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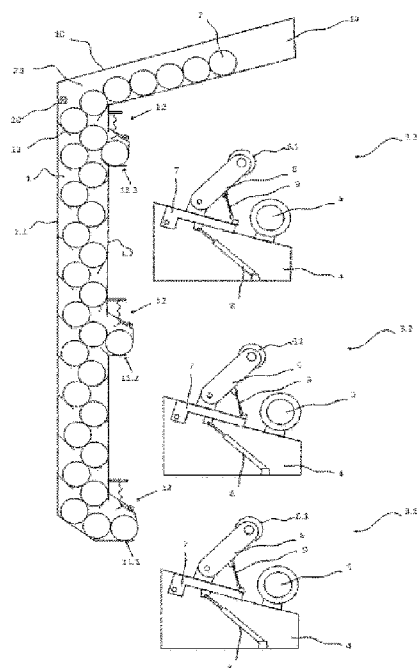


Fig.1

(57) Abstract: Present invention discloses a winding apparatus of textile machinery having multiple winding devices (3.1 - 3.9) which are stacked in multiple layers, and a supply mechanism accommodating a plurality of winding tubes (2) ready to be supplied, wherein, each winding device (3.1 - 3.9) includes a rotatable cradle (6), a drive roller (5) driving rotation of the winding tubes (2), and a yarn guiding mechanism for guiding yarns, wherein, the supply mechanism includes a tube chamber (1) with a central winding tube inlet (23), wherein, the tube chamber (1) is arranged along the layer-stacking direction to centrally supply the winding tubes (2) to the multiple layers of winding devices (3.1 - 3.9). The winding tube central inlet (23) of the tube chamber (1) permits winding tubes (2) needed to multiple layers of winding devices (3.1 - 3.9) to be centrally put in via one inlet. Comparing to existing technology where winding tubes have to be put in successively for each layer, present invention lessens the intensity of workload for operator to put in all winding tubes.

A winding apparatus of textile machinery

Technical field

- 5 Present invention relates to a winding apparatus of a textile machinery, in particular to a winding apparatus able to perform supply of empty winding tubes.

Background art

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Winding apparatus of textile machinery normally is combination of multiple winding devices. The multiple winding devices are placed as stacked in layers along longitudinal direction and as side-by-side along transversal direction. Each winding device, as an independent function unit, winds one or two yarns into full bobbin, and then replaces full bobbin with empty winding tube. Each winding device includes a cradle, a drive roller, a yarn guiding mechanism and a supply mechanism for accommodating winding tubes.

15

- 20 EP2002006845 has disclosed a winding device of said kind. With reference to yarn advancing direction, the yarn guiding mechanism is positioned at upper stream side of the drive roller. In its description, it is specifically disclosed that, each winding device is equipped with an independent supply mechanism. Each supply mechanism has successively arranged winding tubes disposed inside. The supply mechanism, which is in almost horizontal placement, is disposed in the zone above each winding device. In this sense, during procedure of winding tube supply, the winding tube has to be taken down from the upper area, and afterwards is loaded onto clamping ends of a cradle.
- 25

The textile machinery industry is demanding increased production capacity and higher production efficiency, which, reflecting on the winding apparatus, means that layers of winding device have taken on an increasing trend, from previously three layers to currently four or five layers. The technical problem that comes along with the increasing layers is, the overall height of winding apparatus is increased, in the sense of which, winding devices at relatively high layers are beyond reach of an operator. Operability of winding apparatus therefore is compromised. The arrangement of supply mechanism as described in EP2002006845 cannot be applied in order to solve the issue of low operability.

Contents of the invention

By utilizing a winding apparatus of textile machinery disclosed by present invention, present invention provides significant improvements on winding apparatus to solve aforementioned problem.

To this end, present invention provides following technical solutions:

20

First, a winding apparatus of textile machinery, having multiple winding devices which are stacked in multiple layers, and a supply mechanism accommodating a plurality of winding tubes ready to be supplied, wherein, each winding device includes a rotatable cradle, a drive roller driving rotation of the winding tubes, and a yarn guiding mechanism guiding yarns, wherein, the supply mechanism includes a tube chamber with a central winding tube inlet, wherein, the tube chamber is arranged along the layer-stacking direction to centrally supply the winding tubes to the multiple layers of winding devices.

The winding tube central inlet of the tube chamber permits winding tubes needed to multiple layers of winding devices to be centrally put in via one inlet. Then winding tubes can fall down inside the tube chamber along layer-stacking direction (or up-down direction) under action of gravity. When
5 compared to the existing technology where winding tubes have to be put in successively for each layer, this solution lessens intensity of workload for operator to put in winding tubes.

10 Further, the tube chamber includes multiple winding tube outlets each correlating with one of the winding devices. Each winding tube outlet corresponds to one winding device, so that winding tube supply of one winding device can be performed with no interference to other winding devices.

15 To ensure no interference to the side used to take out the full bobbin, further, the tube chamber is positioned at back side of the winding devices. The winding tubes are centrally via a tube chamber supplied to the winding device from one side of the winding device, which does not occupy space above the winding device when compared with existing technology. In this
20 case, gap between winding devices of adjacent layers can be reduced, which lowers overall height of the winding apparatus.

The tube chamber can optionally be comprised of a plurality of sections of sub-tube-chambers or can be designed as an integral structure.

25

Furthermore, one side of the longitudinal tube chamber close to the winding device has the plurality of winding tube outlets which are distributed along the layer-stacking direction, by means of which the winding tube is supplied to the cradle of the winding device of the corresponding layer.

Furthermore, each said winding tube outlet is assigned with a blocking mechanism used for temporarily preventing the winding tube from falling off.

5

Aim of the blocking mechanism is to temporarily block the winding tubes, such that when situation requires winding tube supply, the blocking mechanism could release blocking restriction to the winding tube under influence of external force; when situation does not require winding tube supply, the blocking mechanism restrictively blocks the winding tubes.

10

In specifics, the blocking mechanism includes a spring body and a bended piece which is rotatable, one end of the bended piece is connected with outer wall of the tube chamber via the spring body; the bended piece has a first blocking part, for blocking the winding tube at the winding tube outlet under non-supply status; the bended piece has a second blocking part, for preventing following winding tube from falling off along with the previous winding tube.

15

Then, along the layer-stacking direction, a guiding element is staggered on two inner walls of tube chamber which are parallel to axis of the winding tube, such that the winding tube moves downwardly in curved trajectory within the tube chamber.

20

Curved falling trajectory can effectively prevent winding tube jams within the tube chamber.

25

Further, the supply mechanism includes a transversal tube chamber communicated with upper end of the tube chamber, one end of the transversal

tube chamber is close to an operation side of the winding apparatus opposite to the back side.

Facing towards the operation side, operator can more easily operate. The
5 winding tubes can be firstly put into the transversal tube chamber then successively falling down within the tube chamber.

Furthermore, a sensor is disposed above the uppermost winding tube outlet on the tube chamber, in order to detect if there are enough winding tubes in
10 the tube chamber.

Therefore only one sensor is needed for three or more layer of winding devices. When the sensor above the winding tube outlet of uppermost layer detects existence of winding tube at such a height it means that there is
15 enough storage of winding tubes inside the tube chamber. In this sense several sensors are not necessary.

Further, in order for the cradle to rotate a relatively large angle, the cradle is rotatably disposed on a winding platform, and the winding platform is ro-
20 tatably disposed on a winding seat.

Furthermore, the cradle is driven by a cradle cylinder, such that the cradle moves between a winding start position and a full bobbin position; the winding platform is driven by a platform cylinder, such that the winding
25 platform moves between an initial position and a winding tube supply position; the cradle cylinder and the platform cylinder act alternately.

From start of winding to full bobbin, the cradle cylinder lifts the cradle up from the winding start position to the full bobbin position. After full bobbin

is taken off, the cradle and the winding platform as a whole is lifted up from the initial position to the winding tube supply position where the cradle obtains winding tube.

5 Description of Figures

Figure 1 schematically shows structural diagram of the winding apparatus of present invention;

Figure 2 schematically shows partial diagram of the winding apparatus of present invention when winding device is at winding start position;

Figure 3 schematically shows partial diagram of the winding apparatus of present invention when winding device is at full bobbin position;

Figure 4 schematically shows partial diagram of the winding apparatus of present invention when winding device is at winding tube supply position;

Figure 5 schematically shows partial diagram of the winding apparatus of present invention when winding device starts to return back to full bobbin position;

Figure 6.1 schematically shows structural diagram of blocking mechanism of the winding apparatus of present invention under non-supply status;

Figure 6.2 schematically shows structure diagram of blocking mechanism of the winding apparatus of present invention under supply status;

Figure 7 schematically shows front view diagram of the winding apparatus of present invention.

Reference signs		
	1	tube chamber
	2、 2.1、 2.2	winding tube
	3.1 to 3.9	winding device
5	4	winding seat
	5	drive roller
	6	cradle
	7	winding platform
	8	platform cylinder
10	9	cradle cylinder
	10	transversal tube chamber
	11.1 to 11.3	winding tube outlet
	12	blocking mechanism
	13	guiding element
15	14	spring body
	15	first blocking part
	16	second blocking part
	17	bended piece
	18	fixed seat
20	19	one end of transversal tube chamber
	20	sensor
	21	winding apparatus
	22.1	oblique slope part
	22.2	horizontal part
25	23	winding tube central inlet
	24	fixed piece
	25	bobbin

Mode for carrying out the invention

Winding apparatus of textile machinery is comprised of multiple winding devices, which are combined as longitudinally stacked in layer and transversally side by side. Said arrangement can be found in figure 7, which is schematically front view of a winding apparatus 21 having nine winding devices 3.1-3.9. The winding devices 3.1-3.9 are arranged in longitudinally three layers and transversally three lines.

Figure 1 schematically shows structural diagram of winding apparatus of present invention. Due to that the perspective is side view, only the winding devices 3.1-3.3 stacked in layers along up-down direction are shown. The winding devices 3.1-3.3 in each case has its own winding seat 4. The winding seat 4 is mounted with a cradle 6, a drive roller 5 and a yarn guiding mechanism not shown in figures. The cradle 6 is arranged as rotatable around one end thereof, and the other end of the cradle 6 is provided with a pair of clamping disks 6.1. The pair of clamping disks 6.1, under drive of a cylinder not shown in figures, are able to move close to each other or away from each other. The clamping disks 6.1, while moving close to each other, are able to clamp a winding tube. Winding tube or winding tube bearing yarns (called "bobbin") will be released when the clamping disks 6.1 move away from each other. The drive roller 5, directly driven by a drive source not shown in figures, is positioned to the right side of the cradle 6 according to the perspective in figure 1. The yarn guiding mechanism, which is not shown and whose structure can be obtained with reference to description of CN104860119, is positioned to the right side of the drive roller 5, such that yarns can be reciprocated along axial direction of the winding tube. As soon as the cradle 6 rotates until the winding tube clamped by the cradle 6 comes into contact with the rotating drive roller 5, the winding tube is driven into

rotation. Advancing yarn firstly travels through the unshown yarn guiding mechanism and then through the gap between the drive roller 5 and the winding tube, until finally being wound onto the winding tube. As a function of yarn laying by the yarn guiding mechanism, yarns come into formation on the winding tube, by which bobbin is formed.

As further shown in figure 1, a supply mechanism of the winding apparatus of present invention includes a tube chamber 1 which is at left side of a row of the winding devices 3.1-3.3. Being apart from the winding devices 3.1-3.3, the tube chamber 1 is installed along layer-stacking direction of the winding devices 3.1-3.3. Right side of the winding devices 3.1-3.3 is the operation side which is for taking out bobbins whose yarn winding is finished. The side opposite to the operation side is back side, which is used for installing the tube chamber 1. The tube chamber 1 in this embodiment has an integral structure. It is possible that, the tube chamber 1 is designed as sectioned structure, comprised of a plurality of sections of sub-tube-chambers. Amount of the sub-tube-chambers is in correspondence to the amount of the winding devices along the layer-stacking direction.

With consideration to convenience of operation, each row of the winding devices 3.1-3.3 is assigned with a tube chamber 1 which has a width slightly greater than length of the winding tube, the feature of which is manifested in figure 7.

The side of the tube chamber 1 close to the winding devices 3.1-3.3 is opened with a plurality of winding tube outlets 11.1-11.3. The winding tube outlets 11.1-11.3, which are distributed along the layer-stacking direction, have its amount equal to the amount of the winding devices 3.1-3.3 and have its opening height greater than diameter of the winding tube 2. In or-

der to prevent the winding tube 2 from falling off the winding tube outlet 11.1-11.3, each said winding tube outlet 11.1-11.3 is assigned with a blocking mechanism 12 for temporarily preventing the winding tube from falling off. Structure of the blocking mechanism will be elaborated in details with
5 following description of winding tube supply process.

Height of the winding tube outlets 11.1-11.3 needs to be arranged with reference to height of the winding device 3.1-3.3, in an aim that, after the cradle 6 of the winding device s 3.1-3.3 rotates a relatively large angle, the
10 clamping disks 6.1 are able to joint with the winding tube outlets 11.1-11.3, such that the clamping disks 6.1 are able to clamp winding tubes from the winding tube outlets 11.1-11.3.

For the purpose that the cradle 6 is able to rotate a relatively large angle, present invention makes further improvements on the winding device. The
15 cradle 6 is rotatably disposed on the winding platform 7. The winding platform 7 is rotatably disposed on the winding seat 4.

As shown in figure 1, the cradle 6 is connected with a cradle cylinder 9, by
20 which the cradle 6 is driven. Via a rod of the cradle cylinder 9, the cradle 6 is rotatable around axis of its one end. Under drive influence of the cradle cylinder 9, the cradle 6 is movable between a winding start position and a full bobbin position. The winding start position is, the position of the cradle 6 when winding is about to start, namely when winding tube clamped by
25 the clamping ends 6.1 abuts against the drive roller; the full bobbin position is, the position where the cradle 6 is lifted to a certain height in order to release bobbin after bobbin finishes winding.

The winding platform 7 is connected with a platform cylinder 8, by which the winding platform 7 is driven. Via a rod of the platform cylinder 8, the winding platform 7 is rotatable around axis of its one end. Under drive influence of the platform cylinder 8, the winding platform 7 is movable between an initial position and a winding tube supply position. The initial position is, the position where the winding platform 7 is always maintained in relative to the winding seat 4 during bobbin winding process; the winding tube supply position is, the position where the cradle 6 and the winding platform 7 as a whole is rotated to where the clamping disks 6.1 are able to totally joint with two ends of the winding tube of the winding tube outlets 11.1-11.3, after full bobbin is released.

The platform cylinder 8 and the cradle cylinder 9 act in an alternate manner, so that a special purpose can be achieved. This will be elaborated in details with following description.

In order to ensure that the winding tube 2 is able to uninterruptedly fall down within the tube chamber 1 without tube jams, along the layer-stacking direction, a guiding element 13 is staggered on two walls 1.1, 1.2 of the tube chamber 1 which are parallel to axis of the winding tube 2. The guiding elements 13 are obliquely fixed on the two walls 1.1, 1.2 and the downward obliqueness starts from the contact point between the guiding element 13 and the wall 1.1, 1.2. The falling trajectory of the winding tube 2 within the tube chamber is under certain restraint to a degree that the winding tube 2 is at curved falling trajectory until reaching the winding tube outlet 11.1 of lowermost layer.

The winding tube 2 is put into the tube chamber 1 via a winding tube central inlet 23. Then the winding tubes 2 are stacked within the tube chamber

1 from down to up successively in a curved arrangement trajectory, whereby the winding tube outlets 11.1-11.3 are successively filled with the winding tubes. Therefore, one line of said winding devices 3.1-3.3 only requires one winding tube central inlet 23.

5

In order to enhance operational friendliness the supply mechanism of the winding apparatus further is provided with a transversal tube chamber 10 in communication with the winding tube central inlet 23 of the tube chamber 1. One end 19 of the transversal tube chamber 10 is close to the operation side of the winding apparatus which is opposite to the back side, so that operators can easily access the winding apparatus in order to fill the tube chamber 1 with said winding tubes 2. The connecting angle between the transversal tube chamber 10 and the tube chamber 1 is slightly greater than 90 degrees.

15

What is about to be described is winding tube supply process. Firstly figure 2 shows partial diagram of winding apparatus of present invention when winding device is at winding start position. This embodiment only shows winding device 3.3 of the uppermost layer. Under such a status, the winding tube abuts against circumferential surface of the drive roller 5 under clamping of the clamping disks 6.1, where yarns are about to be wound into the winding tube after traveling through between the winding tube and the drive roller. The blocking mechanism 12 at the winding tube outlet 11.2 is under non-supply status, where the winding tube 2.2 is constantly under blocking restriction of the blocking mechanism 12, by which the winding tube 2.2 is prevented from falling off the winding tube outlet 11.3. The winding platform 7 is positioned at the initial position to be approximately parallel with upper surface of the winding seat 4.

25

Subsequently, the yarn, under guiding of the unshown yarn guiding mechanism and drive of the drive roller, starts to be wound onto the winding tube. Provided that the yarn winding process and winding principle are already known technique, both are not described for the sake of clarity.

5

Then, figure 3 shows partial diagram of winding apparatus of present invention when winding device is at full bobbin position. Bobbin 25 is formed after yarns are wound onto the winding tube. After a control system of the winding apparatus has monitored winding for a certain period of time or
10 when a control system of the winding apparatus detects bobbin diameter has reached a certain value, the bobbin is recognized as a full bobbin. Afterwards the cradle cylinder 9 controls the cradle 6 to lift up until reaching the full bobbin position. At the full bobbin position, the bobbin 25 is separated from the drive roller. During process from figure 2 to figure 3, the winding
15 platform 7 is always maintained at said initial position.

The pair of clamping disks 6.1 which clamp on the bobbin 25 move away from each other under action of a small cylinder not shown. The bobbin 25 is then released. The released bobbin 25 can be directly taken away by an
20 operator or can roll via a full bobbin track to the operation side easily accessible to an operator. Multiple full bobbins can be stored centrally.

Figure 4 shows, partial diagram of winding apparatus of present invention when winding device is at winding tube supply position. After the cradle 6
25 is lifted to the full bobbin position, the cradle 6 is maintained at the full bobbin position under influence of the cradle cylinder 9. Then under control of the control system of the winding apparatus, the platform cylinder 8 drives the winding platform 7 to lift. The maintained cradle 6 together with the winding platform 7 lift upwardly, until reaching the winding tube sup-

ply position. At the winding tube supply position, the cradle 6 is lifted to be jointed with the winding tube outlet 11.3, such that the pair of clamping disks 6.1 can in each case totally joint with two ends of the winding tube 2.2. The pair of clamping disks 6.1 under action of the small cylinder not shown moves close to each other, in order to clamp two ends of the winding tube 2.2.

Figure 5 shows, partial diagram of winding apparatus of present invention when winding device returns to full bobbin position. After clamping the winding tube 2.2, the platform cylinder 8 controls the winding platform 7 to lower down under control of the control system of the winding apparatus. As shown under supply status the blocking mechanism 12 rotates. With aid of the cradle 6, the winding tube 2.2 overcomes restrictions of the blocking mechanism 12.

The platform cylinder 8 drives the winding platform 7 to return back to aforementioned full bobbin position, where the positional relationship among the winding platform 7, the cradle 6 and the winding seat 4 can be obtained by referring to figure 3.

Afterwards the winding platform 7 is maintained at the initial position by the platform cylinder 8. The cradle 6 lowers down under action of the cradle cylinder 9, until contacting circumferential surface of the drive roller. A new yarn winding starts. Positional relationship among the winding platform 7, the cradle 6 and the winding seat 4 can be obtained by referring to figure 2.

For the sake of more details about structure and working principle of the blocking mechanism 12, figure 6.1 shows structural diagram of the block-

ing mechanism 12 under non-supply status; figure 6.2 shows structural diagram of the blocking mechanism 12 under supply status.

As shown in figure 6.1 the blocking mechanism 12 includes a bended piece 17. The bended piece 17 includes a first blocking part 15 and a second blocking part 16. The bended piece 17 is rotatably connected with a fixed piece 24 which is fixedly connected the wall 1.2 of the tube chamber 1. The bended piece 17 has its left side connected with a fixed seat 18 via a spring body 14. The fixed seat 18 is in fixed connection with the wall 1.2. In order to enable that the blocking mechanism 12 can restrictively block the winding tube 2.2 under non-supply status, connecting point between the bended piece 17 and the spring body 14 should be at the left side of the rotation axis of the bended piece 17. With aid of drawing force of the spring body 14 the bended piece 17 maintains a clockwise rotation momentum. In this case the first blocking part 15 of the bended piece 17 abuts against the winding tube 2.2 at the winding tube outlet, and the second blocking part 16 does not perform any blocking to the winding tubes. The winding tube outlet includes an oblique slope part 22.1 and a horizontal part 22.2 connected with the oblique slope part 22.1. The oblique slope part 22.1 enables that the winding tubes are guided to the winding tube outlet. Under joint restriction of the horizontal part 22.1 and the first blocking part 15, the winding tube 2.2 will not fall off the winding tube outlet.

As shown in figure 6.2, after the cradle 6 lifts up to joint with the winding tube outlet, the clamping disks clamp on the winding tube 2.2. The cradle 6 and the winding platform lower down together. The winding tube 2.2 is forcibly taken out from the winding tube outlet by the cradle 6. The first blocking part 15 abutting against the winding tube 2.2 is forced to rotate with the winding tube 2.2, by which the bended piece 17 as a whole rotates anti-

clockwise. The second blocking part 16, after rotation, performs blocking to winding tube 2.1 following the winding tube 2.2, to prevent the following winding tube 2.1 from falling off the winding tube outlet along with the winding tube 2.2.

5

After the winding tube 2.2 is totally taken out the bended piece 17 will no longer contact the winding tube 2.2 and will rotate to the position shown in figure 6.1 under action of the spring body 14. At this moment the winding tube 2.1 is restrained at the winding tube outlet, waiting to be taken away at next winding tube supply process.

10

As shown from figure 1 to figure 5, a sensor 20 is installed above the uppermost winding tube outlet, for detecting whether winding tube exists at such a height. If winding tubes are detected to be existing at such a height, it means that there are enough winding tubes in the tube chamber 1 under such a height. The sensor 20 could adopt photoelectric sensor as commonly known technology. If no winding tubes are detected to be existing at such a height, it means that the tube chamber 1 could have a problem of insufficient winding tubes. Therefore more winding tubes are required to be put in from the operation side by operator, until the sensor detects existence of winding tubes at such a height. When the tube chamber 1 is filled with the winding tube 2, the arrangement trajectory of the winding tube 2 is S-shaped, as can be seen in figure 1.

15

20

Figure 7 schematically shows front view of winding apparatus of present invention. As shown the winding apparatus 21 has nine winding devices 3.1-3.9 in three rows and three layers. Each row of the winding device s 3.1-3.3 is assigned with one said tube chamber 1. The transversal tube chamber 10 is communicated with the tube chamber 1. Each said transver-

25

sal tube chamber 10 has one end 19 which is positioned above the winding device 3.3 of the uppermost layer. Operator is able to put into the winding tubes from the one end 19 of the transversal tube chamber 10. The winding tube will fall down within the almost vertical tube chamber 1 in curved trajectory. Successively the winding tubes fill up the winding tube outlets 11.1 to 11.3.

With comparison to existing technology, outstanding substantial feature of present invention lies in that, one side of the winding devices is equipped with a tube chamber which has a winding tube central inlet for centrally supplying winding tubes. As a result, overall height of winding apparatus is effectively reduced.

Claims

1. A winding apparatus of textile machinery, having multiple winding de-
vices which are stacked in multiple layers, and a supply mechanism ac-
commodating a plurality of winding tubes ready to be supplied, wherein,
each winding device includes a rotatable cradle, a drive roller driving
rotation of the winding tubes, and a yarn guiding mechanism guiding
yarns,
characterized in that,
the supply mechanism includes a tube chamber with a central winding
tube inlet, wherein, the tube chamber is arranged along the layer-
stacking direction to centrally supply the winding tubes to the multiple
layers of the winding devices.
2. The winding apparatus of claim 1,
characterized in that,
the tube chamber includes multiple winding tube outlets each correlating
with one of the winding devices.
3. The winding apparatus of claim 2,
characterized in that,
the tube chamber is positioned at back side of the winding devices.
4. The winding apparatus of claim 2,
characterized in that,
the tube chamber is comprised of a plurality of sections of sub-tube-
chambers;
the sub-tube-chambers are successively communicated.

5. The winding apparatus of claim 2,
characterized in that,
the tube chamber is designed as an integral structure.
- 5 6. The winding apparatus of claim 2,
characterized in that,
one side of the longitudinal tube chamber close to the winding device
has the plurality of winding tube outlets which are distributed along the
layer-stacking direction, by means of which the winding tube is supplied
10 to the cradle of the winding device of the corresponding layer.
7. The winding apparatus of claim 2,
characterized in that,
each said winding tube outlet is assigned with a blocking mechanism
15 used for temporarily preventing the winding tube from falling off.
8. The winding apparatus of claim 7,
characterized in that,
the blocking mechanism includes a spring body and a bended piece
20 which is rotatable, one end of the bended piece is connected with outer
wall of the tube chamber via the spring body;
the bended piece has a first blocking part, for blocking the winding tube
at the winding tube outlet under non-supply status;
the bended piece has a second blocking part, for preventing following
25 winding tube from falling off along with the previous winding tube.
9. The winding apparatus of either one from claim 1 to claim 8,
characterized in that,
along the layer-stacking direction, a guiding element is staggered on two

inner walls of tube chamber which are parallel to axis of the winding tube, such that the winding tube moves downwardly in curved trajectory within the tube chamber.

- 5 10. The winding apparatus of claim 9,
characterized in that,
the supply mechanism includes a transversal tube chamber communicat-
ed with upper end of the tube chamber, one end of the transversal tube
chamber is close to an operation side of the winding apparatus opposite
10 to the back side.
11. The winding apparatus of either one from claim 5 to claim 8,
characterized in that,
a sensor is disposed above the uppermost winding tube outlet on the
15 tube chamber, in order to detect if there are enough winding tubes in the
tube chamber.
12. The winding apparatus of claim 1,
characterized in that,
20 the cradle is rotatably disposed on a winding platform, and the winding
platform is rotatably disposed on a winding seat.
13. The winding apparatus of claim 12,
characterized in that,
25 the cradle is driven by a cradle cylinder, such that the cradle moves be-
tween a winding start position and a full bobbin position;
the winding platform is driven by a platform cylinder, such that the
winding platform moves between an initial position and a winding tube
supply position;

the cradle cylinder and the platform cylinder act alternately.

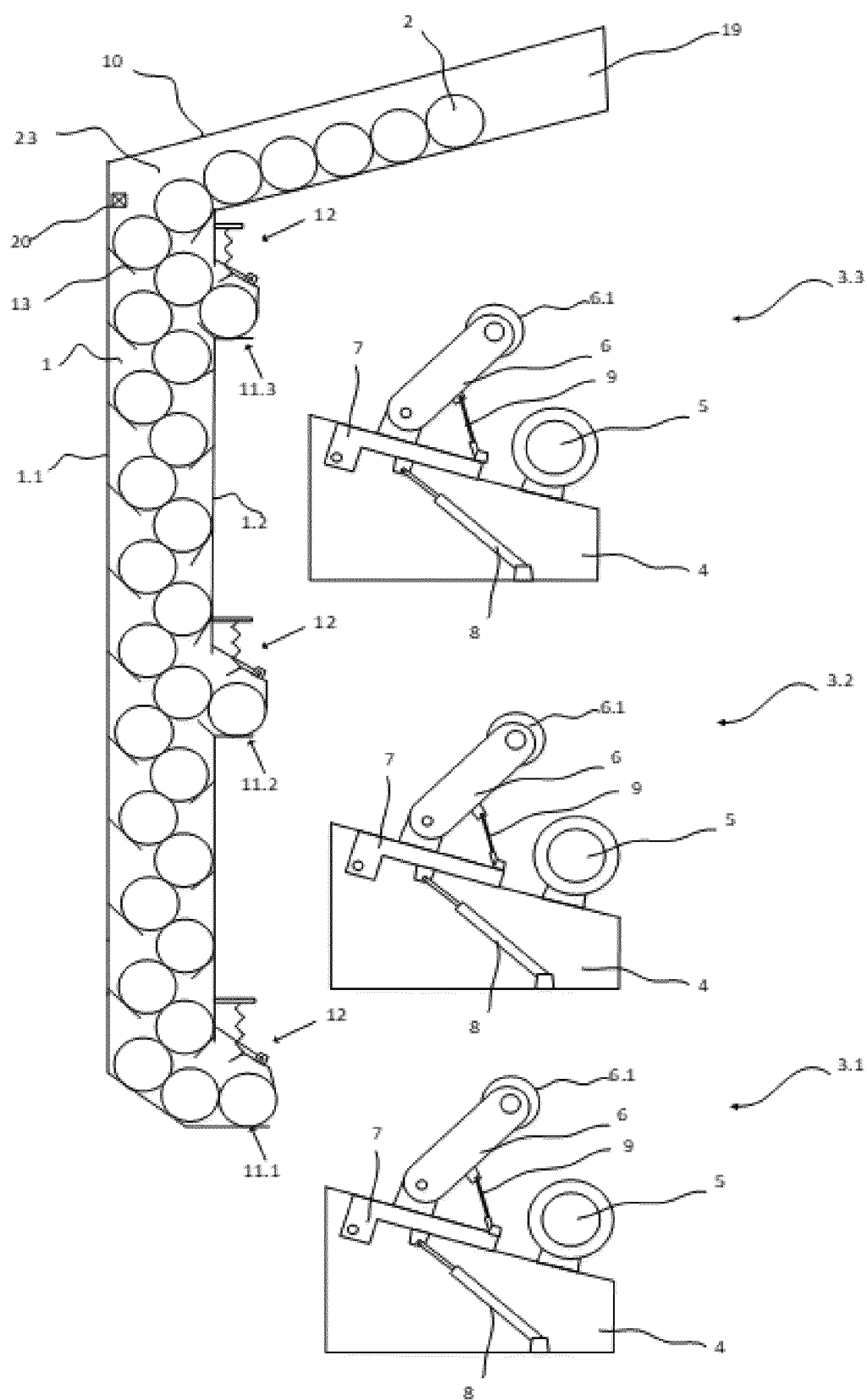
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Fig. 1

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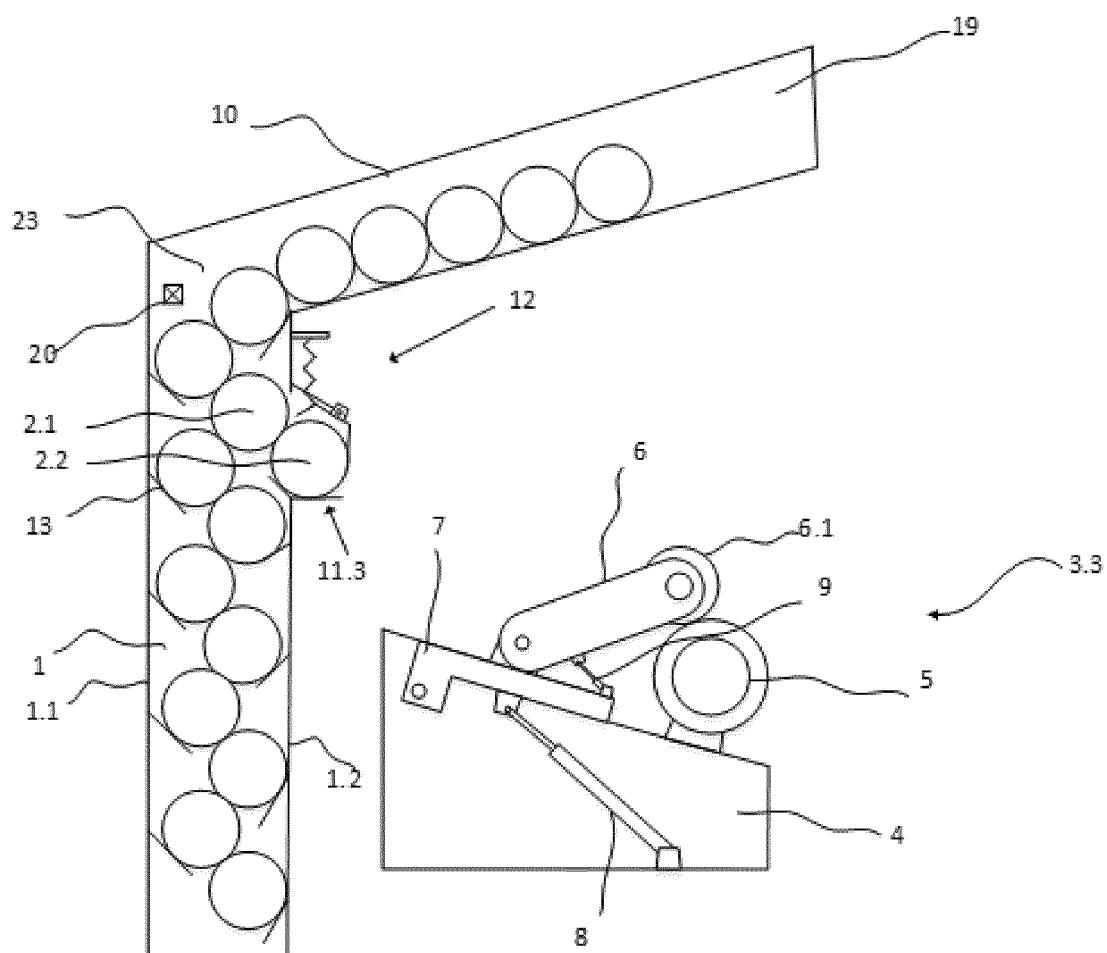


Fig.2

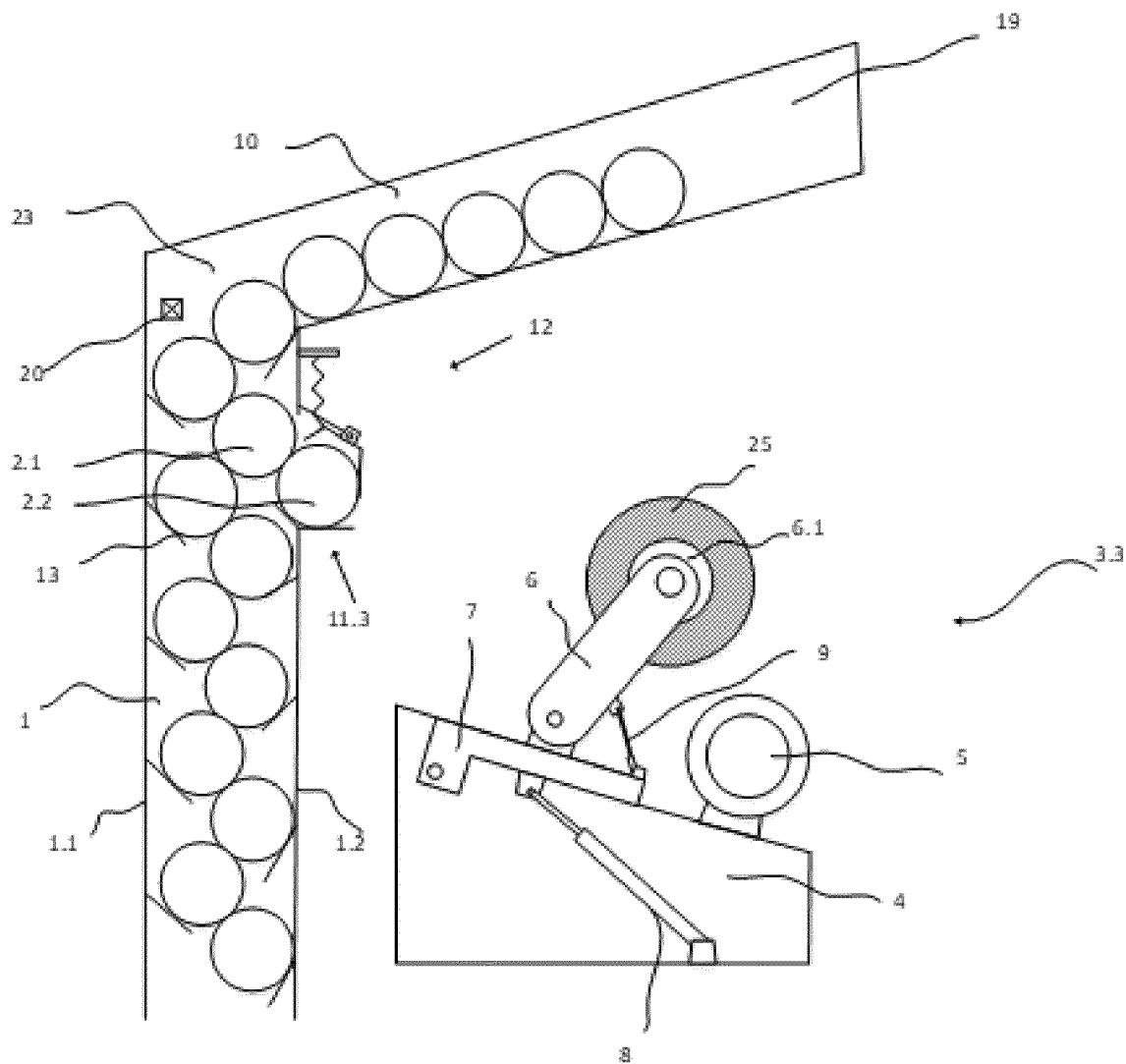


Fig.3

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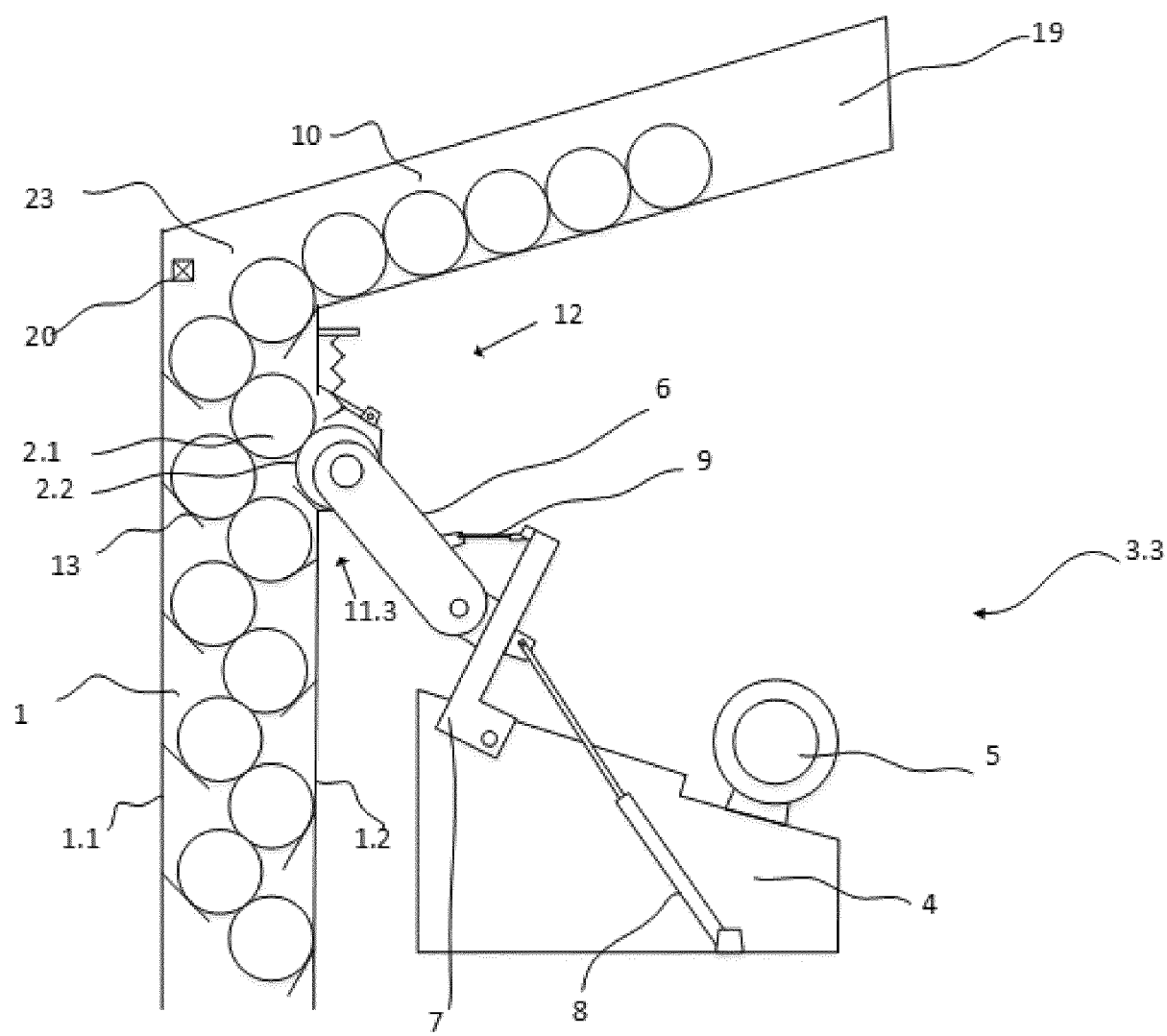


Fig.4

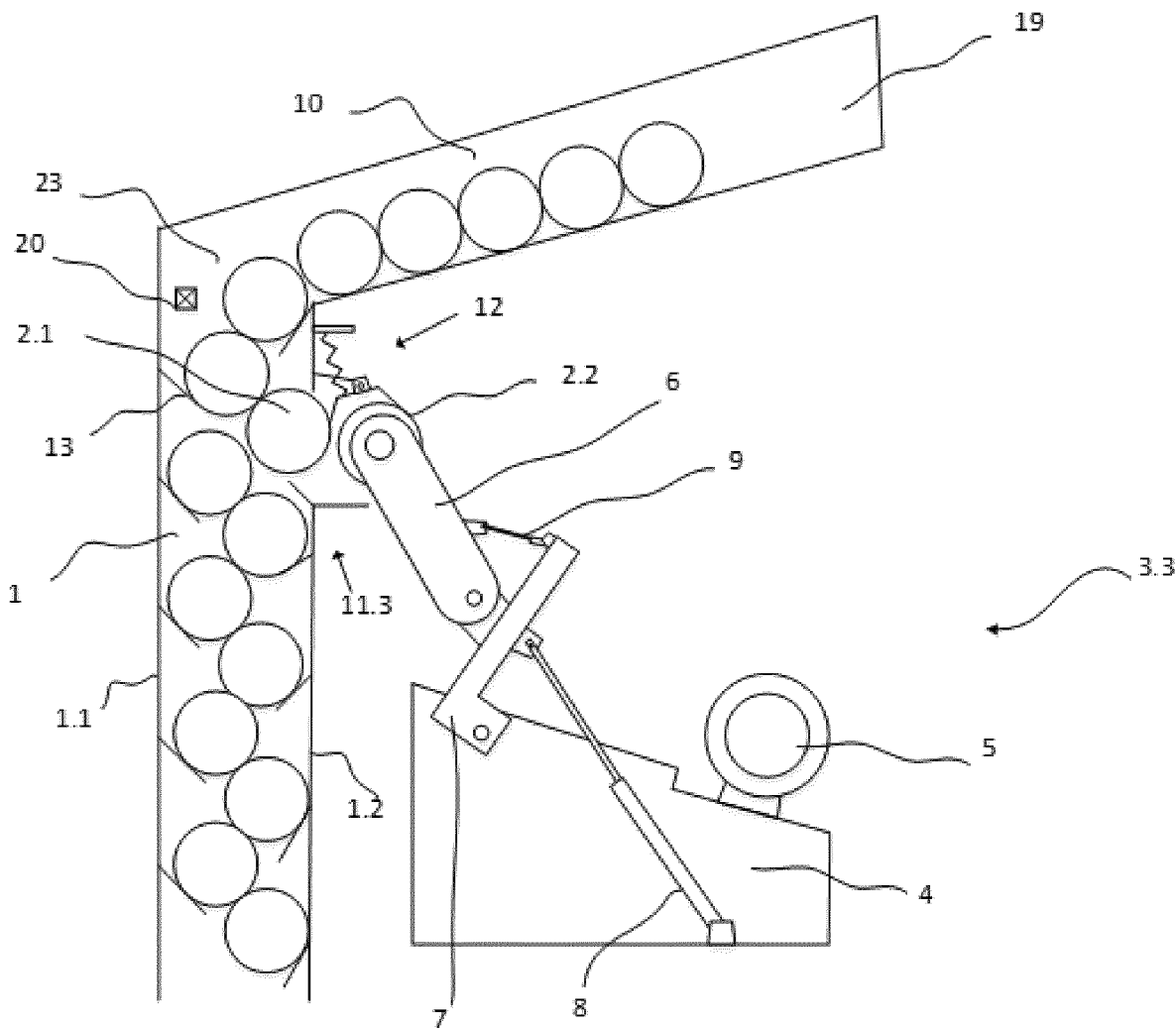


Fig.5

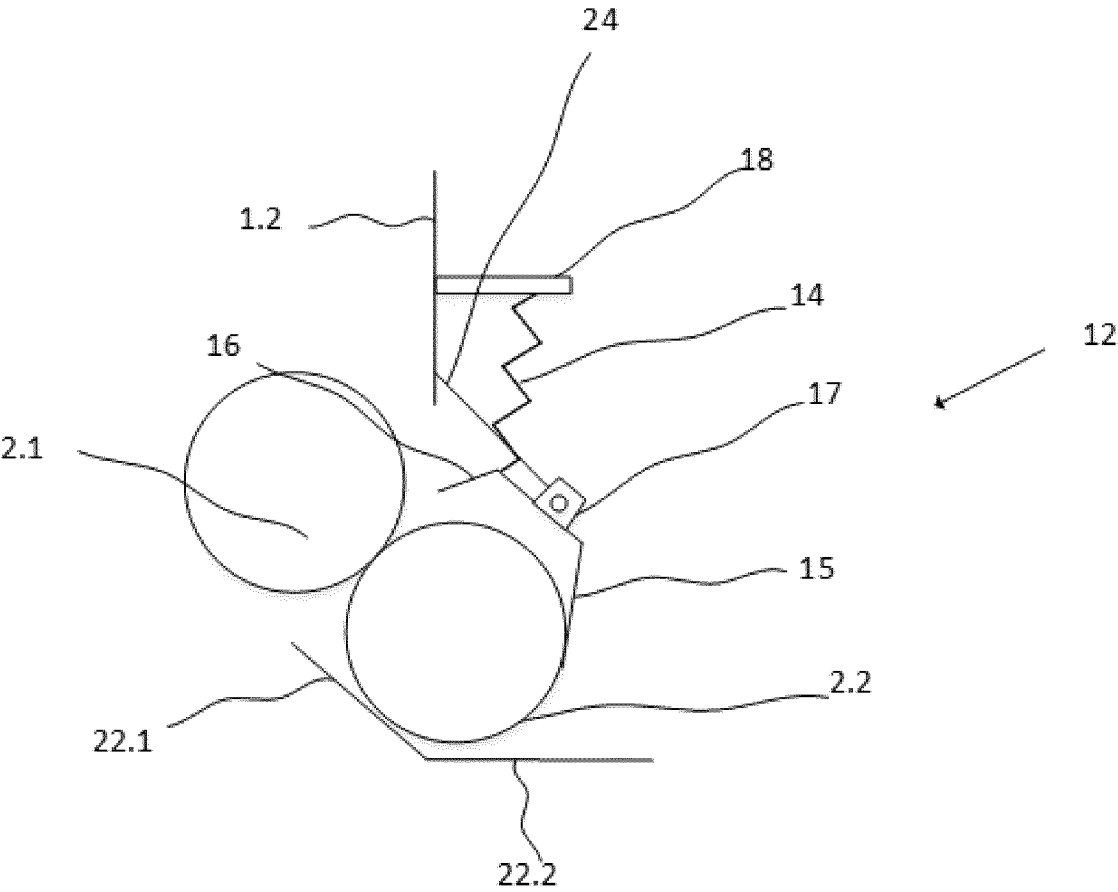


Fig.6.1

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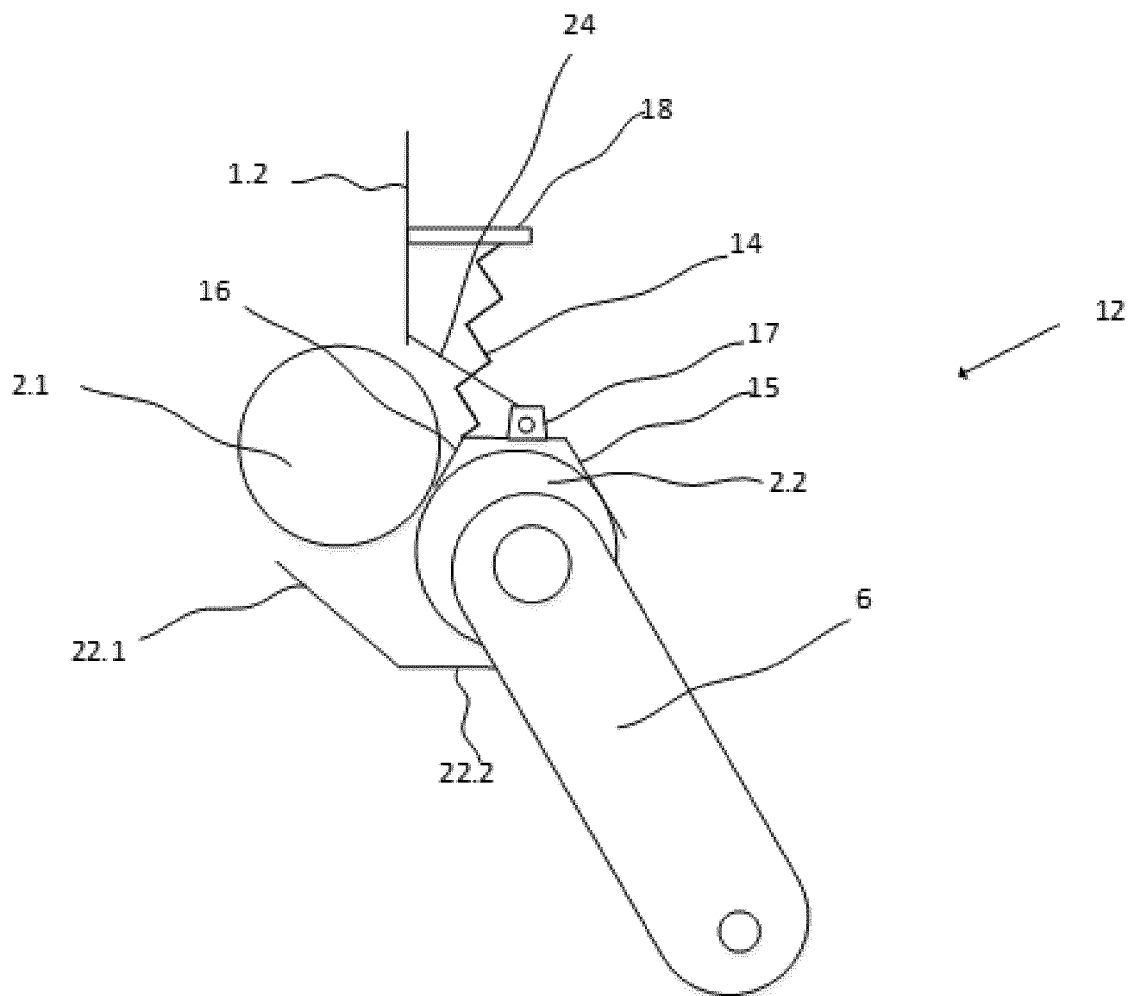


Fig.6.2

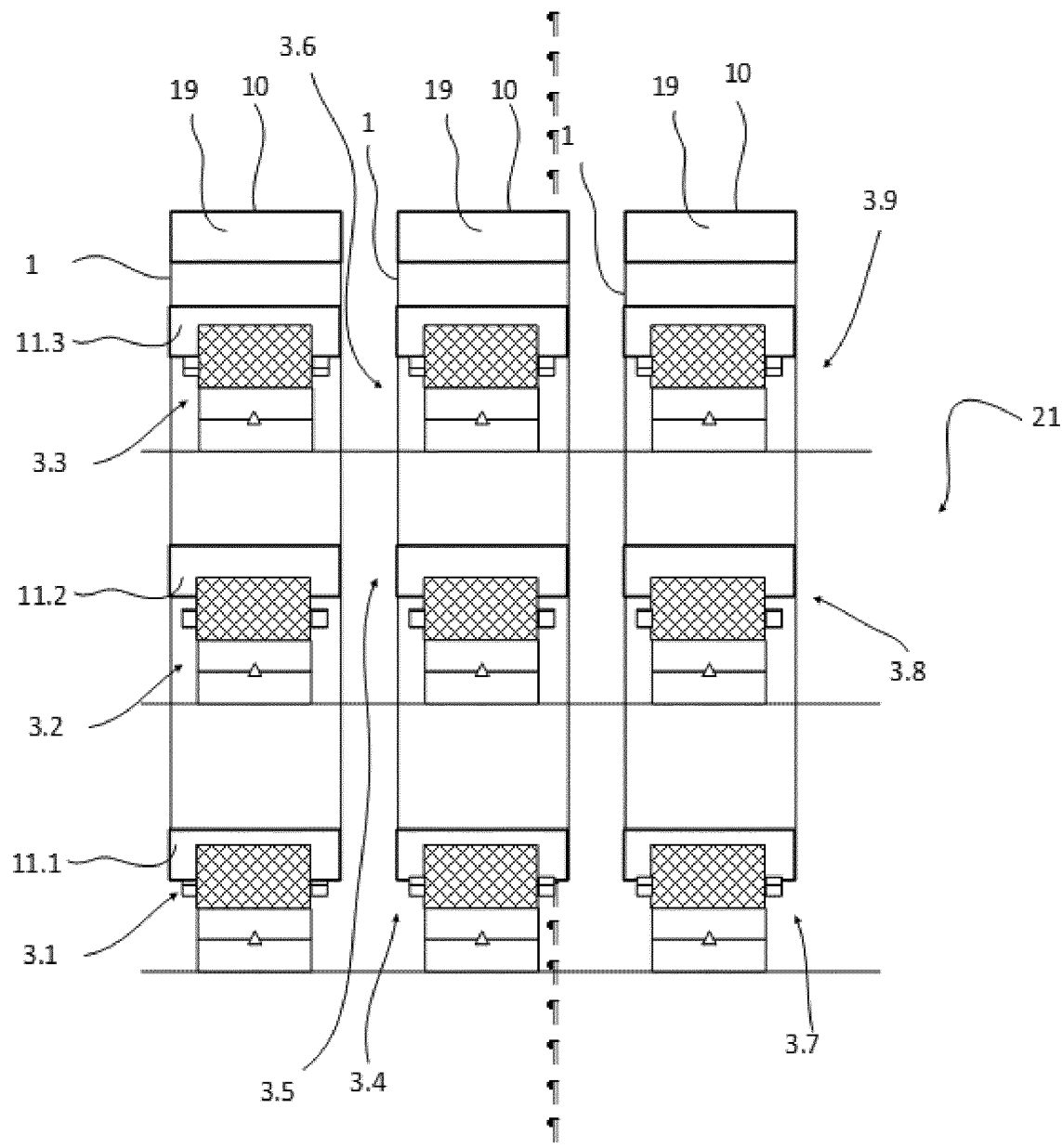


Fig.7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/076572

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65H67/04
ADD.

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 D02G

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 21 28 974 A1 (BARMAG BARMER MASCHINENFABRIK AG) 21 December 1972 (1972-12-21) page 9, line 12 - page 10, line 3; figures -----	1-13
A	CN 206 476 594 U (OERLIKON TEXTILE GMBH & CO KG) 8 September 2017 (2017-09-08) figures -----	7,8
A	WO 03/000973 A1 (BARMAG BARMER MASCHF [DE]; PYRA MICHAEL [DE]; JASCHKE KLEMENS [DE]) 3 January 2003 (2003-01-03) cited in the application page 7, lines 27-31 figures -----	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

28 November 2019

Date of mailing of the international search report

09/12/2019

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/076572

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2128974	A1	21-12-1972	DE 2128974 A1 21-12-1972
			FR 2141356 A5 19-01-1973
			GB 1399891 A 02-07-1975
			IT 958269 B 20-10-1973

CN 206476594	U	08-09-2017	NONE

WO 03000973	A1	03-01-2003	AT 369447 T 15-08-2007
			CN 1516758 A 28-07-2004
			DE 10130389 A1 02-01-2003
			EP 1425450 A1 09-06-2004
			ES 2290315 T3 16-02-2008
			JP 4155922 B2 24-09-2008
			JP 2004530806 A 07-10-2004
			KR 20040016866 A 25-02-2004
			TW 565634 B 11-12-2003
			US 2004098964 A1 27-05-2004
			WO 03000973 A1 03-01-2003
