4,40	4,80
26	0,77	1,15	1,54	1,92	2,31	2,69	3,08	3,46	3,85	4,23	4,62
27	0,74	1,11	1,48	1,85	2,22	2,59	2,96	3,33	3,70	4,07	4,44
28	0,71	1,07	1,43	1,79	2,14	2,50	2,86	3,21	3,57	3,93	4,29
29	0,69	1,03	1,38	1,72	2,07	2,41	2,76	3,10	3,45	3,79	4,14
30	0,67	1,00	1,33	1,67	2,00	2,33	2,67	3,00	3,33	3,67	4,00
31	0,65	0,97	1,29	1,61	1,94	2,26	2,58	2,90	3,23	3,55	3,87
32	0,63	0,94	1,25	1,56	1,88	2,19	2,50	2,81	3,13	3,44	3,75
33	0,61	0,91	1,21	1,52	1,82	2,12	2,42	2,73	3,03	3,33	3,64
34	0,59	0,88	1,18	1,47	1,76	2,06	2,35	2,65	2,94	3,24	3,53
35	0,57	0,86	1,14	1,43	1,71	2,00	2,29	2,57	2,86	3,14	3,43
36	0,56	0,83	1,11	1,39	1,67	1,94	2,22	2,50	2,78	3,05	3,33
37	0,54	0,81	1,08	1,35	1,62	1,89	2,16	2,43	2,70	2,97	3,24
38	0,53	0,79	1,05	1,32	1,58	1,84	2,10	2,37	2,63	2,89	3,16
39	0,51	0,77	1,03	1,28	1,54	1,79	2,05	2,31	2,56	2,82	3,08
40	0,50	0,75	1,00	1,25	1,50	1,75	2,00	2,25	2,50	2,75	3,00

$f\% - f_1\%$

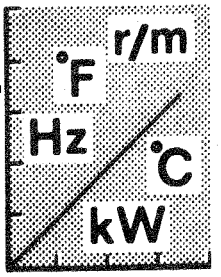
$F\% - f_1\%$	1,3	1,4	1,5	1,6	1,7	1,8	1,9	2,0	2,1	2,2	2,3
20	6,5	7,0	7,5	8,0	8,5	9,0	9,5	10,0	10,5	11,0	11,5
21	6,19	6,66	7,14	7,62	8,09	8,57	9,05	9,52	10,0	10,5	11,0
22	5,91	6,36	6,82	7,27	7,73	8,18	8,64	9,09	9,54	10,0	10,45
23	5,65	6,09	6,52	6,96	7,39	7,82	8,26	8,69	9,13	9,56	10,00
24	5,42	5,83	6,25	6,67	7,08	7,50	7,92	8,33	8,75	9,17	9,58
25	5,20	5,60	6,00	6,40	6,80	7,20	7,60	8,00	8,40	8,80	9,20
26	5,00	5,38	5,77	6,15	6,54	7,92	7,31	7,69	8,08	8,46	8,85
27	4,81	5,19	5,56	5,93	6,30	6,67	7,04	7,41	7,78	8,15	8,52
28	4,64	5,00	5,36	5,71	6,07	6,43	6,78	7,14	7,50	7,86	8,21
29	4,48	4,83	5,17	5,52	5,86	6,21	6,55	6,90	7,24	7,59	7,93
30	4,33	4,67	5,00	5,33	5,67	6,00	6,33	6,67	7,00	7,33	7,67
31	4,19	4,52	4,84	5,16	5,48	5,81	6,13	6,45	6,77	7,10	7,42
32	4,06	4,38	4,69	5,00	5,31	5,63	5,94	6,25	6,56	6,88	7,19
33	3,94	4,24	4,55	4,85	5,15	5,45	5,76	6,06	6,36	6,67	6,97
34	3,82	4,12	4,41	4,70	5,00	5,29	5,59	5,88	6,18	6,47	6,76
35	3,71	4,00	4,29	4,57	4,86	5,14	5,43	5,71	6,00	6,29	6,57
36	3,61	3,89	4,17	4,44	4,72	5,00	5,28	5,56	5,83	6,11	6,39
37	3,51	3,78	4,05	4,32	4,59	4,86	5,13	5,40	5,68	5,95	6,22
38	3,42	3,68	3,95	4,21	4,47	4,74	5,00	5,26	5,53	5,79	6,05
39	3,33	3,59	3,85	4,10	4,36	4,62	4,87	5,13	5,38	5,64	5,90
40	3,25	3,50	3,75	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75



The scale of the flow meter is neither graduated in percent nor in volume per hour. Such a graduation would - since the deviation is influenced by the viscosity - only apply to a certain content and temperature of the measured liquid.

The accurate values must be determined by tests. To ensure that these values remain correct, the output, the content of the separated liquid and the temperature should of course be almost constant. The values thus obtained will be valid only for the meter they have been measured on.

The throughput can be regulated during separation by means of the regulating valve of the flow meter.



DATA

Supplementary particulars are contained in the technical information sent to you in connection with the purchase of the machine.

MOTOR

Suitable motor output: 4 kW (5.5 HP).

SPEED

The prescribed speed of the worm wheel shaft, which must not be exceeded, is stamped on the type plate of the machine.

The table below indicates the speed in rpm.

	Drive		
	M&R *	M&R-60 **	T
Worm wheel shaft	1420 - 1500	1700 - 1800	1070 - 1120
Tachometer	710 - 750	850 - 900	540 - 560
Revolution counter	71 - 75	85 - 90	54 - 56

*) with direct coupling: 4-polar, 50 c/s A.C. motor or D.C. motor.

**)with direct coupling: 4-polar, 60 c/s A.C. motor.

RUNNING-UP TIME

From standstill to full bowl speed: 7 - 8 min.

LUBRICATING OIL

See lubricating instructions and table in chapter H.

THROUGHPUT

Rated throughput: 5 000 l/h.

PRESSURES

See next page.

DRIVE

M - drive indicates flange motor drive.
R - drive indicates V-belt drive.
T - drive indicates transmission drive.

PRESSURES for machine WITHOUT feed pump

The values below are approximative and may vary somewhat in various machines due to small deviations in the flow resistance of the machine or in bowl speed.

The throughput is regulated by altering the pressure in the inlet to the machine.

Lowest permissible feed pressure is 2.5 kg/sq.cm (35 psi.) at a highest outlet pressure in the skim milk outlet of 1.3 kg/sq.cm (18.5 psi.). If the outlet pressure exceeds this value the inlet pressure must be increased correspondingly.

If the back pressure in the skim milk outlet is very low, it may be preferable not to use the discharge pump. In that case, the latter is removed.

When 10% of the throughput is taken out as cream (medium-fat cream) at rated throughput, the cream pressure exceeds the skim milk pressure by 1.4 - 1.6 kg/sq.cm (15 - 18 psi.).

In consideration of the lifetime of the packing collars the discharge pressures (= resistance in subsequent heat exchangers and pipes) should not exceed 3 kg/sq.cm (43 psi.).

PRESSURES for machine WITH feed pump

The values below are approximative and may vary somewhat in various machines due to small deviations in the flow resistance of the machine or in bowl speed.

The throughput is regulated in the first place by exchanging the nozzle in the pump housing cover and in the second place by exchanging the pump wheel. It is also possible to regulate the throughput during operation by replacing the pump housing cover by a cover with built-in regulating valve -- see chapter X.

The lowest permissible feed pressure is 0.2 kg/cm^2. Recommended feed pressure is 0.5 - 1.5 kg/cm^2.

Surplus pressure

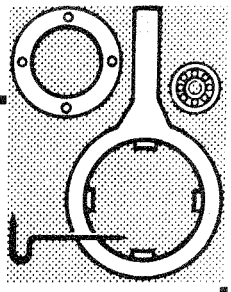
The table shows the connexion between throughput, nozzle diameters and surplus pressure in the skim milk outlet expressed in kg/cm^2 at a feed pressure of 0.2 kg/cm^2, using a feed pump wheel with a diameter of 97 mm.

Throughput lit/h	Nozzle diameter in mm 12	8	7	6
5 000	2.4	0.7	-	-
4 500	3.0	1.4	0.7	-
4 000	3.5	2.2	1.3	0.4

A pump wheel with the diameter 104 mm will increase the value stated for the surplus pressure by 0.5 kg/cm^2, a 90 mm pump wheel will reduce the value by 0.6 kg/cm^2 and an 80 mm pump wheel by 1.0 kg/cm^2. At feed pressures exceeding 0.2 kg/cm^2 the surplus pressure will increase by the corresponding values.

When 10% of the throughput is taken out as cream (medium-fat cream) at rated throughput, the cream pressure exceeds the skim milk pressure by 0.2 - 0.3 kg/cm^2.

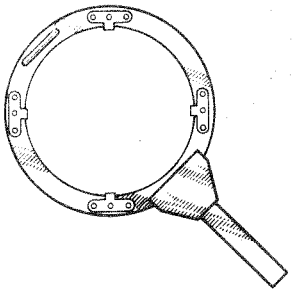
In consideration of the lifetime of the packing collars the discharge pressures (= resistance in subsequent heat exchangers and pipes) should not exceed 3 kg/cm^2.



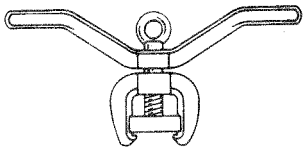
SET of TOOLS

The special tools for the bowl are preferably hung up as close to the machine (cleaning-place) as possible. If a tool is provided with left-hand thread or intended for a left-hand screwed joint, this has been specially pointed out in the dismantling and assembling instructions. Notofication in this respect is not made where right-hand thread is concerned.

TOOLS for BOWL

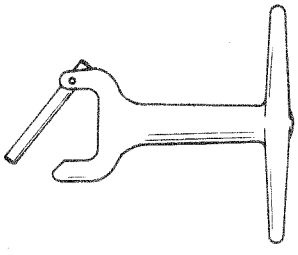


Spanner for lock ring
-- 9139

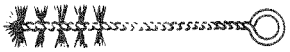


Lifting tool for distributor and bowl body
-- 11418

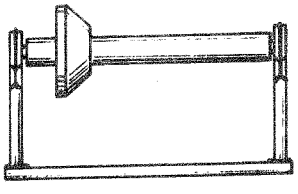
Stand for distributor
-- 9900



Spanner for cap nut
-- 11415

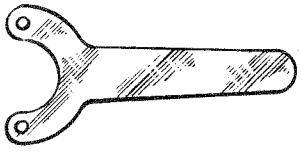


Brush for top disc
-- 20315

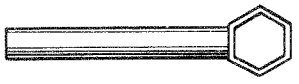


Disc drying stand
-- 9894

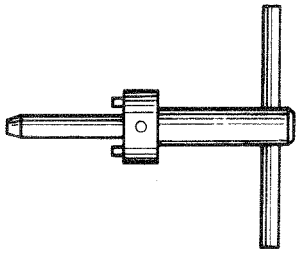
TOOLS for INLET and OUTLET



Pin spanner for outlet pump
-- 3574

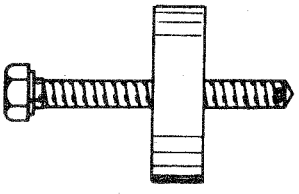


Socket wrench for wear sleeve and outlet sleeve
-- 11653

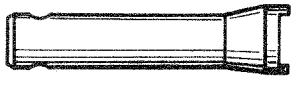


Pin spanner for inlet pump
-- 43717

TOOLS for CLUTCH COUPLING and WORM WHEEL SHAFT



Puller tool for coupling nave
-- 11645

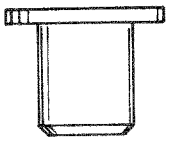


Pin spanner for round nuts
-- 62522

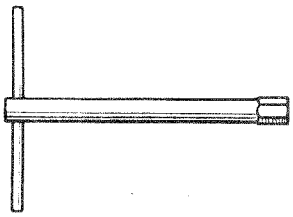
Jack screw for fixed ball bearing of worm wheel shaft (2)
-- 65389

Guide bolt for motor (2)
-- 11649

TOOLS for BOWL SPINDLE

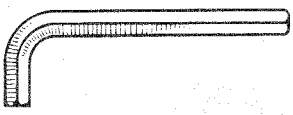


Protecting sleeve for bowl spindle top
-- 11738



Socket wrench for top bearing screws
-- 11647

Hook spanner for top bearing stop nut
-- 66988



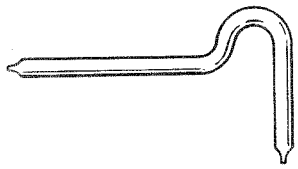
Hexagonal hole wrench for bottom bearing screws
-- 66416

Brush for bowl spindle
-- 9689

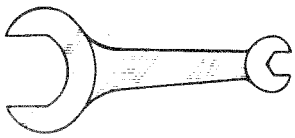
GENERAL TOOLS

Drift
-- 2279

Screw driver
-- 8594

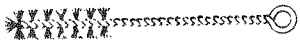


Screw driver
-- 14486



Screw spanner (23/31)
-- 8432

Hook spanner for pipe couplings
-- 11782



Brush for flow meter
-- 12545

SET of SPARE PARTS

The set of spares listed below includes only parts belonging to the standard equipment of the machine. Spare parts for special equipment are found together with the description of the latter in chapter X. In both cases make it a rule always to keep consuming articles in stock. Avoid incorrect dispatch – observe the ordering routine described in chapter A.

The figure in brackets indicates the quantity (if more than 1).

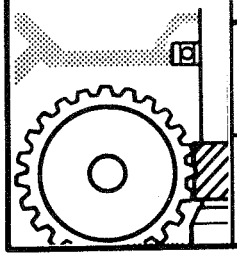
Part number	Part (quantity)
518859-82	Touch-up paint (tin 1/8 l)
10489	Glass tube (2) for flow meter
11705	Packing (2) for glass tube
65397	Pad (2) for friction block for 50 c/s machine
8956	Pad (2) for friction block for 60 c/s machine
43764	Rubber ring for bowl
9867	Bowl disc
11675	Height adjusting ring (2) for outlet
785951-1	Height adjusting ring (2) of stainless steel for outlet
11678	Cup for packing collar
11426	Packing collar (8) for cream outlet bend
11595	Packing collar (4) for milk outlet bend
11426	Packing collar (4) for inlet without pump
11595	Packing collar (4) for inlet with pump

SPECIAL SPARE PART NUMBERS

Listed below are some spare part numbers which for practical reasons have not been inserted in the chapter where they properly belong.

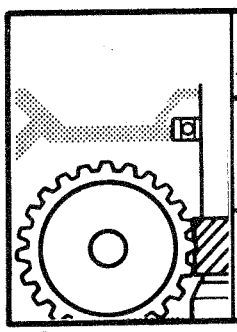
Power transmission (comp. chapter P)

For machine with flange motor or V-belt drive (M- or R-drive):



Speed of worm wheel shaft in rpm.	1420 - 1500	1700 - 1800
Worm wheel	11539	11736
Worm	11521	11737
Friction block (2) with pad and screws	11717 76315 NEW PART NO.	11784

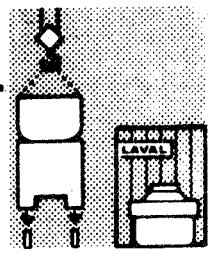
For machine with transmission drive (T-drive):



Speed of worm wheel shaft in rpm.	1070 - 1120
Worm wheel	11625
Worm	11602
Friction block (2) with pad and screws	11627

The speed of the worm wheel shaft is indicated on the type plate of the machine.
Always check that the old part of the worm gear and the new one have the same number of teeth.

For machines with M- and R-drive:
With D.C. or A.C. 50 c/s operate the machine at a speed of 1420 - 1500 rpm.
With A.C. 60 c/s operate the machine at a speed of 1700 - 1800 rpm.

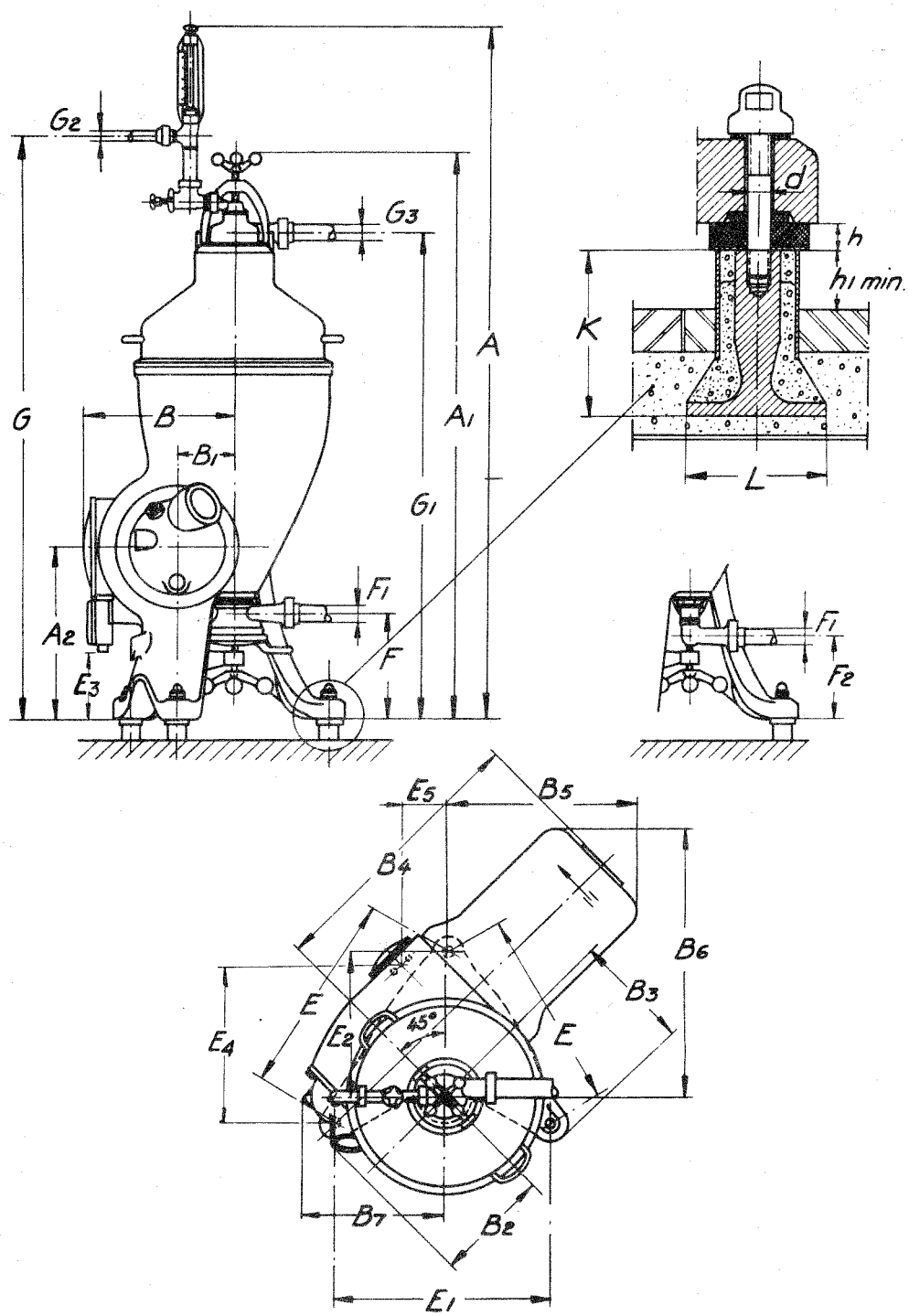


INSTALLATION

This chapter deals with the mounting of the machine and with the actions to be taken before the first start. The ALFA-LAVAL/DE LAVAL-representative is always glad to provide further advice and information.

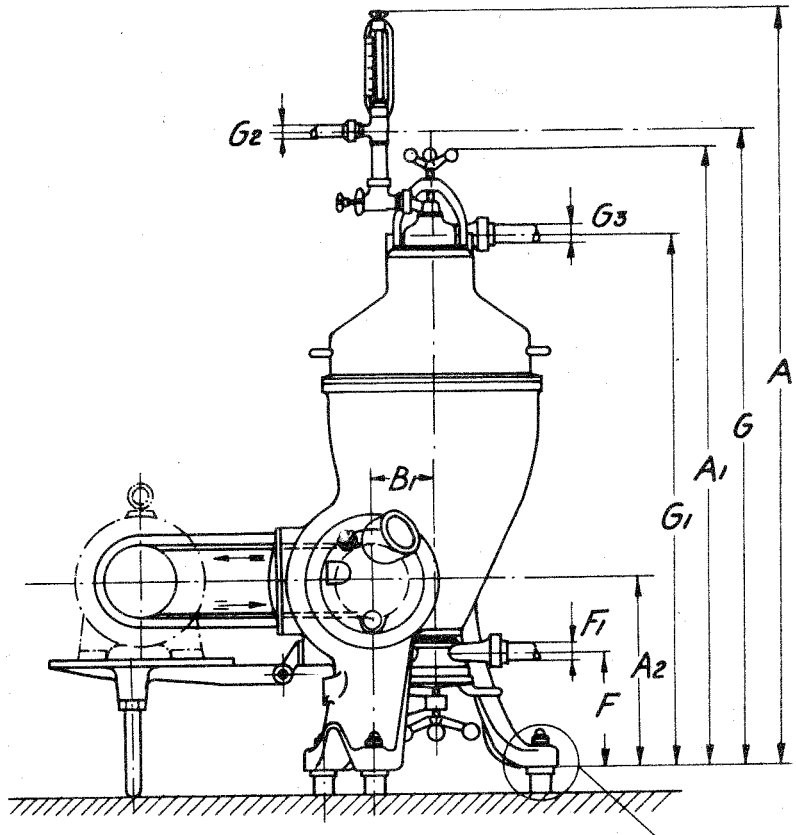
DIMENSIONED DRAWING	All measurements needed for the installation appear from the dimensioned drawing.

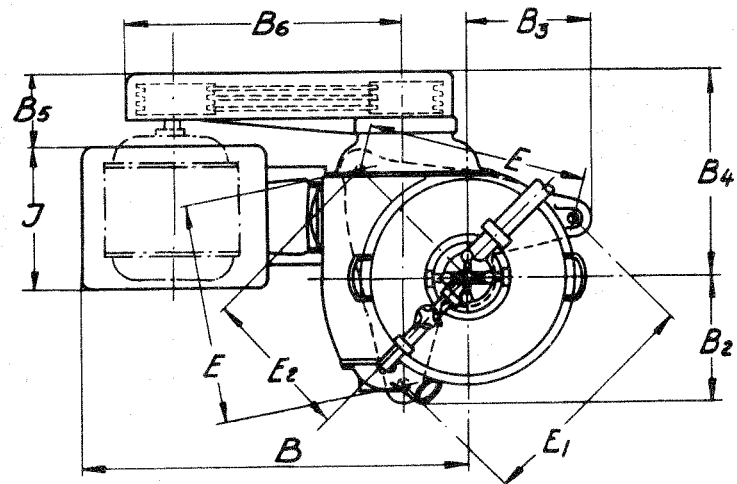
M

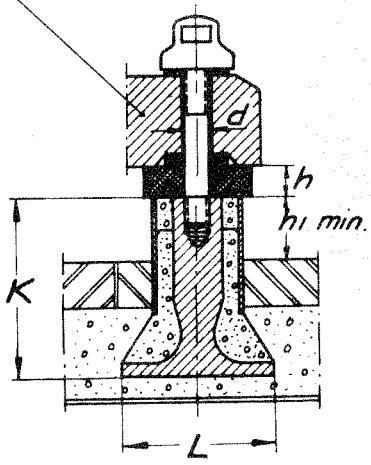


	A.	A1	A2	B	B1	B2	B3	B4	B5	B6	B7	E	E1	E2	E3	E4	E5
mm	1670	1365	420	360	139	285	270	670	460	660	350	500	520	365	135	387	120
inches	65 3/4	53 3/4	16 9/16	14 3/16	5 1/2	11 1/4	10 5/8	26 3/8	18 1/8	26	13 3/4	19 11/16	20 1/2	14 3/8	5 5/16	15 1/4	4 3/4
	F	F1	F2	G	G1	G2	G3	K	L	d	h	h1 min					
mm	262	38	208	1410	1175	25	38	100	85	W 5/8"	16	30					
inches	10 5/16	1 1/2	8 3/16	55 1/2	46 1/4	1	1 1/2	4	3 3/8	W 5/8	5/8	1 3/16					

R

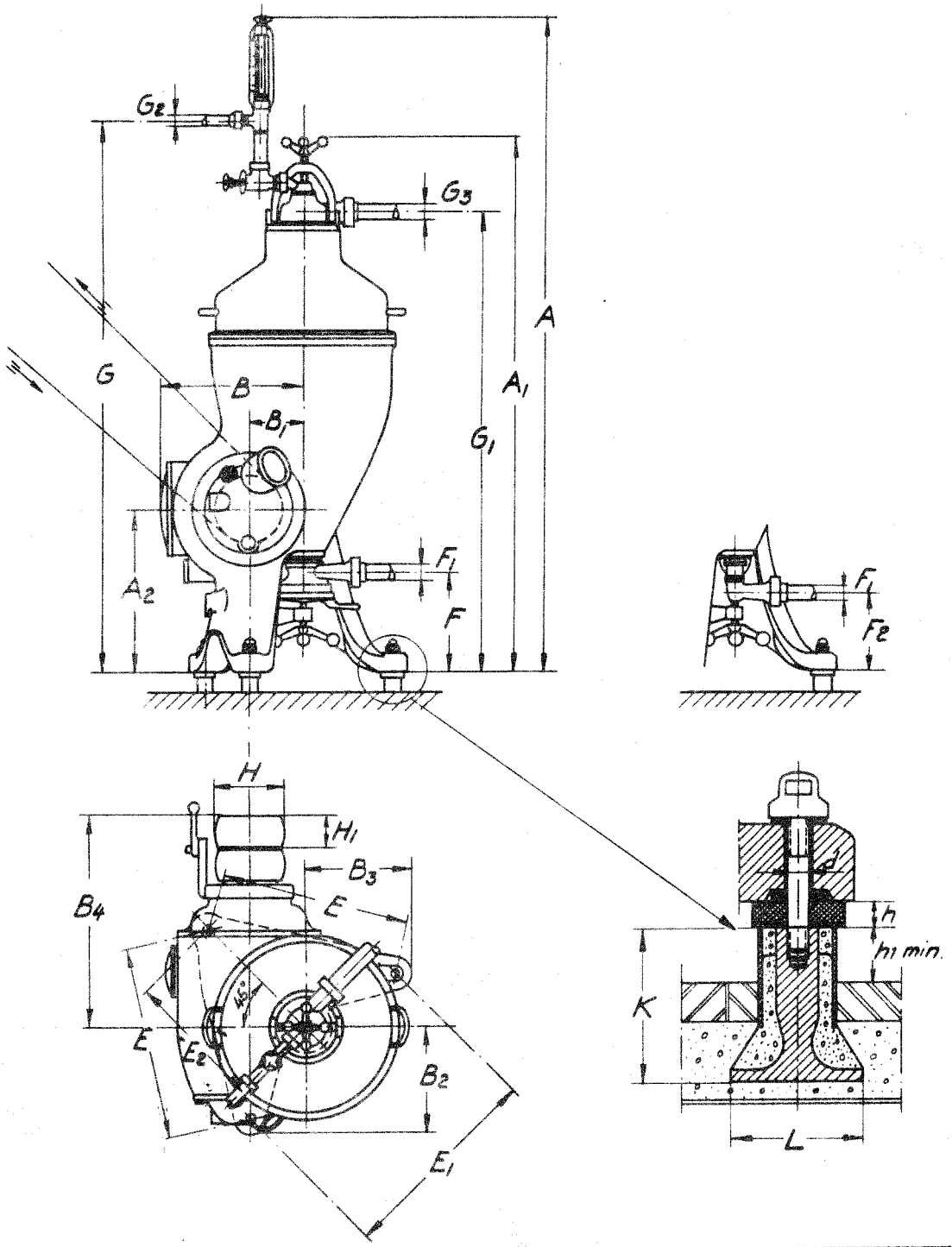






	A	A1	A2	B	B1	B2	B3	B4	B5	B6	E	E1	E2
mm	1670	1365	420	815	139	285	270	445	150	625	500	520	365
inches	65 3/4	53 3/4	16 9/16	32 1/8	5 1/2	11 1/4	10 5/8	17 1/2	5 7/8	24 5/8	19 11/16	20 1/2	14 3/8
	F	F1	F2	G	G1	G2	G3	J	K	L	d	h	h1 min
mm	262	38	208	1410	1175	25	38	310	100	85	W 5/16"	16	30
inches	10 5/16	1 1/2	8 3/16	55 1/2	46 1/4	1	1 1/2	12 3/16	4	3 3/8	W 5/8	5/8	1 3/16

T



	A	A1	A2	B	B1	B2	B3	B4	E	E1	E2	F	F1
mm	1670	1365	420	360	139	285	270	505	500	520	365	262	38
inches	65 3/4	53 3/4	16 9/16	14 3/16	5 1/2	11 1/4	10 5/8	19 7/8	19 11/16	20 1/2	14 3/8	10 5/16	1 1/2
	F2	G	G1	G2	G3	H	H1	K	L	d	h	h1 min	
mm	208	1400	1175	25	38	180	75	100	85	W 5/8"	16	30	
inches	8 3/16	55 1/2	46 1/4	1	1 1/2	7 1/16	3	4	3 3/8	W 5/8	5/8	1 3/16	

UNPACKING

When unpacking take care not to scratch metallic or printed surfaces.
Check by means of the packing list that all parts have been unpacked.

FOUNDATION

The foundation must be plane and solid and can consist of girders, concrete or the like. Bolt dimensions, distance between the bolts etc. appear from the dimensioned drawing. The distance to the nearest wall must not be smaller than the minimum stated in the dimensioned drawing. Arrange pipes, pumps and other apparatues so that they are easily accessible for inspection.

FRAME. ERECTION

See chapter S. Necessary measurements are found in the dimensioned drawing.

LUBRICATION

Never start the machine unless there is oil in the worm gear housing. See chapter H.

HEIGHT ADJUSTMENT

Check as described in chapter L.

BOWL. INLET. OUTLET

Dismantle and (if necessary) clean the parts in contact with liquid - see chapter I. Make sure the seal rings are fitted in their places (in some cases they are packed separately in the pack box).

The lower edge of the bowl hood must be protected against injury. The bowl hood should, therefore, be placed on for example a wooden stand.

If the cap nut sits on the bowl spindle unscrew it (clockwise) before mounting the bowl body.
Before running, the bowl must be assembled as directed in chapter I.

MOTOR MOUNTING

See chapter R.

CONNECTION to MAINS

Connect the motor to mains so that the bowl will rotate CLOCKWISE.

Note.

The machine must never be started unless the bowl is placed on the spindle and the worm gear housing contains lubricating oil in the prescribed quantity and of the proper quality. If the machine is to be run up to full speed the cover must be fastened.

ACCESSORIES

For installation of pumps, meters etc., if any, see chapter X.

Piping

Fit the pipes and hoses so that the inlet and outlet connections of the machine are not subjected to strain.
Tightweld (hard-solder) internal pipe ends in connection sleeves so as to avoid dirt-collecting pockets. This is particularly important in plants on which high hygienic demands are made, such as in the food industry.
Grind and polish all welding seams (hard-solderings) carefully.
All attachements should be made so as to allow variations in length and to prevent transmission of strains and vibrations.
Blow or flush out each section of the piping after mounting. Also flush out the whole pipe system after installation so that metallic ashes and other impurities are removed entirely and cannot get into the, machine, pumps or other apparatuses.

Circulation system

Since liquid (water or skim milk - see chapter K) must circulate through the machine also during the acceleration and retardation periods, recirculation pipes are required both from the cream outlet and the skim milk outlet to the feed pump. If the machine is provided with remixing or standardizing device including a three-way valve only a return pipe is necessary.

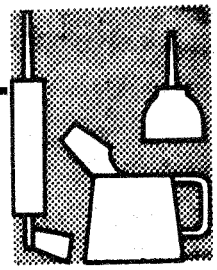
CHECKING

Examine the installation before putting the machine into service. Check particularly:

- That the worm wheel shaft rotates at prescribed speed and that the bowl rotates in the correct direction.
- That the nuts of the anchor bolts are tightened according to directions in chapter S.
- That the directions given under the heading BEFORE STARTING in chapter K have been observed.

CLEANING PLACE

A table, a stand or the like affording place for the bowl and its special tools should be arranged as near the machine as possible.



LUBRICATION

It should be understood that the mentioning of certain brands as examples of a suitable lubricant does not involve an exclusion of other brands with equivalent properties.

ABREVIATIONS – see chapter A.

The machine is delivered without oil in the worm gear housing. It must NOT be started unless oil in the quantity and of the quality prescribed has been supplied. A change of the separating temperature can make it necessary to replace the oil by oil of a different type.

Lubricants, oil as well as grease, must be kept in clean, closed cans to prevent penetration of dust and moisture and to reduce the oxidizing effect to the air as far as possible. The storing room should be dry and cool.

LUBRICANTS

Lubricating oil for worm gear housing

For choise of lubricating oil type follow the recommendations given in the lubrication scheldue.
The oil types mentioned in the table must meet the demands on quality stated below. When in doubt consult an authorized ALFA-LAVAL/DE LAVAL representative.
Always use a high grade mineral lubricating oil.

SAE-oils

Oil type	Max. viscosity		Min. viscosity index	Lowest liquidity temperature °C (°F)
	SSU at 210°F	°E at 100°C		
SAE 10W	210 at 100°F	1,5-2 at 50°C	-	-20 -4
SAE 20	45-58	1,4-1,8	80	-10 +14
SAE 30	58-70	1,8-2,1	80	-10 +14
SAE 40	70-85	2,1-2,5	80	-10 +14
SAE 50	85-110	2,5-3,2	80	-10 +14

EP-oils

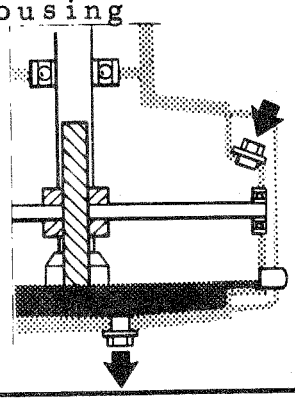
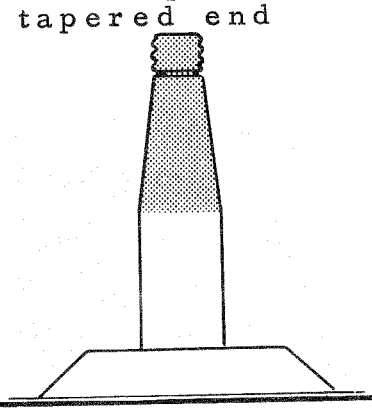
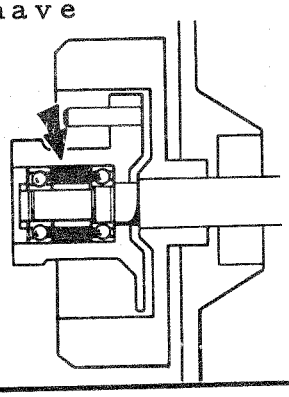
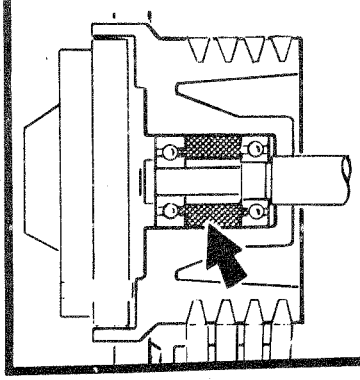
EP-table I	EP-table II
BP Energol Gear 300 EP	BP Energol Gear 425
Caltex Meropa Lubricant 3	Caltex Meropa Lubricant 3
Esso Pen-O-Led EP 3	Esso Pen-O-Led EP 3
Gulf EP Lubricant 75	Gulf EP Lubricant 115
Mobil Compound DD	Mobil Compound EE
Shell Macoma 72	Shell Macoma 75
Castrol Alpha 617	Castrol Alpha 717

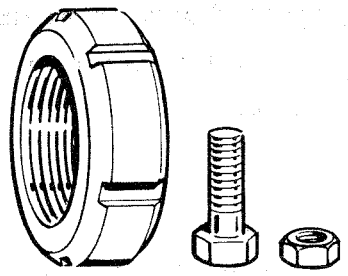
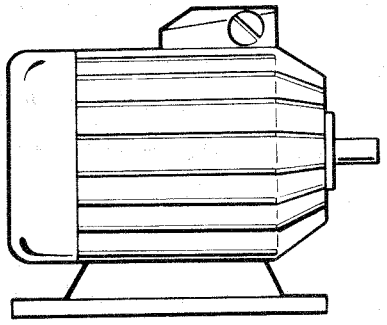
Observe

Special Diesel cylinder lubricating oils containing amine type additives (generally intended for heavy-oil-burning marine diesel engines) and "multigrade" motor-car lubricating oils should not be used.

(Lubricants, page 2)

Molybdenum disulfide lubricants	Example of molybdenum disulfide paste: Molykote Paste G Rocol Anti-Scuffing Paste Example of molybdenum disulfide grease: Molykote Universal Grease BR3 Polyethylene-castor oil paste or polytetrafluoro ethylene-castor oil paste is recommended for machines used in the food industry or where dark-coloured lubricants are unsuitable.
EP-grease	Example: Molykote BR-2 Molykote BR-3 Multy-Purpose-Grease Polyethylene-castor oil paste or pure castor oil is recommended for machines used in the food industry.
Ball bearing grease	Always use a high grade lithium soap type ball bearing grease according to NLGI-class 2 or 3 and usable at temperatures above 100°C (212°F). Pour point about 180°C (356°F) according to ASTM D 566-44. Examples: BP Energrease 2 or 3, Caltex Starfak premium Grease 2 or 3, Castrol Spheerol AP Grease 2 or 3, Esso Beacon Grease 2 or 3, Gulfcrown Grease 2 or 3, Mobilux Grease 2 or 3, Shell Alvania Grease 2 or 3.
Lubricating grease. Consistent grease.	Always use one of the recommended ball bearing greases.
Oil	Use the oil recommended for the worm gear housing.

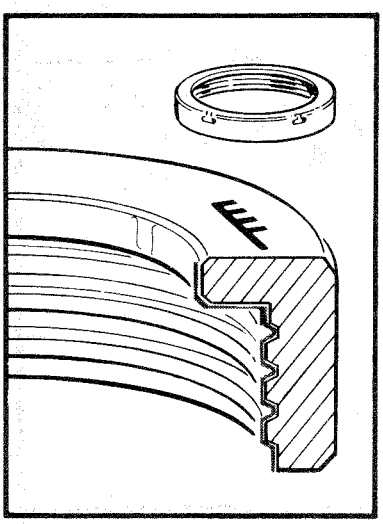
LUBRICATION POINT	LUBRICANT	WHEN
Worm gear housing 	At normal separating temperature: SAE 30 Oil quantity: 2.7 litres	Filling before first starting. First oil exchange after 300 hours´ operation, then after every period of 1500 hours´ operation. In seasonal operation before every operating period. Clean before exchange. Oil level in upper half of the oil gauge glass.
Bowl spindle tapered end 	Molybdenum disulfide paste Oil Grease Rustpreventive	Always before putting the bowl body on the spindle, however at least once a month. Apply sparsely to avoid slipping but sufficiently to avoid seizing. At service interruptions with bowl removed.
Clutch coupling nave 	Anyone of the recommended ball bearing greases.	Renewal of grease once a year, as well as cleaning of bearings and bearing seats. Grease the bearings and fill the space around the spacing sleeve to approx. one third.
Nave of V-belt and flat belt gearing 	Anyone of the recommended ball bearing greases.	Renewal of grease once a year, as well as cleaning of bearings and bearing seats. Grease the bearings and fill the space around the spacing sleeve to approx. one third.

LUBRICATION POINT	LUBRICANT	WHEN
Other machine parts 	Parts of stainless steel: Molybdenum disulfide grease, EP-lubricating-grease or equivalent. Parts of steel: Oil as recommended for the worm gear housing.	Before every mounting. Observe, however, that the conveyor pulley must NEVER be lubricated.
Motor 	Follow motor supplier´s recommendations.	Follow motor supplier´s recommendations.
Bowl lock ring and other bowl parts	See special recommendations below.	See special recommendations below.

(Lubrication Directions, page 2)

Bowl

Before every assembly wipe clean the threads of lock rings, bowl body and bowl hood as well as the contact surfaces between these parts. If necessary, they should be cleaned with a clean cloth moistened with cleaning agent (see chapter L). After wiping, lubricate them according to one of the alternatives below.

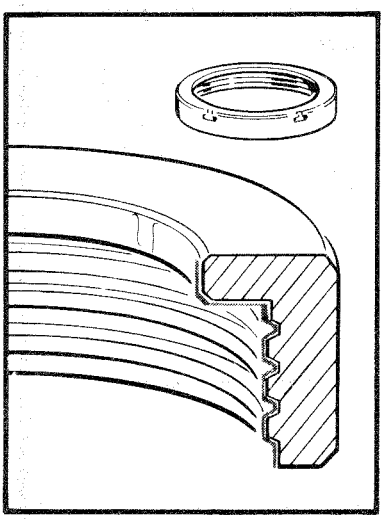


Alternative 1

If either the lock ring, bowl body or bowl hood is made of stainless stell or monel metal, molybdenum disulfide lubricant is recommended. Rub or brush in the paste sparsely all over the surface — follow directions given on the wrapping. Polyethylene-castor oil paste or polytetrafluoro ethylene-castor oil paste is recommended for machines used in the food industry or where dark-coloured lubricants are unsuitable.

Note.

The above recommendations are valid when the lock ring is stamped with the symbol shown in the adjoining illustration.



Alternative 2a

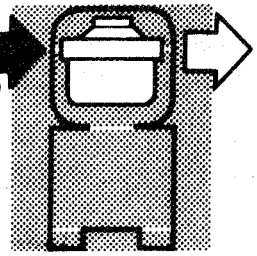
If the lock ring is made of carbon steel and not marked with the symbol mentioned above an EP grease is recommended.

Polyethylene-castor oil paste or pure castor oil is recommended for machines used in the food industry.

Alternative 2b

If no tendency to seizing is observed, the same oil as in the worm gear housing, or consistent grease, can be used as lubricant.

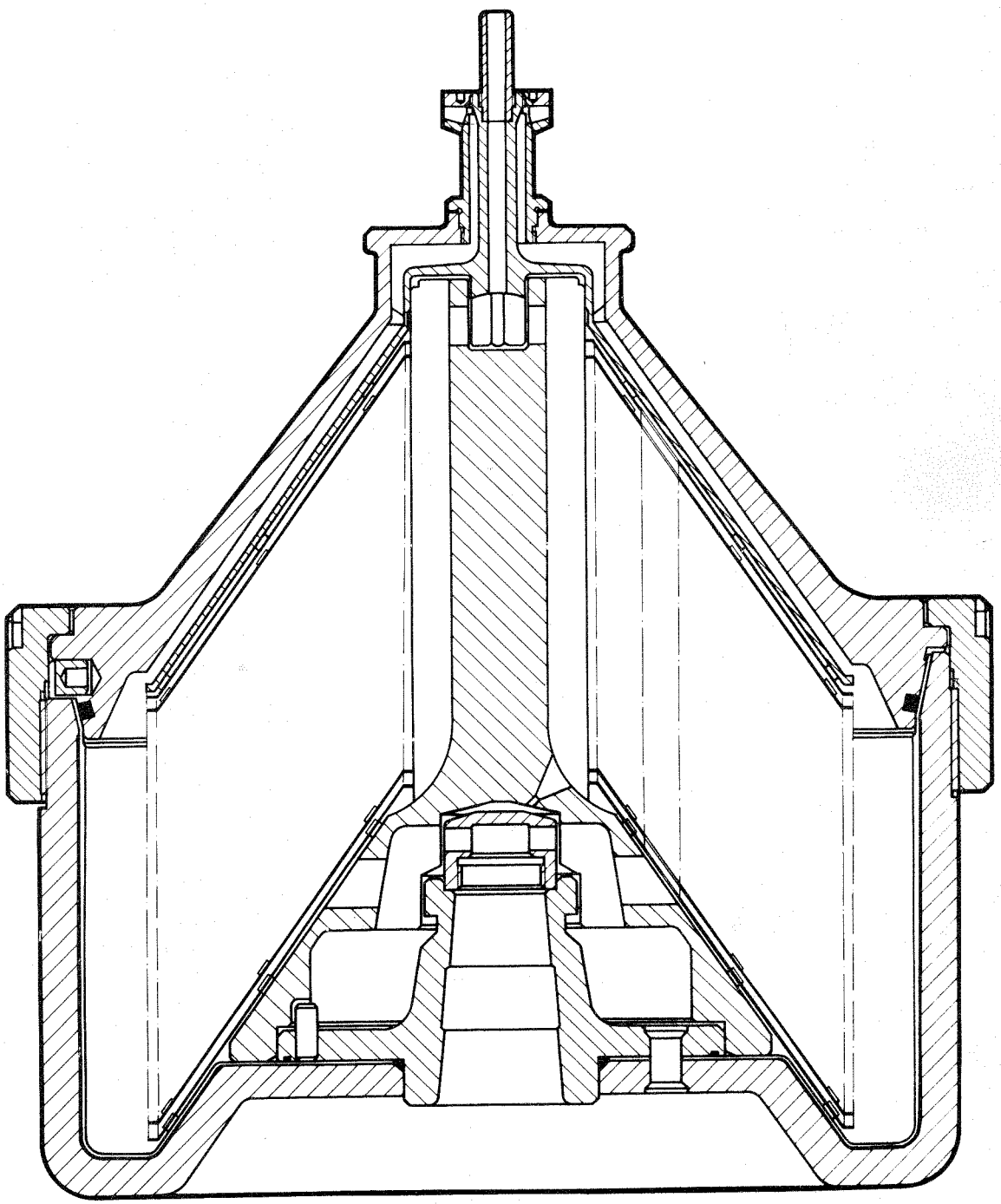
Tallow or paraffin oil can be used for machines emploied in the food industry.



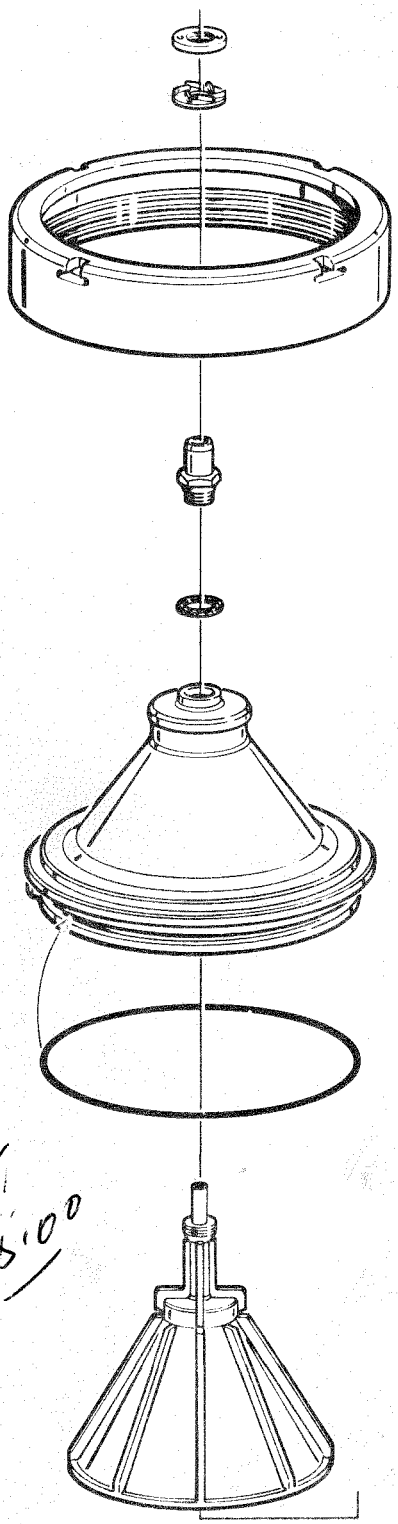
INLET. BOWL. OUTLET

General drawings - Perspective drawings with part numbers - Dismantling - Assembling.

SPECIAL TOOLS see chapter F - LUBRICATION see chapter H - CLEANING see chapter L - ORDERING ROUTINE see chapter A.



SEPARATOR BOWL (except cap nut) -- 11739



Impeller, top part
(left-hand thread)
-- 9901

Impeller, bottom part
-- 9902

Lock ring*
(left-hand thread)
-- 9052

Outlet sleeve
(left-hand thread)
-- 11742

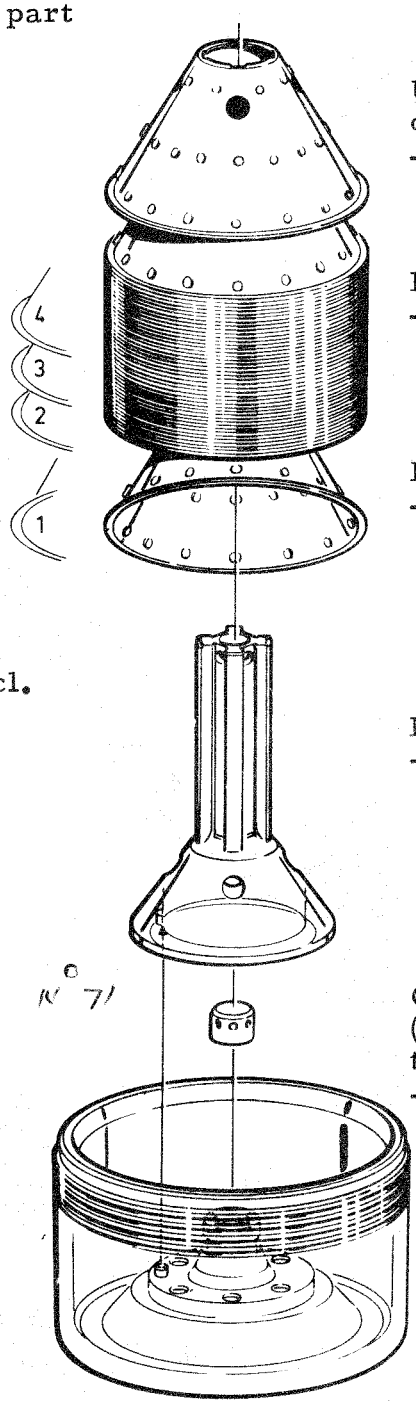
Packing
-- 9733

Bowl hood * , incl.
outlet sleeve
-- 43498

Rubber ring
-- 43764

Wear sleeve
(left-hand thread)
-- 9728

Top disc **
-- 785149-80



Uppermost
disc **
-- 9869

Bowl disc **
-- 9867

Bottom disc **
-- 9870

Distributor*
-- 9860

Cap nut **
(left-hand
thread)
-- 11951

Bowl body *
-- 43518

*) Exchange necessitates rebalancing - send the COMPLETE bowl to an authorized Alfa-Laval - representative.

**) Parts of stainless steel.

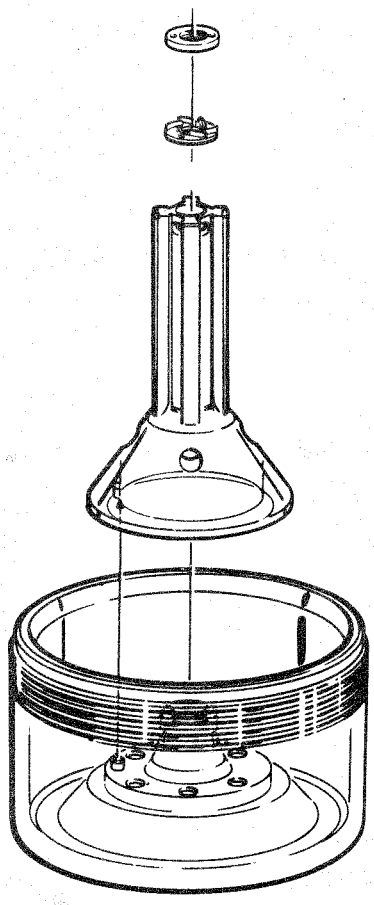
SEPARATOR BOWLS -- 11949 and 43483

Normally, the machine is delivered with standard bowl (see foregoing page), which is provided with top disc and bowl discs of stainless steel.

As an alternative to the standard bowl, bowls with further parts of stainless steel are available -- see below.

If the standard bowl is modified by substituting such parts, it must be sent in for rebalancing. This is not necessary, however, if the discharge pump only is exchanged.

Parts of stainless steel



Pump wheel, top part (left-hand thread) -- 11815

Pump wheel, bottom part -- 11814

Distributor -- 43432

Bowl body -- 43501

SEPARATOR BOWL -- 11949

SEPARATOR BOWL -- 43483

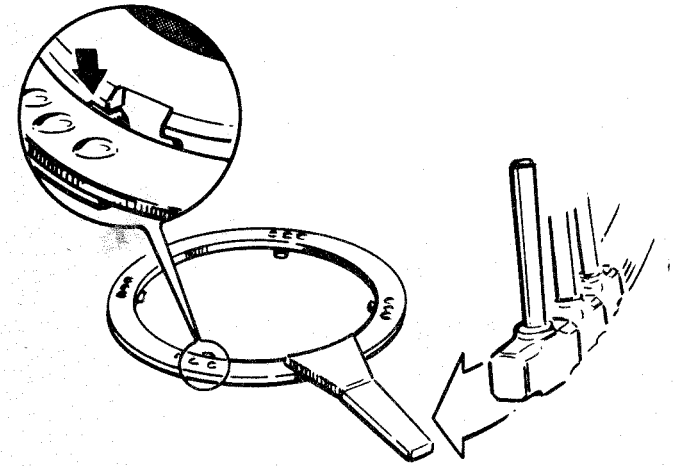
DISMANTLING

Place the parts on a soft, e.g. a wooden or rubber, base. Use the special tools -- see chapter F.
Observe that the bowl MUST be at rest before the dismantling is commenced -- check that the revolution counter does not move.
Dismantle the outlet. Unscrew the hood locking screws and lift off the frame hood.

Left-hand threads

The bowl rotates clockwise. For this reason, the threads of the rotating parts are left-handed. This is always mentioned in the text.

Bowl lock ring



Screw in the lock screws so that they just bottom the incisions in the bowl body. Unscrew the lock ring CLOCKWISE (left-hand thread) with the spanner. When necessary loosen it by knocking on the spanner handle with a lead mallet or the like. Push the spanner forwards as far as possible in the hitting direction before every blow.
Lift off the lock ring.

Bowl hood

Lift off the bowl hood. Take care not to damage the seal ring in the lower edge of the hood. It is to be removed in case of exchange only.

Distributor

Lift off the top disc. Fasten the distributor lifting tool and lift out the distributor with the set of discs. Place the distributor on its wooden stand.

Cap nut

Unscrew the cap nut CLOCKWISE (left-hand thread) with its spanner.

Bowl body

Insert the protecting sleeve into the spindle top and press the bowl body off the bowl spindle by aid of the lifting tool. Unscrew the lock screws in the frame and lift the bowl body from the spindle. Put it on a soft base.

CLEANING. OVERHAUL. LUBRICATION

Satisfactory functioning cannot be ensured unless the parts in contact with liquid are carefully cleaned before assembly. This applies particularly to seal rings, sliding surfaces, guiding and contact surfaces, and threads. Also take care that no burrs are knocked up on the metal parts when handling them.
Follow the directions given in chapter L and H.

ASSEMBLING

Each bowl constitutes a balanced unit which will get out of balance if any parts having an "*" added to their part number in the general drawing are exchanged without the bowl being rebalanced. To prevent confusion of parts, for instance when a plant consists of several machines of the same type, these main parts are stamped either with the complete manufacturing number or its three last digits.

Guides

When assembling make sure that the parts are placed in the positions defined by the guides. Be careful not to damage the guides when handling the parts.

Seal rings

After mounting check:
... that the ring lies properly (not twisted) in the groove.
... that it fills the groove evenly all around.

ASSEMBLING

Bowl body

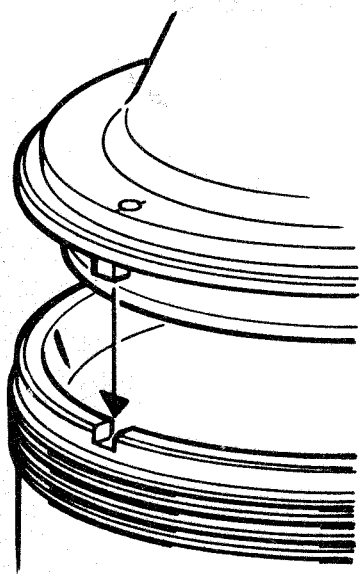
Ascertain that the lock screws in the frame are screwed out. Wipe off the spindle top and the bowl body nave. When necessary lubricate the thread and cone of the spindle top. Insert the protecting sleeve into the bowl spindle top and insert the bowl body by means of the lifting tool. Screw in the lock screws in such a way that they just bottom the incisions in the bowl body. Remove the protecting sleeve and tighten the cap, nut anti-clockwise (left-hand thread) with the spanner.

Distributor

Place the distributor on the wooden stand and slip the bowl discs on to the distributor in numerical sequence with disc No. 1 undermost, fitting their recesses over the guide rib of the distributor. Place the distributor with disc set in the bowl body by means of the lifting tool, turning it till the guide pin in the bowl body bottom enters the incision in the distributor bottom.

Turn the top disc so that the punch mark faces the recess in the bowl body, and fit the disc over the guide. Oil the wear sleeve and put on the protecting sleeve.

Bowl hood

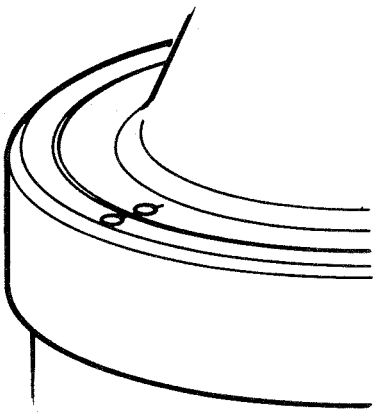


Check that the seal ring lies properly in the groove and fit the hood very carefully over the sleeve of the top disc. Make sure the hood drops into correct position, i.e. so that its guide lug enters the recess in the bowl body. Never press down the hood by screwing on the lock ring. If it does not sink properly into its seat, check instead whether some parts has been wrongly mounted.

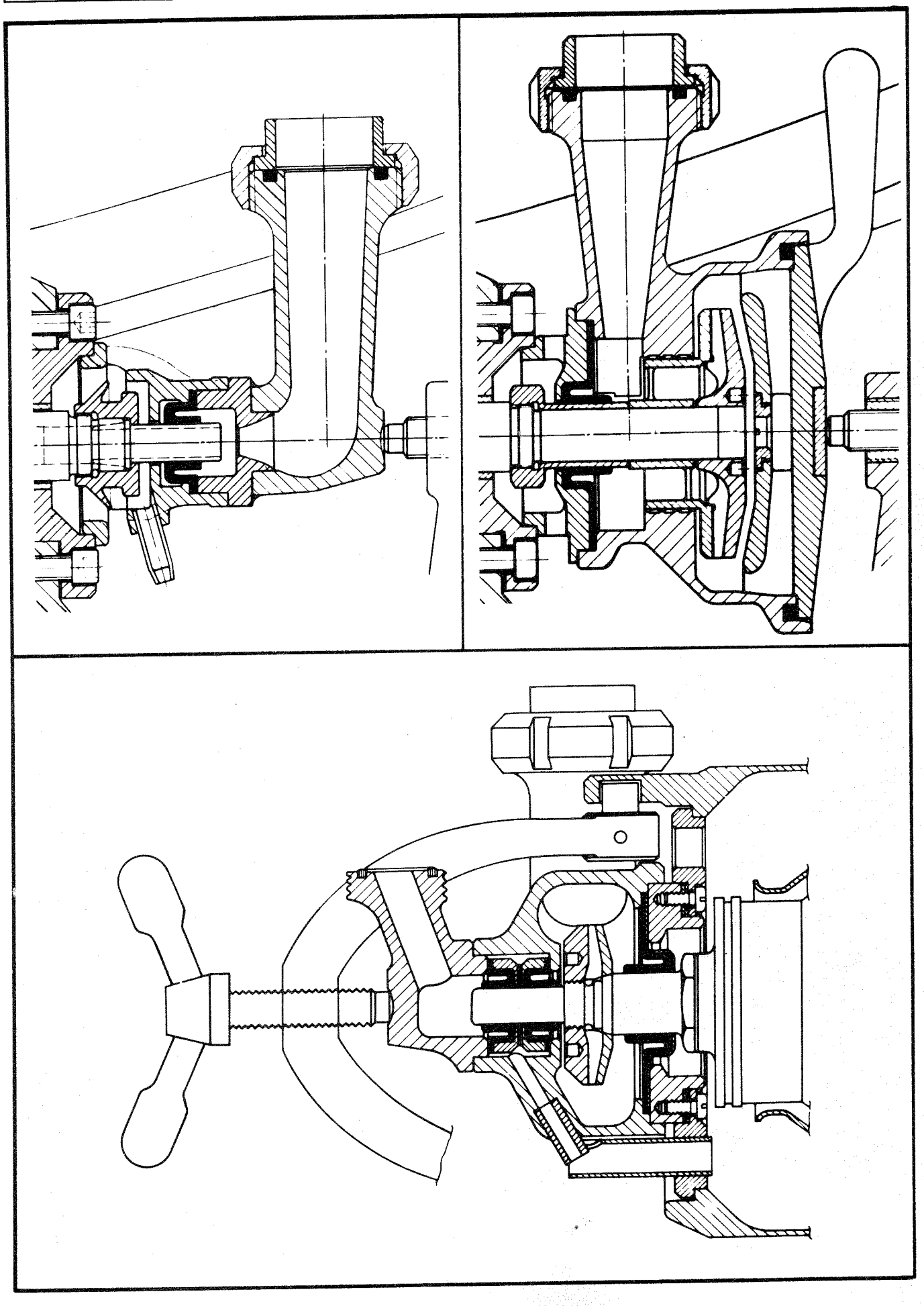
(Assembling, page 2)

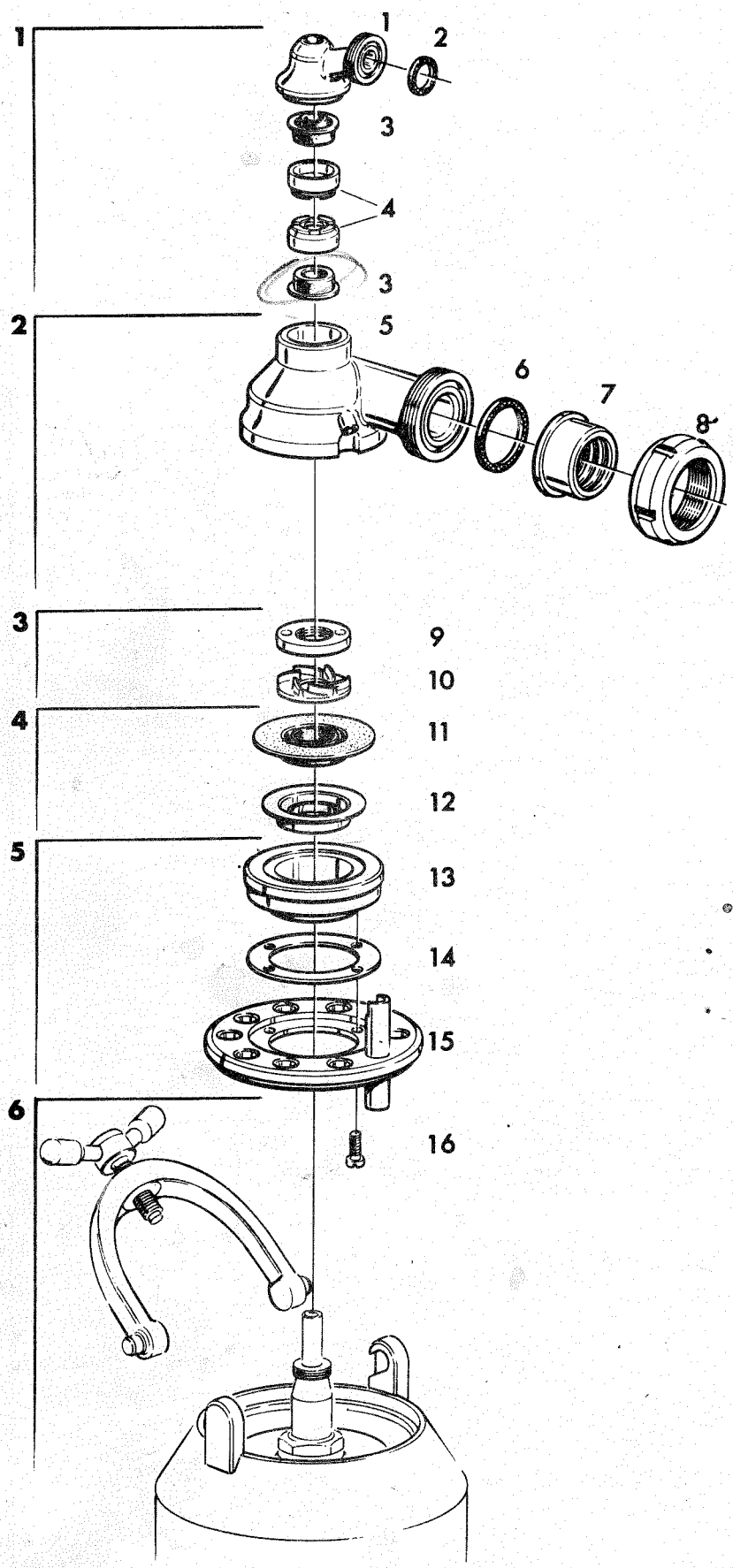
Bowl locking

Clean and lubricate the threads of the lock ring and its contact surfaces with bowl hood and bowl body before every assembly. Seizing may be the result, especially in new machines, if this lubrication is neglected or an unsuitable lubricant is used. Careful lubrication of these surfaces will prevent unnecessary wear of threads and contact surfaces.
Screw on the lock ring anti-clockwise till the bowl hood rests TIGHTLY against the bowl body.
The best way to use the spanner is to move the handle clockwise and check the movement with a heavy jerk. The lock ring should press the bowl hood against the bowl body so that perfect sealing is obtained at the seal ring, and also keep the distributor pressed against the bowl body bottom, firmly clamping the disc set. For final tightening it may thus be necessary to hit the spanner handle with a lead mallet or the like (NEVER extend the spanner handle).
In a new bowl the marks will be right in front of each other (see fig.)



Pressure in disc set and thread checking -- see chapter L.





1 Cream outlet bend
-- 11682, 11813*

2 Rubber ring
-- 190601

3 Packing collar (2)
-- 11426

4 Spacing ring (2)
-- 11425

5 Milk outlet bend
-- 785586-80
-- 785035-80*

6 Rubber ring
-- 190603

7 Connecting sleeve
-- 190629

8 Coupling nut
-- 190615

9 Impeller, top part (left-hand thread)
-- see Bowl

10 Impeller, bottom part
-- see Bowl

11 Packing collar
-- 11595

12 Cup for collar
-- 11678

13 Guide ring
-- 11676, 785476-2*

14 Height adjusting ring (1-3)
-- 11675, 785951-1*

15 Bottom ring
-- 11672, 785355-81*

16 Screw (4)
-- 11677

*) Parts of stainless steel.

DISMANTLING

Dismantle the parts by means of the special tools in the sequence shown in the illustration. All parts except those in stage 5 must be removed before the bowl can be dismantled. Note that

- o the connecting pipes must be loosened before backing off the clamp screw.
- o the pump nut unscrews clock-wise (left-hand thread).
- o the overflow pipe on the frame hood is removed.

Stage 5

These parts are dismantled only in connection with height adjustment and more extensive overhaul.

CLEANING and LUBRICATION

Satisfactory functioning cannot be ensured unless the parts in contact with liquid are carefully cleaned before assembly. This applies particularly to packing collars, sliding surfaces, guiding and contact surfaces and threads. Also take care that no burrs are knocked up on the metal parts when handling them.
Follow the directions given in chapter L and H.

ASSEMBLING

Proceed in numerical order according to illustration, observing any instructions given in correspondingly numbered paragraphs below.

Stage 5

Only in connection with height adjustment and more extensive overhaul - see above.

Stage 6

Clamp the frame hood. This involves that the bowl is unlocked - a locked bowl may sit obliquely in the frame with eccentric clamping of the packing collars as a result.

Stage 4

Moisten the packing collars before mounting them.

Stage 3

Tighten the nut of the pump wheel anti-clockwise (left-hand thread) with the pin spanner.

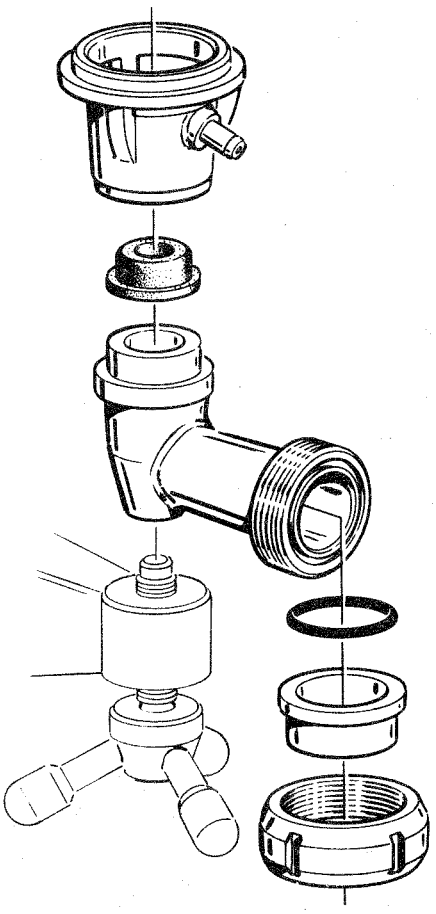
Stage 2

Do not connect the pipe until the outlet is completely mounted. Fit the drain tube of the milk outlet bend over the tube in the bottom washer. Check the height position wear sleeve/outlet bend - see chapter L.

Stage 1

Fit the parts. Turn the outlet bend into suitable position, raise the locking stirrup and compress lightly with the clamp screw. Connect the connecting pipes. Tighten the clamp screw and coupling nuts finally. Fit the overflow pipe onto the frame hood.

INLET PIECE



Packing collar holder
-- 11691

Packing collar
-- 11426

Inlet piece, incl. connection
-- 11693

Inlet piece, incl. connection, of stainless steel
-- 43115

Rubber ring
-- 190603

Joint sleeve
-- 190629

Coupling nut
-- 190615

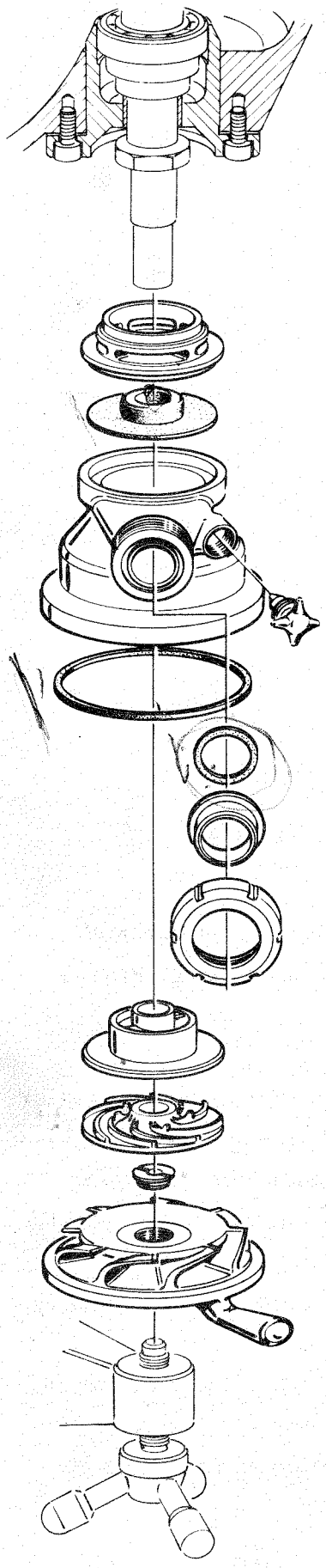
Dismantling

Back off the clamp screw CLOCKWISE (left-hand thread), swing the clamping arm aside and remove the inlet parts.

Assembling

Put together the packing collar holder, packing collar and inlet piece. Slip the assembled unit over the inlet sleeve of the bowl spindle. Swing the clamping arm into position and tighten the clamp screw lightly ANTI-CLOCKWISE (left-hand thread).
Connect the pipe and tighten the clamp screw finally.

Note. The clamp screw only holds the inlet in place and has NO influence on the seals. If it is tightened too much, the clamping arm and its pivot may suffer damage.



Frame and
bowl spindle

Collar holder
-- 785976-1

Packing collar
-- 11595

Pump housing, incl. screw
-- 785821-80, 785461-80*

Vent screw
-- 10866, 785098-80*

Seal rings
-- 30856
-- 190603

Connecting sleeve
-- 190629

Coupling nut
-- 190615

Top part
-- 11584, 11811*

Bottom part
-- 11583, 11810*

→ Complete pump wheel
-- 11582, 11809*
(see also chapter X)

Nozzle
-- see table

Pump shousing
cover
-- 10698, 11833*

Nozzle	
Diam. in mm (")	Part number
12 (0.47")	10700, 11837*
8 (0.31")	10885, 11839*
7 (0.28")	10941, 11840*
6 (0.24")	10899, 11841*

Clamp screw
-- see chapter S

* Parts of stainless steel.

DISMANTLING

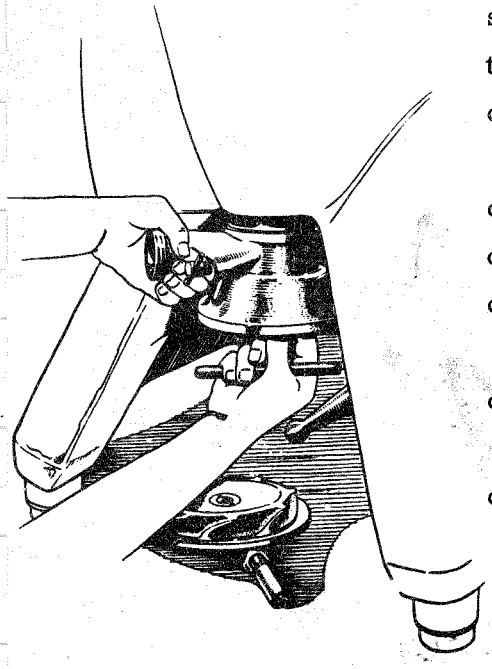
Dismantle the parts by means of the special tools in the sequence shown in the illustration.
Leave the bowl body on the spindle and screw home the lock screws.

- o Disconnect the pipe and slacken the clamp screw CLOCKWISE (left-hand thread).
- o Remove the cover and unscrew the pump wheel with the pin spanner. Be careful not to damage the packing collar.
- o Rinse the parts in water immediately.

CLEANING and LUBRICATION

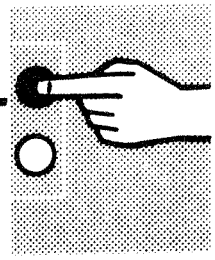
Satisfactory functioning cannot be ensured unless the parts in contact with liquid are carefully cleaned before assembly. This applies particularly to packing collars, sliding surfaces, guiding and contact surfaces, and threads. Also take care that no burrs are knocked up on the metal parts when handling them.
Follow the directions given in chapter L and H.

ASSEMBLING



Assemble in sequence according to illustration. The bowl should sit on the spindle and the lock screws be screwed in so that they just bottom the incisions in the bowl body.

- o Check that the rubber ring has been fitted in the pump housing.
- o Moisten the packing collar and press it into the holder.
- o Place the cup and the holder on the pump housing.
- o Slip the top and bottom part of the pump wheel over the pin spanner.
- o Lift the pump housing to its seat and screw on the pump wheel properly (but not too firmly).
- o Lift the cover with nozzle and screw down the clamp screw lightly ANTI-CLOCKWISE (left-hand thread) For selection of nozzle and pump wheel see chapter B and C.
- o Connect the pipe and tighten the clamp screw finally. Note: The clamp screw only holds the inlet in its place and has no influence on the packing collars. Excesive tightening of the screw may cause damaging of the clamping arm and its shaft.



OPERATION

DATA see chapter C.
SPECIAL EQUIPMENT see chapter X.

SAFETY REGULATIONS

In all centrifugal separators the bowl rotates at a very high speed, normally between 100 and 150 revolutions per SECOND. Thus, very great forces are released and it is essential, therefore, to follow strictly the directions given in the Instruction Book concerning assembly of parts, starting, stopping and overhaul.

In this connection remember particularly:

... to tighten the bowl lock ring (lock rings),

... to fasten carefully the frame hood as well as the inlet and outlet parts,

... to check the speed,

... that no machine part must be loosened until the bowl has topped rotating,

... that bowl body, bowl hood and lock ring must never be heated by means of a flame,

... that the machine must never be used for processing liquids with a higher density (temperature, sludge nature etc.) than that for which it was originally intended. Thus, always consult an ALFA-LAVAL representative before using the machine beyond its proper range of separation.

CREAM SEPARATION

Before starting

The bowl as well as the other parts in contact with liquid must be well cleaned and assembled as advised in chapter I. For selection of feed pressure, nozzle and throughput see chapter B and C.

Before every start check
- o that the brake is released and the bowl rotates unimpeded.
- o that the frame hood is clamped with the locking arms.
- o that the clamping means of inlet and outlet are well tightened.
- o that the oil level in the worm gear housing lies at the middle of the oil gauge glass.

Starting

The packing collars are lubricated and cooled by the liquid to be treated.
To avoid excessive wear of the packing collars during acceleration and retardation liquid must be fed to the machine already before starting it. Since the liquid to be treated is not satisfactorily separated during these periods due to the low bowl speed, it is better to supply water or skimmilk and recirculate it.

:: Open the liquid feed and the vent screw of the feed pump — tighten the screw when liquid begins to flow out.
:: Start the machine when liquid appears in the cream flow meter.

Heat is always generated in the clutch coupling during the running-up period, especially when the pads on the friction blocks are new. This is noticeable through smoke and a smell of burning. Like the sliding sound this is quite normal and has no importance.

During the running-up period the amperage is above normal. The ammeter reading will drop as soon as the bowl has attained full speed.

The bowl will attain full speed 5 to 6 minutes after starting at the earliest. Check the tachometer by pressing a finger lightly against the push-button of the revolution counter and counting the number of strokes during a minute. Speed table is found in chapter C.

:: Circulate liquid through heat exchanger and machine. The throughput should be the same as when treating milk.
:: Shift to milk.
:: Adjust the machine as described in chapter B or according to previously established values.

Running

The fat content of the cream can be regulated during the separation process by changing the pressure in the cream outlet. This can be effected by means of the regulating valve in the cream flow meter.

o By screwing in the regulating valve, a thicker cream (higher fat content) is obtained.

o By screwing out the regulating valve, a thinner cream is obtained.

If the cream becomes very thick, it may happen that the indicator rod rises, although the amount of cream does not increase — open the regulating valve of the cream flow meter and readjust.

If the supply is interrupted — switch over immediately so that liquid remains in the inlet and outlet also during the interruption.

If the milk supply is interrupted and air penetrates into the system, it may become difficult to start pumping again — loosen the vent screw of the inlet pump for a moment ant tighten again as soon as the milk begins to flow out.

Stopping

The subsequent cleaning can be facilitated by flushing with lukewarm liquid, e,g. water before the machine is stopped. This is possible, however, only when the installation has been made so as to allow such a procedure. If so, warm water can be supplied through the liquid inlets after reconnection of the discharge pipes.

The flushing should go on till the waterflow in the outlets are free from impurities.

Liquid must be supplied throught the inlet throughout the retardation period.

:: Stop the motor for the machine and apply the brake.

:: Release the brake when the machine has stopped.

:: Stop the feed pump.

The stirrup for the outlet, the support for the inlet and the locking arms MUST NOT be loosened until the bowl has stopped.

See Cleaning after Operation and Periodic Cleaning.

MILK CLARIFICATION

The discharge pump must be removed so that the cream discharge pressure will exceed the skim milk discharge pressure.

Read "Milk Clarification" in chapter B, and follow the directions for cream separation.

STANDARDIZATION

The discharge pump must be removed so that the cream discharge pressure will exceed the skimmilk discharge pressure.

Read "Standardization" in chapter B. Preset the cream flow meters. See also direction for cream separation.

MECHANICAL FUNCTIONS

The trouble tracing chart of course cannot be made complete and positively cannot replace good knowledge of the working principle and construction of the machine. To ensure the best result the Instruction Book should, therefore, be carefully studied before undertaking anything on the machine. Observation of defects in the auxiliary equipment is not of minor importance.

When overhauling the machine always follow strictly directions given for dismantling, cleaning, lubrication and assembling. In case of heavy bowl damage the complete bowl must be sent to an authorized ALFA-LAVAL/DE LAVAL representative for repair and rebalancing.

Examination and operation tests should in the first hand be concentrated on:

Machine run – Auxiliary apparatus of the plant – Inlet and outlet liquids – Number of revolutions – Power consumption during starting and operation – Running-up and operating time – Leakage – Lubricating oil level – Abnormal smell.

CREAM SEPARATION

The suitable technique of operation must be found out experimentally in each special case. For best results study carefully chapters B, C and K.

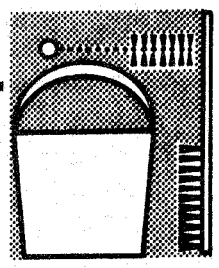
Sampling

For checking the clean skimming, a skim milk sample is to be drawn from the pipe next to the machine. It may happen that samples which have been taken out simultaneously at the machine and in the skim milk tank show a different fat content. This can be due to the fact that whole milk or cream has leaked into the skim milk somewhere after the machine.

Indication	Cause	Remedy
Machine vibrates	1. Moderate vibrations normally occur at the critical number of revolutions during the running-up and retardation periods.	None.
	2. Bowl out of balance due to: bad cleaning – wrong assembling – badly tightened lock ring – bowl assembled with parts from different machines.	Stop immediately and establish cause. Badly tightened lock ring involves fatal danger.
	3. Vibration damping rubber washers have lost elasticity.	Renew rubber washers.
	4. Top bearing spring broken.	Exchange all springs.
	5. Foundation too weak.	Reinforce foundation.
Speed too high	1. Tachometer reading wrong.	Check by means of revolution counter.
	2. Wrong transmission.	Stop immediately. Check that proper transmission or belt pulley is used in view of motor speed.
	3. The motor speed is not appropriate.	Stop immediately and provide a motor with correct speed.
Speed is too low. Running-up time too long.	1. Brake applied.	Release the brake.
	2. Pads of clutch are worn or oily.	Exchange or clean all pads.
	3. Voltage drop in mains.	Check mains voltage (D.C.)
	4. Ball bearing damage.	Locate and exchange defective bearing.
	5. Other machine defects.	Stop immediately. Check that bowl can be rotated by hand.
	6. Motor defect.	Exchange or repair motor.
Starting power too low.	1. Ammeter reading wrong.	
	2. Clutch pads worn or oily.	See -- Speed is too low.
Starting power too high.	1. Ammeter reading wrong.	
	2. Motor defect.	Exchange or repair motor.
	3. Ball bearing damaged.	Locate and exchange defective bearing.
	4. Other machine defects.	See -- Speed is too low.
Retardation time too long.	Brake lining worn or oily.	Exchange or clean lining.
Water in worm gear housing.	1. Condensation.	Drain water.
	2. Axial seals not tight or turned wrongly.	Exchange rings and turn correctly.
	3. Leakage via top bearing.	Exchange seal rings and adjust axial seal.
Noise from worm gear housing.	1. Oil quantity wrong.	Check quantity and quality.
	2. Worm wheel or worm worn.	Exchange worn parts. Exchange of complete gear is generally advisable.
	3. Ball bearing worn or damaged.	Exchange bearing.
Noise from clutch coupling.	1. Normal when starting and stopping due to sliding of friction blocks.	None.
	2. Wrong play between coupling pulley and elastic plate.	Adjust.
	3. Speed too low.	See -- Speed too low.
Smell	1. Normal at start and stop when friction blocks are sliding, thus causing burnt smell.	None.
	2. V belts or flat belts are sliding.	Clean belts. Adjust belt tension.
	3. Bearing running hot.	Feel over machine and locate spot. Exchange bearing.
	4. Motor overheated.	Trace cause. Adjust overcurrent relay, if any provided.
"Scraping" sounds	Wrong height position	Stop and adjust -- see Chapter L.

Indication	Cause	Remedy
Machine noisy	1. "Grinding" sounds. One or several ball bearings are worn or damaged.	Locate and exchange defective bearing. Check quantity and quality of lubricating oil.
	2. Bowl spindle top or conveyor damaged, cap nut not tightened.	Stop and establish cause.
Liquid discharge through bowl casing drain	1. Seal ring between bowl hood and bowl body does not seal.	Stop immediately. Adjust.
	2. Bowl lock ring is insufficiently tightened.	Danger. Stop immediately and tighten.
Abnormal wear of packing collars	1. The machine has been started, operated or braked without liquid passing through inlet and outlet.	See Operation. Renew the packing collars.
	2. The rotating surfaces against which the packing collars seal are worn obliquely, scratched or covered by dry casein deposits.	Clean, polish or exchange the wear sleeve or the outlet sleeve. Renew the packing collar.
	3. The bowl is out of balance (this will affect the outlet only).	Stop. Ascertain that the bowl is cleaned and correctly assembled. Renew the packing collar.
	4. The collar holder is deformed and therefore wrongly clamped.	Exchange packing collar and collar holder.
	5. The outlet packing collars have been eccentrically mounted.	Renew the packing collars. Never mount them while the bowl is locked with the lock screws.
	6. The liquid pressure in inlet or outlet is abnormally high.	See chapter C.
The pump fails to work or its output is too low	1. The pump runs dry.	Ventilate.
	2. Suction pipe leaks.	Seal and ventilate.
	3. Feed pressure too low.	Increase feed pressure.
	4. Strainer and pipes are abstructed.	Clean. Ventilate.

Indication	Cause	Remedy
CREAM SEPARATION		
Fat content in skim milk abnormally high.	1. Bowl badly cleaned.	Stop and clean bowl.
	2. Extracted cream is too thick.	Open up the regulating valve of cream flow meter.
	3. Unsuitable operating temperature.	The temperature should lie at approx. 45°C.
	4. Sourish milk.	
	5. Throughput too high.	Reduce throughput.
	6. Fat globules split.	Check that the pump is regulated on delivery side.
	7. Air leaks in.	Check with vent screw of feed pump. Check packing collars and feed pipes.
	8. Steam leaks into milk.	Check pasteurizer or preheater for leakage.
	9. Incorrect analysis.	
	10. Whole milk or cream has leaked in after machine.	Check any change-over connections and the setting of the valves.
Cream blockage.	1. Extracted cream is too thick.	Shut off the milk feed and shift to water. Readjust the cream flow meter.
Cream too thin.	1. Insufficient pressure difference between skim milk outlet and cream outlet.	Throttle with regulating valve of cream flow meter.
Cream too thick.	1. Pressure difference between skim milk outlet and cream outlet too high.	Open up the regulating valve of cream flow meter.
	2. Skim milk pressure too low.	Throttle the skim milk pipe if the regulating valve of the cream flow meter is already fully open.
Remixing fails when clarifying or standardizing.	1. Skim milk pressure higher than cream pressure in the outlets.	Remove the discharge pump.
Throughput too low.	1. Back pressure in discharge pipes too high.	See chapter C.
	2. Nozzle in feed pump too small.	Fit a larger nozzle.
	3. Feed pressure too low.	Increase the feed pressure.
	4. Pump wheel in feed pump too small.	Consult an ALFA-LAVAL/DE LAVAL - representative.



CLEANING. OVERHAUL

Set of spares - Service interruptions - Overhaul (yearly) - Cleaning agents - Bowl cleaning - Bowl overhaul - Exchange of bowl parts - Thread checking - Check of pressure in disc set - Power transmission - Height adjustment - Bearings - Packing collars.

It has proved very difficult in practice to prescribe how often cleaning should be carried out and how thorough the overhaul should be. However, aided by the directions given in this chapter it should not be difficult to make up a suitable working routine with regard paid to special local conditions.

The ALFA-LAVAL/DE LAVAL - representative will always be glad to provide further advice and information.

GENERAL HINTS

When cleaning and overhauling always follow strictly the directions given in this book concerning the dismantling, lubrication and assembling.

Set of spares

Make it a habit to inspect and replenish the set of spare parts (and tools) once a year. It pays to keep the consuming parts in stock.

Service interruptions

If the machine is to be put out of service for some time, the parts in contact with liquid should be piled. Preferably, the bowl should be removed from the spindle. The seal rings should be taken out and kept flat, not hanging. Drain any condensation water from the worm gear housing if the machine has been at rest for some time.

The time intervals stated below relate to continuous operation. If the mentioned number of operating hours is not obtained during the period, the latter can be extended, but a thorough overhaul at least once every third year is imperative.

OPERATING HOURS	Operation check	
Every 24th (every day*)	Machine run (speed). Power consumption. Oil level in worm gear housing. Observation of discharged liquids. Temperature.	Throughput. Pressure.
Every 200th (every week*)	Worm gear housing Check and if necessary replenish oil.	Further actions Speed check. Leakage tracing.
Every 750th (every month*)	Bowl Dismantling of bowl and thorough cleaning of bowl inset parts. Thorough cleaning and lubrication of lock rings and oiling of bowl body nave bore. Check on seals.	Power transmission Cleaning and oiling of bowl spindle cone. Control system Check flow of operating liquid. Check sludge discharge interval of automatic control device Strainers and filters Cleaning and checking.
Every 1500th (every second month*)	Worm gear housing Cleaning and oil change. (In case of new installation, however, after 300 operating hours and in seasonal operation before every working period).	
Every 9000th (every year*)	Thorough overhaul, cleaning and lubrication. Bowl check Pressure in set of discs. Lock ring joint. Corrosion and other material attacks. Power transmission. Dismantle bowl spindle, clutch coupling and worm wheel shaft. Check particularly ball bearings and gear as well as top bearing springs and buffers. Exchange friction pads. Renew grease in nave.	Frame Renew brake lining. Touch up the paint. Check elasticity of vibration dampers and mounting of machine. Motor - see special manual for motor.

* In continuous operation.

CLEANING AGENTS

Metallic machine parts

Use cleaning kerosene, white spirit, mineral spirit or another solvent with equivalent properties.
If the cleaning agent is unsuitable in view of the product of the process, the bowl, inlet and outlet parts in contact with liquid can normally be cleaned with a soda or trisodiumphosphate solution, or with any current technical defatting agent on an alkaline basis.
A certain care should be exercised when cleaning light metal parts, as these may be attacked by strong alkaline solutions.
Benzine or benzol may also be used for the metal parts, but if so, the cleaning should be done in the open air due to the risk of explosion, and because benzol vapours are dangerous to inhale.

Seal rings

Wipe seal rings with a cloth moistened with some of the above cleaning agents.

Coupling pads and brake lining

Trichlorethylene should be used for cleaning these parts and the corresponding friction surfaces. Note that it should be done under safe control (ventilation), and preferably in the open air.

Note.

All metallic parts EXCEPT the friction surfaces in clutch coupling and brake must be oiled after cleaning - see chapter H.

BOWL CLEANING

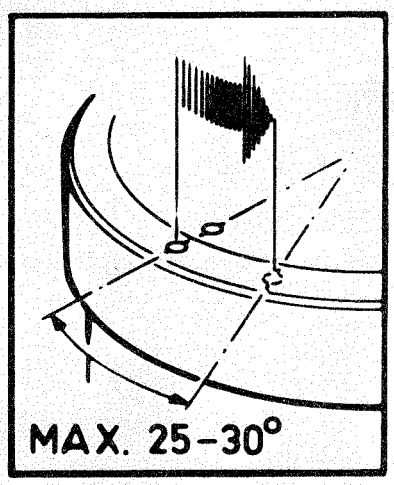
How often the bowl should be stopped, dismantled and cleaned must be learned by experience. Any tendency of the lock ring to stick to the bowl body must also be considered when determining the intervals between dismantlings. During the first time the bowl spindle cone and the lock ring threads must be lubricated at least once a month. In time the interval between lubrications may be extended according to experience.

BOWL OVERHAUL

Exchange of parts

Bowl parts marked " * " on the perspective drawing in chapter I can be exchanged only in an authorized ALFA-LAVAL/DE LAVAL workshop, as the exchange necessitates rebalancing – thus the COMPLETE bowl must be sent in. Other parts can be exchanged on the spot.

Thread checking



On a new bowl, the guide marks (◊) should be right in front of each other. In time, these marks can be drawn past each other due to wear of the threads. When the ◊-mark of the lock ring can be drawn past the other ◊-mark by more than 25-30°, an authorized ALFA-LAVAL/DE LAVAL representative should be consulted. Thread checking should be done at least once a year. The checking is carried out as follows:
Unscrew the lock ring, remove the distributor with disc set. Remove the bowl hood seal ring, put on the hood and screw on the lock ring. Tighten the lock ring anti-clockwise till tight contact is obtained between the contact surfaces of bowl body and bowl hood. Check the angle.

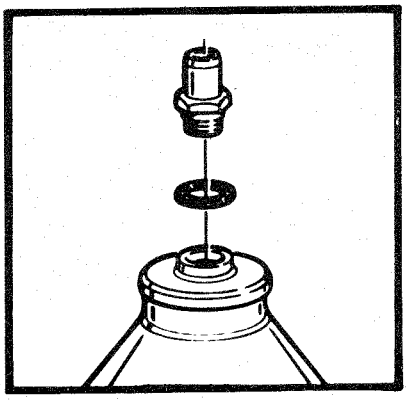
Pressure in disc set

If the lock ring can be tightened without resistance by means of the spanner till the hood lies tightly against the bowl body, the pressure should be increased by adding the extra bowl disc (included in the set of spares) on top of the set of bowl discs. Make sure the seal ring lies in its groove in the bowl hood.

EXCHANGE OF TIGHTENING SLEEVES IN THE OUTLET

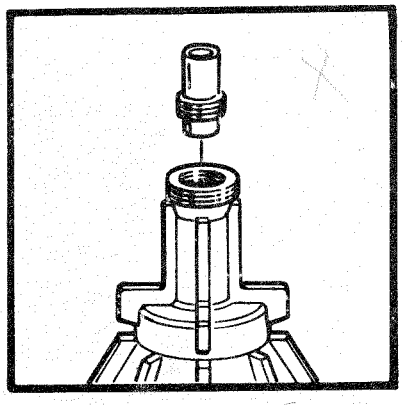
The tightening sleeves can be exchanged when they are wearied out, but they should be removed only in connection with this exchange.

Bowl hood outlet sleeve



Unscrew the bowl hood outlet sleeve clockwise (left-hand thread). Oil the sleeve both out- and inwardly and screw it with the packing into the bowl hood.
The bowl hood must be removed from the bowl when screwing in the sleeve. The sleeve is provided with a fine thread - do not screw it in obliquely as this would cause damage of the thread and seazing between the outlet sleeve and the top disc wear sleeve.

Top disc wear sleeve



Melt off the soldering metal round the sleeve base and screw it off clockwise (left-hand thread).
Tighten the new sleeve carefully and tightsold round the base. After mounting, remove any excessive tin.
After the bowl hasbbeen assembled, check that the wear sleeve runs true. If not, this may damage the packing collars in the outlet.

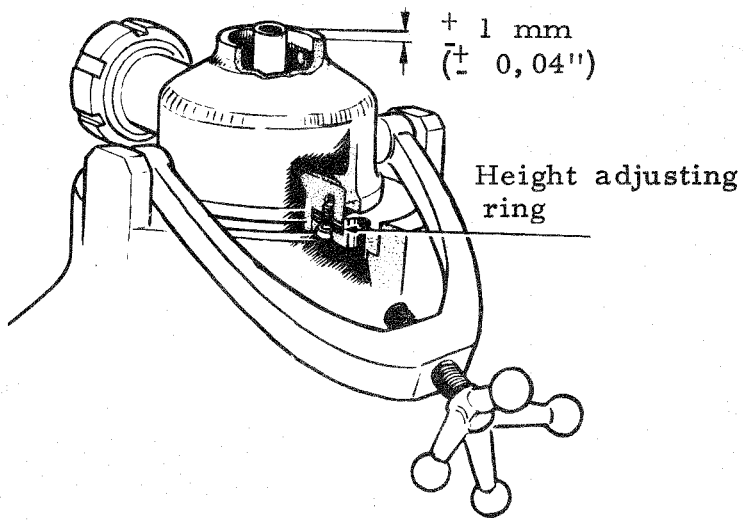
HEIGHT ADJUSTMENT OF OUTLET

The height of the outlet should be checked both in connection with the yearly overhaul and after exchange of parts which can affect the height position.

The tolerance is narrow and it is essential, therefore, that all parts are well cleaned and free from burrs.

o Mount the bowl and the outlet parts except the packing collars and upper outlet piece.

o Check that the wear sleeve of the top disc is flush with the top surface of the lower outlet piece (tolerance ± 1 mm). Add a height adjusting ring if the sleeve is too high, and vice versa.



POWER TRANSMISSION

Bowl spindle

When overhauling the bowl spindle, check particularly the nave bore in the bowl body, the conical portion of the bowl spindle, and the height position.

Clutch coupling. Brake

Clean the conveyor pulley, pads of friction blocks and brake lining. Roughen up the wearing surfaces of pads and lining with a coarse file. Remember that all pads must be exchanged at the same time even if only one of them is worn.

Worm wheel shaft. Worm

When exchanging the worm wheel check the worm. If it is heavily worn or its tooth flanks are scratched, renew it.

Oil pan

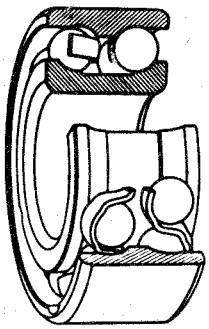
Clean the oil pan in the worm gear housing. Supply fresh oil.

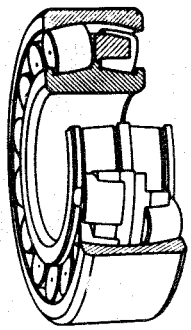
FRAME

Check the rubber washers of the anchoring parts. Renew them every second year.
Clean the bowl casing in the frame with a brush and a non-fluffy cloth (never use twist). When using washing liquid, never pour it into the bowl casing, nor flush out the casing after washing. If washing or flushing liquid enters the oil bath of the worm gear housing it will ruin the lubricating oil.

BEARINGS

(ball and roller bearings etc.)

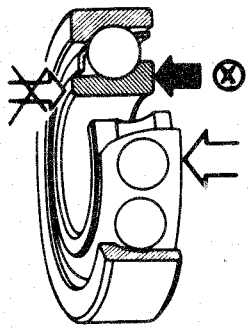




Note the following directions for inspection and exchange of bearings.

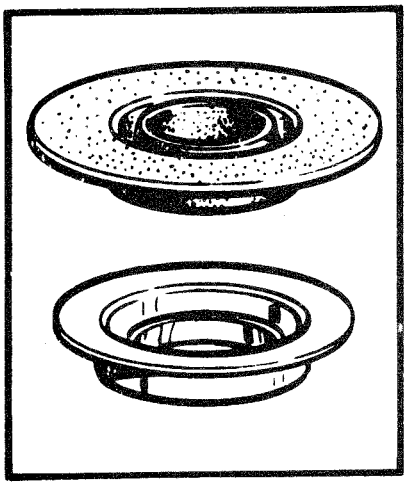
- o Leave the bearing in its wrapping until ready to fit.
- o A new bearing is covered with grease. Leave the grease untouched.
- o If a bearing should be heated in oil before mounting, the oil temperature must not exceed 80°C (180°F). As soon as the bearing has become thoroughly warm, remove it from the oil bath.
- o A bearing should never be forced on to a shaft by blows applied to the outer race, nor into a housing or seat by pounding on the inner race.
- o A bearing which has been taken out of the machine must be washed in clean kerosene and lubricated before refitting.
- o Make sure that no impurities (burrs) get into the bearing during mounting or afterwards. Never spin an ungreased bearing.
- o Never blow a bearing with compressed air.

Single row angular contact ball bearings



In a single row angular contact ball bearing each ball race has a high and a low shoulder. It is essential to fit the bearing in the correct direction, as an axial load on the low shoulder would damage the bearing. In the SKF bearing an impressed mark, + , characterizes the side of the inner ball race on which the axial load (bowl weight or the like) should act.

PACKING COLLARS



The figure shows a packing collar with inner sealing and cup for this, The design in detail may vary depending on make and type.

The packing collars should be stored in a dry place where they are protected against dust and other impurities. When storage for long periods is essential they should be stored in air-tight containers.

The packing collars should be handled with care. Special care should be taken to protect the sealing lips. Even small damage, such as scratches, hacks etc. can reduce their sealing ability.

Rules for mounting

The sequence of assembling and the direction of turning the collars are obtained by the general drawing in each chapter.

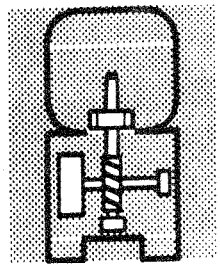
The shaft which is sealed off by the packing collar must be free from burr and sharp edges which can damage the sealing lip. If the end of the shaft are not sufficiently chamfered, a fitting sleeve should be used. This applies also when the sealing lip is to be passed over keyways, screw threads etc. where it is often possible to use a rolled slip of paper or plastic.

Insert the packing collar in the cup in such a manner that the pressure is evenly applied all around the collar. In no circumstances should blows be applied directly to the ring.

Directly before starting the separation, moisten the collars and insert them into their places. After mounting, check that the cup rests evenly in its seat, and that the sealing lip has not been rolled inside out.

The packing collars should always be moist when the bowl spindle rotates. If they are allowed to become dry, they will wear out much quicker. This means that the separator should never be started or operated if there is no liquid in the inlet and outlet.

Any leakage of the inlet packing collar cannot be remedied by tightening the clamp screw.



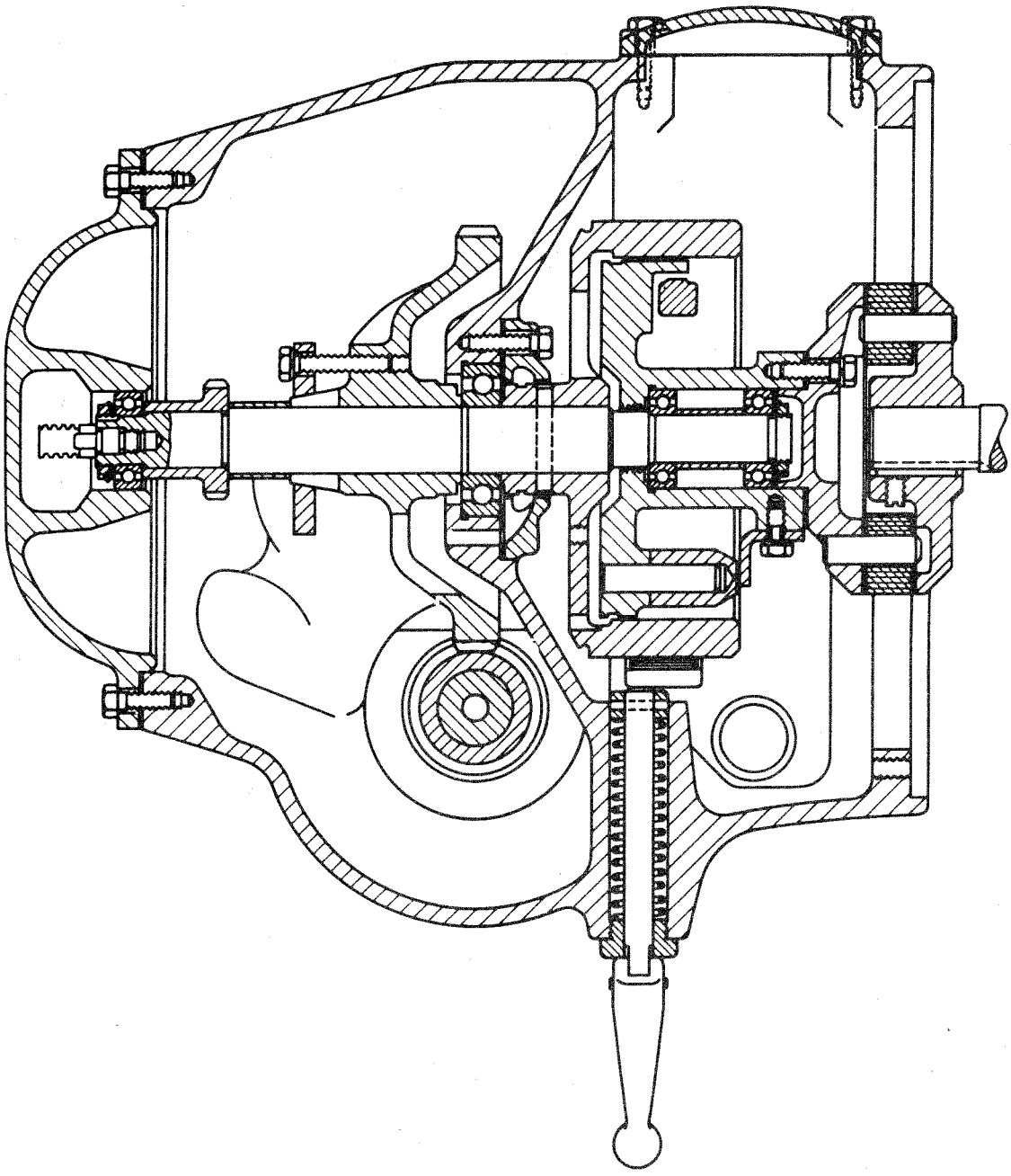
POWER TRANSMISSION

Tools -- see chapter F

Lubrication -- see chapter H

Cleaning -- see chapter L

COUPLING. WORM WHEEL SHAFT

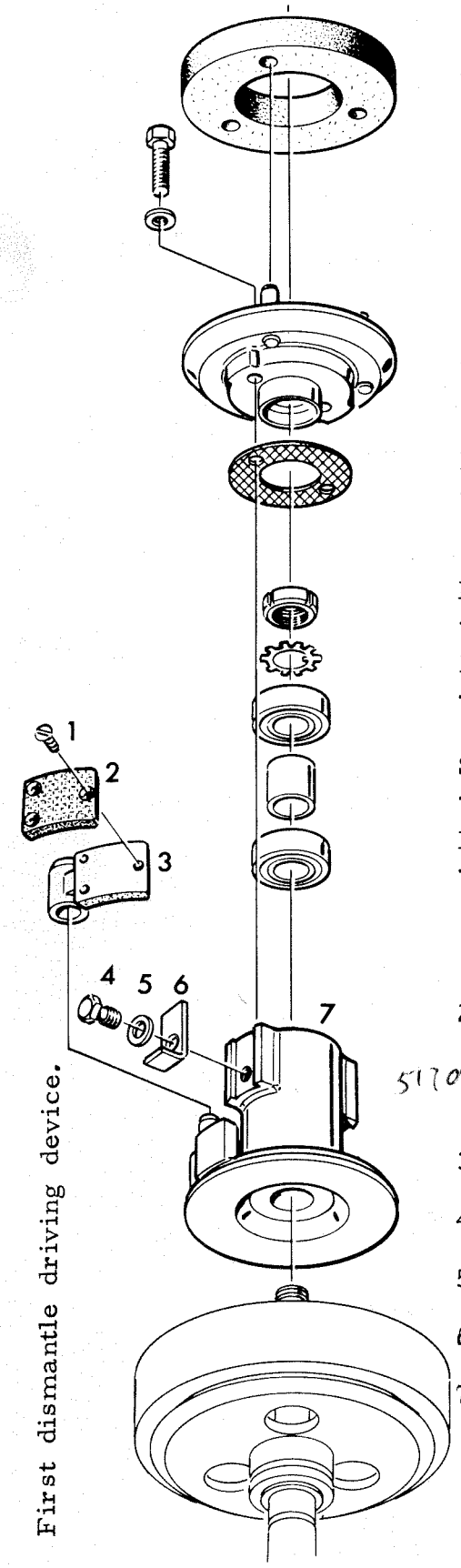


DISMANTLING
ASSEMBLY

Dismantle and assemble the parts in sequence shown in the illustrations on the following pages, using the special tools supplied.

In addition to the specific instructions, remember the following points at all times:

- cleanliness and neatness are essential
- make sure that all seal rings and gaskets are intact
- exchange spring washers whenever necessary
- exchange all clutch pads, even if only one of them is worn
- oily clutch pads should be degreased according to the directions in Chapter L, Cleaning Agents, and roughened with a coarse file
- take care to avoid getting oil or grease on the clutch and the friction surface of the conveyor pulley
- avoid unnecessary dismantling of ball bearings
- follow the directions given in Chapter L for assembly of roller bearings
- round nuts should be tightened with a spanner and locked with lock washers
- the worm-gear housing should be cleaned and filled with clean oil after any work that may have introduced dirt
- follow the directions for cleaning and overhaul in Chapter L and the directions for lubrication in Chapter H.



First dismantle driving device.

Elastic plate
-- 36121

Screw (3)
-- 34963

Spring washer (3)
-- 9488

Coupling pulley
-- 11507

Packing
-- 11509

Round nut *
-- 67472

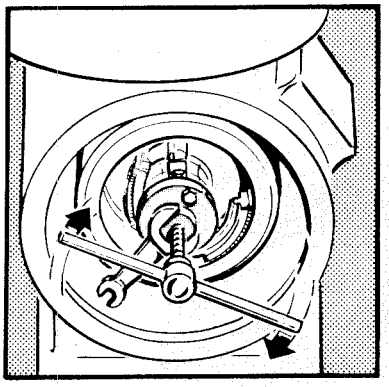
Lock washer *
-- 38159

Spacing sleeve
-- 11506

Ball bearing (2)
-- 11455

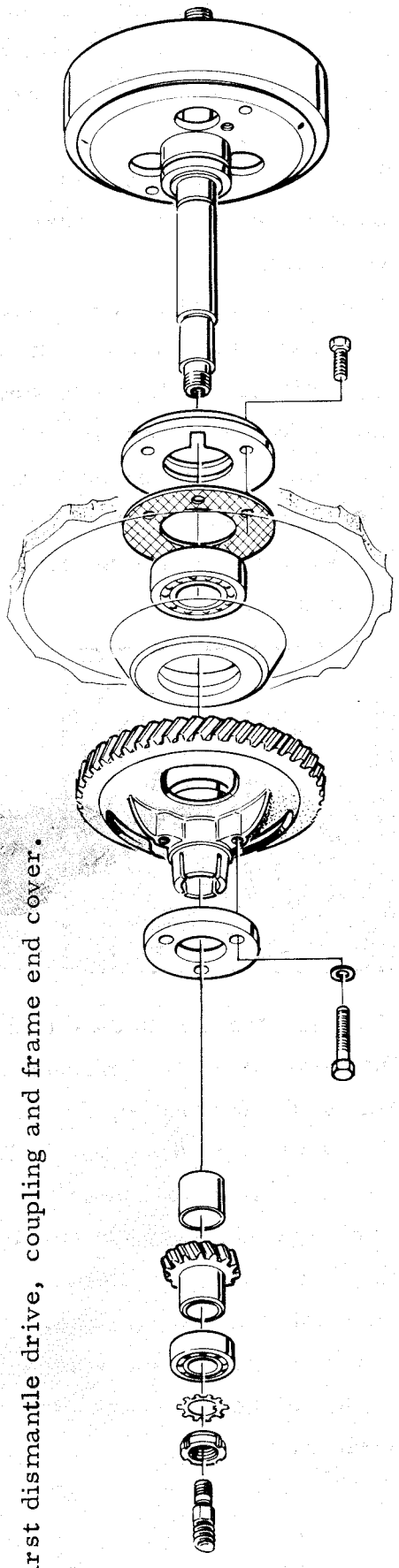
1 Screw (6)
-- 8341
2 Lining (2)
for M-drive
-- 517083-1
for R&T-drive
-- 65398
3 Friction block
-- see chapter F
4 Screw (2)
-- 65159
5 Spring washer (2)
-- 40040
6 Holding bracket (2)
-- 65158
7 Nave
-- 11504

The friction blocks can be removed without the necessity of dismantling the rest of the clutch.
Remove the frame cap, through which the blocks are available.
When the blocks are assembled they should move freely, and the holding brackets should be mounted so that they engage the groove in the nave and prevent the blocks from slipping off their pivots.



The illustration shows how the nave is eased off the shaft. To assemble, first fit the nave on the shaft and then the inner ball bearing. Pack one-third of the space about the spacing sleeve with ball bearing grease. Use the driving-on sleeve to drive the bearings into position.

*) Included in complete worm wheel shaft.



First dismantle drive, coupling and frame end cover.

Conveyor pulley

Worm wheel shaft with conveyor pulley, round nuts and lock washers
-- 11541

Screw (3) -- 34963

Protecting cover -- 11546

Packing -- 11547

Ball bearing -- 6611

Frame

Worm wheel -- see chapter F

Clamp ring -- 11540

Spring washer (3) -- 9488

Screw (3) -- 32957

Spacing sleeve -- 43583

Gear wheel for tachometer
-- 11548

Ball bearing -- 11455

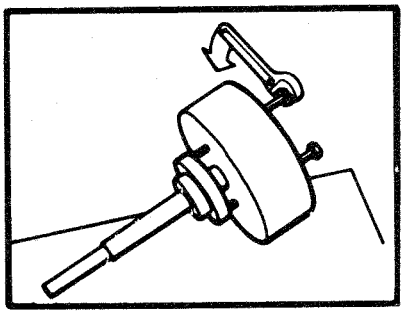
Lock washer -- 38159

Round nut -- 67472

Gear wheel for revolution counter
-- 11545

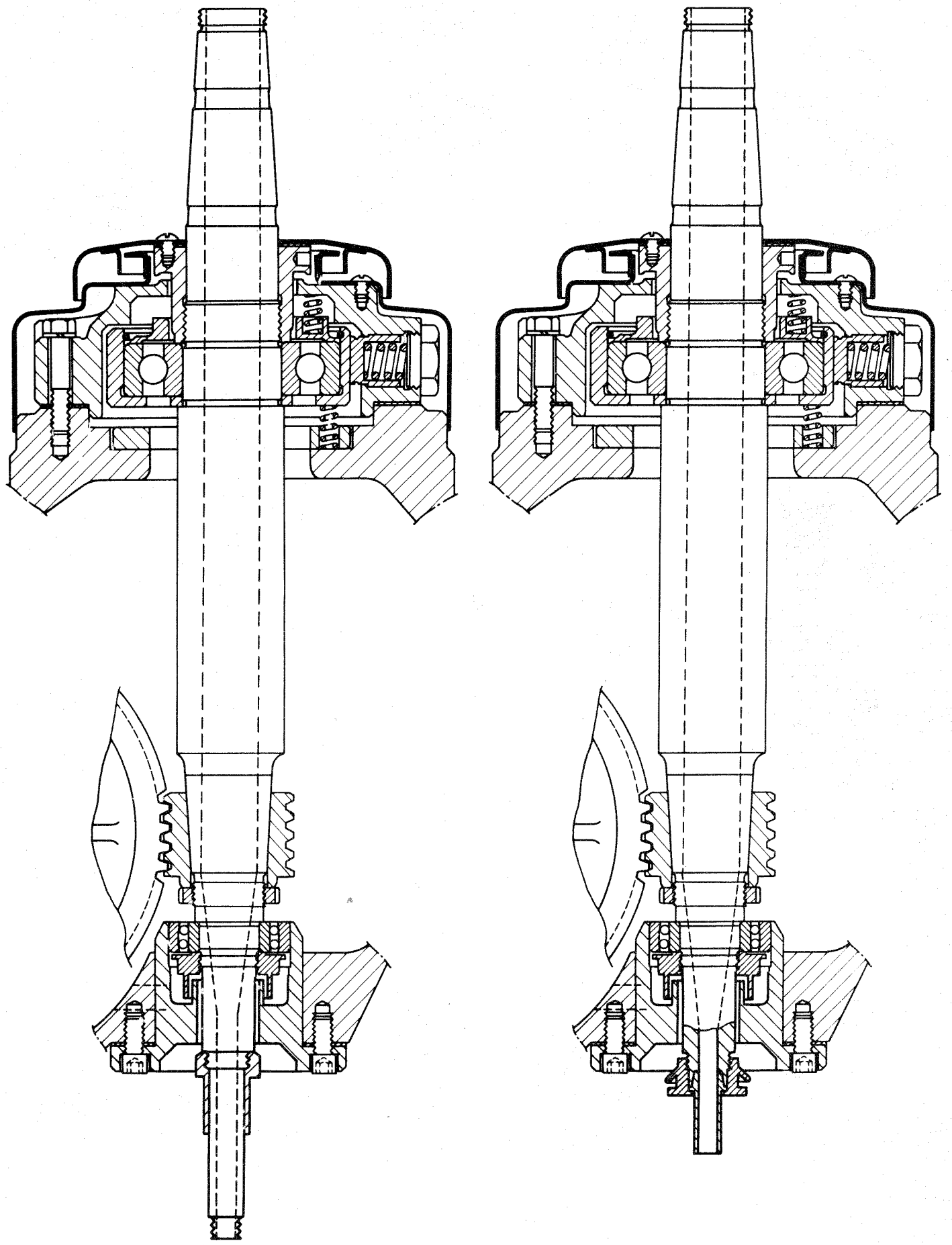
DISMANTLING

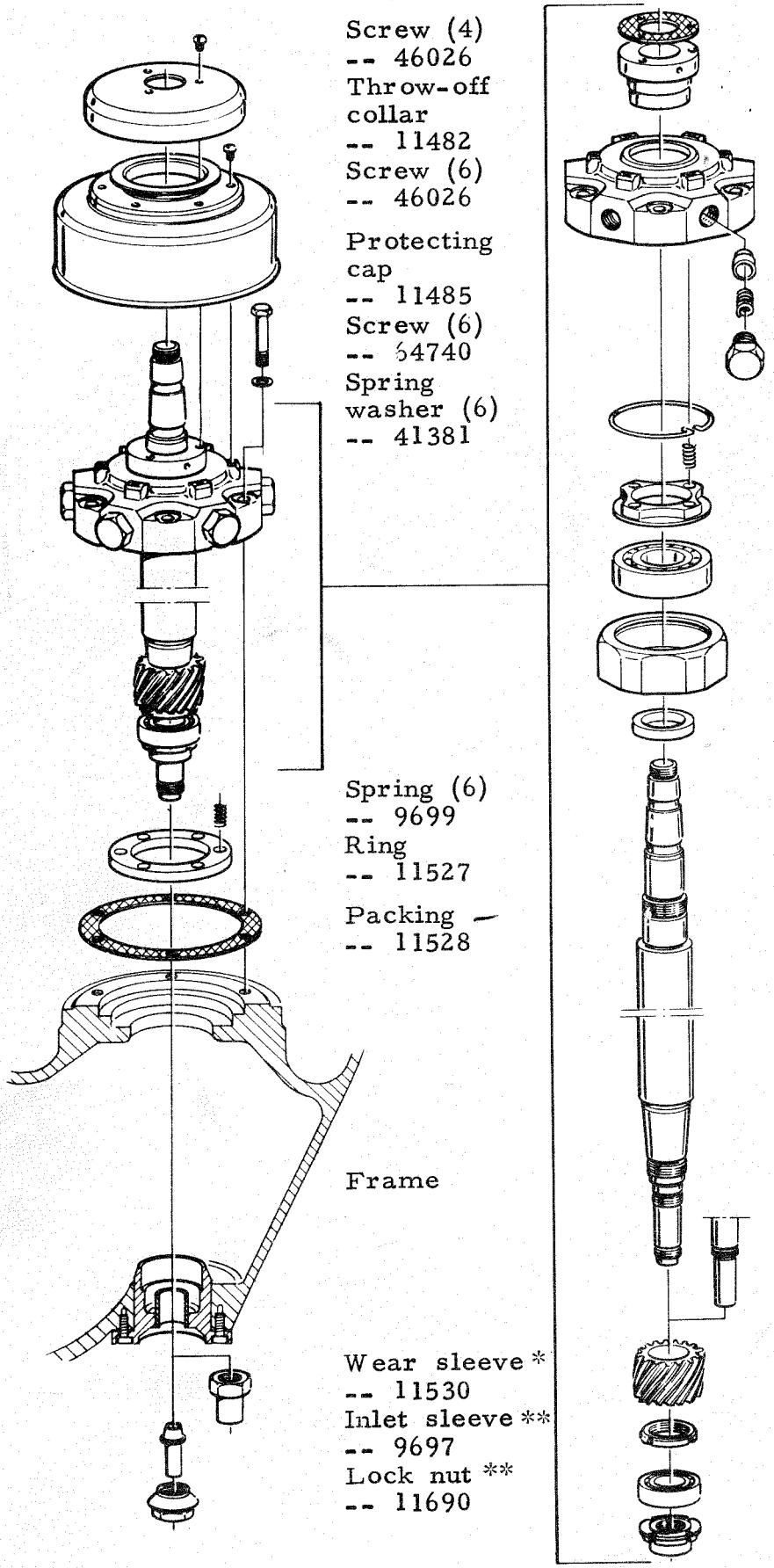
Drain off the oil from the gear housing. Remove the frame end cover with revolution counter and tachometer. Remove driving device and clutch coupling. Bend up the lock washer lobe and use the pin spanner to unscrew the round nut.
Loosen the clamp ring and pull off the worm wheel.
After unscrewing the nuts, insert the socket wrench through the conveyor pulley and unscrew the screws for the protecting cover.
If the "fixed" ball bearing should be exchanged, screw the jack screws (in tool set – chapter F) into the threaded holes of the conveyor pulley and tighten the screws alternative till the bearing comes off.



ASSEMBLING

If the "fixed" ball bearing has been loosened, it should be replaced by a new bearing. This must be heated before mounting.
Fit protecting cover and packing on worm wheel shaft. Check that one of the holes registers with the oil groove in the protecting cover. It is advisable to glue the packing onto the cover. The old bearing should be replaced by a new one. This must be heated in oil before mounting and pushed up as far as possible on the shaft.
Push on the worm wheel and tighten the clamp ring.
Tighten the round nut and secure it with the lock washer.
Screw on the gear wheel of revolution counter.
Put on the end cover and make sure that the gear wheels of tachometer and revolution counter engage with the shafts.
Supply fresh oil in the worm gear housing.





Screw (4)
-- 46026
Throw-off collar
-- 11482
Screw (6)
-- 46026
Protecting cap
-- 11485
Screw (6)
-- 54740
Spring washer (6)
-- 41381

Spring (6)
-- 9699
Ring
-- 11527
Packing
-- 11528

Frame

Wear sleeve *
-- 11530
Inlet sleeve **
-- 9697
Lock nut **
-- 11690

Packing -- 11529
Lock nut (left-hand thread)
-- 11526

Spring casing
-- 11524

Buffer (6) -- 10593
Spring (6) -- 31366
Screw plug (6) -- 11525

Elastic ring -- 9878
Spring (4) -- 9699
Protecting washer
-- 10795
Ball bearing
-- 9876

Ball bearing sleeve
-- 9880
Stop ring
-- 9883

Bowl spindle
-- 11601 **
-- 11520 *

Worm
-- see chapter F
Round nut -- 11522

Ball bearing
-- 11464
Stop nut
-- 11523

*) For machine with feed pump.
**) For machine without feed pump.

DISMANTLING

Place the bowl body on the bowl spindle and lock it with the lock screws. Remove the inlet parts. Unscrew the lock screws and lift out the bowl body with the lifting tool.

Remove the top shields. Unscrew the screws holding the spring casing to the frame.

Screw on the cap nut anti-clockwise (left-hand thread) and lift out the bowl spindle with top bearing. Clamp the spindle in a vice fitted with soft metal lining (e.g. copper plating). Remove the screw plugs with springs and buffers. If a buffer spring can no longer be used, all springs should be replaced.

Unscrew the lock nut clockwise (left-hand thread) and lift off the parts. Loosen the elastic ring with a pair of tonges.

If the worm or its ball bearing has to be replaced, unscrew the lock nut by using the hook spanner and loosen the worm by tapping it slightly.

ASSEMBLING

Assemble the bowl spindle according to figure.

Tighten the lock nut anti-clockwise (left-hand thread). Ascertain that the plane surfaces of the ball bearing housing come right in front of the buffers and fit the latter with their springs and screw plugs.

Fasten the worm and ball bearing with the nuts.

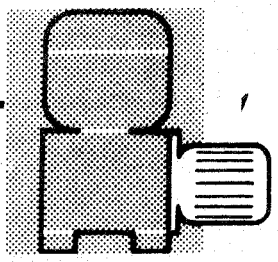
Put the spring casing packing, the ring and the springs into the frame.

Screw on the cap nut anti-clockwise (left-hand thread), lift the spindle into the frame and tighten the spring casing – do not overlook to insert the spring washers.

Screw on the top shields.

Put on the bowl body and screw on the cap nut anti-clockwise (left-hand thread). Lock the bowl with the lock screws.

Screw on the wear sleeve or the inlet sleeve respectively.



MOUNTING the MOTOR

General Drawing - Perspective Drawing with Part Numbers - Mounting.

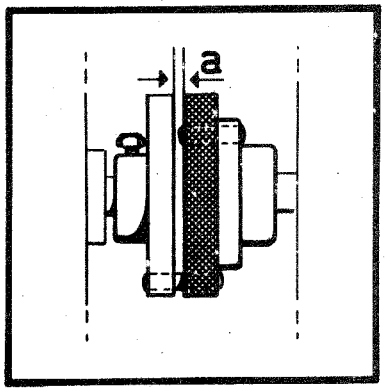
SPECIAL TOOLS see chapter F - LUBRICATION see chapter H - CLEANING see chapter L - MOTOR see special manual.

GENERAL HINTS

Motor

The speed prescribed for the ingoing shaft of the machine (the worm wheel shaft) and which must on no conditions be exceeded, is stamped on the type plate of the machine. The worm gear ratio and the friction blocks of the clutch are suited to this speed.
Check the number of revolutions by means of the revolution counter after installation and after exchange of motor.
For particulars concerning power requirement and speed see chapter C.

Coupling pulley or belt pulley



When the machine is delivered with motor, the pulley has been fastened in its correct position on the motor shaft. Score the position of the pulley before loosening it from the motor shaft. The axial play for the elastic plate - measurement "a" in illustration - should be about 2 mm (5/64").
When finishing a predrilled coupling pulley or belt pulley, the tolerance H7 according to ISO should be applied.

Electric cable

The electric cable to the motor should preferably have a free length allowing the removal of the motor without disconnecting the cable from the terminals.

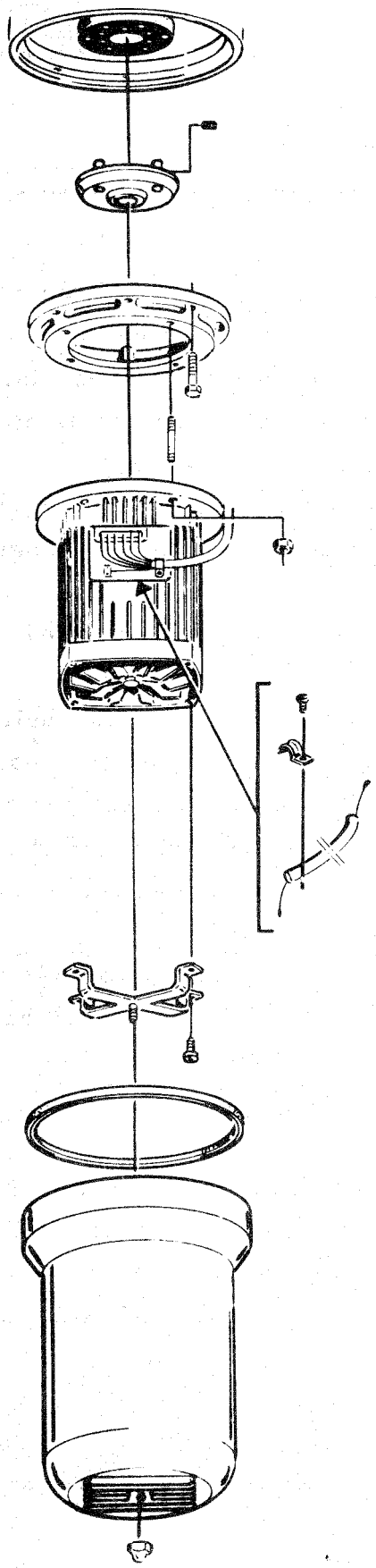
Connection to mains

Connect the motor to mains so that the bowl will rotate CLOCKWISE.

Note

The machine must never be started unless the bowl is placed on the spindle and the worm gear housing contains the prescribed quantity and quality of lubricating oil.

FLANGE MOTOR (M or 4-drive)



Frame

Set screw -- 34939

Coupling pulley (when ordering – follow the instructions given in chapter A)
-- 11516

Motor adapter
-- 786044-3

Screw (6) -- 34963

Stud bolt (4) -- 2216261-3

Nut (4) -- 72946

Motor

Screw -- 221126-33

Cable clamp -- 786173-1

Earthing wire -- 786176-1

Plastic tube -- 786170-1

Holder for protecting hood
-- 786139-80

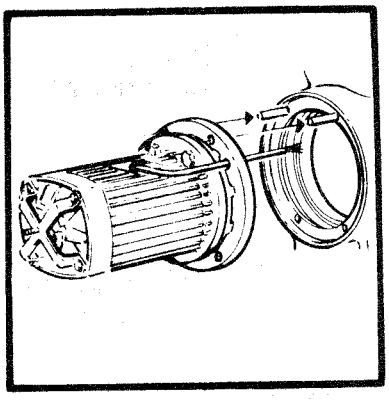
Screw
-- belong to motor

Seal strip
-- 11591

Protecting hood
-- 786181-80

Cap nut
-- 72947

FLANGE MOTOR
(M or 4-drive)



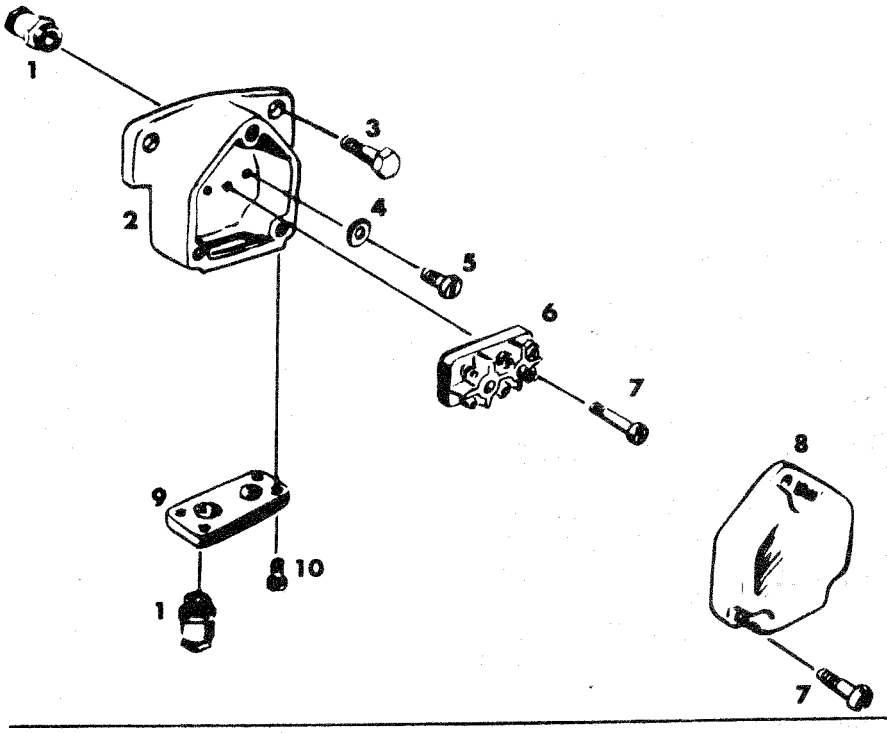
Note that, as a rule, it is not necessary to loosen the motor and motor adapter from each other when mounting and dismounting.

Push the elastic plate on to the pins in the coupling pulley of the machine. Screw the two guide bolts (see chapter F) into the two upper, opposed screw holes in the frame flange.

Hang the motor (with the adapter fixed) on the guide bolts and push it into correct position, fitting the pins of the coupling pulley into the holes in the elastic plate. Fasten the motor and replace the guide bolts by screws. Tighten the screws alternately and check that the motor enters the frame. Fit the protecting hood.

When dismounting observe that the electric cable must not be loosened in the terminal block.

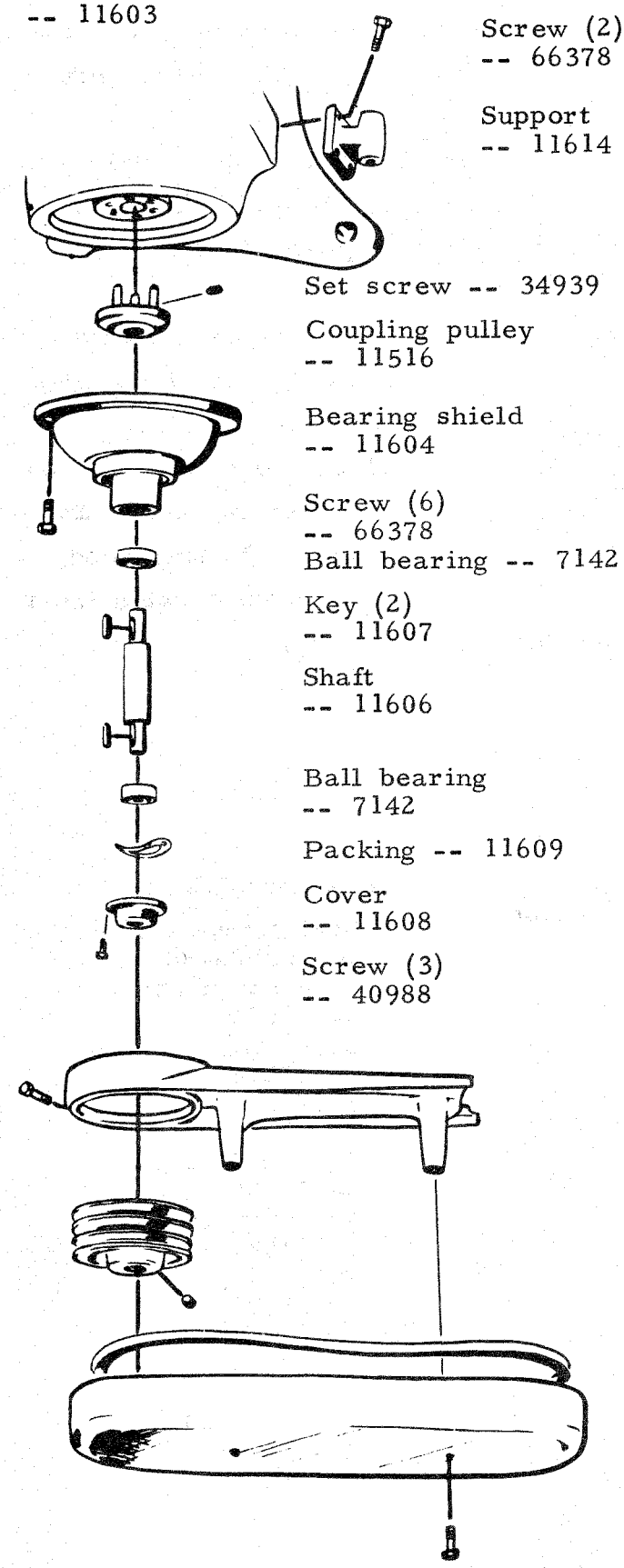
CONNECTION BOX (except screw No. 66378)
-- 11952



Part numbers

1 Seal sleeve (2)
-- 528924-80
2 Connection box
-- 11621
3 Screw (2)
-- 66378
4 Washer
-- 11622
5 Earthing screw
-- 14655
6 Terminal block
-- 11623
7 Screw (5)
-- 16483
8 Cover
-- 11624
9 Flange
-- 786113-1
10 Screw (4)
-- 66442

BELT GEAR
(R or 6-drive)
-- 11603



Screw (2)
-- 66378

Support
-- 11614

Set screw -- 34939

Coupling pulley
-- 11516

Bearing shield
-- 11604

Screw (6)
-- 66378

Ball bearing -- 7142

Key (2)
-- 11607

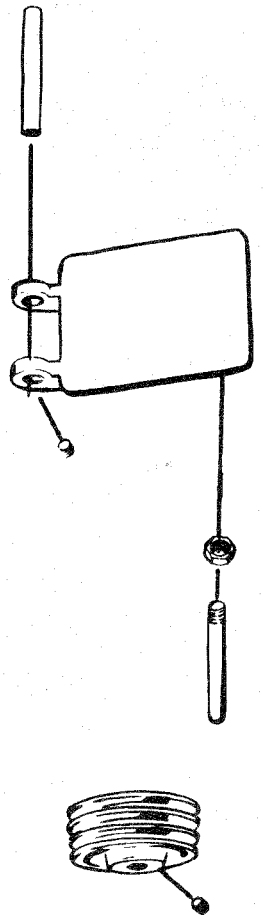
Shaft
-- 11606

Ball bearing
-- 7142

Packing -- 11609

Cover
-- 11608

Screw (3)
-- 40988



Shaft
-- 11613

Motor plate
-- 11612

Set screw
-- 34939

Nut
-- 11616

Adjusting screw
-- 11615

V-belt pulley
for motor
50 c/s -- 11658
60 c/s -- 11734

Set screw
-- 34939

Screw -- 41268

Support
-- 11620

V-belt pulley
-- 11611

Set screw -- 72876

V-belt (3) -- 63159

Belt guard
-- 11617

Screw (2)
-- 40988

V - BELT GEARING (R or 7 - drive)

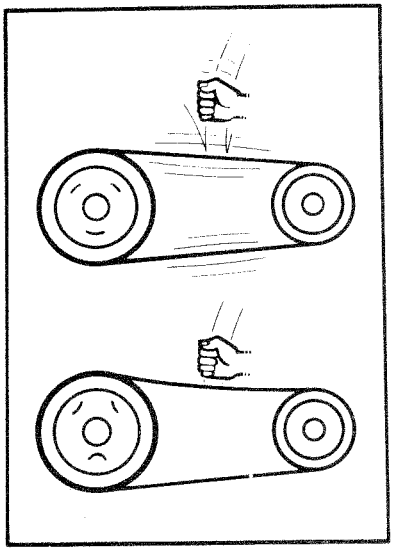
Mount the motor on the motor plate, align the motor belt pulley with the machine belt pulley, and put on the V - belts. Check that the motor is not pulled askew and that the belt pulleys are in line with each other so that the belts run straight.

Lubrication

When assembling, pack one-third of the space between the ball bearings with ball bearing grease. Check the quantity and quality of the grease once a year.

Belt tension

It is important that the belts are correctly tensioned. A belt that slips on its pulley is exposed to abnormal wear. If on the other hand the belts are too tight, this will cause wear on the bearings.



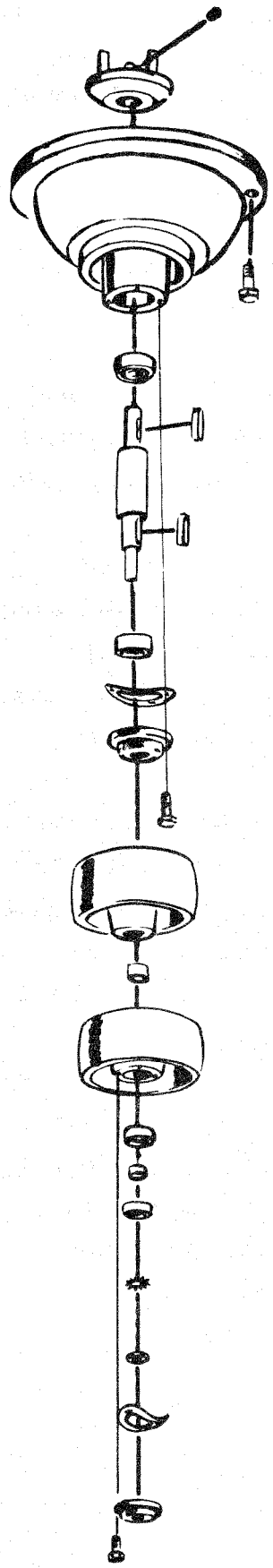
On a new machine the belts should be retensioned after some time, but seldom need tightening again after this, as the length of the belts remains practically constant. When exchanging belts, never force them over the side of the pulley but always loosen the motor mounting first.

A good way to check the belt tension is to strike the belts with a clenched fist. A slack belt will feel dead under this test, whereas a properly tensioned belt will vibrate and feel alive. Check the belt tension from time to time. The tension is adjusted by means of the adjusting screw under the motor plate.

Cleaning

The working life and proper functioning of the belts depend to a high degree on how they are cared for. Oil and grease will soon perish and ruin them. Oily or greasy belts can be suitably cleaned with a rag soaked in some grease-dissolving agent such as petrol or trichlorethylene.

TRANSMISSION DRIVE -- 11629
(T or 8 - drive)



Set screw
-- 34939

Coupling pulley
-- 11516

Bearing shield
-- 11604

Screw (6)
-- 66378

Ball bearing
-- 7142

Shaft
-- 11631

Key (2)
-- 11607

Ball bearing
-- 7142

Packing -- 11609

Cover -- 11608

Screw (3)
-- 40988

Fixed belt pulley
-- 11632

Spacing sleeve
-- 11634

Loose belt pulley
-- 11633

Ball bearing (2)
-- 11455

Spacing washer
-- 11635

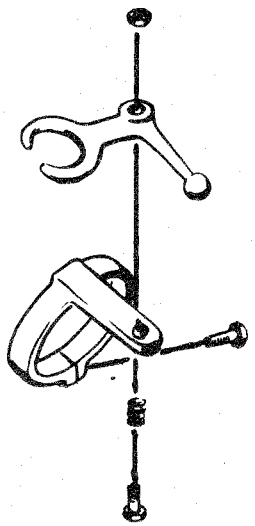
Lock washer
-- 38159

Round nut
-- 67472

Packing -- 11637

Cover -- 11636

Screw (3) -- 12172



Nut
-- 40036

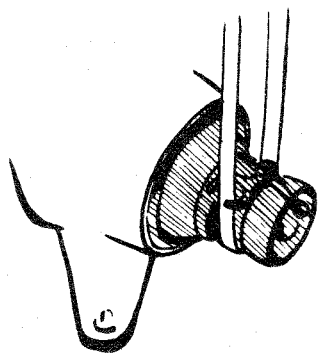
Belt shifter
-- 11638

Support
-- 11641

Screw -- 41268

Spring
-- 11640

Screw
-- 41268



TRANSMISSION DRIVE (T or 8 - drive)

Driving pulley

The pulley of the transmission shaft should have a flat face. The diameter of the belt pulley is calculated as follows:

in mm: $D = \frac{202\,000}{V}$ in inches: $D = \frac{7\,950}{V}$

V = number of revolutions per minute of the transmission shaft.

D = diameter of the belt pulley to be put on the transmission shaft (in mm and inches respectively).

Driving belt

The belt can be of rubber or leather and be glued or sewn. Its width should be 65 mm (2 1/2").

Lubrication. Mounting

When fitting the ball bearings, the space between them should be filled to one third with ball bearing grease. Before fitting, heat the ball bearings -- see chapter L. When necessary, lubricate the belt shifter with ball bearing grease.

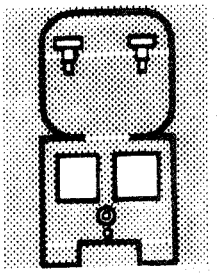
The belt pulley of the machine should be lined up with that of the transmission shaft, so that the two pulleys are parallel.

Dismantling

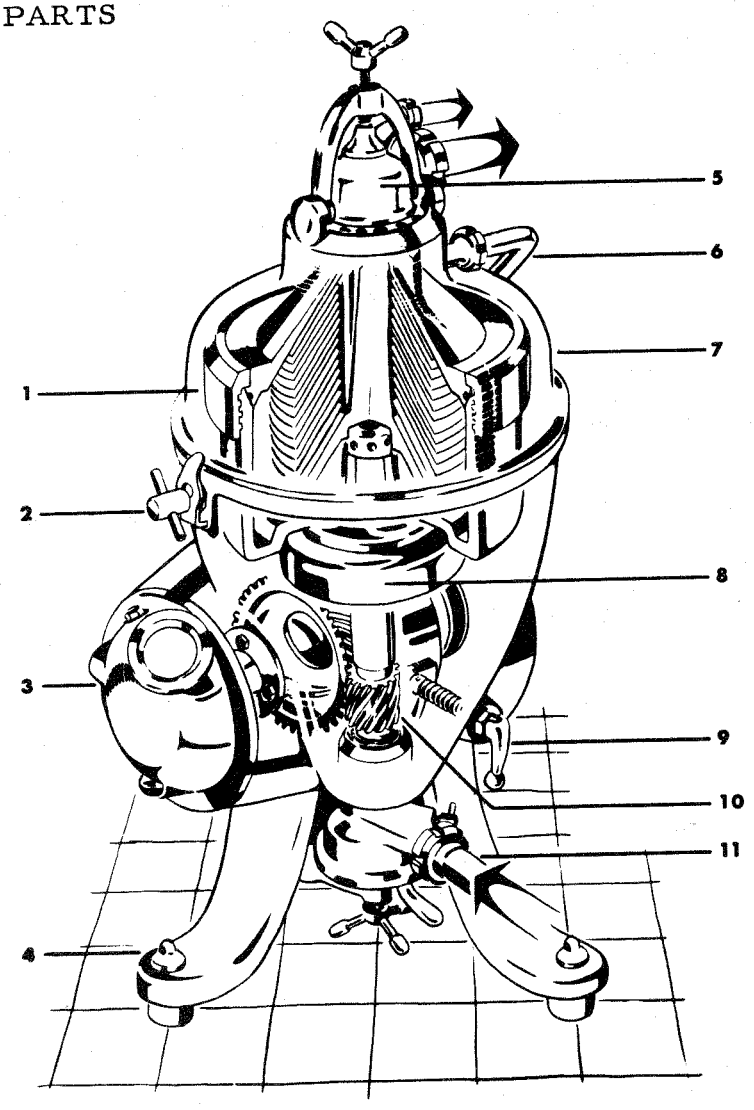
Unscrew the screws, and remove the shield with belt gearing from the frame.

Remove the ball bearing cover. Bend down the tongues of the lock washer, and screw off the round nut.

Fix the flange of the tool to the fixed belt pylley by means of screws. Tighten the jack screw of the tool, until the belt pulley with ball bearings is pressed off the shaft. When doing this, the belt pulley is retained by means of a universal spanner put on the flat surfaces of the tool. Draw the loose belt pulley off the shaft with the same tool and in the same way.



FRAME PARTS



1 Bowl
-- see chapter I

2 Hood locking
-- see chapter S

3 Frame end cover
-- see chapter S

4 Foundation foot
-- see chapter S

5 Outlet device
-- see chapter I

6 Drain pipe
-- see chapter S

7 Frame hood
-- see chapter S

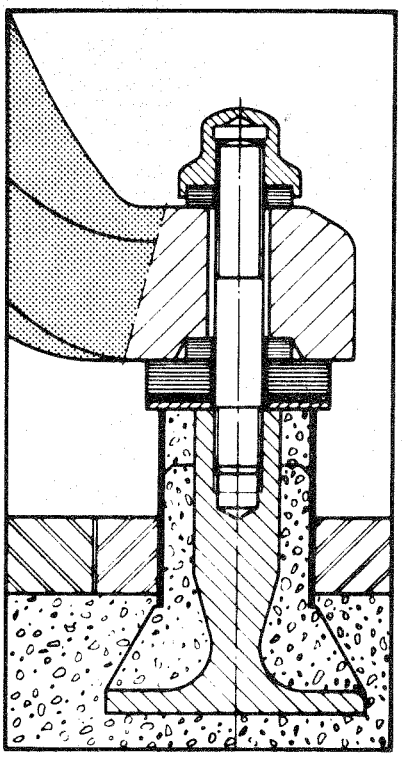
8 Top bearing
-- see chapter P

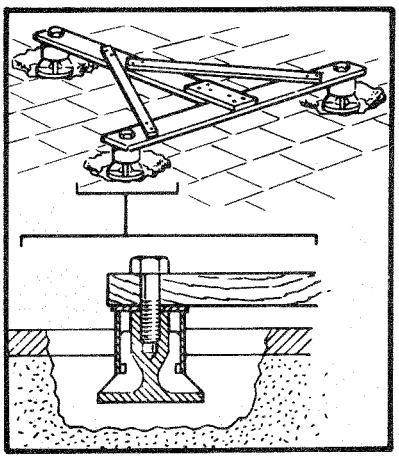
9 Brake
-- see chapter S

10 Worm wheel. Worm
-- see chapter P

11 Inlet device
-- see chapter I

ERECTION





For necessary measures for embedment of the anchoring feet – see dimensioned drawing in chapter G.

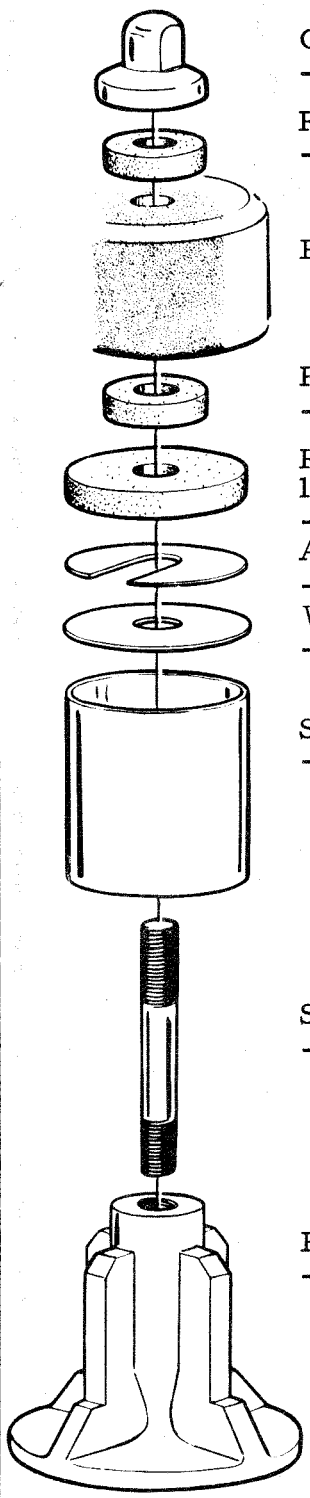
The foundation for the separator must be plane, solid and vibrationless. Support the frame so that the feet stand at a suitable depth in the foundation holes (at least with their entire conical part under the concrete surface).
Exact levelling is necessary before embedment is carried out.

Screw the short thread of the stud bolt into the foundation foot and slip on the sleeve and washers. Lift the frame and fasten the feet. Support the frame and check whether its top rim is exactly horizontal. Fill up with concrete.

Note. A steel or wooden templet according to the sketch is preferably used to facilitate the levelling of the anchoring feet. It is essential to provide for exactly correct centre distance between the anchor bolts, so that the bolts will not press against the edges of the holes in the frame. Otherwise the resilient mounting of the frame will be impeded.

After the concrete has hardened:
Lift off the frame (or templet) and remove the washers.
Fill up the space inside the sleeves with concrete and let this harden.
Put on the washers, put the frame onto the feet and check by means of a spirit level and at least in two directions that the levelling has been correctly done.
When necessary adjust by means of adjusting washers.
Put on a small rubber washer and tighten the nuts, but not so firmly that the elasticity of the rubber washers is eliminated.

FOUNDATION FOOT (3)



Cap nut
-- 11669

Rubber washer, small
-- 11668

Frame foot

Rubber washer, small
-- 11668

Rubber washer, large
-- 11667

Adjusting washer (2)
-- 11666

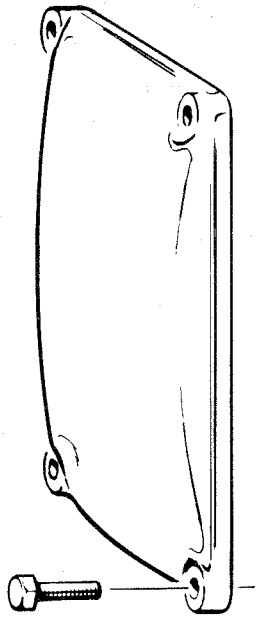
Washer
-- 11665

Sleeve
-- 11664

Stud bolt
-- 11663

Foundation foot
-- 11662

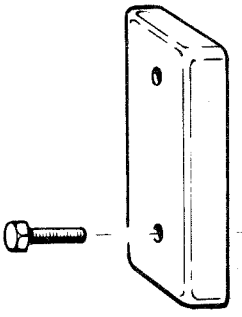
FRAME CAP, large



Cap
-- 11531

Screw (4)
-- 66378

FRAME CAP, small
(only for R- and T-drive)



Cap
-- 11642

Screw (2)
-- 66378

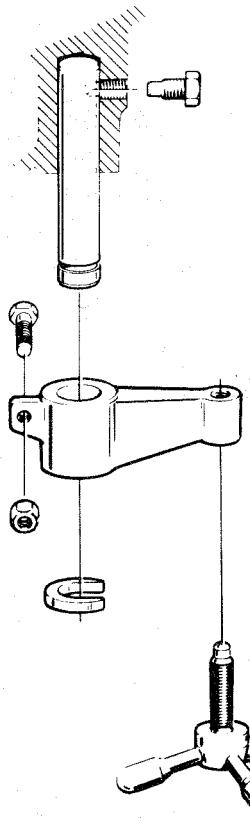
FRAME HOOD

*) Parts of stainless steel

Coupling nut
-- 190613

CLAMPING ARM

*) Parts of stainless steel



Screw
-- 8949

Shaft
-- 11575

Adjusting screw
-- 11593

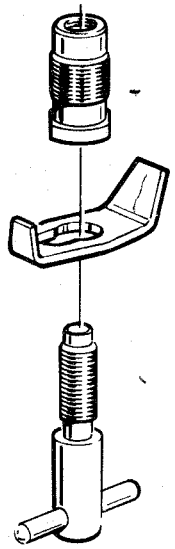
Clamping arm with screw and nut
-- 11568

Nut
-- 41274

Lock washer
-- 11576

Clamp screw
-- 43599, 785362-80 *

HOOD LOCKING (4)

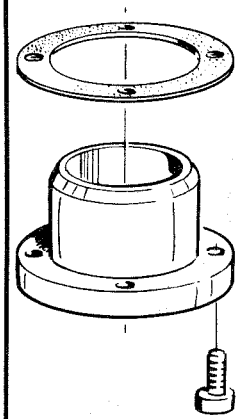


Bushing
-- 11578

Clamp
-- 43099

Lock screw
-- 43588

BOTTOM BUSHING

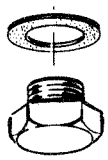


Packing
-- 11536

Bushing
-- 11535

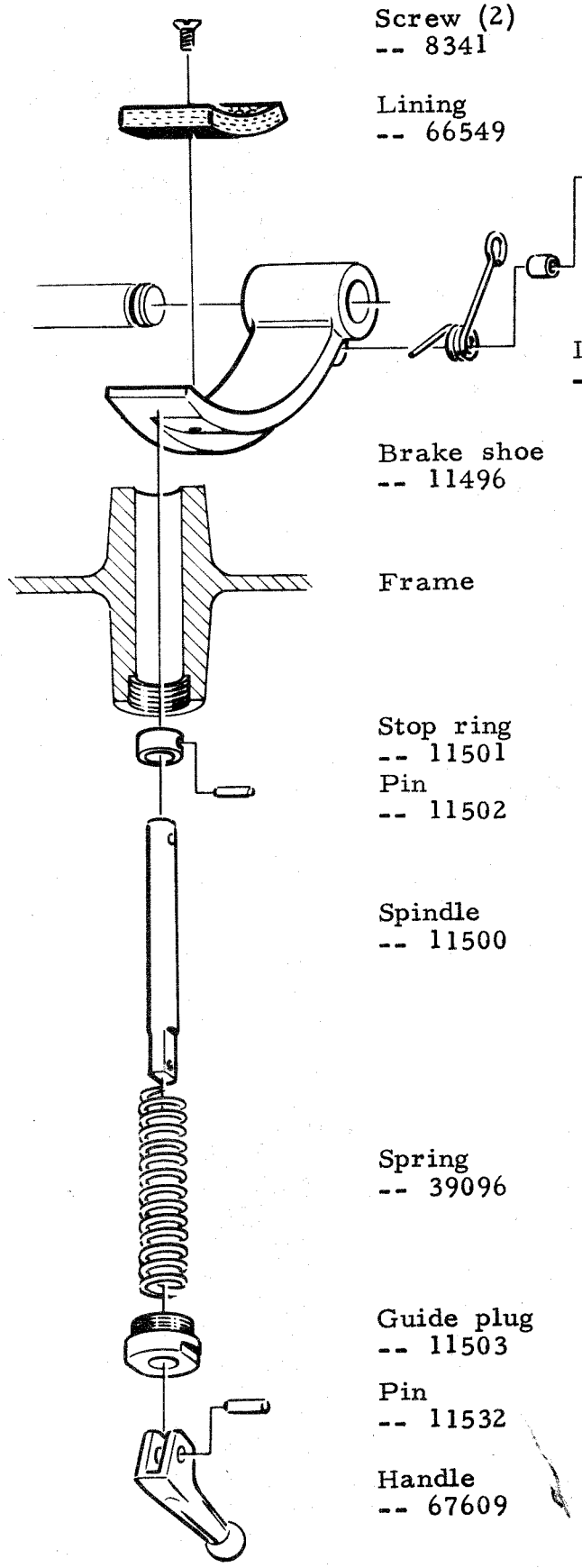
Screw (6)
-- 11537

OIL DRAIN



Packing
-- 35002

Plug
-- 11494



EXCHANGE OF LINING

See to that brake is released. Remove the frame cap.

Bend down the eye of the lock spring and pull the brake shoe off the pivot.

Both ends of the lining screws are slotted.

DISMANTLING

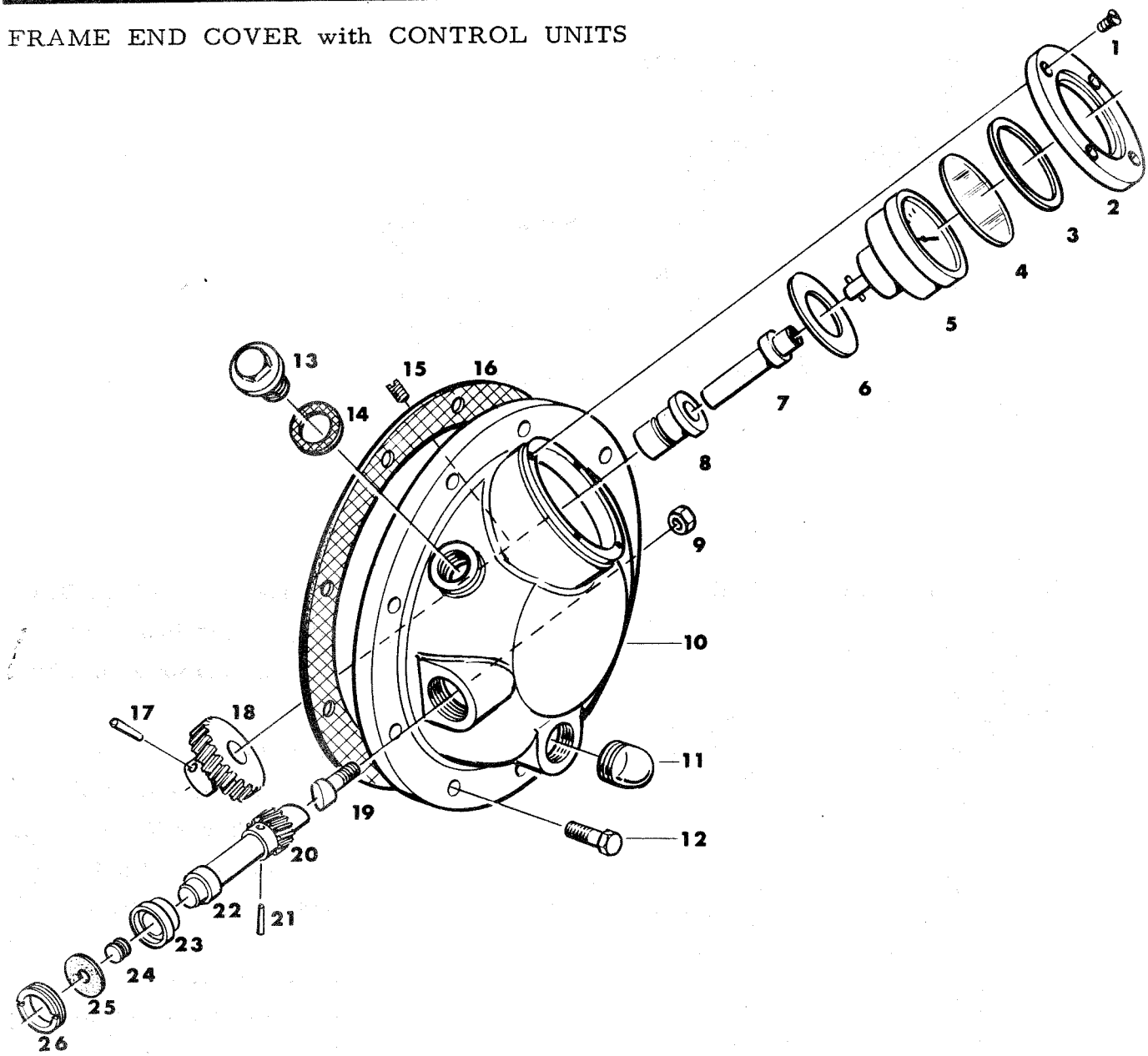
Screw out the guide plug.

Drive out the pins.

CLEANING

See chapter L.

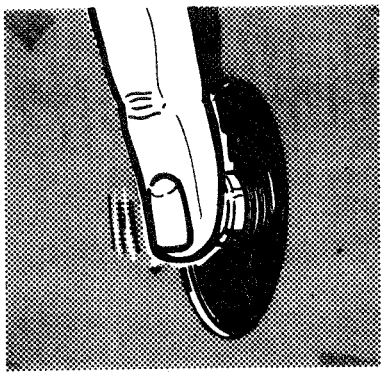
FRAME END COVER with CONTROL UNITS



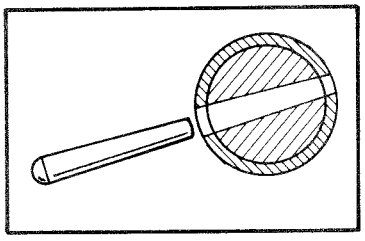
1 Screw (4)
-- 11565
2 Lock ring
-- 8066
3 Packing
-- 8068
4 Cellerloid disc
-- 73204
5 Tachometer
-- 8866
6 Packing
-- 11564
7 Shaft
-- 11560
8 Bushing
-- 11559
9 Nut
-- 22164
10 Cover
-- 11549
11 Gauge glass
-- 11493
12 Screw (8)
-- 66378
13 Oil filling screw
-- 65293
14 Packing
-- 33787
15 Set screw
-- 60655
16 Packing
-- 11566
17 Pin
-- 12526
18 Gear wheel
-- 11563
19 Plug
-- 11550
20 Gear wheel
-- 11554
21 Pin
-- 63796
22 Shaft
-- 11552
23 Bushing
-- 11555
24 Push button
-- 11557
25 Packing
-- 11556
26 Lock ring
-- 11558

Drain the oil from the gear wheel housing before removing the frame end cover.

Revolution counter
Speed checking



The motion of the worm wheel shaft is transmitted at reduced speed to the revolution counter. Keep a finger on the push-button and count the number of strokes during one minute. The correct number of strokes for this machine is given in chapter C.



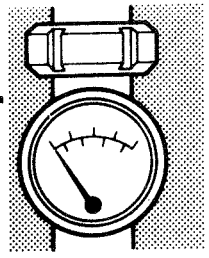
When mounting lubricate shaft and gear wheel with oil of the type used in the gear housing. Direct the gear wheel correctly – pin and hole are tapered. In case of play ream the hole (conicity 0.02). Make sure that the gear wheel engages with the gear wheel of the worm wheel shaft.

Tachometer

Speed particulars – see chapter C.
Unscrew the tachometer from the holder. Remove the gear wheel and knock out the shaft towards the tachometer side.

Lubricate shaft and gear wheel with oil of the same type as used in the gear housing. Direct the gear wheel correctly – pin and hole are tapered. In case of play ream the hole (conicity 0.02).
Push home the shaft and secure the gear wheel with the taper pin. Check the packing for defects and fasten the tachometer to the end cover.

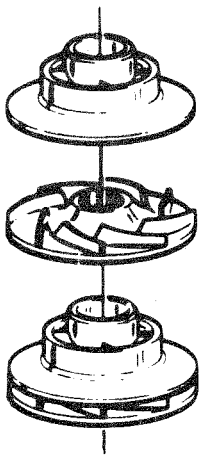
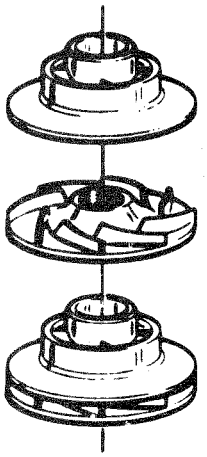
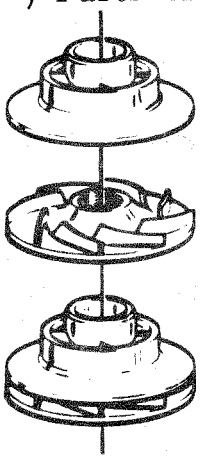
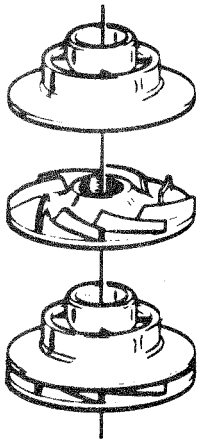
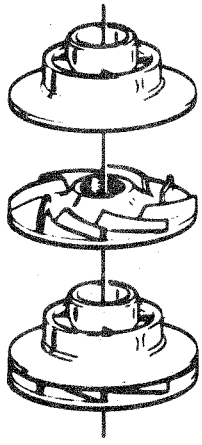
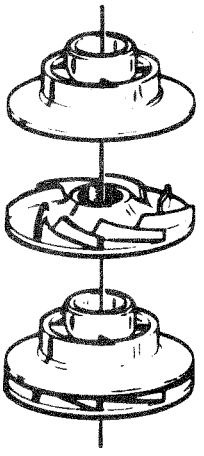
Check the packing against frame for defects and put on the end cover. Make sure the tachometer engages the shaft.



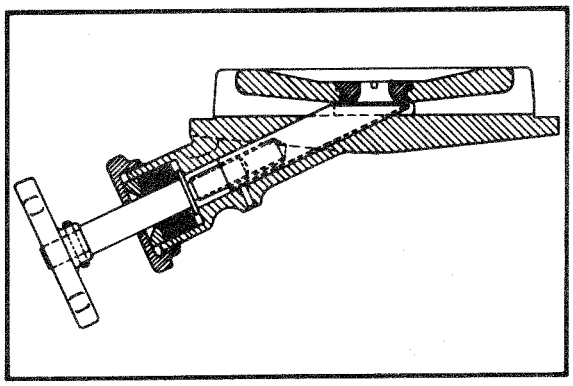
ACCESSORIES

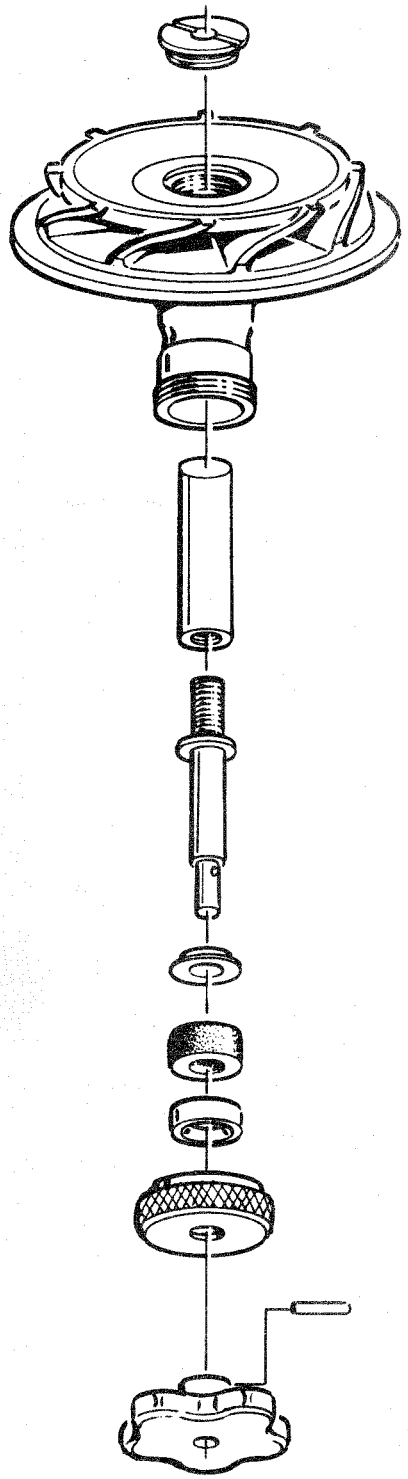
The accessories described in the following are normally not included in the standard equipment of the machine. They have been entered in the instruction book partly because they are often ordered as extra equipment, partly because in some cases it has proved adventageous to procure some of these accessories subsequently as a complement to the standard equipment.

Special operating instructions related with the installation of one or more of these accessories are also inserted in this chapter. Any spare parts should be considered as consuming articles - thus always keep them in stock.

ADDITIONAL PARTS: (Extra equipment)	OMITTED PARTS: (Standard equipment)
PUMP WHEEL for INLET PUMP, higher pressure  Top part -- 11590 Bottom part -- 11589 Complete pump wheel, ∅ 110 mm diam. -- 11588	PUMP WHEEL for inlet pump  Complete pump wheel, ∅ 97 mm diam.
PUMP WHEEL for INLET PUMP, higher pressure *) Parts of stainless steel  Top part -- 11587, 11955* Bottom part -- 11586, 11954* Complete pump wheel, ∅ 104 mm diam. -- 11585, 11953*	PUMP WHEEL for inlet pump  Complete pump wheel, ∅ 97 mm diam.
PUMP WHEEL for INLET PUMP, lower pressure *) Parts of stainless steel  Top part -- 11581, 11958* Bottom part -- 11580, 11957* Complete pump wheel, ∅ 90 mm diam. -- 11579, 11956*	PUMP WHEEL for inlet pump  Complete pump wheel, ∅ 97 mm diam.

PUMP HOUSING COVER for THROUGHPUT REGULATION -- 11049





Nozzle
-- 11051

Pump housing cover
-- 11058

Piston
-- 11055

Spindle
-- 11056

Washer
-- 11053

Packing
-- 10959

Gland
-- 10958

Coupling nut
-- 11054

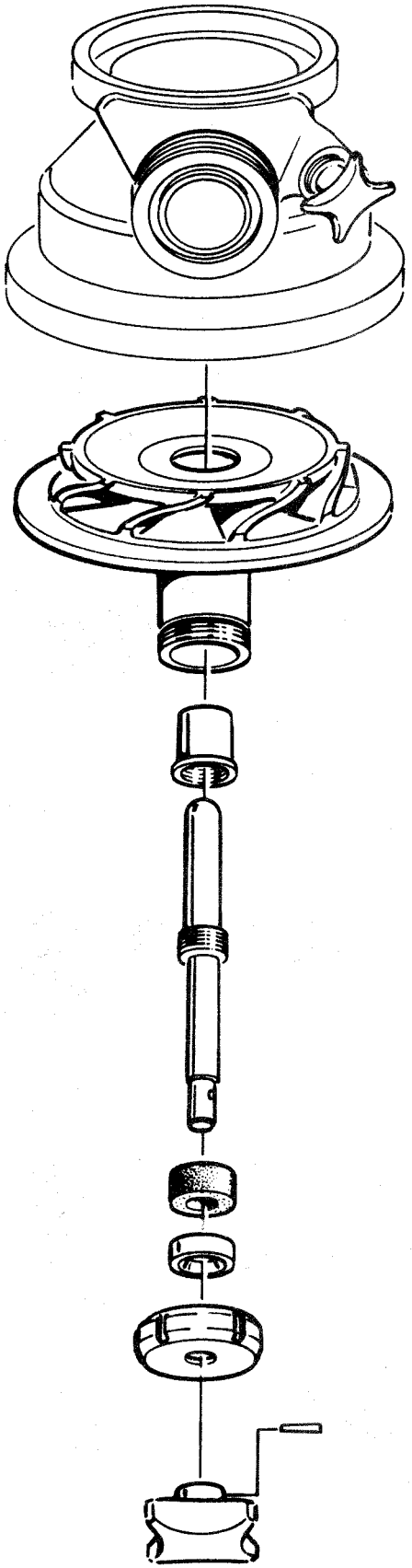
Pin
-- 32405

Hand wheel with pin
-- 10960

The pump housing cover for throughput regulation is intended to substitute the standard pump housing cover with nozzle when infinitely variable throughput regulation is wanted. Turn the hand wheel to the right to reduce the throughput, and to the left to increase it.
This cover is mounted and dismounted in the same manner as the standard cover.

Mounting. Dismounting.
Unscrew the nut and draw out the whole valve. Be careful of threads and sealing surfaces. Knock the pin out of the hand wheel.
Before assembly lubricate the parts according to instructions in chap. H.
Tighten the nut just sufficiently to prevent leakage around the spindle. If leakage occurs, tighten the nut a little more.

PUMP HOUSING COVER of stainless steel for THROUGHPUT REGULATION -- 11842



Pump housing

Pump housing cover -- 11843

Threaded sleeve -- 11799

Valve spindle -- 11847

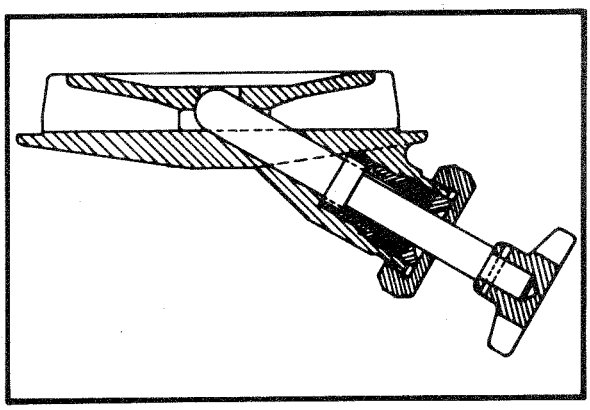
Packing -- 10959

Gland -- 10958

Hand wheel nut -- 785235-1

Pin -- 43033

Hand wheel -- 785233-1

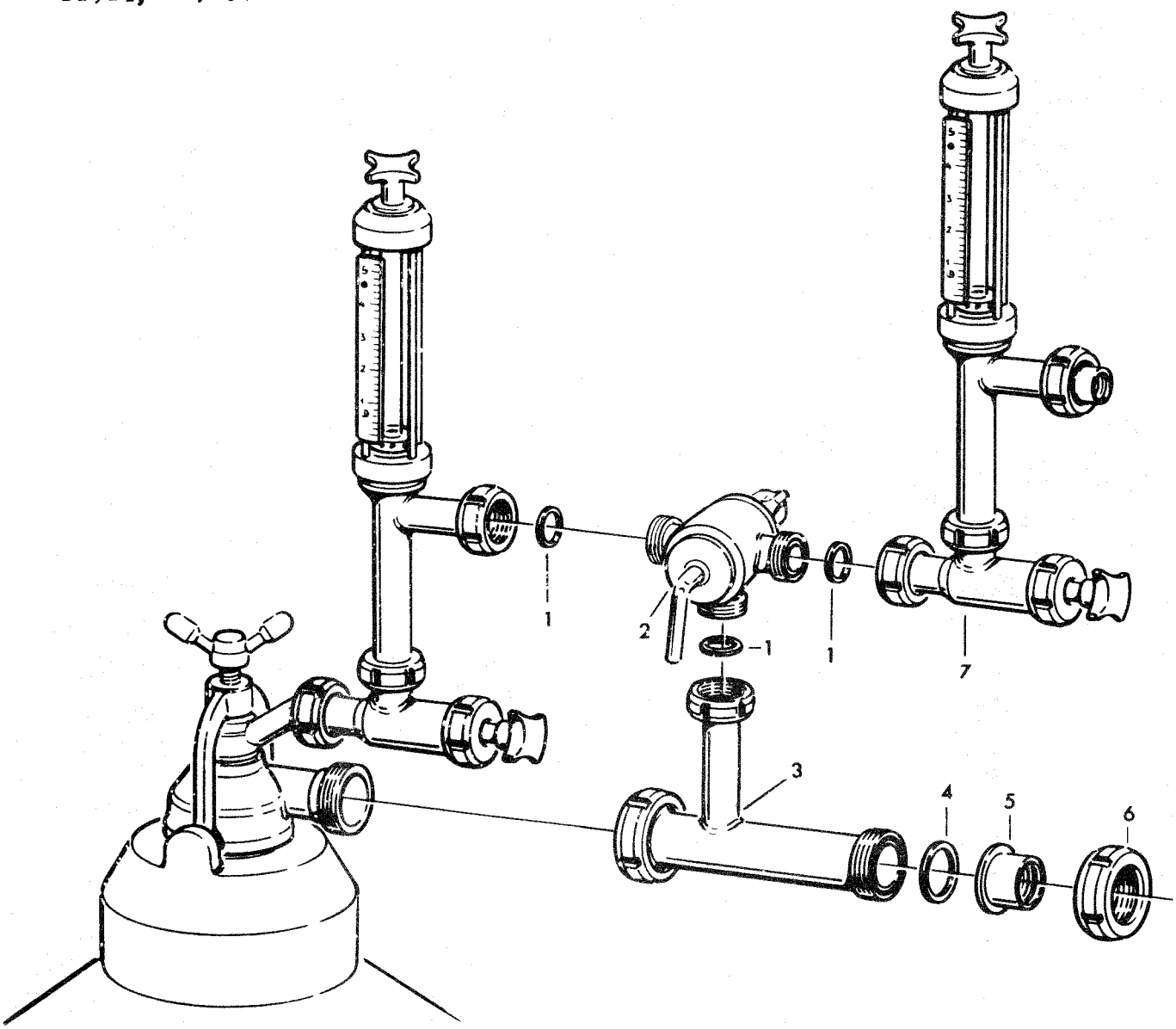


The pump housing cover for throughput regulation is intended to substitute the standard pump housing cover with nozzle when infinitely variable throughput regulation is wanted. Turn the hand wheel to the right to reduce the throughput, and to the left to increase it.

This cover is mounted and dismounted in the same manner as the standard cover.

Mounting. Dismounting.
Unscrew the nut and draw out the whole valve. Be careful of threads and sealing surfaces. Knock the pin out of the hand wheel.
Before assembly lubricate the parts according to instructions in chapter H.
Tighten the nut just sufficiently to prevent leakage around the spindle. If leakage occurs, tighten the nut a little more.

STANDARDIZING DEVICE
-- 11914, 11916*



1 Seal ring (3) -- 190601
2 Three-way cock -- 41479, 191624 *
2a Seal ring for cock plug -- 41480
3 T-piece -- 11886
4 Seal ring -- 190603
5 Sleeve -- 190629
6 Coupling nut -- 190615
7 Flow meter -- 11728, 11803*

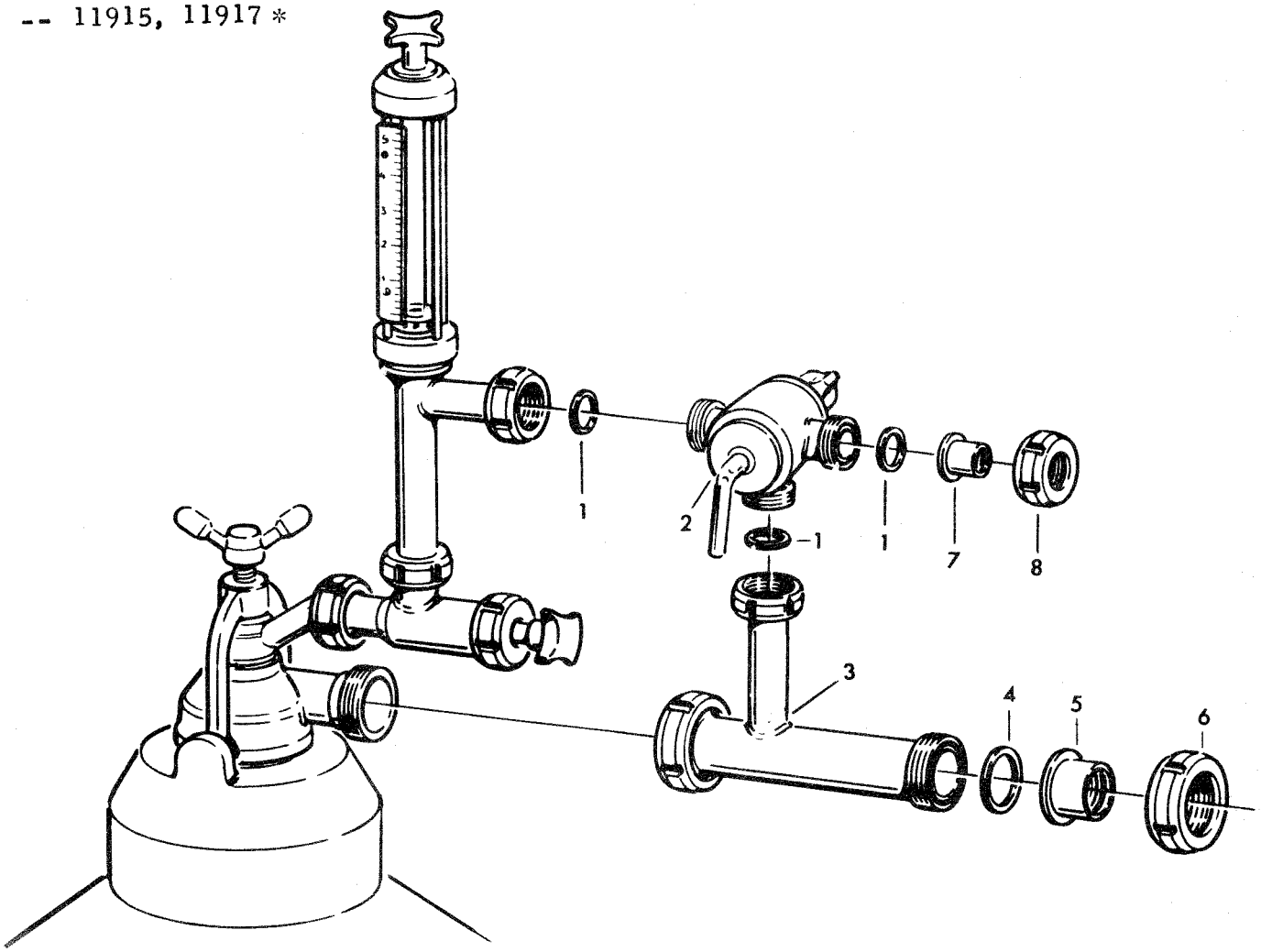
The standardizing device is used as a supplement to the standard machine when standardizing to a predetermined fat content is wanted.

The device is mounted and dismounted according to the illustration.

See also instructions in chapters B and K.

*) Parts of stainless steel.

REMIXING DEVICE
-- 11915, 11917 *



1 Seal ring (3) -- 190601
2 Three-way cock -- 41479, 191624*
2a Seal ring for cock plug -- 41480
3 T-piece -- 11886
4 Seal ring -- 190603
5 Sleeve -- 190629
6 Coupling nut -- 190615
7 Sleeve -- 190627
8 Coupling nut -- 190613

The remixing device is used as a supplement to the standard machine when return of the cream is wanted, e.g. when clarifying. The device is also suitable for circulation of liquid through the machine during the running-up and braking periods as well as during feed interruptions.

Mounting and dismounting takes place according to the illustration.

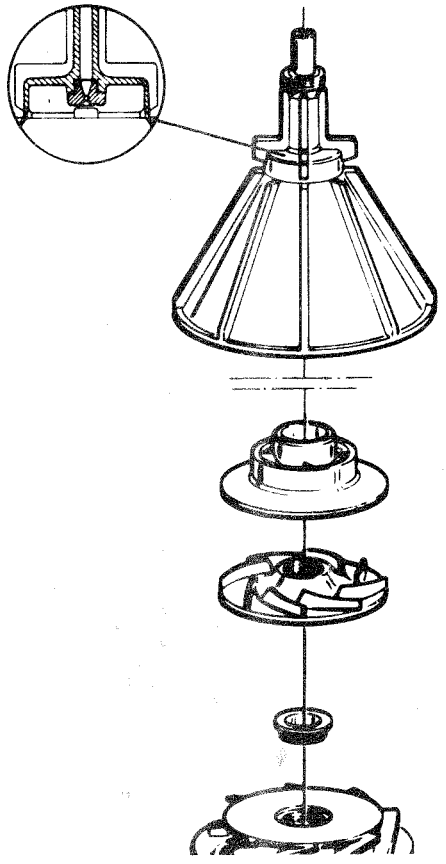
See also instructions in chapters B and K.

*) Parts of stainless steel.

PARTS for WHEY SEPARATION

When the machine is to be used for separation of whey, the parts below must be substituted for the corresponding standard equipment parts.

Parts marked "*" are made of stainless steel.



Top disc with nozzle
-- 785285-81

Nozzle
-- 43045

Pump wheel, top part
-- 11587, 11955*

Pump wheel, bottom part
-- 11586, 11954*

} Complete pump wheel for feed pump Ø 104 mm.
-- 11585
-- 11953*

Nozzle in inlet
Ø 15 mm diam.
-- 66934, 11836*

SEPARATION of WHEY

For separation of whey at a throughput of 7 500 - 8 000 l/h (1600-1800 UK gal/h) a special pump wheel is required in the feed pump, a nozzle with 15 mm hole, and a special top disc with a nozzle in its centre bore.

The cream regulation is effected by means of the regulating valve in the cream flow meter - however, reading of the meter is not possible due to the small cream quantity.

The inlet pressure should be as for separation of milk -- see chapter C.

The back pressure in the whey pipe must not exceed 1.5 kg/cm^2 (21 psi.) if the throughput should reach 7 500 - 8 000 l/h.

PARTS for COLD-MILK SEPARATION

When the machine is to be used for separation of cold-milk, the parts below must be substituted for the corresponding standard equipment parts.

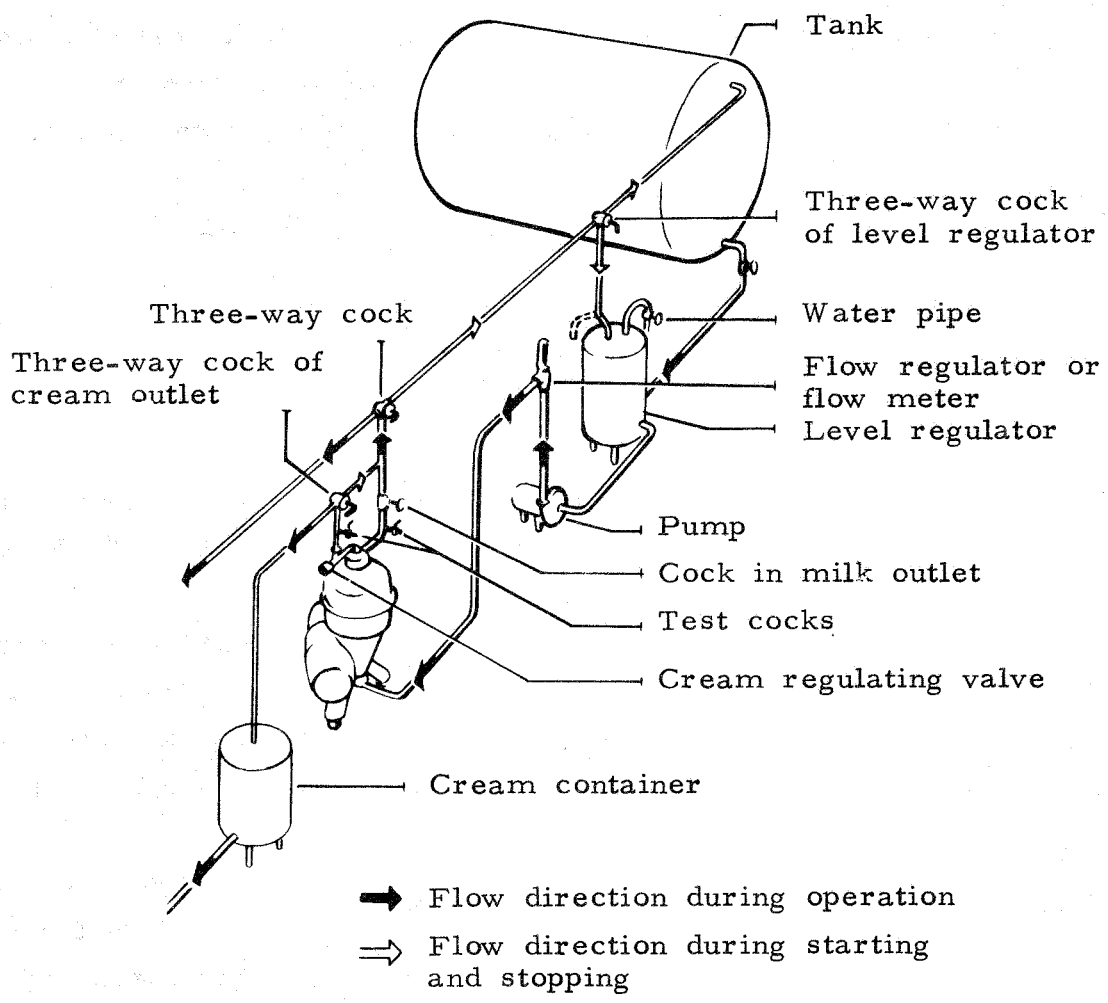
CREAM REGULATING VALVE
-- 43781

SEPARATOR BOWL
-- 43800

Cold-milk separation means separation of milk which has been cooled down to 10°C (50°F) or below after milking, and has been stored and transported at this low temperature. On arrival in the dairy a further cooling may possibly be carried out, but no heating before separation. The temperature during separation may be as low as about 3-4°C (40°F).

The discharge pump of the separator bowl is not used in cold-milk separation, but only for separating preheated milk and in connection with increased throughput in order to increase the outlet pressure in the skim milk pipe.

INSTALLATION



The sketch shows diagrammatically a suitable installation. To ensure constant throughflow independently of the milk level in the tank, a level regulator should be fitted before the pump. The level regulator also serves as a circulation container during starting. If the pump is adjustable, a flow regulator or flow meter should be fitted to allow setting to the same throughflow. The cock in the skim milk line serves to increase the skim milk pressure and thus to force out the cream more rapidly from the bowl when blockage occurs. By means of the three-way cocks the milk can be returned to the milk tank or to the level regulator.

COLD-MILK SEPARATION

Separation at low temperature is more difficult than normal skimming and requires more exact attention, particularly if cream with a fat content of about 40% should be separated off. This is due to the fact that cold cream has a considerably higher viscosity than warm cream with the same fat content and that, therefore, the bowl is very easily obstructed if the back pressure or throughflow varies. Also, variations in the fat content of the milk, and air suction may cause cream blockage. The installation, therefore, must be made so as to avoid the above variations as far as possible and so that the separator can be restored quickly to normal working if a blockage occurs in the bowl.

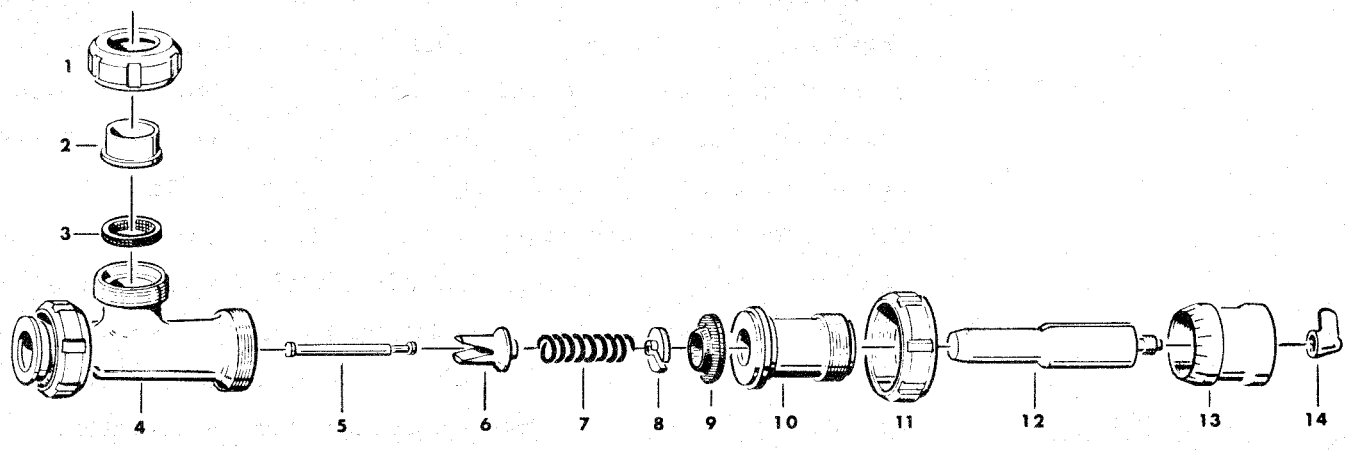
If clean skimming is of no importance - i.e. the skim-milk is used for standardizing purposes or the like - the throughflow can be raised.

If the outgoing cream must have the right fat content right from the beginning so that the regulation must be made while the milk circulates between the separator and the tank, test cocks should be provided. Furthermore, the circulation pipes should be arranged so as to give the same resistance as the normal discharge pipes, i.e. when setting the three-way cocks from circulation to normal operation the pressures in the two separator outlets should remain as unchanged as possible.

The cream pipe leading to the cream container should be as short as possible. If the latter is placed at a large distance from the separator, a smaller container should be provided near the separator and the cream be passed on by means of a special pump.

The skim milk can be forced a longer way, but should preferably not be pressed through any apparatus involving a risk of resistance variations. Thus, it is preferable to lead the skim milk directly into a tank.

REGULATING VALVE
-- 43781



Part numbers

1 Coupling nut
-- 190613

2 Sleeve
-- 190627

3 Seal ring
-- 190601

4 Inlet piece
-- 43792

5 Shaft
-- 43783

6 Valve cone
-- 43782

7 Spring
-- 43784

8 Lock washer
-- 43785

9 Packing collar
-- 43577

10 Threaded sleeve
-- 43787

11 Coupling nut
-- 190614

12 Spindle
-- 43790

13 Hand wheel
-- 11219

14 Wing nut
-- 11220

Spare parts

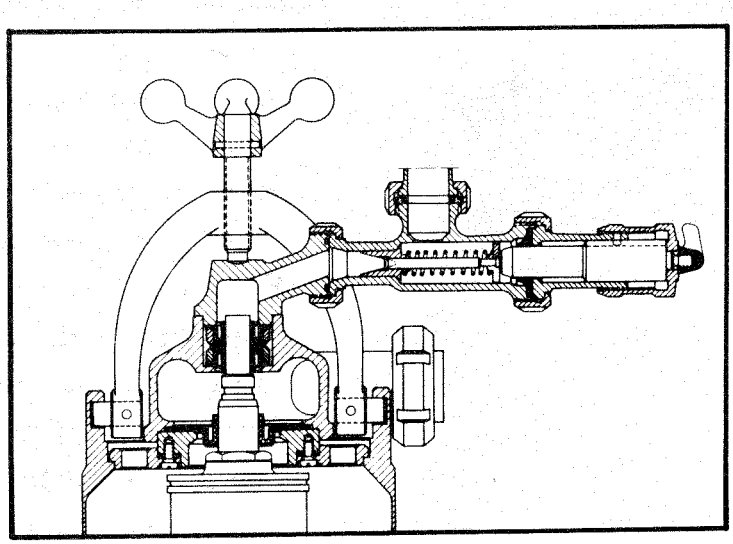
9 Packing collar
-- 43577

Dismantling. Assembling

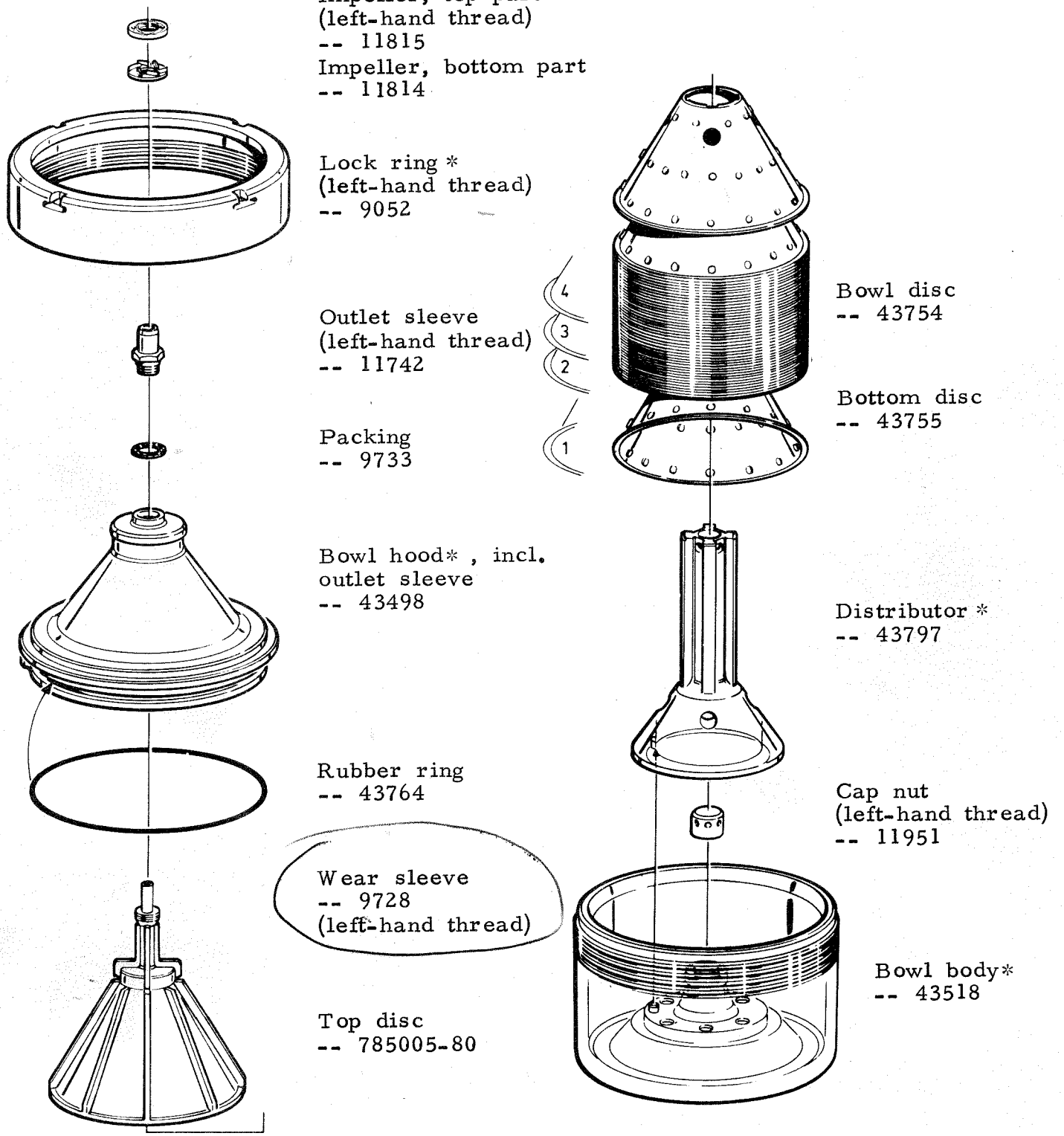
Loosen the connecting pipe.

Unscrew the coupling nut and take out the complete spindle. Be careful not to damage the parts.

Lubricate before assembling.



BOWL for COLD-MILK SEPARATION (except cap nut)
-- 43800



Impeller, top part
(left-hand thread)
-- 11815

Impeller, bottom part
-- 11814

Lock ring *
(left-hand thread)
-- 9052

Outlet sleeve
(left-hand thread)
-- 11742

Packing
-- 9733

Bowl hood* , incl.
outlet sleeve
-- 43498

Rubber ring
-- 43764

Wear sleeve
-- 9728
(left-hand thread)

Top disc
-- 785005-80

Bowl disc
-- 43754

Bottom disc
-- 43755

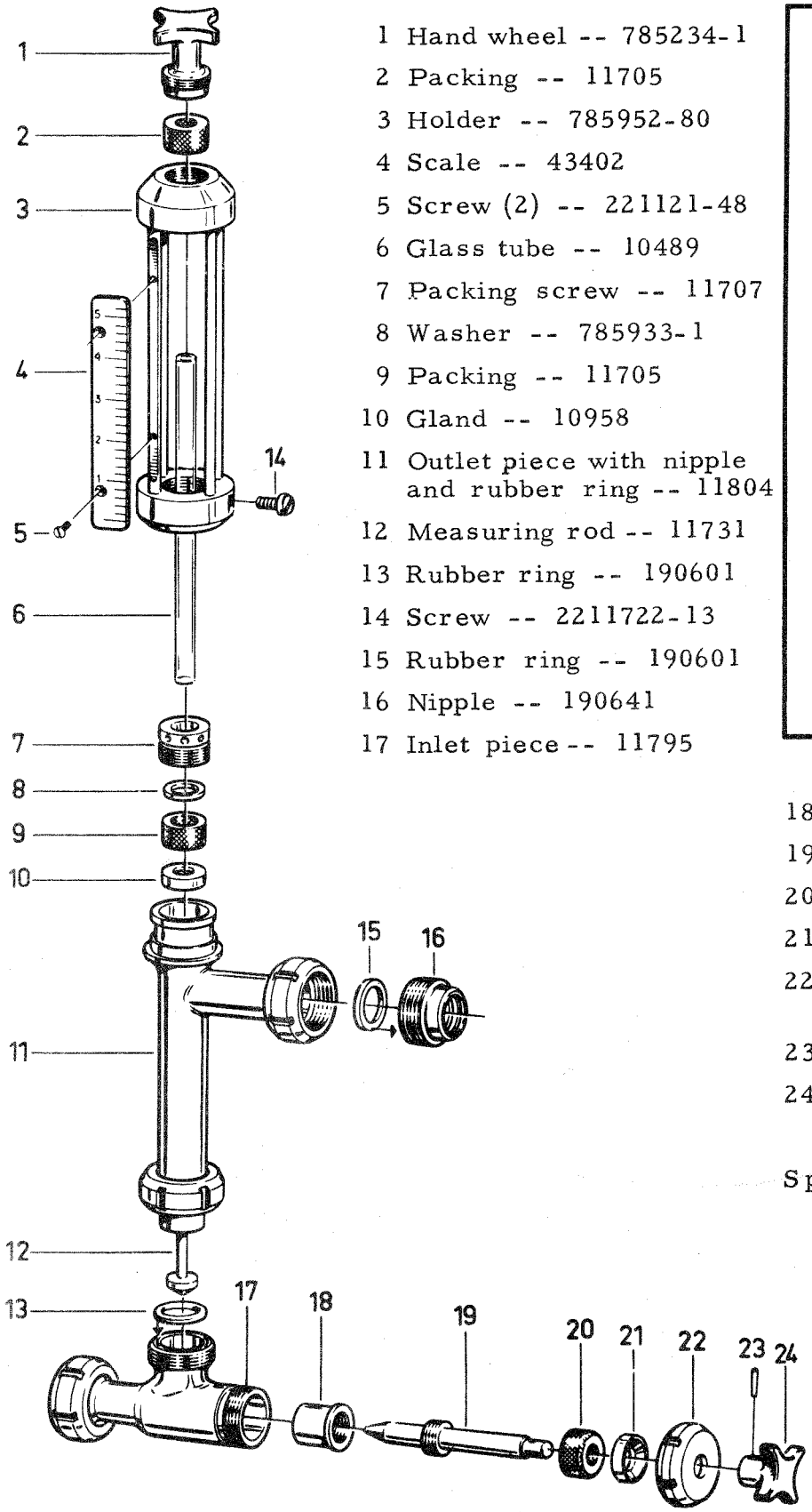
Distributor *
-- 43797

Cap nut
(left-hand thread)
-- 11951

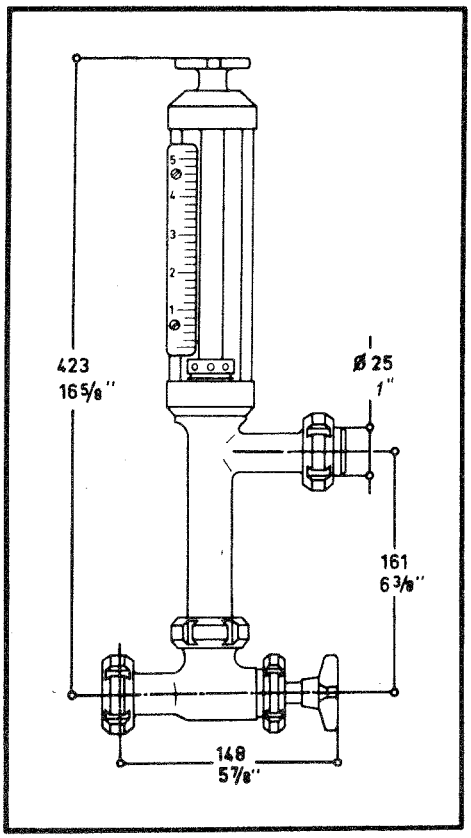
Bowl body*
-- 43518

*) Exchange necessitates rebalancing - send the COMPLETE bowl to an authorized Alfa-Laval - representative.

FLOW METER with regulating valve, of stainless steel -- 11803
(for connection to unthreaded pipes)



1 Hand wheel -- 785234-1
2 Packing -- 11705
3 Holder -- 785952-80
4 Scale -- 43402
5 Screw (2) -- 221121-48
6 Glass tube -- 10489
7 Packing screw -- 11707
8 Washer -- 785933-1
9 Packing -- 11705
10 Gland -- 10958
11 Outlet piece with nipple and rubber ring -- 11804
12 Measuring rod -- 11731
13 Rubber ring -- 190601
14 Screw -- 2211722-13
15 Rubber ring -- 190601
16 Nipple -- 190641
17 Inlet piece -- 11795

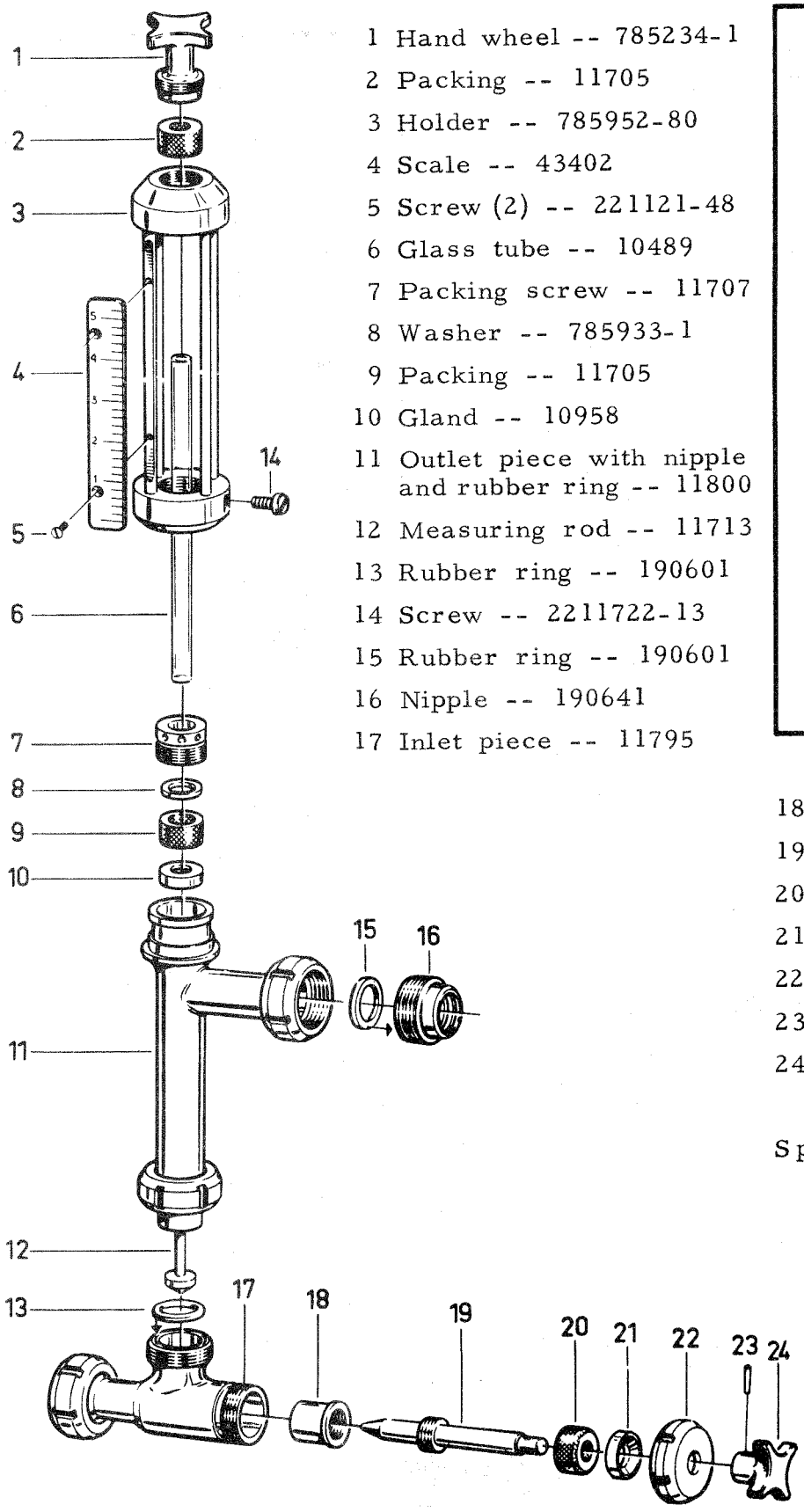


18 Threaded sleeve -- 11799
19 Valve spindle -- 11798
20 Packing -- 10959
21 Gland -- 10958
22 Hand wheel nut -- 785235-1
23 Pin -- 43033
24 Hand wheel -- 785233-1

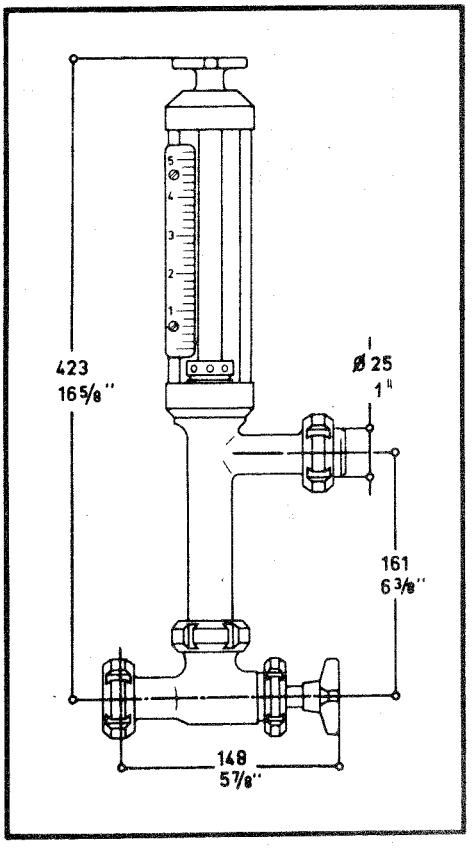
Spare parts

Glass tube (2) -- 10489
Packing (2) -- 11705

FLOW METER with regulating valve, of stainless steel -- 11794
(for connection to unthreaded pipes)



1 Hand wheel -- 785234-1
2 Packing -- 11705
3 Holder -- 785952-80
4 Scale -- 43402
5 Screw (2) -- 221121-48
6 Glass tube -- 10489
7 Packing screw -- 11707
8 Washer -- 785933-1
9 Packing -- 11705
10 Gland -- 10958
11 Outlet piece with nipple and rubber ring -- 11800
12 Measuring rod -- 11713
13 Rubber ring -- 190601
14 Screw -- 2211722-13
15 Rubber ring -- 190601
16 Nipple -- 190641
17 Inlet piece -- 11795

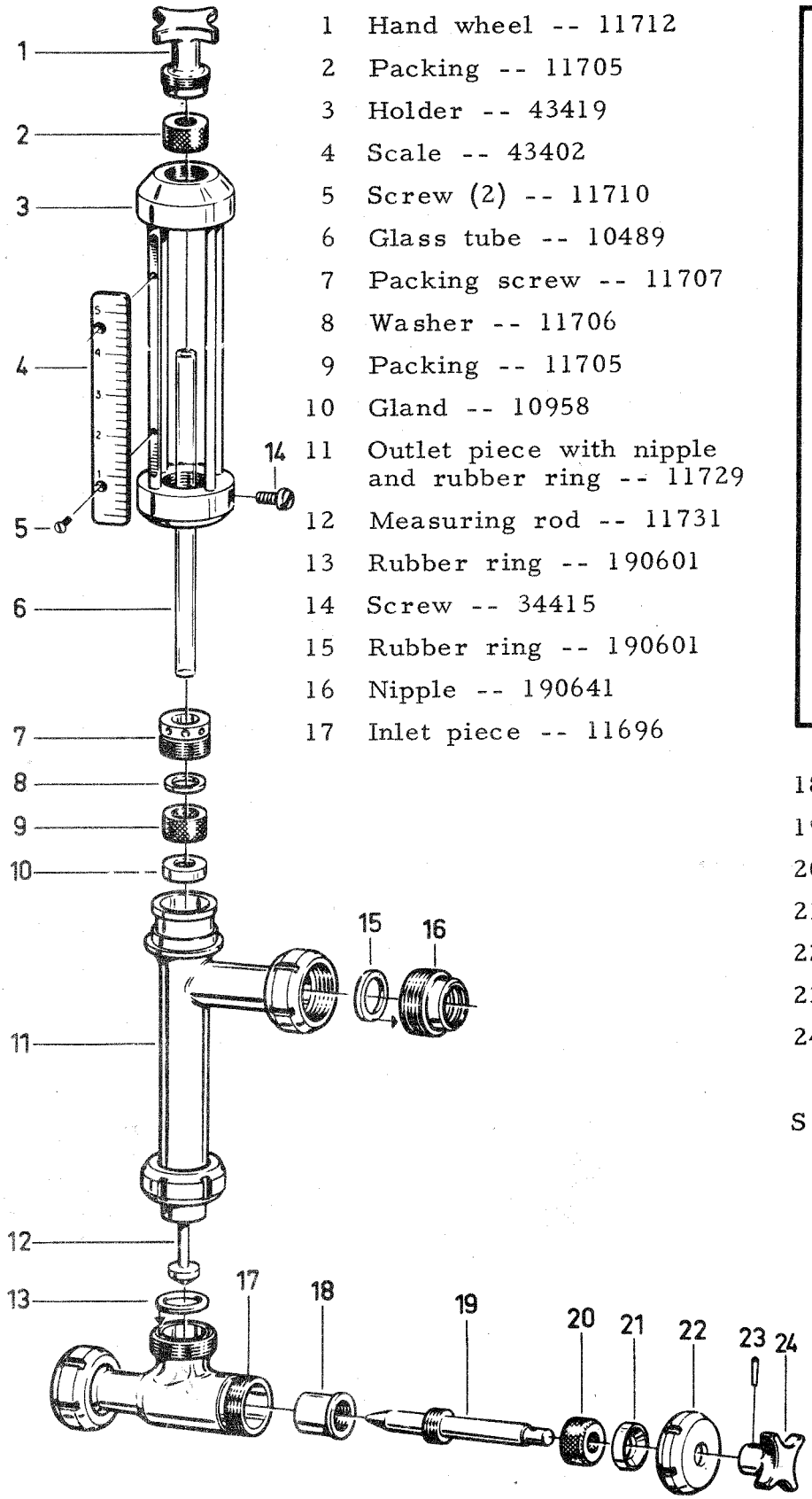


18 Threaded sleeve -- 11799
19 Valve spindle -- 11798
20 Packing -- 10959
21 Gland -- 10958
22 Hand wheel nut -- 785235-1
23 Pin -- 43033
24 Hand wheel -- 785233-1

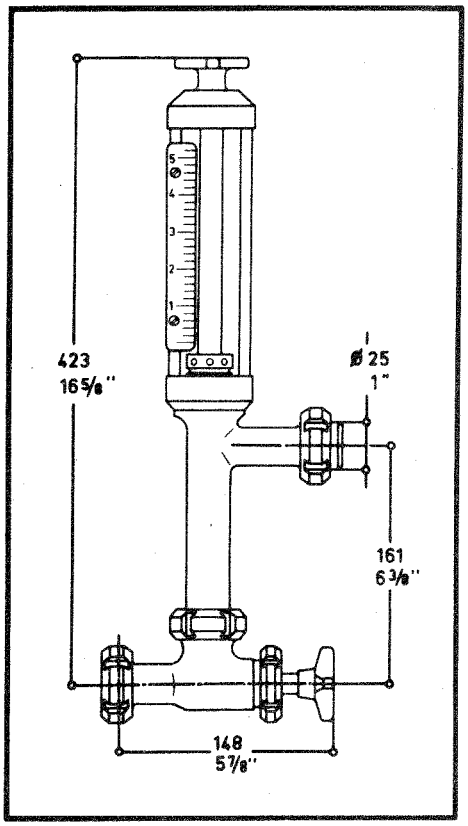
Spare parts

Glass tube (2) -- 10489
Packing (2) -- 11705

FLOW METER with regulating valve -- 11728 (for connection to unthreaded pipes)



1 Hand wheel -- 11712
2 Packing -- 11705
3 Holder -- 43419
4 Scale -- 43402
5 Screw (2) -- 11710
6 Glass tube -- 10489
7 Packing screw -- 11707
8 Washer -- 11706
9 Packing -- 11705
10 Gland -- 10958
11 Outlet piece with nipple and rubber ring -- 11729
12 Measuring rod -- 11731
13 Rubber ring -- 190601
14 Screw -- 34415
15 Rubber ring -- 190601
16 Nipple -- 190641
17 Inlet piece -- 11696

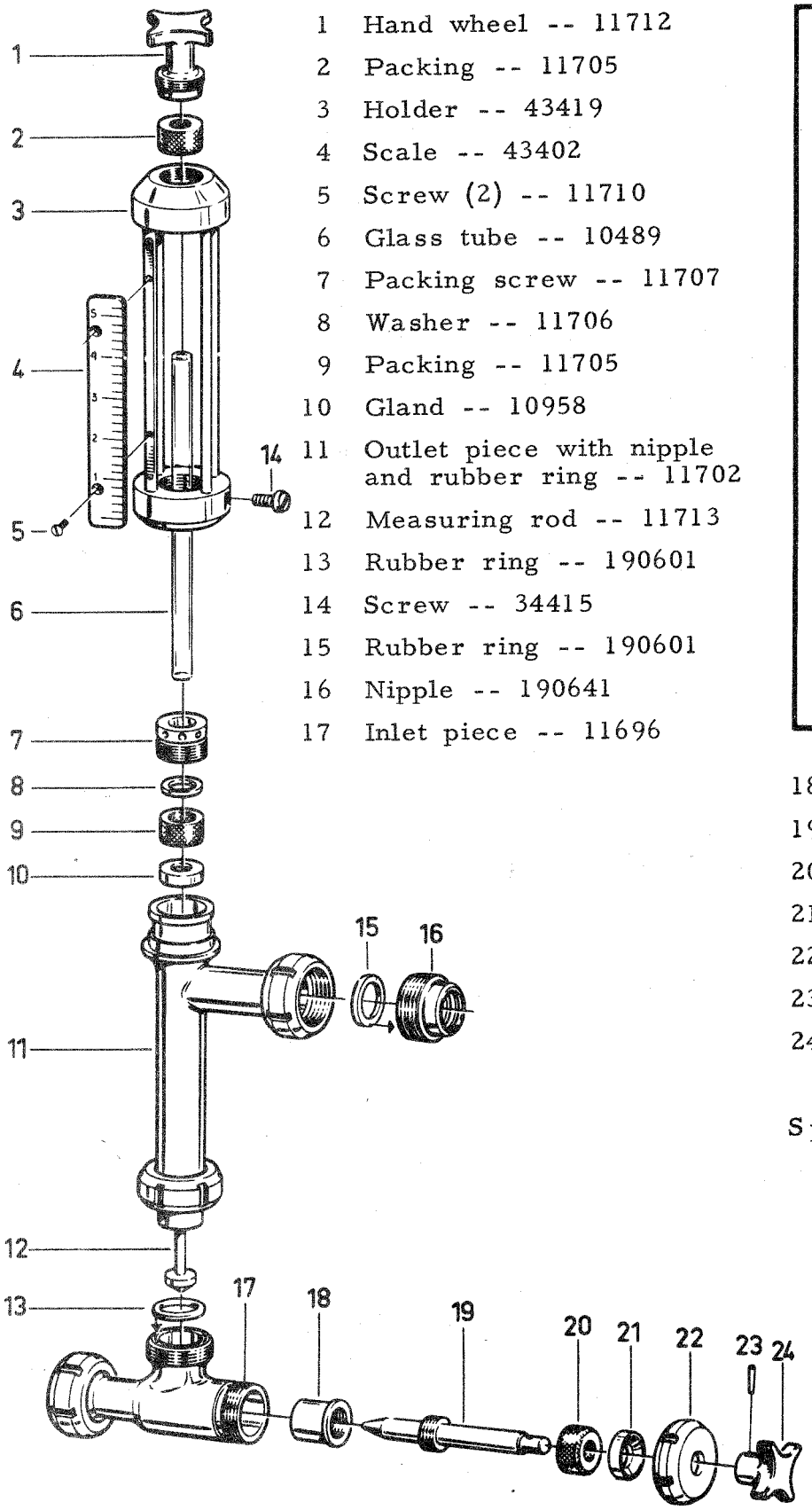


18 Threaded sleeve -- 11699
19 Valve spindle -- 11698
20 Packing -- 10959
21 Gland -- 10958
22 Hand wheel nut -- 11700
23 Pin -- 32405
24 Hand wheel -- 11701

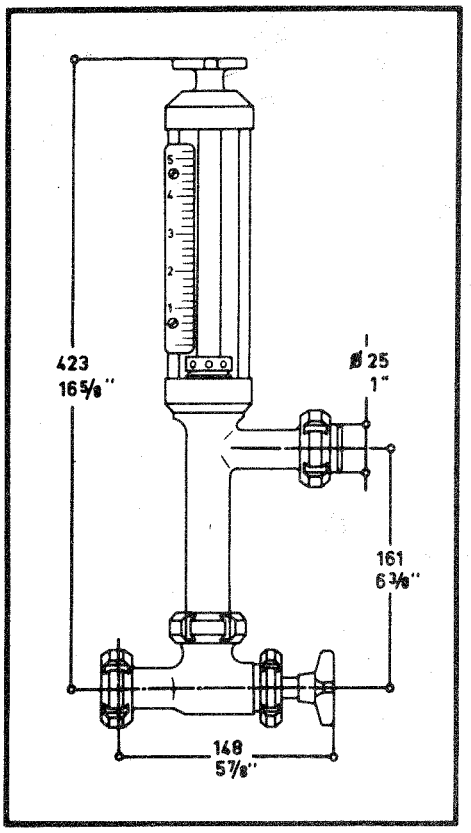
Spare parts

Glass tube (2) -- 10489
Packing (2) -- 11705

FLOW METER with regulating valve -- 11695 (for connection to unthreaded pipes)



1 Hand wheel -- 11712
2 Packing -- 11705
3 Holder -- 43419
4 Scale -- 43402
5 Screw (2) -- 11710
6 Glass tube -- 10489
7 Packing screw -- 11707
8 Washer -- 11706
9 Packing -- 11705
10 Gland -- 10958
11 Outlet piece with nipple and rubber ring -- 11702
12 Measuring rod -- 11713
13 Rubber ring -- 190601
14 Screw -- 34415
15 Rubber ring -- 190601
16 Nipple -- 190641
17 Inlet piece -- 11696



18 Threaded sleeve -- 11699
19 Valve spindle -- 11698
20 Packing -- 10959
21 Gland -- 10958
22 Hand wheel nut -- 11700
23 Pin -- 32405
24 Hand wheel -- 11701

Spare parts

Glass tube (2) -- 10489
Packing (2) -- 11705