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(71) Applicants:

- Advanced Manufacture Technology Center, China  
Academy of Machinery Science & Technology  
Beijing 100083 (CN)
- Taian Companion Machinery Co., Ltd.  
Taian, Shandong 271000 (CN)

(72) Inventors:

- SHAN, Zhongde  
Beijing 100083 (CN)

• WU, Shuangfeng

Beijing 100083 (CN)

• YANG, Wanran

Beijing 100083 (CN)

• DAI, Jun

Beijing 100083 (CN)

• CHEN, Dufan

Shandong 271000 (CN)

• LIU, Lin

Shandong 271000 (CN)

• LU, Qingfu

Shandong 271000 (CN)

(74) Representative: Peters, Hajo

Zacco GmbH

Bayerstraße 83

80335 München (DE)

## (54) SARONG TRANSPORTATION APPARATUS

(57) The disclosure provides a yarn cage conveyor equipment, comprising: a first beam, which is arranged on a guide rail and can move along the guide rail; a second beam, which is moveably arranged on the first beam and can move along the first beam; a mechanical gripper, which is arranged on the second beam and comprises a telescoping mechanism and a grab mechanism connected with the telescoping mechanism; a position detection unit, which is used for detecting the positions of the first beam and the second beam; and a control device, which is used for controlling the movements of the first beam, the second beam and the mechanical gripper according to the position information detected by the position detection unit. The disclosure can realize the automatic conveyance of yarn cage through the control device and the mechanical gripper, thereby improving the production efficiency and safety of dyeing production and reducing labour cost.

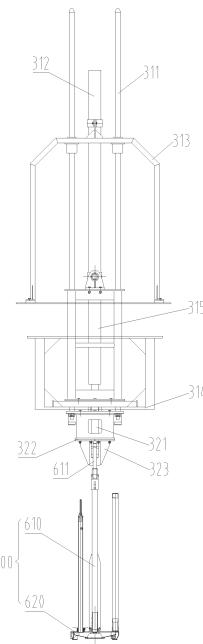


Fig. 3

**Description****Field of the Invention**

**[0001]** The disclosure relates to the field of dyeing and finishing equipment, and in particular to a yarn cage conveyor equipment.

**Background of the Invention**

**[0002]** In recent years, with the rapid development of textile dyeing and finishing industry, how to improve production rate and reduce cost becomes the primary task of each enterprise; and it is an inevitable tendency for dyeing to develop towards semi-automation and full-automation. The conveyance of yarn cage is an important factor for production rate and cost; therefore, fast and accurate conveyance of yarn cage has an important real significance in the dyeing industry.

**[0003]** In prior art, during the dyeing production of bobbin yarn, workers hoist a yarn cage in and out a dye vat through a manual crown block (that is, electric overhead travelling crane, also called motor hoist). The crown block in the prior art comprises a first beam, a second beam and a hanger, wherein the first beam moves along a first direction, the second beam is arranged on the first beam and can move along the extension direction of the first beam, and the hanger is arranged on the second beam through a steel cable. The first beam and the second beam are driven by a motor respectively, and the steel cable is dragged by a motor. During operation, an open-loop control mode is adopted, and the movements of the first beam, the second beam and the hanger are controlled by manually pressing a button on the operation handle of the crown block; when the hanger reaches a correct position, workers hang the lug of the yarn cage and the yarn cage on the hanger of the crown block using a steel cable, thereby implementing the conveyance of the yarn cage.

**[0004]** However, the yarn cage conveying method in the prior art has drawbacks as follows:

- (1) Since the crown blocks is open-loop controlled and the manual operation is instable and immeasurable, the crown block can not be positioned accurately and the operation is time consuming.
- (2) Since the steel cable is a flexible part, if the yarn cage and the crown block are viewed as a whole body, the rigidity is insufficient, consequently the steel cable has big swing and can not be controlled during the travelling process of the crown block hanging the yarn cage, thus collision and other safety accidents are easy to happen.
- (3) Since workers need to connect the lug of the yarn cage with the hanger of the crown block using a steel cable every time, the operation is time consuming; further, the steel cable is easy to break due to abrasion and thus leads to accidents.

**Summary of the Invention**

**[0005]** The disclosure aims at providing a yarn cage conveyor equipment, to solve problems existing in prior art that the conveyance of yarn cage has a low efficiency, poor safety and a high labour cost.

**[0006]** In order to solve the above technical problems, according to one aspect of the disclosure, a yarn cage conveyor equipment is provided, comprising: a first beam, which is arranged on a guide rail and can move along the guide rail; a second beam, which is moveably arranged on the first beam and can move along the first beam; a mechanical gripper, which is arranged on the second beam and comprises a telescoping mechanism and a grab mechanism connected with the telescoping mechanism; a position detection unit, which is used for detecting the positions of the first beam and the second beam; and a control device, which is used for controlling the movements of the first beam, the second beam and the mechanical gripper according to the position information detected by the position detection unit.

**[0007]** Further, the yarn cage conveyor equipment further comprises: a first motor used for driving the first beam and a second motor used for driving the second beam, wherein the control device is electrically connected with the first motor and the second motor.

**[0008]** Further, the telescoping mechanism comprises a first cylinder; the grab mechanism is connected with a piston rod of the first cylinder.

**[0009]** Further, the telescoping mechanism further comprises: a guide part, which comprises a bracket, a guide rod and a connecting plate; the bracket is provided with a guide hole, and the guide rod passes through the guide hole; one end of the guide rod and the piston rod of the first cylinder are connected with the connecting plate respectively; the grab mechanism is connected with the connecting plate.

**[0010]** Further, the first beam comprises a frame, wherein the frame is provided with a first opening, and the second beam is provided with a second opening corresponding to the first opening; at least one part of the guide rod passes through the first opening and the second opening.

**[0011]** Further, the grab mechanism comprises: a second cylinder, a jaw and a base; the second cylinder is mounted on the base; the jaw comprises a first hinge part and a second hinge part; the jaw is connected with the base through the first hinge part, and the jaw is connected with the piston rod of the second cylinder through the second hinge part.

**[0012]** Further, the yarn cage conveyor equipment further comprises: a guide device, which comprises a frame and a plurality of guide wheels mounted on the frame, wherein the guide wheels contact the guide rail in a rolling manner.

**[0013]** Further, each of the guide wheels comprises an axle and a bearing mounted on the axle; one end of the axle is connected with the frame.

**[0014]** Further, there are two guide wheels; at least one part of the guide rail is clamped between the two guide wheels.

**[0015]** Further, the position detection unit is a magnescale.

**[0016]** The disclosure can realize the automatic conveyance of yarn cage through the control device and the mechanical gripper, thereby improving the production efficiency and safety of dyeing production and reducing labour cost.

#### **Brief Description of the Drawings**

**[0017]** For a better understanding of the disclosure, accompanying drawings described hereinafter are provided to constitute one part of the application; the schematic embodiments of the disclosure and the description thereof are used to illustrate the disclosure but to limit the disclosure improperly. In the accompanying drawings:

- Fig. 1 shows a top view of the disclosure;
- Fig. 2 shows a side view of the disclosure;
- Fig. 3 shows a diagram of a mechanical gripper and a yarn cage that are jointed; and
- Fig. 4 shows a diagram of the mounting structure of a guide device and a guide rail.

#### **Detailed Description of the Embodiments**

**[0018]** The embodiment of the disclosure is described below in detail in conjunction with accompanying drawings. However, the disclosure can be implemented by multiple different methods limited and covered by the claims.

**[0019]** As shown in Fig. 1 and Fig. 2, the yarn cage conveyor equipment of the disclosure comprises: a first beam 100, a second beam 200, a mechanical gripper 300, a position detection unit and a control device, wherein the first beam 100 is arranged on a guide rail 400 and can move along the guide rail 400; the second beam 200 is moveably arranged on the first beam 100 and can move along the first beam 100; the mechanical gripper 300 is arranged on the second beam 200 and comprises a telescoping mechanism 310 and a grab mechanism 320 connected with the telescoping mechanism 310; the position detection unit is used for detecting the positions of the first beam 100 and the second beam 200; and the control device is used for controlling the movements of the first beam 100, the second beam 200 and the mechanical gripper 300 according to the position information detected by the position detection unit. Preferably, the position detection unit is a magnescale.

**[0020]** As shown in Fig. 3, a yarn cage 600 comprises a base 620 and a vertical post 610 arranged on the base 620, wherein the end part of the upper end of the vertical post 610 is provided with a grab part 611 matched with the grab mechanism 320. Preferably, the grab part 611

is a groove or a convex.

**[0021]** During use, the position detection unit detects the position of the first beam 100 and the second beam 200 at all times; the control device compares the information detected by the position detection unit with a preset position information of yarn cage; when the mechanical gripper 300 which has been conveyed through the composite motion of the first beam 100 and the second beam 200 is positioned above the yarn cage 600, the control device controls the telescoping mechanism 310 to extend downwards (that is, towards the yarn cage 600); when the grab mechanism reaches the preset position, the control device further controls the grab mechanism to capture the grab part 611 of the yarn cage 600. Then, the control device can control the telescoping mechanism 310 to contract so as to lift the yarn cage 600, and further control the first beam 100 and the second beam 200 to move to a target position. Thus it can be seen that, in the whole operation, the yarn cage conveyor equipment of the disclosure realizes close-loop control through the position detection unit and the control device, thereby realizing the accurate positioning of the mechanism gripper 300, improving working efficiency, shortening production cycle and reducing labour cost. Meanwhile, the disclosure uses the grab mechanism 320 to capture the yarn cage 600, thereby overcoming the disadvantage existing in prior art that workers need to connect the yarn cage 600 with the crown block through a steel cable, improving rigidity and stability of operation. During the entire conveying process, the yarn cage 600 would not swing greatly, thereby avoiding collision and other potential safety accidents, and avoiding accidents caused by worn and broke steel cable.

**[0022]** Preferably, the yarn cage conveyor equipment further comprises a first motor used for driving the first beam 100 and a second motor used for driving the second beam 200, wherein the control device is electrically connected with the first motor and the second motor. The control device can control the rotation speed, direction and start-stop of the first motor and the second motor, thereby enabling the first beam 100 and the second beam 200 to move to a preset position.

**[0023]** In a preferred embodiment, the telescoping mechanism 310 comprises a first cylinder 312; the grab mechanism 320 is connected with a piston rod of the first cylinder 312. Of course, the telescoping mechanism 310 also can be of other forms, for example, lead screw. Through the telescoping operation of the first cylinder 312, the position of the grab mechanism 320 can be adjusted.

**[0024]** As shown in Fig. 1, the first beam 100 comprises a frame; the frame is provided with a first opening 120, and the second beam 200 is provided with a second opening corresponding to the first opening 120; at least one part of the guide rail 311 passes through the first opening 120 and the second opening. The first beam 100 is provided with a guide bar 110 (for example, guide rail) matched with the second beam 200.

**[0025]** Preferably, the telescoping mechanism 310 further comprises: a guide part, which comprises a bracket 313, a guide rod 311 and a connecting plate 314; the bracket 313 is provided with a guide hole, and the guide rod 311 passes through the guide hole; one end of the guide rod 311 and the piston rod of the first cylinder 312 are connected with the connecting plate 314 respectively; the grab mechanism 320 is connected with the connecting plate 314. Particularly, the piston rod of the first cylinder 312 is connected with the connecting plate 314 through a connecting rod 315. Refer to Fig. 2, the upper end of the guide rod 311 can move freely in the vertical direction; when the telescoping mechanism 310 performs an extension motion, the upper end of the guide rod 311 moves downwards; when the telescoping mechanism 310 performs a contract motion, the upper end of the guide rod 311 moves upwards.

**[0026]** As shown in Fig. 2 and Fig. 3, the grab mechanism 320 comprises: a second cylinder 321, a jaw 323 and a base 322; the second cylinder 321 is mounted on the base 322; the jaw 323 comprises a first hinge part 324 and a second hinge part; the jaw 323 is connected with the base 322 through the first hinge part 324, and the jaw 323 is connected with the piston rod of the second cylinder 321 through the second hinge part. Through the second cylinder 321, the jaw 323 can be expanded and closed. When the jaw 323 is closed, the yarn cage 600 can be grabbed; when the jaw 323 is expanded, the yarn cage 600 can be released. Preferably, the jaw 323 has a self-locking function to prevent accidentally loose.

**[0027]** As shown in Fig. 2 and Fig. 4, the yarn cage conveyor equipment further comprises a guide device 500, which comprises a frame 510 and a guide wheel mounted on the frame 510, wherein the guide wheel contacts the guide rail 400 in a rolling manner. The guide device 500 can ensure that the first beam 100 does not deviate when moving. Preferably, the guide wheel comprises an axle 530 and a bearing 540 mounted on the axle 530; one end of the axle 530 is connected with the frame 510. Preferably, the axle 530 can be implemented through a bolt. The bolt is used as the axle of the bearing 540, which has a simple structure, and is easy to mount and is easily available. Preferably, there are two guide wheels. At least one part of the guide rail 400 is clamped between the two guide wheels. When two guide wheels are adopted, the guide rail 400 can be clamped between the two guide wheels, thus guide effect is improved, error is reduced and the precision of positioning and re-positioning is improved. Preferably, the frame 510 is provided with a mounting hole 550; the inside of the frame 510 is provided with a reinforced rib 520. The guide device 500 can be mounted on the first beam 100 through the mounting hole 550 and a bolt.

**[0028]** Preferably, the yarn cage conveyor equipment further comprises a position detection part used for detecting the positions of the grab mechanism 320. Preferably, the position detection part is a guy-type encoder.

**[0029]** The disclosure can realize the automatic con-

veyance of yarn cage through the control device and the mechanical gripper, thereby improving the production efficiency and safety of dyeing production and reducing labour cost.

**[0030]** The above are only the preferred embodiments of the disclosure and not intended to limit the disclosure. For those skilled in the art, various modifications and changes can be made to the disclosure. Any modification, equivalent substitute and improvement made within the spirit and principle of the disclosure are deemed to be included within the scope of protection of the disclosure.

## 15 Claims

1. A yarn cage conveyor equipment, **characterized by** that comprising:
  - 20 a first beam (100), which is arranged on a guide rail (400) and can move along the guide rail (400);
  - 25 a second beam (200), which is moveably arranged on the first beam (100) and can move along the first beam (100);
  - 30 a mechanical gripper (300), which is arranged on the second beam (200) and comprises a telescoping mechanism (310) and a grab mechanism (320) connected with the telescoping mechanism (310);
  - 35 a position detection unit, which is used for detecting positions of the first beam (100) and the second beam (200); and
  - 40 a control device, which is used for controlling movements of the first beam (100), the second beam (200) and the mechanical gripper (300) according to the position information detected by the position detection unit.
- 45 2. The yarn cage conveyor equipment according to claim 1, **characterized by** that further comprising: a first motor used for driving the first beam (100) and a second motor used for driving the second beam (200), wherein the control device is electrically connected with the first motor and the second motor.
- 50 3. The yarn cage conveyor equipment according to claim 1 or 2, **characterized in that**, the telescoping mechanism (310) comprises a first cylinder (312); the grab mechanism (320) is connected with a piston rod of the first cylinder (312).
- 55 4. The yarn cage conveyor equipment according to claim 3, **characterized in that**, the telescoping mechanism (310) further comprises: a guide part, which comprises a bracket (313), a guide rod (311) and a connecting plate (314); the bracket (313) is provided with a guide hole, and the guide rod (311)

passes through the guide hole; one end of the guide rod (311) and the piston rod of the first cylinder (312) are connected with the connecting plate (314) respectively; the grab mechanism (320) is connected with the connecting plate (314). 5

5. The yarn cage conveyor equipment according to claim 4, **characterized in that**, the first beam (100) comprises a frame; the frame is provided with a first opening (120), and the second beam (200) is provided with a second opening corresponding to the first opening (120); at least one part of the guide rod (311) passes through the first opening (120) and the second opening. 10

6. The yarn cage conveyor equipment according to claim 3, **characterized in that**, the grab mechanism (320) comprises: a second cylinder (321), a jaw (323) and a base (322); the second cylinder (321) is mounted on the base (322); the jaw (323) comprises a first hinge part (324) and a second hinge part; the jaw (323) is connected with the base (322) through the first hinge part (324), and the jaw (323) is connected with the piston rod of the second cylinder (321) through the second hinge part. 15

7. The yarn cage conveyor equipment according to claim 1, **characterized by** that further comprising a guide device (500), which comprises a frame (510) and a plurality of guide wheels mounted on the frame (510), wherein the guide wheels contact the guide rail (400) in a rolling manner. 20

8. The yarn cage conveyor equipment according to claim 7, **characterized in that**, each of the guide wheels comprises an axle (530) and a bearing (540) mounted on the axle (530); one end of the axle (530) is connected with the frame (510). 25

9. The yarn cage conveyor equipment according to claim 7 or 8, **characterized in that**, there are two guide wheels; at least one part of the guide rail (400) is clamped between the two guide wheels. 30

10. The yarn cage conveyor equipment according to claim 1, **characterized in that**, the position detection unit is a magnescale. 35

11. A yarn cage conveyor equipment, **characterized by** that comprising: 40

a first beam (100), which is arranged on a guide rail (400) and can move along the guide rail (400); 45

a second beam (200), which is moveably arranged on the first beam (100) and can move along the first beam (100); 50

a mechanical gripper (300), which is arranged on the second beam (200) and comprises a telescoping mechanism (310) and a grab mechanism (320) connected with the telescoping mechanism (310); 55

a position detection unit, which is used for detecting positions of the first beam (100) and the second beam (200); 60

a control device, which is used for controlling movements of the first beam (100), the second beam (200) and the mechanical gripper (300) according to the position information detected by the position detection unit; wherein, the telescoping mechanism (310) comprises a first cylinder (312); the grab mechanism (320) is connected with a piston rod of the first cylinder (312); 65

the telescoping mechanism (310) further comprises: a guide part, which comprises a bracket (313), a guide rod (311) and a connecting plate (314); the bracket (313) is provided with a guide hole, and the guide rod (311) passes through the guide hole; one end of the guide rod (311) and the piston rod of the first cylinder (312) are connected with the connecting plate (314) respectively; the grab mechanism (320) is connected with the connecting plate (314); 70

the piston rod of the first cylinder (312) is connected with the connecting plate (314) through a connecting rod (315). 75

12. The yarn cage conveyor equipment according to claim 11, **characterized by** that further comprising: a first motor used for driving the first beam (100) and a second motor used for driving the second beam (200), wherein the control device is electrically connected with the first motor and the second motor. 80

13. The yarn cage conveyor equipment according to claim 11, **characterized in that**, the first beam (100) comprises a frame; the frame is provided with a first opening (120), and the second beam (200) is provided with a second opening corresponding to the first opening (120); at least one part of the guide rod (311) passes through the first opening (120) and the second opening. 85

14. The yarn cage conveyor equipment according to claim 11, **characterized in that**, the grab mechanism (320) comprises: a second cylinder (321), a jaw (323) and a base (322); the second cylinder (321) is mounted on the base (322); the jaw (323) comprises a first hinge part (324) and a second hinge part; the jaw (323) is connected with the base (322) through the first hinge part (324), and the jaw (323) is connected with the piston rod of the second cylinder (321) through the second hinge part. 90

15. The yarn cage conveyor equipment according to

claim 11, **characterized by** that further comprising  
a guide device (500), which comprises a frame (510)  
and a plurality of guide wheels mounted on the frame  
(510), wherein the guide wheels contact the guide  
wheel (400) in a rolling manner. 5

16. The yarn cage conveyor equipment according to  
claim 15, **characterized in that**, each of the guide  
wheels comprises an axle (530) and a bearing (540)  
mounted on the axle (530); one end of the axle (530) 10  
is connected with the frame (510).

17. The yarn cage conveyor equipment according to  
claim 15 or 16, **characterized in that**, there are two  
guide wheels; at least one part of the guide rail (400) 15  
is clamped between the two guide wheels.

18. The yarn cage conveyor equipment according to  
claim 11, **characterized in that**, the position detec-  
tion unit is a magnescale. 20

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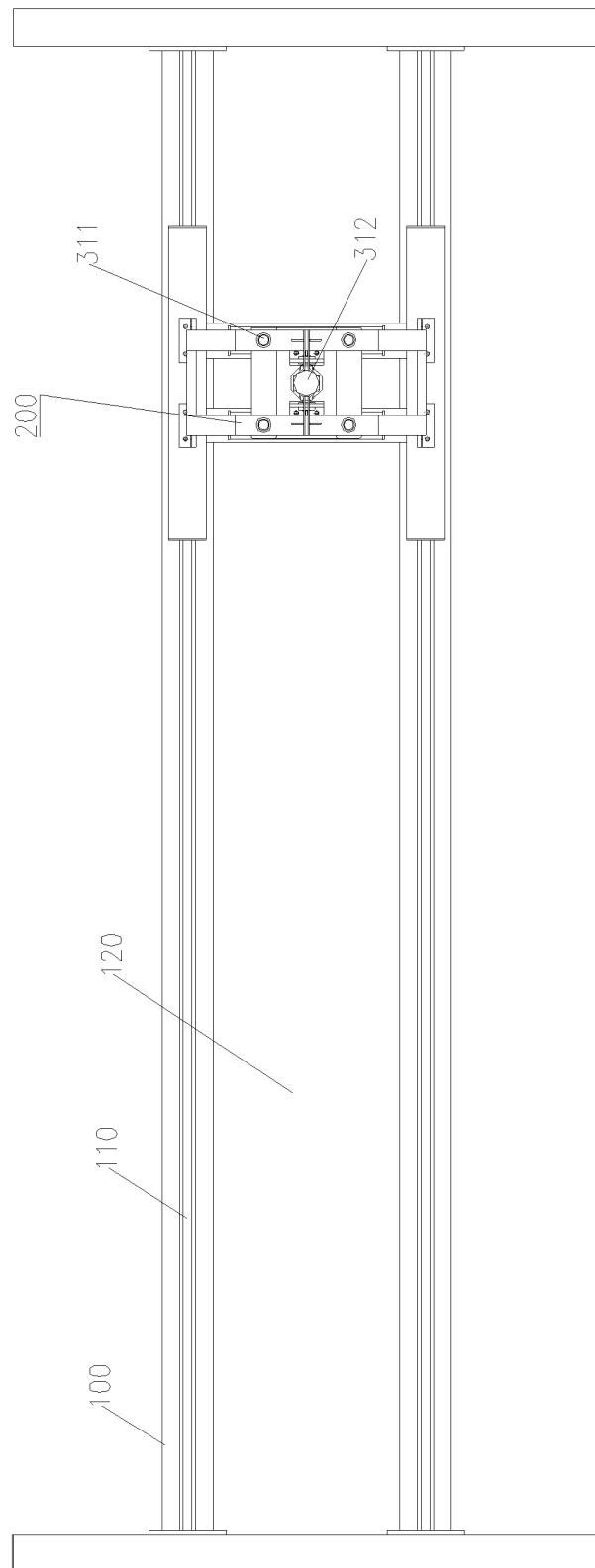
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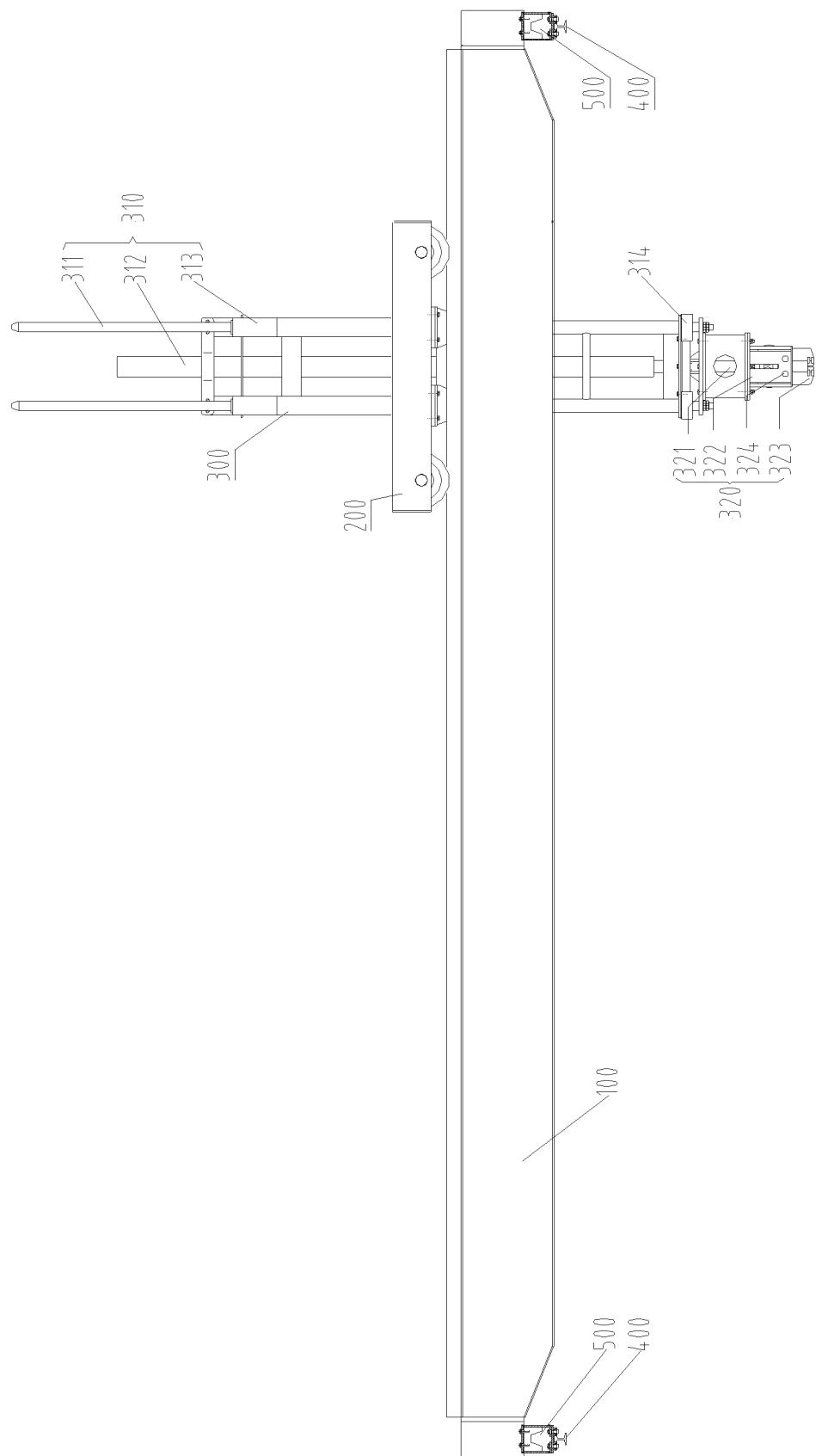
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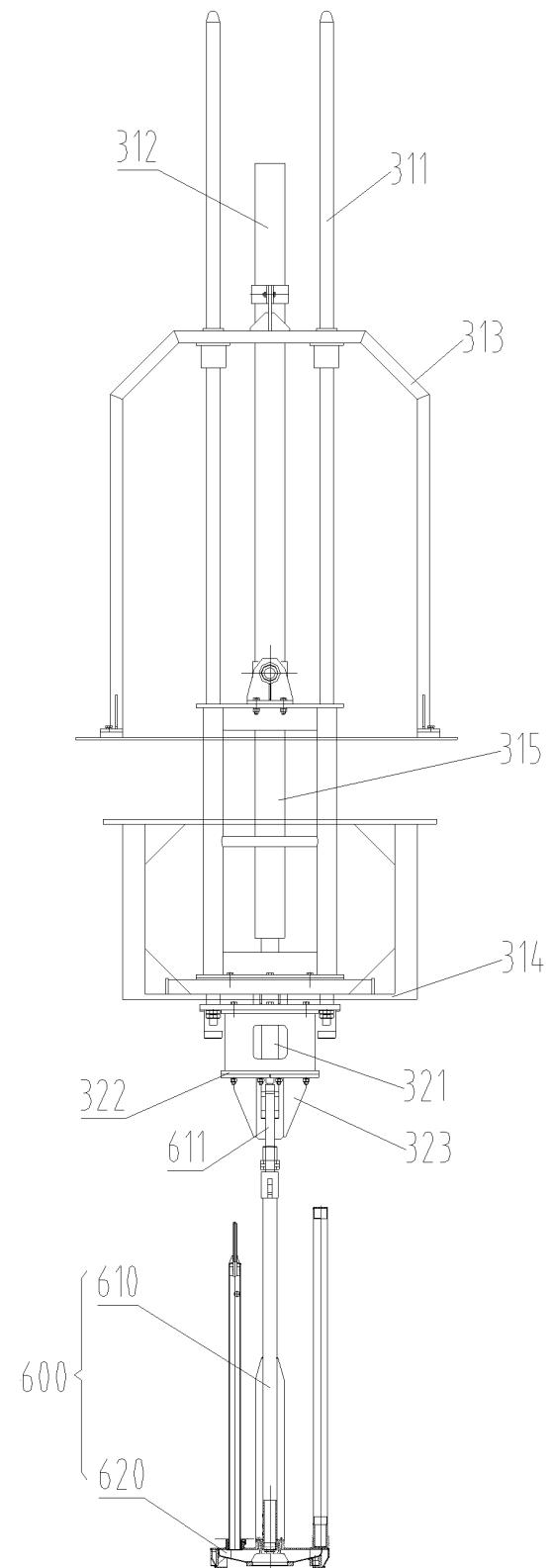
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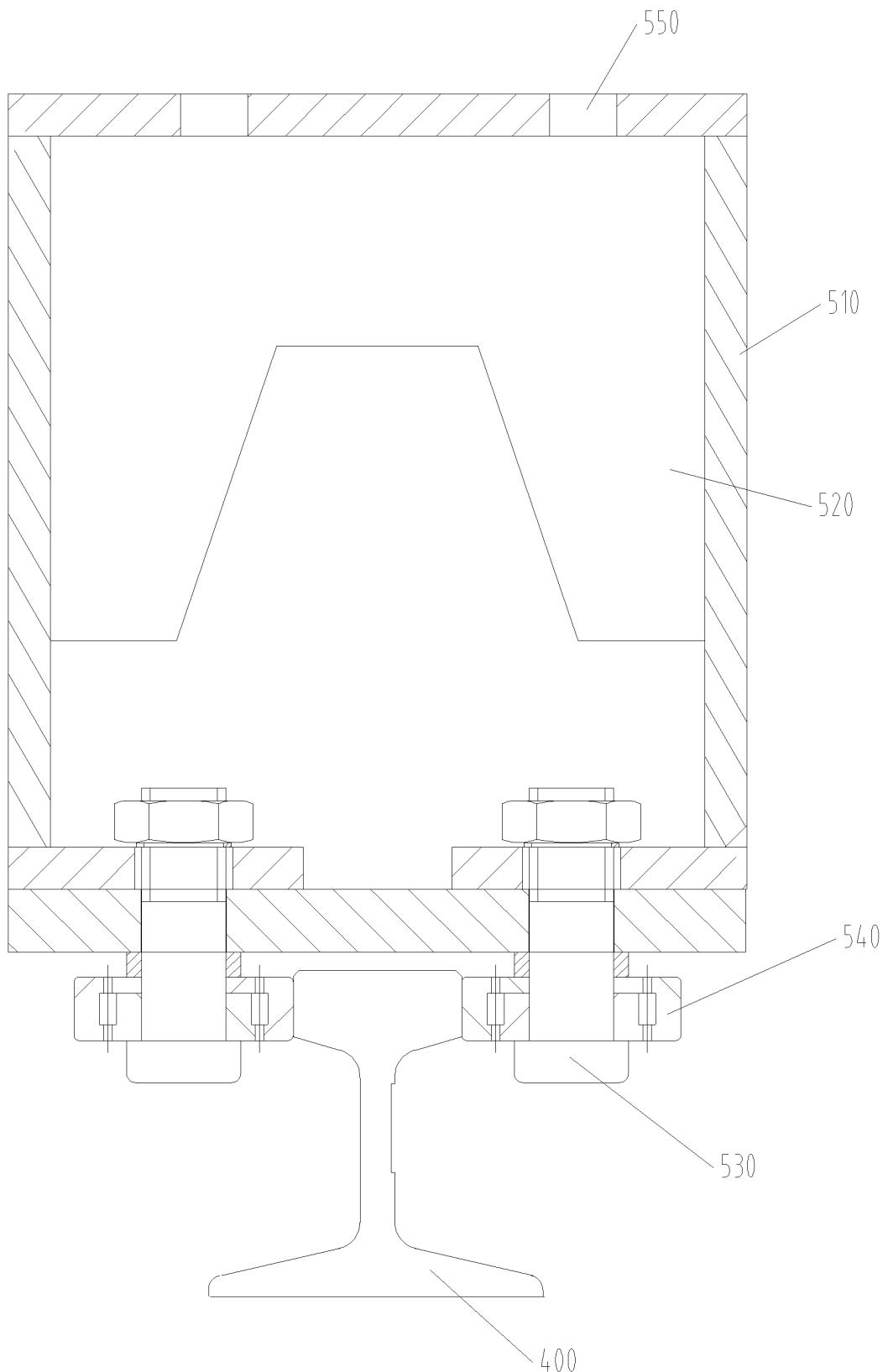
**Fig. 1**



**Fig. 2**



**Fig. 3**



**Fig. 4**

<b>INTERNATIONAL SEARCH REPORT</b>		International application No. <b>PCT/CN2013/070450</b>	
5	<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
	See extra sheet		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	<b>B. FIELDS SEARCHED</b>		
	Minimum documentation searched (classification system followed by classification symbols)		
	IPC: D06B 3/-; D06B 5/-; D06B 23/-; B65G 46/-; B65H 67/-; B66C 17/-		
15	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)		
20	CNPAT, CNKI, WPI, EPODOC: transfer+, convey+, exchange+, package?, reel?, carrier?, heese?, bobbin?clamp+,grip+,dye+		
	<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
25	Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim
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35	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		
40	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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		
45			
50	Date of the actual completion of the international search 08 March 2013 (08.03.2013)	Date of mailing of the international search report <b>21 March 2013 (21.03.2013)</b>	
	Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer <b>ZHU, Minghui</b> Telephone No. (86-10) <b>62085484</b>	

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/070450

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Form PCT/ISA /210 (continuation of second sheet ) (July 2009)

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
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5	Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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**INTERNATIONAL SEARCH REPORT**

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PCT/CN2013/070450

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**A. CLASSIFICATION OF SUBJECT MATTER**

B65G 47/90 (2006.01) i

D06B 5/16 (2006.01) i

B66C 17/00 (2006.01) i

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