

Machinery House Service Crane

Instruction Manual

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1. General

Design and manufacturing is based on:

the national standard : GB/T3811-1983 " hoist design specification "
GB/T6067-1985 " safety norm of the hoist " Mechanical industry
standard JB/T3695-1994 " bridge type hoist of the electronic calabash "
and refer to F.E.M standard " European hoisting machinery design
specification " and relevant standards of our group ZPMC.

The structural pattern of machinery house service crane is divided
into double beams and single beam electronic calabash bridge type hoist.
Rely mainly on electronic calabash bridge type hoist of double beams to
machinery of port, it is mainly composed of gantry carriage, trolley
carriage and gantry travel, trolley travel, and hoisting mechanism, etc.. Its
advantages is so many, including rational structure, esthetic appearance,
steady operation, being safe and reliable and can match various domestic
and international power supply power.

Applicable working environment:

- (1) Complete machine working rank is A3, hoisting mechanism working
rank is M3, gantry travel mechanism working rank is M2, trolley
travel mechanism working rank is M2 .
- (2) Working ambient temperature :- 25 - +50 °C
- (3) The relative humidity is not more than 95%

2. Introduction of machine structure

Machinery house service crane is made up of gantry, hoisting trolley, cable track support and power supply system. (see Fig. 1)

Based on different projects, structural patterns of power supply system of gantry is divided into **powerail enclosed conductor system** and towing cable; hoist motor is divided into conical rotor motor, dual winding motor and variable frequency motor; gantry and trolley travel motor is divided into single speed motor and dual winding motor. The concrete pattern and technical parameter, etc. refer to main parameter sheet on the general drawing and general drawings of the attached file of machinery house service crane.

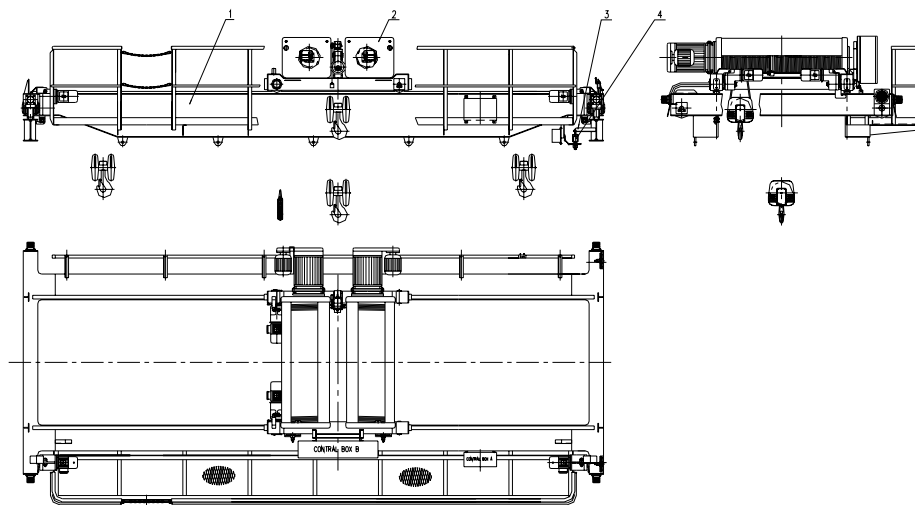


Fig. 1 machinery house service crane

1. gantry 2. trolley 3. cable track support 4. power supply system

2.1 Gantry

The part of gantry is made up with carriage, platform and rail, electrical control box (CONTRAL BOX A), " trinity " decelerator, driving wheel unit,

buffer, sweep plate, driven wheel unit, gantry cable lead, anti-jump plate, limit switch device , rubbery cushion, baffle, trolley power supply system (divided into towing cable, powerail enclosed conductor system and cable tow chain), and standard components. (see Fig. 2)

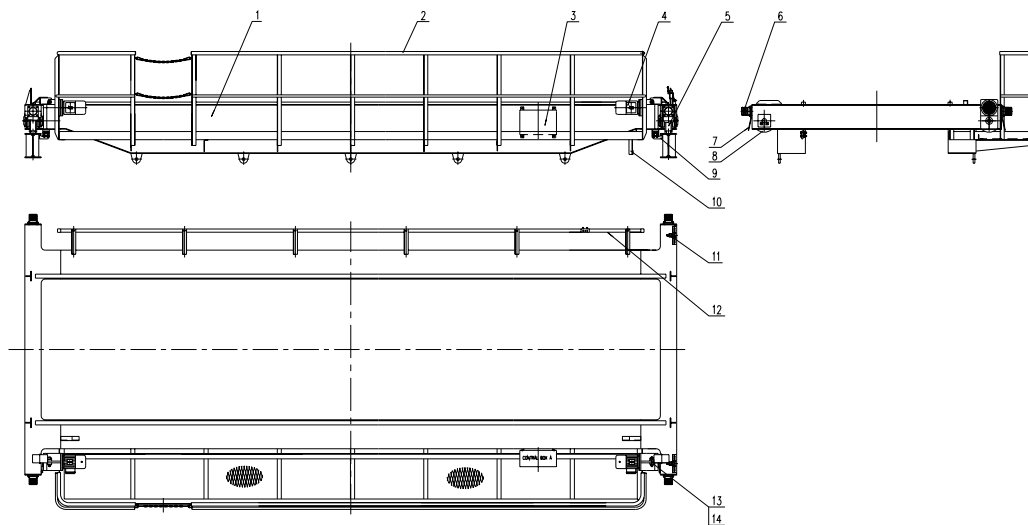


Fig. 2 Gantry of machinery house service crane

- 1. crane carriage 2. platform and rail
- 3. (CONTRAL BOX A) electrical control box 4. “trinity” decelerator
- 5. driving wheel unit 6. buffer 7. sweep plate 8. driven wheel unit
- 9. anti-jump plate 10. gantry cable lead 11. limit switch device
- 12. power supply system of gantry 13. rubbery cushion 14. baffle

2.2 Trolley

The structural patterns of trolley is divided into dual rollers and single roller.(see Fig. 3, Fig. 4)

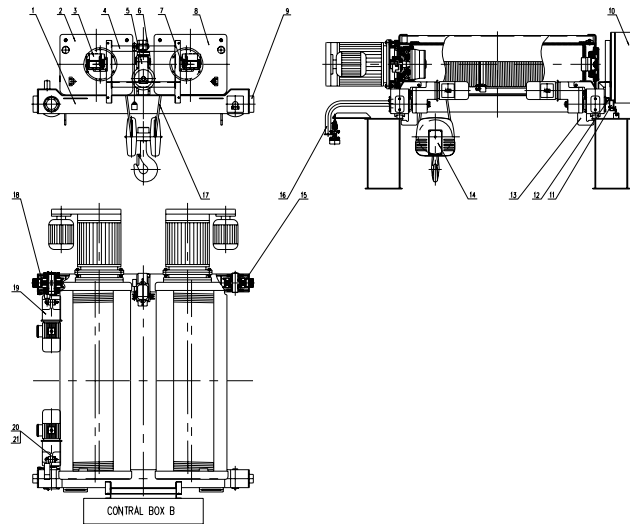


Fig.3 Dual rollers crane carriage of machinery house service crane

1. trolley carriage 2. right-turned roller 3. cam limit switch
 4. electrical control box support 5. height limiter 6. heavy hammer limit switch
 7. cam limit switch support 8. left-turned roller 9. buffer
 10. (CONTRAL BOX B) electrical control box
 11. limit switch 12. limit switch support 13. anti-jump plate 14. hook
 15. driven wheel unit 16. trolley cable lead 17. wire rop 18. driving wheel unit
 19. “trinity” decelerator 20. rubbery cushion 21. baffle

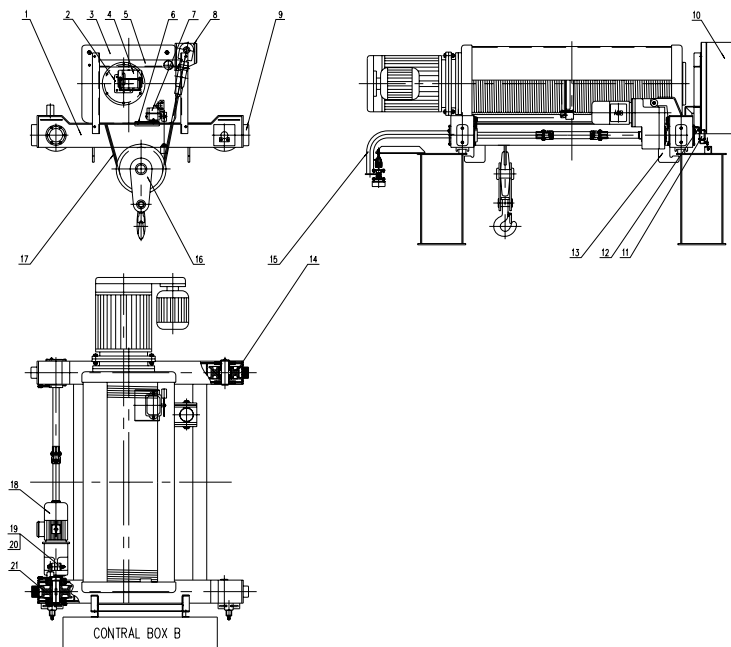


Chart 4 single roller hoisting crane carriage of machinery
house service crane

1. trolley carriage 2. cam limit switch support 3. left-turned roller

- 4. cam limit switch 5. electrical control box support
- 6. mounting plate of heavy hammer limit switch 7. heavy hammer limit switch
- 8. fixed support of wire rope 9. buffer
- 10. (CONTRAL BOX B) electrical control box 11. limit switch
- 12. limit switch support 13. anti-jump plate 14. driven wheel unit
- 15. guide bar 16. hook 17. wire rope 18. "trinity" decelerator
- 19. rubbery cushion 20. baffle 21. driving wheel unit

The trolley is made up of the trolley carriage, the roller assembly, cam limit switch, cam limit switch support, height limit device, heavy hammer limit switch, " trinity " decelerator, driving wheel unit, rubbery cushion, baffle, driven wheel unit, control box support, control box (CONTRAL BOX B), trolley cable lead, buffer, the mounting plate of limit switch , limit switch, wire rope, hook [divided into times rate of pulley is 4/2 (see Fig.3) and times rate of pulley is 2/1 (see Fig.4), and standard components .

2.3 Power supply system

Power supply system is divided into powerail enclosed conductor system , cable towing and tow chain.

(1) Powerail enclosed conductor system is composed by power supply device, fixed clip, hanger, slippery line, connecting clip, end cap, collecting electric apparatus, tractor and standard components.

(see Fig. 5)

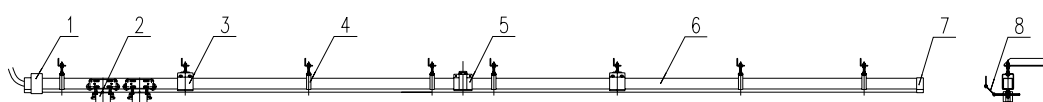


Fig. 5 powerail enclosed conductor system

1. power supply device 2. collecting electric apparatus 3. fixed clip 4. hange
5. connecting clip 6. slippery line 7. end cap 8. tractor

(2) Cable towing is composed of end cap, Model C guide, hanger, connector, cable tackle, fixed tackle, wire rope, guy rod unit, cable, standard components. (see Fig. 6)

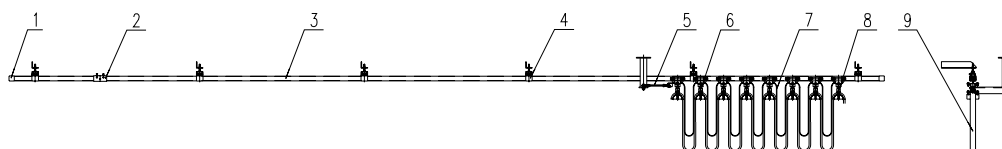


Fig.6 cable towing

1. end cap 2. connector 3. Model C guide 4. hanger
5. guy rod unit 6. cable tackle 7. steel rope 8. fixed tackle 9. cable

(3) Cable tow chain is composed of cable, tow chain, tow chain guider trough and standard components. (see Fig. 7)

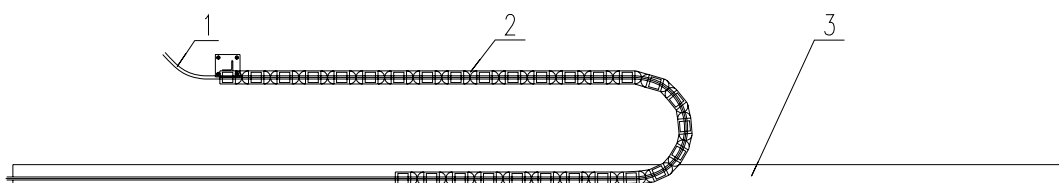


Fig. 7 cable tow chain

1. cable 2. tow chain 3. guide trough of tow chain

3. Installation and adjustment

The installation and adjustment of machinery house service crane must be operated by professional personnel, layman can't be engaged in this. Before erecting, please carefully check if the spare parts is damaged or lost while transportation and confirm whether the products accord with the technical parameter of this project and technical requirements.

3.1 Traveling mechanism

Traveling mechanism is made up of gantry travel mechanism and trolley travel mechanism.

Gantry travel mechanism is made up of two group driving wheel unit (two groups of "trinity" decelerators) and two groups of driven wheels assembly. (see Fig. 8, Fig. 9)

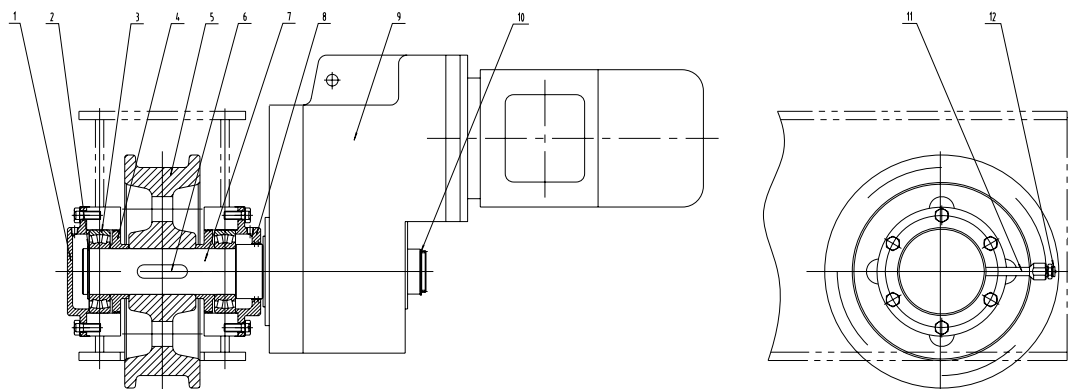


Fig. 8 driving wheel unit

- | | | | |
|--------------------------|--------------------|-----------------------------------|----------------|
| 1. bearing cover | 2. shield bearing | 3. bearing | 4. axle sleeve |
| 5. wheel | 6. axle | 7. driving axle | 8. cover |
| 9. "trinity" decelerator | 10. shield bearing | 11. connecting pipe of oil nozzle | 12. oil nozzle |

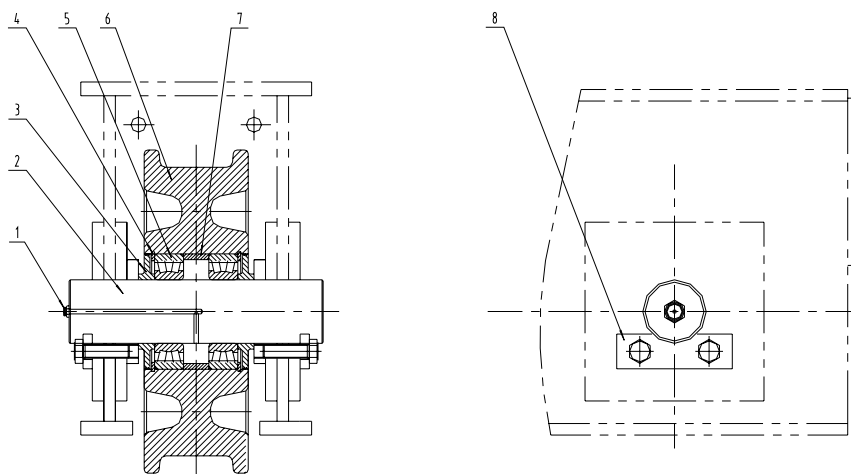


Fig. 9 driven wheel unit

- | | | | |
|---------------|----------------|-------------------|-------------------|
| 1. oil nozzle | 2. driven axle | 3. shield bearing | 4. shield bearing |
|---------------|----------------|-------------------|-------------------|

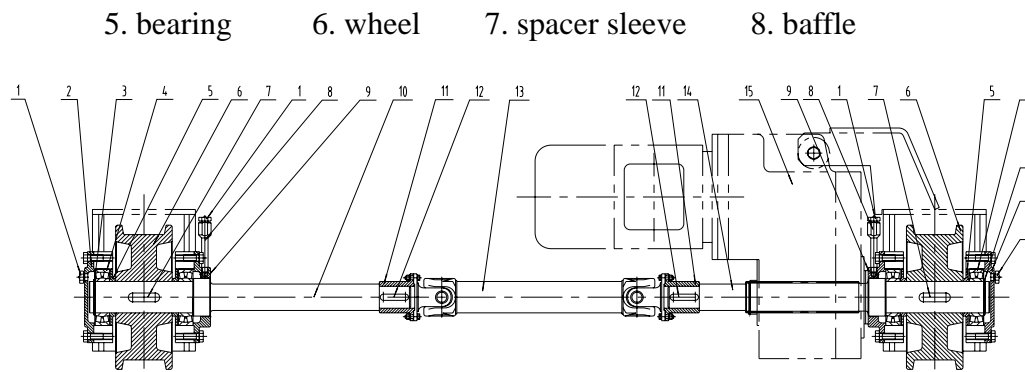


Fig. 10 driving wheel unit

1. oil nozzle 2. end cap 3. shield bearing 4. bearing 5. shield bearing
 6. wheel 7. splin 8. connecting pipe of oil nozzle 9. cover
 10. axle 11. flange 12. spline 13. axle connector 14. spline axle
 15. " trinity " decelerator

According to different technical parameters of the project, the structural pattern of trolley is divided into: one kind is composed of two groups driving wheel assembly (two groups of " trinity " decelerators) and two groups driven wheels assembly (see Fig. 8, Fig. 9); Another kind is composed of a group of driving wheel assembly (a group " trinity " decelerator) (see Fig. 10) and two groups driven wheels assembly (see Fig. 9)

Driving wheel assembly relies on " trinity " decelerator that drives driving wheel unit and driven wheel unit to make gantry and trolley operate through spline axle, it is through button controller to cut power to operate . The brake is inside the travel motor, normally closed and power lost. When power is cut, it is brake state and when power is normal, it is off state. Brake interval of friction disc has already adjusted well when leaving the factory.

The " trinity " decelerator is that the motor connects with decelerator through shaft coupling. The decelerator and wheel spline axle is inserted mode, lubricating oil additional must be injected into decelerator before operating, 2.8 liters for decelerator of gantry, 1.5 liters for decelerator of trolley, using L-CKC150 in winter and L-CKS150 in summer. Fully inject the calcium base lubricating grease No. 3 while installing driving wheel unit and driven wheel unit, and make the oil nozzle is full. Wheel stepping surface keeps in full touch with track, its level degree does not exceed 1mm, and straight line degree with the side wheel does not exceed 2mm.

3.2 Hoisting mechanism

According to different requested load, the structural patterns of hoisting mechanism is divided into: one kind is dual rollers, times rate of pulley is $4/2$; Another kind is single roller, pulley times rate $2/1$ (see Fig. 3, picture 4). Dual rollers is composed of left turned roller and right turned roller, other parts of roller and on the roller are made in pairs, fixed symmetrically.

The working principle of hoisting mechanism: hoisting motor is installed at switching plate, which connects with roller support through transition plate, another side is installed on the roller support through the bearing on the built-in stub axle of roller, the axle of motor joins on the built-in planetary decelerator of the roller and drives the roller through

the plum blossom type shaft coupling, make the wire rope wound on two rollers drive hooks to rise and drop. (see Fig. 11)

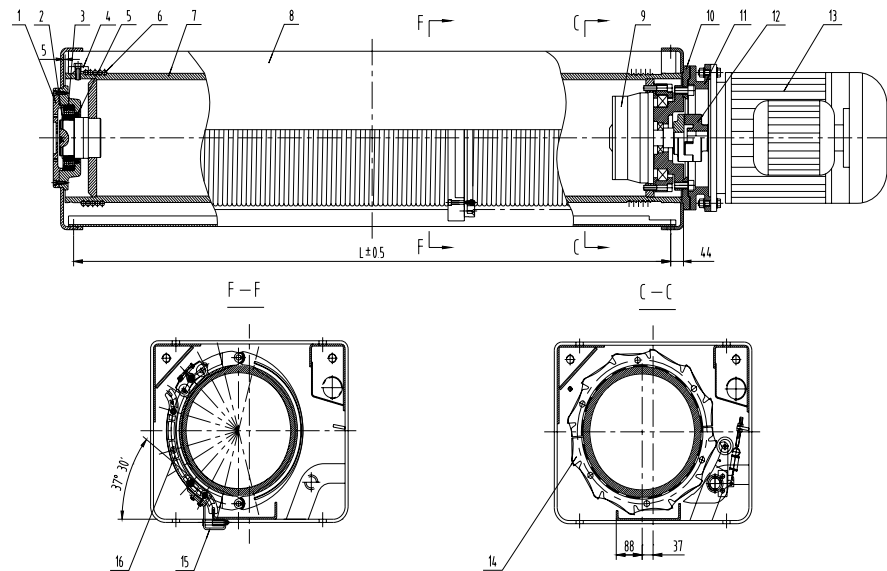


Fig. 11 left-turned roller (right-turned roller

placed symmetrically according to this chart)

1. end cap of bearing 2. shield bearing 3. bearing 4. pressing plate of steel rope
5. sealing ring 6. wire rope 7. left-turned roller 8. left-turned roller support
9. planetary decelerator 10. transitional plate 11. changeover plate
12. coupling with spider 13. hoisting motor 14. Ratchet and detent mechanism
15. anti-reversion device 16. rope guider

Built-in planetary decelerator must be injected 1 to 1.2 liters of lubricating oil before installation, using L-CKD220 in summer, Mobil gear SHC220 in winter. (see Fig. 12)

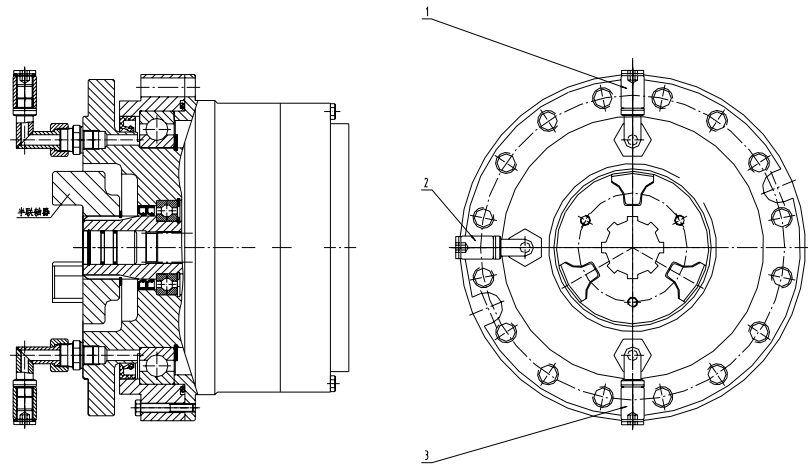


Fig. 12 planetary decelerator

1. filler and breather plug 2. fuel level plug 3. drain plug

The installation of wire rope: pulling out the wire rope from the rope barrel, make sure the rope barrel can rotating freely, and pulling out it along the tangent direction. Install the steel wire on the roller by three groups of pressing plates erecting on the roller, make their coiling on this roller according to project demand length of wire rope, penetrate into one pulley and crane carriage bridge of high limit location device at the fixed pulley of device with another end of wire rope, then return and penetrate another pulley, finally install and fix the wire rope on another roller by three groups of pressing plates, start this roller alone, it is the same to make the quantity of the wire rope of winding roller. (see Fig. 4)

The working principle of single roller is the same as that of dual rollers. Its wire rope's installation is to fix the rope at the end of rope steel wire on roller by three groups of pressing plates, winding on the roller according to the length of the wire rope of the project demand, and then

penetrate another end of wire rope on the pulley, penetrate the wire rope on mounting bracket, while end part of the wire rope. is tightened with clip.(see Fig. 4)

3.3 Rope guider

On the basis of the demanded material, rope guider is divided into two kinds: one kind of material is the polytef; another is a metal casting. The direction of turning of rope guider is divided into left and right, for left installation on the left turned roller; for right installation on the right turned roller, the pressing plate erected on the wire rope which prevents from hopping. (see Fig. 13)

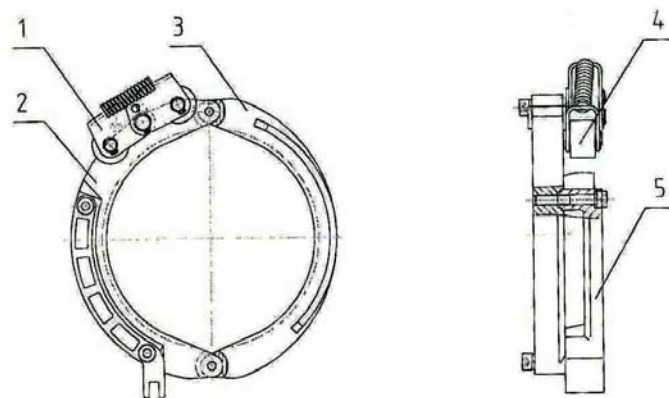


Fig. 13 rope guider

1. rope presser 2. entering sling ring 3. guiding rope ring

The elasticity adjustment of the rope guider: the material is polytef, loose the nut joined the middle two rope rings, adjust the size of the interval the saw tooth that relies on between two ropes of ring, fasten the nut after adjusting; if the material is metal casting, increase or reduce the

adjustment spacers among the rope guider, i.e. its interval's size is adjustable.

3.4 Ratchet and detent mechanism

Ratchet and detent mechanism is also called the second brake, which is composed of ratchet wheel, washer, cam, butterfly shape spring, card board, axle, axle sleeve, detent, limit cam switch, extension spring, guide roller, adjusted spiral shell pole and standard components. (see Fig. 14)

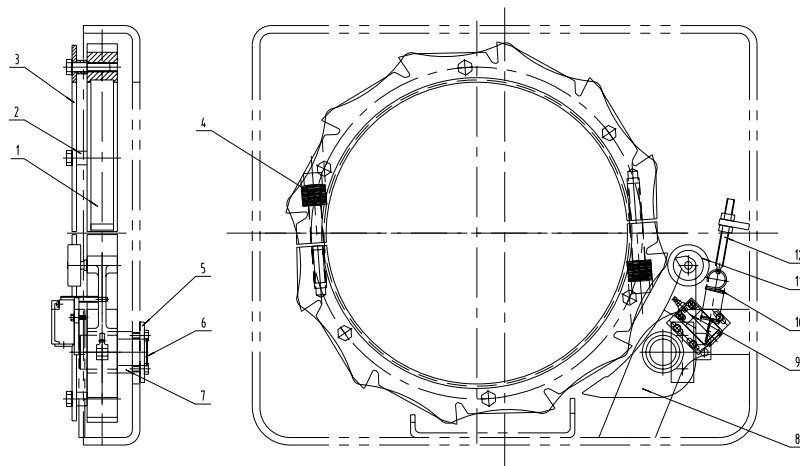
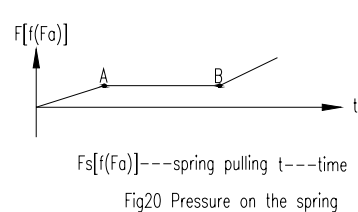
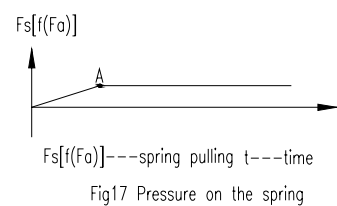
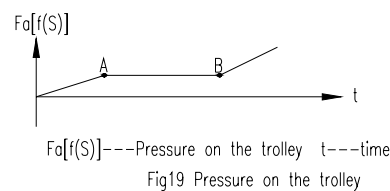
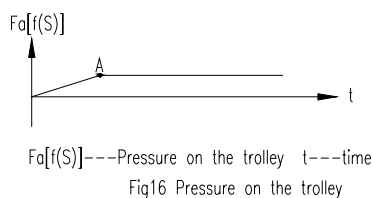
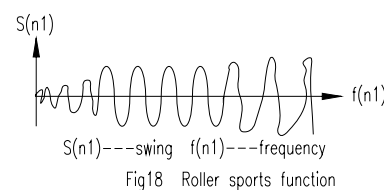
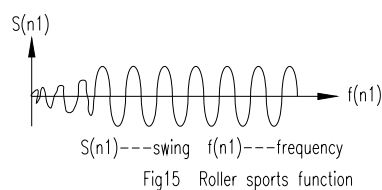


Fig. 14 Ratchet and detent mechanism

1. ratchet 2. washer 3. cam 4. butterfly spring 5. fixing plate
6. axle 7. axle sleeve 8. detent 9. limit switch 10. extension spring
11. reel 12. adjusting screw

At first adhere the rubber to the groove in the ratchet with glue, and then apply the cam mechanically through the washer, install butterfly shape spring on the hexagon socket head bolt and fix two ratchet on roller; the guide roller is fixed on detent, penetrate axle detent through axle sleeve on fixing plate and fix it on roller support; at last hang the extension spring on the detent and adjusting screw, adjust screw and regulate the extension of the spring.

The structure of ratchet and detent mechanism is one-way intermittent, depending on the pulling force of the spring, guide roller sticks to cam outline closely to move, when rising roller with normal speed turns round, guide roller's movement is concave and convex, which driving detent, overcoming the pulling force of spring, in certain amplitude (see Fig. 15, Fig. 16, Fig. 17) acting the cycle similar to the SIN function to swing. As rising roller exceeding normal speed rotates, the pulling force of spring utilizes frequency converter to debug in advance, which has high sensitivities, as frequency only exceeds 5-10Hz, the rotational speed “n” is raised by 5% (see Fig. 18, Fig. 19, Fig. 20),



AS illustrated in fig.16, 17, 19,20 A is the beginning of the operation
B is the beginning of fault Technical Team

Detent instantly inserts among the teech spaces of ratchet to make roller stop rotating, playing pole installed limit switch at fixing plate touch end to squeeze into and cut off power at the meanwhile, preventing

the roller from rotating and make the hook stop dropping immediately through the double protection of movement of machinery and electric.

3.5 Hoisting limit

On the basis of control mode, hoisting limit is divided into two kinds: One kind is controlled by limit cam switch; another kind is controlled by journey limit switch.

While selecting the control of limit cam switch, it links with stub axle of end roller, transmitting to decelerator part of limit cam switch through universal joint, which is composed of first class worm gear and three class pinions, bring the memory cam finally, stir the limit cam switch to work by memory cam. The position of memory cam can be changed by regulating screw according to different rising height. There are three memory cams: one is lower limit memory cam; one is upper delay cam; one is upper limit memory cam. The height of limit location must be regulated according to the requirement of crane. The steps: (1) When the hook drops to the lower position, unclamp the locking nut, the memory cam of the lower location should push the lower location switch aside, then lock the locking nut. That is to say that should stop running when the hook reaches this position; (2) when the hook reaches the floor position of the machinery house, it unclamps the locking nut, the memory cam of the upper location should push the upper location switch aside, then lock the locking nut. That is to say that should rising slowly not

quickly to make it when the hook reaches this position; (3) When the hook rises to the position of upper limit, unclamp the locknut, the location memory cam of upper limit should push the location switch of upper limit aside, then lock the locking nut. Just stop running when the hook reaches this position. So far run three times repeatedly, adjustment is over. After some limit cam moves, reverse journey resumes normal running. (see Fig. 21)

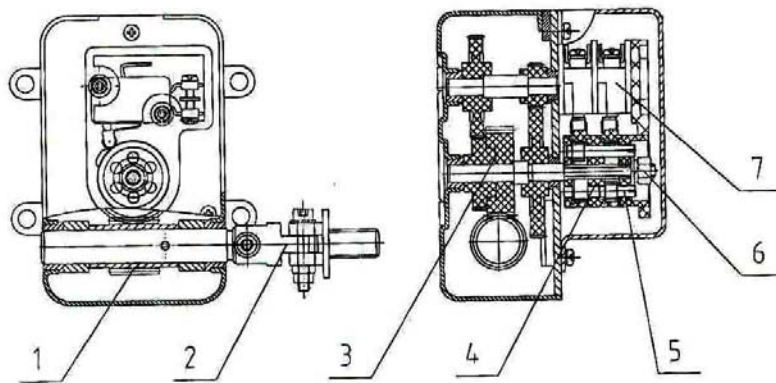


Chart 21 limit cam switch

- | | | | |
|--------------------|--------------------|-----------------|---------------|
| 1. worm | 2. universal joint | 3. gear drive | 4. memory cam |
| 5. adjusting screw | 6. locking nut | 7. limit switch | |

When selecting for the control of journey limit, it sets 3 journey switches respectively in roller support, i.e. B11, B12, B13 and B21, B22, B23. Frog is fixed on rope guider, which moves with the quantity of the steel wire from left side to right side, frog collides with 2 groups of journey switches to limit the height and make the hook stop running; When the hook drops to the lower limit position, knock the B12, B22 switch to open, middle relay K12, K22 lose the electricity, the hook rises slowly not quickly to make it. The adjustment of 2 groups of journey

switches: 2 group journey switches are fixed on 4 stencil plates with rectangular hole, one that is through journey switch movement to get the result of finely adjustment by setting from side to side. (see Fig. 22)

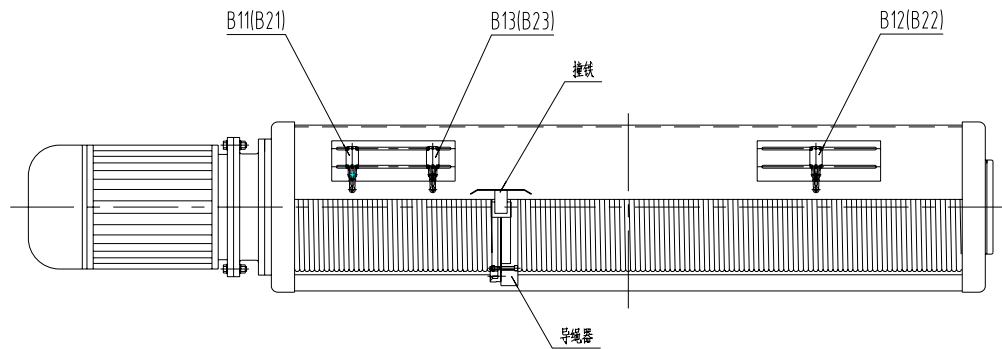


Fig. 22 journey limit switch

No matter which kind of control mode is adopted, heavy hammer limit switch is set on the highest limit location, it is installed and fixed on the height limiter of the trolley carriage, when upper limit switch does not work, pulley block will carry heavy hammer of limit switch, turn on the heavy hammer limit switch to cut power, the hook stops rising.

3.6 Mode of power supply

The mode of power supply is divided into three types: powerail enclosed conductor system, cable towing and cable tow chain.

(1) Powerail enclosed conductor system

With fixed clip and hanger inserting in slippery line (four meters per pc) from very beginning 200mm, install the first slippery line according to 1200mm distance from very beginning 200mm, then put current collector into slippery line, fix hanger and fixed clip the angle steel of

track support, joint two slippery lines with connecting clip, install the power box in close to control box, another installs end cap. Weld the electric apparatus according to the current collector and the tractor with the parallel position, after adjusting the position of fixed clip and hanger to maintain parallel between slippery and service crane, slippery line of line degree is not greater than 1.5mm/m, make sure straight line degree of all the line maintaining parallel with slippery line in itself and mechanism house not greater than 15mm after finishing the installation. (see Fig. 5)

(2) cable towing

With hanger inserting Model C track (6 meters per pc) according to the distance designated in the drawing from very beginning 200mm, installing it on the Model C track separately, and then put them in the Model C track according to the quantity of cable trolley and one fixed trolley designated in the drawing, join two Model C tracks with the connector, mounting two cap ends on two ends separately. Cable trolley is fixed in close to control box, fix Model C track on the angle steel of track support through hanger, and then install the cable and wire rope on every cable trolley and fixed trolley in the equal length respectively according to the demand of the project, and finally fix the fixed trolley at the one end of Model C track, with guy rod unit assembly and cable guide hole fixing on the crane bridge to connect the cable trolley on another side. (see Fig. 6)

(3) cable tow chains

The cable tow chains is only suitable for trolley. Firstly, penetrate the cable into tow chains, and fix the entering electric end of towing chains on the guide groove of cable towing from 1000mm of centre line, with guide groove fixing on the support surface of walking platform, connecting cable towing chains and the pole of cable guider at another side, finally achieve to supply power for trolley. (see Fig. 7)

3.7 Supply system

3.7.1 General

Controlling system of service crane is composed of hoisting mechanism control system, trolley moving control system, gantry moving control system. The components of hoisting mechanism control system and trolley moving control system are distributed in a big control box, and the components of gantry moving control system is distributed in a small control box, the operation of service crane is realized by the button controller.

3.7.2 Mode of control

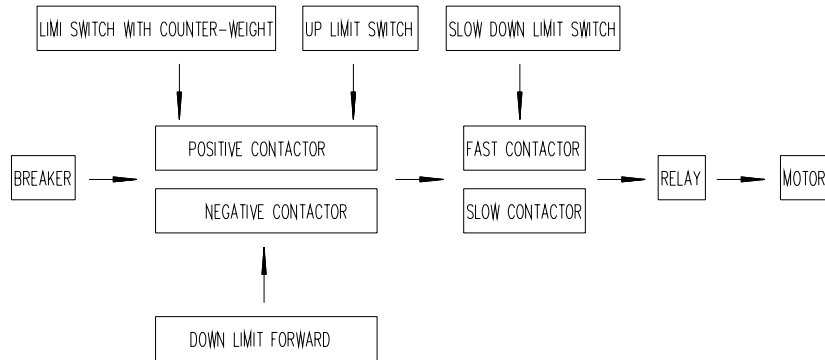
Hoisting system of service crane is divided into conical rotor motor control system, dual winding motor control system, variable frequency control system.

Moving system of gantry and trolley is divided into motor control system of the single speed and the control system of variable frequency control.

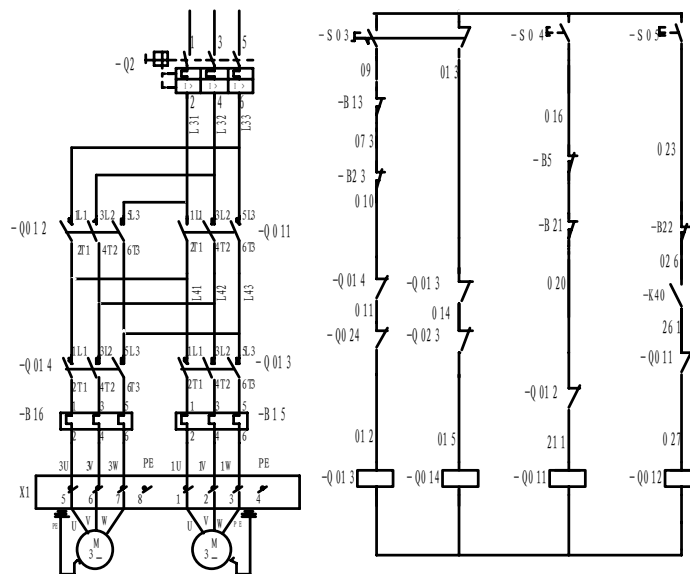
3.7.3 The makeup of hoisting control system

The control system of conical rotor motor and dual winding motor is

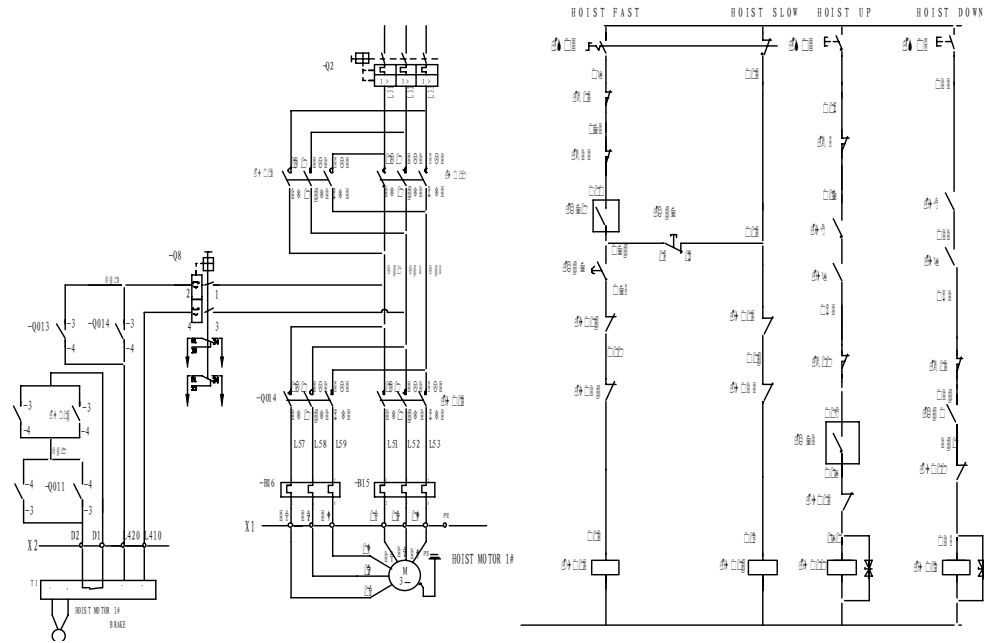
composed of the air circuit breaker, main contactor, positive and negative contactor, fast and slow contactor, relay, journey limit switch, etc.. The electric principle is as follows Fig. 7-3A, 7-3B, 7-3C



7-3A Control diagram of dual winding Conical rotor hoisting motor

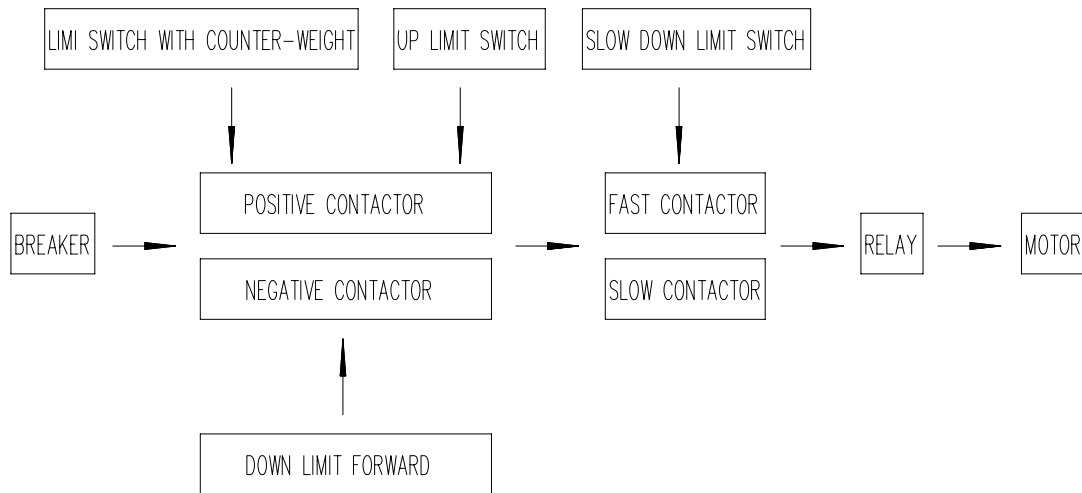


7-3B Electric schematic diagram of conical rotor hoisting motor

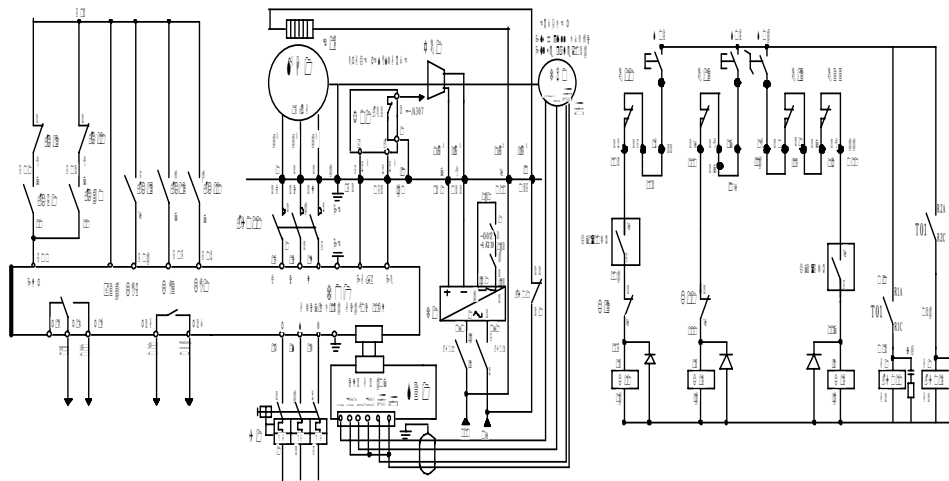


7-3C Electric schematic diagram of dual winding hoisting motor

Variable frequency control system is made up of components such as air circuit breaker, main contactor, frequency converter, journey limit switch, etc.. The electric principle is as follows Fig. 7-3D, 7-3E



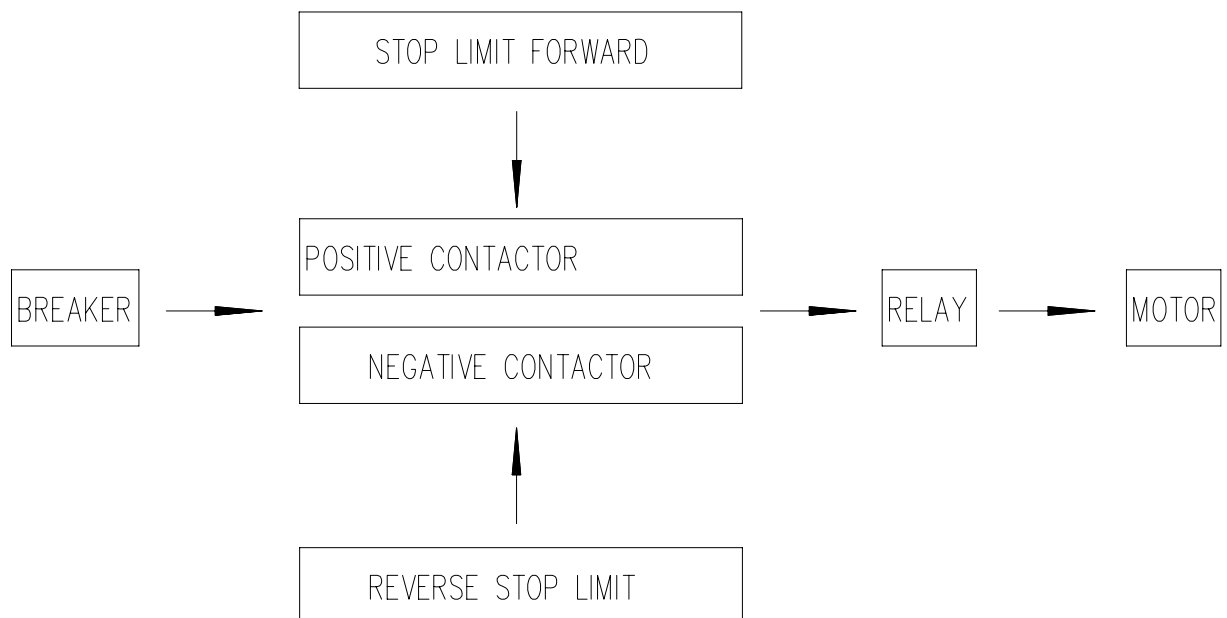
7-3D Control diagram of variable frequency hoisting motor



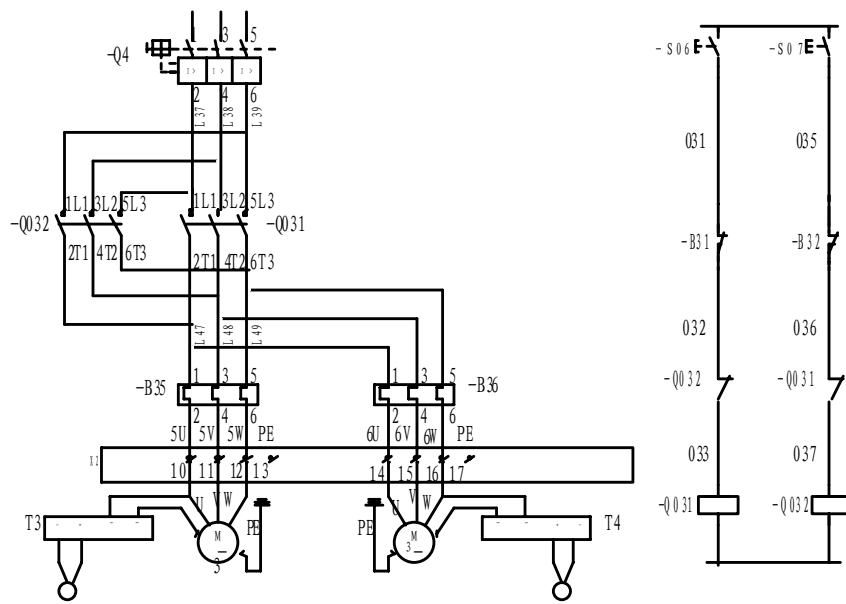
7-3E Control diagram of frequency converter hoisting motor

3.7.4 The makeup of moving control system

The moving control system of single speed motor is composed of air circuit breaker, positive and negative contractor, relay, journey limit switch, etc.. The electric principle is as follows Fig. 7-4A , 7-4B



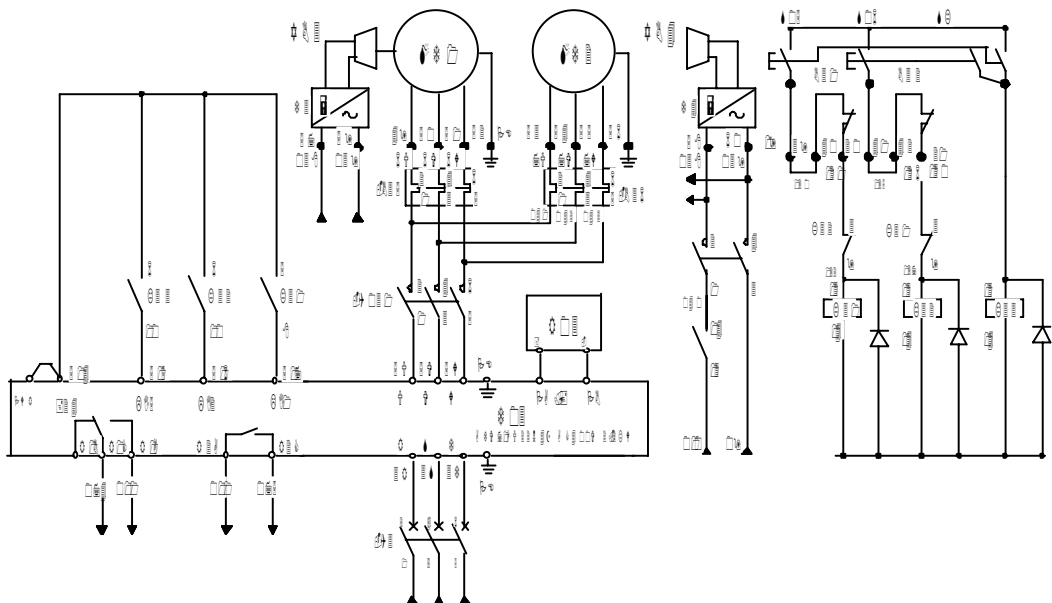
7-4A Control diagram of single speed moving



7-4B Electric schematic diagram of single speed motor controlling gantry and trolley

The moving control system controlled by variable frequency control is made up of components such as air circuit breaker, frequency converter, relay, journey limit switch, etc.. The electric principle is as follows Fig. 7-4C , 7-4D

7-4C Electric schematic diagram of single frequency converter controlling gantry and trolley.



Circuit diagram of single frequency converter controlling gantry and trolley.

3.7.5 Classification of relay switch

The pattern of the hoisting relay switch and up-down stop switch is as follows, cam limit switch, rocker arm type journey limit switch, inductive and approachable switch..

The pattern of journey switch of gantry and trolley: rocker arm type journey limit switch.

3.7.6 Protection

(1) phase lack and phase dislocation protection

The phase lack and phase dislocation protection of supplying power is finished by phase-sequence relay, as phase-sequence that supplies power is under phase lack and phase dislocation ,which will not work.

(2) over-load protection

The weight of hoisting system is controlled by over-load, realizing light load, high speed and stopping hoisting when overloading. The over-load is made up of the controller and weight transducer, and the controller is installed in the big control box, and the weight transducer is installed on the axle of the fixed pulley in the middle of two rollers.

(3) over-travel protection

The over-travel protection of hoisting mechanism is composed of upper relay switch, upper stopping switch, lay last switch, heavy hammer limit switch (two rollers have their own upper relay switch, upper stopping switch and lower stopping switch separately), which guarantee the hook can run in the established rage.

The travel protection of gantry and trolley is composed of up-down stopping switch, sea-land side stopping switch, which ensure the gantry and trolley can run in the established range.

(4) Over-speed protection

Over-speed protection is composed of the ratchet wheel and detent of machinery and over-speed limit switch in electrical respects. Ratchet wheel, detent movement make roller seized when the dropping speed exceeds 1.4 times of the rated speed, at the same time over-speed limit switch stop lowering and the motor is black out, but can rise while being ranging at this moment. The over-speed limit switch is self-locking journey limit switch and must be restored by hand.

3.7.7 Button controller

Button controller is composed of emergency switch, fast and slow transition switch, up switch, down switch , sea side switch of trolley, land side switch of trolley, forward switch of gantry, backward switch of gantry , which realize the operation of service crane. (see Fig 23)

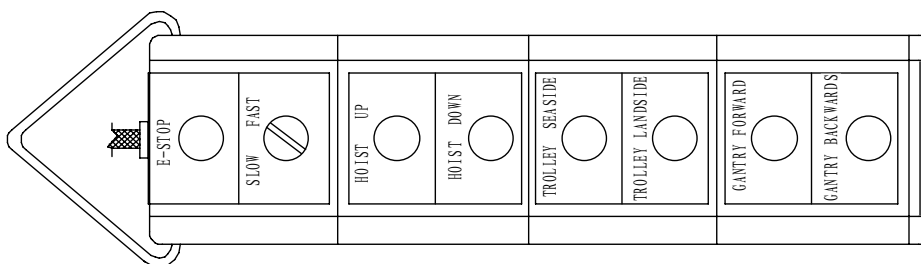


Fig.23 button station

4. Operating instructions

The operator can work hold the card after passing the examination through training and examining, who also fully grasps the operational procedure. Please read the operation instructions carefully and forbid the person without license to operate and service crane.

Before operating, the operator must look over if the components of gantry and trolley of the service crane is perfect ,fuel-injection of

lubricating parts is abundant, the parameter of control power is in conformity with the machine parameter, please be familiar with every button of functions at button controller, press button to check if the hook runs up and down well, the running direction of gantry and trolley is right, emergency stop button is under good condition; when commissioning without load, check the hoisting mechanism, gantry and trolley do not have abnormal sound, all switched are allergic and the scope that the hook can reach sets warning marks.

During operating, forbidden to stand under hook, forbidden to carry any human being, no lifting while the lifting objects are swinging and forbidden any oblique lift, never lift anything connected to the ground and never pull other objects by wire of button station, do not press the button too frequency, and the cam limit switch is a protective device, it shall not be used repeatedly; caution when the lifting load and hoisting speed are different! When the speed is high, the lifting load is small and over load is not allowed; normal working noise of complete machine is below 80db; during operating, if troubles happen, cut off the general power and ask professional personnel to maintain.

5. Maintenance

The service crane should be maintained regularly by professional personnel.

Lubricating oil: the planetary decelerator, gantry and " trinity "

decelerator shall be renewed every three months; after working for 150 hours for the first time, change lubricating oil; check the oil level regularly every week and if there is abnormal noises, check oil once every half a year, change the lubricating oil after working 1500 hour (according to the first person) or every year. The temperature of lubricating oil can reach 90 °C. Other parts with bearing should be lubricated every week, and change the lubricating grease during the overall inspection every year. (see the picture 24, table 2)

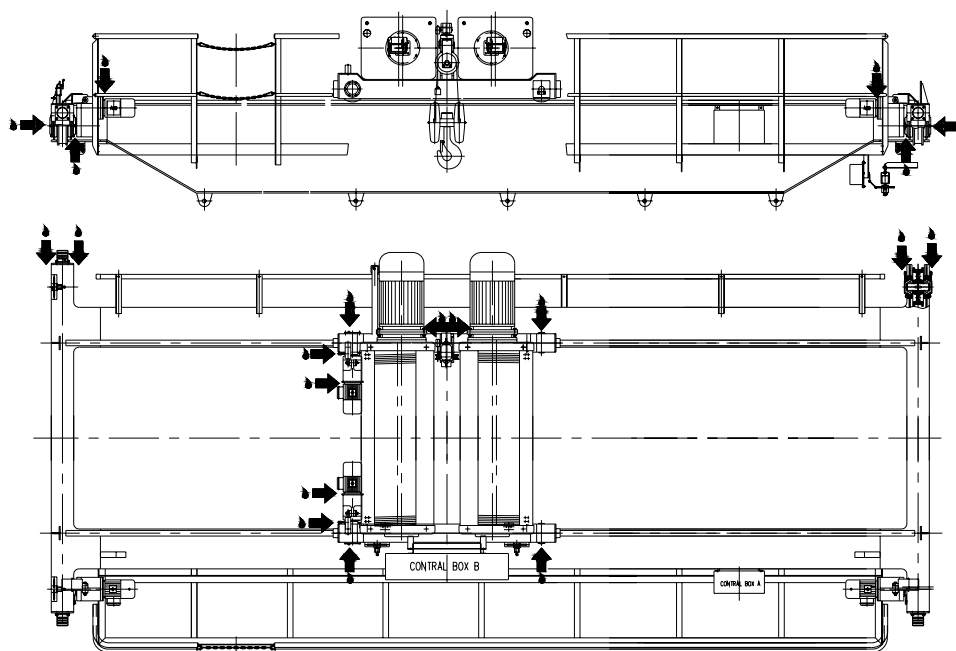


Fig.24 Position of injecting oil

list 2

position	type	quantity
Grease cup of all ball bearings	3 no. Ca-lubricare	
planetary decelerator	Summer L-CKD220	1~1.2

	Winter MOBIL GEAR SHC220	liter
Decelerator of traverse mechanism(06 seat no.)	Summer L-CKC150 Winter L-CKS150	1.5 liter
Decelerator of travel mechanism(08 seat no.)	Summer L-CKC150 Winter L-CKS150	1.8 liter

The surface of rope guider and wire rope should be lubricated every three months. Check the wearing and tearing of rope guider and press wheel, the wire rope, hook, pulley, wheel should be under observation when working, the cooling duct of motor should be cleaned regularly, often check whether the covers of all electric equipment are connected to the ground, whether all electrical parts are fixed tightly, whether all switches are allergic, maintain or change immediately whenever any vulnerable part is abnormal.

6. Components rejection terms

After very long time operation of service crane, some of its components are unavoidable damaged and worn, so must be replaced and repaired.

6.1 Wire rope (see list 3)

Wire rope rejection according to broken wire amount

Safety factor of Wire rope	18×19+FC-15-1770	
	broken wire amount in one pitch	
	Entwist each other	Entwist in one direction

<6	6	4
6~7	8	6
>7	10	8

After rusted or worn on the wire rope, reduce broken wire amount for rejection in the above form according to the form below and reject the cable according to broken wires.

list 4

Reduce factor of wire rope

Wire rope surface worn and rusted (%)	10	15	20	25	30~ 40	>40
Reduce factor (%)	85	75	70	60	50	0

Reject wire rope when it has broken wire, its core exposed, or its diameter reduce 7%; reject the cable when radial worn or corrupted over 40% of the original diameter.

6.2 Hook & pulley group (see list 5)

list 5

Hook

position	condition
any position	crack
dangerous section	worn out to 10% of original dimension
hook mouth	Increase 15% than original
complete	Distortion over 10%
Dangerous section or hook neck	Plastic deformation

Screw nut, hook beam	Crack, deformed
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Any item in the form appears, reject the hook.; reject parts pertain to the hook and its pulley block at the same time.

6.3 Traveling wheel (see list 6)

list 6

Traveling wheel

position	condition
any position	crack
wheel flange thickness	Worn out to 50% of original dimension
wheel flange thickness	Bending deformation to 20% of original thickness
Tread thickness	Worn out to 15% of original thickness
Ovality	$V < 50\text{m/min}$, ovality is 1mm
Two driving wheel working diameter	Difference $> 1/600 \times \text{working diameter}$

Any item appears in the above form, the wheel should be rejected.

7. Common trouble and Maintenance

Part	Malfunction	Usual cause	Solution
Motor	Abnormity or failure of lifting motor	The electric pressure is too low	Ensure the voltage of the motor output is 90-110% of rated pressure.
		The three phase voltage vary too much from each other	Adjust the power and ensure the difference among three phases is lower than 3%.
		Lack of power or Phase sequence is wrong	Inspect the electric circuit, whether the contactor and wiring is correct, and

			inspect Phase sequence
		The brake is not normal	Check the brake's circuit and the DC part of brake is under energized during the motor operation.
decelerator	The noise is beyond allowable value	Lack of grease	infuse grease
	Oil leak	The reducer is over oiled, or the oil plug goes without seal packing, or the seal packing is not tight.	Drain the superfluous oil and keep mass of the oil as much as 2/5-1/2 of the total volume capacity, screw the seal packing tight
Electric control box	The contact point of contactor or the voltage transformer is over burned	The voltage is too high or too low or the power is left uncut when it stops working	Make sure the deviation of power from rated power is within 10%; always cut off power supply after working time
	Loose connector lug or poor contact	Be vibrated during transportation	Inspection and tighten before installation
	Loose contact of press button	The handle is seriously knocked	Check the button and contact timely
		The inner control cable is broken	Change or switch on the cable of handle
	Hoisting and moving mechanism run abnormally	Phase short, phase fault	Check the power supply
		The relay acts	Check all relays of the motors
others	The rope guider is damaged	Lift and pull inclined	The operator shall be trained and familiar with instruction.
	The wire rope at the hook twists together.	The wire rope in itself is twisted.	Remove one side of wire rope and relax it, then fix it again

The components rejection of service crane are wire rope, rope guider,
the friction disc of motor.

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