Woerh®
Industrial Solutions

CLARIFICADORA
ECH70D2

Manual de operación y Mantenimiento

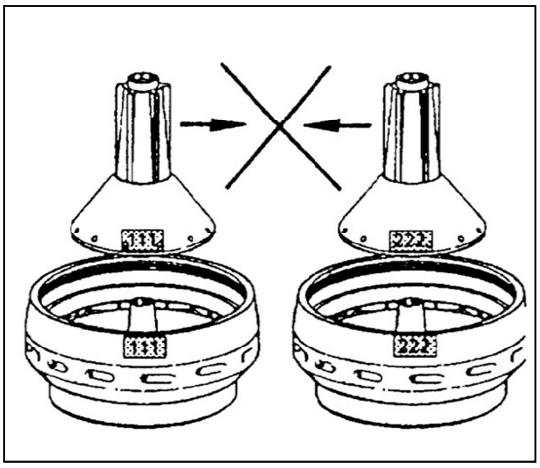
ECH70D2 Disk Separator

Index

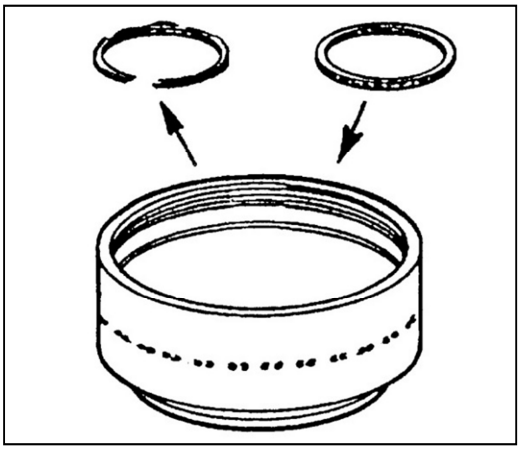
1. Safety Instructions

The centrifuge includes parts that rotate at high speed. This means that Kinetic energy is high, great forces are generated and stopping time is long.

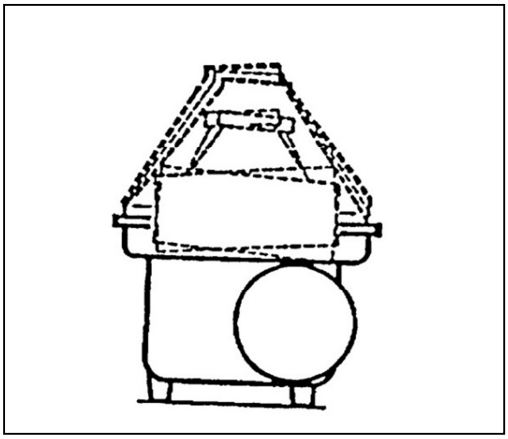
For your operator and machine safety, please strictly following the following safety rules.



1.01 Do not exchange rotating parts, if your company has several separators. The thread conjunction part must install to right position. Pay attention to the mark (or arrow) on the bowl, they must in line with each other when assembling. Before starting, strictly check operating- water pump system, the water can't be leaking when the solenoid valves are closed.

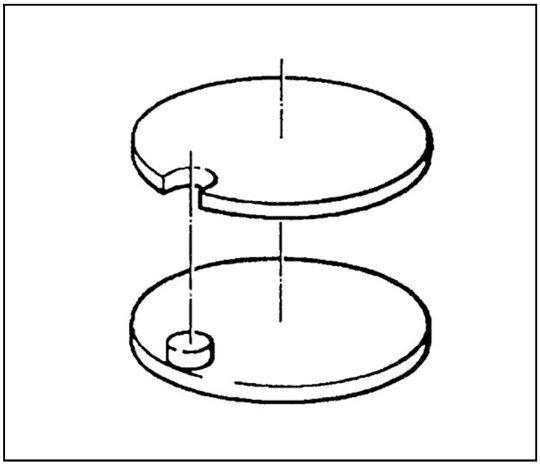


1.02 Broken spare parts need be replaced in time Do not start the separator before the inlet and outlet ports are installed, clamp-ring and other fastening screws have not fastened.

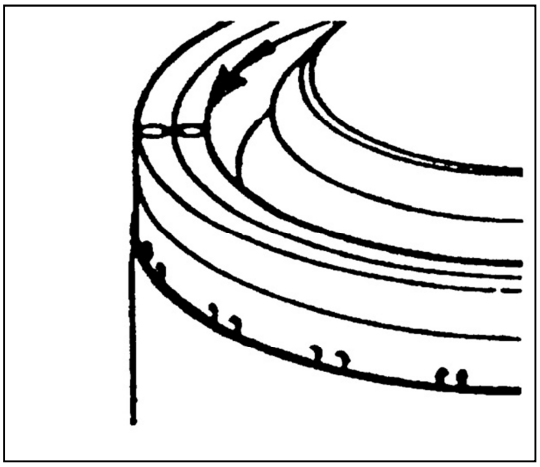


1.03 Every three months open to check bowl parts for corrosion, wear and fatigue, especially bowl sludge port, locked ring nut etc. The main spare parts should be changed. In case anything unusual advice WOERH as soon as possible, do not repair or replace without Woerh advice. It is recommended a nondestructive cracks detection when used two

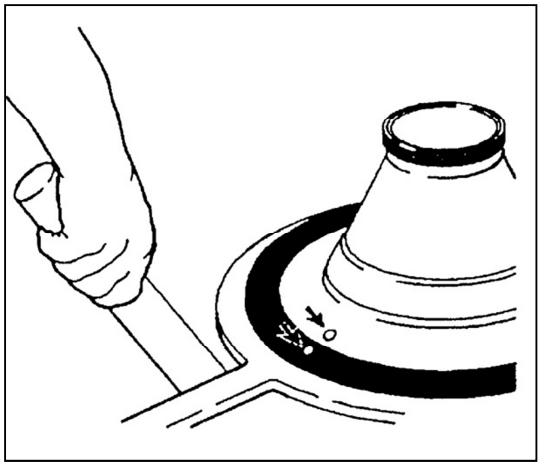
years,



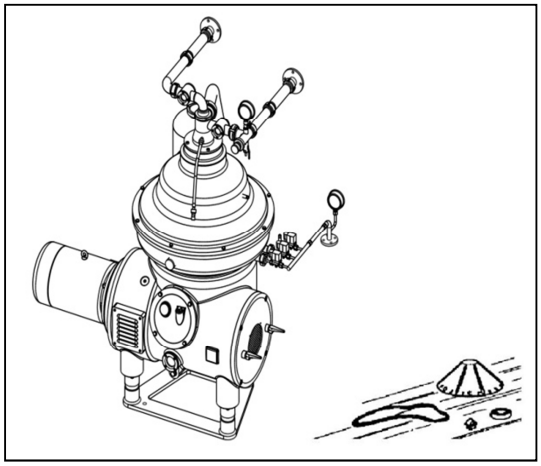
1.04 When assemble bowl, all position pins must be in good condition, if loose obviously, stop immediately and notice our company



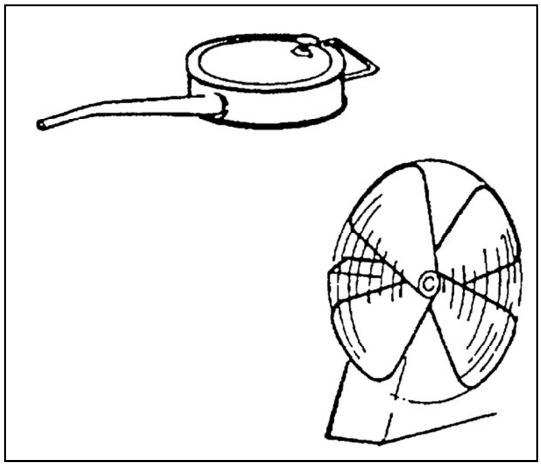
1.05 Do not replace or missing any parts when install separator bowl parts, spiral connecting parts must be installed in place, aligned in position if has assembly mark.



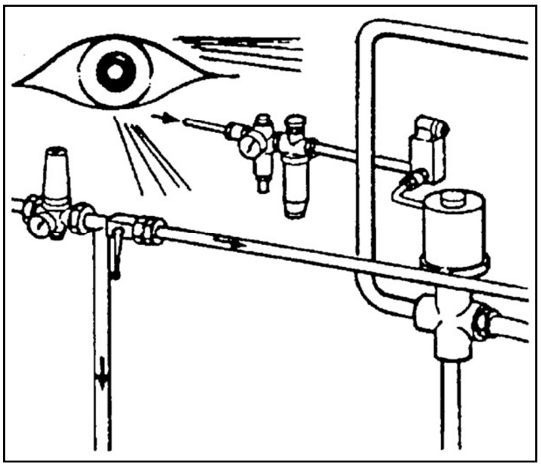
1.06 Wear on the large lock ring thread must not exceed safety limit. ϕ-mark on lock ring must not pass opposite ϕ-mark by more than specified distance.



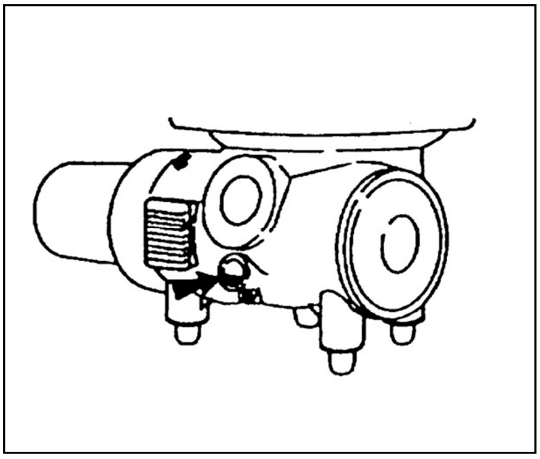
1.07 Check separator all the parts are in the place, do not leave part out of the machine.



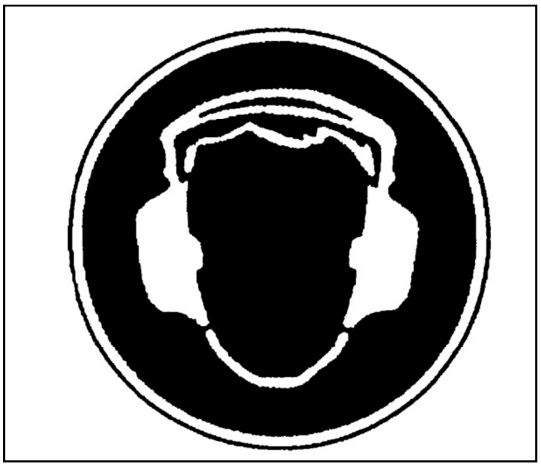
1.08 Check lubrication and cooling system



1.09 Check wiring line and soft pipe, sight glass



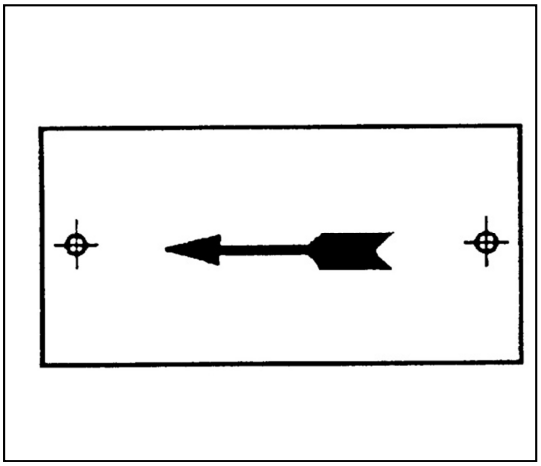
1.10 Check oil mark level of gearbox before each time start, oil level should be at sight glass middle line.



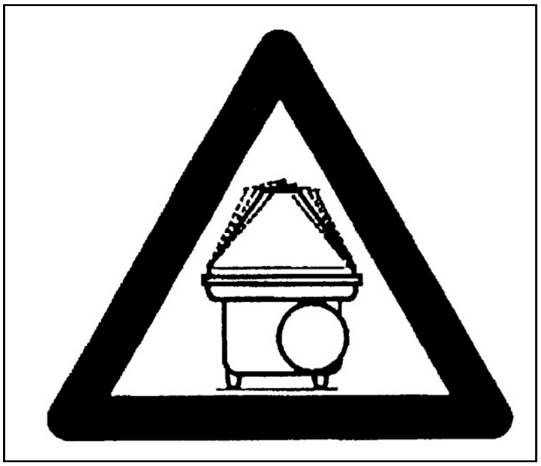
1.11 As separator is a high speed rotating machine, protect you ears with headphones.

1.12 Do not introduce explosion material to separator

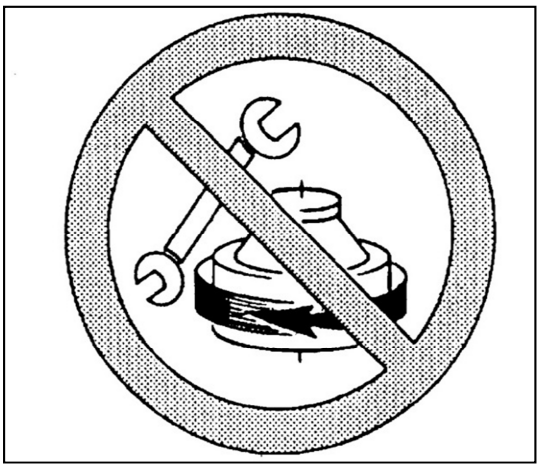
1.13 The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose. Since the separator is equipped with a frequency controlled motor, it is extremely important to ensure that the motor speed does not exceed the allowed maximum speed. A serious break down may be the consequence



1.14 When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.

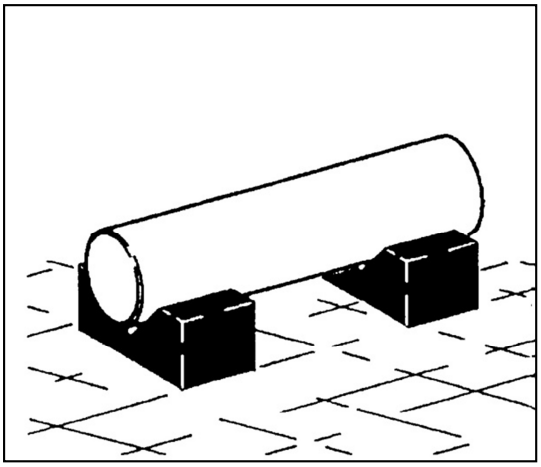


1.15 If excessive vibration occurs, stop separator and keep bowl filled with liquid during rundown.

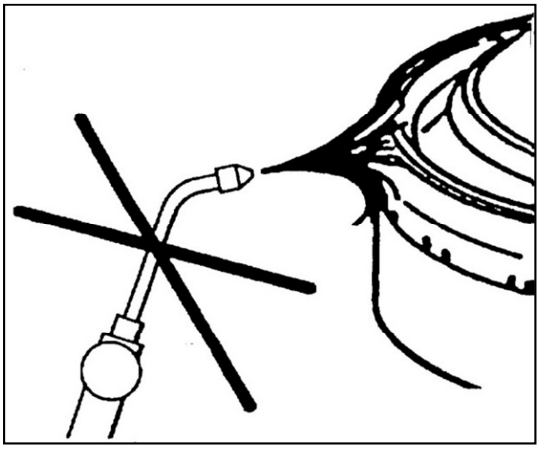


1.16 Make sure that rotating parts have come to a **complete standstill** before starting **any** dismantling work.

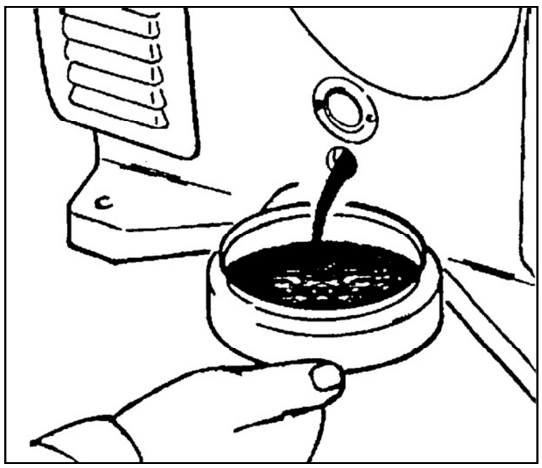
1.17 Use working plate when disassemble, do not climb up or stand in the separator to avoid damage the parts.



1.18 Removed parts should be put in appropriate place, such as rubber washer or board to avoid parts scroll or injury.



1.19 Welding or heating of parts that rotate can seriously affect material strength.



1.20 Recycle used oils to avoid environment contamination, please dispose the oil in accordance local laws.

1.21 The bowl must be hoisted up as a whole, with special-purpose tool. Before hoisting up, the bowl must be jacked with the special-purpose 7, press the discs with the compact device 5. Assembly and disassemble the bowl parts of the separator is forbidden.

1.22 Poor quality of the operating water may with time cause erosion, corrosion and/or operating problem in the separator and must therefore be treated to meet certain demands.

1.23 Soft operating water: Turbidity-free water, solids content <0,001% by volume, total hardness 150 mg CaCO3, Chlorine less than 70mg/l , pH >6.5, use filter on water line of at least 10 microns. Operating water pressure:0.3～0.6MPa(adjustable)

1.24 Please use Original Spare Parts supplied by the WOERH.

2. Product model and name

Abbreviation：ECH70D2 Disk Separator

3. Performance and application

All the parts that in contact with the product are made of stainless steel. Availably reduce the chemical effect of the feedstock and the machine spare parts. The separated clarifying products are discharged from the machine by centripetal pump, so the product may enter the machine under lower pressure. The separator is controlled by a PLC automatic control system, can carry out automatic desludging, allowing a smooth operation and excellent product quality control. Is easy to adjust, and control.

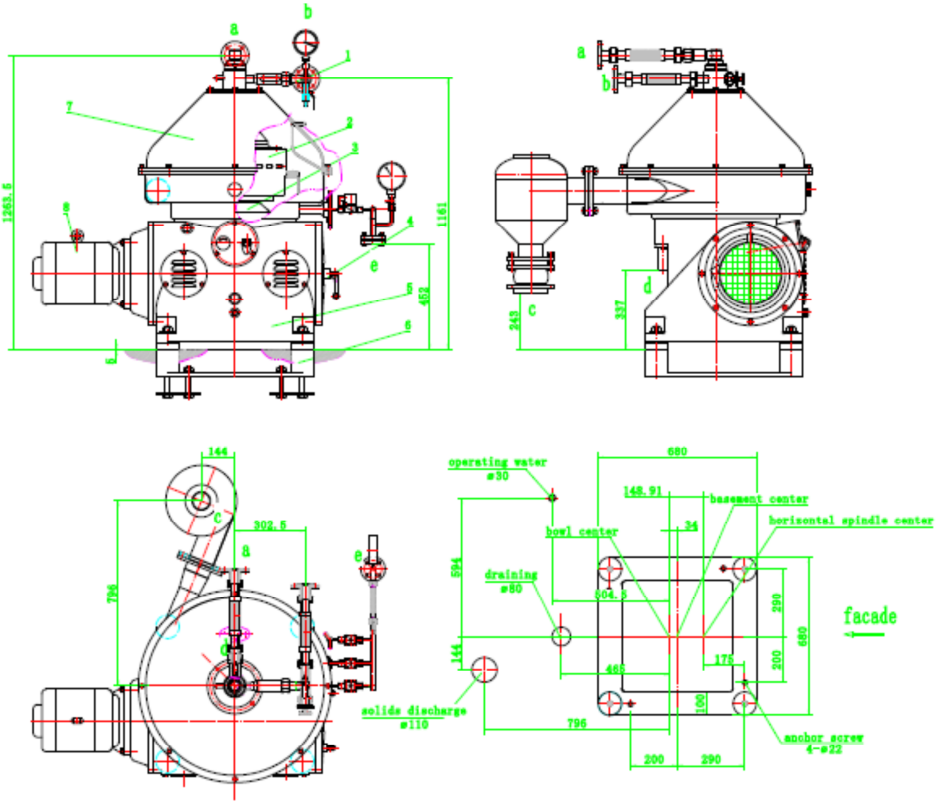
The solids content within the product cans be widely adjusted from 0,5% to maximum of 5% by sludge timing adjustment.

Power drive use a fluid clutch, Torque is transferred by the fluid, so starts reliably and prevents overloads.

This disk stack centrifuge is one of the most sophisticated apparatus in continuous clarification, it is also used in chemical, pharmaceutical and food etc. industry.

4. Separator configuration (see attach fig. 1)

The separator can be divided on the following parts: Inlet and outlet device, Bowl, Hood, Vertical spindle, horizontal drive, frame, foundation, motor, cyclone and PLC automatic control system etc.



5. Main technical data (see table one)

Table one

Model	ECH70D2
Bowl speed	>7000rpm
Capacity	1000~3000L/h
Motor power	11KW
Dimension (Lx W xH)	1500×1100×1500
Weight	~1580kg

6. Working principle (see attach fig. 2)

Three solenoid valves are controlled automatically by the PLC controller. Customer may adjust the control timing according to separation results. When the PLC is in automatic Control, the solenoid valve used in sealing water is opened by the control PLC once every minute to add the water. This water is entering to the water distributor, to the space between the bowl and the sliding piston. We water centrifugal force lift the sliding piston, Closing the sliding piston to the gasket (nylon ring) on the upper bowl cover. This is a complete bowl sealing. Now the water can be feed to the bowl which should exit through the product outlet.

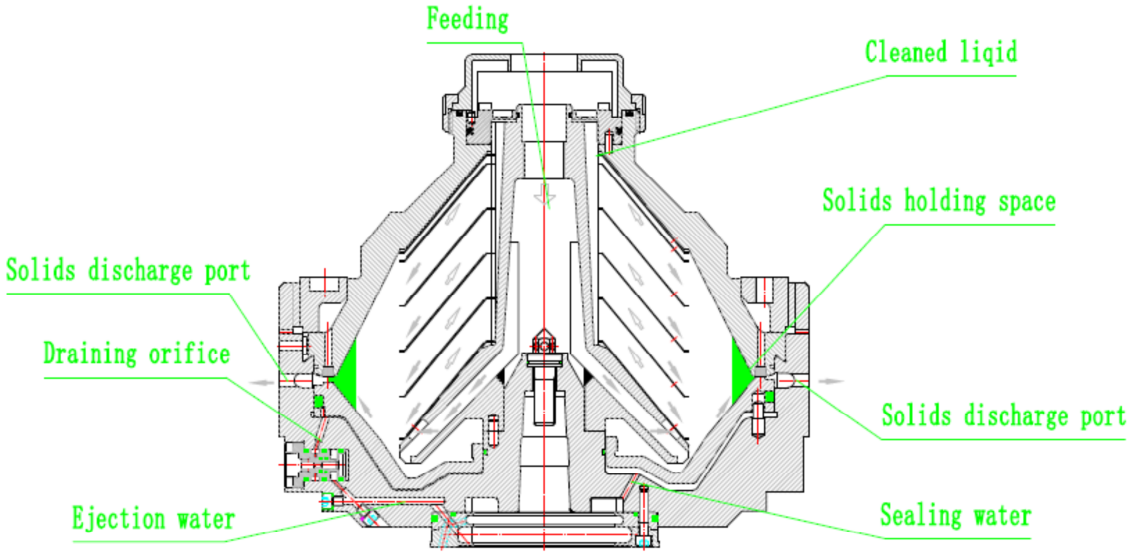


Fig 2 Working principle

A Test dislodge can be done to test the discharge system. When de-sludging, opening water is entering from the water distributor to the opening channel. This water pushes the small piston open, on the piston valve. This valve evacuates the sealing water through the discharge nozzle, eliminating the pressure that keeps the bowl closed, then the sliding piston falls, solid impurities in sediment holding space are ejected from the sediment ejection ports by centrifugal force. Then, immediately, sealing water fills again the bottom of the sliding piston, pushing it up, so the bowl close. Simultaneously the washing water solenoid valve is opened, flushing solids in the hood. The

process is made by PLC control system, product feed is not required to be stopped.

The Product to be processed is fed to the bowl through the feeding pipe, and enters through eight holes channels on the distributor. Under the effects of centrifugal force, the solids that have heavier density are collected against the bowl wall; they include all impurities and solids within the product, and are collected in sediment holding space. After a while, the separated solids are ejected from the bowl at defined timing set upon the PLC. The intervals at which de-sludging have to take place depend on the quality of the feed product. The control system includes automatic de-sludging, total de-sludging, partial de-sludging. Normally customer do not require a total de-sludging, Manual Dislodge can be manually set as well as total Dislodge. Always wait until motor current is reduced to normal before producing another dislodge. Clutch overtemperature may happen if dislodging is done too often. The interval between two partial de-sludging is should be more than two minutes, and electric current should be normal. Then re-establish the automatic de-sludging interval. The heavier or higher density product is thrown towards the bowl wall under the effects of centrifugal force; the lighter products (lower density) flow along the inner side of the disks into the passage into the upper distributor, the lighter product is discharged from the machine by the centripetal pump. The separator is self-cleaning machine and has centripetal pump, the machine can work continuously for a long time, attaining good separation effects in long run.

7. Main structure in brief

7.1 Feed and discharge device (see attach fig. 3)

It is used to feed the process product to the bowl. It is located at the top of the machine (see attached fig.3). Its main parts such as name, quantity and specification see table two. When assembling, overlap the centripetal pump to the oil inlet pipe (put the lower end of the feeding pipe into the center of the bowl) Then cover with the centripetal pump cover housing, Corresponding pipe parts should also be formed a complete set of the inlet and outlet pipe lines

Table two

No	Name	Qty	Code
1	Feeding inlet pipe	1	600-0350
2	Washer	1	200-0012
3	Sampling nozzle	1	600-0351
4	Sampling valve	1	600-0275
5	Light phase outlet	1	600-0352
6	Cushion	1	200-0001
7	Pressure gauge	1	750-0051
8	Nut	1	450-0249
9	Key	2	450-0360
10	Glass pipe	1	600-0353

11	Sealing ring	2	250-0204
12	O type sealing ring	1	100-0060
13	Locked nut	1	650-0360
14	Feeding inlet	1	450-0361
15	Sealing ring	2	250-0013
16	Glass pipe	1	600-0354
17	Nut	1	450-0362
18	Feeding joint	1	600-0355
19	O type sealing ring	1	100-0025
20	Steel cable stop collar	1	450-0240
21	Sealing ring	1	250-0350
22	Handle wheel	1	600-0356
23	Washer (一)	1	450-0363
24	Locked wheel	1	600-0357
25	Bush	1	450-0364
26	Round nut	1	450-0367
27	Piston	1	600-0358
28	Y type sealing ring	1	250-0350
29	Axle sleeve	1	450-0365
30	Axle	1	450-0368
31	Flow regulating room	1	
32	Soft metal pipe	2	600-0361
33	Sealing ring	4	250-0016
34	Flange device	2	600-0362

7.2 Bowl (see attach fig. 4)

The bowl is the place that separate materials, the “heart of the machine”. (see attached fig.4) Its name, quantity and code of main parts see table three. The bowl body is mounted onto the top of the vertical spindle, fixed tightly in vertical shaft through nuts. Then assemble successively distributor, disks, top panel, bowl top, lock sleeve, lock circle, centripetal pump cover and small lock ring, etc. All parts are align in position with a 0 Mark. Add the required orings to the positions that require seal. The disks are numbered from the bottom to the top, and should be mounted by the same order after disassembly and cleaning. Otherwise, the dynamic balance will be modified. As the same, the parts from different machines cannot be exchanged from one machine to another in the case the customer have several machines with the same type. All the axial threads except the disassembly and assembly thread is left-hand thread, and should be installed accurately, especially the lock sleeve must be fixed to the mark position. The peripheral direction should be aligned to the mark place.

Table three

No	Name	Qty	Code
1	Centripetal pump cover	1	650-0361
2	Sealing ring	1	250-0351
3	Distributor	1	650-0362
4	O type sealing ring	1	100-0051
5	O type sealing ring	1	100-0500
6	Small locked ring	1	650-0363
7	Bowl cover	1	650-0364
8	Middle disks	84	650-0365
9	Vertical shaft bolt	1	450-0369
10	O type sealing ring	1	100-0501
11	Locked ring	1	650-0366
12	Nylon sealing ring	1	250-0352
13	Sealing ring	1	250-0353
14	Position pin	3	450-0370
15	Sliding piston	1	650-0367
16	O type sealing ring	1	100-0202
17	O type sealing ring	1	100-0203
18	Screw	4	450-0115
19	Water room	1	650-0037
20	Position pin	3	450-0371
21	O type sealing ring	1	100-0502
22	Screw	4	450-0009
23	Washer	7	200-0004
24	Piston	2	500-0050
25	O type sealing ring	6	100-0003
26	Valve core	2	200-0002
27	Valve body	2	600-0040
28	O type sealing ring	4	100-0002
29	Position block	1	450-0205
30	Bowl body	1	650-0368
31	Position pin	1	450-0372
32	Centripetal pump cover	1	650-0369
33	Position pin	1	450-0373

7.3 Hood (see attach fig.5)

Hood is the protection device to guarantee safe operation of bowl and the correct conduction of discharged solids, see attached fig.5. It's main parts such as name, quantity and Code see table four.

Table four

No	Name	Qty	Code
1	Adjusting washer		450-0364
2	Upper cover	1	650-0369
3	Hexagon screw	8	450-0375
4	Bottom cover	1	650-0370
5	Inner hexagon screw	8	450-0116
6	Water shield	1	650-0371
7	O type sealing ring	1	100-0503
8	Soft metal pipe	1	600-0207
9	Soft metal pipe	1	600-0208
10	Filter	1	650-0372
11	Pressure gauge	1	750-0051
12	O type sealing ring	1	100-0504
13	Nylon ring	1	250-0354
14	O type sealing ring	2	100-0016
15	Sealing pludge	1	450-0247
16	Nut	2	450-0014
17	Screw cap	1	450-0106
18	Hexagon screw	8	450-0015
19	Round nut	2	450-0108
20	Sealing ring	2	250-0211
21	Joint pipe（Ⅰ）	1	600-0076
22	Casing pipe（Ⅰ）	1	600-0077
23	O type sealing ring	2	100-0208
24	Pipe joint	2	450-0121
25	Solenoid valve	3	450-0208
26	Diverter	1	600-0209
27	Joint pipe（Ⅱ）	1	600-0078
28	Casing pipe（Ⅱ）	1	600-0079
29	Three direct links	1	600-0221
30	Soft metal pipe	1	600-0210
31	Joint	1	450-0376

7.4 Vertical spindle (see attach fig.6)

Vertical shaft is a part, which can increase speed and transfer power and adjust height of the bowl. It is one of the main components of the machine (see attached fig.6). Its name, quantity, code of

main parts see table five. Spring room and fixed sleeve are separately fixed onto the frame by bolts, and vertical shaft is flexible. A single-row ball bearing supported by radial springs is fitted at the upper end of the shaft, a double-row self-centering ball bearing and two single-row angular contact ball bearings are filled at the down end of the shaft to let the machine pass the resonance area steadily. To ensure the position of water panel, water room, centripetal pump and centripetal pump chamber cover stay in a suitable position, you can regulate the support spring and regulation set to control the axial position of vertical shaft. The Bearings should be changed every 8000 hours or one year of operation. Careful inspection of the bearing fixation area and vertical spindle should be performed by specialized technicians

Table five

No	Name	Qty	Code
1	Inner hexagon screw	3	450-0377
2	Spring washer	3	450-0080
3	Protective cover	1	650-0373
4	Sealing cover	1	650-0374
5	O type sealing ring	1	100-0505
6	Vertical shaft	1	650-0375
7	Spring	1	450-0379
8	Oil retaining disk	1	650-0376
9	Bearing stop collar	1	650-0377
10	Bearing	1	400-0004
11	Spring room	1	650-0378
12	Screw	6	450-0111
13	Spring	6	450-0380
14	Spring base	6	500-0050
15	Bearing protective sleeve	1	650-0379
16	Spiral gear	1	650-0380
17	Spring pin	1	650-0381
18	Stop collar	1	450-0381
19	Bearing	1	400-0050
20	Bearing stop collar	1	450-0382
21	Bearing	2	400-0051
22	Bearing pressing sleeve	1	450-0383
23	Ball support	1	650-0382
24	Support spring	1	650-0383

25	Inner hexagon screw	4	450-0375
26	Spring washer	4	450-0385
27	Bottom spring base	1	650-0384
28	Regulating sleeve	1	650-0385
29	Bottom bearing cover	1	650-0386
30	Washer	1	250-0355
31	Paper cushion	1	250-0356
32	Paper cushion	1	250-0357
33	Paper cushion	1	250-0358
34	Screw	2	450-0386
35	Skeleton seal	1	350-0276
36	O type sealing ring	1	100-0025

7.5 Horizontal spindle (see attach fig.7)

Horizontal shaft is part of the power transmission. It is located in the middle of the machine (see attached fig.7). Its main parts such as name, quantity, specification see table six. The bearings are located separately on the frame by the bushing sleeves, to keep the horizontal shaft rigid and ensure its position. The motor drives gradually the horizontal shaft using the Variable speed drive, the big gear is locked tightly in horizontal shaft with a cone fixation and speed measurement gear. Then the gear rim drives the small worm gear of vertical spindle to rotate and another cross splash lubricant oil to the bearing of vertical shaft to cool and lubricate by mist the bearing. The brake device is installed on the other end of the shaft, which make the machine pass the resonance area quickly and decrease the stop time. The motor of the machine use a Variable speed drive to start smoothly, avoid overloading and it can regulate start time.

Table six

No	Name	Qty	Code
1	Motor 11Kw	1	650-0387
2	Key	1	450-0386
3	Hexagon screw	4	450-0010
4	Spring washer	4	450-0080
5	Level washer	4	450-0062
6	Coupling (-)	1	450-0368
7	Elastic plate	1	650-0388
8	Support cover	1	450-0387
9	Inner hexagon screw	12	450-0375

10	Spring washer	12	450-0062
11	Washer	1	450-0374
12	Left tooth screw	1	450-0024
13	Coupling (=)	1	450-0389
14	Horizontal shaft	1	650-0389
15	Bearing pressing cover（Ⅰ）	1	650-0390
16	O type sealing ring	2	100-0300
17	Felt collar	2	250-0800
18	Hexagon screw	8	450-0015
19	Bush （Ⅰ）	1	450-0390
20	Paper cushion	2	250-0359
21	Bearing	1	400-0052
22	Snap ring	1	450-0400
23	Inner hexagon screw	4	450-0118
24	Gear Rim	1	650-0391
25	Bearing	1	400-0053
26	Lock washer	1	450-0407
27	Lock round nut	1	450-0406
28	Hexagon screw	4	450-0390
29	Inner end cap	1	650-0392
30	Paper cushion	1	250-0360
31	Bearing pressing cover（Ⅱ）	1	650-0393
32	Brake wheel	1	650-0394
33	Hexagon screw	1	450-0022
34	End cap	1	650-0395
35	Brake pieces	2	500-0130
36	Support board	2	500-0131
37	Screw	8	450-0309
38	Round pin	1	450-0391
39	Set screw	2	450-0018
40	Brake bush	2	450-0392
41	Round nut	2	450-0393
42	Handle shank	2	450-0131

43	Spring	2	450-0082
44	Stop collar	1	450-0394
45	Clamping sleeve	1	450-0132
46	Fixation cone	1	450-0118
47	Velocity meter worm	1	650-0395

7.6 Frame and base (see attach fig.8)

The frame supporting and protecting the device of main parts is the base of the machine including frame bearing cap and so on. The hood, horizontal shaft and vertical shaft are installed in the frame. The motor is directly joined to the frame through support cover. In order to make the separator reach the smoothly to set speed, a fixation base is applied at the bottom, with dampening supports on all 4 legs. It supports the whole frame, absorbs the vibration, decrease vibration transfer to the support structure and increases separator service life. Its name, quantity, Code of main parts see table seven

Table seven

No	Name	Qty	Code
1	Hexagon screw	6	450-0319
2	Shutter	2	600-0359
3	Screw	4	450-0395
4	Hexagon nut	4	450-0045
5	Shock pad	4	450-0396
6	Shock pad	4	450-0135
7	Base	1	650-0396
8	Frame	1	650-0397
9	Hexagon screw	2	450-0502
10	Drain pipe	1	600-0360
11	Sealing ring	1	250-00013
12	oil plug	1	450-0397
13	Oil remark	1	600-0360
14	Axle cover	1	650-0398

15	Indication plate	1	500-0025
16	Vent plug	1	450-0398
17	Velocimeter axle	1	650-0399
18	Hexagon screw	3	450-0036
19	Round pin	2	650-0136
20	Velocimeter rim gear	1	650-0405
21	Name plate	1	
22	Clutch oil plug	1	450-0033

7.7 Cyclone (see attached fig.9)

The cyclone is connected to the lower frame. It absorbs solids energy that lower cover collected and reduce the noise produced by high speed rotation bowl. The bottom of the cyclone connects through a rubber joint with pipe to reduce the vibration. Its main parts see table eight.

Table eight

No	Name	Qty	Dimension
1	Cover nut	1	450-0399
2	Cyclone	1	650-0406
3	Hexagonal screw	4	450-0405
4	Nut	4	450-0005
5	Flat gasket	4	450-0230
6	Hexagonal screw	4	450-0036
7	Nut	4	450-0002
8	Flat gasket	4	450-0057
9	Rubber Joint	1	600-0360
10	"O" ring	1	100-0059
11	Sight glass	1	600-0133
12	Screw	4	450-0009

7.8 Automatics control instrument

The structure detail of Automatics control instrument is on the Automatics control instrument manual. Before install and setup and debug, please read the manual carefully.

Our company inputs the procedure of Automatics control instrument ourselves. Please don’t take

apart and repair it or connect the line at random.

8. Delivery installation and adjustment

8.1 Delivery

8.1.1 Consult with Woerh for delivery and packing of the separator.

8.1.2 The complete machine is delivered in a packed box, along with a set of auxiliary tools, anchor device, one copy of operation specification. There is only one group of tools for the same model and the same client.

8.1.3 The machine fixed on the bottom of the packing box, when lift, it is not allowed more than 30 degrees, must keep stable and avoid press on top.

8.2 installation and adjustment

8.2.1 When design equipment flat arrangement diagram and concrete the base of the separator, be insure that other machines' vibration don't affect the separator. And set aside enough space for disassembly and installation of the horizontal shaft. The distance between the centers of two separators is up to 3.6m. The base should accord with request in figure 1. Four foods protrude from the ground by approx. 10mm. Make it level, then install after basic maintenance.

8.2.2 Check all the parts of the separator carefully before installing the separator, and flush the pipe line.

8.2.3 When lifting, the cord must be fastness. Don't lift separator by the stationary ring hole of the motor. Be steady when lifting and putting down and not allowed more than 30 degree.

8.2.4 Test the machine level after putting it down to foundation. Then install the bowl.

8.2.5 The operating-water must be soft water. Pressure should be at least 0.2-0.4mPa, and it is stable and adjustable. **Note**: the operating-water must be supplied by the separateness pump. Strainer of up to 10 microns must be installed in the pipeline.

8.2.6 Power of the motor is 11 kW, the fluid clutch drive power, the starting current is usually 60A, the starting time is approximately 6~10minutes. After reach the total speed the working current should not be lower than 10 to 12A.

9. Operating

9.1 Preparing before starting

(1)Check the oil in gear oil box should be up to centre line of oil mark.

(2)Open the upper hood to check if there is foreign substance around the bowl, release the brakes, then turn the bowl clockwise by hand, check if anything blocking, and can turn freely, nothing abnormal, shortly switch on the motor, check if the bowl rotates clockwise, then close the upper hood. Connect the entire pipe. Connect the pipe system according to the requirements of production technology. Flush the pipe system.

(3)Check all set screw, nut to see if there is any one loose and should be fixed.

(4)The two brake handle should be kept level.

(5)Check the voltage to see if it is steady, because the motor is overloading rotation and the starting time is so long to prevent the motor brake.

9.2 Starting

Check if the brakes are released, close the entire feed valve. Start the motor, if find abnormal friction noise, immediately stop to check, solve it as soon as possible, and do not force start. Normally the starting current is 45A; the electric current should lower 12 Ampere immediately after reaching full speed, vibration accretion is normal phenomenon when the machine passes the critical speed, vibration will reduce after reaching full speed. The starting time should be about 4~8 minutes, the lateral speed indicator counter should show about 67rpm. When the electric current is lower 10Ampere and no abnormal phenomenon appear, open the water operating pump, and adjust the water pressure, the pressure should be between 0.2mPa and 0.45mPa, then set the PLC to auto, so the solenoid valves are opened automatically, seal the bowl, noise and vibration reduce again, then open the hot water valve slowly (the water flow rate about 3m3/h enough to just cover the feed sight glass), after about one minute, discharge clear water from the light-phrase outlet should be discharged. Observe the Ampere meter and the separator, if no abnormal phenomenon appear, starting complete. If noise rises and the electric current increase after hot water feed , then close hot water immediately. This is because the bowl is not sealed completely. Check if the solenoid valves are plugged, and check if the control instrument has worked, solve it and feed hot water, debug again.

After the separator works normally, feed the liquid to be separated according to the requirements of production process. Adjust feed flow rate, and then adjust discharge pressure according to separating condition.

De-sludging interval of the separator cannot be under three minutes generally, choose partial de-sludging when request manual de-sludging. Every manual de-sludging does not start until the electric current is normal. The current can raise at once when de-sludging. Undulation of the current is not up to 5A.

Work listed above may be accomplished under guidance of our company's engineer according to customer request.

9.3 Stop

Before stop, close feed valve first, feed hot water to flush the bowl, simultaneity open the diskharging-dirty valve on the light-phrase discharge pipeline, till flow the clear water from the light-phrase discharge port. Start manual de-slugging to discharge the impurities in the bowl for saving parking time. After complete flushing, stop feeding the hot water, press "manual de-slugging" button to discharge remain liquid in the bowl. Shut down the motor and the pump; let the separator stop at freedom.

Note: 1. Do not brake at normal stopping, to avoid the wheel gear wear.

2. Do not stop the operating-water pump and shut down the operating water line during operation.

3. Operator should inspect the machine during normal running, in order to find any problem and solve it in time.

10. **Maintenance**

10.1 The separator must be maintained regularly according to production condition.

It is recommended a maintenance program which includes 4 maintenance operation during 1 year. Every 3 month a intermediate maintenance should be done, opening the bowl, changing all the sealing elements and cleaning oll parts in contact with the product.

10.1.1. The bowl blowdown hole

The bowl de-slagging hole can be worn out after using for a time because the hard solids erodes it, so a frecuent inspection should be done to verify is any erosion or abnormal cracks appears on the bowl parts. Especially when dealing with the hard solids or erosive material within the product, a more often inspection is required, in case of any erosion or cracks are found stop using the machine and contact the supplier

10.1.2. Main lock ring and bowl screw

When Main lock ring and bowl screw are used for a long time is worn out, it can modify the dynamic balance and cause unusual vibrations, so an expert inspection is recommended.
Always use high solid content grease, to avoid damages to the bowl and lock ring threads.
While with a new bowl, the bowl body mark “0” should align the one on the main lock ring, but after using for a while, it may over run an angle up to 10°. When checking the angle differences, we should take the disk stack and the bowl’s nylon ring, then close the main lock ring, check the angle difference. When the angle is > = 10°, we should stop using the bowl.
We should tighten the screw after setting, repair the damaged parts, daub lube on the screw to avoid the damage.

10.1.3 The disk group pressure

The disk group must be tightened enough, if not, it will alter the dynamic balance, causing the machine to vibrates abnormally. If you lock ring arrives to position too easily and goes over to the mark cero, then this means more disks are required.

10.1.4 Bowl cover nylon seal ring and the piston seal cover

If the Bowl cover nylon seal ring and the piston seal cover is damaged, the bowl seal cover will leak. We should check the nylon seal ring and the piston seal cover carefully when opening. The biggest mark allowed is 0.5mm.

10.2 Wash the bowl after every processing stop. When the machine is stopped without cleaning, severe vibrations may develop during starting. The bowl need be washed. But the longest interval of washing the bowl cannot exceed one month.

10.2.1 Disassembling procedure: When the machine stopped completely, close all the inlet and outlet valves, loosen the relevant round nuts on the pipeline, disjoin the inlet and outlet pipes with the feed and discharge housing, release the grooved nut, unscrew four hex head screws on the feed and discharge housing, remove the feed and discharge housing, unscrew eight hex head screws on the upper hood, remove the upper hood with the lifting device (for the upper hood). Loosen small lock ring clockwise with the annular wrench (for small lock ring). Remove the centripetal pump chamber cover、the centripetal pump、and the feeding pipe orderly. Then use the socket wrench (for spindle screw) to unscrew the spindle screw clockwise and remove it. Use the jack (for the bowl) to force the bowl off the spindle cone. Place the bowl on a wooden plate, then compress the disk stack with disk stack compressing device, unscrew the main lock ring clockwise, remove other parts with

special tools orderly.

10.2.2Wash the feeding pipe, centripetal pump and parts of bowl with the hot Alkaline water clean agent. If needs, may scrape off the dirty substance with shovel made of bamboo and wood, but is is not allowed to use any kind the metal, to avoid damaging the parts surface. Clean the sealing groove and operating-water holes in the bottom of bowl carefully.
Note: the sealing surface of the polyamide main bowl gasket in the bowl top must be smooth, if be damaged, replace it in time.

10.2.3 Reinstall all the bowl parts according to their original sequence after cleaning, especially the disks must be reassembled by the original sequence, they are not interchangeable. Replace damaged gaskets, smoothen the burr of the big gasket on the sliding piston, do not damage the sealing surface of the gasket. Before placing the assembled bowl onto the drive spindle, oil the upper part of the spindle cone. Then clean and wipe dry the conical part of the spindle with a smooth rag. Carefully clean the inside cone of the bowl hub as well to assure proper fitting. Then clean and grease threads on bowl top and lock ring to prevent seizing. Use high content solids grease. When assembling, avoid striking, also forbid knocking at the surface of parts straightly, “0” mark on the bowl and the bowl top must be in line with each other when assembling. Then assemble feed and discharge device. Shortly switch on the motor, if friction occurs between the centripetal pump and parts of the bowl, then a height adjustment is needed between the light-phrase discharge housing and the upper hood. Remove the adjusting washer and four hex head screws, tighten the grooved nut connecting to the feeding pipe, then lift the light-phrase discharge housing with screwdriver. Measure the clearance between the light-phrase discharge housing and the upper hood.
Example: Clearance is 5.8mm, and then thickness of the washer is 4mm;
Clearance is 3mm, and then thickness of the washer is 1mm;

10.3 Replace lubricant oil in the gear housing after the first 250 hours of running after startup and every 1500 hours afterwards. Use only first quality oils grade EP 2 Viscosity 220 for normal temperature, and 320 to high temperature environments.

10.4 After continuous using after a trimester, in time check if any parts of the bowl is corroded or eroded, in case a replace is needed, please contact us. It is required to check once, to rebalance the bowl and apply harmless crack-detection on both the vertical shaft and the bowl every two years of continuous use.

10.5 Once a year is main transmission and bowl maintenance is recommended, use original spare parts from WOERH. An expert technician is recommended to perform this maintenance to verify all parts of the vertical spindle and eventually replace the worn parts

10.6 The clutch has a special protective plug, which melts in case of overload. After solving the problem, replace the plug. The driving liquid in the clutch is sae 32 hydraulic oil. The volume is 4.5l, if starting time is lower than 4 minutes, oil volume is excessive, if starting time exceeds 8 minutes,

the oil volume is deficient. Replace driving oil in the clutch after 2000 hours of running.

10.7 When stop running the separator over a longer period of time, should wash and wrap dry all the parts of the bowl, oil the antirust on it, and lay it on the wooden plate or rubber base at dry and ventilated place. The gaskets should be preserved at cool and dry place, out of the sunshine and dust, prevent from vulcanizing.

11. **Trouble shooting** (see table nine)

Table nine

Fault	Possible cause	Remedies
The bowl does not come up to rated speed or takes too long time to do so.	a、 Brake is applied. b、 The oil in the clutch is deficient or leakages. c、 Friction occurs at the upper and lower surface of the centripetal pump. d、 big spiral gear slippery	a、 Release brake. b、 Check the clutch, and fill oil according to request. c、Check the adjusting washer's thickness. d、Tighten the screws on the big spiral gear
The bowl speed drops during operation.	a、The clutch leakages. b、Motor speed drops. c、De-slugging continually	a、Check the clutch, and fill oil according to request. b、Check motor and line voltage. c 、 Don't manual de-slugging often
Starting time is too short or starting current is too high	a、The oil in the clutch is excessive. b、 Mechanical fault	a、Check oil level in the clutch. b、Check carefully, solve it.
Uneven run of the separator	a 、 Bowl is not properly assembled. b、Ball bearings damaged c、 Bearing supporting springs damaged d、Gear damaged e、Bowl is out of balance.	a、Reassemble the bowl. b 、 Replace the damaged bearings c、Change all the springs. d 、 Replace the gear and lubricant e、Rebalance the bowl.
Abnormal noise	a、 Friction occurs at the upper and lower surface of the centripetal pump b、The ejected solids cannot discharge.	a、Adjust height of the bowl, After stopping. b、Clean out the solids in the lower hood.
Bowl is not sealing.	a 、 The pressure of operating-water is too low. b 、 The solenoids valve	a、Stop and adjust the water pressure. b、Check the control instrument

	damaged c 、 The polyamide gasket damaged	and the solenoid valves c、Stop and replace
The bowl does not open at all or not completely.	a、Gaskets in annular piston are damaged. b、Gaskets in the small piston or valve body are damaged. c、Resistance of annular piston is too large. d 、 Hole in valve body is clogged. e 、 Small piston movement Chamber is dirty	a、Check and replace. b、Check and replace c 、 Clean guide and contact surface. d、Clean valve body. e、Clean the chamber, insure small piston move freely.

12. **List of special tools**

12.1 Special tools(see attach fig. 10). The details see table ten.

Table nine

No	Name	Application	Dimension
1	Wrench	Assemble/disassemble locked ring	
2	Lifting device	Assemble/disassemble bowl body	
3	Wrench	Assemble/disassemble disk clamping device	90×360
4	Wrench	Assemble/disassemble round nut	46×275×6
5	Lifting device	Lift distributor and bowl parts	669×530

6	Assemble/disassemble device（Ⅰ）	Assemble/disassemble sliding piston	M110×3×612×530
7	Lifting device	Assemble/disassemble upper cover	ϕ240×310
8	Clamp device	Clamp disk	M205×6 左×ϕ245×262
9	Assemble/disassemble device（Ⅱ）	Assemble/disassemble sliding piston	ϕ30×15
10	Wrench	Assemble/disassemble locked nut	ϕ257×600
11	Assemble/disassemble device	Assemble/disassemble valve body	355×270
12	Assemble/disassemble device	Assemble/disassemble piston	300×100
13	Assemble/disassemble tool	Assemble/disassemble brake wheel	ϕ85×20
14	Assemble/disassemble tool	Assemble/disassemble bolt	ϕ32×250×250
15	Assemble/disassemble tool	Assemble/disassemble oil plug of clutch	ϕ32×250×250
16	Assemble/disassemble tool	Assemble/disassemble clutch	M30×1.5×320×350
17	Wrench	Assemble/disassemble locked nut	70×16×450
18	Wrench	Assemble/disassemble vertical bolt	525×225
19	Fixing device	Assemble/disassemble oil inlet pipe	ϕ24×150
20	Hand mallet		ϕ40×384

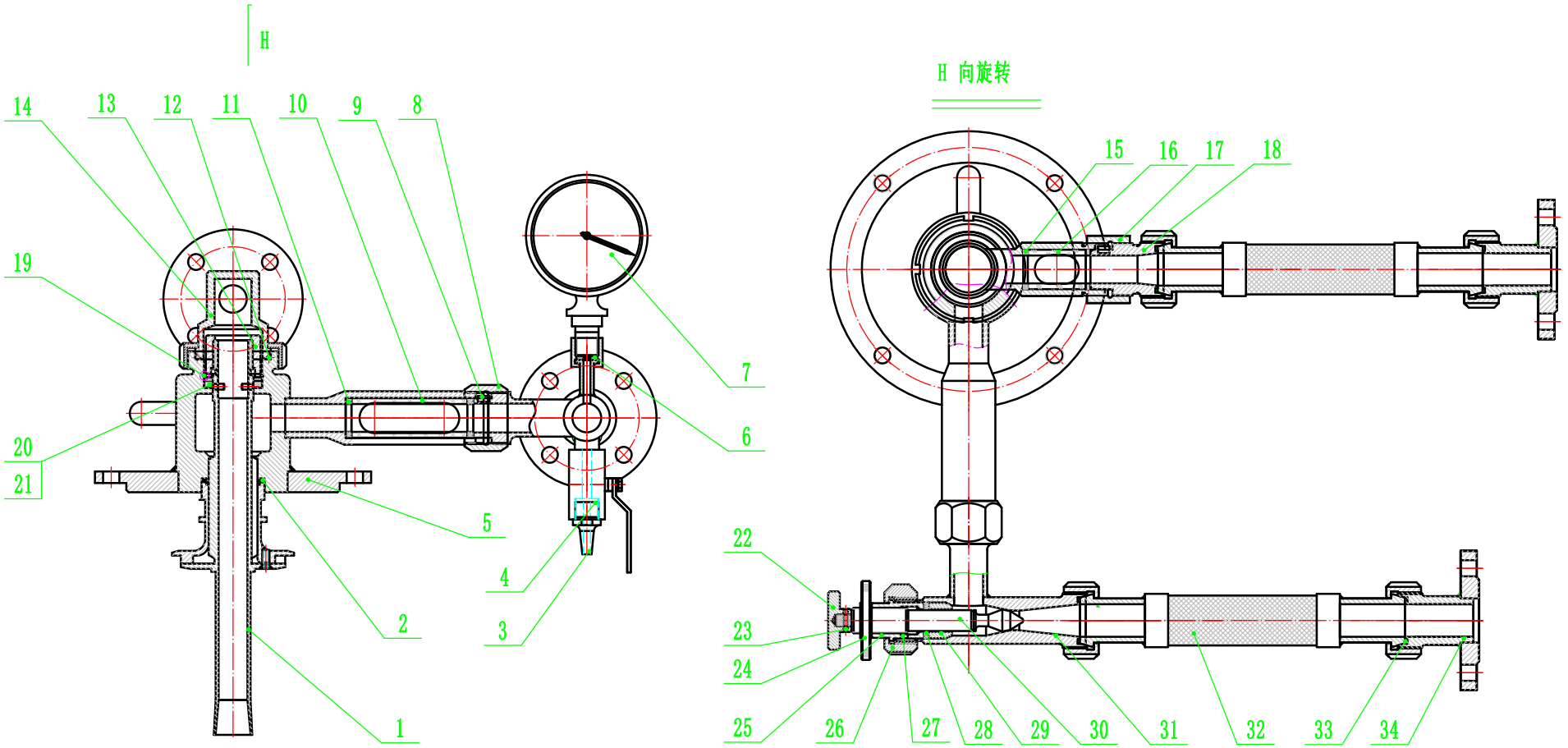


Fig3 Inlet and outlet

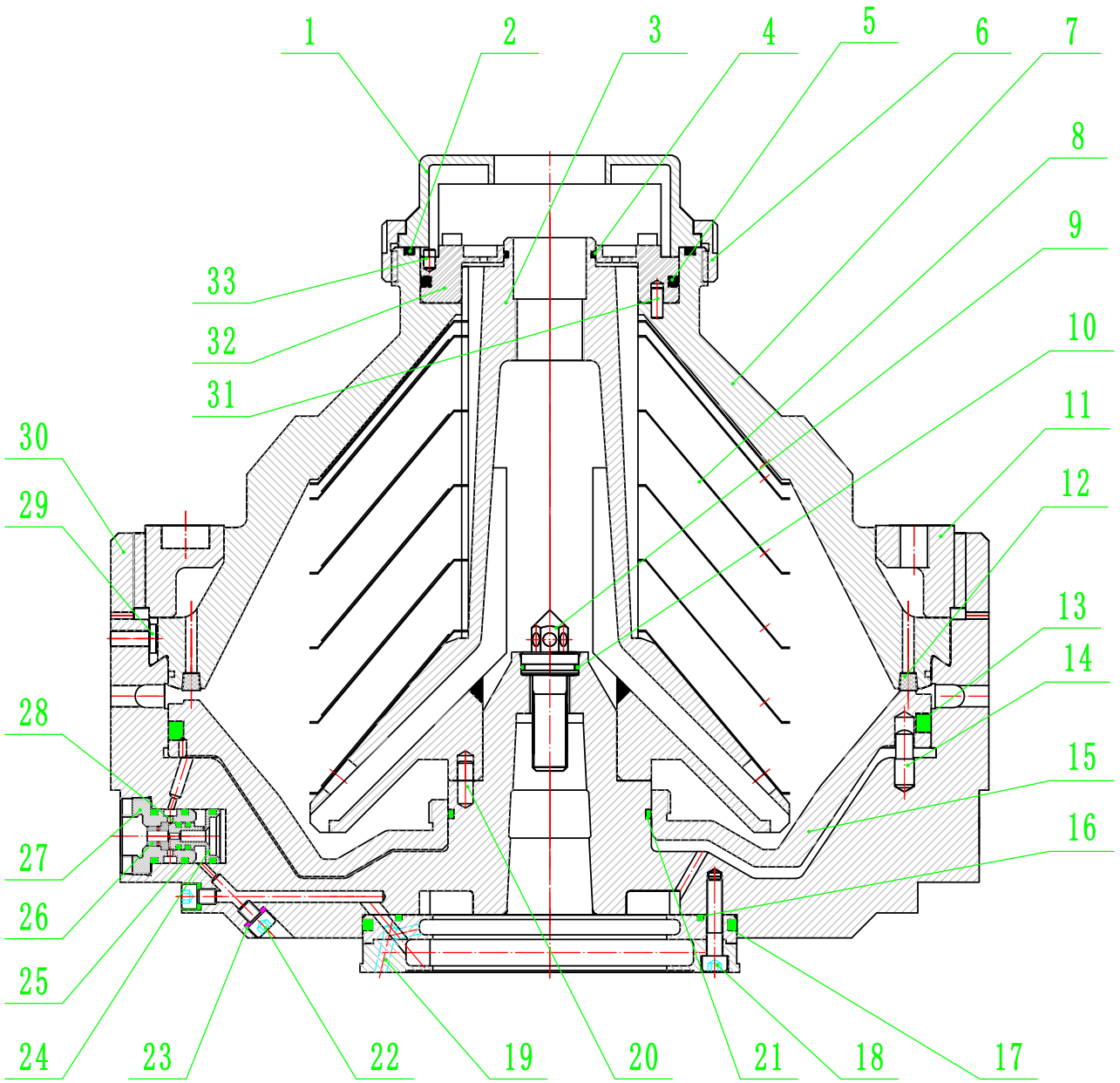

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Fig 4 Bowl

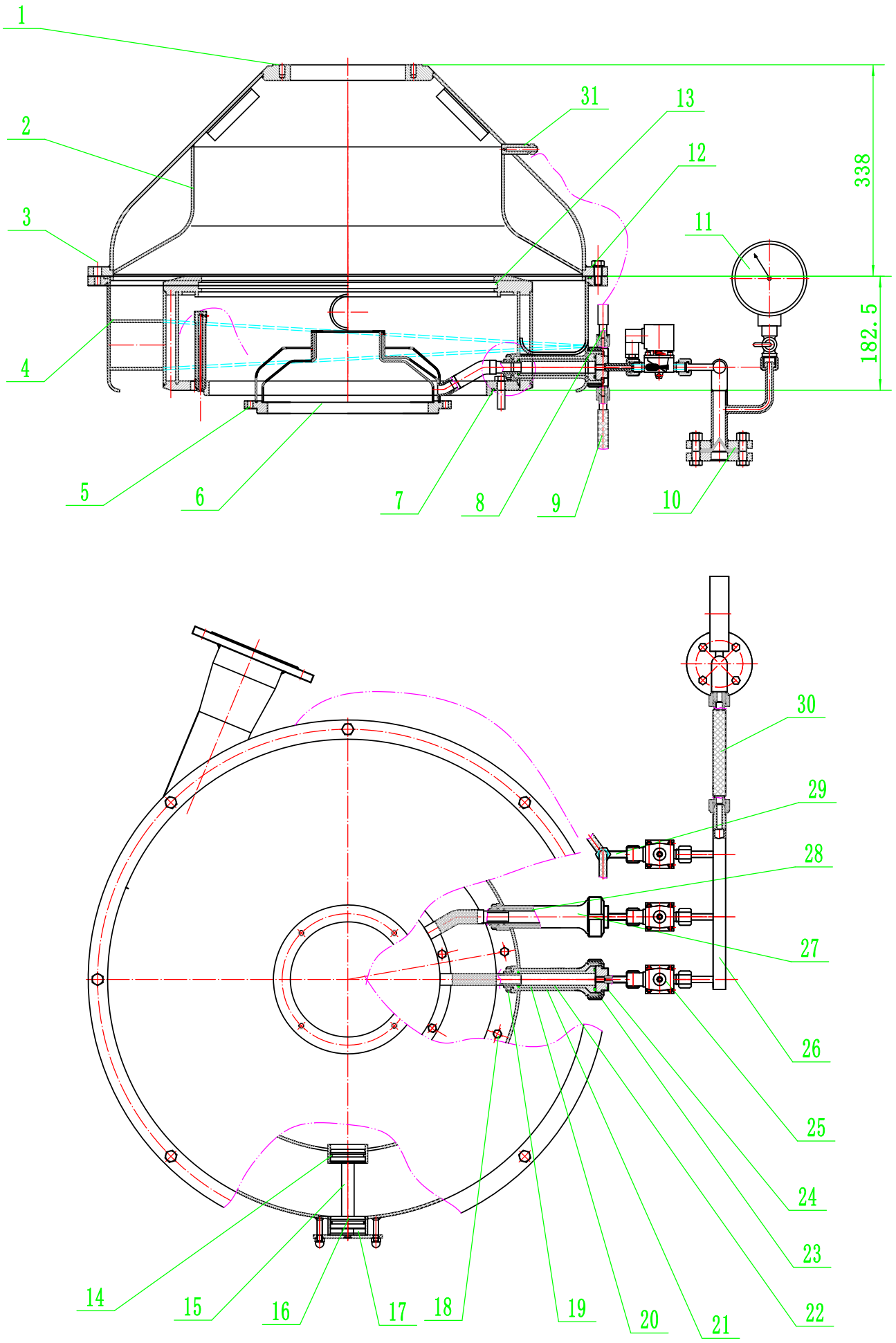
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Fig 5 Hood

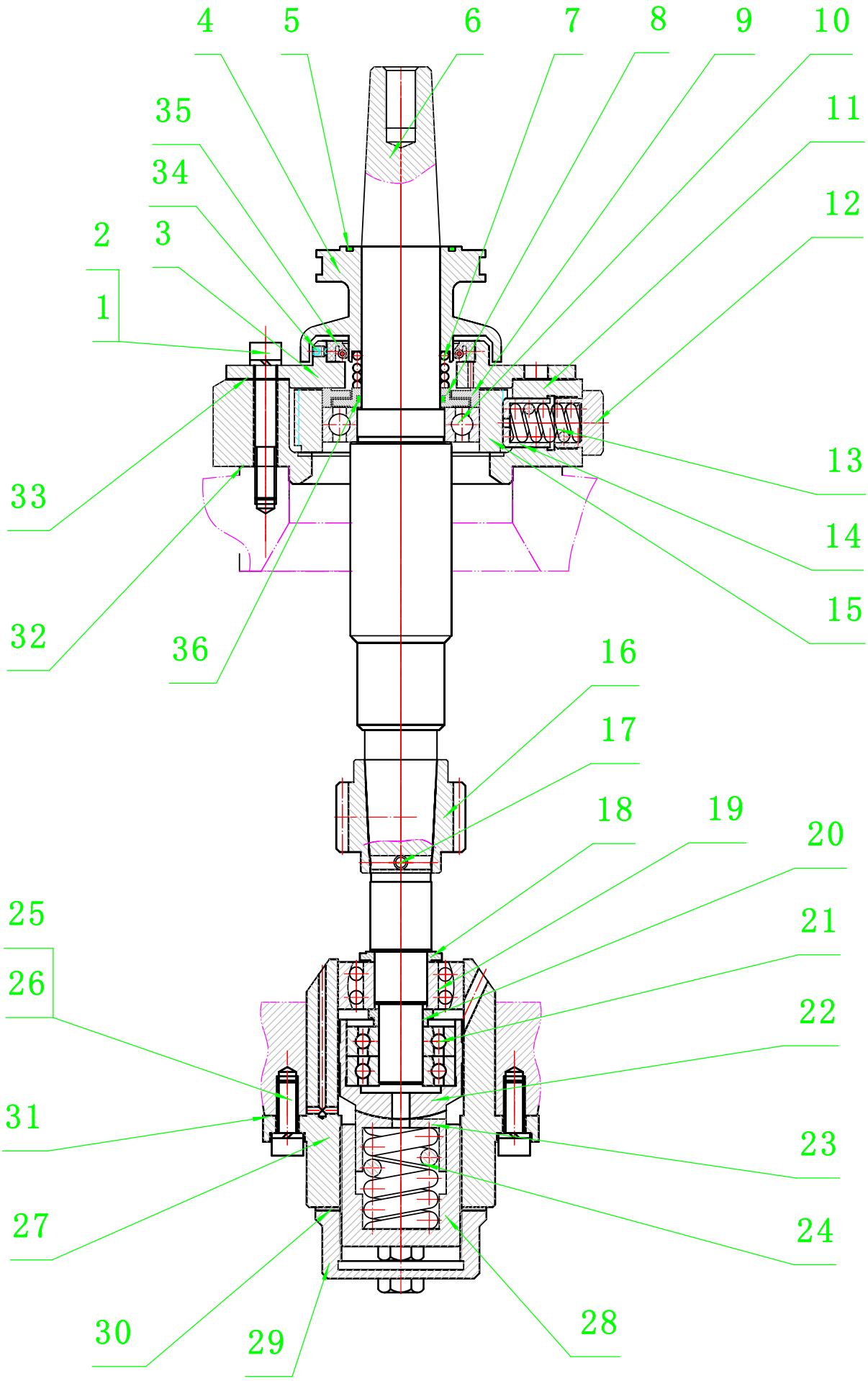


Fig 6 Vertical spindle

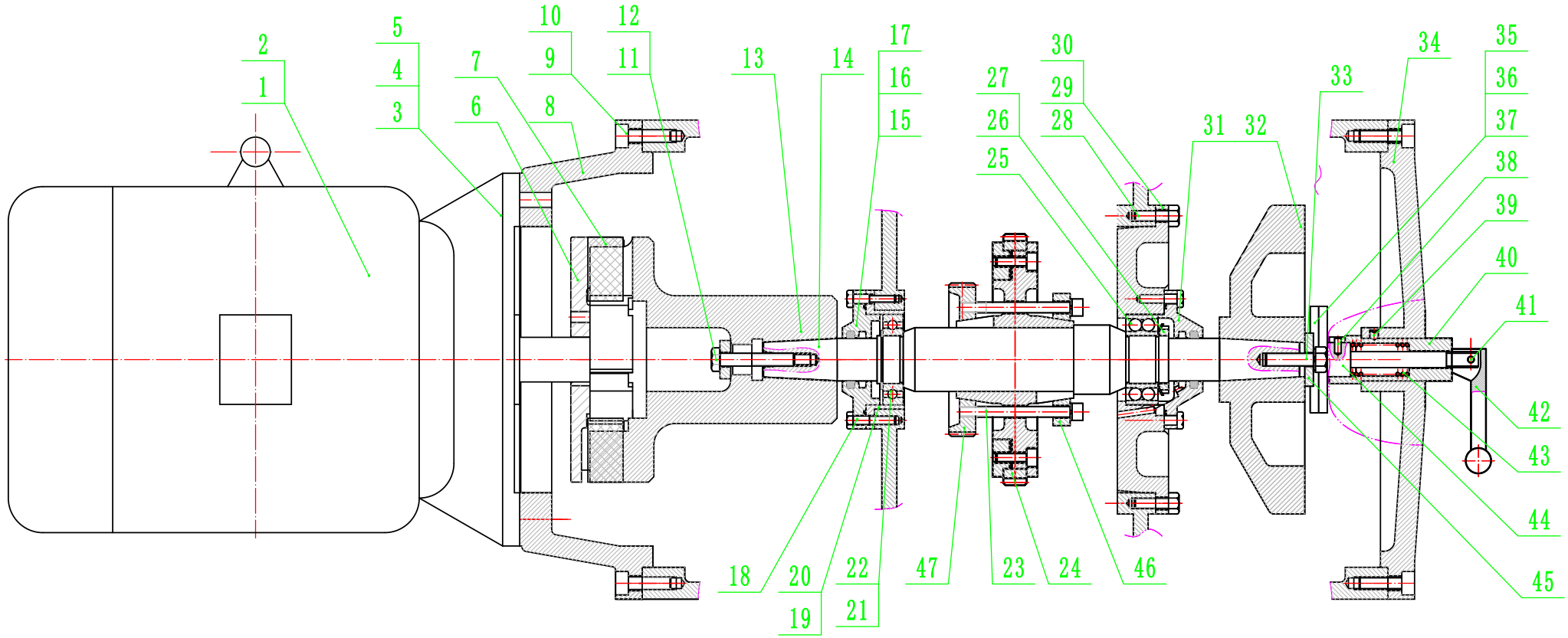


Fig 7 Horizontal spindle

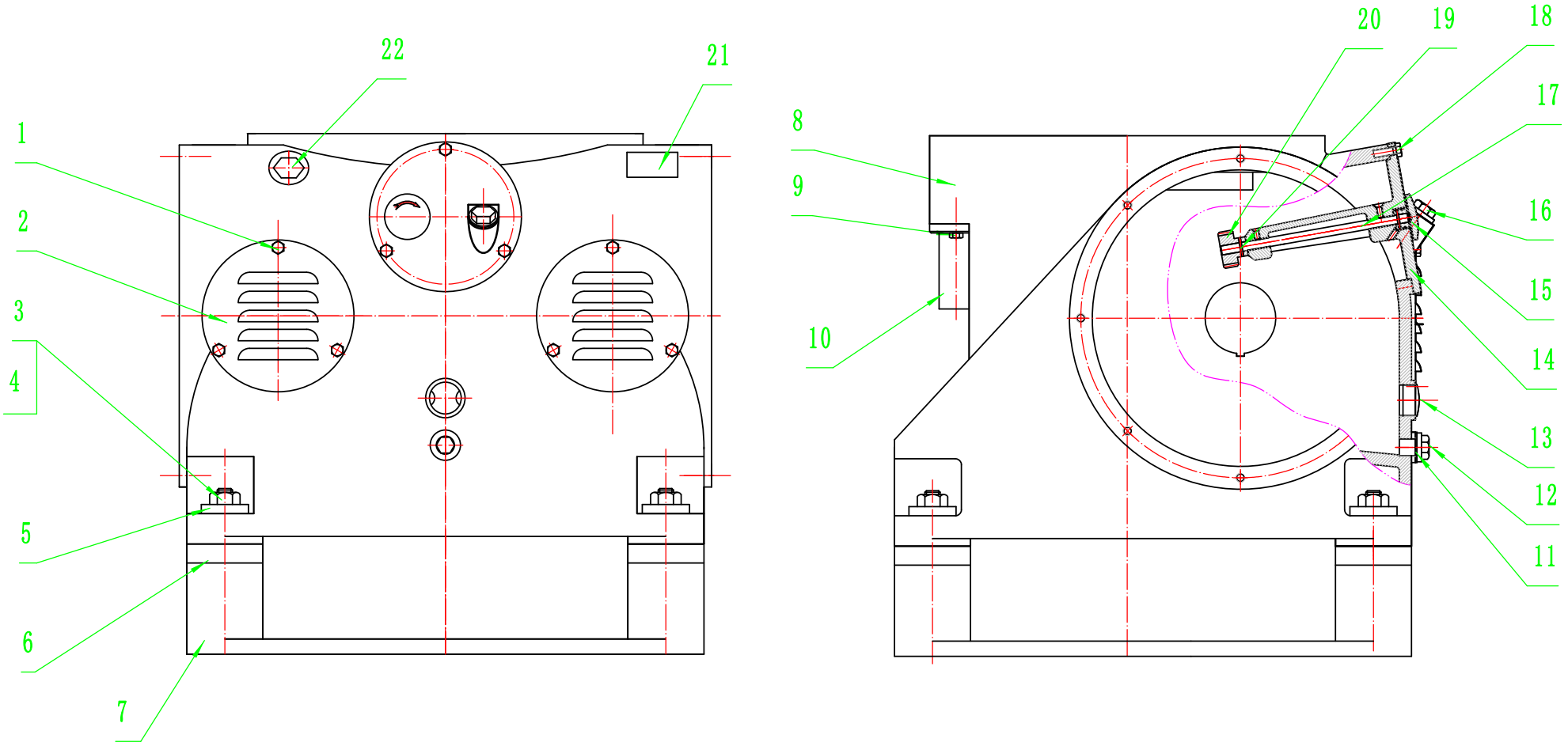


Fig 8 Frame

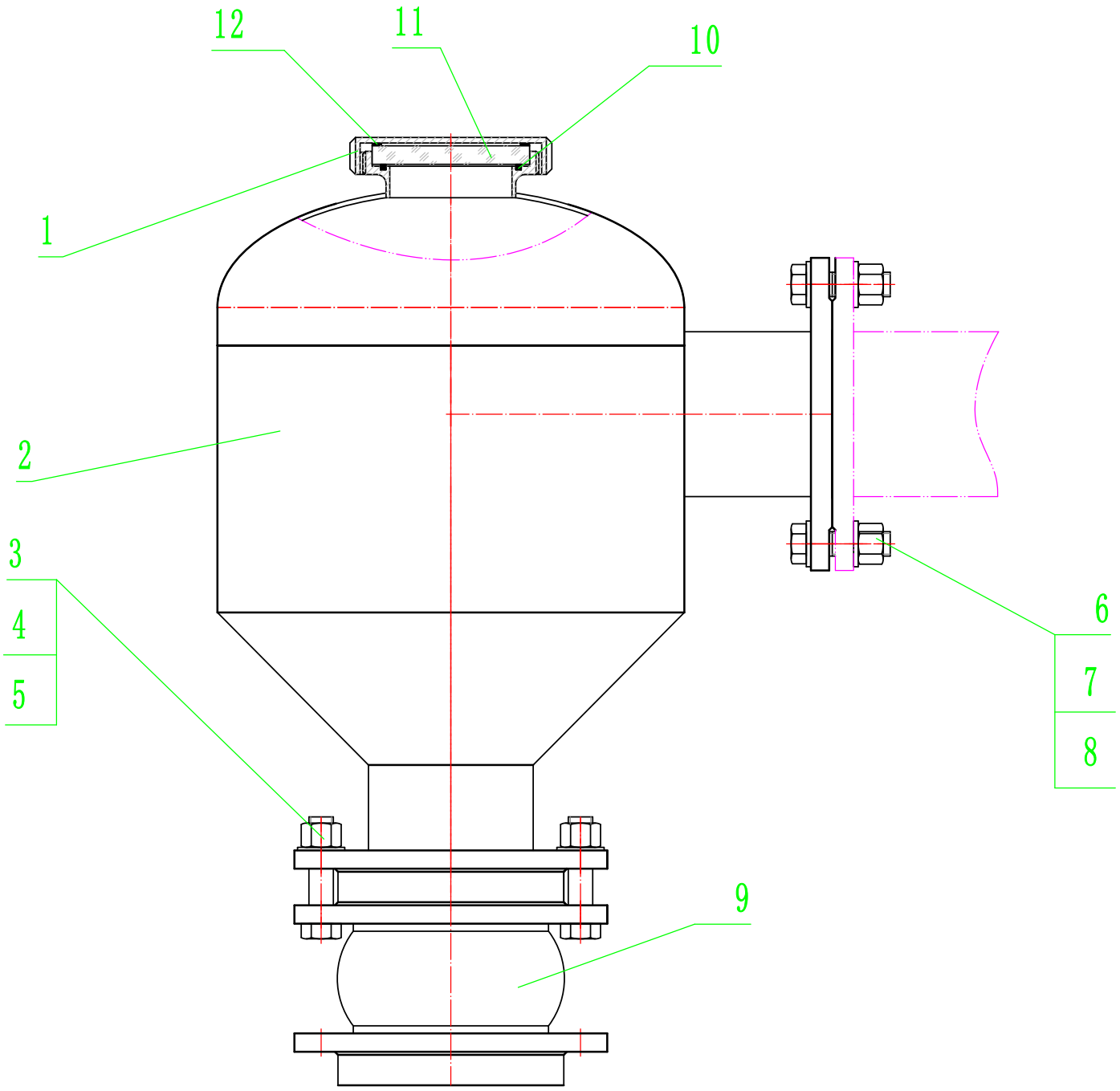
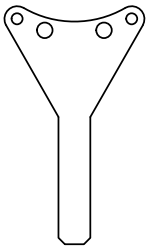


Fig 9 Hydrocyclone



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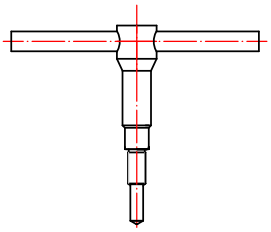

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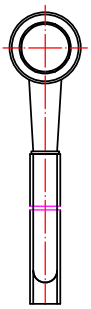

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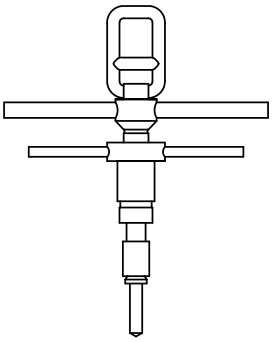

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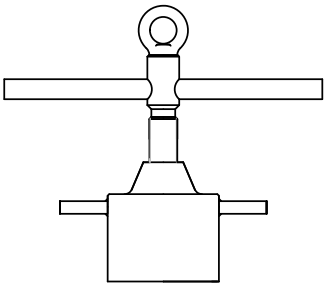

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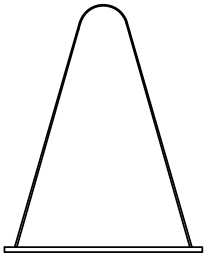

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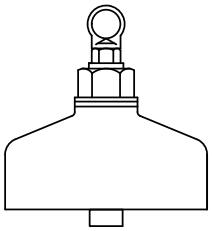

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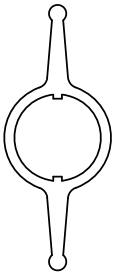

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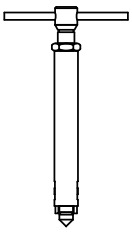

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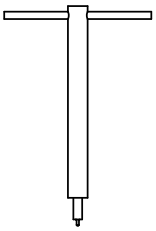

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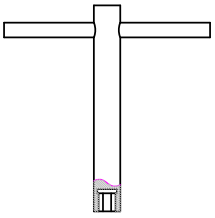

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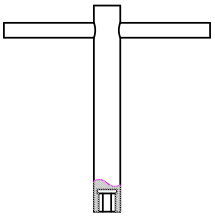

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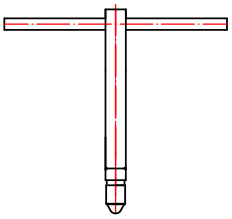

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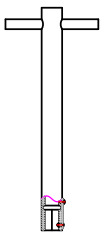

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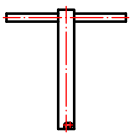

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Fig 10 Special tools