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(71) Applicant(s):

China Three Gorges Corporation
1 Liuhe Road, Jiang'an Dist., Wuhan City,
Hubei 430010, China

(72) Inventor(s):

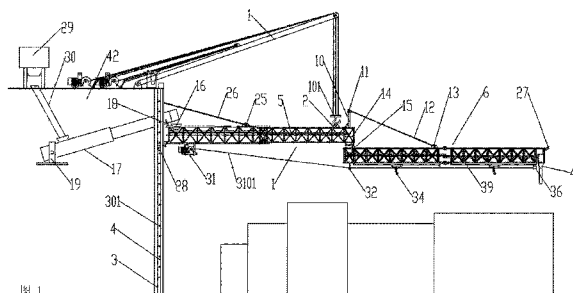
Zhiguo Tan
Peng Gao
Tianran Yang
Xinming Xiao
Xujia Huo

(74) Agent and/or Address for Service:

IP Consult
21A Commercial Road, Swanage, BH19 1DF,
United Kingdom

(54) Title of the Invention: **Rapid pouring and hoisting device and operation method thereof**
Abstract Title: **Rapid pouring and hoisting device and operation method thereof**

(57) Provided are a rapid pouring and hoisting device and an operation method thereof. The device comprises: a mast crane; a mast crane hoisting hook is connected to a primary hoisting point of a fabric belt conveyor apparatus; a climbing rack frame and a climbing rack are arranged on a mast crane foundation; the fabric belt conveyor apparatus comprises a telescoping belt conveyor and a swing fabric belt conveyor, and a belt conveyor tail frame at an end portion of the telescoping belt conveyor has a pinion disposed thereon and is driven by a motor; a pull rod is arranged on a truss of the telescoping belt conveyor; a rotary hoisting lug is arranged at the upper end of the pull rod and is connected to a connecting hoisting lug by means of a pull cable; a first hopper is arranged on the telescoping belt conveyor; a second hopper is arranged on the swing fabric belt conveyor; and the second hopper is rotationally mounted at the lower end of the first hopper and is driven to rotate by a rotary mechanism. The device and the operation method thereof provide an enhanced pouring range, achieve continuous pouring, and improve pouring efficiency.



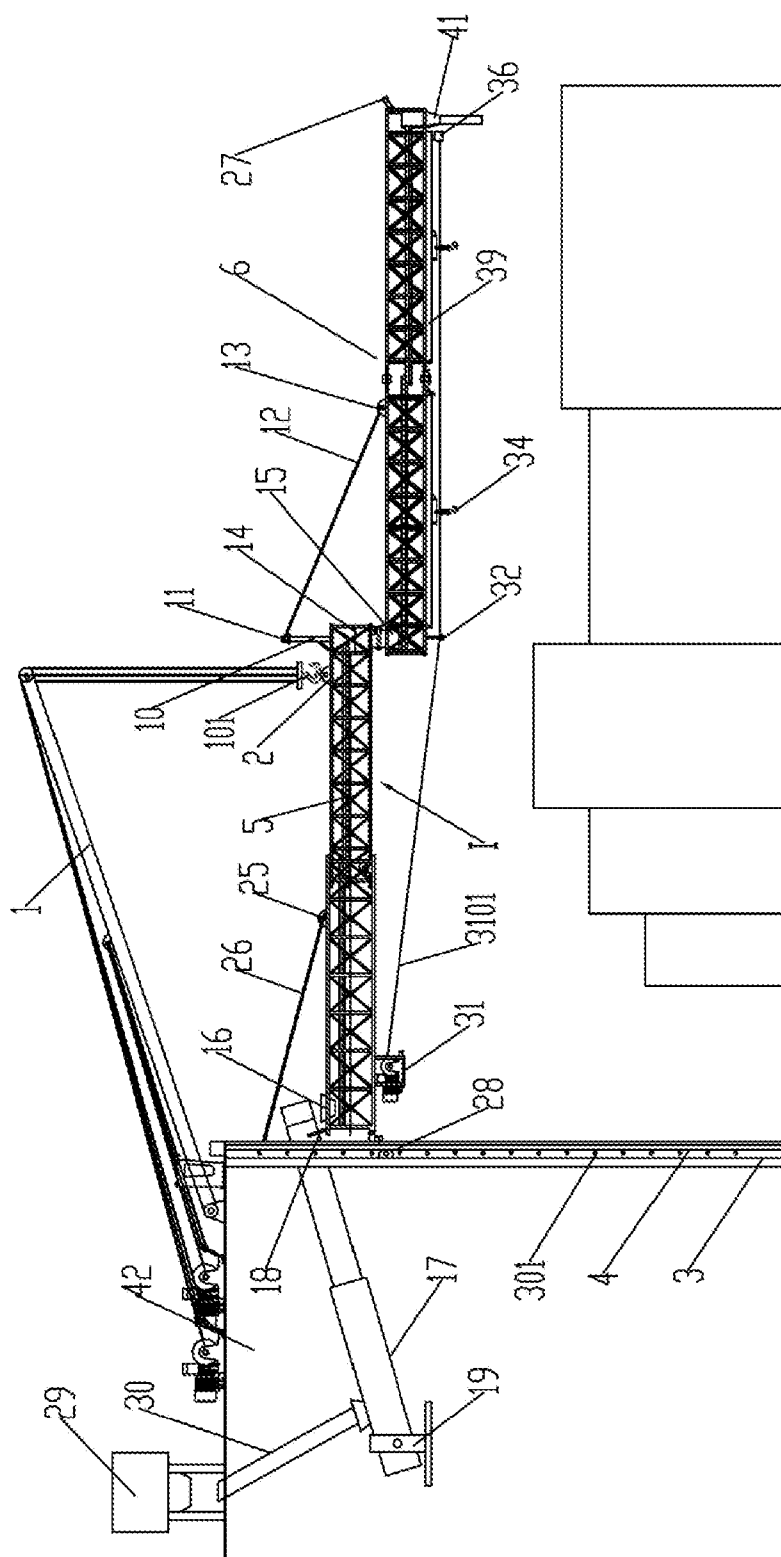


FIG. 1

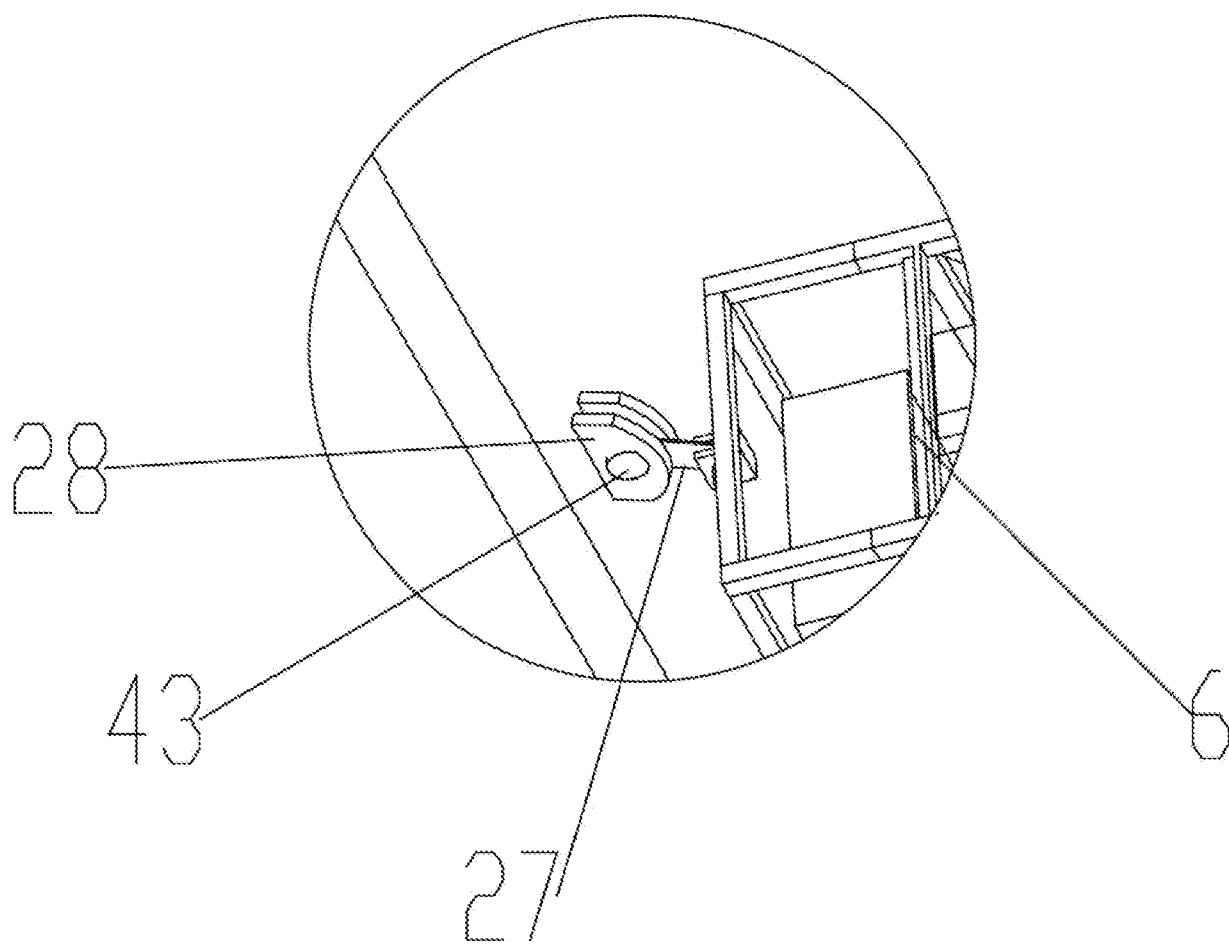


FIG. 3

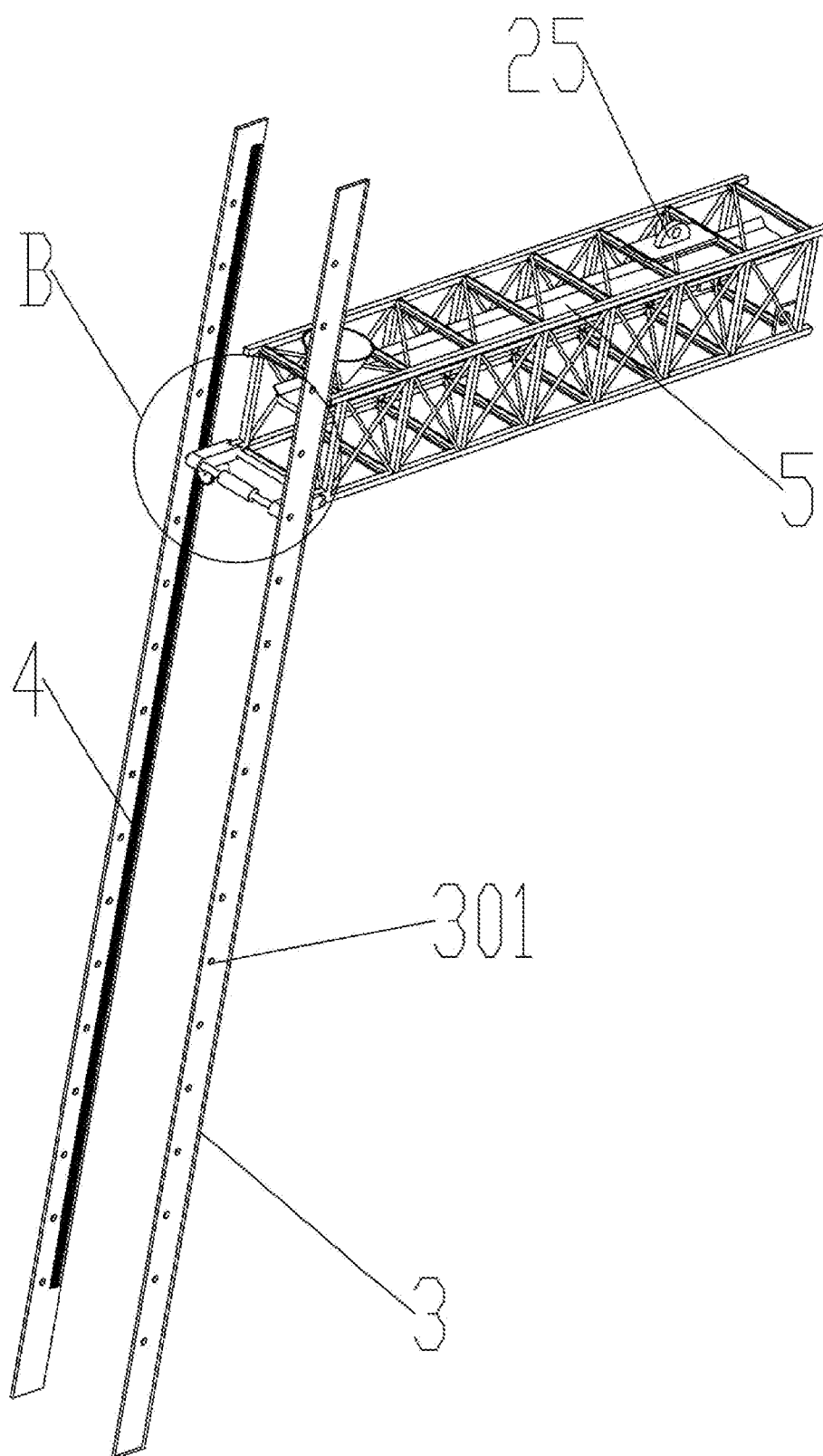


FIG. 4

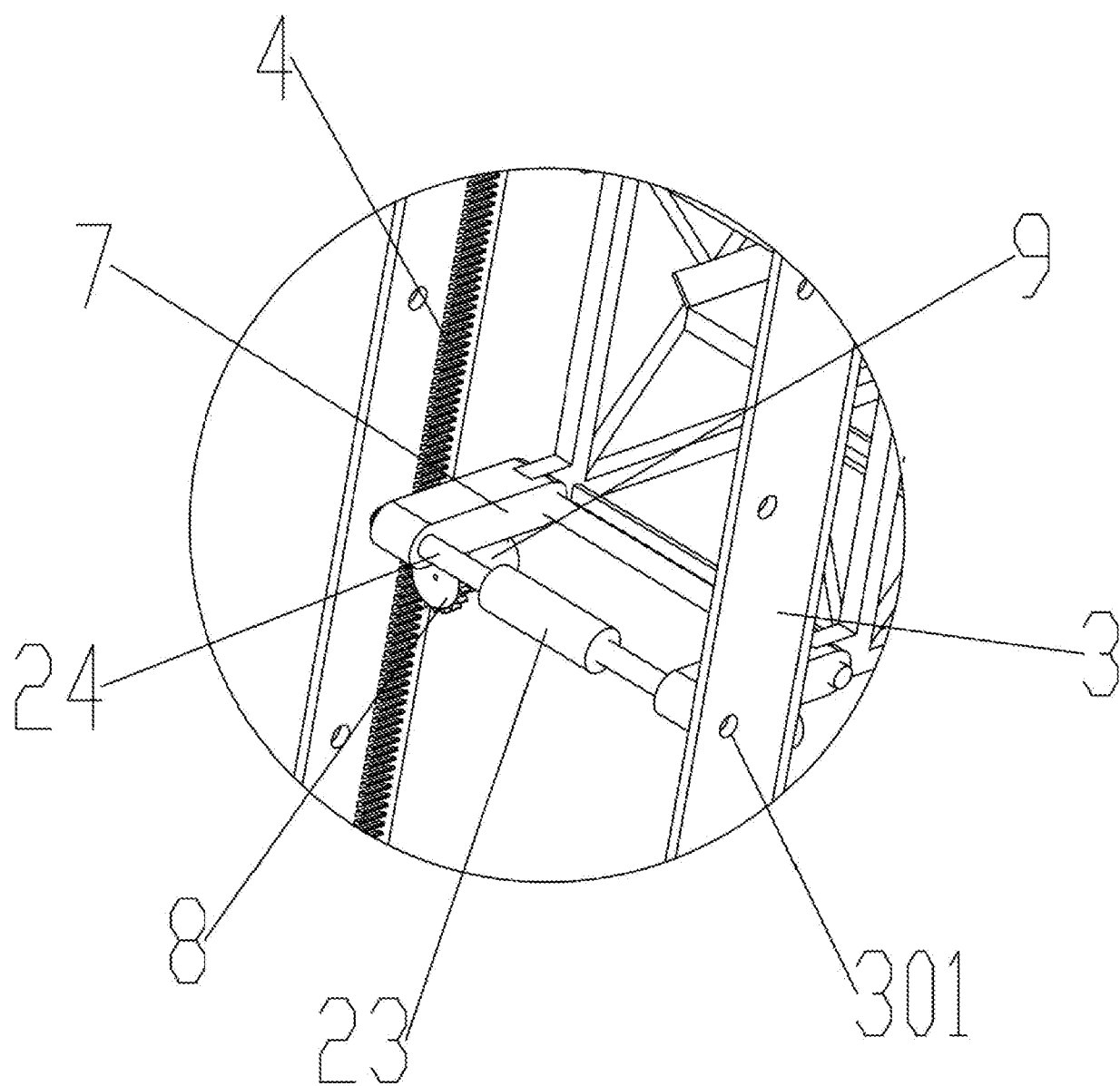


FIG. 5

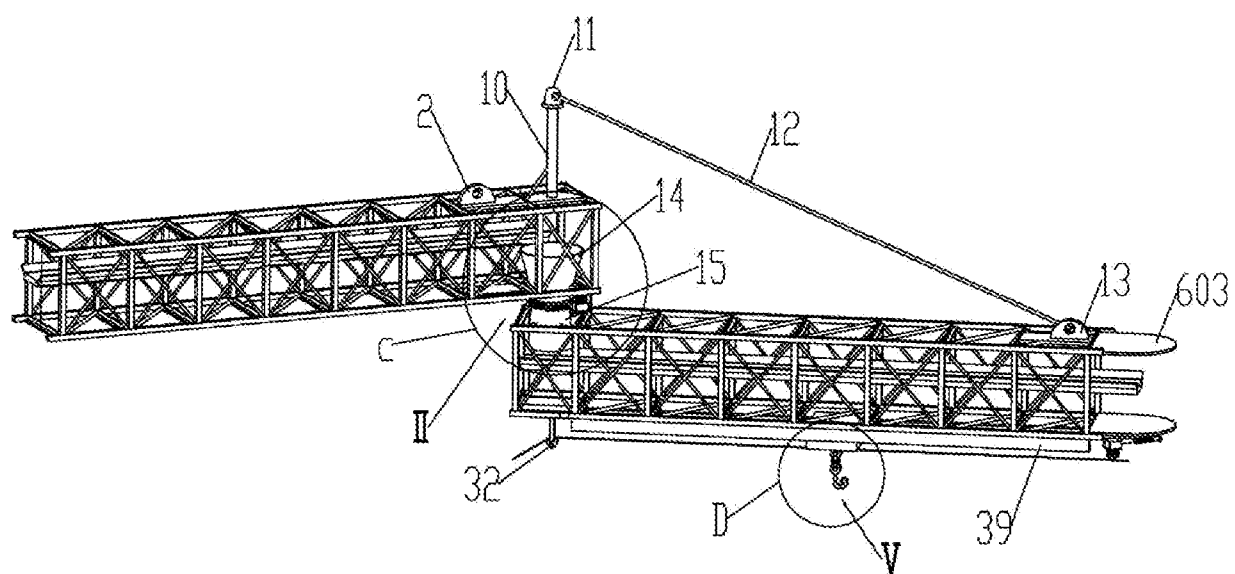


FIG. 6

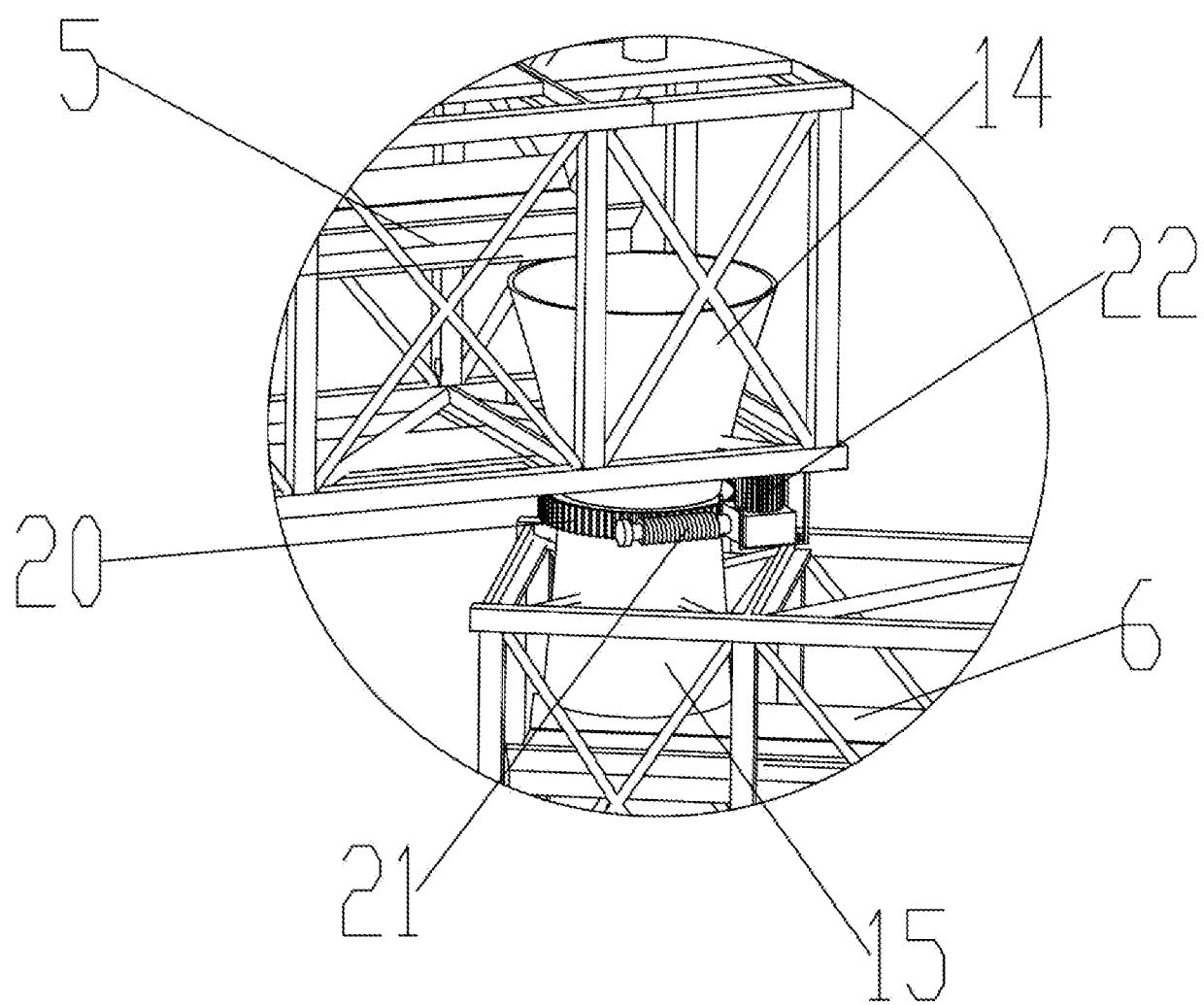


FIG. 7

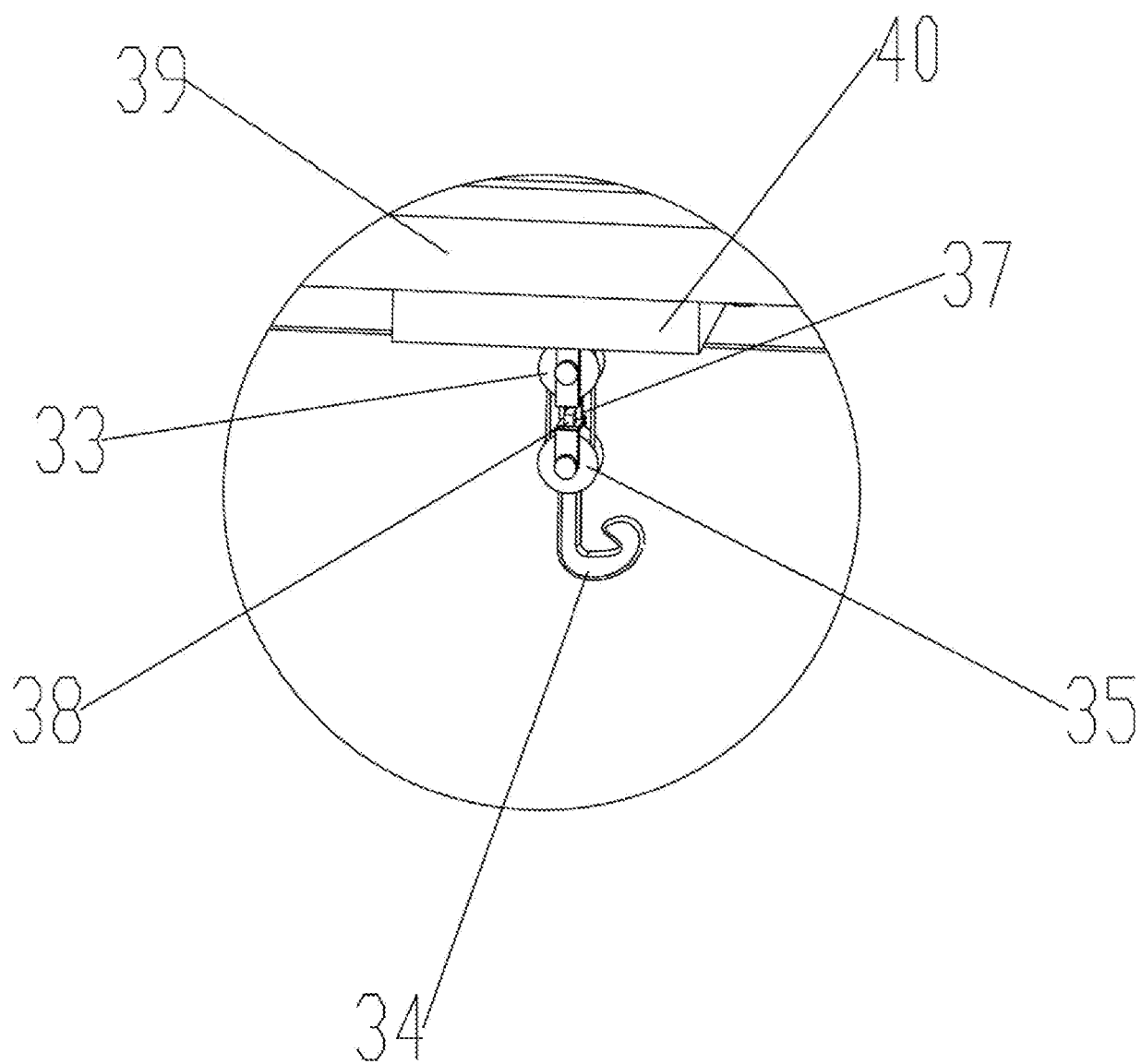


FIG. 8

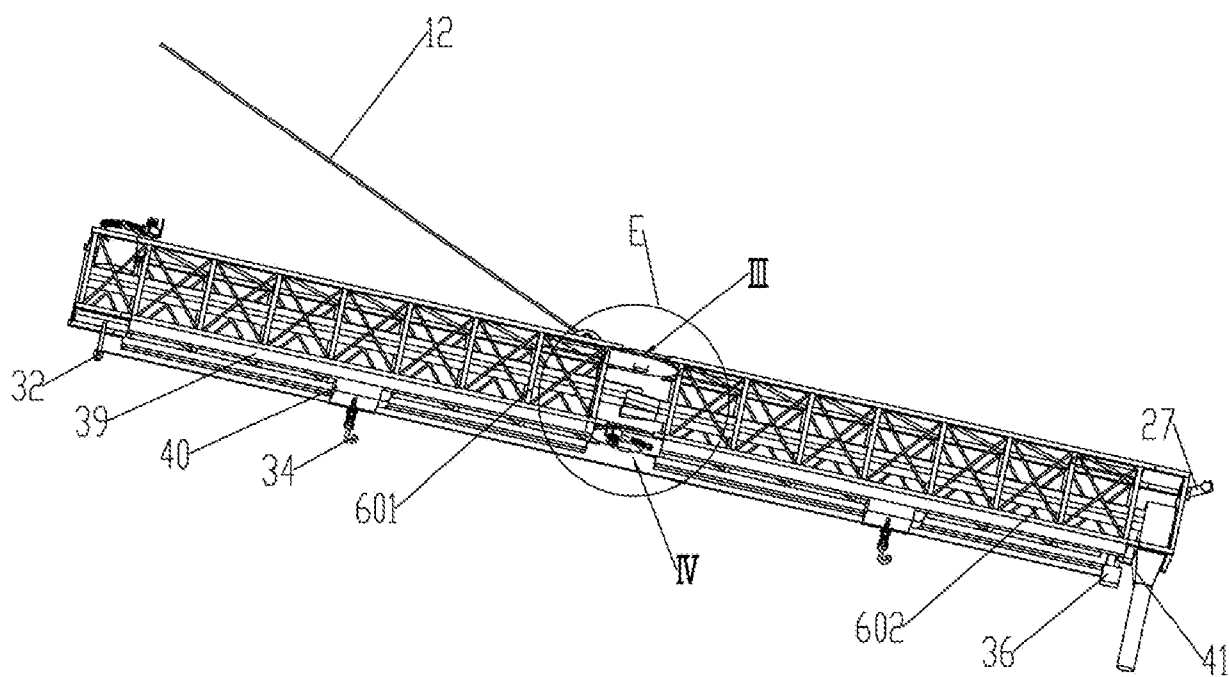


FIG. 9

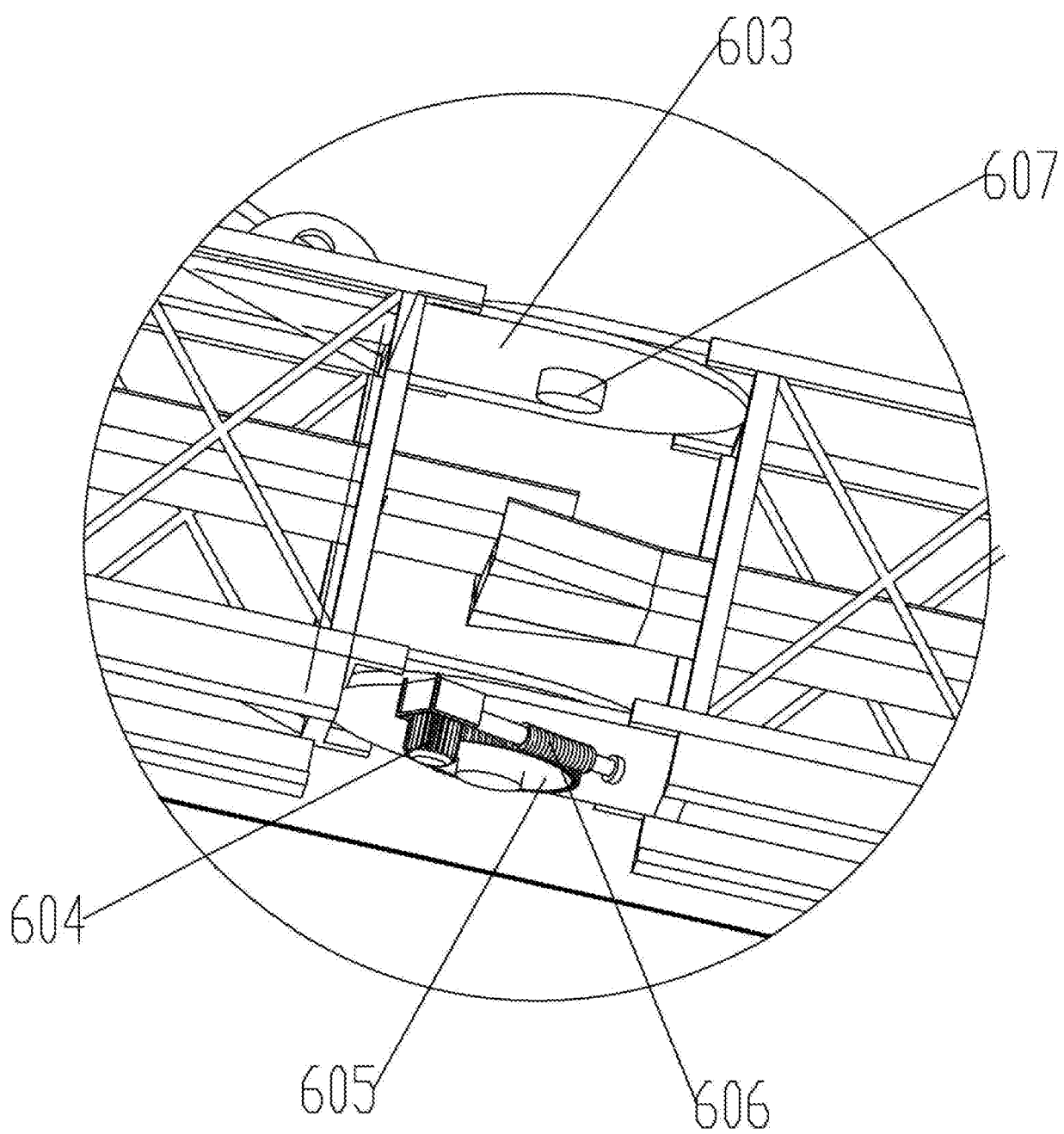


FIG. 10

RAPID POURING AND HOISTING DEVICE AND OPERATION METHOD THEREOF

TECHNICAL FIELD

[0001] The present disclosure relates to the field of mass concrete pouring construction, in particular to a rapid pouring and hoisting device and an operation method thereof.

BACKGROUND

[0002] For construction conditions of hydropower dams, houses and the like, which need to pour mass concrete in a small area, an original solution generally adopts hoisting and pouring devices such as a cable crane, a portal crane and tower crane, a tower belt crane, and the like. A raise cage is utilized in the cable crane and the portal crane and tower crane for pouring, which pertains to discontinuous pouring and has low pouring efficiency. In a belt concrete transportation and pouring device such as the tower belt crane, a feeding line tower needs to be arranged on a concrete warehouse surface, and the tower needs to be continuously raised with lifting of poured concrete, which affects continuous construction of engineering and has poor economy performance. Therefore, it is necessary to develop a highly effective pouring and hoisting device with less influence on engineering and higher efficiency.

SUMMARY

[0003] The technical problem to be solved by the present disclosure is to provide a rapid pouring and hoisting device and an operation method thereof to improve a pouring range, achieve continuous pouring, and improve pouring efficiency.

[0004] In order to solve the above technical problem, a technical solution adopted by the present disclosure is as follows: a rapid pouring and hoisting device comprises a mast crane arranged on a mast crane foundation, wherein a mast crane hook of the mast crane is connected with a main hoisting point of a concrete distribution belt conveyor apparatus, an outer side of the mast crane foundation is provided with a climbing rack frame, the climbing rack frame is provided with a climbing rack, the concrete distribution belt conveyor apparatus comprises a telescoping belt conveyor and an oscillating concrete distribution belt conveyor, one end of the telescoping belt conveyor close to the mast crane is provided with a belt conveyor tail frame, the belt conveyor tail frame is provided with a gear meshed with the climbing rack, the gear is driven by a motor, the telescoping belt conveyor is provided with a tension rod, a slewing hoisting lug is connected with an upper end of the tension rod by a bearing, the slewing hoisting lug is connected with a connecting hoisting lug on a truss of the oscillating concrete distribution belt conveyor by a draw

cord, the telescoping belt conveyor is provided with a first hopper, the oscillating concrete distribution belt conveyor is provided with a second hopper corresponding to the first hopper, an upper end of the second hopper is rotationally installed at a lower end of the first hopper, the second hopper is driven to rotate by a slewing mechanism, and an end portion of the oscillating concrete distribution belt conveyor away from the telescopic belt conveyor is provided with an discharge hopper.

[0005] In a preferred solution, a feeding telescopic belt conveyor is further comprised, wherein an feeding end of the feeding telescopic belt conveyor is arranged above a discharge end of the telescoping belt conveyor, the feeding end of the feeding telescopic belt conveyor is installed on the telescoping belt conveyor by a supporting frame, the feeding telescopic belt conveyor is rotationally connected with the supporting frame, the other end of the feeding telescopic belt conveyor is rotationally installed on a corner bracket, and the discharge end of the telescoping belt conveyor or the feeding end of the feeding telescopic belt conveyor is provided with a hopper.

[0006] In a preferred solution, the slewing mechanism comprises a worm wheel arranged outside the second hopper, a worm is matched with the worm wheel, the worm is driven by an oscillating drive motor, and the oscillating drive motor is fixed on the telescoping belt conveyor.

[0007] In a preferred solution, the belt conveyor tail frame is provided with a pin-penetrating cylinder, pin holes are distributed on the climbing rack frame along a length direction of the climbing rack frame, a telescoping end of the pin-penetrating cylinder is provided with a pin rod adapted to the pin holes, the telescoping belt conveyor is provided with a suspension and locking point, and the suspension and locking point is connected with the pin hole through a locking draw cord.

[0008] In a preferred solution, the oscillating concrete distribution belt conveyor comprises an inner concrete distribution belt conveyor and an outer concrete distribution belt conveyor, connecting ends of the inner concrete distribution belt conveyor and the outer concrete distribution belt conveyor are provided with connecting mechanisms, the connecting mechanisms are rotationally connected, and the connecting mechanisms are driven by a slewing supporting mechanism.

[0009] In a preferred solution, the connecting mechanism comprises rotating ear plates, and the rotating ear plates are connected by a pin shaft.

[0010] In a preferred solution, the slewing supporting mechanism comprises a drive worm wheel arranged on one of the connecting mechanisms, the drive worm wheel is matched with a drive worm, and the drive worm is driven by a slewing motor.

[0011] In a preferred solution, an end portion of the oscillating concrete distribution belt conveyor close to the discharge hopper is provided with a locking plate, the locking plate is rotationally installed on the oscillating concrete distribution belt conveyor, the outer side of the mast crane foundation is provided with a plurality of locking ear plates, and the locking plate and the locking ear plate are connected by a locking pin.

[0012] In a preferred solution, the mast crane foundation is provided with a concrete mixing plant, and concrete in the concrete mixing plant is conveyed to a loading opening of the feeding telescopic belt conveyor through a chute.

[0013] In a preferred solution, a bottom portion of the truss of the telescoping belt conveyor is provided with a belt lifting winch, the end portion of the oscillating concrete distribution belt conveyor is provided with an idler, a bottom portion of the oscillating concrete distribution belt conveyor is provided with a hook mechanism, the hook mechanism comprises a fixed pulley arranged on the oscillating concrete distribution belt conveyor, a lifting hook is connected with a movable pulley, a winch rope of the belt lifting hoist passes through an upper side of the idler and an upper side of the fixed pulley in turn, and then returns from a lower side of the movable pulley to the upper side of the fixed pulley, and an end portion of the winch rope of the belt lifting hoist is connected with a weight sensor at the bottom portion of the oscillating concrete distribution belt conveyor.

[0014] In a preferred solution, a plurality of hook mechanisms are arranged along a length direction of the concrete distribution belt conveyor apparatus, the winch rope of the belt lifting hoist is connected with the hook mechanisms in turn, the fixed pulley is provided with a solenoid valve base plate, the movable pulley is provided with a solenoid valve tongue, and the solenoid valve base plate and the solenoid valve tongue are mutually attracted.

[0015] In a preferred solution, a bottom portion of the oscillating concrete distribution belt conveyor is provided with a hook track, a motor drive dolly moves along the hook track, and the hook mechanism is connected with the motor drive dolly.

[0016] The present disclosure further provides a method for operating a rapid pouring and hoisting device, comprising the steps of:

[0017] Step 1: connecting a mast crane hook of a mast crane with a main hoisting point, when a pouring height needs to be adjusted according to a position of a poured warehouse surface, starting a pin-penetrating cylinder and retracting a pin rod to release restriction on a telescoping belt conveyor, starting a motor to mesh a gear with a climbing rack, moving a concrete distribution belt conveyor apparatus up and down to match with the mast crane, after moving into proper position, starting the pin-penetrating cylinder, and making the pin rod extend out and penetrate into a pin hole to lock a position;

[0018] Step 2: telescoping the telescoping belt conveyor according to a position of the warehouse surface, adjusting an angle of the mast crane meanwhile, and driving an oscillating concrete distribution belt conveyor to oscillate along an axis of a second hopper by a slewing mechanism to make an discharge hopper align with an unloading point; and

[0019] Step 3: feeding concrete to the telescoping belt conveyor and conveying the concrete into a pouring position by the telescoping belt conveyor and the oscillating concrete distribution belt conveyor in turn.

[0020] In a preferred solution, when a hoisting operation needs to be carried out, retracting the telescoping belt conveyor, driving the oscillating concrete distribution belt conveyor to rotate by the slewing mechanism to make a locking plate rotate to a position of a locking ear plate, after locking through a locking pin, making the pin rod extend out and penetrate into the pin hole to lock a position of the telescoping belt conveyor, wherein the mast crane is unhooked for hoisting.

[0021] In a preferred solution, when a hoisting operation needs to be carried out, starting a belt lifting hoist to make a movable pulley and a lifting hook move downward, after hoisting by the lifting hook, driving the movable pulley and the lifting hook to move upward by the belt lifting hoist to move a hoisted object to a target position.

[0022] The rapid pouring and hoisting device and the operation method thereof provided by the present disclosure have the following beneficial effects.

[0023] 1. Concrete is fed by telescoping of the telescoping belt conveyor and swinging of the oscillating concrete distribution belt conveyor, and meanwhile, the whole concrete distribution belt conveyor apparatus can realize fast full-dimensional and full-covering pouring at the pouring point without dead angle through up-and-down translation of the climbing rack, luffing of the mast crane, and up-and-down height adjustment of the mast crane hook of the mast crane.

[0024] 2. The feeding telescopic belt conveyor and the concrete mixing plant continuously feed concrete to the concrete distribution belt conveyor apparatus continuously, and combined with the conveying and pouring of the concrete distribution belt conveyor apparatus which is continuously connected with production and feeding of the concrete mixing plant, high efficiency of belt conveyor conveying is fully played, thus realizing efficient pouring.

[0025] 3. A main platform for hoisting is the simple mast crane, which has very simple structure, heavy hoisting weight and large control range. In addition, the continuous arrangement of the multi-section telescoping belt conveyor and the oscillating concrete distribution belt conveyor effectively expands a pouring range, and has great advantages in economy performance compared with the cable crane, the portal crane and tower cranes and other devices.

[0026] 4. There is no interference to warehouse surface preparation and construction. The concrete distribution belt conveyor apparatus of the device is not arranged in the warehouse surface, which has no interference to warehouse surface construction and greatly improves construction efficiency.

[0027] 5. The device can well meet demand of rising height changing of the warehouse surface. An important feature of mass concrete such as hydropower engineering is that the warehouse surface is constantly rising with the progress of engineering construction. Obviously, a device with a fixed pouring height cannot adapt to this change. A height of the concrete distribution belt conveyor apparatus of the device can be adjusted, which is very adapted pouring height changing, has very strong flexibility and applicability as well as very good versatility.

[0028] 6. The device can not only realize an efficient concrete pouring function, but also hoist objects according to hoisting requirements, weight and amplitude of the hoisted objects respectively by using the mast crane or the hook mechanism arranged at the bottom portion of the oscillating concrete distribution belt conveyor combined with the belt lifting winch, which meets requirements for functional diversity of a construction device.

BRIEF DESCRIPTION OF DRAWINGS

[0029] The present disclosure is further described hereinafter with reference to the drawings and the embodiments.

[0030] FIG. 1 is a schematic diagram of an overall structure of the present disclosure;

[0031] FIG. 2 is a schematic structural diagram when an oscillating concrete distribution belt conveyor is locked;

[0032] FIG. 3 is a schematic structural diagram of a portion A in FIG. 2;

[0033] FIG. 4 is a schematic installation diagram of a belt conveyor tail frame;

[0034] FIG. 5 is a schematic structural diagram of a portion B in FIG. 4;

[0035] FIG. 6 is a schematic diagram of connection between a telescopic belt conveyor and an oscillating concrete distribution belt conveyor;

[0036] FIG. 7 is a schematic structural diagram of a portion C in FIG. 6;

[0037] FIG. 8 is a schematic structural diagram of a portion D in FIG. 6;

[0038] FIG. 9 is a schematic diagram of connection between an inner concrete distribution belt conveyor and an outer concrete distribution belt conveyor; and

[0039] FIG. 10 is a schematic structural diagram of a portion E in FIG. 9.

[0040] In the drawings: I: concrete distribution belt conveyor apparatus; II: slewing mechanism; III: connecting mechanism; IV: slewing supporting mechanism; V: hook mechanism; 1: mast crane; 2: main hoisting point; 3: climbing rack frame; 4: climbing rack; 5: telescopic belt conveyor; 6: oscillating concrete distribution belt conveyor; 7: belt conveyor tail frame; 8: gear; 9: motor; 10: tension rod; 11: slewing hoisting lug; 12: draw cord; 13: connecting hoisting lug; 14: first hopper; 15: second hopper; 16: hopper; 17: feeding telescopic belt conveyor; 18: supporting frame; 19: corner bracket; 20: worm wheel; 21: worm; 22: oscillating drive motor; 23: pin-penetrating cylinder; 24: pin rod; 25: suspension and locking point; 26: locking draw cord; 27: locking plate; 28: locking ear plate; 29: concrete mixing plant; 30: chute; 31: belt lifting winch; 32: idler; 33: fixed pulley; 34: lifting hook; 35: movable pulley; 36: weight sensor; 37: solenoid valve base plate; 38: solenoid valve tongue; 39: hook track; 40: motor drive dolly; 41: discharge hopper; 42: mast crane foundation; 43: locking pin; 101: mast crane hook; 301: pin hole; 601: inner concrete distribution belt conveyor; 602: outer concrete distribution belt conveyor; 603: rotating ear plate; 604: slewing motor; 605: drive worm wheel; 606: drive worm; 607: pin shaft; and 3101: winch rope.

DETAILED DESCRIPTION

[0041] As shown in FIGs. 1 to 5, a rapid pouring and hoisting device comprises a mast crane 1, a concrete distribution belt conveyor apparatus I and a feeding telescopic belt conveyor 17, while each part further comprises related auxiliary apparatuses. A mast crane foundation 42 is provided with a cab, which is used to operate movement and start-stop of the mast crane 1 and the concrete distribution belt conveyor apparatus I.

[0042] The mast crane 1 is arranged on the mast crane foundation 42. The mast crane 1 comprises a mast crane boom, a mast crane hook 101 and other components. In the embodiment, the mast crane foundation 42 is provided with a luffing hoist and a lifting hoist. The luffing hoist is used for adjusting an angle of the mast crane boom of the mast crane 1, and the lifting hoist is used for up-and-down movement of the mast crane hook 101 of the mast crane 1.

[0043] The mast crane hook 101 of the mast crane 1 is connected with a main hoisting point 2 of a concrete distribution belt conveyor apparatus I. An outer side of the mast crane foundation 42 is provided with a climbing rack frame 3, and the climbing rack frame 3 is provided with a climbing rack 4. Specifically, the climbing rack 4 and the climbing rack frame 3 for climbing the concrete distribution belt conveyor apparatus I are vertically slotted outside a pier wall of the mast crane foundation 42.

[0044] The concrete distribution belt conveyor apparatus I comprises a telescoping belt conveyor 5 and an oscillating concrete distribution belt conveyor. The telescoping belt conveyor 5 is a multi-section telescoping belt conveyor, which is convenient for length adjustment, and the main hoisting point 2 is preferentially arranged on a truss of the telescoping belt conveyor 5. One end of the telescoping belt conveyor 5 close to the mast crane 1 is provided with a belt conveyor tail frame 7, the belt conveyor tail frame 7 is provided with a gear 8 meshed with the climbing rack 4, and the gear 8 is driven by a motor 9. Through the meshing of the climbing rack 4 with the gear 8 and the driving of the motor 9, the whole concrete distribution belt conveyor apparatus I is driven to move up and down along the climbing rack 4. The mast crane 1 is used for bearing a main gravity during a working process of the concrete distribution belt conveyor apparatus I, and matching with the climbing rack 4 to move the concrete distribution belt conveyor apparatus I up and down during a climbing process.

[0045] As shown in FIG. 6, the truss is provided with a tension rod 10, and a slewing hoisting lug 11 is connected with an upper end of the tension rod 10 by a bearing. The slewing hoisting lug 11 may rotate along the tension rod 10. The slewing hoisting lug 11 is connected with a connecting hoisting lug 13 on a truss of the oscillating concrete distribution belt conveyor 6 by a draw cord 12. The truss of the telescoping belt conveyor 5 is provided with a first hopper 14, and the truss of the oscillating concrete distribution belt conveyor 6 is provided with a second hopper 15 corresponding to the first hopper 14. An upper end of the second hopper 15 is rotationally installed at a lower end of the first hopper 14, the second hopper 15 is driven to rotate by a

slewing mechanism II, and an end portion of the oscillating concrete distribution belt conveyor 6 away from the telescopic belt conveyor 5 is provided with a discharge hopper 41. The second hopper 15 may rotate along an axis of the first hopper 14, so that the oscillating concrete distribution belt conveyor 6 can oscillate for feeding along the first hopper 14 in a horizontal plane, which is beneficial to improving a feeding range and easily adjusting a pouring point.

[0046] By arranging the tension rod 10 and the draw cord 12, a cantilever moment of the oscillating concrete distribution belt conveyor 6 can be shared, a stress on a connected position of the first hopper 14 and the second hopper 15 can be reduced, and the oscillating of the oscillating concrete distribution belt conveyor 6 will not be affected at the same time.

[0047] As shown in FIG. 7, the slewing mechanism II comprises a worm wheel 20 arranged outside the second hopper 15, a worm 21 is matched with the worm wheel 20, the worm 21 is driven by an oscillating drive motor 22, and the oscillating drive motor 22 is fixed on the truss of the telescoping belt conveyor 5. The worm wheel and the worm may also be replaced by other transmission mechanisms, such as a gear ring and a gear, wherein the gear ring is arranged outside the second hopper 15 and the gear is arranged at an output end of the drive motor 22.

[0048] The feeding telescopic belt conveyor 17 is arranged in a feeding corridor below the mast crane foundation 42, and mainly undertakes a function of supplying concrete produced in a concrete mixing plant to the concrete distribution belt conveyor apparatus I. An feeding end of the feeding telescopic belt conveyor 17 is arranged above a discharge end of the telescoping belt conveyor 5, the feeding end of the feeding telescopic belt conveyor 17 is installed on the truss of the telescoping belt conveyor 5 by a supporting frame 18, the feeding telescopic belt conveyor 17 is rotationally connected with the supporting frame 18, the other end of the feeding telescopic belt conveyor 17 is rotationally installed on a corner bracket 19, and the discharge end of the telescoping belt conveyor 5 or the feeding end of the feeding telescopic belt conveyor 17 is provided with a hopper 16.

[0049] The feeding telescopic belt conveyor 17 is rotationally connected with the supporting frame 18 to support the feeding telescopic belt conveyor 17 and ensure that the feeding end of the feeding telescopic belt conveyor 17 is aligned with the hopper 16. The other end of the feeding telescopic belt conveyor 17 is rotationally installed on the corner bracket 19. The corner bracket 19 is connected with an end portion of the feeding telescopic belt conveyor 17 through a pin shaft, so that the concrete distribution belt conveyor apparatus I can rotate around the pin

shaft of the corner bracket 19 when driving the feeding telescopic belt conveyor 17 to move up and down.

[0050] When the concrete distribution belt conveyor apparatus I moves up and down, a length of the feeding telescopic belt conveyor 17 changes, the feeding telescopic belt conveyor 17 rotates along the corner bracket 19, and the feeding end of the feeding telescopic belt conveyor 17 can rotate along the supporting frame 18, so that the feeding end of the feeding telescopic belt conveyor 17 is always located above the hopper 16, and a relative position of the feeding telescopic belt conveyor does not change. Therefore, the feeding telescopic belt conveyor 17 adopts a sleeve-frame telescoping structure, so that the feeding telescopic belt conveyor 17 can adapt to the change of the length during telescoping.

[0051] The mast crane foundation 42 is provided with a concrete mixing plant 29, and concrete in the concrete mixing plant 29 is conveyed to a loading opening of the feeding telescopic belt conveyor 17 through a chute 30.

[0052] The concrete in the concrete mixing plant 29 is conveyed through the chute 30, which can realize uninterrupted feeding, give full play to the conveying efficiency of the concrete distribution belt conveyor apparatus I, and facilitate the realization of efficient pouring.

[0053] Preferably, the belt conveyor tail frame 7 is provided with a pin-penetrating cylinder 23, pin holes 301 are distributed on the climbing rack frame 3 along a length direction of the climbing rack frame 3, and a telescoping end of the pin-penetrating cylinder 23 is provided with a pin rod 24 adapted to the pin holes 301. The truss of the telescoping belt conveyor 5 is provided with a suspension and locking point 25, and the suspension and locking point 25 is connected with the pin hole 301 through a locking draw cord 26.

[0054] When the concrete distribution belt conveyor apparatus I moves into proper position, a hydraulic station arranged on the mast crane foundation 42 controls the pin-penetrating cylinder 23 to start, so that the pin rod 24 penetrates into the corresponding pin hole 301, thus realizing up-and-down position locking of the concrete distribution belt conveyor apparatus I.

[0055] When pouring is not needed, the telescoping belt conveyor 5 is retracted and fixed, and the suspension and locking point 25 is locked with the pin hole 301 with a proper height through the locking draw cord 26, so that the concrete distribution belt conveyor apparatus I is completely locked, the mast crane 1 can be unhooked, and a heavy object can be hoisted by the mast crane 1.

[0056] Preferably, as shown in FIGs. 9 to 10, the oscillating concrete distribution belt conveyor 6 comprises an inner concrete distribution belt conveyor 601 and an outer concrete distribution belt conveyor 602. Connecting ends of the inner concrete distribution belt conveyor 601 and the outer concrete distribution belt conveyor 602 are provided with connecting mechanisms III, the connecting mechanisms III are rotationally connected, and the connecting mechanisms III are driven by a slewing supporting mechanism IV.

[0057] In the embodiment, the connecting mechanisms III are rotating ear plates 603, and the rotating ear plates 603 are connected by a pin shaft 607.

[0058] The slewing supporting mechanism IV comprises a drive worm wheel 605 arranged on the rotating ear plate 603 of the outer concrete distribution belt conveyor 602, the drive worm wheel 605 is matched with a drive worm 606, the drive worm 606 is driven by a slewing motor 604, and the outer concrete distribution belt conveyor is driven by the slewing supporting mechanism IV to rotate along the pin shaft 607. In specific use, the slewing motor 604 is connected with the drive worm 606 by a reduction box. The drive worm wheel 605 and the drive worm 606 may also be replaced by other transmission mechanisms.

[0059] The outer concrete distribution belt conveyor 602 is driven by the slewing supporting mechanism IV to oscillate relative to the inner concrete distribution belt conveyor 601, which further improves feeding flexibility.

[0060] As shown in FIG. 3, an end portion of the oscillating concrete distribution belt conveyor 6 close to the discharge hopper 12 is provided with a locking plate 27, the locking plate 27 is rotationally installed on the truss of the oscillating concrete distribution belt conveyor 6, and the outer side of the mast crane foundation 42 is provided with a plurality of locking ear plates 28. According to a actual working condition, multiple groups of locking ear plates 28 are arranged along a height direction of the mast crane foundation 42. The locking plate 27 and the locking ear plate 28 are connected by a locking pin 43.

[0061] When pouring is not needed, the locking ear plate 28 is rotated to a position of the locking ear plate 28 by rotating the oscillating concrete distribution belt conveyor 6, and locked by the locking pin 43.

[0062] Although the lifting hook of the mast crane 1 can only move back and forth along an axis of the concrete distribution belt conveyor apparatus I, when the concrete distribution belt conveyor apparatus I does not work, the telescoping belt conveyor 5 is retracted, the oscillating

concrete distribution belt conveyor 6 rotates, and the locking ear plate 28 rotates to the position of the locking ear plate 28 for locking, so that an actual extension length of the concrete distribution belt conveyor apparatus I is greatly shortened, and the oscillating concrete distribution belt conveyor 6 can also oscillate out an axis range of a hoisting point of the mast crane. After the mast crane hook of the mast crane 1 takes materials on a foundation platform, the mast crane hook can extend out of an influence range of the retracted concrete distribution belt conveyor apparatus I through luffing to unhook the hoisted object.

[0063] Preferably, as shown in FIGs. 1 to 2 and FIG. 8, a bottom portion of the truss of the telescoping belt conveyor 5 is provided with a belt lifting hoist 31, the end portion of the oscillating concrete distribution belt conveyor 6 is provided with an idler 32, and a bottom portion of the oscillating concrete distribution belt conveyor 6 is provided with a hook mechanism V. The hook mechanism V comprises a fixed pulley 33 arranged on the truss of the oscillating concrete distribution belt conveyor 6, a lifting hook 34 is connected with a movable pulley 35, a winch rope 3101 of the belt lifting hoist 31 passes through an upper side of the idler 32 and an upper side of the fixed pulley 33 in turn, and then returns from a lower side of the movable pulley 35 to the upper side of the fixed pulley 33. An end portion of the winch rope 3101 of the belt lifting hoist 31 is connected with a weight sensor 36 at the bottom portion of the oscillating concrete distribution belt conveyor 6. A plurality of hook mechanisms V are arranged along a length direction of the concrete distribution belt conveyor apparatus I. The fixed pulley 33 is provided with a solenoid valve base plate 37, and the movable pulley 35 is provided with a solenoid valve tongue 38. The solenoid valve base plate 37 and the solenoid valve tongue 38 are mutually attracted.

[0064] When hoisting is needed, the belt lifting hoist 31 is started to move the movable pulley 35 and the lifting hook 34 downward. After hoisting by the lifting hook 34, the belt lifting hoist drives the movable pulley 35 and the lifting hook 34 to move upward to realize hoisting.

[0065] A plurality of hook mechanisms are arranged along the length direction of the concrete distribution belt conveyor apparatus I to meet the requirements of different hoisting parts, and the lifting hook near the mast crane can hoist a load with a larger weight because the boom is relatively short. The belt lifting hoist 31 connects the plurality of hook mechanisms V in series. As the plurality of hook mechanisms V are connected in series, only one hook mechanism V can be used at the same time, and the other hook mechanisms V need to be locked, which means that,

the solenoid valve base plate 37 and the solenoid valve tongue 38 are mutually attracted to lock, and the belt lifting hoist 31 is controlled to approach the movable pulley 35 and the fixed pulley 33, and then the corresponding solenoid valve thereof is controlled to attract, so that the movable pulley 35 of the hook mechanism V is in a non-working state, and the movable pulley 35 and the lifting hook 34 cannot move up and down to achieve locking. If the solenoid valve base plate 37 corresponding to a certain hook mechanism V is controlled not to attract with the solenoid valve tongue 38, the movable pulley 35 of the hook mechanism V can move freely up and down, and normal hoisting operation can be carried out.

[0066] That is, a plurality of lifting hooks share one set of lifting hoist and lifting rope apparatus, which simplifies mechanism arrangement. In practical application, in order to achieve an effect that multiple hook mechanisms V work at the same time, multiple sets of lifting hoists and wire ropes may also be set to drive separately.

[0067] Preferably, a bottom portion of the oscillating concrete distribution belt conveyor 6 is provided with a hook track 39, a motor drive dolly 40 moves along the hook track 39, and the hook mechanism V is connected with the motor drive dolly 40.

[0068] By setting the hook track 39 and the motor drive dolly 40, the motor drive dolly 40 is started to move along the hook track 39, so that the position of the lifting hook 34 is moved, and the hoisted object may be moved to the target position or the hoisting position may be adjusted.

[0069] An method for operating a rapid pouring and hoisting device comprises the three working conditions as follows.

[0070] I. Feeding condition of a belt conveyor

[0071] Step 1: connecting a mast crane hook 101 of a mast crane 1 with a main hoisting point 2, when a pouring height needs to be adjusted according to a position of a poured warehouse surface, starting a pin-penetrating cylinder 23 and retracting a pin rod 24 to release restriction on a telescoping belt conveyor 5, starting a motor 9 to mesh a gear 8 with a climbing rack 4, moving a concrete distribution belt conveyor apparatus I up and down to match with the mast crane 1, after moving into proper position, starting the pin-penetrating cylinder 23, and making the pin rod 24 extend out and penetrate into a pin hole 301 to lock a position.

[0072] Firstly, a boom frame of the mast crane 1 is luffed and vertically aligned with the main hoisting point 2, and the mast crane hook 101 of the mast crane 1 is connected with the main hoisting point 2 through a wire rope.

[0073] When the pouring height needs to be adjusted according to the position of the poured warehouse surface, the pin-penetrating cylinder 23 is controlled to be started by a hydraulic station and the pin rod 24 is retracted to release the restriction on the telescoping belt conveyor 5, the motor 9 is started to mesh the gear 8 with the climbing rack 4, the concrete distribution belt conveyor apparatus I is moved up and down to match with the mast crane 1, after moving into proper position, the pin-penetrating cylinder 23 is started, and the pin rod 24 extends out and penetrates into the pin hole 301 to lock the position.

[0074] When the concrete distribution belt conveyor apparatus I moves up and down, a feeding telescopic belt conveyor 17 rotates along a corner bracket 19, and an feeding end of the feeding telescopic belt conveyor 17 can rotate along a supporting frame 18, so that the feeding end of the feeding telescopic belt conveyor 17 is always located above a hopper 16, and a length of the feeding telescopic belt conveyor 17 changes to adapt to angle change brought by up-and-down movement.

[0075] Step 2: telescoping the telescoping belt conveyor 5 according to a position of the warehouse surface, and adjusting an angle of the mast crane 1 meanwhile to ensure that a lifting rope of the mast crane is in a vertical stretching state relative to the concrete distribution belt conveyor apparatus I to avoid slanting and oblique hoisting, and driving an oscillating concrete distribution belt conveyor 6 to oscillate along an axis of a second hopper 15 by a slewing mechanism II to make an discharge hopper 41 align with an unloading point.

[0076] Concrete is fed by telescoping of the telescoping belt conveyor 5 and swinging of the oscillating concrete distribution belt conveyor 6, and meanwhile, the whole concrete distribution belt conveyor apparatus I can realize fast full-dimensional and full-covering pouring at the pouring point without dead angle through up-and-down translation of the climbing rack 4, luffing of the mast crane 1, and up-and-down height adjustment of the mast crane hook 101 of the mast crane 1.

[0077] During a pouring process of inner and outer distribution belt of the telescoping belt conveyor 5, it is inevitable to deviate from an original axis position, which will cause a deflection moment to the truss of the concrete distribution belt conveyor apparatus I. In order to overcome such influence, on one hand, the truss of the telescoping belt conveyor 5 is strengthened laterally in a design stage to ensure that the truss can bear the deflection moment. On the other hand, the oscillating concrete distribution belt conveyor 6 may be set as a multi-

section arrangement of the inner concrete distribution belt conveyor 601 and the outer concrete distribution belt conveyor 602, and an angle of the oscillating concrete distribution belt conveyor 6 may be adjusted to reduce the deflection moment.

[0078] Step 3: after concrete is produced by a concrete mixing plant 29, making the concrete flow from a chute 30 into a feeding opening of the feeding telescopic belt conveyor 17, and then continuously transferring the concrete to the concrete distribution belt conveyor apparatus I and feeding the concrete to a pouring position.

[0079] After the concrete distribution belt conveyor apparatus I is adjusted into proper position, the concrete is produced by the concrete mixing plant 29, flows from the chute 30 into the feeding opening of the feeding telescopic belt conveyor 17, and then continuously transferred to the concrete distribution belt conveyor apparatus I and fed to the pouring position to start pouring.

[0080] In the pouring process, if it is necessary to adjust the pouring unloading point, Step 1 and Step 2 need to be repeated in time to adjust the unloading point.

[0081] II. Hoisting condition of the main hook of the mast crane

[0082] After the pouring of the above step is completed, when hoisting is needed, the telescoping belt conveyor 5 is retracted, and the suspension and locking point 25 is locked with the pin hole 301 with a proper height through the locking draw cord 26. The slewing mechanism II drives the oscillating concrete distribution belt conveyor 6 to rotate, so that the locking plate 27 rotates to a position of the locking ear plate 28. After locking by the locking pin 43, the concrete distribution belt conveyor apparatus I is completely locked, the mast crane 1 can be unhooked, and a heavy object can be hoisted by the mast crane 1.

[0083] Although the mast crane can only move back and forth along an axis of the concrete distribution belt conveyor apparatus I, when the concrete distribution belt conveyor apparatus I does not work, the telescoping belt conveyor 5 is retracted, the oscillating concrete distribution belt conveyor 6 rotates and then is locked, an actual extension length of the concrete distribution belt conveyor apparatus I is greatly shortened, and the oscillating concrete distribution belt conveyor 6 can also oscillate out an axis range of a hoisting point of the mast crane. After the mast crane hook 101 of the mast crane 1 takes materials on a foundation platform, the mast crane hook can extend out of an influence range of the retracted concrete distribution belt conveyor apparatus I through luffing to unhook the hoisted object.

[0084] III. Hoisting condition of the lifting hook of the belt conveyor

[0085] When a warehouse surface needs to be hoisted, a solenoid valve is controlled to disconnect a solenoid valve base plate 37 and a solenoid valve tongue 38 of a certain hook mechanism V, and a belt lifting hoist 31 is started to move a movable pulley 35 and the lifting hook 34 downward. After hoisting by the lifting hook 34, the movable pulley 35 and the lifting hook 34 are driven to move upward by the belt lifting hoist 31. A motor drive dolly 40 is started to move along a hook track 39 to move the hoisted object to a target position.

[0086] A plurality of hook mechanisms are arranged to meet the requirements of different hoisting parts, and the hook mechanism V near the mast crane can hoist a load with a larger weight because a boom is relatively short. A platform of a mast crane foundation 42 may be extended to be provided with a lifting hook material taking platform or a lifting hook for taking materials from the warehouse surface, and the object is hoisted to other warehouse surfaces after material taking.

[0087] The device has a variety of operation modes to choose. On one hand, the device may be controlled and operated on site through a cab arranged near the platform of the mast crane foundation 42; on the other hand, the device may be operated through a local wireless remote control device, and the device may also be remotely monitored and operated through a monitoring system configured on the device. The operation modes of the device are flexible and convenient.

WE CLAIM:

1. A rapid pouring and hoisting device, characterized by comprising a mast crane (1) arranged on a mast crane foundation (42), wherein a mast crane hook (101) of the mast crane (1) is connected with a main hoisting point (2) of a concrete distribution belt conveyor apparatus (I), an outer side of the mast crane foundation (42) is provided with a climbing rack frame (3), the climbing rack frame (3) is provided with a climbing rack (4), the concrete distribution belt conveyor apparatus (I) comprises a telescoping belt conveyor (5) and an oscillating concrete distribution belt conveyor (6), one end of the telescoping belt conveyor (5) close to the mast crane (1) is provided with a belt conveyor tail frame (7), the belt conveyor tail frame (7) is provided with a gear (8) meshed with the climbing rack (4), the gear (8) is driven by a motor (9), a truss of the telescoping belt conveyor (5) is provided with a tension rod (10), a slewing hoisting lug (11) is connected with an upper end of the tension rod (10) by a bearing, the slewing hoisting lug (11) is connected with a connecting hoisting lug (13) on a truss of the oscillating concrete distribution belt conveyor (6) by a draw cord (12), the telescoping belt conveyor (5) is provided with a first hopper (14), the oscillating concrete distribution belt conveyor (6) is provided with a second hopper (15) corresponding to the first hopper (14), an upper end of the second hopper (15) is rotationally installed at a lower end of the first hopper (14), the second hopper (15) is driven to rotate by a slewing mechanism (II), and an end portion of the oscillating concrete distribution belt conveyor (6) away from the telescopic belt conveyor (5) is provided with a discharge hopper (41).

2. The rapid pouring and hoisting device according to claim 1, further comprising a feeding telescopic belt conveyor (17), wherein an feeding end of the feeding telescopic belt conveyor (17) is arranged above a discharge end of the telescoping belt conveyor (5), the feeding end of the feeding telescopic belt conveyor (17) is installed on the telescoping belt conveyor (5) by a supporting frame (18), the feeding telescopic belt conveyor (17) is rotationally connected with the supporting frame (18), the other end of the feeding telescopic belt conveyor (17) is rotationally installed on a corner bracket (19), and the discharge end of the telescoping belt conveyor (5) or the feeding end of the feeding telescopic belt conveyor (17) is provided with a hopper (16).

3. The rapid pouring and hoisting device according to claim 1, characterized in that the slewing mechanism (II) comprises a worm wheel (20) arranged outside the second hopper (15), a

worm (21) is matched with the worm wheel (20), the worm (21) is driven by an oscillating drive motor (22), and the oscillating drive motor (22) is fixed on the telescoping belt conveyor (5).

4. The rapid pouring and hoisting device according to claim 1, characterized in that the belt conveyor tail frame (7) is provided with a pin-penetrating cylinder (23), pin holes (301) are distributed on the climbing rack frame (3) along a length direction of the climbing rack frame (3), a telescoping end of the pin-penetrating cylinder (23) is provided with a pin rod (24) adapted to the pin holes (301), the telescoping belt conveyor (5) is provided with a suspension and locking point (25), and the suspension and locking point (25) is connected with the pin hole (301) through a locking draw cord (26).

5. The rapid pouring and hoisting device according to claim 1, characterized in that the oscillating concrete distribution belt conveyor (6) comprises an inner concrete distribution belt conveyor (601) and an outer concrete distribution belt conveyor (602), connecting ends of the inner concrete distribution belt conveyor (601) and the outer concrete distribution belt conveyor (602) are provided with connecting mechanisms (III), the connecting mechanisms (III) are rotationally connected, and the connecting mechanisms (III) are driven by a slewing supporting mechanism (IV).

6. The rapid pouring and hoisting device according to claim 5, characterized in that the connecting mechanisms (III) comprise rotating ear plates (603), and the rotating ear plates (603) are connected by a pin shaft (607).

7. The rapid pouring and hoisting device according to claim 5, characterized in that the slewing supporting mechanism (IV) comprises a drive worm wheel (605) arranged on one of the connecting mechanisms (III), the drive worm wheel (605) is matched with a drive worm (606), and the drive worm (606) is driven by a slewing motor (604).

8. The rapid pouring and hoisting device according to claim 1, characterized in that an end portion of the oscillating concrete distribution belt conveyor (6) close to the discharge hopper (12) is provided with a locking plate (27), the locking plate (27) is rotationally installed on the oscillating concrete distribution belt conveyor (6), the outer side of the mast crane foundation (42) is provided with a plurality of locking ear plates (28), and the locking plate (27) and the locking ear plate (28) are connected by a locking pin (43).

9. The rapid pouring and hoisting device according to claim 1, characterized in that the mast crane foundation (42) is provided with a concrete mixing plant (29), and concrete in the concrete

mixing plant (29) is conveyed to a loading opening of the feeding telescopic belt conveyor (17) through a chute (30).

10. The rapid pouring and hoisting device according to claim 1, characterized in that a bottom portion of the truss of the telescopic belt conveyor (5) is provided with a belt lifting hoist (31), the end portion of the oscillating concrete distribution belt conveyor (6) is provided with an idler (32), a bottom portion of the oscillating concrete distribution belt conveyor (6) is provided with a hook mechanism (V), the hook mechanism (V) comprises a fixed pulley (33) arranged on the oscillating concrete distribution belt conveyor (6), a lifting hook (34) is connected with a movable pulley (35), a winch rope (3101) of the belt lifting hoist (31) passes through an upper side of the idler (32) and an upper side of the fixed pulley (33) in turn, and then returns from a lower side of the movable pulley (35) to the upper side of the fixed pulley (33), and an end portion of the winch rope (3101) of the belt lifting hoist (31) is connected with a weight sensor (36) at the bottom portion of the oscillating concrete distribution belt conveyor (6).

11. The rapid pouring and hoisting device according to claim 10, characterized in that a plurality of hook mechanisms (V) are arranged along a length direction of the concrete distribution belt conveyor apparatus (I), the winch rope (3101) of the belt lifting hoist (31) is connected with the hook mechanisms (V) in turn, the fixed pulley (33) is provided with a solenoid valve base plate (37), the movable pulley (35) is provided with a solenoid valve tongue (38), and the solenoid valve base plate (37) and the solenoid valve tongue (38) are mutually attracted.

12. The rapid pouring and hoisting device according to claim 11, characterized in that a bottom portion of the oscillating concrete distribution belt conveyor (6) is provided with a hook track (39), a motor drive dolly (40) moves along the hook track (39), and the hook mechanism (V) is connected with the motor drive dolly (40).

13. An method for operating a rapid pouring and hoisting device, characterized in that during a pouring operation, the method comprises the following steps of:

Step 1: connecting a mast crane hook (101) of a mast crane (1) with a main hoisting point (2), when a pouring height needs to be adjusted according to a position of a poured warehouse surface, starting a pin-penetrating cylinder (23) and retracting a pin rod (24) to release restriction on a telescopic belt conveyor (5), starting a motor (9) to mesh a gear (8) with a climbing rack (4), moving a concrete distribution belt conveyor apparatus (I) up and down to match with the

mast crane (1), after moving into proper position, starting the pin-penetrating cylinder (23), and making the pin rod (24) extend out and penetrate into a pin hole (301) to lock a position;

Step 2: telescoping the telescoping belt conveyor (5) according to a position of the warehouse surface, adjusting an angle of the mast crane (1) meanwhile, and driving an oscillating concrete distribution belt conveyor (6) to oscillate along an axis of a second hopper (15) by a slewing mechanism (II) to make an discharge hopper (41) align with an unloading point; and

Step 3: feeding concrete to the telescoping belt conveyor (5) and conveying the concrete into a pouring position by the telescoping belt conveyor (5) and the oscillating concrete distribution belt conveyor (6) in turn.

14. The method for operating the rapid pouring and hoisting device according to claim 13, characterized in that when a hoisting operation needs to be carried out, retracting the telescoping belt conveyor (5), driving the oscillating concrete distribution belt conveyor (6) to rotate by the slewing mechanism (II) to make a locking plate (27) rotate to a position of a locking ear plate (28), after locking through a locking pin (43), making the pin rod (24) extend out and penetrate into the pin hole (301) to lock a position of the telescoping belt conveyor (5), wherein the mast crane (1) is unhooked for hoisting.

15. The method for operating the rapid pouring and hoisting device according to claim 13, characterized in that when a hoisting operation needs to be carried out, starting a belt lifting hoist (31) to make a movable pulley (35) and a lifting hook (34) move downward, after hoisting by the lifting hook (34), driving the movable pulley (35) and the lifting hook (34) to move upward by the belt lifting hoist (31) to move a hoisted object to a target position.

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

E02D 15/02(2006.01)i;E04G 21/02(2006.01)i;B66C23/60(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E02D15; E04G21; B66C23

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS; WPABSC; VCN; DWPI; VEN; ENTXT; OETXT; CJFD: 桅杆吊, 布料, 皮带机, 伸缩, 摆动, 回转, belt W feeder, belt W conveyor, feed W conveyor, spreader, rotat+, swing, wigg+, waver, oscillat+, vibrat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	CN 203048125 U (CHINA GEZHOUBA GROUP INTERNATIONAL ENGINEERING CO., LTD.) 10 July 2013 (2013-07-10) description, paragraphs 18-26, and figures 1-4	1-15
A	CN 213233462 U (ANHUI JINZHAI PUMPED STORAGE CO., LTD. et al.) 18 May 2021 (2021-05-18) entire document	1-15
A	CN 204690756 U (GANSU HYDROPOWER HYDRAULIC MACHINERY CO., LTD. et al.) 07 October 2015 (2015-10-07) entire document	1-15
A	CN 215048189 U (CHINA CONSTRUCTION FIFTH ENGINEERING BUREAU CO., LTD.) 07 December 2021 (2021-12-07) entire document	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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“P” document published prior to the international filing date but later than the priority date claimed

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“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

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China National Intellectual Property Administration (ISA/CN)
China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088

Facsimile No. (86-10)62019451

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

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Information on patent family members

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