

TJA20"-50 BUCKING UNIT

For Casing Coupling

OPERATION MANUAL

(MECHANICAL PART)

Goldenman Petroleum Equipment Co., Ltd

January, 2011

CONTENTS

1. General description-----	2
2. Specifications-----	8
3. Main assemblies structures and principles-----	10
4. Installation and adjustment-----	13
5. Operation instructions-----	14
6. Maintenance-----	15
7. Troubleshooting-----	18
8. Some instructions-----	19
9. API specifications for coupling surface defects-----	19

1.GENERAL DESCRIPTION

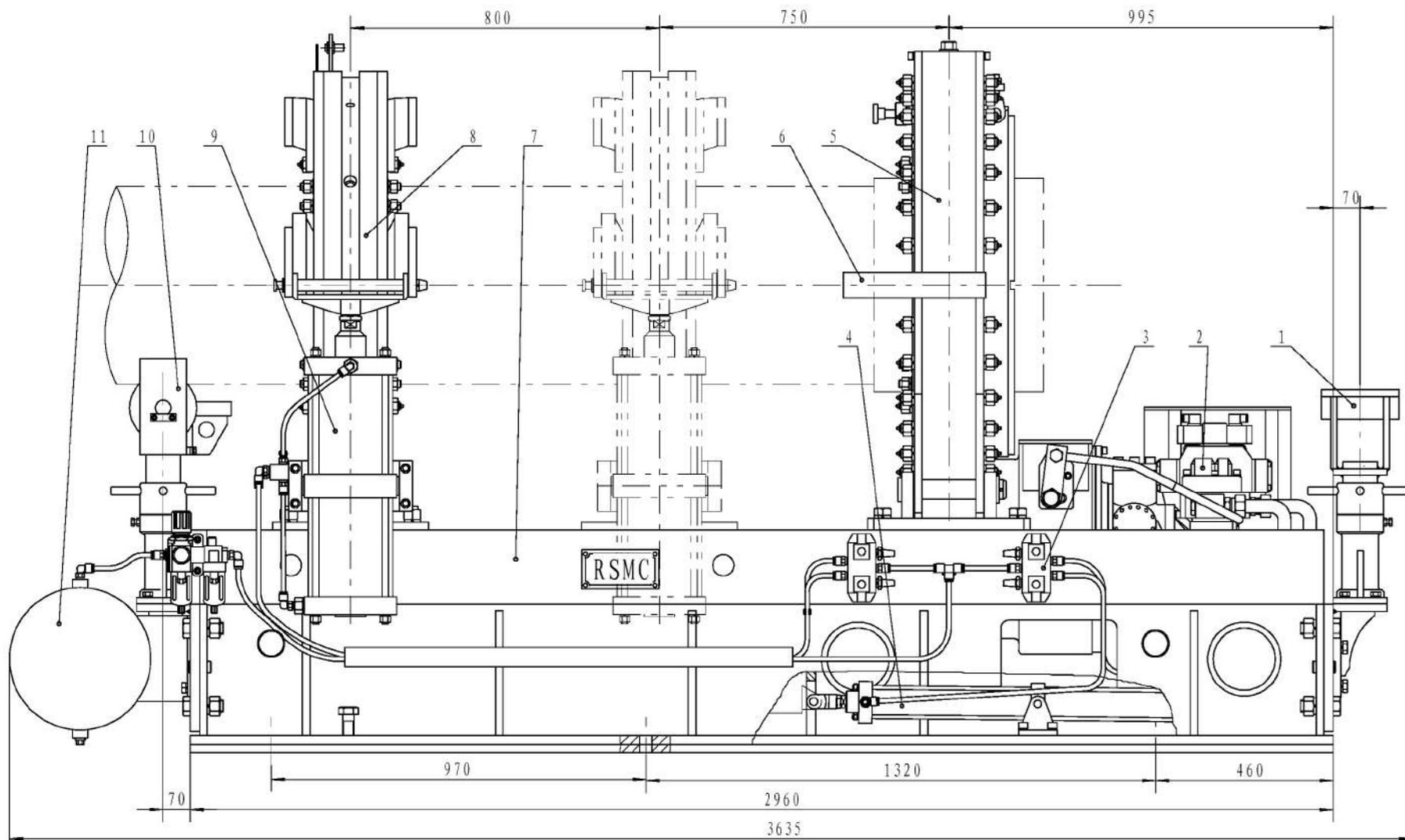
TJA20"-50 bucking unit is a new-type manufacturing machine for casing. It is researched and developed cooperatively by Goldenman Petroleum Equipment Co., Ltd and Lanzhou Lanxin Machinery Equipment Co., Ltd. According to API Spec 5CT, main function of the bucking unit is to make up or break out the coupling from the pipe. The machine is equipped with the latest non-sticking clamping mechanism and precise torque measure & control system. The product has awarded national invention patent. Patent No.:ZL200510107747.8.

TJA20"-50 bucking unit consists of two parts: main part and auxiliary part. Main part involves master tong, backup tong, hydraulic & pneumatic control system, and base seat. Auxiliary part contains the hydraulic power unit and the operating controls. Refer to Figure 1, 2 and 3, the master tong is used for spinning, making up or breaking the couplings, and backup tong is used for clamping and moving pipe. The output of making-up torque is generated from backup tong, and transferred to torque control system via the sensor.

The bucking unit can perform the makeup operation for pipes from 9⁵/₈" through 20". Different size of casing needs corresponding sizes of master tong jaws and backup tong jaws. The available jaws include all standard sizes for casing body and coupling within the range 9⁵/₈"-20". For other non-standard sizes of jaws, please order additionally.

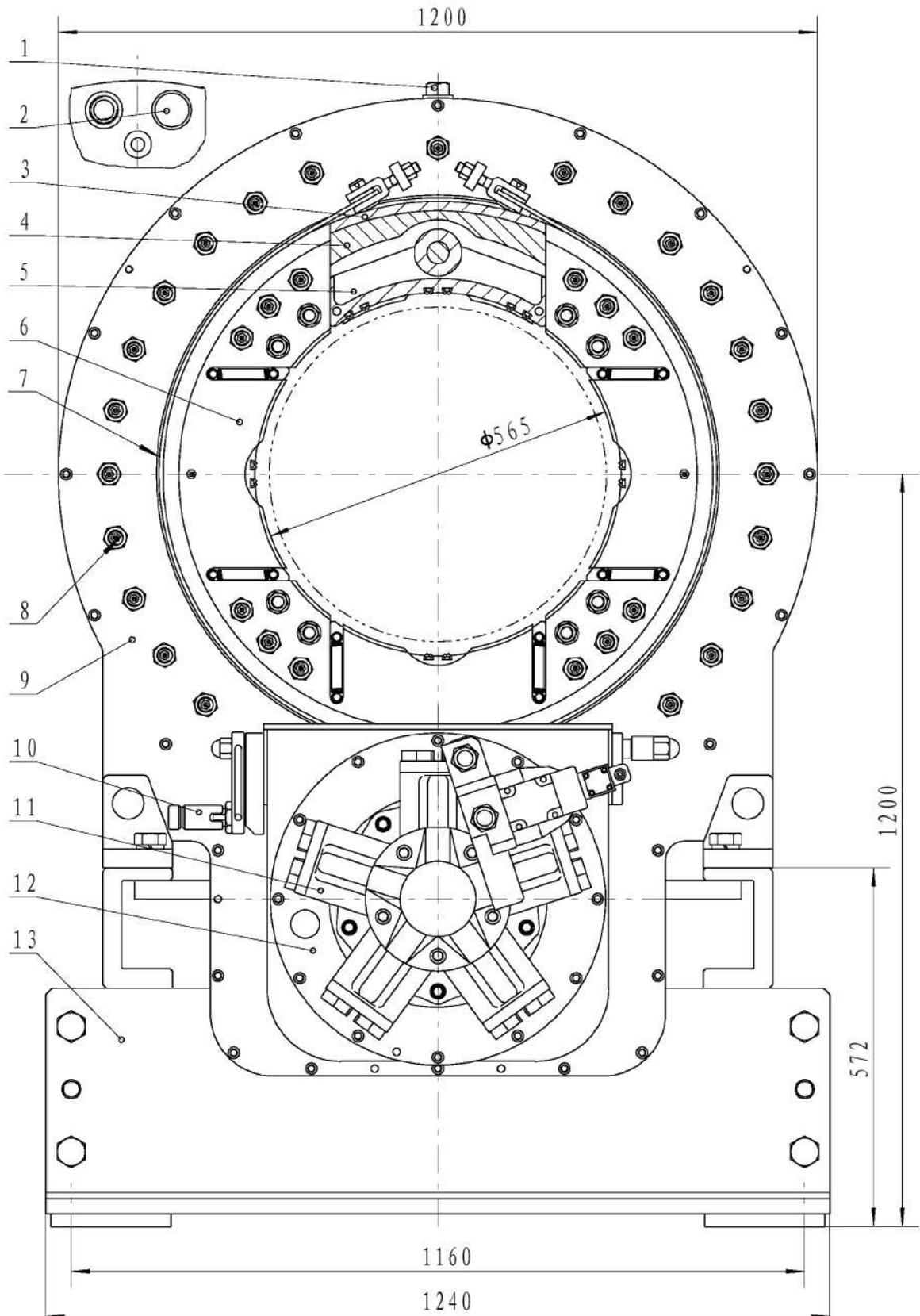
Features:

- 1.TJA20"-50 bucking unit is driven and controlled cooperatively by hydraulic system and pneumatic system. Simple, reliable and convenient for operation.
2. Master tong is driven by a low-speed large-torque hydraulic motor. Mechanical gear change and transmission system is simple and effective. Action of backup tong is driven by air cylinder, which is good for the nonoccurrence of oil-leaking of the system.
- 3.Both the master tong head and the backup tong head are designed close. Gripping mechanism is finished through the rollers going up onto the cams surface. Four jaws inside the tong heads are distributed evenly at 90°. Each jaw is fitted with three dies. Dies and coupling are surface contacted. Clamping sites include 24 dies, which is favorable for reliable clamping and never stick the coupling. Die marking on the coupling meets the API standard. Restoration of the tong head is a kind of automatic locating mechanism, quick and reliable.
- 4.Special design of the cam can assure gripping force and torque increase simultaneously during making up, and keep clamping at best status.
- 5.Backup tong is floating type. Master tong and backup tong can align automatically to meet the operation requirements for different clearances. It is easy to replace jaws and dies.
- 6.There is a teeth ring on the friction wheel of the brake band. Screwing rounds can be measured out via photoimpact. Tensile sensor equipped with the backup tong is to measure the torque, and in theory, the value is very correct.
- 7.The bucking unit is supplied with TPC (torque process controller) system. The system is to evaluate the torque reading and screwing rounds with the preset values, and automatically control the action of the bucking unit.



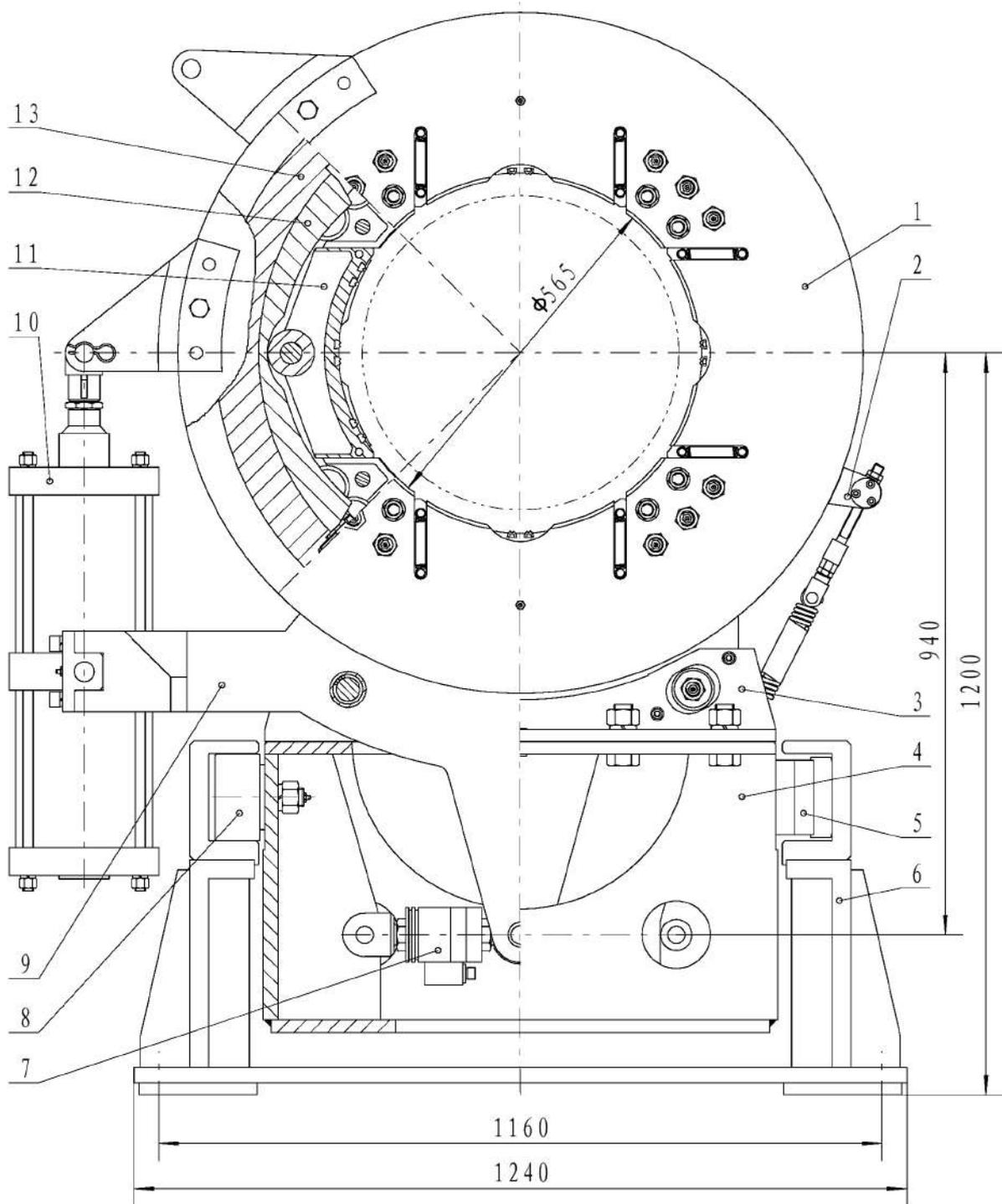
- | | | | | | |
|-------------------------------|----------------------------|----------------------------|---------------------|---------------|------------|
| 1.head support control system | 2.hydraulic control system | 3.pneumatic control system | 4.shifting cylinder | 5.master tong | 6.electric |
| 7.base seat | 8.backup tong | 9.gripping cylinder | 10.rear support | 11.air tank | |

Figure 1: General View of TJA20'' -50 Bucking Unit for Casing



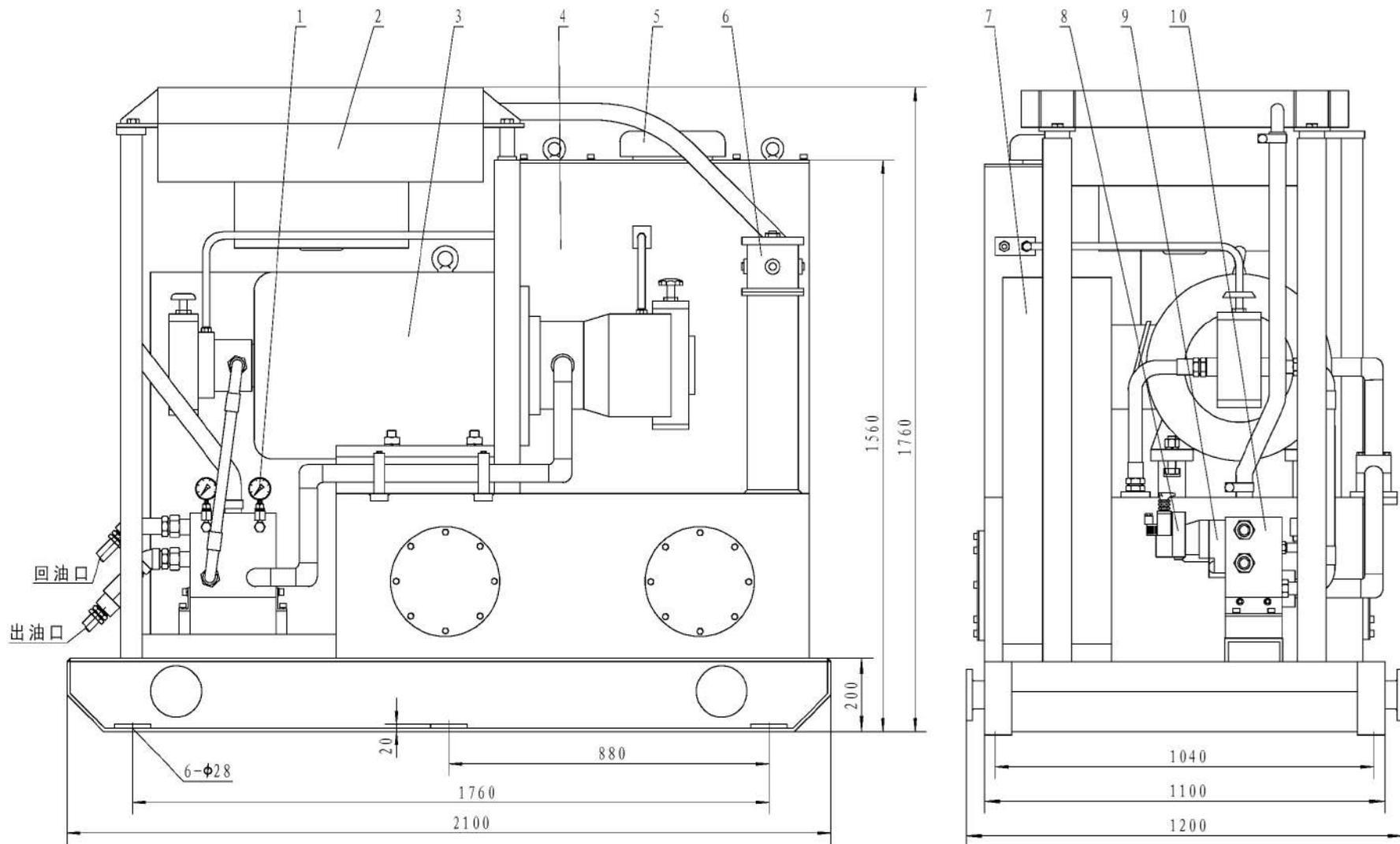
1. plug screw 2. reverse pin 3. rotary gear 4. cam 5. jaw assembly
 6. jaw holder 7. brake band 8. roller 9. housing 10. gear-shifting mechanism
 11. hydraulic motor 12. planet gearbox 13. base seat

Figure 2: Outline of Master Tong of TJA20'' -50 Bucking Unit



- 1.jaw holder 2.balance mechanism 3.swing support seat 4.moving support
 5.buffer 6.base seat 7.sensor 8.roller 9.swing support 10.gripping cylinder
 11. jaw assembly 12. cam 13.cam body

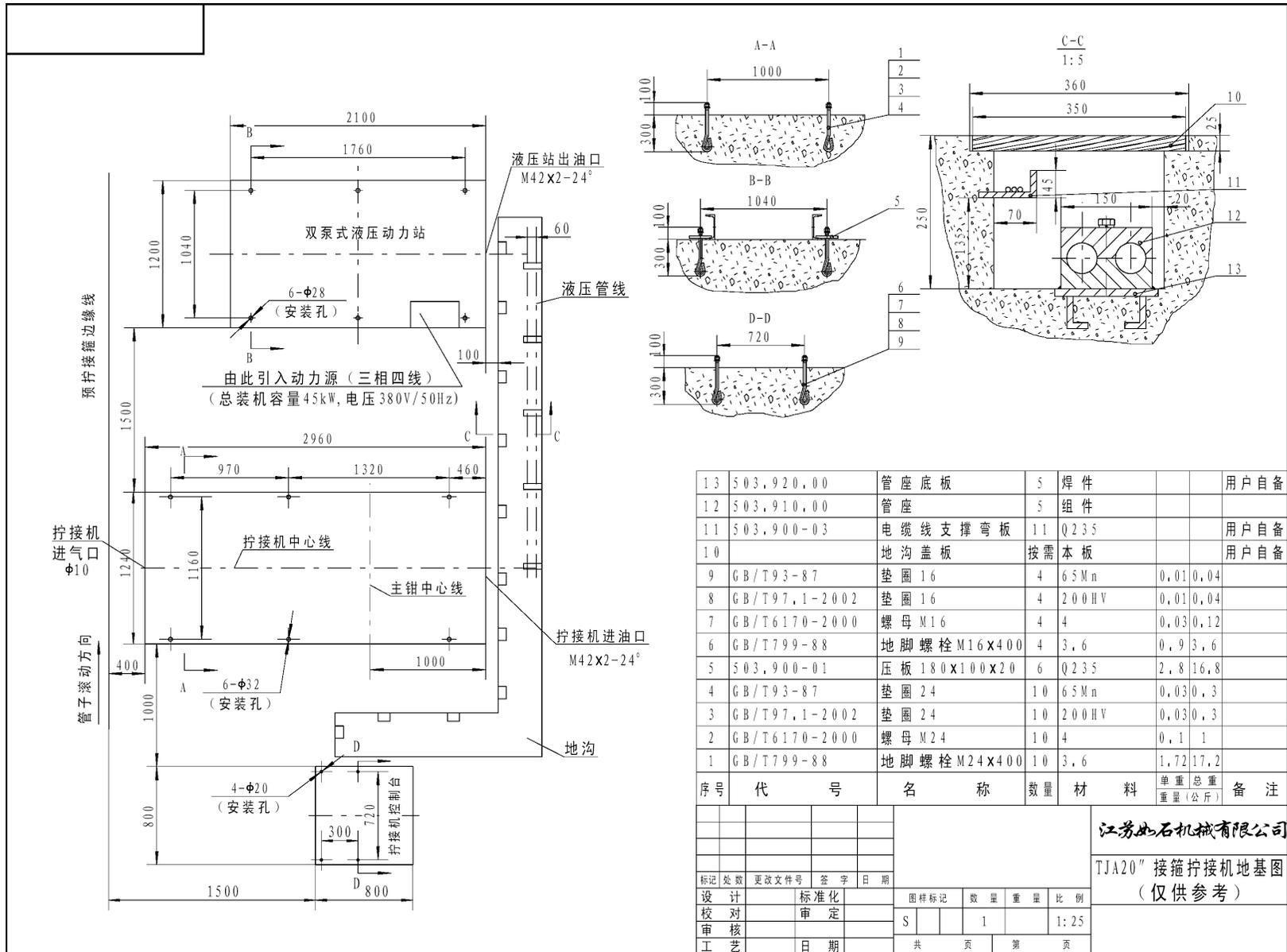
Figure 3: Outline of Backup Tong of TJA20'' -50 Bucking Unit



- 1.pressure gauge 2.air cooler 3.motor-pump module 4.oil tank 5.air filter 6.return filter 7.electric start cabinet
 8,9.discharge relief valve 10.valve panel

Figure 4: Outline of Dual-pumps Hydraulic Power Unit

Figure 5:
Ground Plot
for
Mounting
TJA20"
Bucking
Unit



2.SPECIFICATIONS

2.1 Tong head bore \varnothing 565mm

2.2 Applicable pipe OD $9\frac{5}{8}$ "-20" casing and coupling

Table 1: Jaw Details for $9\frac{5}{8}$ "-20" Pipes

No.	Size	Jaw body		Roller (qty.)	Pin	Die (qty.)
1	244.46	$9\frac{5}{8}$ "		$\varnothing 120 \times \varnothing 35$ (孔)	$\varnothing 35$	15 × 10 × 75
2	269.88		$9\frac{5}{8}$ "NU			
3	273.05	$10\frac{3}{4}$ "				
4	298.44	$11\frac{3}{4}$ "	$10\frac{3}{4}$ "NU			
5	323.85		$11\frac{3}{4}$ "NU			
6	339.725	$13\frac{3}{8}$ "				
7	365.13		$13\frac{3}{8}$ "NU			
8	406.4	16"		$\varnothing 75 \times \varnothing 35$ (孔)		
9	431.8		16" NU			
10	473.1	$18\frac{5}{8}$ "				
11	508	20"	$18\frac{5}{8}$ "NU			
12	533.4		20" NU			

2.3 Hydraulic system

Hydraulic system for the bucking unit includes Single-pump type and Dual-pump type for selection. (refer to Table 2 for details)

Table 2: Specification for Hydraulic Power Unit

	Single Pump	Dual Pump
Flow (L/min)	30-160	8-185
Max working Pressure	20	20
Power of master electric motor	37	37
Power of full machine	45	45

2.4 Torque and Speed (refer to Table 3)

Table 3: Torque and Speed

		High Gear	Low Gear
Speed(rpm)	Single pump	4-17	1.5-6
	Dual pump	0.8.1-22	0.5-9
Max torque(kN.m)		17.5	50

2.5 Pneumatic System

Pressure: 0.4-1.0MPa

Air consumption: 2m³/h

2.6 Center height: 1200mm

2.7 Stroke of shifting cylinder : 800mm

2.8 Overall dimensions and weight

2.8.1 Master machine

L×W×H: 3650mm×1480mm×1850mm

Weight: 6900kg

2.8.2 HPU

L×W×H: 2100mm×1200mm×1800mm

Weight: 1750kg

2.8.3 Control cabinet

L×W×H: 880mm×880mm×1000mm

Weight: 150kg

2.8.4 Total weight of the machine: 8800kg

3. STRUCTURE AND PRINCIPLES

Main machine of TJA20"-50 bucking unit contains master tong, backup tong, hydraulic control system, pneumatic control system and base seat.

3.1 Master Tong

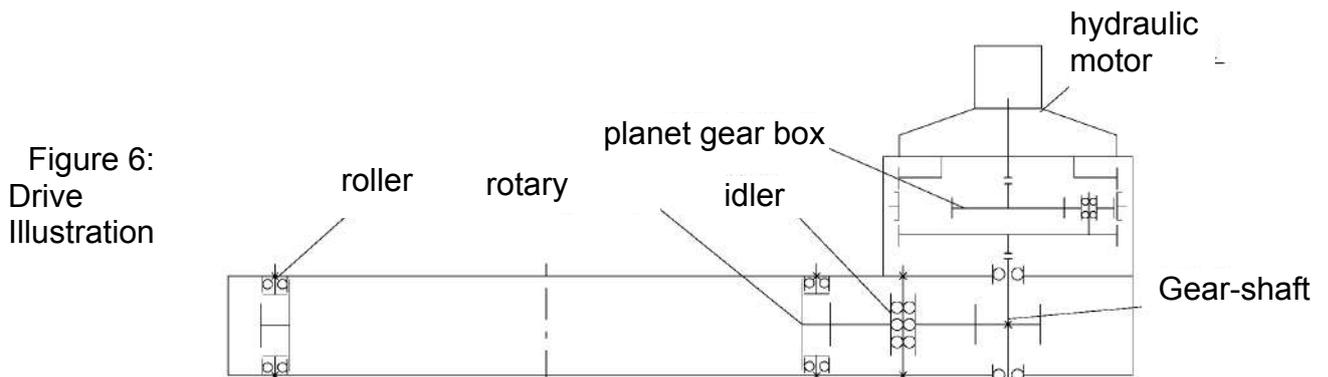
3.1.1 Main parts

Refer to figure 2, the master tong includes hydraulic motor, gear train, triple gear, idler, rotary gear, jaw holder, jaw, cam, brake band and housing.

3.1.2 Gear train

Refer to Fig.6, the force from hydraulic motor goes through planet gearbox, gear-shaft, idler, and then is transferred to the rotary gear. The force passes through cams, jaws and dies and eventually reaches the casing coupling. The rotary gear is of hollow structure, located and supported by the rollers around housing. The master tong is driven by the low-speed large-torque motor, which will simplify the force transfer system and increase transmission efficiency.

As through planet gearbox, two kinds of output speed are available.



3.1.3 Gripping theory

Jaws are mounted on the jaw holder and cams are fixed with the rotary gear. Brake bands mounted on the cage plate will produce friction force on jaw holder. When rotary gear starts to rotate, rollers in the jaws will roll up onto the curve surface of cams, consequently, the jaws will slide along the sideway on the jaw holders, and will gradually go to contact with the surface of the coupling. When the torque is larger than the brake force, the jaw holder, the jaw and the coupling will rotate along with the rotary gear. This procedure realizes the connection of coupling and pipe.

3.1.4 Measuring rotary turns

There is one circuit of tooth on brake drum, and the teeth distribute every 6 degree. A photoelectric sensor may be installed on the side. When the brake drum rotates along with the jaw holder and one tooth matches with one pulse, that will fulfill the measuring of rounds.

3.1.5 The theory and structure of backing pin

Backing pin is designed for change of makeup and breakout. It locates in the jaw holder of master tong. There are two holes in the jaw holder for makeup and breakout respectively. In the rotary gear are cut with two curve grooves, reversing process is the process of the backing pin into the two grooves. Refer to Figure 7.

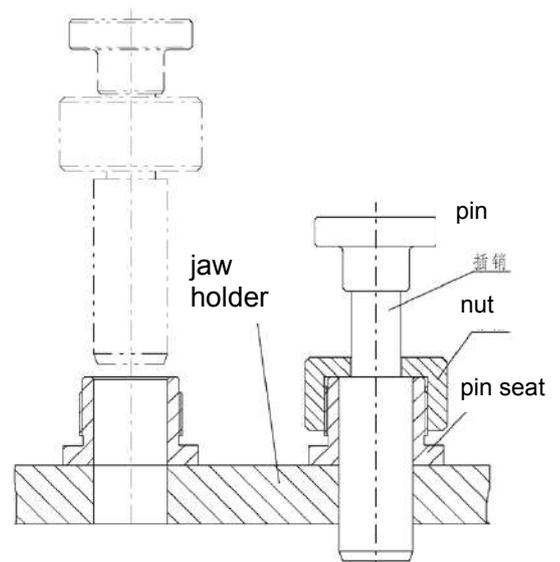


Figure 7 : Backing pin configuration

Operation Process:

1. Making-up

For making-up, rotate the master tong to maximum opening, then loosen the screw cap for backing pin. Pull out the backing pin and insert it into hole marked “make up”. Tighten the screw cap. It is ready for making up.

2. Breaking-out

For breaking-out, rotate the master tong to maximum opening, then loosen the screw cap for backing pin. Pull out the backing pin and insert it into hole marked “break out”. Tighten the screw cap. It is ready for making up.

3.2 Backup Tong

3.2.1 Main parts

Refer to Figure 3, main parts for backup tong include: cylinder, jaw holder, jaw, cam, housing, rocking arm, moving frame and swinging rack.

3.2.2 Drive and grip principle

Tong head structure and grip principle for backup tong are the same with master tong, except that the cams in backup tong do not turn. Cams are fitted in the backup tong housing, and jaws are installed in the jaw holders. When jaw holder is pushed by air cylinder and turns to a certain angle, roller in the jaw will go up along the cam surface. And simultaneously jaw will slide along the jaw holder sideway and goes towards pipe

body.

3.2.3 Change of makeup and breakout

The change of makeup and breakout are completed by changing the connection position of cylinder fork with rocking arm. Refer to Figure 3.

3.2.3.1 Makeup

Connect the cylinder fork with top rocking arm via insert pin. Air goes into top cavity of cylinder and pull downward the jaw holder and keeps jaws bite pipe body. If air goes into bottom cavity, jaws will release pipe.

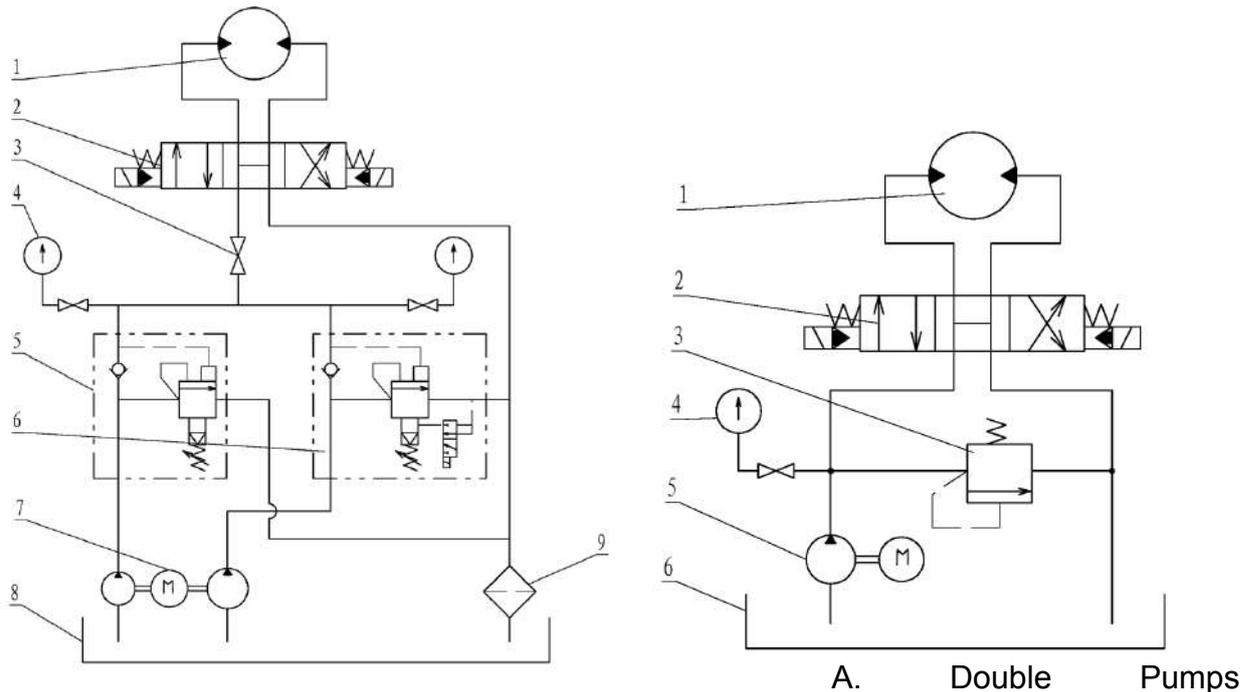
3.2.3.2 Breakout

Connect the cylinder fork with bottom rocking arm via insert pin. Air goes into bottom cavity of cylinder and pull upward the jaw holder and keeps jaws bite pipe body. If air goes into bottom cavity, jaws will release pipe.

Note: If casing is fed into bucking unit from right hand, the connection position of cylinder fork and rocking arm for makeup and breakout are on the contrary.

3.3 Hydraulic Control System(see Figure 8)

The hydraulic system includes reservoir, pump assembly, discharge relief valve, pressure gauge, and electro hydraulic reverse valve and hydraulic motor for master tong. Variable pump is to supply pressure oil for hydraulic motor of master tong, and electro hydraulic reverse valve is to control rotation of master tong head.



B. Single Pump

- 1.hydraulic motor
- 2.electrohydraulic reverse valve
- 3.stop valve
- 4.pressure gauge
- 5&6.discharge relief valve
- 7.double-pump assembly
- 8.oil reservoir
- 9.filter

- 1.hydraulic motor
- 2. electro hydraulic reverse valve
- 3.relief valve
- 4.pressure gauge
- 5.single-pump assembly
- 6.oil reservoir

Figure 8: Illustration of Hydraulic System

3.3.1 Flow adjustment

Refer to Figure 9, pump flow can be adjusted through rotating the hand wheel. For double pumps assembly, big pump flow can be adjusted within the range from 0 to 160L/min, and small pump can be adjusted within the range from 0 to 40L/min. For single pump assembly, flow can be adjusted within the range from 0 to 160L/min. Flow adjustment can be showed on the dial. Scale range is from 0 to 10. Scale 10 indicates the corresponding flow is 160L/min or 40L/min. Lock tight the hand wheel with lock nut after flow adjustment is finished.

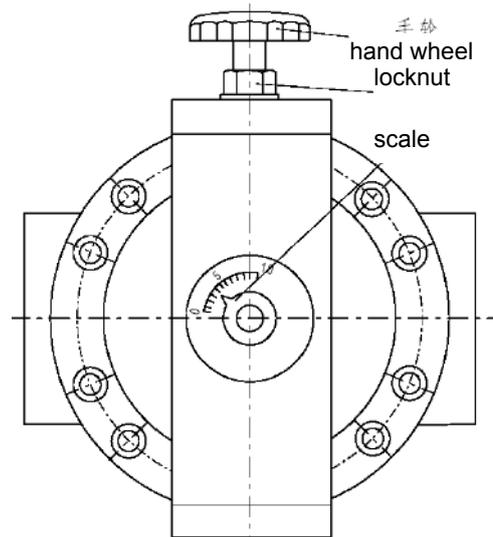


Figure 9: Flow Adjustment Illustration for Pump

3.3.2 Adjustment of System Pressure

Refer to Fig. 8, system pressure can be adjusted through the relief valve of the power unit. Increase or decrease pressure as per the arrow direction shows under the handwheel of relief valve. For double-pump system, the pressure is adjusted through discharge relief valve 5 (Fig.8, A). For single pump system, its pressure adjustment is finished via relief valve 3 (Fig.8, B). Pressure adjustment depends on different pipes and take the API recommended maximum makeup torque plus extra 10%. If torque not enough increase for a little, but not over 20MPa.

3.3.3 Adjusting way for double-pump power unit during addressing special joint. (for reference)

Pressure adjusting: Refer to Fig.8(A) first shut off stop valve (3) at outlet of power unit. Adjust discharge relief valve for small pump system to 20MPa. Then increase pressure for 3~5MPa by adjusting discharge relief valve (6) for big pump system. Open the stop valve after adjusting.

Flow adjusting: Adjust the flow of big pump to scale 7~9 (equal to 110~125L/min), and adjust the flow of small pump to scale 3 (equal to 10L/min).

Operation: For making up, two pumps will work together. Once reaches the No.1 torque value, the big pump begins to overflow, and the bucking unit continues to perform making-up. If reaches the No.2 torque value, control console will start the big pump to discharge, while small pump continues to work, and once up to rated torque, the control console will start reverse valve to shut off.

3.3.4 Pneumatic Control System

Refer to Fig.10, pneumatic system involves air source, air reservoir, electric-controlled air valve and air cylinders. There are two cylinders to control shifting and gripping of backup tong respectively.

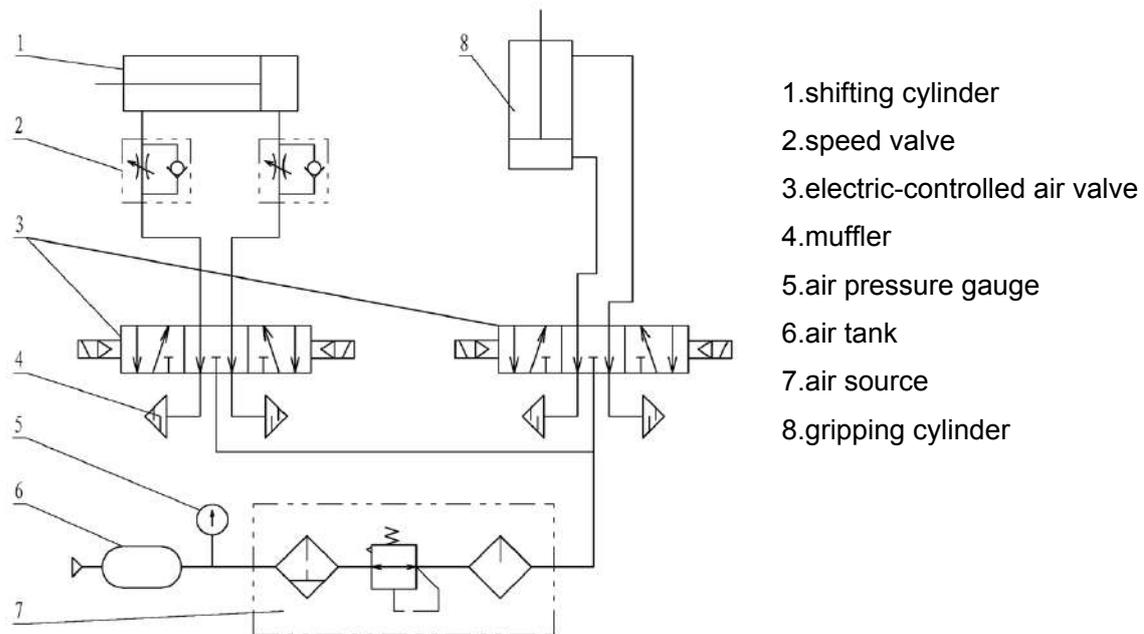


Figure 11 Schematic Diagram for Pneumatic System

4. Installation and Debugging

4.1 Preparation

- 4.1.1 Check foundation to ensure the installation qualification.
- 4.1.2 A lifting appliance with capacity up to 5ton is available.
- 4.1.3 Must provide installing tools, casings and hydraulic oil for debugging.
- 4.1.4 Air source of 0.4~1MPa is available.

4.2 Installation

- 4.2.1 Refer to Fig.5, set the bucking unit, hydraulic power unit and control cabinet in place, and tighten with foot bolts. Master tong central line should be at the same shaft with rolling track for the product line.
- 4.2.2 Select the appropriate jaws for master tong and backup tong, and install in place.
- 4.2.3 According to the drawing to correctly connect electric circuits, oil lines and air lines.
- 4.2.4 Add N46 anti-wear hydraulic oil into the oil reservoir until to the central line of oil pointer. Then check to ensure no oil and air leaking. (In winter you may choose N32 anti-wear hydraulic oil).
- 4.2.5 Switch on all electric supplies.

4.3 Trial run steps

- 4.3.1 Start the hydraulic power unit and watch if leaking or abnormal noise appears.
- 4.3.2 Start the oil motor of master tong for idle run. Keep the pressure around 2MPa, and check if run normally. .
- 4.3.3 Continue run the oil motor for 3~5 minutes to eliminate air inside motor and lines.

- 4.3.4 Run the hydraulic motor in both directions and test the restoration mechanism of tong head.
- 4.3.5 Check the air pressure to ensure it within the range 0.4~1.0MPa.
- 4.3.6 Operate the gripping cylinder to ensure smooth running.
- 4.3.7 Operate the shifting cylinder to ensure smooth running.
- 4.3.8 If torque not enough, increase pressure but not over 20MPa.

5.Operation Instructions

5.1 Manual operation

When need manual operation, put the reverse button to “manual” position.

※Making-up※

- 1.Switch on the electric supply For HPU, and let the oil pump run.
- 2.Open the air valve to feed air into the air reservoir.
- 3.Check the backing pin on the master tong to ensure it in the “makeup” position.
- 4.Check the piston rod of the gripping cylinder on the backup tong to ensure it be connected to “makeup” position.
- 5.Rotate the master tong and let its mouth open for entry of casing.
- 6.Rotate the backup tong and let its mouth open for entry of casing.
- 7.Press “feed’ button and move the pre-connected casing into its work position, normally set the casing coupling at master tong central line.
- 8.Operate the backup tong to clamp pipe body.
- 9.Operate the master tong to grip coupling, and start to rotate, and then stop until torque up to the API recommended value.
- 10.Release the master tong and then the backup tong.
- 11.Retreat the casing from production line.
- 12.Continue the operation as per the steps from 7 to 11.

※Breaking-out※

- 1.Switch on the power supply for HPU, and let the oil pump run.
- 2.Open the air valve to feed air into the air reservoir.
- 3.Check the backing pin of the master tong to ensure it in the “breakout” position.
- 4.Check the piston rod of the gripping cylinder of the backup tong to ensure it be connected to “Breakout’ position.
- 5.Rotate the master tong and let its mouth open for entry of casing.
- 6.Rotate the backup tong and let its mouth open for entry of casing.
- 7.Press “feed” button and move the pre-connected casing into its work position, normally set the casing coupling at master tong central line.
- 8.Operate the backup tong to grip pipe body.
- 9.Operate the master tong to grip coupling, and start to break out until the coupling can

be screw out by hand.

10. Release the master tong firstly, and then release the backup tong.

11. Retreat the casing from production line.

12. Repeat the steps 7~11 to continue the operation.

5.2 Automatic Operation

Normal operation should be automatic. Set the reverse button at option column for action mode on the control console to “automatic” position. The bucking unit will complete its functions as the following steps.

1. Let the pipe with coupling go into “makeup” state from “idle” state.

2. Feed the pipe into bucking unit and decrease speed after the pipe enters into the backup tong, and then stop until the pipe reaches the master tong.

3. The backup tong will clamp the pipe tightly.

4. The master tong will bite the coupling and bring it to rotate.

5. When torque up to the preset value, the master tong will rotate in the contrary direction and release the pipe. And subsequently the backup tong will release.

6. Retreat the casing from the bucking unit.

7. Shift the pipe to the “feed out” position, and feed in the next pipe, and start a new turn of operation.

8. When abnormal things occur, press the “emergency” button to stop the action of the bucking unit.

6. Maintenance

It is recommended to establish a responsibility system for the bucking unit, and set up maintenance plan. Perform washing, lubricating and adjusting works in a regular interval.

6.1 Washing

6.1.1 To wash or replace the filters for hydraulic system as necessary according to the actual service condition.

6.1.2 Replace the hydraulic oil after one month use of a new bucking unit. Subsequently, change the oil every half year. In the process of operation, fluid level should not be below the lowest limit of oil pointer.

6.1.3 The replaced jaws should be washed clean and blew dry, and apply grease on the surface of rollers and shafts.

6.2 Diluted oil lubrication

Use L-CKC gear compound for lubrication in the gearbox of master tong. Refer to Figure 11, screw out the plug in oil-feed port (1) at top of the master tong, and add oil to middle line of oil pointer (4).

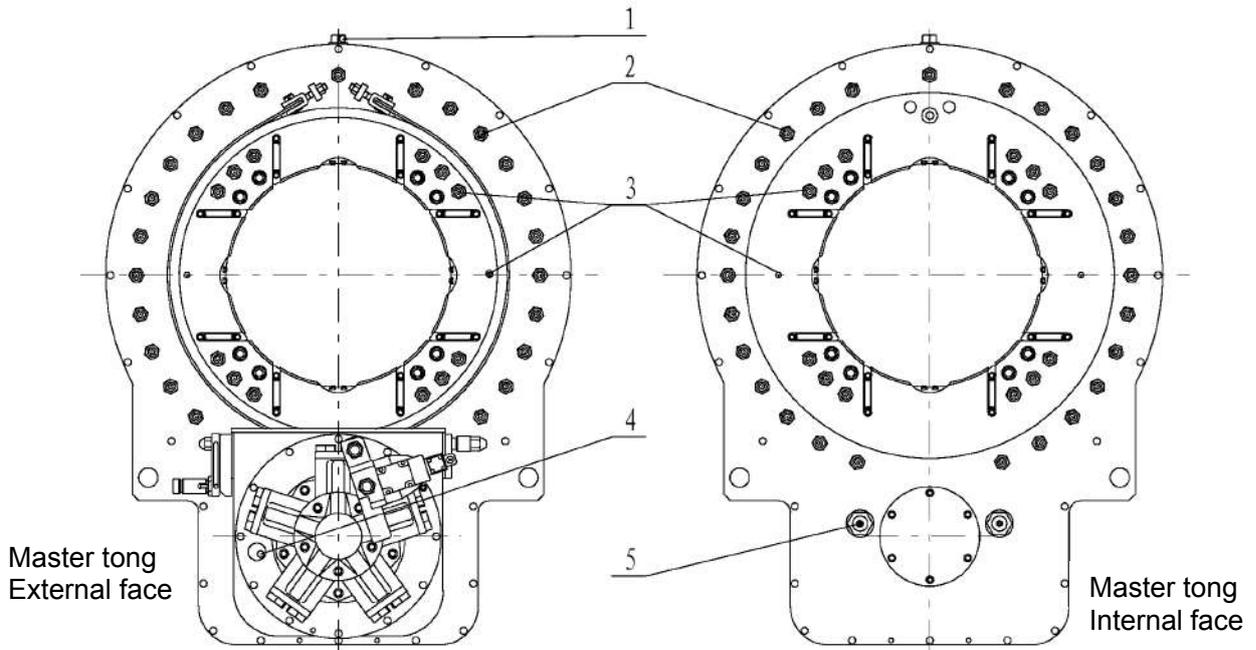


Figure 11: Lubrication Illustration for Master Tong

6.3 Grease lubrication

Apply grease on the following parts: Tong head, rollers and bearings for idlers (see Fig.11) of master tong; tong head, shaft seat for gripping cylinder, bearings for stud of swing rack, and roller wheel for backup tong(see Fig.12); bearing for rear wheel support (See Fig.12).

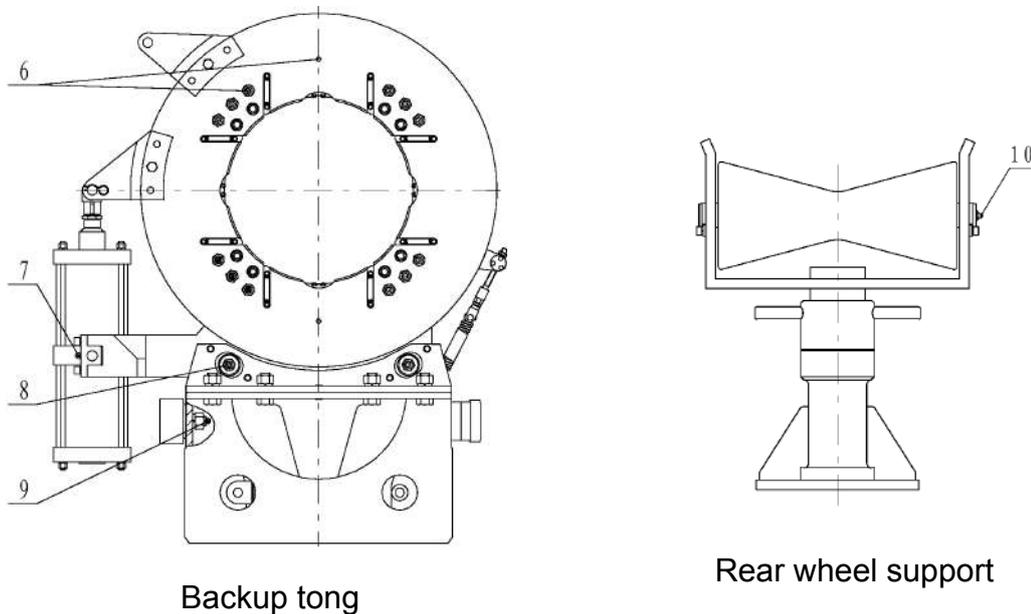


Figure 12: Lubrication Illustration for Backup Tong and Rear Wheel Support

Normally inject grease once each month. Refer to Table 5 for numbers and distribution of grease fittings. To inject No. 3 calcium base grease from the grease fittings (2), (3) and (5).

Table 5: Distribution and Numbers of Grease Fittings

Item	2	3	5	6	7	8	9	10
Location	Roller, master tong	Idler, master tong	Tong head, master	Tong head, backup	Swing rack bearing, backup	Grip cylinder shaft seat, backup	Wheel, backup tong	Bearing, Rear rack support
Nipple Numbers	54	28	2	28	4	2	4	1

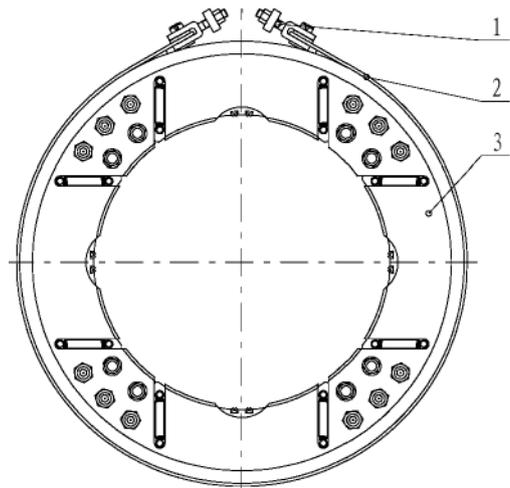
6.4 Adjustment

6.4.1 Band adjustment of master tong

During the use of master tong, wear will occur on the brake band. If band is too loose, it is easy to cause slippery of tong head, so adjust the adjusting bolts at two ends of the band to tighten the band. Increased friction resistance will help the tong head to clamp pipe. See Figure 13.

1. adjusting bolt 2. brake band 3. tong head

Figure 13: Brake Band Adjustment



6.4.2 Float adjustment for backup tong

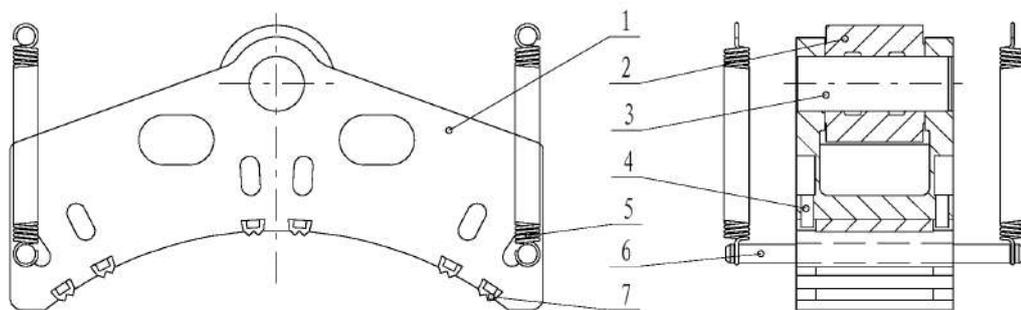
During the use of backup tong, float will decrease due to deformation of springs. Refer to Fig. 3. Firstly adjust the balance mechanism (2) to set the swing rack (9) at middle position, and promise the equal of right and left clearance. Then adjust the bolt in supporting roller inside the swing rack and ensure the equal of clearance

6.5 Replacement of wearing parts

To meet the need for handling different pipe sizes, the jaws for master tong and backup tong may be replaced with appropriate ones.

6.5.1 Replacement of jaws

Refer to Fig. 14, when replacing jaws, firstly remove out spring (5) from pin (6), then pull out the pin and take out jaw from jaw rack. Installation is as the reverse procedure.



1.jaw body 2. roller 3.pin 4.spring pin 5.spring 6.pin 7.die

Figure 15: Structural Drawing for Jaw Parts

6.5.2 Replacement of dies

Long term use of the equipment will cause wear of dies, and effect clamping. So it is necessary to replace dies.

Refer to Figure 14, it is no need to take out the jaw or die plate, only need to rotate the tong head and make jaw extend out . Pull out the spring pin (4) in the top side of die (7) and remove out the used die. Insert a new die and hit the spring pin in.

6.5.3 Replacement of roller and pin

Take out jaw according to the replacing way for jaws, and hit out the pin (3), then it is accessible to take out roller (2) for maintenance or replacement. See Fig. 14.

7.Troubleshooting

Problem	Reasons	Solutions
Dies slipping.	<ul style="list-style-type: none"> ① Dull dies. ② Die grooves plugged with dirties. ③ Brake band of master tong adjusted insufficient, and cause jaws not move to cam. ④ Air pressure too low. ⑤ Gripping cylinder of backup tong leaking. ⑥ Wrong location of backing pin for master tong. ⑦ Wrong location of fork pin for gripping cylinder of backup tong . 	<ul style="list-style-type: none"> ① Replace dies. ② Clean with wire brush. ③ Adjust the band. ④ Turn on air pump to increase pressure. ⑤ Replace seal rings. ⑥ Re-insert the backing pin to correct position. ⑦ Insert the fork pin to correct hole.
Master tong will not run.	<ul style="list-style-type: none"> ① System pressure not enough. ② Hydraulic motor damaged. 	<ul style="list-style-type: none"> ① Set system pressure to the indicated value in Table 4. ② Repair or replace the motor.
Hydraulic system overheating.	<ul style="list-style-type: none"> ① Cooling facility not start. ② Oil viscosity too high or too low. ③ Oil level in reservoir too low for proper cooling. 	<ul style="list-style-type: none"> ① Turn on the cooling facility. ② Change oil. ③ Maintain proper oil level.
Hydraulic pressure insufficient.	<ul style="list-style-type: none"> ① Oil leaking of hydraulic line. ② Relief valve damaged. ③ Relief pressure is set too low. 	<ul style="list-style-type: none"> ① Check lines and replace seal rings. ② Repair or replace relief valve. ③ Reset relief pressure.
Failure of jaws to grip pipe.	<ul style="list-style-type: none"> ① Wrong position of backing pin for master tong. ② Not correct location of gripping cylinder fork for backup tong. ③ Not appropriate jaws or die plates. 	<ul style="list-style-type: none"> ① Insert the backing pin into correct position. ② Change connection position of cylinder fork with swing arm. ③ Replace with correct jaws or die plates.

8. Some Instructions

8.1 Selection for hydraulic oil

8.1.1 It is recommended to use N46 anti-wear oil, and may use N32 anti-wear oil in winter.

8.1.2 Not allow contaminants in oil over 0.05-0.1mm.

8.1.3 Keep oil in the reservoir within the range from 15°C to 70°C.

8.1.4 Check regularly oil for change of quality or viscosity. To filter or replace the oil if contaminants excessive.

8.1.5 Maximum working pressure for hydraulic system no over 20MPa.

8.2 Sizes for jaws and die plates.

To meet the requirements for handling different casings and couplings. The bucking unit is fitted with full range of jaws from 9⁵/₈" to 20". Pay attention to the differences of jaws of master tong and backup tong.

8.2.1 Jaw sizes

Standard jaws for master tong and backup tong include 7 sizes: 9⁵/₈", 10³/₄", 11³/₄", 13³/₈", 16", 18⁵/₈" and 20".

9. API specifications for coupling surface defects.

Refer to Table 6 for allowable gripping mark depth on coupling after connection, according to API specifications for defect allowable depth on coupling surface.

Table 6: Allowable Mark Depth on Coupling Surface (mm)

Applicable pipe size for coupling (in)		Group1, group 2 (except C90 and T95 steel) and group 3		Group 2 (except C90 and T95 steel) and group 4
		Dot and round gouge	Clamp and sharp gouge	Dot and round gouge Clamp and sharp gouge
Tubing	<3 ¹ / ₂	0.76	0.64	0.76
	≥3 ¹ / ₂ ~≤4 ¹ / ₂	1.14	0.76	0.89
	<6 ⁵ / ₈	0.89	0.76	0.76
Casing	≥6 ⁵ / ₈ ~≤7 ⁵ / ₈	1.14	1.02	0.89
	>7 ⁵ / ₈	1.52	1.02	0.89

These data come from API Spec 5CT specification for casing and tubing, seventh edition, 2001.