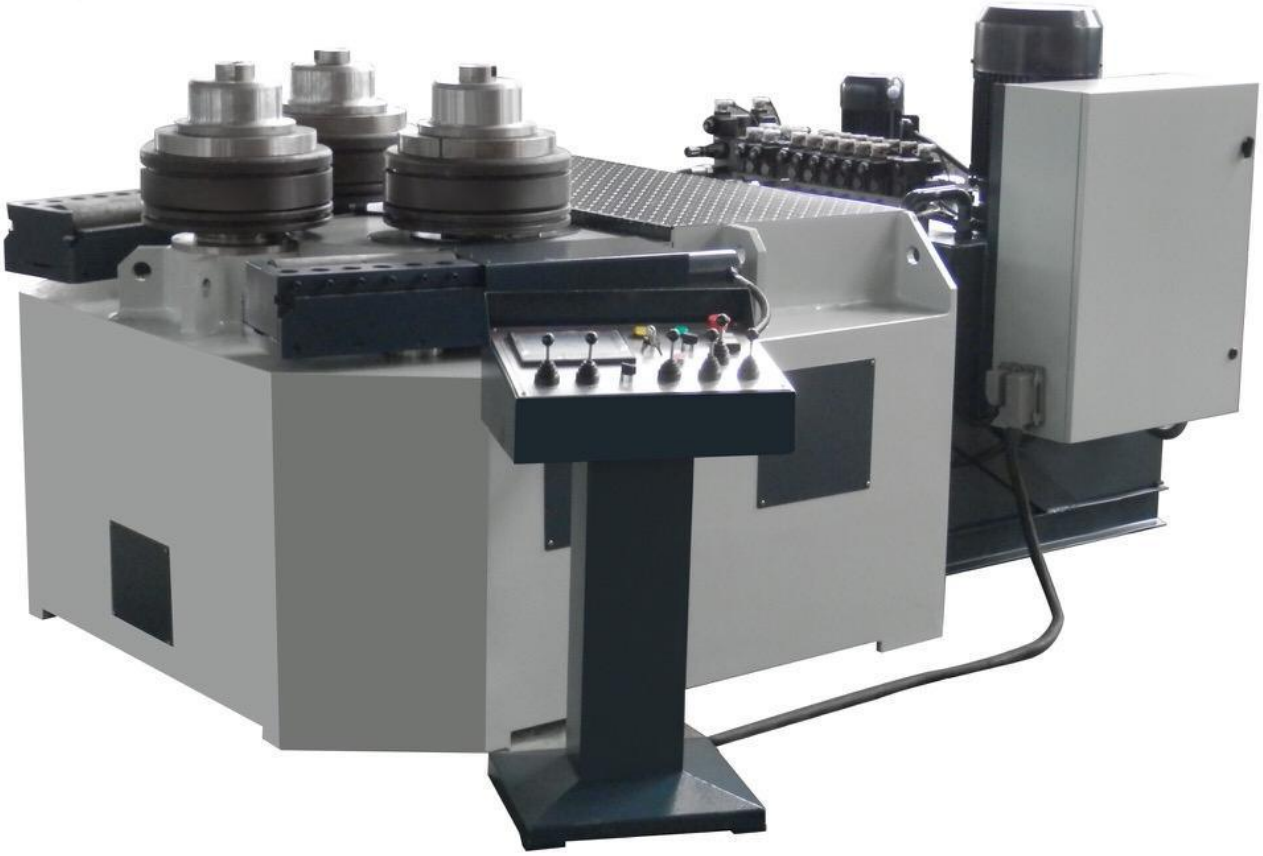
Keywords: Angle Roller, Profile Bending Machine, Angle Rolling Equipment, Angle Rolling Machine, Angle Roll, Section Bending Machine, Angle Bending Machine, Profile Bending Machine, Angle Rolling Equipment, Angle Rolling Machine, Angle Rolls, Section Benders, Angle Steel Bending Machine, Steel Angle Rolling Machine

W24S-75 Profile Bending Machine Operating Manual



Nantong Borisbang Industrial Technology Co.,Ltd.

Catalogue

1, Purpose and basic parameters of the machine

1.1, Purpose of the machine

This machine is a three-roller profile bending machine with an arc-down type, which is a general equipment specially used for profile bending. The equipment can be used to roll profiles into circular, curved, spiral and other workpieces, widely used in petroleum, chemical, shipbuilding, hydropower, metal structure and machinery manufacturing industries.

W24S-75 Profile Bending Machine Technical Parameters

Technical parameters \ Device model	Unit	W24S-75
The Max bending section modulus of profile	Cm^3	75
Bending speed	m/min	4.5
Material yield limit	MPa	α 5=235
Oil pump motor	kW	11

Diameter of shaft		mm	Upper shaft φ140, lower shaft φ130
Standard roller diameter		mm	Φ385
Size		mm	1600*1600*1345
Angle bar bending (outer bending)	Max section	mm	120*120*12
	Min bending diameter	mm	Φ1500
Angle bar bending (inner bending)	Max section	mm	120*120*12
	Min bending diameter	mm	Φ2000
Flat steel vertical-bending	Max section	mm	120*25
	Min bending diameter	mm	Φ1000
Flat steel plane-bending	Max section	mm	250*30
	Min bending diameter	mm	Φ1000
U-steel	Max section	mm	200
	Min bending diameter	mm	Φ1000
Rectangular tube	Max section	mm	100*100*6
	Min bending diameter	mm	Φ2000
I-beam	Max section	mm	200
	Min bending diameter	mm	Φ1000
Square steel	Max section	mm	70*70
	Min bending diameter	mm	Φ800
Circular tube	Max section	mm	140*4
	Min bending diameter	mm	Φ1800
Remarks: except for round steel and round tupe moulds.			

2, Overview of the structure and performance of the machine

2.1, Overview of the structure

The machine is an arc-down three-roll profile bending machine. The shape of the machine (see Figure 1), the body is welded with steel plate. The main roller performs a rotary motion by the power transmitted by the hydraulic motor, the gear, and the sprocket. The two side rollers can move in an arc around the central shaft. The power transmitted by the hydraulic motor and the gears is rotated simultaneously with the main shaft.. The support rollers are mounted on both sides of the side rollers, so that the

support rollers can do arc motion with the side rollers. Lifting movements can be made through the respective lifting cylinders. Transmission diagram (see Figure 2).

2.2, Performance of the machine

The three rollers of the machine are all driving rollers. The end of the profile can be pre-bent during rolling, and the distortion of the profile during rolling can be corrected by adjusting the guide roll.

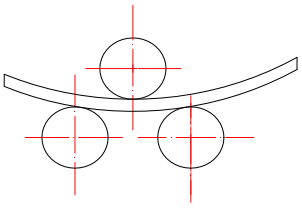
All of the above movements are achieved by button operations on the electrical control cabinet.

Note: During the rolling process, the rotary motion of the three rollers and the lifting movement of the side rollers cannot be performed at the same time to avoid malfunction. After the three rollers are installed, the side rollers can be lifted and moved. After the mold of three rollers are installed, the side rollers can be raised and lowered.

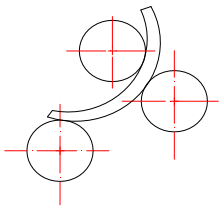
3, Pre-bending and rolling of the machine

3.1, Operation name

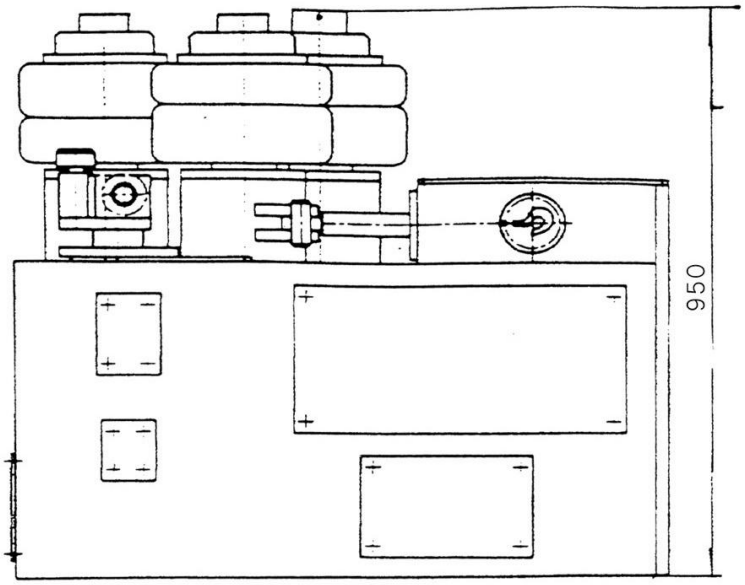
Operations can be divided into symmetrical bending and asymmetric bending:

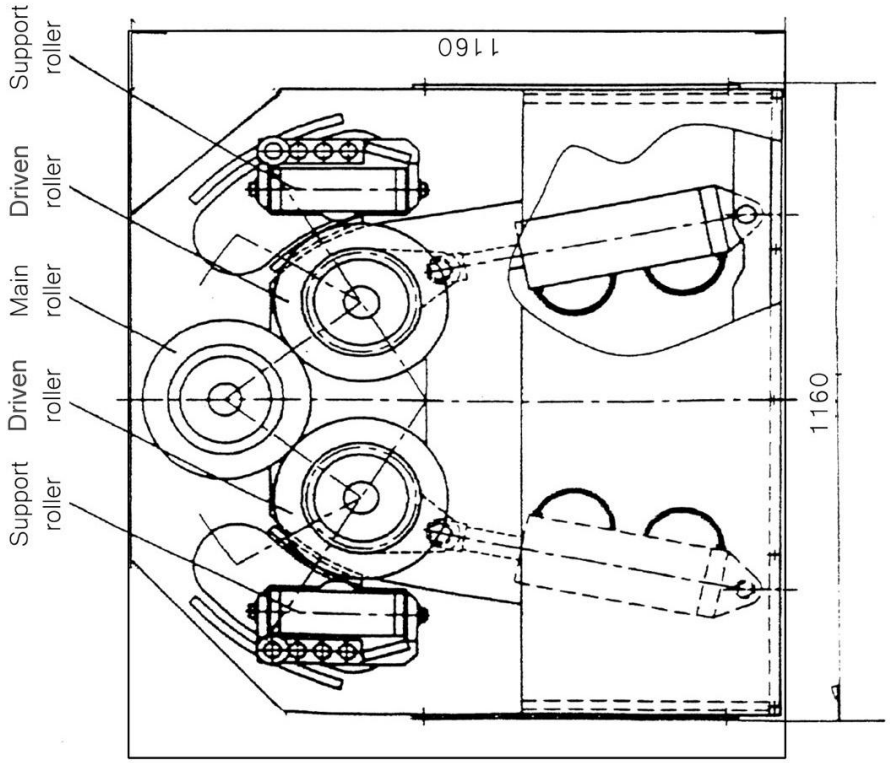


symmetric bending

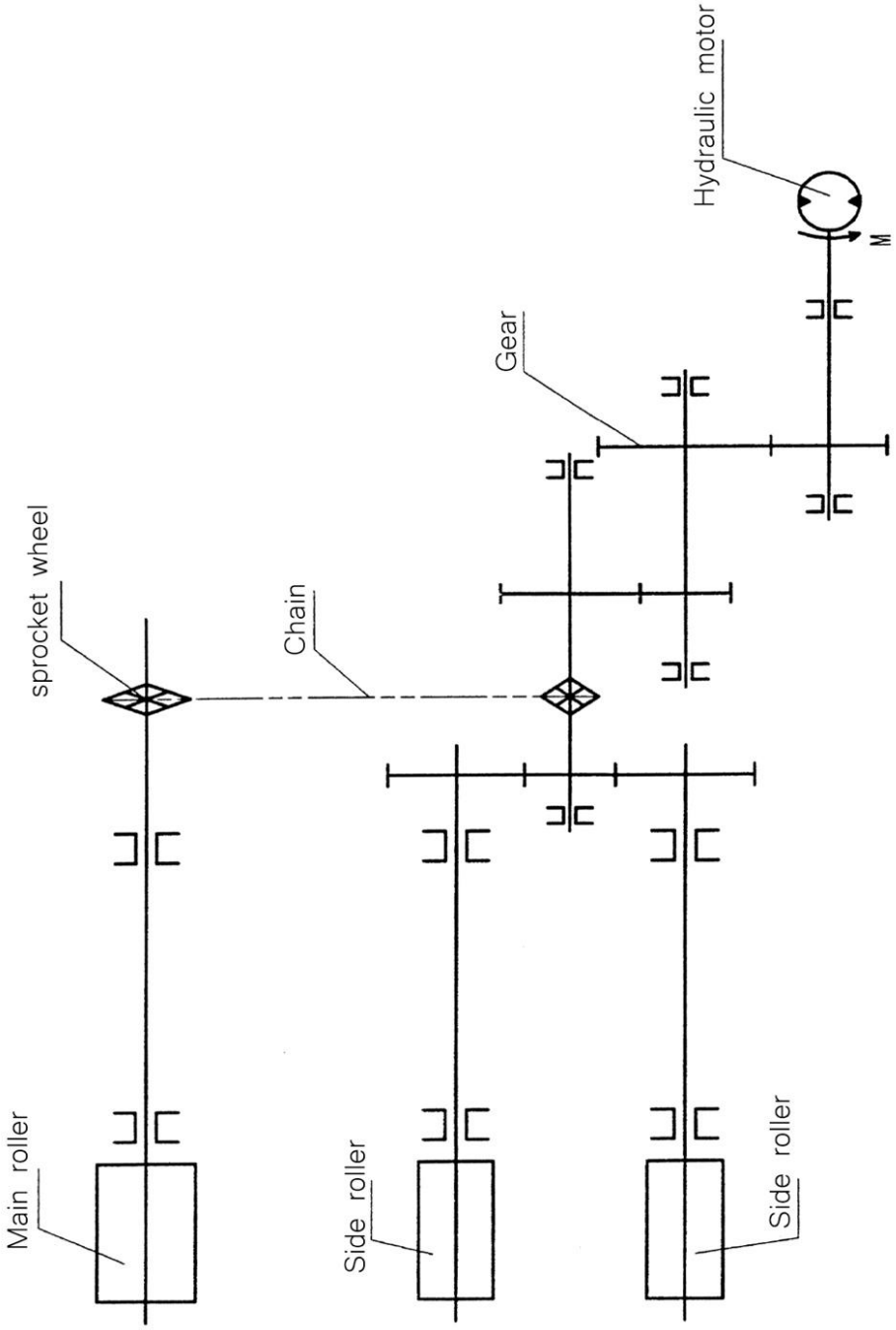


asymmetric bending





Machine shape diagram



Drive system diagram

3.2, Universal mold combination

The general mold combination is as follows: the mold bending profile

specifications are limited, users should put forward the required bending profile specifications and varieties when ordering, in order to prepare different molds.

No.: 1, small standard roll 2, drive roll 3, large standard roll

4, bolt for drive roller 5, chuck 6, clamping ring 7. screw

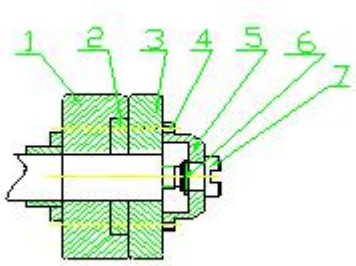


Figure 3-1

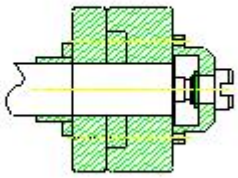


Figure 3-2

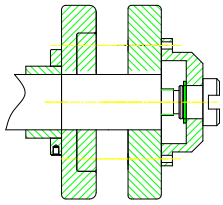


Figure 3-3

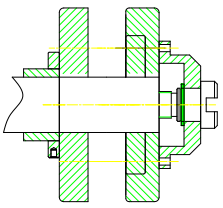


Figure 3-4

3.3, Rolling method

There are three types of rolling methods, as shown in the figure.

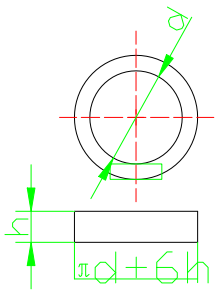


Figure 3-5

Rolling method 1, Figure 3-5 is suitable for heavy workpieces, cutting the remaining straight edges after bending into a circle or when rolling to a certain arc.

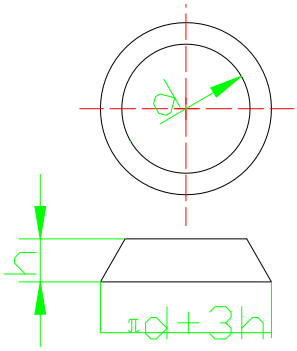


Figure 3-6

Rolling method 2, Figure 3-6 is suitable for medium and small profiles, or single-piece rolling. The angle must be cut before rolling, end bending adopts asymmetric bending.

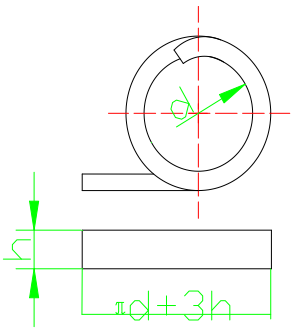
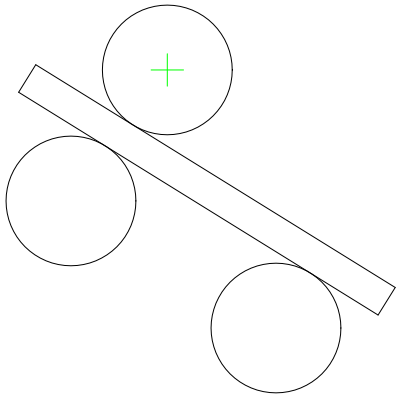


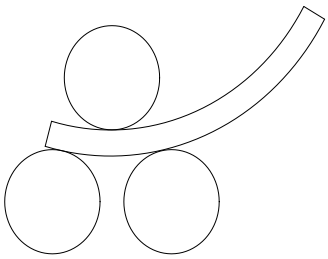
Figure 3-7

Rolling method 3, Figure 3-7 Applicable to all kinds of profiles, the workpiece with a large diameter of a single curved bending diameter.

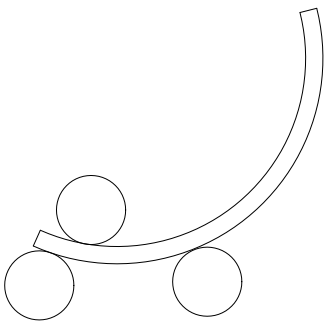
Pre-bending and rolling process



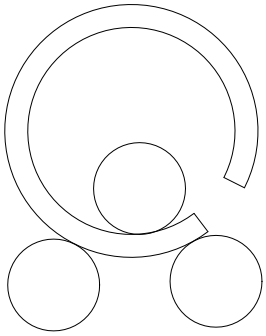
(1), The right roller is in the lower limit position, the left roller moves to the contact workpiece, and clamps the workpiece with the main roller.



(2), The right roller slowly rises and begins to roll, pre-bending between the main roller and the left roller.



(3), The left roller is down, while the right roller is up, send the material to the left side, and three rollers began to roll, pre-bend between the main roll and the right roller.



(4), Pre-bending and rolling end.

3.4, Rolling of flat steel and square steel

Flat steel and square steel are symmetrical profiles, which are easy to roll, and the pre-bending adopts asymmetric bending. A certain degree of distortion is unavoidable, if one or less times of roll, the distortion can be reduced. If the workpiece is rolled in multiple passes, it is necessary to increase the gap of the molds.

When rolling, please follow the basic parameters on the first page.

The friction clutch should be adjusted to a loose state.

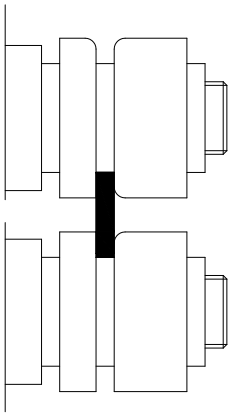


Figure 3-8

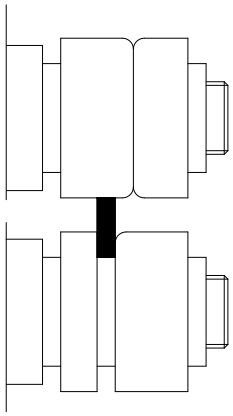


Figure 3-9

Figure 3-8 mold combination: use the form of Figure 3-1. It is suitable for profiles with large section modulus and high height. When rolling, the mold retains at least 0.5mm gap.

Figure 3-9 Mold combination: The upper roller is in the form of Figure 3-2 or Figure 3-3, and the two lower rollers are in the form of Figure 3-1. It is suitable for the rolling of profiles with large section modulus and small height, small square steel also adopts this combination for bending.

As shown in FIG. 3-8 and 3-9, the third spiral rolling method is not allowed.

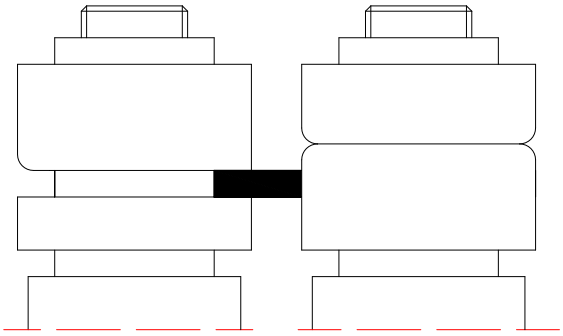


Figure 3-10

Figure 3-10 is suitable for small profile mold combinations. Rolling is performed as shown in the first or second method as shown.

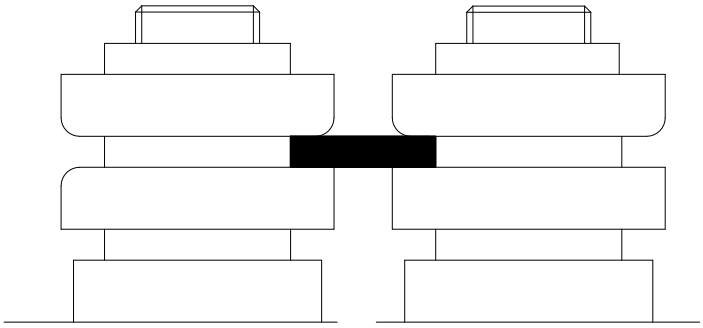


Figure 3-11

Figure 3-11 is suitable for combination of profile mold with large section. As shown in the figure, three rolling methods can be adopted, especially the third method.

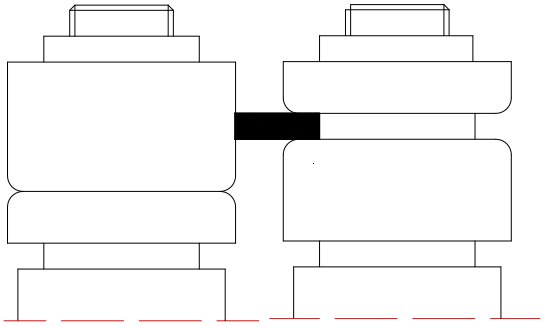


Figure 3-12

Figure 3-12 applies to the combination of profile molds with small section height, as shown in the figure, and the rest are the same as shown in figure 3-11.

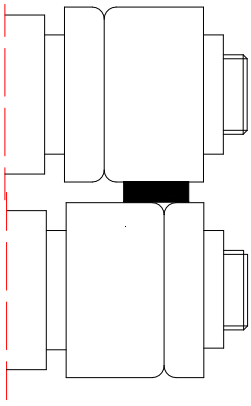


Figure 3-13

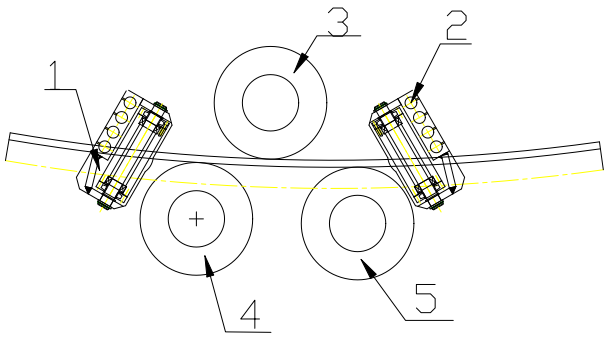
The flat bend of flat steel, and square steel bending can be combined with optional molds.

Adopts asymmetric bending, the side rollers rise slowly, otherwise the material will be distorted. Adjusting the guide rollers to the same distance, one side profile has the correct angle relative to the roller axis, it is suitable for small workpieces with small bending stress. There will be a slippage during the bending process, mainly due to the small friction during feeding, increasing the roller clamping force eliminates slippage.

The profile can be bent into a circular workpiece of a diameter slightly larger than the diameter of the mold, and the friction clutch should be adjusted tightly.

5, Rolling of angle steel

5-1, Outer bending of angle bar Figure 3-14



No.: 1, large guide roller 2, small guide roller 3, main roller

4, left roller 5, right roller

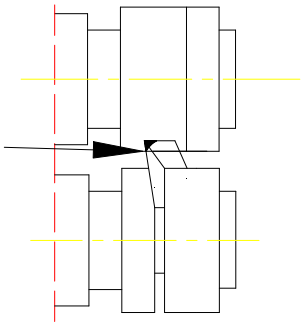


Figure 3-15

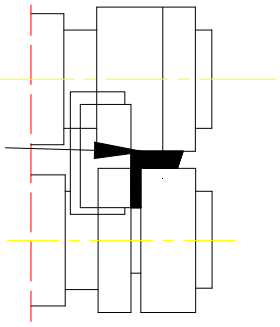


Figure 3-16

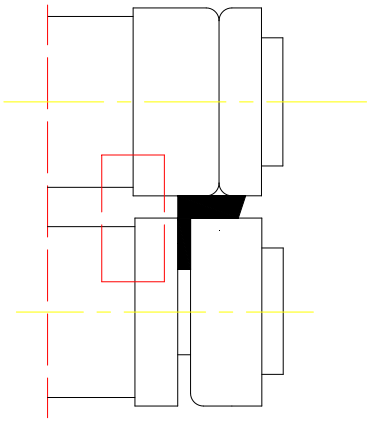


Figure 3-17

Overview of the outer bends of angle steel

The angle steel is an asymmetrical profile. When rolling, the distortion often

occurs. Therefore, the support roller needs to give the angle steel an anti-deformation external force when it is rolled, so that it can be corrected and the deformation can be reduced.

The support roller must be adjusted slowly to prevent the angled steel from twisting outward. The mold combination is shown in the figure. Pre-bending adopts asymmetric, rolling adopts symmetric, friction clutch should be adjusted loose.

5.2, Inner bending of angle bar

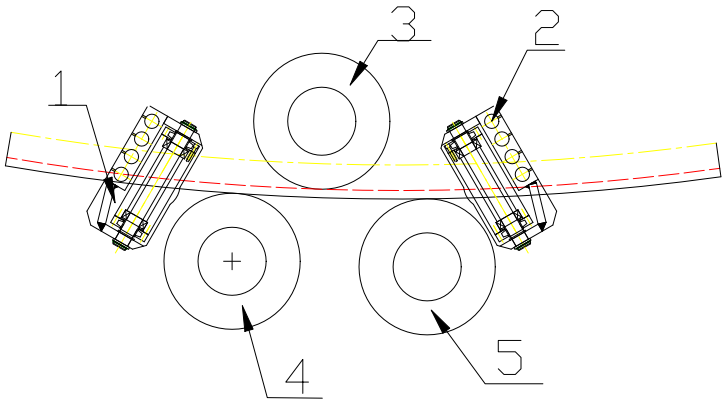


Figure 3-18

No.: 1, large guide roller 2, small guide roller 3, main roller

4, left roller 5, right roller

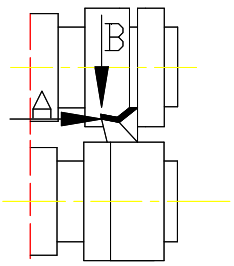


Figure 3-19

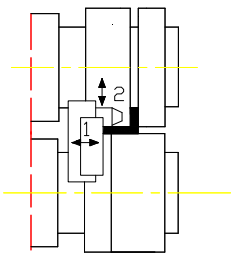


Figure 3-20

Overview of the inner bends of angle steel

The inner bending process of the angle steel is similar to the outer bending of the angle steel flange workpiece. As shown in Figure 3-19, two directions of distortion will occur during the bending process, so the large guide roller (1) and the small guide roller

(2) are used to provide the force, the small guide roller (2) is a torsion roller for adjustment.

The inner bends of angle steel is easy to produce distortion. Therefore, when the angle steel is inner bent, the diameter of the bent workpiece is larger than that of other profiles.

Bending

Symmetric adjustment

Start bending the workpiece at one end of the large guide roller, adjust the side roller and feed the workpiece to the tail of the small guide roller, adjust the guide roller so that the workpiece can be rolled back regularly, the large guide roller will be close to the flange end of the workpiece , guiding the workpiece out of the machine.

If the adjustment of the small guide roller is too large, the workpiece will twist to the inside.

When winding the workpiece, the other end will stop immediately when it reaches the middle of the large guide roller, and repeat winding on the other side with opposite direction. Make sure that the guide is in the correct position and then bend as above until the desired diameter is rounded. Be sure to adjust the guide to the correct position and then bend it as above method until it is bent into the circle of the desired diameter.

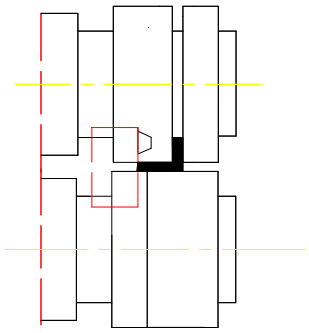


Figure 3-21

3.6, Rolling of T-shaped steel

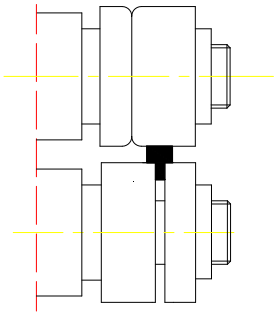


Figure 3-22

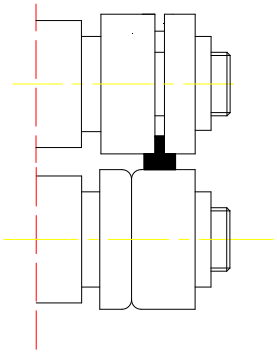


Figure 3-23

Outer bending of T-shaped steel

The mold combination is shown in Figure (3-22), adopts asymmetric bending, the side roller close to the main roller should not be too stressed, as this may cause twisting of the inner side during the beding and the friction clutch is tightly adjusted.

Inner bending of T-shaped steel

The mold combination is shown in Figure (3-23). The bending method is the same as above, and the friction clutch device is tightened, which is especially important for bending small diameter workpieces.. The friction clutch is tightened as above, which is especially important for bending small diameter workpieces.

3.7, Introduction to rolling of other profiles

3.7.1, Bending of I-beam

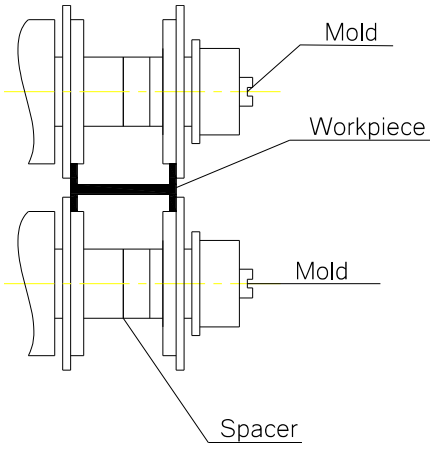


Figure 3-24

3.7.2, Bending of U-steel

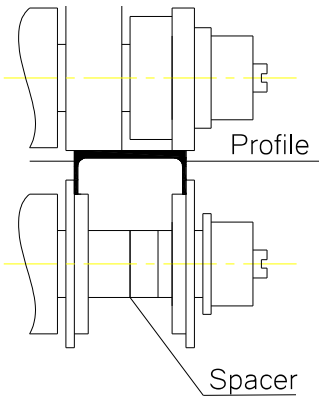


Figure 3-25

3.7.3, Bending of round steel

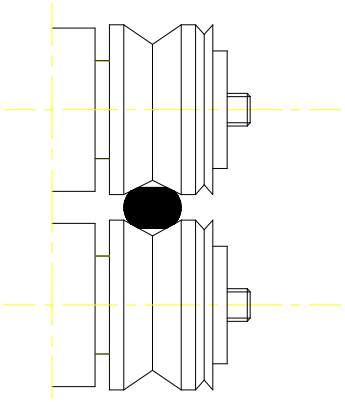


Figure 3-26

Special molds adopts one or more v-shaped grooves.

Adopts symmetrical bending.

Adjust the friction clutch slightly.

3.7.4, Bending of round steel

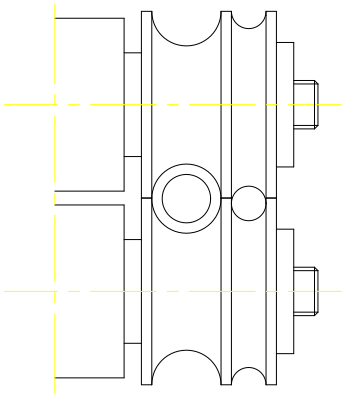


Figure 3-27

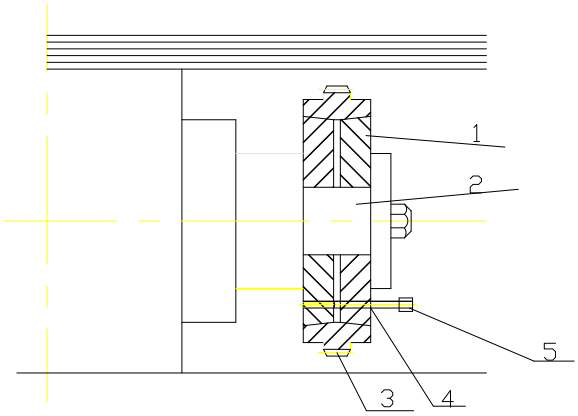
Special molds of different sizes are required for different types of workpieces.

Adopts asymmetric bending.

Due to the pressure in the neutral shaft, the neutral shaft is pulled, which will cause the workpiece to produce a certain oval deformation, which is related to wall thickness and curved diameter.

Excellent helical bending is possible. Adjust the friction clutch tight.

4, Friction clutch



No.: 1, Upper roller shaft 2, Friction block 3, Sprocket

4. Adjustment screw 5, Butterfly spring

Adjustment of friction clutch

After opening the cover, adjust the friction clutch.

The power transmission is adjusted by tightening and loosening the adjustment screw.

The friction clutch is set to a low power transmission state at the factory.

Note: The friction clutch cannot be tightened too tightly.

5, Lubrication

Reasonable lubrication of the machine is an effective measure to reduce power consumption and improve the life of the machine. Therefore, it is necessary to select a reasonable lubricating material and establish the necessary lubrication system.

5.1, Lubrication method

The lubrication of this machine is relatively simple, using oil cup lubrication and manual oiling. Lubrication of the oil cup and the surface of the transmission gear are required to be lubricated once a week. The remaining sliding surfaces and pin shafts of each other are manually filled with lubricating oil.

Other mutually moving sliding surface and pin shaft, each shift to manually add lubricating oil.

5.2, Selection of lubricating oil

For manual lubrication, use 40# mechanical oil. Oil cup lubrication point and gear surface, No. 2 calcium-based grease is used in summer, and No. 1 calcium-based grease is used in winter.

5.3, Lubrication system and precautions

The user should establish a specific lubrication system according to the specific system, load and operation of the machine.

5.3.1, The lubrication points must be well lubricated before starting the machine.

5.3.2, When the machine is in continuous operation, the interval between lubrications should be shortened.

5.3.3, The entire lubrication system of the machine is cleaned once a year.

6, Hydraulic system

This machine is fully hydraulically driven. The motor of the hydraulic system is

Y132M-4 with a power of 11KW. The motor drives a double gear pump with a displacement of 25ml/rev and 10ml/rev. The hydraulic system has a maximum working pressure of 20 MPa and a rated working pressure of 16MPa. The oil pump with a displacement of 25ml/rev provides power to the main drive system (rotation of the work rolls in the forward and reverse directions), the oil pump with a displacement of 25ml/rev auxiliary drive system (each oil cylinder) provides power.

The hydraulic system is in the form of switch control. The electromagnet's electric power makes the electromagnetic reversing valve work to perform the corresponding action. For the working condition, refer to the hydraulic system diagram (Fig. 6) and the solenoid valve action sequence table.

6.1, The working medium of this system is No. 46 anti-wear hydraulic oil.

After being filtered by the fine oil-filtered vehicle, it is injected into the fuel tank, the tank level should reach the upper limit of the oil level gauge. After starting the motor and checking its rotation direction, starting up and turn on the action of each actuator several times, if leakage, shock, vibration, etc. occur, stop in time and check. After the oil has fully entered the pipeline and the oil cylinder, the oil should be replenished to the fuel tank again so that the oil level of the tank always reaches the upper limit of the oil mark.

6.2, When the oil pump starts or stops, the system should be in the unloading state. Once the set pressure value of the overflow valve is adjusted and determined, the lock nut of the overflow valve should be tightened, beware of accidents caused by machine vibration or artificial random operation.. After a period of no-load test, the gas in the pipeline can be fully drained and the oil is fully filtered. After the movement of each actuator is stable and reliable, it can start load commissioning.

6.3, The oil temperature of the system should be appropriate, and the oil temperature of the fuel tank should not exceed 60 °C. Considering the specific environmental conditions, if the machine is working in a hot environment, the user may choose a hydraulic oil with a higher viscosity; in order to ensure a better working

condition and a longer service life, the oil contamination should be minimized. Clean or replace the filter cartridge regularly. Check the degree of deterioration of the oil every six months. If it exceeds the limit of use, replace it in time.

6.4, Analysis and elimination of common faults in hydraulic systems

Fault phenomenon	Cause	Method of exclusion
1、Noise	A、The oil suction filter is blocked; the inner diameter of the suction pipe is too small; the oil temperature is too low; the oil viscosity is too high, etc.	Replace or clean the oil filter; Increase the suction pipe diameter; Warming the oil; Use a hydraulic oil of appropriate viscosity.
	B、The oil level is too low; the oil suction pipe leaks and the air enters the system by other means to cause the oil foam.	Fuel the oil tank; Replace fittings, tubing or seals; Venting the system; Exhaust.
	C、The transmission center line is not correct; the coupling is loose; the vibration of the pipeline causes mechanical vibration	Align the center; tighten the screws; add pipe clamps to reinforce the pipe.
	D、Pump or motor damage	Replace the oil pump or motor
	E、Overflow valve instability	Change the valve
2、Insufficient or no pressure	A、Wrong rotation of oil pump, inhaling air	Correct the turn direction
	B、Oil pump damage	Replace the oil pump
	C、The pressure adjustment method is not appropriate; There are dirty things in the overflow valve; Poor sealing inside the cylinder causes leakage from the high pressure side to the low pressure side.	Correctly adjust the pressure; Cleaning the relief valve; Check and replace damaged parts or seals.
	D、Coupling or motor is faulty	Check and replace
3、Pressure disorder, flow or	A、Oil pump suction empty	See fault 1
	B、Oil bubbles	

pressure fluctuations	C、Mechanical vibration	
	D、Uneven oil transfer from oil pump	Repair or replace the oil pump
	E、The system is mixed with air	Exhaust
4、Flow is too small or no flow	A、Empty oil pump	See fault 2
	B、Oil bubbles	
	C、Oil pump wear	
	D、Leakage of the high pressure side to the low pressure side of the cylinder	Repair or replacement, see fault 2
	E、Wrong rotation of oil pump	Correct motor wiring
5、The oil temperature is too high	A、System pressure is too high	Correctly adjust the pressure
	B、Too little oil	Add oil
	C、The oil pump is damaged	Replace the oil pump

8, Machine installation and commissioning

8.1 Machine installation

The installation of the machine requires that the floor of the workshop be leveled, and the installation should be leveled with a diagonal iron. The horizontal deviation should not exceed 0.5 mm per meter.

The installation of the machine requires the floor of the workshop to be flat, and the horizontal deviation shall not be greater than 0.5 mm per meter.

8.2, Test run

8.2.1, Preparation before test run

(1), Check that all fastening joints are reliable;

(2), Check that each oil cup lubrication point and manual refueling point are adequately supplied with oil.

(3), Check if the circuit of the electronic control system is good and the grounding is proper.

8.2.2, No-load test

(1), After checking and confirming the normal condition, the operator can be tested by the operator who is familiar with the performance of the machine. The test procedure is as follows: The air running test of the main drive and the lift drive alternates in a discontinuous manner, one cycle every 15 minutes, in each cycle The single-stroke running time ratio of the main drive and the lifting movement is 2:1..

(2), When making a single main drive operation, it is advisable to make the main roll mold contact the side roll mold to make it rotate, and the positive and negative times take half of the time.

(3), During the single auxiliary transmission time, the lifting is repeated..

8.2.3, Test requirements

(1), The maximum temperature of rolling bearings shall not exceed 80℃

(2), The working mechanism and operating mechanism of the machine should coordinate with each other and operate flexibly without abnormal noise or jammed shut.

8.2.4, Load test

The load test can only be carried out after the no-load test is normal. The general procedure is as follows:

(1), According to the relevant profile parameters specified in the basic parameter table, after processing, press and press

Pre-bend sheet ends at specified diameters.

(2), Roll into a circular workpiece of the specified diameter according to the proficiency of the operation.

8.2.5, Load test requirements

(1), The load test should meet the relevant performance requirements in the basic parameters.

(2), During the loading and loading operation, the transmission system should be stable, no impact, no abnormal noise, the working system and operating system should

be flexible, accurate and reliable, the rollers should not swing, and the temperature of each shaft must not exceed the above regulations.

(3), There must be no slippage between the mold and the profile during the rolling process.

9, Safe operation and maintenance

9.1, Safety Operations

9.1.1, The operator should understand the structure and performance of the machine, be familiar with the operation method of the control system and the bending process of the workpiece, and strictly observe the safety operation.

9.1.2, All buttons of the electronic control system must be placed in the original position before driving and parking.

9.1-3, During the use, the oil supply of each lubrication point should be checked frequently.

9.1-4, In the course of operation, if irregular noise, impact, and swing are found, stop and repair immediately.

9.1-5, During the use process, the transmission mechanism and the link parts should be checked frequently to maintain no looseness or damage.

9.1.6, During the bending process, the profile must move with the roller. Slippage is not allowed.

9.1.7, During the rolling process, the side rollers must be lifted and lowered before the main drive is stopped.

9.1.8, Unloading work is to remove the workpiece after the machine has stopped and lower the side roller.

9.2, Machine maintenance

Proper use and reasonable maintenance can extend the life of the machine and reduce repair costs. The maintenance work of this machine mainly has the following points:

(1). The machine must be operated under normal operation and good lubrication, and the lubrication system must be strictly implemented.

(2). Develop a regular inspection and repair system.

(3). All vulnerable parts should be replaced in time if there is excessive wear or loss of original performance requirements. If the parts are damaged, they should be replaced in time.

(4). During the use, attention should be paid to the temperature of each part. The temperature of the rolling bearing must not exceed 80 °C.

(5). The electrical system should be regularly repaired and dedusted, and the damaged components should be replaced in time. The machine tool should be properly grounded.

(6). The work site is not allowed to stack the materials casually, and the oxidation should be cleaned up in time.