D.N. 085

ADANI POWER LIMITED,

MUNDRA – 4620 MW

OPERATION & MAINTENANCE

DOCUMENTATION CENTER



Title :- Installtion and operation instructions Variable speed couplings type YOTcs

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Installation and Operation Instructions

Variable Speed Couplings
Type YOTcs

(ID FAN)

Zhongxing Power Transmission Co., Ltd.

Adani Power Ltd Mundra Thermal Power Project Documentation Center Dept.: O&M

28

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1. Preface

This manual will help you to use our couplings in a safe, proper and economical way.

This manual shall always be read and used by every person before working on the coupling, it shall be available on the machine site for easy reference.

The YOTcs coupling is designed on the basis of the advanced theory & technology in field of power transmission of Voith, Germany, referenced with the ideal cavity and manufactured according to the requirement of GB 5837-86 < The Types and basic parameters of Hydrodynamic Couplings> in standardization, seriezation and universaztion.

The YOTcs coupling is designed to transmit power at rated values and under definite conditions. Incorrect use including incorrect installation or filling, use for other purpose or excessive power or speed etc., will cause damages to the coupling and other machines and may even endanger the safety of operating personnel. The manufacturer is not liable for any responsibility on all loss out of incorrect handling of the couplings.

This manual has been issued with utmost care. However, in case you need any further information, please contact

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2. Operation Principle

The operating fluid enters the working cavity of coupling when the engine brings the shaft of oil pump running. The pump wheel, which is working like centrifugal pump, brings the fluid inside working cavity into the kinetic energy. The fluid is forced to run from inside to outside, then the fluid is driven through the gap of two wheels and arrived the turbine wheel. When the fluid is running from the outside to the center through the channel of blades of turbine wheel, the kinetic energy is converted into the mechanical energy. The new circulation starts when the fluid returns pump wheel. Thus power of motor is transmitted to the working machine by the rotating fluid.

How does the YOTcs coupling regulate the speed?

When machine starts, the oil is forced out from the bottom of the housing by the gear pump of input shaft, arrives the scoop tube through cooler and enters the working cavity through the oil inlet of pump wheel.

When the couplings is running, the fluid extravagates from the working cavity via the hole on edge pump wheel and enters the cavity of scoop tube. There is an adjustable scoop tube (see figure 9) in the housing of scoop tube. As the nozzle of scoop tube is put inside of the scoop tube room, the flex of scoop tube is controlled by the electric actuator placed outside, and the thickness of the oil ring inside scoop tube cavity depends on the radial position of scoop tube nozzle, thus the filling volume of working cavity and output speed is fixed. The oil is brought out from the cavity of scoop tube when the scoop tube enters the rotating oil ring, thus the thickness of oil ring is reduced and the fluid inside working cavity is out and flows to the bottom of housing, which supports the circulation. Contrarily, when the scoop tube draws back, the thickness of oil ring increases and more fluid inside the working cavity. Thus, the adjustment is made between two-limit position "full" and "empty" with the outside controlling device – scoop tube, and the stepless regulating of output shaft is achieved. Please pay attention that the nozzle of scoop tube must move towards the rotating direction of working fluid.

3. Function and Application

YOTcs coupling is a hydrodynamic component, which can adjust the output speed. It is placed between the engine machine and working machine, realizing the power transmission. It can make the engine startup without load. It can make the working machine realize stepless regulating and change the output power under the condition that the input speed keeps unchanged. Its regulating scope: for centrigular machine (such as fan, pump): 1~1:5 ; for constant torque machine: 1~1:3. YOTcs coupling is compact in structure and convenient in installation & adjustment, which has its own oil supply system. The flex of scoop tube can be adjusted by the electric actuator with automatic & remote control. The coupling can be used as soon as a suitable cooler and relative pipes is equipped.

3.1 Advantages:

- Increase the startup ability of squr-motor, and accelerate the driven machine at its maximum torque; can be equipped with high-voltage motor.
- Overload protection; prevent the motor from damage by overspeed and protect the motor from overload of working machine.
- Enable the motor to start at no load, shorten the startup time and reduce the average current during startup.
- Synchronize multi-motor drive.
- Dampen shocks and vibrations, prolong the service life of machine.
- No special maintenance is needed for long time, no friction to transmit torque, longer working life.
- Stepless regulating can be realized; good energy saving at about 10%~40%; low investment with less electric equipment.
- Allow remote and automatic control.
- High transmit efficiency at about 0.97~0.98.

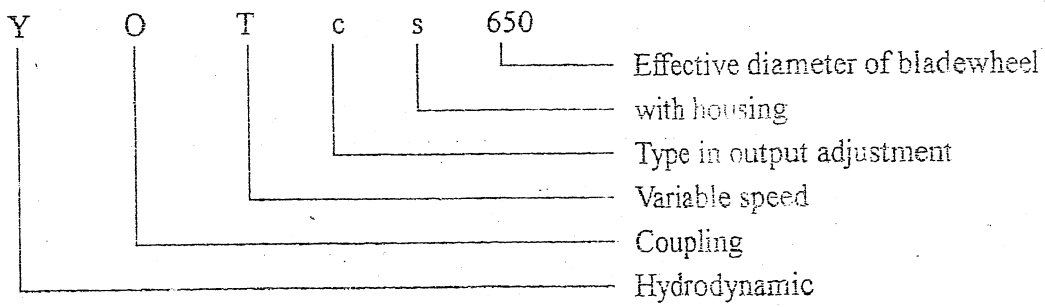
3.2 Applications:

- Pumps: boiler feed pump, circulation pump, cooling and condensation pump, crude oil pump, pipeline pump, ash pump, piston pump, etc.
- Fans: dedust fans in the field of metallurgy industry, ventilation fan, induce draft fan, forced draft fan, blower, compressors and fans used in steel plant, power plant and cement plant.
- Belt conveyor, crusher, centrifugal machine and rotating dryer, etc.

4. Constructions

4.1 Code meanings:

For example: meanings of YOTcs650



4.2 Construction features:

YOTcs couplings mainly consists of housing, rotation components, oil supply components, oil drainage components, scoop operating device and instruments. It can be in operation after adding the auxiliary parts (such as cooler, speed inspection device,etc.).

(1) Housing

The rotation components of YOTcs coupling is supported by a rectangle welding housing, which has enough capacity for fluid and connects the cooler in outlet. Oil is pumped directly from the housing, entered inlet & working cavity after cooling. Oil will be drained to the housing after aspirated by scoop tube.

(2) Rotation component

Input side: input shaft, back shell, pump wheel, shell and bearing sleeve of pump wheel.
Output side: turbine wheel and output shaft.
Pump wheel, turbine wheel and back shell are aluminum castings with high strength. For special case, such as large power & high speed, they should be steel castings. There are a number of radial blades in pump wheel & turbine wheel. Rotation components are supported on the housing. Since all rotation components are supported on housing, the flexible coupling must be used for connection between YOTcs coupling & working machine.

(3) Oil supply components

I. Oil pump

The oil pump is put in the pump shell of coupling's input side, driven by the gear of input shaft. As the power transmitted and filling volume is different, the structure of oil supply device is different. Oil supply device can consists of single pump, double pump or four pumps, etc.

II. Oil inlet and outlet

There are inlet & outlet on the housing, which connects the in & out pipes of cooler with a flange.

III Oil position, temperature & pressure

There is an oil glass showing oil level behind the housing. The oil level must stand between the minimum & maximum oil position during normal operation. There is a speed inspection device on the other side of housing to check the temperature. The light (or warning device) will give an alarm when the temperature is above 90°C. Additionally, there place a connection with the thermograph in flange of inlet, which the warning temperature is 45°C.

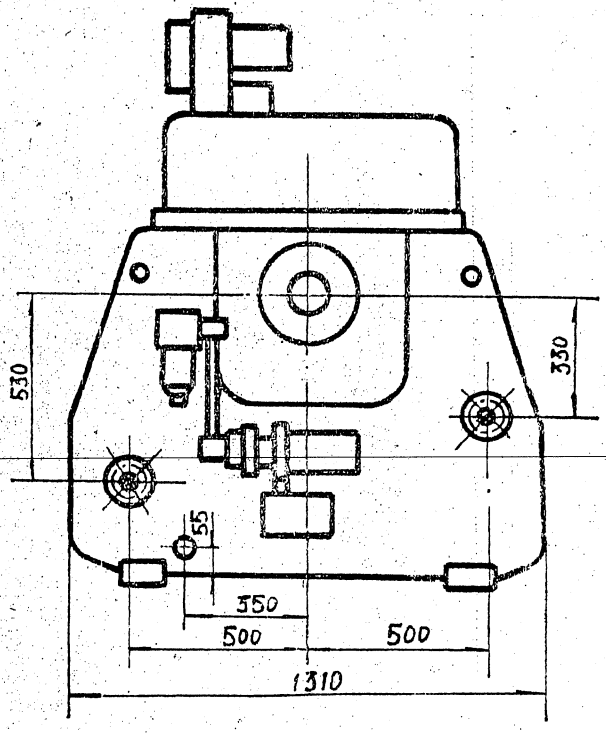
The contact point of the oil pressure instrument is placed in the flange of outlet. The warning pressure is 0.35 Mpa.

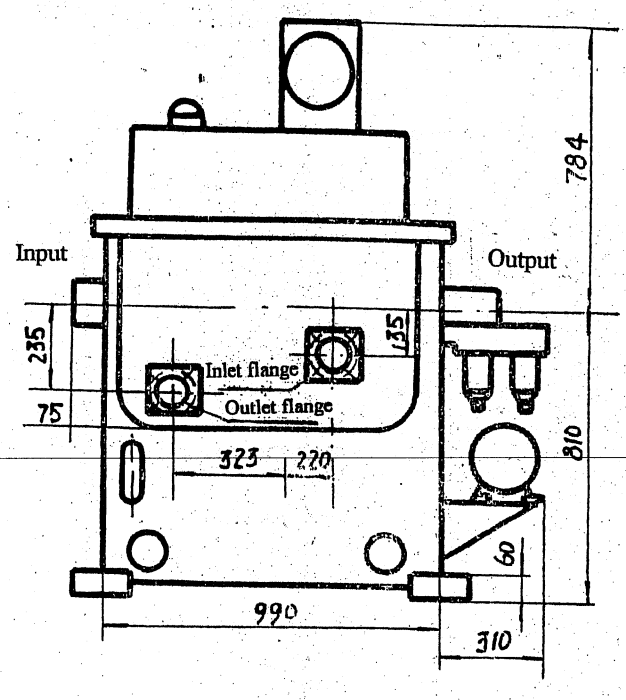
(4) Oil draining components

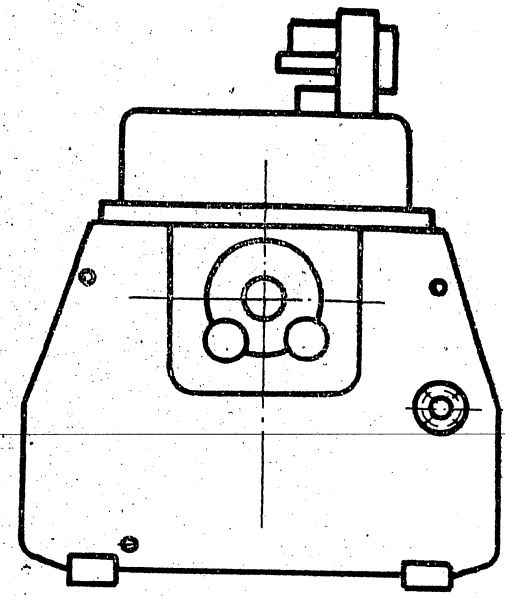
Mainly consists of scoop tube, oil returning device and oil ventilation device.

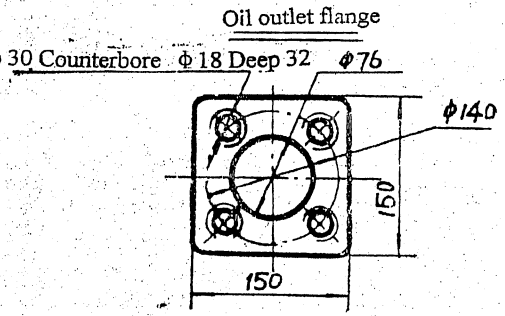
(5) Controlling device of scoop tube

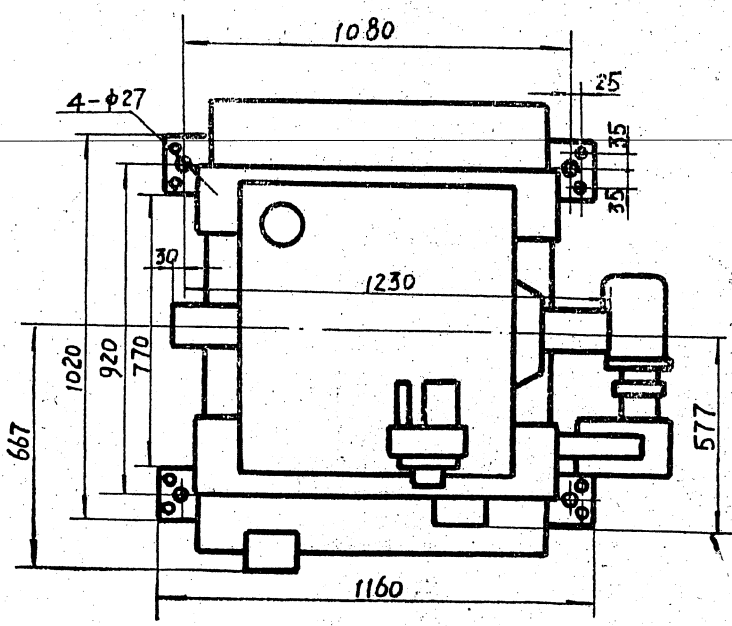
The speed regulation of coupling is realized via the moving of scoop tube to change the filling volume of working cavity. The device which can control the moving of scoop tube is electric actuator, which can realize remote and automatic control.

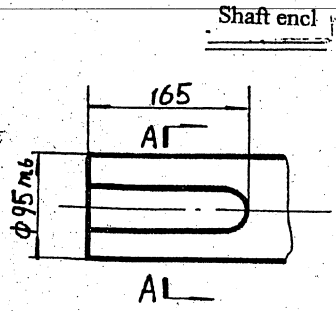












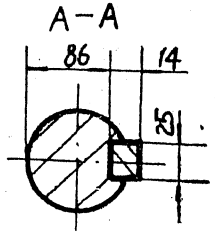
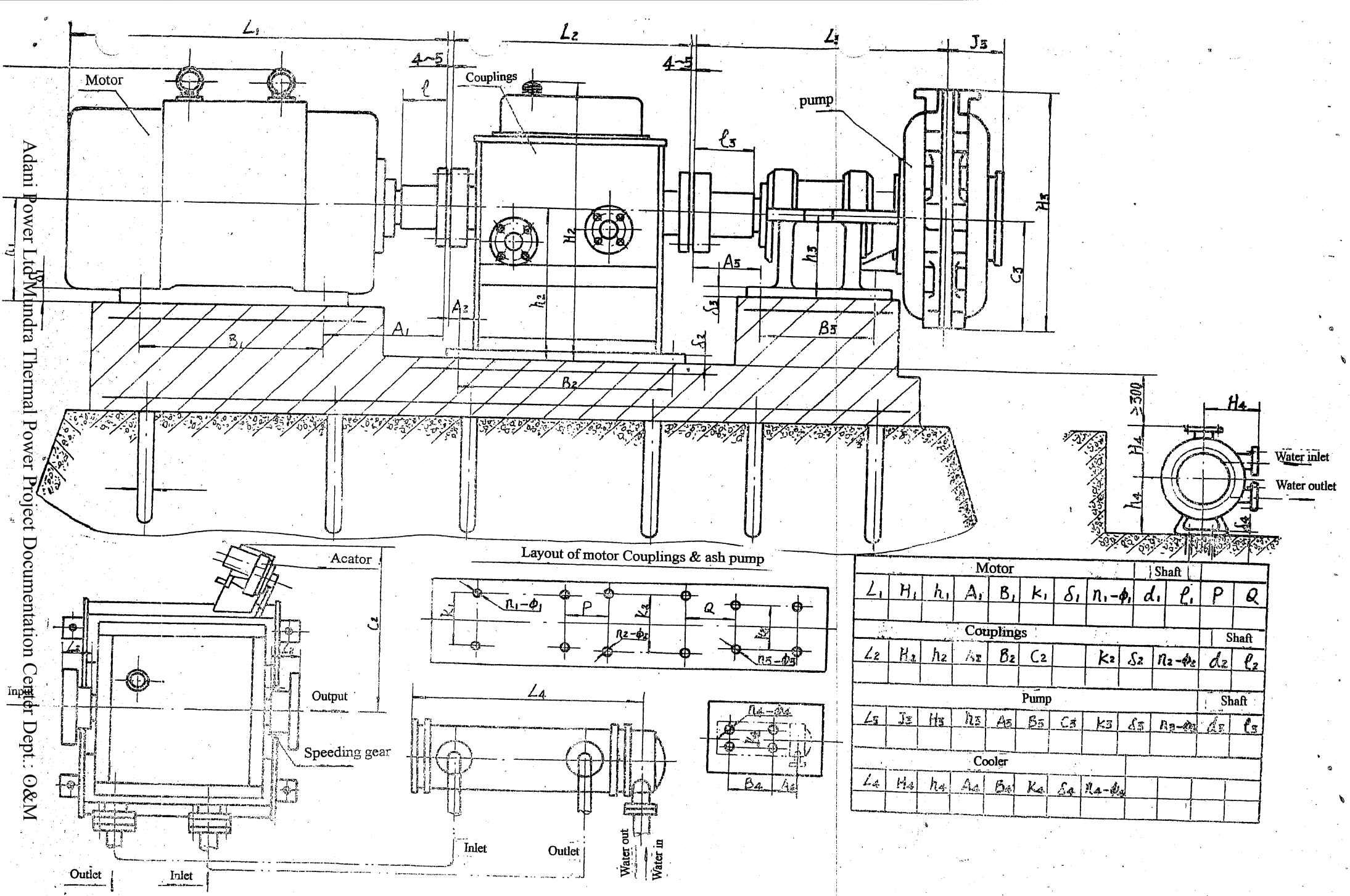


Fig. 1 a Outside Dimension of YOTcs580

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Motor										Shaft	
L_1	H_1	h_1	A_1	B_1	k_1	δ_1	$n_1-\phi_1$	d_1	ℓ_1	P	Q

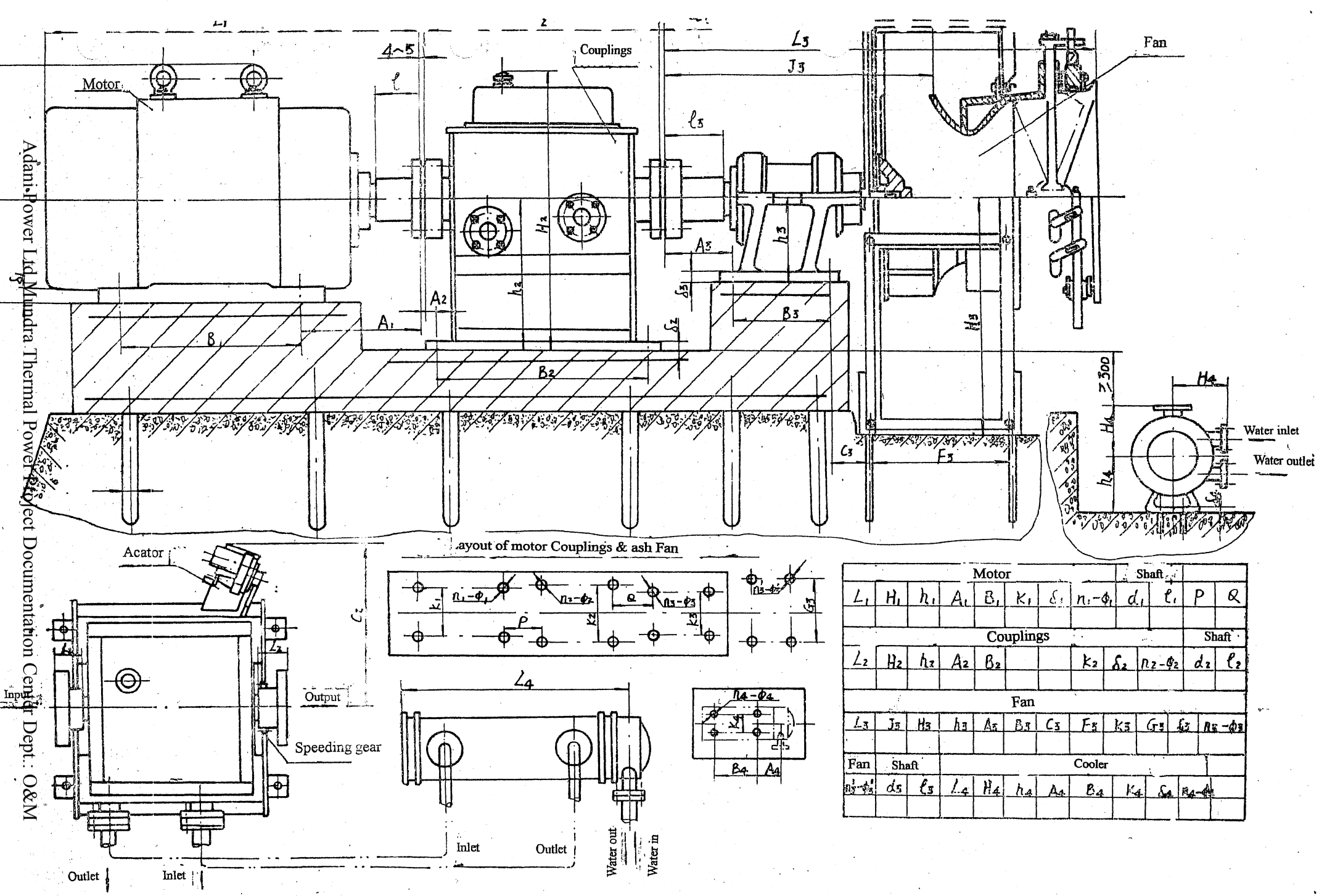
Couplings									Shaft	
L_2	H_2	h_2	A_2	B_2	C_2	K_2	δ_2	$n_2-\phi_2$	d_2	ℓ_2

Pump										Shaft	
L_3	J_3	H_3	h_3	A_3	B_3	C_3	K_3	δ_3	$n_3-\phi_3$	d_3	ℓ_3

Cooler								
L_4	H_4	h_4	A_4	B_4	K_4	δ_4	$n_4-\phi_4$	

Fig. 2 Layout of Motor, Coupling & Pump

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ayout of motor Couplings & ash Fan

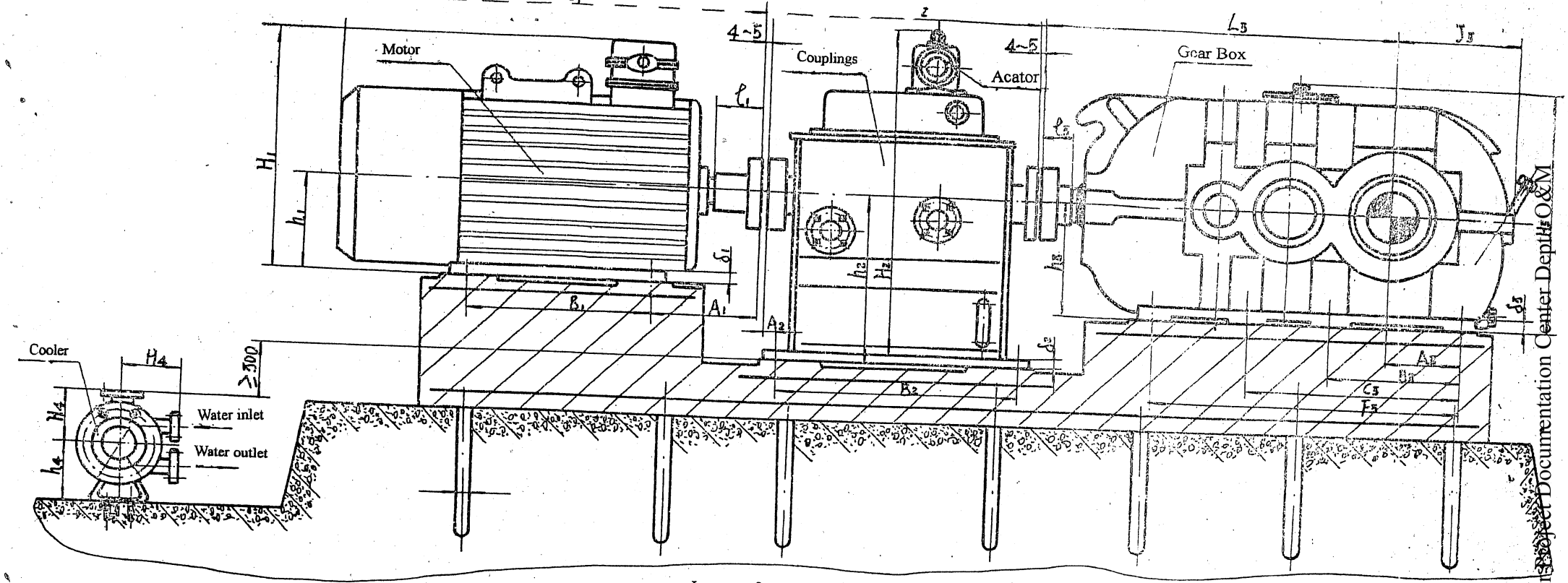
Motor								Shaft			
L_1	H_1	h_1	A_1	B_1	K_1	δ_1	$n_1-\phi_1$	d_1	ℓ_1	P	Q

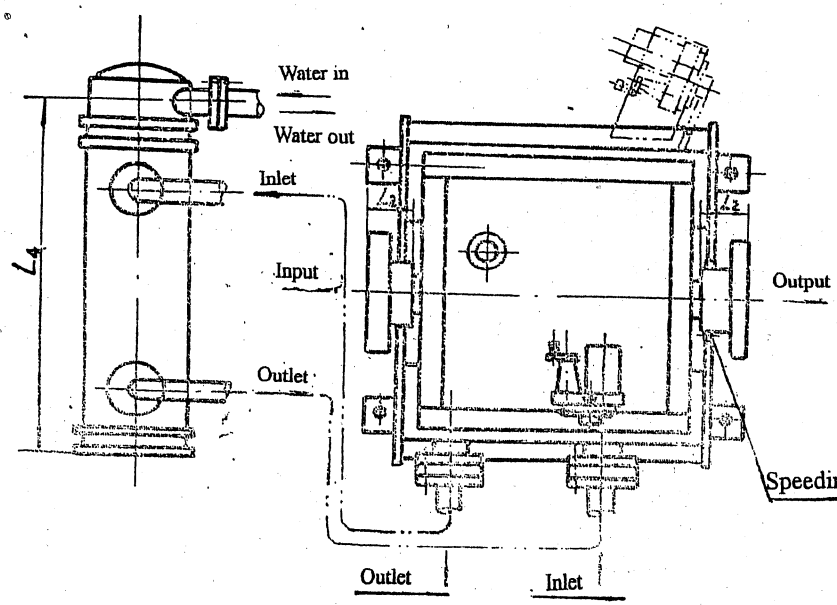
Couplings								Shaft	
L_2	H_2	h_2	A_2	B_2		K_2	δ_2	$n_2-\phi_2$	d_2	ℓ_2

Fan											
L_3	J_3	H_3	h_3	A_3	B_3	C_3	F_3	K_3	G_3	δ_3	$n_3-\phi_3$

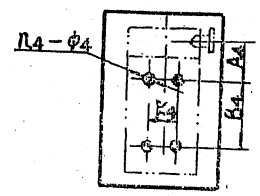
Fan	Shaft		Cooler							
$n_3-\phi_3$	d_3	ℓ_3	L_4	H_4	h_4	A_4	B_4	K_4	δ_4	$n_4-\phi_4$

Fig. 2-b Layout of Motor, coupling & Fan

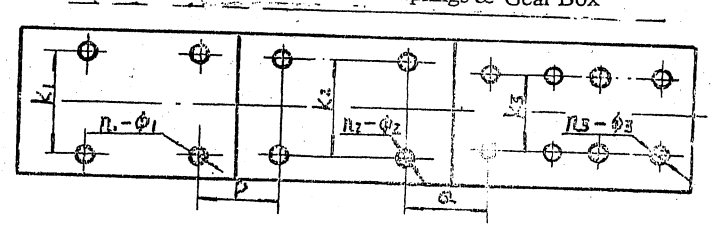




Layout of Cooler



Layout of motor Couplings & Gear Box

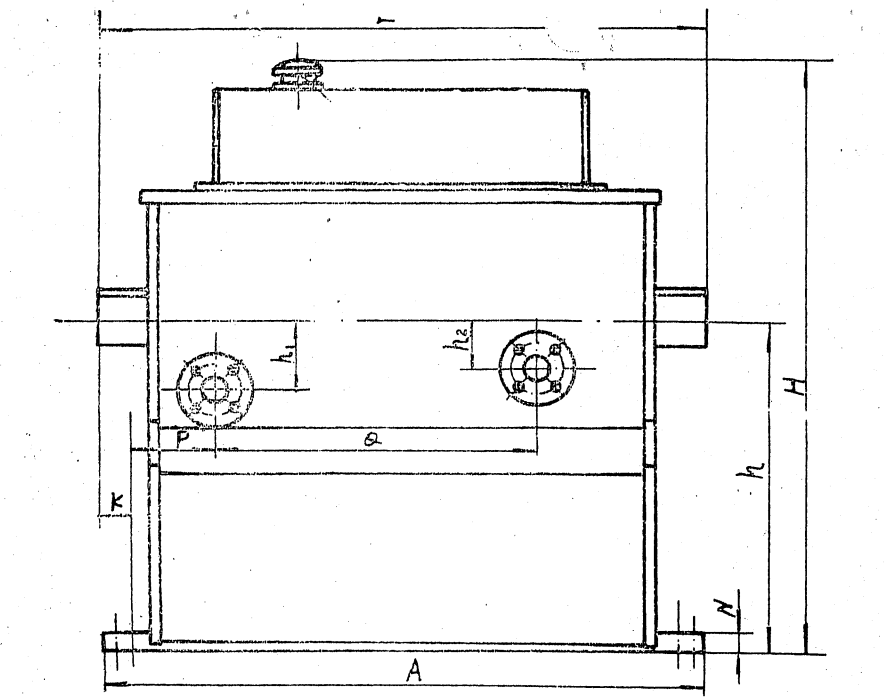


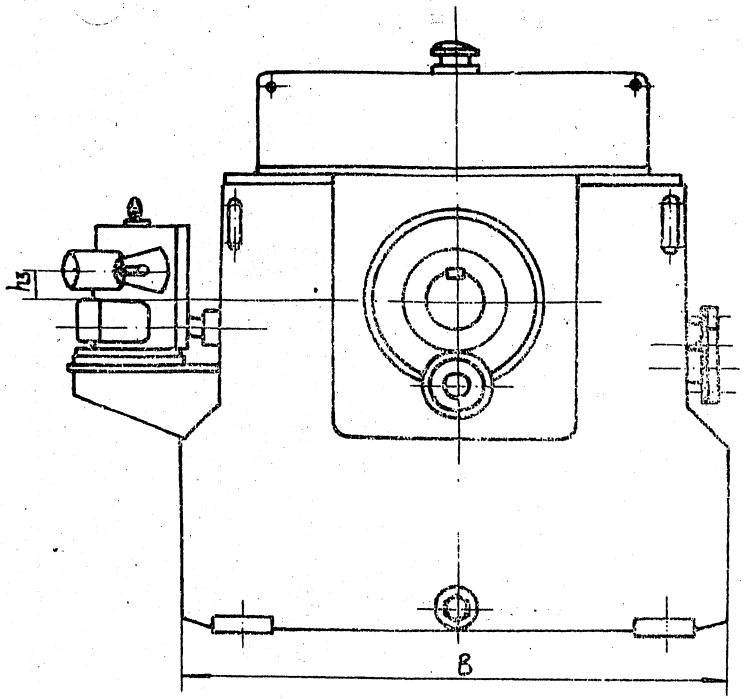
Motor										Couplings											
L_1	H_1	h_1	A_1	B_1	K_1	δ_1	$n_1-\phi_1$	Shaft d_1	Shaft l_1	L_2	H_2	h_2	A_2	B_2	K_2	δ_2	$n_2-\phi_2$	Shaft d_2	Shaft l_2	P	α

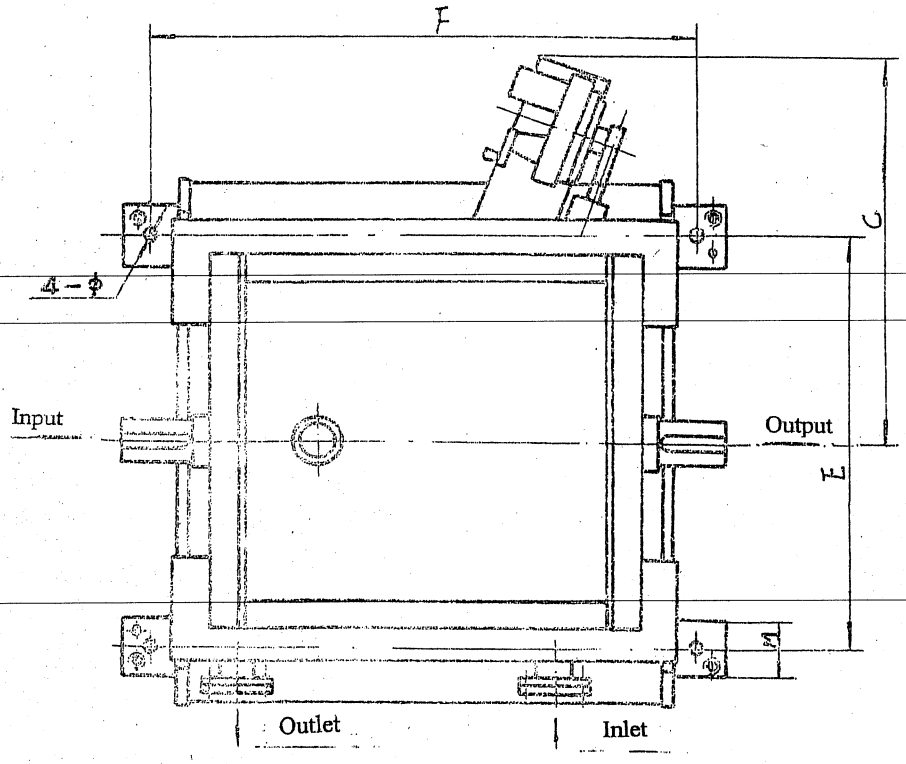
Gear Box												Cooler								
L_3	J_3	H_3	h_3	A_3	B_3	C_3	T_3	K_3	δ_3	$n_3-\phi_3$	d_3	l_3	L_4	H_4	h_4	A_4	B_4	K_4	δ_4	$n_4-\phi_4$

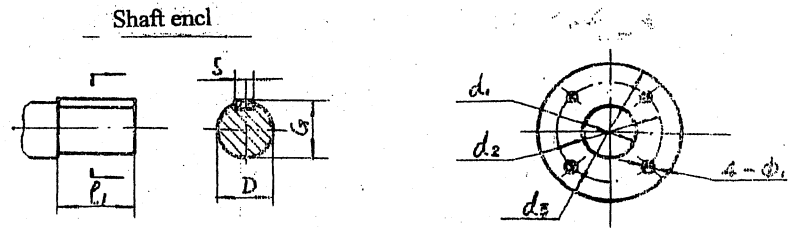
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Note: The Input & Output side is connected with the motor and working machine by a pair of flexible connecting coupling (GB108-60). The relevant dimension should be provided by the user. The connecting coupling on output shaft should be machined with speed inspection gear (60 splines), or designed by user.

Fig. 1 Outside Dimension

Table 2 Connecting Dimension List for Coupling Outside

No.	Size	A	B	C	E	F	L	P	Q	M	N	h_1	h_2	h_3	h	H	l_1	D	G	S	4—ϕ	d_1	d_2	d_3	4—ϕ
1	YOTcs 360	712	912	750	680	652	830	176	380	100	40	65	65	40	560	940	120	60	64	18	4—ϕ27	ϕ30	ϕ90	ϕ120	4—ϕ14
2	YOTcs 400	712	912	750	680	652	830	176	380	100	40	65	65	40	560	940	120	60	64	18	4—ϕ27	ϕ30	ϕ90	ϕ120	4—ϕ14
3	YOTcs 450	1020	1120		865	940	1020	180	500	100	40	75	75		635	1375	145	75	79.5	20	4—ϕ27	ϕ54	ϕ120	ϕ152	4—ϕ18
4	YOTcs 500	1020	1120		865	940	1020	180	500	100	40	75	75		635	1375	145	75	79.5	20	4—ϕ27	ϕ54	ϕ120	ϕ152	4—ϕ18
5	YOTcs 560	1020	1120		865	940	1020	180	500	100	40	75	75		635	1375	145	75	79.5	20	4—ϕ27	ϕ54	ϕ140	ϕ152	4—ϕ18
6	YOTcs 650	1300	1250	950	900	1180	1300	274	680	120	50	220	75	40	840	1350	150	100	106	28	4—ϕ35	ϕ48	ϕ140	ϕ178	4—ϕ18
7	YOTcs 750	1300	1250	950	900	1180	1300	274	680	120	50	220	75	40	840	1350	150	100	106	28	4—ϕ35	ϕ48	ϕ140	ϕ178	4—ϕ18
8	YOTcs 875	1700	1500	1100	1580	1200	1720	300	860	150	50	110	110	60	950	1640	250	130	137	32	4—ϕ45	ϕ50	ϕ100	ϕ130	4—ϕ14
9	YOTcs1050	1930	1840	1385	1250	1810	1930	272	1116	150	60	300	130	155	1060	1810	250	150	158	36	4—ϕ35	ϕ76	ϕ140	ϕ178	4—ϕ18
10	YOTcs1150	1930	1840	1385	1250	1810	1930	272	1116	150	60	300	130	155	1060	1810	250	150	158	36	4—ϕ35	ϕ76	ϕ140	ϕ178	4—ϕ18
11	YOTcs1250	2250	2180	1800	1600	1980	2250	450	950	230	100	375	175	110	1170	2150	300	160	169	40	4—ϕ45	ϕ65	ϕ230	ϕ280	4—ϕ18

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6. Transportation, Installation & Commissioning

6.1 Transportation

The coupling is packed with a wooden box for transportation. The coupling must be lifted at holes on two sides when arriving the application site and checking its spare parts.

6.2 Mounting foundation

It is recommended to add a foundation with steel frame for motor-coupling-working machine or motor-coupling on the concrete foundation for convenient installation. Concrete should be finished in two times after the level of steel frame is adjusted, so that the motor, coupling and working machine is in the same foundation.

6.3 Installation & adjustment

1) The flexible coupling is used for the connection between YOTcs coupling and motor, working machine, which the tolerance between the hole of flexible coupling and hub is H7/js6. The coaxial between outer diameter and inner hole is required not to exceed 0.05mm. The vertical requirement between the plane and shaft line of inner hole should not exceed 0.04mm. The micrometer gauge is used for adjustment during alignment.

2) The alignment of YOTcs coupling. Normally the working machine should be adjusted firstly, then the coupling is aligned to working machine. Finally the motor is aligned to the coupling.

3) The alignment of coupling is very important. If the alignment between these three machines, the flexible component inside flexible coupling will be damaged very quickly, resulting in the damage of bearings. Seriously, the hub will be bent or broken. Therefore, the following procedures should be followed for alignment:

   a. To align the position of hubs & shafts roughly.
   b. To align the hubs & shafts on horizontal plane, which should not exceed 0.06/1000.
   c. To align the hubs & shafts on vertical plane. As the center height will rise with the increase of temperature when the motor, coupling and working machine is running, while their increase value is different, this factor should be considered and suitable value should be reserved during alignment. The detailed value can be determined by the increase ratio of motor, working machine and coupling.

The increase value (mm) of center height, which causes by the temperature increase of coupling, is referenced as table 3.

Table 3 (mm)

Type	360	400	450	500	560	580	650	750	875	1050	1150	1250
Increase value	0.25		0.30			0.35	0.35		0.35	0.40		0.45

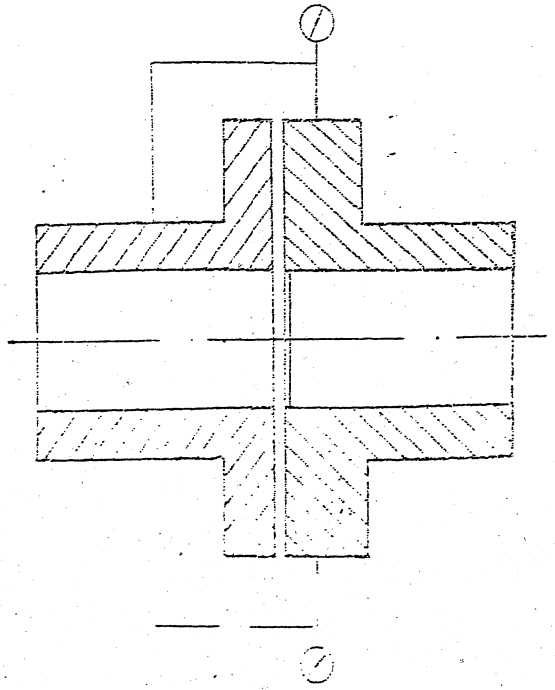


Figure A Schematic diagram of alignment

Therefore, the center height can be a little lower than the fix value during alignment.

d. Machines can be run after motor, coupling and working machine is aligned and trial running, finding that the temperature is increased to stable and the vibration, noise complies to the requirement. If the vibration and noise exceeds the normal range, machines should be sopped for checking and looked for reasons to align again for re-trial running. Please find the Table 4 for the required standard value of vibration and noise of coupling.

Table 4 JB/JQ 19120--88

Check-up Item				Measurement unit	Excellent product	First-class product	Qualified product	
Performance	Rated slip S			%	To be determined	≤3		
	Performance figure(not less tha			min^2/m		1.9×10^{-6}	1.7×10^{6}	
	Regulating range(not less than)					5:1		Loading for fans
						3:1		Loading for constant torque
Normal Require	Result of sealing					no leakage		
Reliability	Average working time with fault (not less than)			h		700	5000	
	Vibration (not larger than)	Speed r/min	3000	μm		20	75	
			1500			33	160	
			1000			42	235	
Safety	Noise (Not larger than)	Speed r/min	≤1500	dB		84	90	
			≤3000			87	93	
			>3000			89	95	

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6.4 Mounting of cooler

The cooler should be mounted near the couplings. Its inlet & outlet flange should be 300mm lower than the bottom of couplings, in order to prevent the cooling oil of cooler filling from other side. The feet of cooler can be fixed with bolts.

6.5 Connections of oil & water pipes

The related oil and water pipes are connected with flanges by solider in accordance the actual requirement on the site. They must be cleaned. The oil pipes should be washed with hot oil after the rusts are moved out by acid. First they are connecting to the inlet & outlet flange of cooler, then they are connected to the inlet & outlet flanges of coupling after fully filling of oil. There should be a gauge for water pressure at the inlet of cooling water, so that the water pressure can be observed whether the pressure is enough or not. The normal water pressure is Pwater ≥ 0.2Mpa. The detailed pipes for oil and water of couplings please refer to table 5.

Table 5 Inner diameters reference for the oil & water pipes of couplings (mm)

Type	360	400	450	500	560	580	650	750	875	1050	1150	1250
Oil pipe	25		38			65	38		38	85		55
Water pipe	32		38			100	45		45	85		85

Note: The inner diameter of water pipe in the Table should be determined by the types of cooler.

6.6 Mounting of power

In accordance with the related requirement, cables of pressure gauge and thermometer should be linked to the related warning circuit, or linked to the control circuit of motor, working machine, so that the motor and working machine can stop operation when the pressure & temperature exceed. The warning point of pressure gauge is adjusted to 0.35Mpa, and the warning temperature is adjusted to 90°C.

The wires of electric actuator, operator and speed inspection device should be connected according to the manual. Or the wires can be linked according to the requirement of auto-control, so that the auto-control can be realized.

7. Working fluid

Couplings must be filled with 6# hydraulic oil or #20 turbine oil before operation. Mixing oil is not allowed. The container for filling must be clean enough. The specified filling quantity is just approximate, which does not include the filling of cooler.

Remove the cap of filling plug on the oil housing and fill to "Maximum level" when filling, then start the machine for short time operation. The scoop tube should be adjusted to the lowest speed. The oil is cycled by the supply pump via pipes and cooler. The oil level should be reached "Maximum level" after the machine is stopped. Be ware not to fill too much. Otherwise, if the oil level is too high, the rotation parts will overheat.

The oil level should be regularly checked during operation. It is not allowed to higher than "Maximum level." or lower than "Minimum level" at any case.

Physical performance of oils

No.	Specification / Performance	6# Hydraulic oil	#20 Turbine oil
1	Density (20°C) KN/M^3	0.872	
2	Viscosity m^2/s	$22\sim26\times10^{-6}$(50°C)	$22\sim23\times10^{-6}$(50°C)
3	Viscosity ratio (V50/V100 not larger than)	4.2	
4	Viscosity index		>90
5	Flash point °C (not lower than)	180	
6	Freezing point (not higher than)	—25	—15
7	Water	no	no
8	Color	Transparent, yellow	Transparent

8. Precautions

8.1 As the rotation direction has been determined during assembly, the motor & working machine must be checked to rotate at the same direction at the first time of start up.

8.2 To check the flexibility and accuracy of electric actuator.

8.3 The input & output shaft is not allowed to vibrate during rotation.

8.4 Leakage is not allowed at any parts.

8.5 The scoop tube must be adjusted to 0% when the coupling is started or stopped.

8.6 To check the oil level regularly. The oil in the housing must be kept between Max. and Min.

8.7 The working temperature of coupling must be between 45°C~88°C. It is not allowed to exceed 88°C. The best working temperature is 70°C±5°C.

The filter core inside supply pump must be cleaned regularly. For new-operated coupling, the filter core must be removed & cleaned after 500hs, then it should be cleaned per 3000hs' operation. The filter core can be removed by taking out the cover of the coupling housing.

8.8 The oil quality must be checked every 3000hs's operation. If there is any pollutant, old fluid must be replaced.

8.9 When the couplings is running at the scoop tube K=0%, maybe noises will be created. This is caused by "hooter effect", i.e. there is a hole between the mouth of scoop & outer wheel. However, this is normal and will not affect the performance of coupling.

9. Maintenance & Repairing

9.1 The removal of supply pump

When the supply pump was worn or not enough oil supply, the pump must be removed and the inner or outer runner or other wearing parts must be replaced. The removal procedures are as following: (please see Fig.6 & Fig.7)

Remove Shaft 21 & Gear 24, take out Key 23, Remove Bolt 36 & Pin20, so that the cover of outer wheel 29 with Hub18, inner & outer runner, eccentric sleeves (14,15,16) are taken out from the shell of outer wheel. Parts must be cleaned for re-mounting according to the reverse procedures.

How to guarantee the fitting of pump?

- The three parts of outer wheel must be stamped with number and fitted together one by one;
- The dimension "Y" of inner & outer runner should be 0.100~0.125 smaller than the fitted eccentric sleeve.
- The radial floating gap after assembly should be 0.05~0.05mm.
- To check that the gaps of pump driven gear is between 0.25~0.35mm.

9.2 The dismounting & checking of bearings (please see Fig.3 & Fig.4)

During the bearings are dismounted, the flexible coupling between input & output shaft must be loosened firstly, then lifting out the rotation parts. The housing should be unmoved, so that the original fitting precision is not affected. Please make reference to the Assembly Drawing & Component Drawing.

a. Firstly, the control device fixed on scoop tube should be removed, also the flexible coupling between input & output shaft.
b. Lift out the housing cover by loosing screws.
c. Remove bolt 5, washer 6 and pins. Take out plate 7 from input side.
d. Pull out the scoop tube after pin43, pin shaft 45 and ring 52 are removed.

e. In this way, the rotation parts & oil suction pipe can be lifted out together. They must be put on the suitable bracket, which the oil suction pipe must not touch the floor. It is not necessary to dismount pipe.

f. Remove the connecting coupling and shaft key on input & output shaft with suitable tools and take out the seal ring 10 on input & output shaft.

g. Now you can take out the plate 7 and pump housing from rotation parts. The inner cycle of rolling bearing should be stayed in input shaft.

h. Remove the bolt 5 and spring washer 23 from input shaft, then take out the components of scoop tube 19 & bearing 21. Now you can check bearings except bearing 5. If you want to check bearing 5, some rotation parts must be dismounted. (please see Fig.8)

9.3 Dismounting of rotation parts (please see Fig.8)

Put the rotation parts out of shell after lifted, so that the shaft of inner wheel turns down. Remove the gear 33 and key 34 from input shaft and take out screw 7 and pin 3 between the flange of input shaft and back shell 30. The input shaft will leave the flange by pulling.

Turn over the inner wheel. Remove the pin 31 and bolts between shell 18 and outer wheel. Lift over the shell, then remove the second "six pins 31" between outer wheel 113 and back shell 29. In this case, the bearing sleeve16 and plate of outer wheel 14 will be lifted out.

Turn down the inner wheel again, so that it can stand on the flange of back shell 30. Take out the washer 5 on the shaft and push out shaft via bearing 5.

It is not necessary to indicate all dismounting, as it is quite easy for other parts. However, it should be noted that normally the bearing ring 6 or oil tube 25 is not necessary to remove, because during production, these they are hammered into the output shaft slightly.

9.4 All components must be kept clean for the re-assembly. The re-assembly should be followed the opposite procedures of dismounting. All rotation parts and some components must be balanced. Parts for pairs should be marked for the re-assembly.

10. Trouble Shooting

10.1 Over Heating

Cause	Action
1. Insufficient water in cooler.	Add more water and increase heat-exchanged area.
2. Too much or too less oil in the house.	Adjust the oil volume to normal.
3. The filter core of pump is blocked.	Clean the filter core.
4. The runner pump is worn and no oil is pressed out.	Replace the inner & outer runner.
5. The safety valve is overflow. The spring is too loose. Seals are damaged.	 Tighten the spring. Replace the seals.
6. The oil circuit and pipes inside the cooler is blocked.	Clean.

10.2 Output Shaft does not turn.

Cause	Action
No oil enters the working cavity.	
1. The pressure value of safety valve is too low.	Tighten the spring.
2. Oil circuit is blocked.	Clean.
3. The pump is damaged.	Replace the inner & outer runner.
4. Wrong rotation of pump.	Turn 180°C of pump cover & eccentric sleeve.
5. Bad sealing of oil circuit.	Improve sealing.

10.3 Serious vibrations of the machinery

Cause	Action
1. Big vibration of motor.	Check motors and eliminates.
2. Big vibration of coupling. Runners of coupling are unbalanced. Motor & coupling is eccentric. Bearing is damaged. Connections are loose.	 Check and re-assemble according to the marks. Realign. Replace the bearing. Tighten.
3. Vibration of working machine. Working machine is unbalanced. Assembly is eccentric.	 Re-balance. Realign.
4. Foundation is not hard enough.	Harden foundation.

10.4 Leakage of shaft ends.

Cause	Action
1. The rotation of flexible coupling causes " vacuum-effect" and the oil is aspirated.	Separate the flexible coupling shaft ends by cover.
2. Lip of seal ring is not flat.	Replace seal ring.
3. The sealed surface of shaft is nicked.	Sharpen.

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10. Spare Parts and Service

On every coupling you will find its Serial Number Stamped on the Mark Plate. In case you need any spare part or service, please inform us the Type of coupling, its Serial Number and the Part Number and Part description.

10.1 Seal List & Bearing List

a. Seal List (refer to Table 6)

b. Bearing List (refer to Table 7)

11.2 Details of Assembly Drawing, Part Drawing and Parts

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Table 6 List of Seals

Description	YOTcs360	YOTcs400	YOTcs450	YOTcs500	YOTcs560	YOTcs580	YOTcs650	YOTcs750	YOTcs875	YOTcs1000	YOTcs1150	YOTcs1250
	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.	Size/Qty.
O-ring	ϕ35×3.55/4	ϕ35×3.55/4	ϕ50×3.55/4	ϕ50×3.55/4	ϕ50×3.55/4	ϕ155×3.55/1	ϕ50×3.55/4	ϕ50×3.55/4	ϕ50×3.55/4	ϕ60×3.55/4	ϕ60×3.55/4	ϕ60×3.55/4
O-ring	ϕ75×3.55/2	ϕ75×3.55/2	ϕ80×3.55/2	ϕ80×3.55/2	ϕ80×3.55/2	ϕ134×3.2/2	ϕ110×3.55/2	ϕ110×3.55/2	ϕ140×3.55/2	ϕ160×3.55/2	ϕ160×3.55/2	ϕ170×3.55/2
O-ring						ϕ57.4×3.2/4	ϕ130×3.55	ϕ130×3.55				PD75×95×12
Seal	PD38×56×12	PD38×56×12					PD60×80×12	PD60×80×12	PD70×90×12			
Seal			PD25×40×10	PD25×40×10	PD25×40×10	PD25×40×10	PD25×40×10					
Yx-ring	d10	d10	d10	d10	d10	d10	d10	d10	d10	d10	d10	d10

Table 7 List of Bearings

Description	YOTcs360		YOTcs400		YOTcs450		YOTcs500		YOTcs560		YOTcs580		YOTcs650		YOTcs750		YOTcs875		YOTcs1000		YOTcs1150		YOTcs1250	
	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.	Size	Qty.
Rolling Bearing	32215	1	32215	1	32216	1	32216	1	32216	1	E361(Ball bearing)	1	32222	1	32222	1	2228	1	32232	1	32232	1	32234	1
Centripetal Ball Bearing	412	1	412	1	314	1	314	1	314	1	YOTcs580-6(Slide bearing)	2	320	1	320	1	324	1	176328	1	176328	1	176234	1
Centripetal Ball Bearing	119	1	119	1	121	1	121	1	121	1	B55563A(Thrust Bearing)	1	130	1	130	1	138	1	144	1	144	1	32152	1
Centripetal Ball Bearing	215	1	215	1	216	1	216	1	216	1	YOTcs580-23 (Oil seal ring)	1	222	1	222	1	228	1	334	1	334	1	176234	1
Ball-planed Ball Bearing					1205	2	1205	1	1205	2														

Table 8 Details of Assembly Drawing (please see Fig. 3 & Fig.4)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Housing	1		32	Oil Outlet Pipe	1	
2	Screw	2		33	O-ring	2	GB1235-76
3	Bolt	4	GB5784-86	34	Screw	4	GB70-76
4	Block	1		35	Flange Joint	2	
5	Bolt	72	GB5754-86	36	Bolt	11	GB5780-86
6	Washer	62	JB982-77	37	Nut	10	GB6170-86
7	Assembly Plate	1		38	Washer	9	GB93-96
8	Oil Supply	1		39	Instrument Plate	1	
9	Input Seal	1		40	Actuator	1	DKJ-310
10	Input Shaft	1		41	Pin	2	GB91-76
11	Bearing	1		42	Connecting Bar	1	
12	Air Filter	1		43	Pin Shaft		GB882-76
13	Seal Washer δ =0.5	1	EF6-80	44	Cover Against Dust	1	
14	Bolt	32		45	Flange Sleeve	1	
15	Washer	36	GB5784-86	46	Screw	6	GB67-76
16	Screw	4	GB93-76	47	Scoop Tube Assembly Plate	1	GB93-76
17	Housing Cover	1	GB70-76	48	Oil Inlet Pipe	1	
18	Oil Inlet & Outlet	1		49	Pipe Hoop	1	
19	Seal Washer δ =0.5	1		50	Pipe Hoop	1	
20	Cover	1		51	Crank	1	
21	Screw	2		52	Yx-ring	1	
22	Washer	10	GB825-76	53	Pointer	1	
23	Cover of Oil Gauge	1	GB93-76	54	Rivet	2	
24	Organic Grass Plate	1		55	Screw	2	GB68-76
25	Seal Washer δ =0.5	1		56	Mark Plate	1	TB8-82
26	Screw	10	Gb822-76	57	Stand	1	
27	Mark Plate	1		58	Remark of Max. Oil Level	1	
28	Direction Plate	1		59	Remark of Min. Oil Level	1	
29	Pin	4	GB120-76	60	Place-restricted Sleeve	1	
30	Nut	8	Gb6170-86	61	Fixing Screw	3	
31	Bolt	4	GB5784-86				

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Table 9 Details of Assembly Drawing (see Fig. 4-1)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
18	Bolt	4	GB5784-86	31	Sealing Unit	1	
19	Acuator	1		32	Oil Return Tube	1	
20	Bearing Stand	1		33	Bolt	2	
21	Bolt	2	GB5784-86	34	Threading Bar	1	
22	Controlling Bar	1		35	Crank	1	
23	Bolt	1	GB5784-86	36	Indicator Plate	1	
24	Threading Bar	1		37	Flange Plate	1	
25	Oil Outlet Pipe	1		38	Assembly Stand	1	
26	Shell of Scoop Tube	1		39	Pin	2	
27	Output Cover	1		40	Button	1	
28	Bolt	6	GB5784-86	41	Controlling Bar	1	
29	Washer	6	GB93-76	42	Screwing Plate	1	
30	Scoop Tube	1		43	Oil Grass	1	

Table 10 Details of Oil Supply Component (see Fig. 5)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Seal Washer δ =0.5	2		19	Screw	4	GB68-76
2	Bolt	6	GB5782-86	20	Pin	2	GB120-76
3	Washer	12	GB93-76	21	Setl-fixed Screw	1	GB1337-77
4	Filter	1		22	Washer	1	GB93-76
5	Oil-absorbed Tube	1		23	Key 5x16	1	GB1098-79
6	Upper Cover	1		24	Driven Gear	1	
7	Pin	2	GB91-76	25	Screw	2	GB71-76
8	Selt-fixed Screw	1	GB1337-77	26	Shaft Sleeve	2	
9	Spring Stand	1		27	Block Ring	2	GB894-76
10	Spring	1		28	Pump Shell	1	
11	Valve Bar	1		29	Cover of Pump	1	
12	Valve Core	1		30	Seal Washer δ =0.5	1	
13	Yx-ring for Hub	1	Yx Type	31	Seal Washer δ =0.5	1	
14	Eccentric Sleeve	1		32	Cover of Pump	1	
15	Runner(BB-B outer)	1		33	Pin	1	GB119-76
16	Inner Runner	1		34	Mark Plate	1	
17	Key	1		35	Nail	2	GB827-76
18	Hub	1		36	Bolt	6	GB5782-86

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Table 11 Details of Rotation Parts (see Fig. 8)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Input Shaft	1		18	Shell	1	
2	Centripetal Bearing	1		19	Screw	8	GB70-76
3	Pin	8	GB120-76	20	Washer	8	GB93-76
4	Block Ring	1	GB894-76	21	Centripetal Ball Bearing	1	GB894-76
5	Centripetal Ball Bearing	1		22	Block ring	2	GB894-76
6	Block Ring	1		23	Key	2	GB1096-79
7	Screw	8	GB70-76	24	Output Shaft	1	
8	Washer	8	GB93-76	25	Lubricate Pipe	2	
9	Bolt	30	GB5782-86	26	Bolt	8	
10	Washer	30	GB93-76	27	Washer	8	GB97-76
11	Washer	30	GB97-76	28	Self-fixed Nut	8	GB1337-77
12	Block of Turbo Wheel	1		29	Turbo Wheel	1	
13	Pump Wheel	1		30	Back Shell	1	
14	Screw	1		31	Pin	9	GB120-76
15	Bearing Sleeve	5	GB818-76	32	Threading Sleeve	8	
16	Centripetal Ball Bearing	1		33	Driving Gear	1	
17		1		34	Key	1	GB1096-79

Table 12 Details of Oil Inlet & Outlet (see Fig. 9)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Scoop Tube	1		6	Washer	4	GB93-76
2	Screw	1	GB73-76	7	Scoop Tube	1	
3	Block Ring	1	GB893-76	8	Oil & air Separator	1	
4	Guide Pin	1		9	Oil Out Pipe	1	
5	Bolt	4	GB5782-86				

Table 13 Details of Oil Inlet & Outlet (see Fig.9-1)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Scoop Tube	1		13	Bolt	1	GB5784-86
2	Oil Drainage	1		14	Washer	1	GB93-76
3	Directing Tube	1		15	Nut	1	
4	Bolt	6	GB5784-86	16	Inner Threading Bar	1	
5	Washer	6	GB93-76	17	Scoop Tube	1	
6	Draining Tube	1		18	Oil-in Tube	1	
7	Bolt	4	GB5784-86	19	Housing	1	
8	Washer	4	GB93-76	20	O-ring	2	
9	Bolt	1	GB5784-86	21	Inner Hex-screw	4	GB70-76
10	Washer	1	GB93-76	22	Washer	4	GB93-76
11	Controlling Bar	1		23	Tighening Flange	1	
12	Outer Threading Bar	1					

Table 14 Details of Instrucment Plate (see Fig.10)

Item No.	Description	Qty.	Remark	Item No.	Description	Qty.	Remark
1	Pressue Gauge P=0~kg/cm^2	1	Yx-	15	Tube Sleeve	2	
2	Nail 3x6	8	GB827-76	16	Nut	2	
3	Indication of Inlet Pressure	1		17	Joint	2	
4	Instrucement Plate	1		18	Sealing Washer10	2	
5	Indication of Outlet Temperature	1	WTZ	19	Bolt	16	GB5782-86
6	Therometer(12000)	1	WTZ	20	Bolt	7	GB5782-86
7	Pressed Therometer	1		21	Nut	7	GB6170-86
8	Indication of Inlet Temperature	1	Y-15	22	Washer	7	GB93-76
9	Manometer P=0~4kg/cm	1		23	Joint Tube	2	
10	Indication of Outlet Pressure	1		24	Nut	2	
11	Red Copper Tube 6x1	2		25	Washer	2	
12	Hoop	2		26	Hoop	1	
13	Hoop	2		27	Hoop	1	
14	Washer	2	JB892-77				

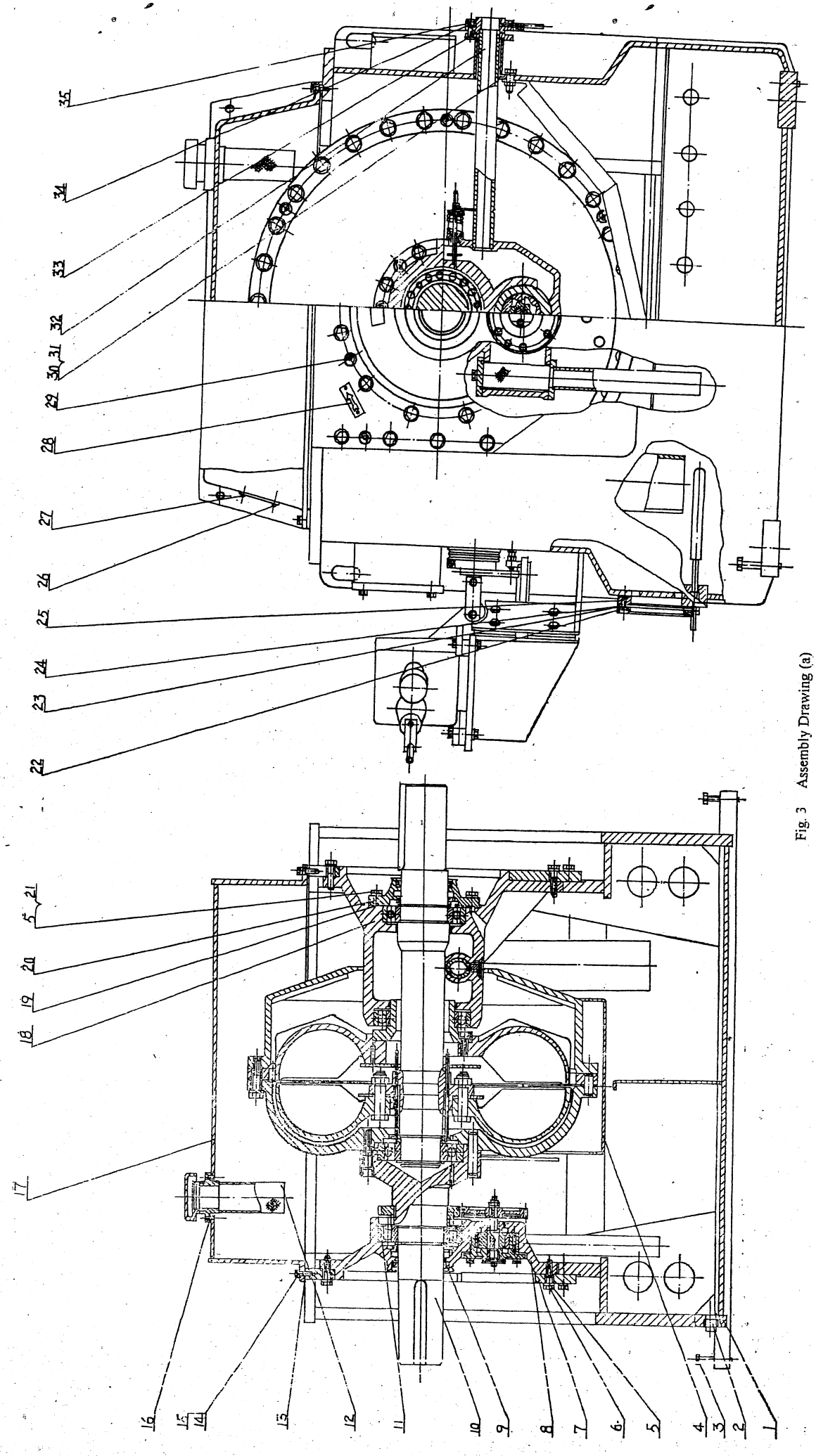


Fig. 3 Assembly Drawing (a)

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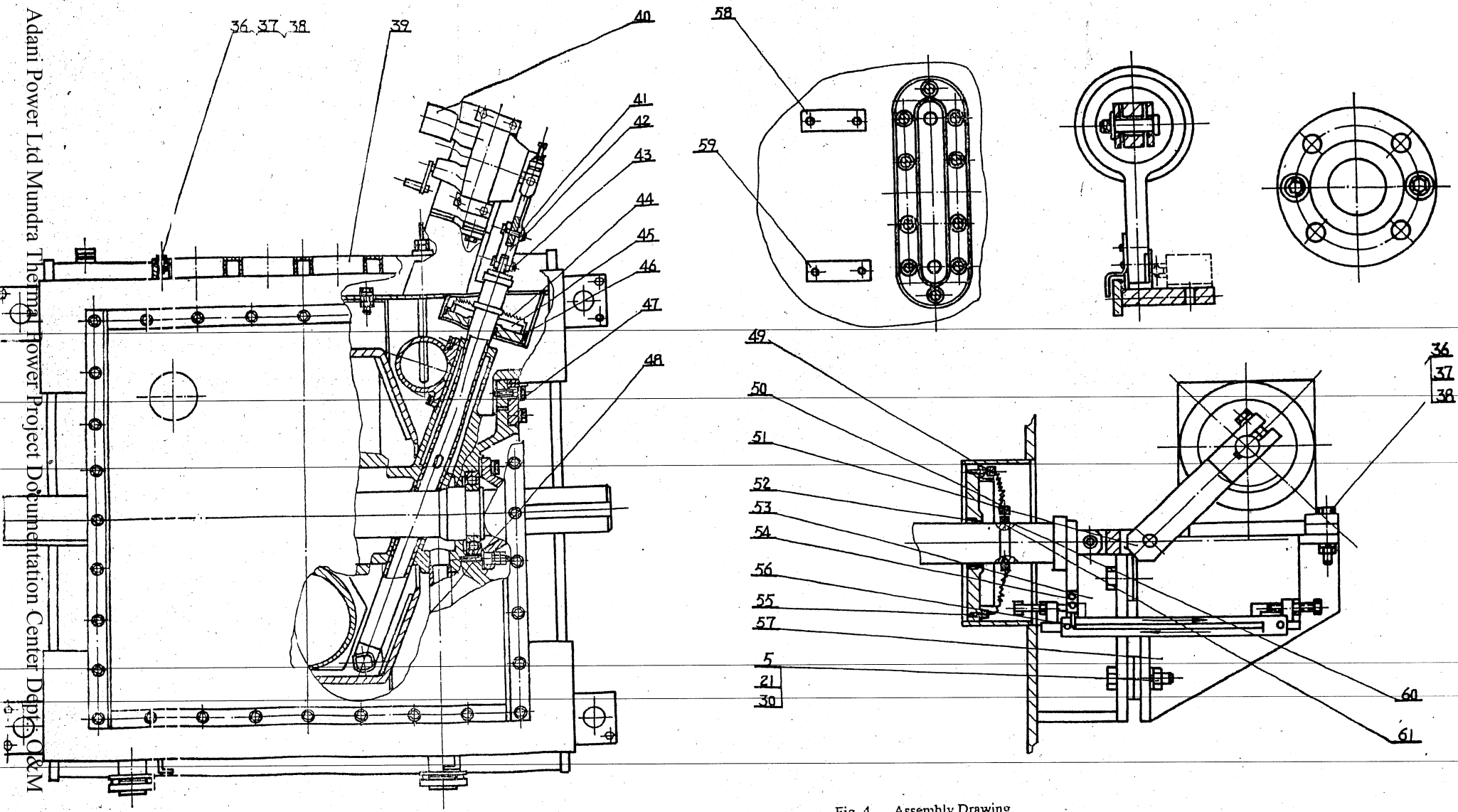


Fig. 4 Assembly Drawing

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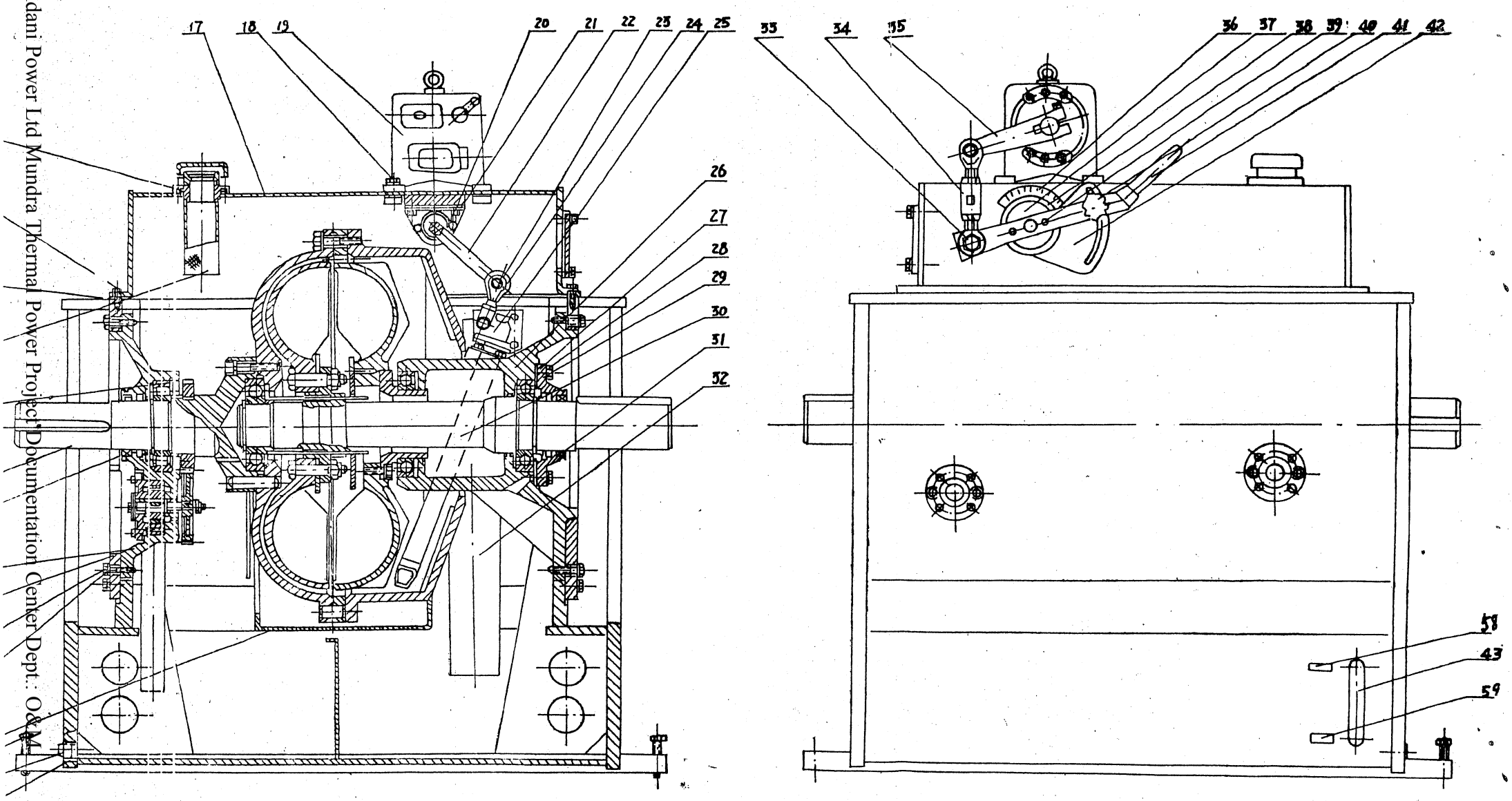


Fig.4-1 Assembly Drawing (b)

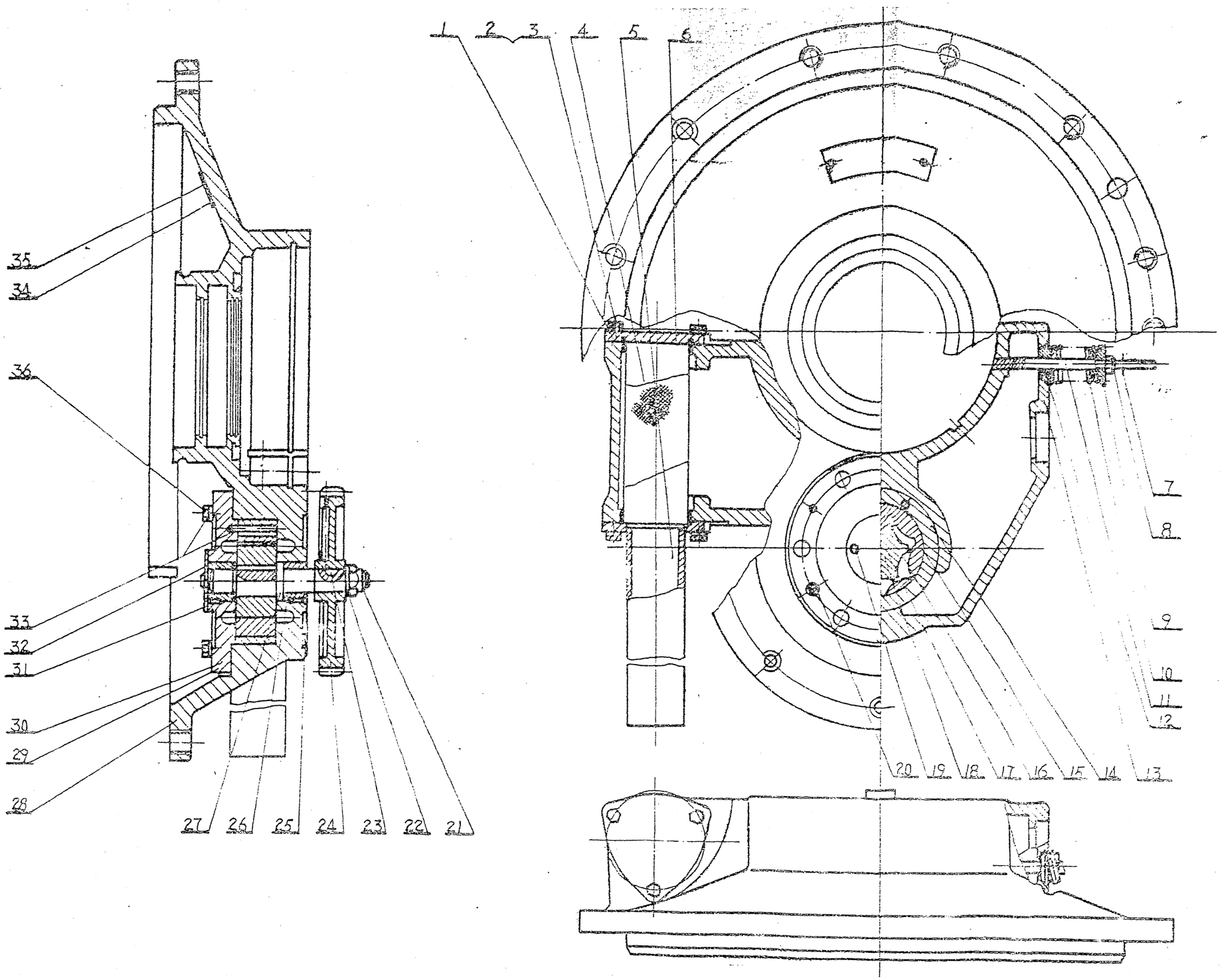


Fig. 5 Oil Supply Component

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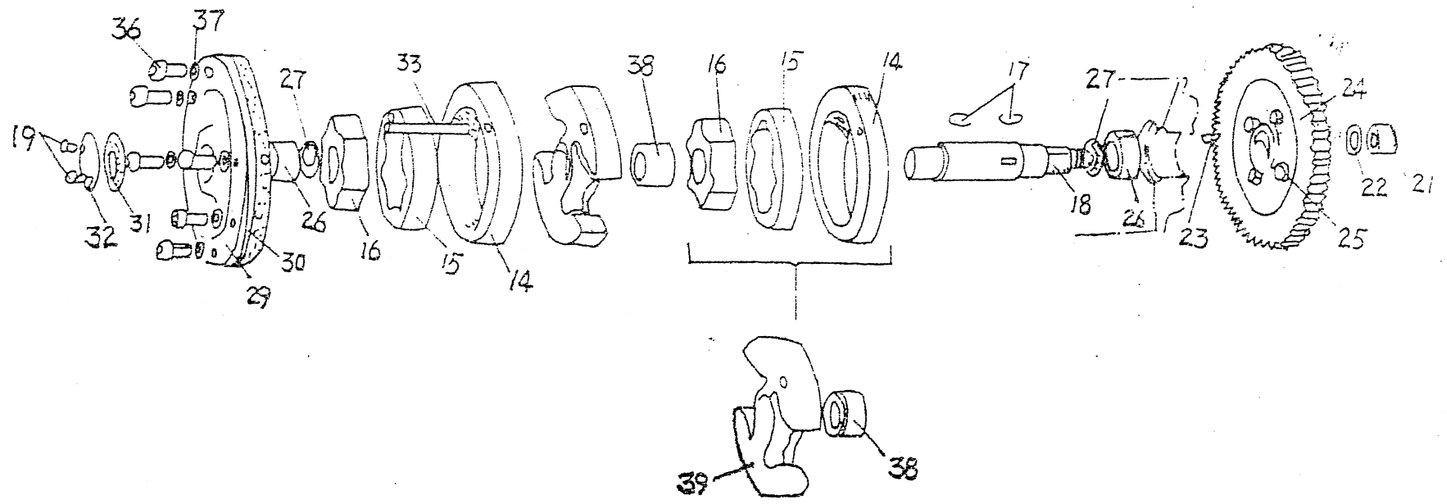


Fig. 6 Scheme for Structure with double pumps

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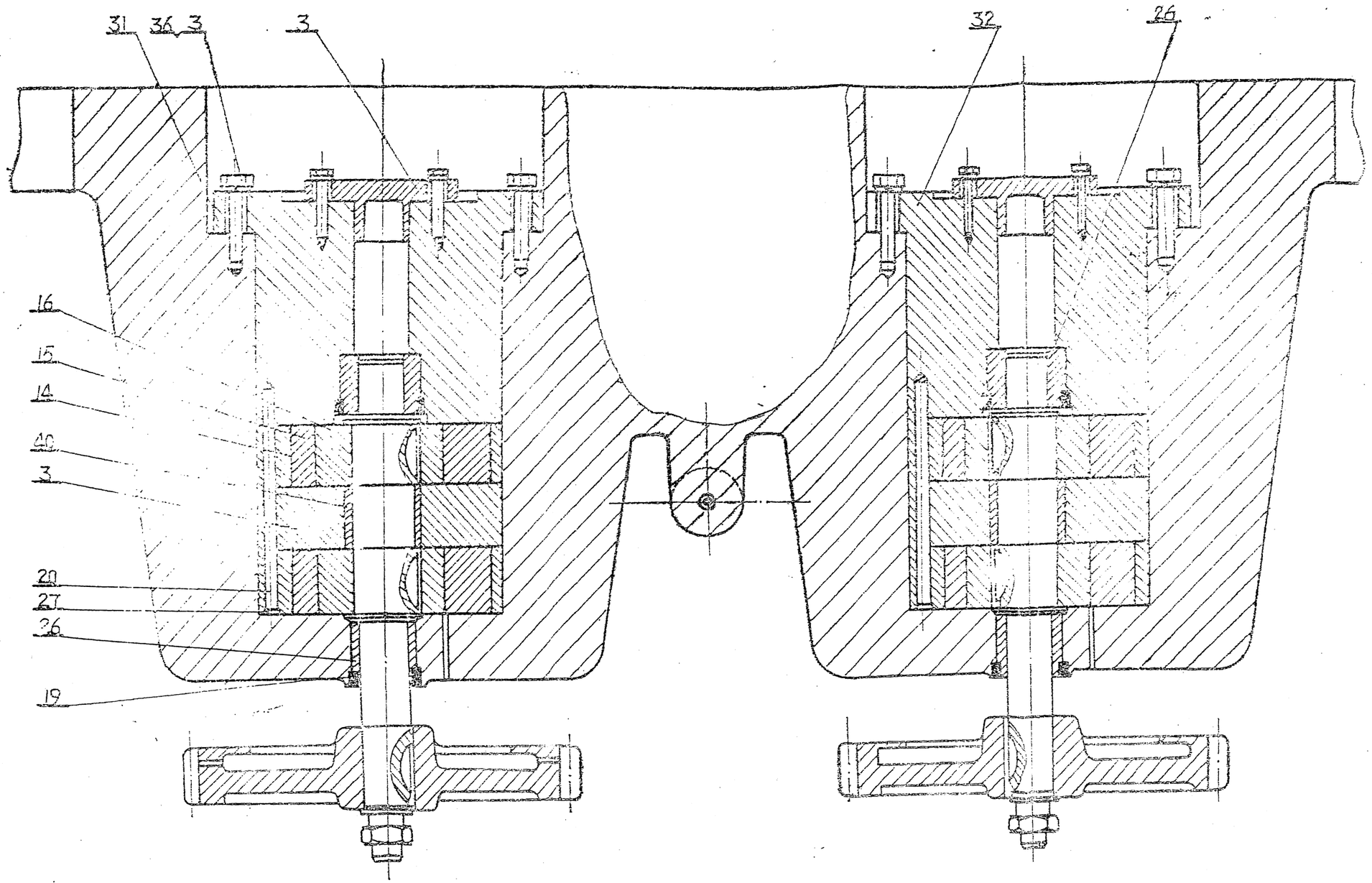
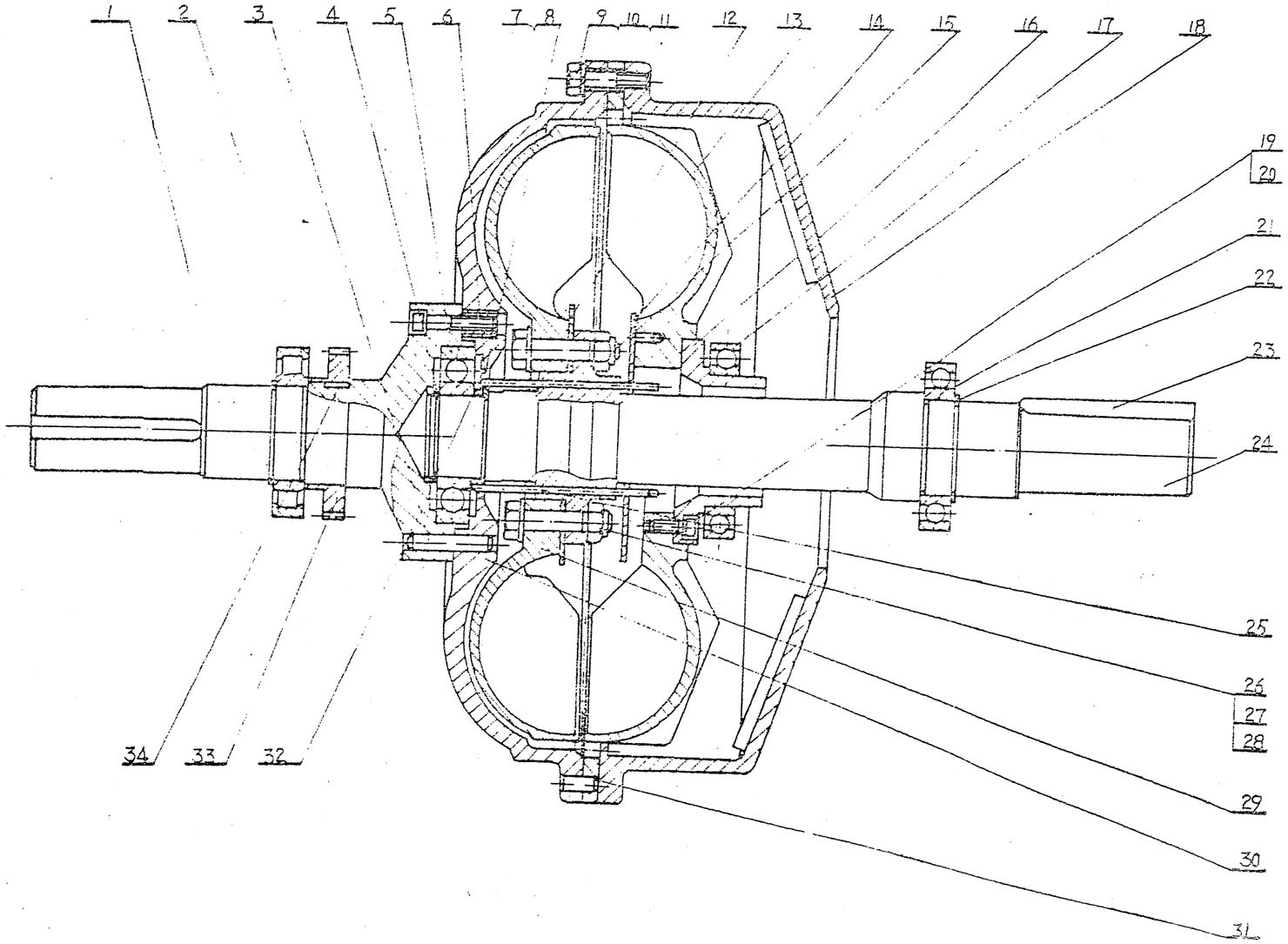


Fig. 7 Construction of Pump

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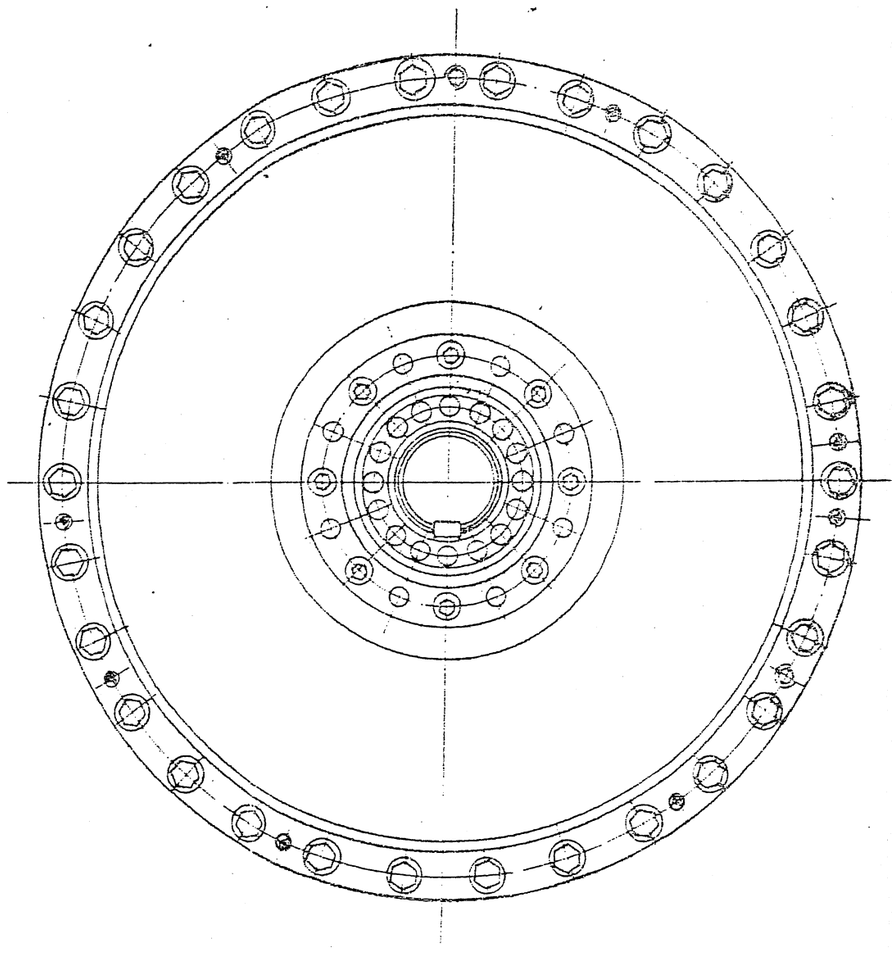


Fig.8 Rotation Parts

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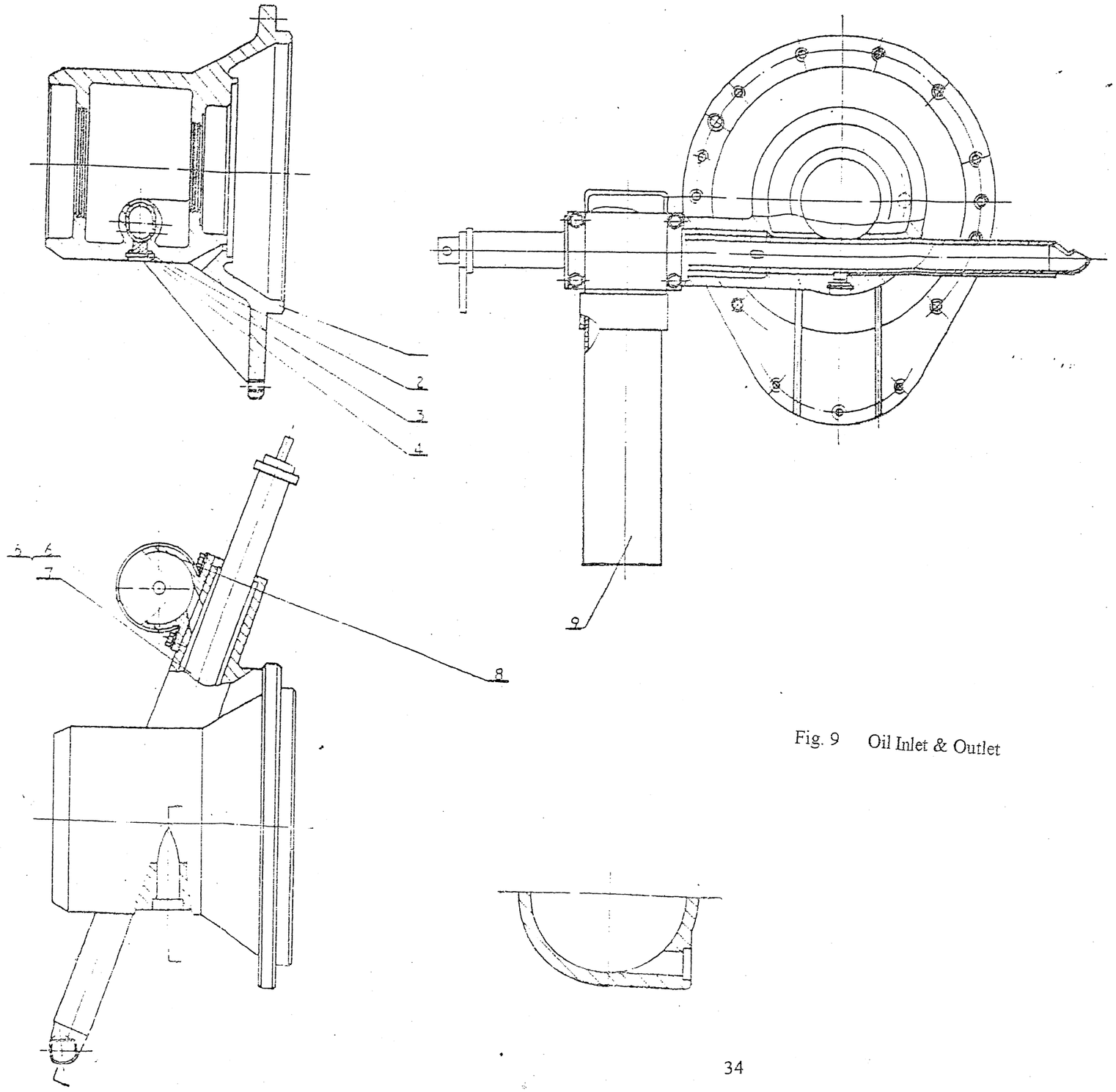


Fig. 9 Oil Inlet & Outlet

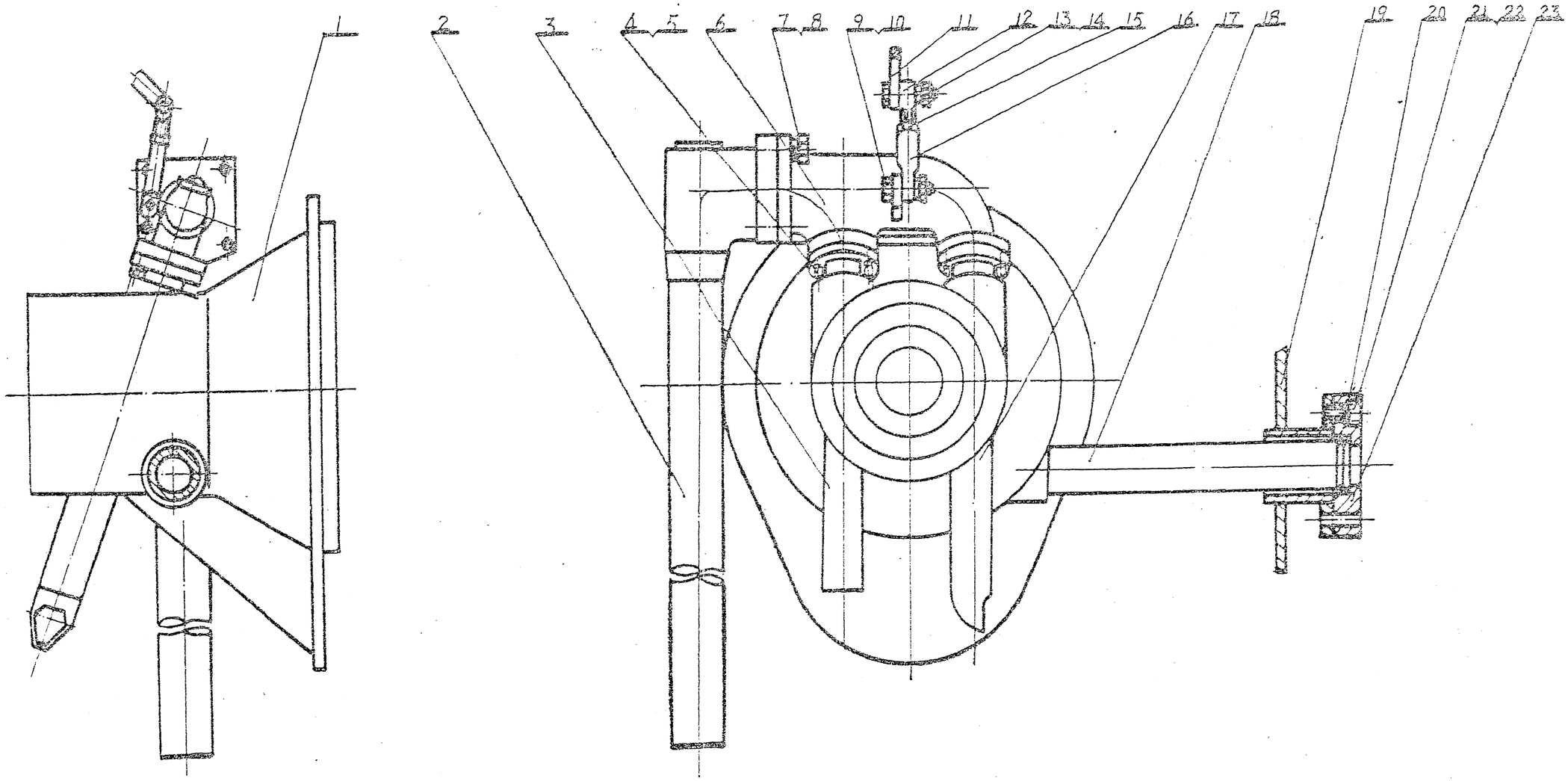


Fig. 9-1 Oil Inlet & Outlet

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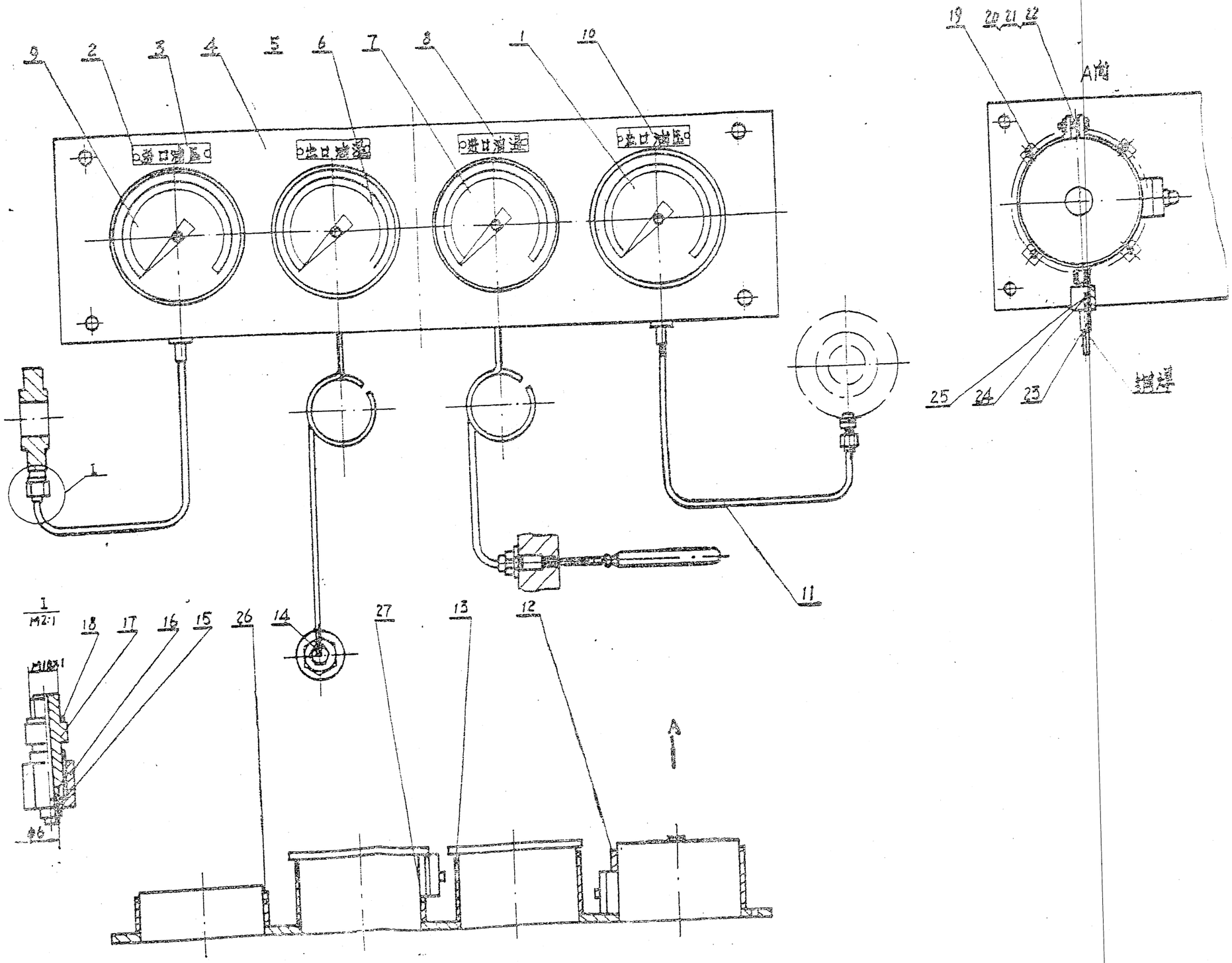


Fig. 10 Instrument Unit

Characteristic Curve λB—i of YOTcs Coupling

Torque Ratio of Pump Wheel:

$$\lambda B = \frac{975N}{\gamma . n^3 . D^5}$$

Where: N---Input Power of Coupling (KW)
γ--- Gravity of working oil
γ=830kg/m³ for 20# Turbine
n---Input Speed of Coupling
D---Coupling Diameter

Testing Temperature: 75°C

Transmission Ratio: $i = \frac{n_T(\text{Speed of Turbine Wheel})}{n_B(\text{Speed of Pump Wheel})}$

