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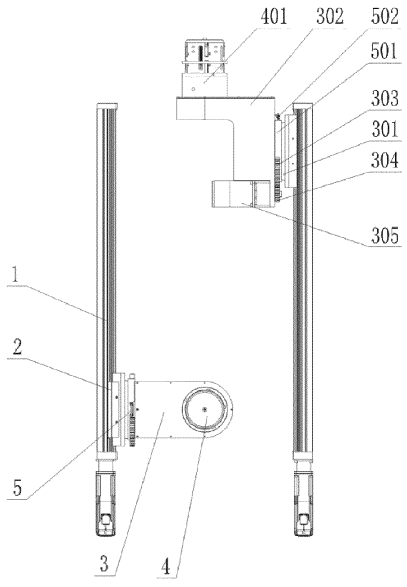
(54) MATERIAL TRANSPOSITION EQUIPMENT AND MATERIAL STATION

(57) The disclosure provides a material transposition equipment and a material station thereof, belonging to the technical field of belt-shaped material processing and forming equipment. The material transposition device reduces the stroke and the occupied space through two opposed transposition devices, in which the transposition device includes a lifting base, a turnover mechanism, an unwinding mechanism and a lifting mechanism. The rotation of the turnover mechanism can drive the rotation adjustment of the unwinding mechanism within the circumference, the provided unwinding mechanism can be used in conjunction with the belt-shaped material tray to fulfill the unwinding use of belt-shaped materials, and the provided lifting mechanism can drive the turnover mechanism to move linearly. When the two transposition devices are cooperated, through the cooperation of the lifting mechanism and turnover mechanism, not only can the transposition of the belt-shaped material be fulfilled in the linear space, simplifying the walking route, and also reduces the volume of the replacement equipment and the occupied space, facilitating the use on a mature tobacco production line.

Fig. 1



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Description

Technical Field

[0001] The disclosure relates to the technical field of belt-shaped material processing and forming equipment, and more specifically, relates to a material transposition equipment and a material station.

Background Art

[0002] During the production of the tobaccos, belt-shaped materials are commonly used, such as a cigarette paper, a cigarette box lining paper, a packaging paper in traditional tobaccos; and a new low-temperature non-burning tobacco belt-shaped tobacco and a cooling section PLA material. The belt-shaped material exists in the form of a tray. During use, the belt-shaped material tray needs to be installed on the unwinding device and then the head of the belt-shaped material is pulled to each roller, only after which can the production be started; and two unwinding device are generally provided, and are used alternately, in which one roll of belt-shaped material tray is used up and then its tail is spliced with the head of another belt-shaped material tray, subsequently, the another belt-shaped material tray participates in the production, and then a new belt-shaped material tray is needed to be installed on the unwinding device, and its head is lead out to prepare for the subsequent splicing of the belt-shaped material.

[0003] Now, most of the carry and the replacement of the material trays and the pulling of the head for belt-shaped materials can only be handled manually, in which the original belt-shaped material is still working normally while the belt-shaped material trays are replaced manually and the head is pulled manually, so there is a certain degree of danger; and there is a low efficiency and high labor intensity in manual operation. With the development of science and technology, the tobacco industry requires more and more automation of cigarette production equipment, and less and less reliance on labor, so the existing methods of manually replacing the belt-shaped material tray and manually pulling the head have severely restricted the development of automated tobacco production.

[0004] Now, the solution to these problems at home and abroad is mainly fulfilled by using material stations. The typical representative is the BOB material station of HAUNI of Germany. This kind of equipment uses a clever mechanical structure to fulfill the full automation of feeding, head finding and traction, and has a high reliability. Some of the domestic material stations are YF72 series of material station, of which the basic function is the same as that of HAUNI's BOB material station, except that in order to achieve the purpose of one for two, the two material stations are arranged one behind the other. Although such equipment can be highly automated, it is not widely used in practical applications since the occupied area is too large. For now, the planning of the tobacco production workshop is relatively mature, so it is difficult to find a large area to arrange the material station; and in the existing material station on the market, the main reason for its large occupied area is that the transposition of new and old belt-shaped material trays adopts the form of a turntable, that is, the old and new belt-shaped material trays are transposed by making a circular motion, which inevitably increases the length of the equipment, resulting in a large material station and occupied area, and seriously affecting the promotion and use of the material station.

[0005] Therefore, a material transposition equipment and a material station are needed to prevent the occurrence of the above-mentioned problems.

Disclosure

[0006] In view of this, the disclosure provides a material transposition equipment and a material station, which can not only fulfill the transposition of the belt-shaped material tray in the linear space to simplify the walking route, but also reduce the volume of the replacement equipment and the occupied area to facilitate the use in mature tobacco production lines.

[0007] In order to solve the above technical problems, the disclosure provides a material transposition equipment including two transposition devices cooperated with each other and arranged oppositely, in which

each of the two transposition devices includes:

a lifting base;

a turnover mechanism rotatably arranged on the lifting base;

an unwinding mechanism arranged on and rotated with the turnover mechanism to drive a belt-shaped material tray to rotate; and

a lifting mechanism connected with the lifting base to drive the lifting base to move in a straight line so as to transpose two unwinding mechanism of the two transposition devices.

[0008] Preferably, the turnover mechanism includes a turnover shaft fixedly arranged on the lifting base, a turnover frame rotatably sleeved on the turnover shaft, and a turnover drive assembly provided between the turnover frame and the turnover shaft; and
the turnover drive assembly is used to drive the turnover frame to rotate with the turnover shaft as an axis.

[0009] Preferably, the turnover frame is an L-shaped case, and two turnover frames of the two transposition devices can avoid each other when walking toward each other on a same linear track.

[0010] Preferably, the turnover drive assembly in-

cludes a large gear fixedly sleeved on the turnover shaft, a planetary gear meshed with the large gear, and a turnover drive member provided on the turnover frame for driving the planetary gear to rotate with a central axis of the planetary gear as an axis. Preferably, each of the two transposition devices includes a limiting mechanism provided on the turnover frame for cooperating with the turnover shaft to limit the rotation angle of the turnover frame.

[0011] Preferably, the limiting mechanism includes a notch opened on an outer circumferential side wall of the large gear, and a stopping block provided on the turnover frame and matched with the notch to stop the rotation of the turnover frame.

[0012] Preferably, a rotation angle of the turnover frame with the turnover shaft as the axis is 0°-90°.

[0013] Preferably, the unwinding mechanism includes an unwinding drive head rotatably arranged on the turnover frame, and an unwinding drive assembly arranged on the turnover frame to drive the unwinding drive head to rotate with a central axis of the unwinding drive head; and

[0014] When each of two unwinding driving heads of the two transposition devices is in a vertical state, extension lines of central axes of the two unwinding driving heads are on one same straight line.

[0015] Preferably, the unwinding drive assembly includes an unwinding motor, in which an output end of the unwinding motor is installed with a driving gear coaxially rotated with the output end, the unwinding drive head is rotatably installed on an outer side wall of the turnover frame through a bearing and sleeved with a driven gear ring, and a transmission toothed-belt is sleeved on the driving gear and the driven gear ring.

[0016] A material station includes a cabinet body and the above-mentioned material transposition device, in which the cabinet body is opened with a transposition slot for accommodating a sliding of an unwinding driving head.

[0017] The advantageous effects of the above technical solutions of the disclosure are as follows.

[0018] In the prior art, the equipment has a long stroke when replacing the belt-shaped material tray, which causes that the equipment occupies a large space and cannot be applied to a mature tobacco production line. However, the disclosure adopts two oppositely arranged transposition devices to reduce the stroke and the occupied space, in which the transposition device includes a lifting base, a turnover mechanism, an unwinding mechanism and a lifting mechanism; the rotation of the turnover mechanism can drive the rotation adjustment of the unwinding mechanism within the circumferential range; the provided unwinding mechanism can be used in conjunction with the belt-shaped material tray to fulfill the unwinding and use of the belt-shaped material; the provided lifting mechanism can drive the turnover mechanism to make a linear motion; and when the two transposition devices are cooperated, the cooperation of the lifting mechanism and the turnover mechanism can fulfill the transposition of the belt-shaped material tray in the linear space, which simplifies the walking route and the structure by transforming it into a straight line, and also reduces the volume of the replacement equipment and the occupied area, thereby facilitating the use in mature tobacco production lines.

[0019] In addition, the adopted turnover mechanism includes the turnover shaft arranged on the lifting base, in which the turnover shaft is fixedly arranged on the lifting base, facilitating to fulfill the stability of the structure of the lifting base, and through the turnover frame provided on the turnover shaft by a rotating member, the rotation of the turnover frame with the turnover axis and the stable structure can be fulfilled, in which the rotating member is a roller bearing or a sliding sleeve; in order to fulfill the rotation of the turnover frame with the turnover axis, a large gear is fixed on the turnover axis and a turnover driving member is provided on the turnover frame, and at the same time, the output shaft of the turnover drive member is provided with a planetary gear meshed with the large gear, thereby fulfilling the circumferential rotation of the turnover frame with the turnover shaft; the turnover mechanism can also adopt another manner in which a stepper motor is provided on the lifting base and the turnover frame is provided on the output shaft of the stepper motor; and the turnover mechanism of the disclosure can fulfill a stable, firmly and reliable operation of the turnover mechanism under the premise of a small space and a small bearing surface.

[0020] In addition, the adopted turnover frame is the L-shaped case, so that after being overturned to a cooperated angle, two L-shaped cases can avoid each other during running on the same straight track, which saves a lot of space and solves the problem of transposing the two transposition devices in a small space; and when the turnover mechanism adopts a stepper motor set on the lifting base and a turnover frame on the output shaft of the stepper motor, the turnover shaft are L-shape and the turnover frame is replaced with a short section away from the lifting base, and thus, the two turnover mechanism can also avoid each other, but when the turnover frame structure of the disclosure is adopted, the support layout is more reasonable, the durability is strong, and the parts can be easily replaced.

[0021] In addition, the adopted limiting mechanism limits the turnover angle of the turnover frame, so that the turnover frame can be limited and locked when the two transposition devices perform transposition avoidance, so as to avoid the damage to the turnover driving member due to the uneven gravity distribution of the turnover frame while not affecting the accuracy of the subsequent turnover angle, in which the damage to the turnover driving member and the inaccuracy of the subsequent turnover angle are not conducive to the stable operation of the two transposition devices when the positions are interchanged; the limiting mechanism used in the disclosure includes the notch opened on the outer ring side of the large gear for the limit, a stopping block cooperating

with the notch is provided on the turnover frame for the limit, in which the length of the notch is a quarter of that of the outer ring of the large gear, which can ensure the strength of the large gear while providing a reliable limit for the stopping block so as to ensure the operation stability of the structure, and meanwhile, a sensor can be provided on the stopping block to detect whether the turnover frame is in place so as to ensure the operation accuracy of the equipment; and obviously, in order to achieve the purpose of the limit, two protrusions with a right angle can be provided on either side of the large gear, and a limit block used in conjunction with the two protrusions can be provided on the turnover frame to fulfill the limit function.

Brief Description of Drawings

[0022]

Fig. 1 is a schematic view of the material transposition equipment of the disclosure;
Fig. 2 is a schematic top view of the structure of Fig. 1;
Fig. 3 is a schematic view of a working state of the material transposition equipment of the disclosure;
Fig. 4 is a schematic view of another working state of the material transposition equipment of the disclosure;
Fig. 5 is a schematic view of the transposition device of the disclosure;
Fig. 6 is a perspective view of the transposition device of the disclosure from one angle;
Fig. 7 is another perspective view of the transposition device of the disclosure from another angle;
Fig. 8 is a schematic view of the material station of the disclosure;
Fig. 9 is a schematic cross-sectional view in the direction of A-A in Fig. 8; and
Fig. 10 is a schematic view of the station layout of the material station of the disclosure.

[0023] In drawings:

1. Electric cylinder;
2. Lifting base;
3. Turnover mechanism; 301, Turnover shaft; 302, Turnover frame; 303, Large gear; 304, Planetary gear; 305, Turnover motor;
4. Unwinding mechanism; 401, Unwinding drive head; 402, Unwinding motor; 403, Driving gear; 404, Driven gear ring; 405, Transmission toothed-belt;
5. Limiting mechanism; 501, Notch; 502, Stopping block;
6. Material storage; 7. Rack; 8. Main vertical plate; 9. Grasping and lifting mechanism; 10. Traction mechanism; 11. Overlap mechanism; 12. Tape supply mechanism; 13. Tension adjustment mechanism; 14. Discharge Channel; 15, Transposition slot; 16, Material supply station; 17, New material tray starting station; 18. Glue station; 19, Splicing station.

Best Mode

[0024] In order to make the objectives, technical solutions, and advantages of the embodiments of the disclosure clearer, the technical solutions of the embodiments of the disclosure will be described clearly and completely in conjunction with accompanying drawings 1-10 of the embodiments of the disclosure. Obviously, the described embodiments are part of the embodiments of the disclosure, rather than all of the embodiments. Based on the described embodiments of the disclosure, all other embodiments obtained by those skilled in the art shall fall within the protection scope of the disclosure.

[0025] As shown in Figs. 1-7, the disclosure provides a material transposition equipment including two transposition devices cooperated with each other and arranged oppositely, in which

each of the two transposition devices includes:

a lifting base 2;

a turnover mechanism 3 rotatably arranged on the lifting base 2;

an unwinding mechanism 4 arranged on and rotated with the turnover mechanism 3 to drive a belt-shaped material tray to rotate; and

a lifting mechanism connected with the lifting base 2 to drive the lifting base 2 to move in a straight line so as to transpose two unwinding mechanism 4 of the two transposition devices.

[0026] Specifically, the disclosure provides a material transposition equipment including two transposition devices cooperated with each other and arranged oppositely, in which

each of the two transposition devices includes:

a lifting base 2;

a turnover mechanism 3 rotatably arranged on the lifting base 2;

an unwinding mechanism 4 arranged on and rotated with the turnover mechanism 3 to drive a belt-shaped material tray to rotate;

a lifting mechanism connected with the lifting base 2 to drive the lifting base 2 to move in a straight line so as to transpose two unwinding mechanisms 4 of the two transposition devices. The lifting mechanism drives the lifting base 2 and the unwinding mechanism 4 to move in the straight line so as to transpose

two unwinding mechanisms 4, and the two unwinding mechanisms 4 move in the straight line for the transposition, resulting in a small volume and occupied area, thereby facilitating the promotion and use.

[0027] In addition, in the lifting mechanism, the existing electric cylinder 1 is preferably adopted, and obviously, a screw, a sliding rail and a stepper motor with an output shaft connected with the screw can also be adopted, while the lifting base is arranged on the sliding rail and is matched with the screw, thereby fulfilling the lifting of the lifting base through the rotation of the screw; an electric telescopic rod can be adopted to fulfill the lifting of the lifting base, and obviously, the lifting base is provided on the chain of the chain associate structure to fulfill the lifting function; and

when the lifting mechanism adopts a preferred solution, the electric cylinder 1 is arranged in a vertical direction.

[0028] As shown in Figs.1-7, in one embodiment of the disclosure, the turnover mechanism 3 includes a turnover shaft 301 fixedly arranged on the lifting base 2, a turnover frame 302 rotatably sleeved on the turnover shaft 301, and a turnover drive assembly provided between the turnover frame 302 and the turnover shaft 301 to drive the turnover frame 302 to rotate with the turnover shaft 301 as an axis. The turnover shaft 301 is a right cylinder and rotatably sleeved with the turnover frame 302 through a bearing, and the turnover drive assembly works to drive the turnover frame 302 to rotate with the turnover shaft 301 as the axis, which fulfills a stable and reliable rotation.

[0029] Further, the turnover drive assembly includes a large gear 303 fixedly sleeved on the turnover shaft 301, a planetary gear 304 meshed with the large gear 303, and a turnover drive member provided on the turnover frame 302 for driving the planetary gear 304 to rotate with a central axis of the planetary gear as an axis; the turnover drive member is a turnover motor 305, which adopts Shinano 28 stepper motor of standard model STP-28D100X; and obviously, the adopted turnover motor can also be driven by hydraulic or oil motor. When the turnover motor 305 works, its output end drives the planetary gear 304 to rotate coaxially together, and the planetary gear 304 meshes with the outer teeth of the large gear 303, so that the turnover frame 302 is driven to rotate with the turnover shaft 301 as the axis, and the driving is stable and reliable.

[0030] In another embodiment, a stepper motor is fixedly installed on the lifting base 2, the turnover shaft 301 adopts a Z-shaped column and has one end fixedly connected with the output end of the stepper motor, in which the turnover frame 302 is replaced with a part of the Z-shaped column, so that only an unwinding mechanism is required to be provided on the short section of the Z-shaped column away from the stepper motor to fulfill the replacement. However, the output shaft of the stepper motor will be applied a large rotational potential when being static, which may cause damage to the stepper motor.

[0031] According to another embodiment of the present invention, as shown in FIG. 2, the turnover frame 302 is an L-shaped case, and when one turnover frame 302 is in a horizontal position, and the other turnover frame 302 is in a vertical or mirror-symmetrical position, the two electric cylinders 1 separately drive the two turnover frames 302 to walk toward each other on the same straight track and avoid each other. Preferably, when the two turnover frames 302 walk to the parallel state, there is no extra space between each other, that is, the two turnover frames 302 walk toward each other on the same straight track and just avoid each other. Thus, the designed structure is reasonable and compact, which saves occupied space, and obviously, a larger gap can also be designed, which improves the fault tolerance rate, and avoids the damage caused by the collision of the two transposition devices due to positioning failure.

[0032] In an embodiment of the disclosure, as shown in Figs. 1-7, a limiting mechanism 5 is installed between the turnover frame 302 and the turnover shaft 301 to limit the rotation angle of the turnover frame 302, and further limit the rotating turnover frame 302 to ensure the accurate and reliable locking of the rotation stop position.

[0033] Further, the limiting mechanism 5 includes a notch 501 opened on an outer circumferential side wall of the large gear 303, and a stopping block 502 provided on the turnover frame 302 and matched with the notch 501 to stop the rotation of the turnover frame 302. The stopping block 502 moves along the arc trajectory in the notch 501 while the turnover frame 302 rotates, in which when the stopping block 502 comes into contact with both ends of the notch 501, it directly acts as a stop and prevents the rotation inertia of the turnover frame 302 from damaging the stepper motor that drives the rotation of the turnover frame 302, which protects the stepper motor to a certain extent, and prolongs the service life of the stepper motor.

[0034] In another embodiment, the limiting mechanism 5 can adopt a travel switch or a position sensor to cooperate with a controller, and the controller controls the stepper motor that drives the turnover frame 302 to rotate. In addition to the stepper motor limiting the position by itself, the cooperation of the travel switch or the position sensor with the controller further controls and locks the stop position of the turnover frame 302, so that the limit is more reliable.

[0035] Further, preferably, the rotation angle of the turnover frame 302 is 0°-90°, that is, the notch 501 is a quarter of the outer circumference of the large gear 303; the two turnover frames 302 can only be turnoverped between the horizontal position of the unwinding drive head 401 horizontally facing the front side and the vertical position with the unwinding drive head 401 facing upright; and obviously, the turnover angle of the turnover frame 302 can also be greater than 90°, which only needs to be adjusted by the limiting mechanism.

[0036] In another embodiment of the disclosure, as

shown in Fig. 7, the unwinding mechanism 4 includes an unwinding drive head 401 rotatably mounted on the turnover frame 302, and an unwinding drive assembly mounted on the turnover frame 302 to drive the unwinding drive head 401 to rotate with its central axis as an axis; and when the two unwinding drive heads 401 are in the vertical state, their central axis extension lines are a same straight line, so that they can be accurately transposed, and the deviation can be prevented from affecting the normal progress of follow-up work.

[0037] Further, the unwinding drive assembly includes an unwinding motor 402, in which an output end of the unwinding motor 402 is installed with a driving gear 403 that rotates coaxially with the output end; the unwinding drive head 401 is rotatably mounted on the outer side wall of the turnover frame 302 through a bearing and is sleeved with a driven gear ring 404; the driving gear 403 and the driven gear ring 404 are drivingly sleeved with a transmission toothed-belt 405; and the unwinding motor 402 is a Demark D1 10M-R600300A-E servo motor. When the motor works, its output end drives the driving gear 403 to rotate coaxially, and the driven gear ring 404 and the unwinding driving head 401 are driven to rotate through the transmission toothed-belt 405, so that the driving is stable and reliable.

[0038] In another embodiment of the disclosure, the output end of the servo motor can be directly connected to the unwinding drive head 401, and the output end of the servo motor directly drives the unwinding drive head 401 to rotate coaxially therewith.

[0039] As shown in Figs. 8-10, since the material transposition equipment according to an embodiment of the disclosure is applied to a material station, an embodiment of the disclosure also correspondingly provides a material station, which includes a cabinet body and the above-mentioned material transposition equipment, the cabinet body is provided with a transposition slot (15) for accommodating a sliding of an unwinding driving head (401).

[0040] The above embodiments of the material transposition equipment are all applicable to the embodiments of the material station, and the same technical effect can also be achieved.

[0041] As another preferred embodiment of the disclosure, a material station includes a material storage 6, a cabinet body, and a material replacement overlap mechanism 11, in which the material replacement overlap mechanism 11 is installed on the cabinet body, and at least one set of material replacement overlap mechanisms 11 are installed on and supported by the cabinet body;

the cabinet body includes a rack 7 and a main vertical plate 8, in which the main vertical plate 8 is fixedly installed at the front end of the rack 7, and the material storage 6 is arranged behind the rack 7 and provided with vertical stacked belt-shaped material trays; and

the material replacement overlap mechanism 11 includes a grasping and lifting mechanism 9, material transposition equipment, a traction mechanism 10, an overlap mechanism 11, a tape supply mechanism 12, a tension adjustment mechanism 13 and a discharge channel 14.

[0042] Specifically, the rear side of the rack 7 is installed with a grabbing and lifting mechanism 9 arranged vertically along the height direction of the rack 7, in which the grabbing and lifting mechanism 9 grabs the belt-shaped material tray in the material storage 6, and lifts and overturns it to a material supply station 16 on the top of the rack 7.

[0043] The material transposition equipment is installed in the rack 7 between the grabbing and lifting mechanism 9 and the main vertical plate 8; the material transposition equipment is arranged vertically along the height direction of the rack 7. The transposition slot 15 is opened on the main vertical plate 8 along the vertical direction. The unwinding driving head 401 is in front of the main vertical plate 8 through the transposition slot 15, and can move up and down along the transposition slot 15 and can be overturned. When the unwinding drive head 401 moves to the top of the rack 7, the unwinding drive head 401 tensions the roll of the belt-shaped material tray of the material supply station 16, and moves the belt-shaped material tray along the transposition slot 15 to a new material tray starting station 17 on the main vertical plate 8.

[0044] The new material tray starting station 17 is in the middle of the transposition slot 15 along the vertical direction, and the unwinding station is the bottom of the transposition slot 15, in which the old belt-shaped material tray is at the unwinding station. The main vertical plate 8 is installed with a tape supply mechanism 12 to provide a double-sided tape for the splicing of the head of the new belt-shaped material and the tail of the old belt-shaped material, in which a glue station 18 is installed on the main vertical plate 8 under the tape supply mechanism 12, a splicing station 19 is installed on the main vertical plate 8 and installed with an overlap mechanism 11 to fulfill the splicing of the head of the new belt-shaped material and the tail of the old belt-shaped material. A traction mechanism 10 is installed on the main vertical plate 8 to pull the head of the new belt-shaped material and the double-sided tape to the overlap mechanism 11, and the tension adjustment mechanism 13 and the discharge channel 14 is installed on the main vertical plate 8 below the overlap mechanism 11, in which the tension adjusting mechanism 13 adjusts the tension of the belt-shaped material, and the discharge channel 14 discharge the belt-shaped material.

[0045] The working principle of the disclosure is as follows.

[0046] S1, the grasping and lifting mechanism 9 lifts the uppermost belt-shaped material tray among the vertically stacked belt-shaped material trays in the material storage 6 to the material supply station 16.

[0047] S2, the turnover motor 305 of the transposition device of the two sets of transposition devices of the material transposition equipment that is not involved in the production is started and drives the corresponding planetary gear 304 to rotate, and then the planetary gear 304 rotates around the large gear 303 while rotating due to the planetary gear 304 meshing with the large gear 303, so that the turnover frame 302 is overturned by 90°, thereby overturning the corresponding unwinding driving head 401 to the vertical upward position;
the electric cylinder 1 is started to drive the unwinding drive head 401 to move vertically upwards, and stops when the unwinding drive head 401 is inserted into the reel of the belt-shaped material tray of the material supply station 16 from bottom to top, the tension shaft of the unwinding driving head 401 is started to make the unwinding driving head 401 tension the inner wall of the reel of the belt-shaped material tray; then the turnover motor 305 is started again to reversely overturn the turnover frame 302 through the planetary gear 304 and the large gear 303 by 90°, so that the unwinding drive head 401 is overturned to a horizontal position facing the front of the main vertical plate 8, and meanwhile, the belt-shaped material tensioned by the unwinding driving head 401 is in front of and in parallel with the main vertical plate 8; and the electric cylinder 1 is started to drive the belt-shaped material tray to move vertically downward along the transposition slot 15 on the main vertical plate 8 to the new material tray starting station 17.

[0048] S3, the traction mechanism 10 is started to find the head of the tape-shaped material at the new material tray starting station 17, and clamps and pulls the head of the new belt-shaped material tray to the overlap mechanism 11 to wait for the splicing.

[0049] S4, the old belt-shaped material tray during the normal production is at the bottom of the transposition slot 15 on the main vertical plate 8, that is, the unwinding station, of which the head passes through the overlap mechanism 11, the tension adjustment mechanism 13 and the discharge channel 14 in turn to the belt-shaped material production system, and when the old belt-shaped material tray is about to be used up and needs to be replaced with a new belt-shaped material, the overlap mechanism 11 is started to splice the head of the new belt-shaped material with the tail of the old belt-shaped material.

[0050] S5, after the splicing is completed, the tensioning shaft of the unwinding drive head 401 where the old belt-shaped material tray is located is started, so that the reel of the old belt-shaped material tray is loosened by the unwinding drive head 401, and pushed out from the unwinding drive head 401; and the turnover motor 305 of the transposition device where the old strip material is located is started, the corresponding unwinding drive head 401 is overturned until facing upwards, then the electric cylinder 1 of the transposition device is started to drive the unwinding drive head 401 to move upward, and the electric cylinder 1 of the transposition device where the new belt-shaped material tray is located is started to drive the new belt-shaped material tray to move down to the unwinding station.

[0051] S6, the grasping and lifting mechanism 9 is restarted to lift the belt-shaped material tray in the material storage 6 to the material supply station 16, the electric cylinder 1 of the transposition device with the unwinding drive head 401 facing upward is started, and the belt-shaped material tray is grasped from the material supply station 16, is turned over, and then is carried to the new material tray starting station 17 so as to prepare for the next splicing of new and old belt-shaped materials.

[0052] In the disclosure, unless otherwise clearly specified and limited, for example, the connection can be a fixed connection, a detachable connection, or a whole; it can be a mechanical connection or an electrical connection; it can be a direct connection or an indirect connection through an intermediate medium; and it can be the internal communication between two elements or the interaction between two elements. Unless otherwise clearly defined, the above terms used in the disclosure can be explained in a specific meaning according to specific circumstances for those skilled in the art.

[0053] The above are the preferred embodiments of the disclosure. It should be pointed out that for those skilled in the art, several improvements and modifications can be made without departing from the principle of the disclosure, and these improvements and modifications shall fall within the protection scope of the disclosure.

Claims

1. A material transposition equipment, including two transposition devices cooperated with each other and arranged oppositely, and

   each of the two transposition devices includes:
   a lifting base (2);
   a turnover mechanism (3) rotatably arranged on the lifting base (2);
   an unwinding mechanism (4) arranged on and rotated with the turnover mechanism (3) to drive a belt-shaped material tray to rotate; and
   a lifting mechanism connected with the lifting base (2) to drive the lifting base (2) to move in a straight line so as to transpose two unwinding mechanisms (4) of the two transposition devices.

2. The material transposition equipment of claim 1, wherein the turnover mechanism (3) includes a turnover shaft (301) fixedly arranged on the lifting base (2), a turnover frame (302) rotatably sleeved on the turnover shaft (301), and a turnover drive assembly provided between the turnover frame (302) and the turnover shaft (301); and
   the turnover drive assembly is used to drive the turn-

over frame (302) to rotate with the turnover shaft (301) as an axis.

3. The material transposition equipment of claim 2, wherein the turnover frame (302) is an L-shaped case, and two turnover frames (302) of the two transposition devices avoid each other when walking toward each other on a same linear track.

4. The material transposition equipment of claim 2, wherein the turnover drive assembly includes a large gear (303) fixedly sleeved on the turnover shaft (301), a planetary gear (304) meshed with the large gear (303), and a turnover drive member provided on the turnover frame (302) for driving the planetary gear (304) to rotate with a central axis of the planetary gear (304) as an axis.

5. The material transposition equipment of claim 4, further including a limiting mechanism (5) provided on the turnover frame (302) for cooperating with the turnover shaft (301) to limit a rotation angle of the turnover frame (302).

6. The material transposition equipment of claim 5, wherein the limiting mechanism (5) includes a notch (501) opened on an outer circumferential side wall of the large gear (303), and a stopping block (502) provided on the turnover frame (302) and cooperated with the notch (501) to stop the rotation of the turnover frame (302).

7. The material transposition equipment of claim 2, wherein a rotation angle of the turnover frame (302) with the turnover shaft (301) as the axis is 0°- 90°.

8. The material transposition equipment of claim 2, wherein the unwinding mechanism (4) includes an unwinding drive head (401) rotatably arranged on the turnover frame (302), and an unwinding drive assembly arranged on the turnover frame (302) to drive the unwinding drive head (401) to rotate with a central axis of the unwinding drive head (401); and when each of two unwinding driving heads (401) of the two transposition devices is in a vertical state, extension lines of central axes of the two unwinding driving heads (401) are on one same straight line.

9. The material transposition equipment of claim 8, wherein the unwinding drive assembly includes an unwinding motor (402), in which an output end of the unwinding motor (402) is installed with a driving gear (403) coaxially rotated with the output end, the unwinding drive head (401) is rotatably installed on an outer side wall of the turnover frame (302) through a bearing and sleeved with a driven gear ring (404), and a transmission toothed-belt (405) is sleeved on the driving gear (403) and the driven gear ring (404).

10. A material station including a cabinet body, further including the material transposition equipment of any one of claims 1-8, in which the cabinet body is opened with a transposition slot (15) for accommodating a sliding of an unwinding driving head (401).

Fig. 1

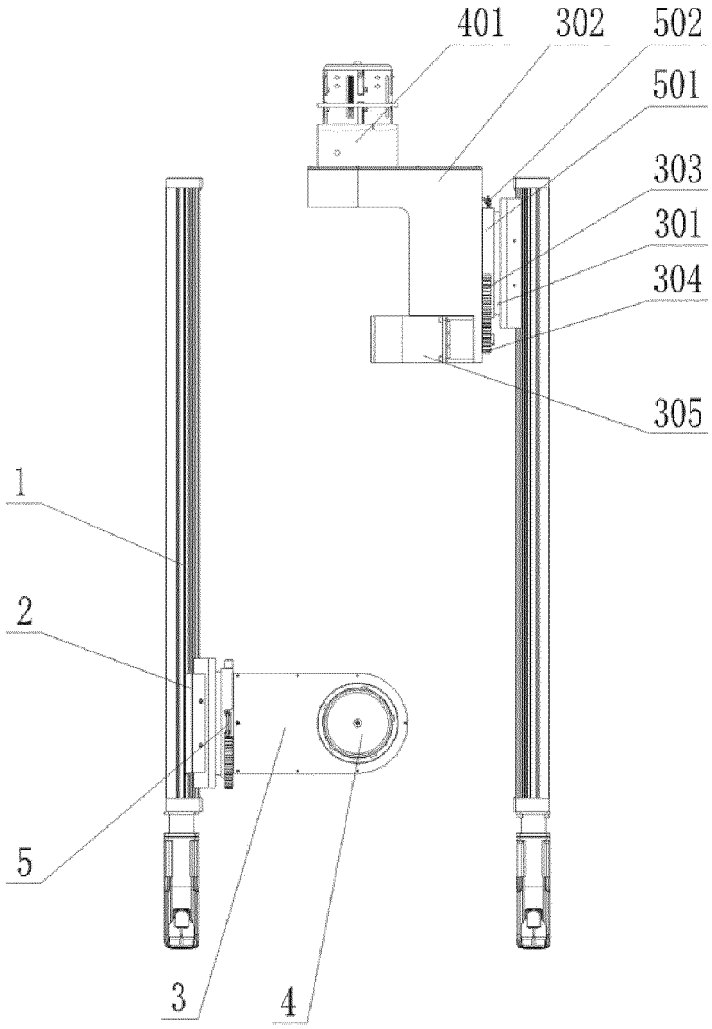


Fig. 2

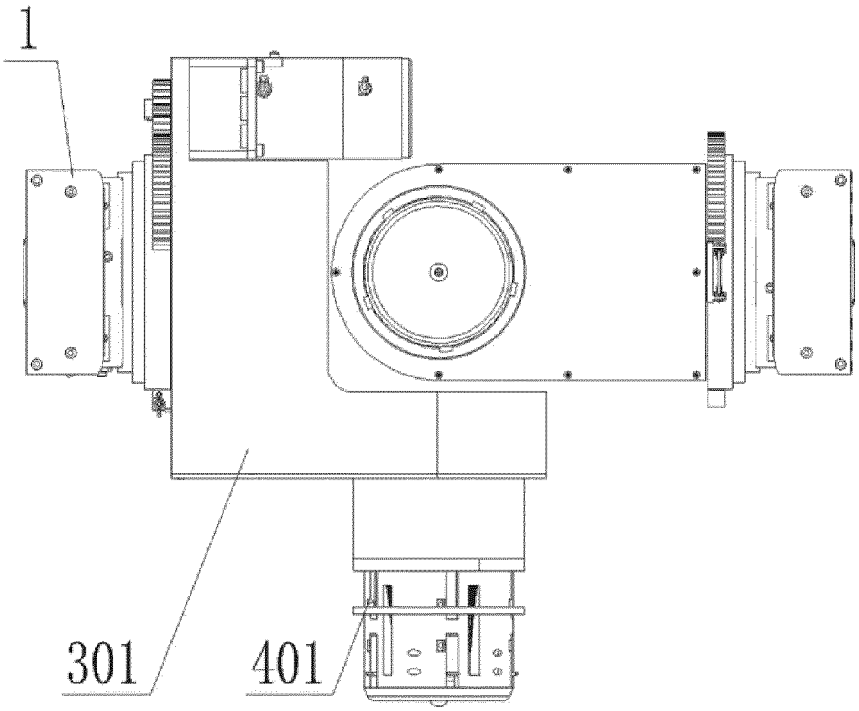


Fig. 3

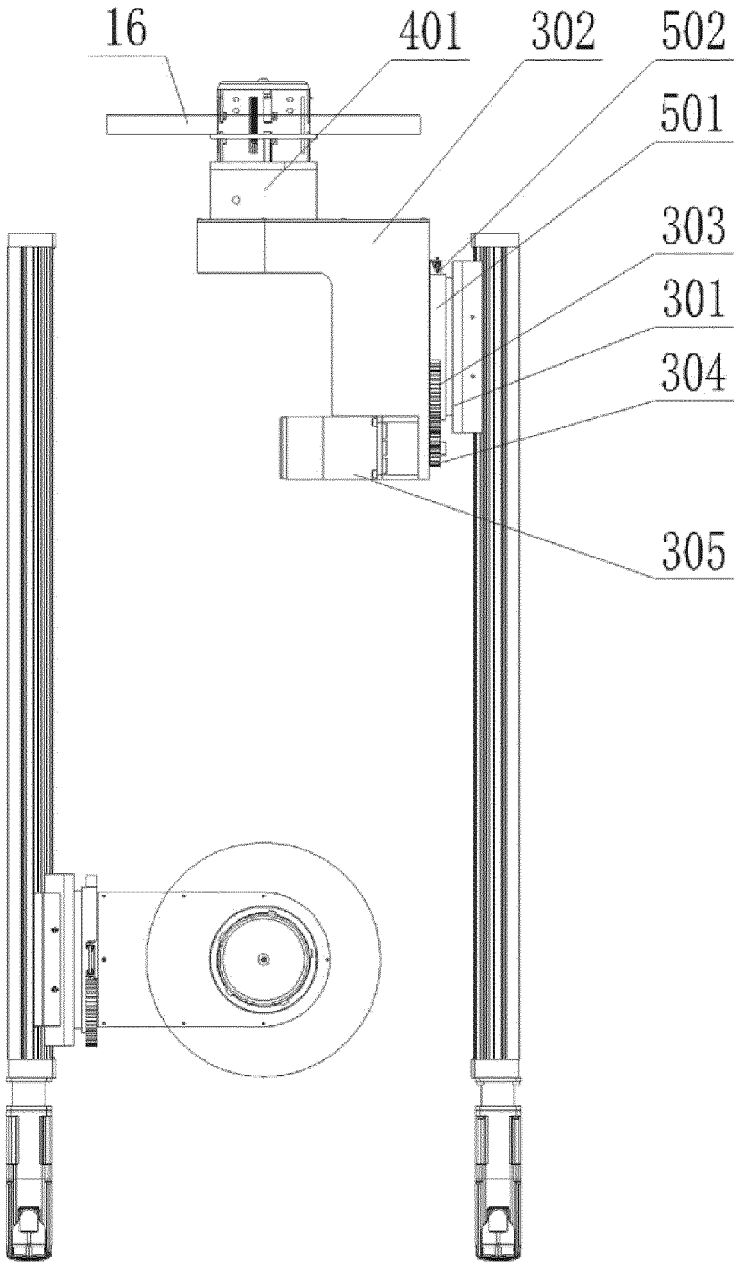


Fig. 4

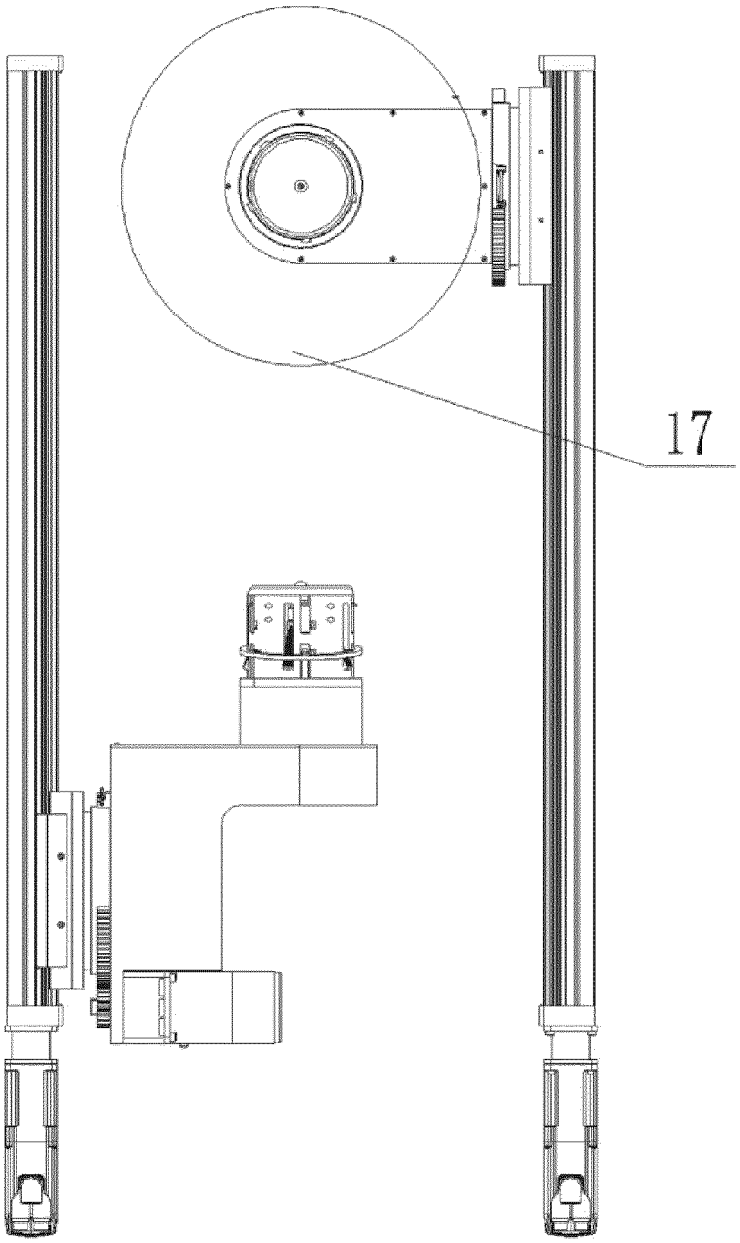


Fig.5

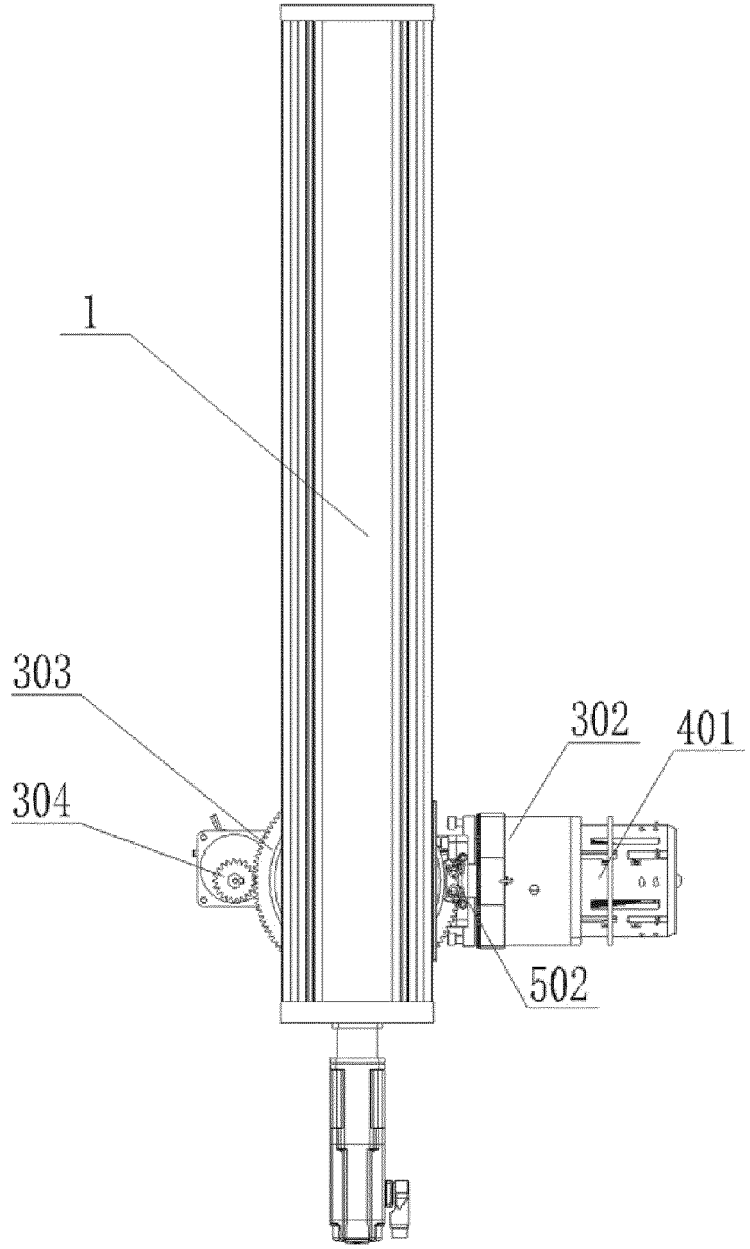


Fig. 6

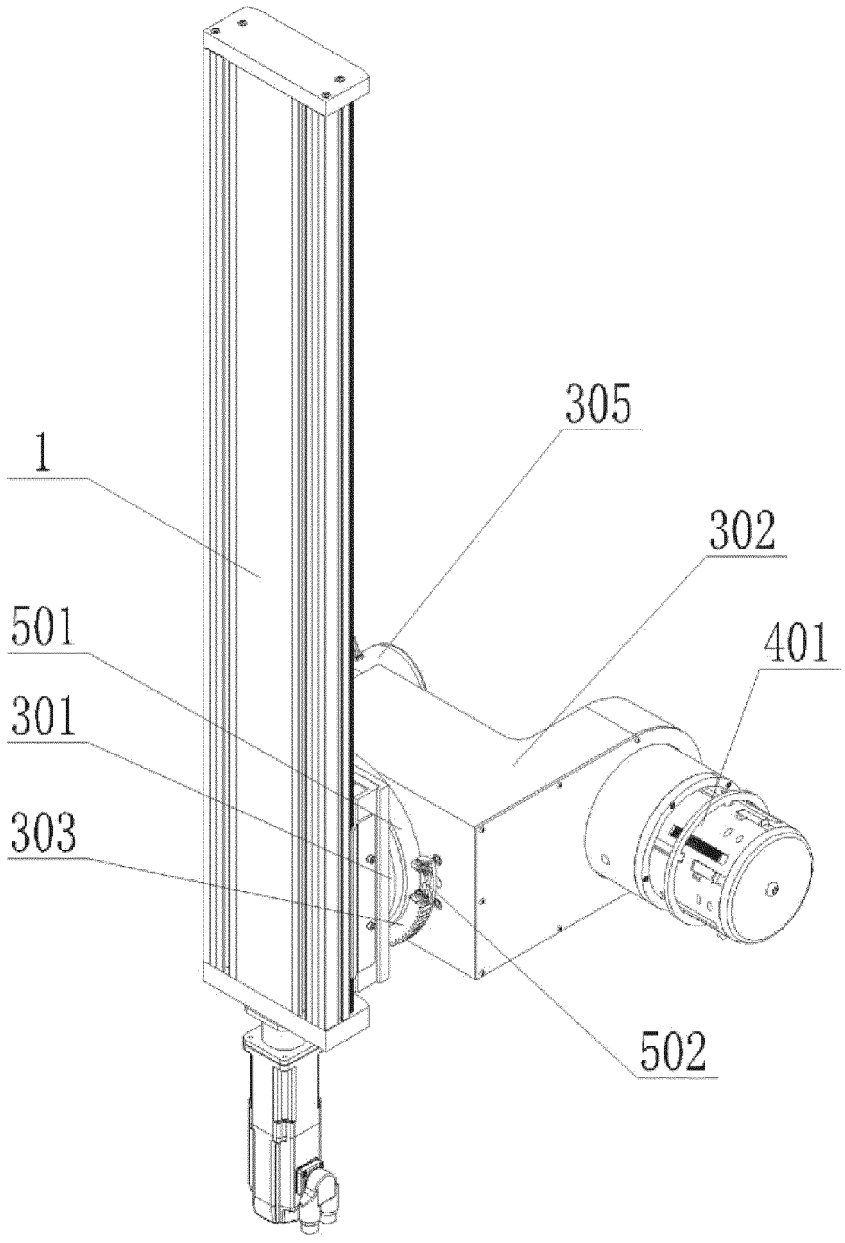


Fig. 7

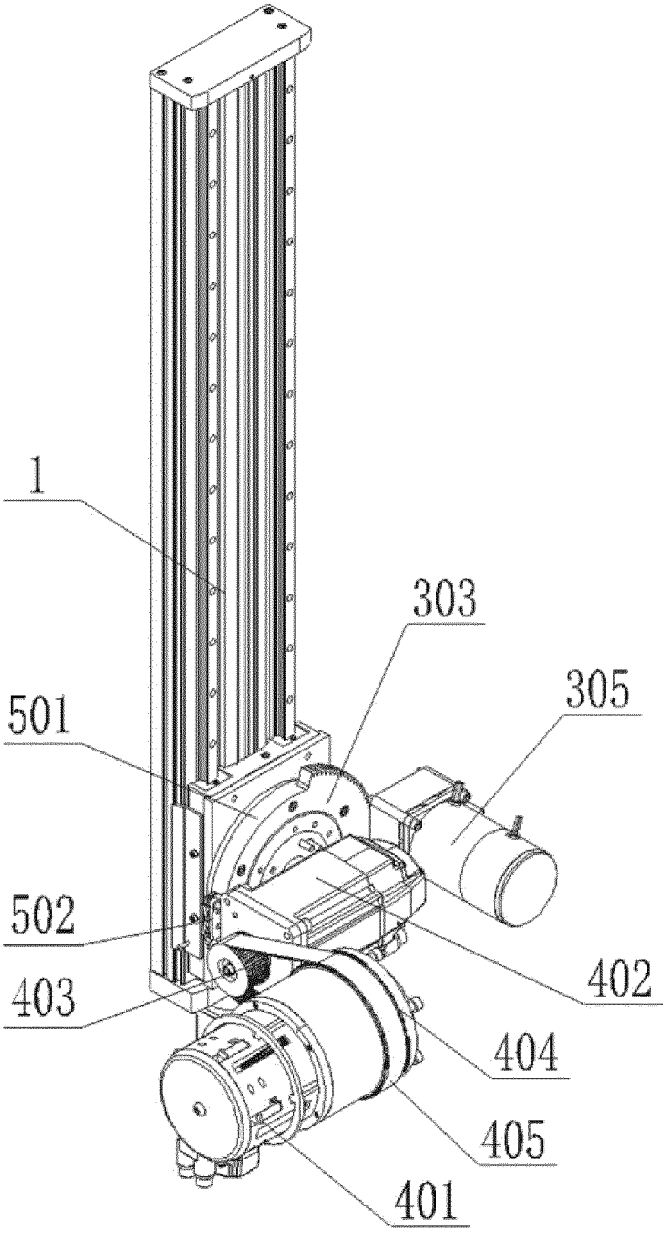


Fig. 8

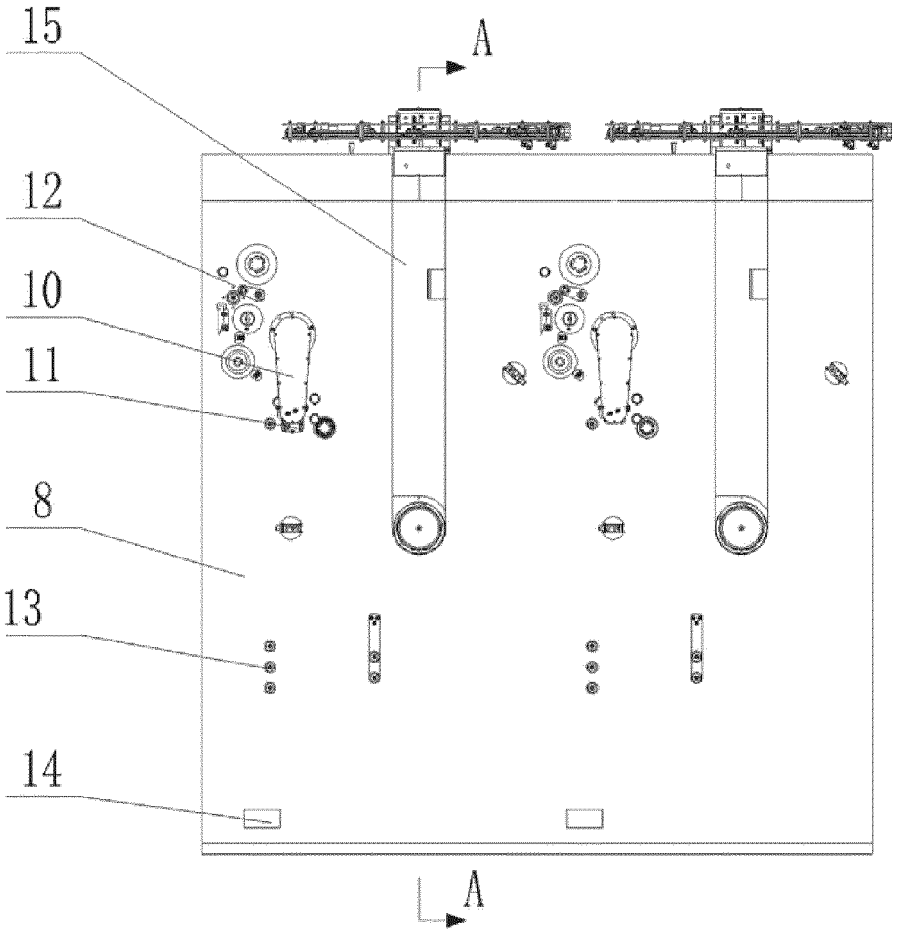


Fig. 9

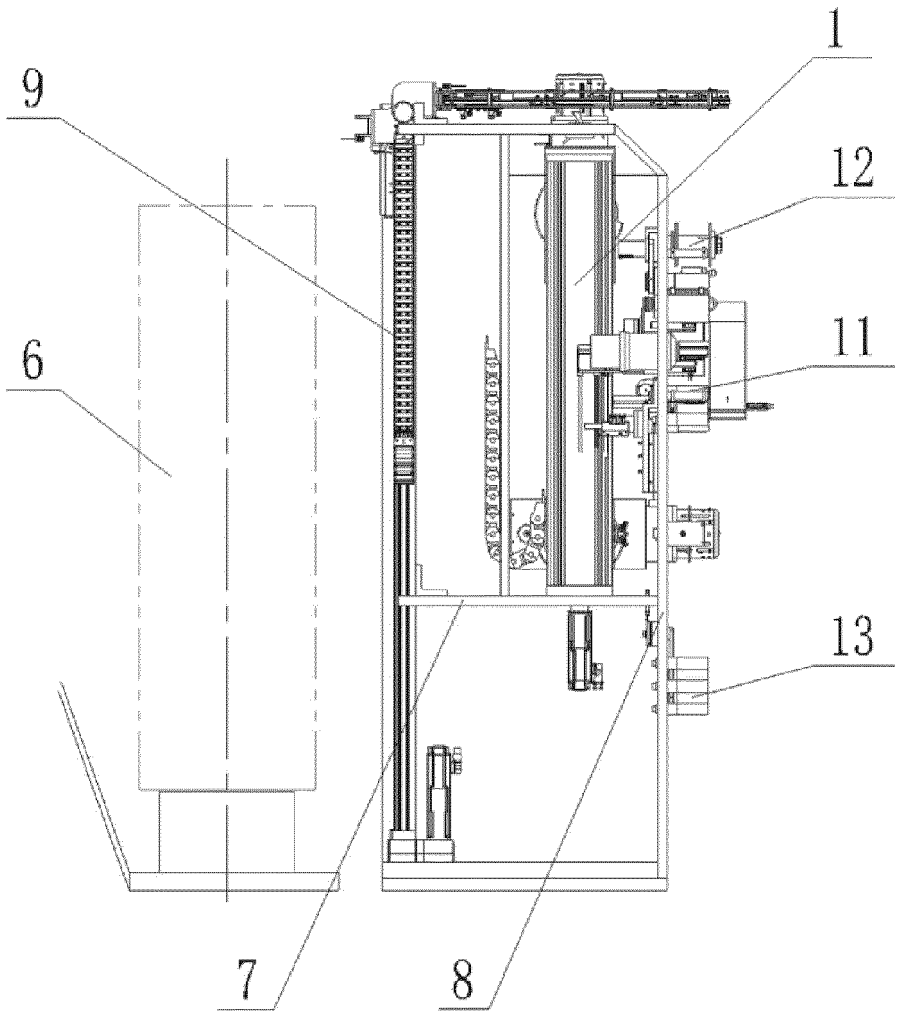
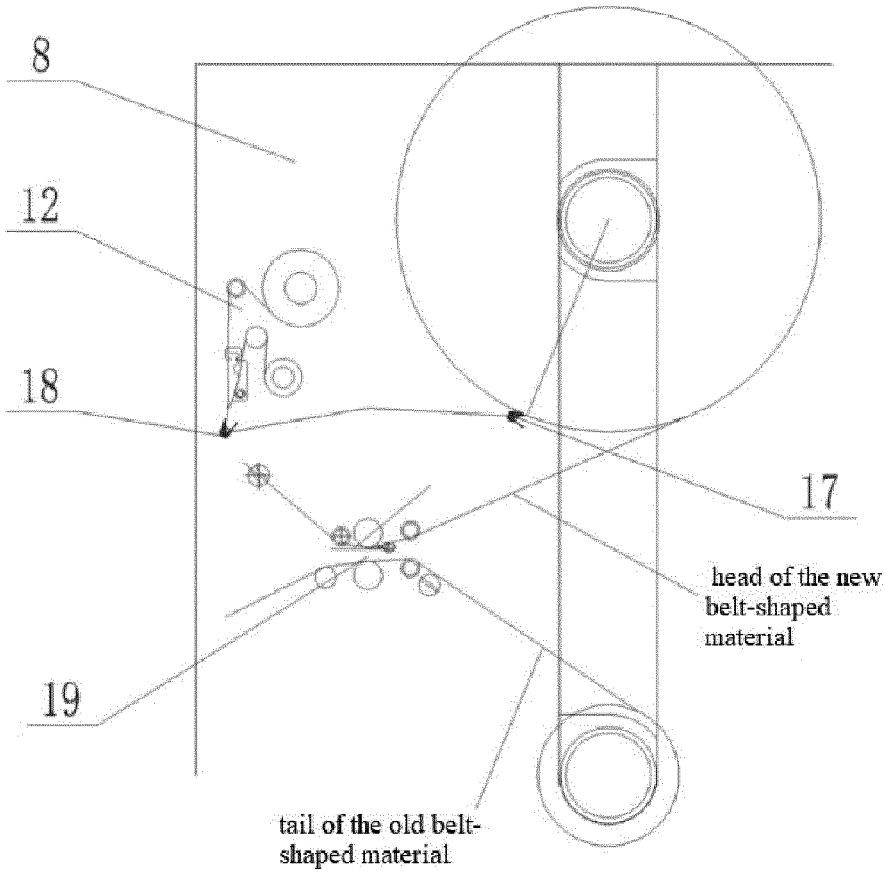


Fig.10


8
12
18
17
head of the new belt-shaped material
19
tail of the old belt-shaped material

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/117907

A. CLASSIFICATION OF SUBJECT MATTER

B65H 19/12(2006.01)i; B65H 19/18(2006.01)i; B65H 16/00(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)

B65H

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; CNKI; CNTXT; VEN; WOTXT; EPTXT; USTXT: 翻转, 提升, 升降, 摆动, 竖直, 垂直, 轨, 空间, 换料, 换位, 放卷, lift, turn, rail, elevate, change, pivot, swing, rotate, vertical, unwind

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 111908216 A (HENAN XINZHILIN ELECTROMECHANICAL DEVICE CO., LTD.) 10 November 2020 (2020-11-10) description, paragraphs [0018]-[0022], and figures 1-10	1-10
PX	CN 111908219 A (HENAN XINZHILIN ELECTROMECHANICAL DEVICE CO., LTD.) 10 November 2020 (2020-11-10) description, paragraphs [0030]-[0050], and figures 1-24	1-10
PX	CN 213264883 U (HENAN XINZHILIN ELECTROMECHANICAL DEVICE CO., LTD.) 25 May 2021 (2021-05-25) description, paragraphs [0037]-[0044], and figures 1-13	1-10
A	CN 208499706 U (SHENG, Jifeng) 15 February 2019 (2019-02-15) description, paragraphs [0025]-[0033], and figures 1-4	1-10
A	JP H06191691 A (ONO KIKOUSHIYO K. K.) 12 July 1994 (1994-07-12) entire document	1-10

☐ Further documents are listed in the continuation of Box C. ☑ 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
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"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
"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

Date of the actual completion of the international search	Date of mailing of the international search report
13 October 2021	**29 October 2021**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/117907

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	111908216	A	10 November 2020	CN	212334122	U	12 January 2021
CN	111908219	A	10 November 2020	CN	212334127	U	12 January 2021
CN	213264883	U	25 May 2021		None		
CN	208499706	U	15 February 2019		None		
JP	H06191691	A	12 July 1994		None		

Form PCT/ISA/210 (patent family annex) (January 2015)