



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.02.2020 Bulletin 2020/08

(51) Int Cl.:
B65H 67/04 (2006.01)

(21) Application number: **19192002.4**

(22) Date of filing: **16.08.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Saurer (Jiangsu) Textile Machinery Co. Ltd.**
215024 Suzhou Jiangsu Province (CN)

(72) Inventor: **WU, Yunfeng**
Suzhou, 215001 (CN)

(74) Representative: **Morgenthum-Neurode, Mirko**
Saurer Spinning Solutions GmbH & Co. KG
Patentabteilung
Carlstraße 60
52531 Übach-Palenberg (DE)

(30) Priority: **17.08.2018 CN 201810937795**

(54) **AUTOMATIC BOBBIN REPLACING DEVICE, ROTOR SPINNING MACHINE USING THE SAME, AND BOBBIN REPLACING METHOD THEREOF**

(57) The present invention provides a bobbin replacing device, a rotor spinning machine using the same, and a bobbin replacing method thereof. The bobbin replacing device includes a bobbin holder for storing an empty bobbin and a driving mechanism capable of driving the bobbin holder to move to a predetermined position. In the spinning machining using the bobbin replacing device, when the bobbin does not need to be changed, the bobbin

holder locates at a first position; when the bobbin needs to be changed, the bobbin holder is driven by the driving mechanism to move to a predetermined second position, and the bobbin on the bobbin holder arrives at a predetermined position; the driving mechanism drives the bobbin holder to return to an original position, thereby achieving an automatic bobbin replacement and reducing the worker's labor intensity.

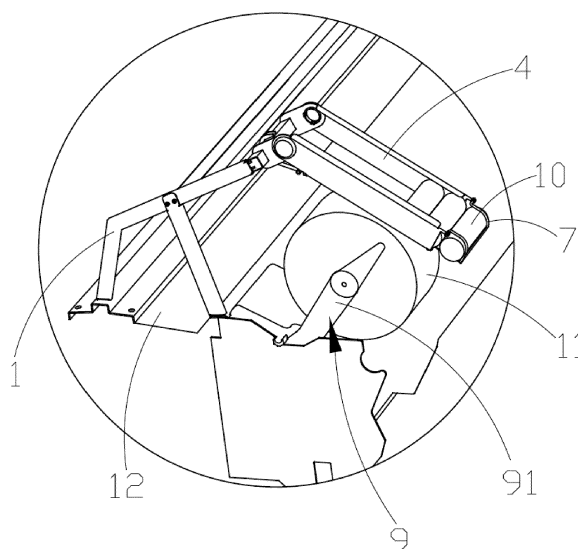


Fig. 3

Description

[0001] The present invention relates to the field of spinning machines, and particularly, to a rotor spinning machine having an automatic bobbin replacing device, and an automatic bobbin replacing method thereof.

[0002] The rotor spinning machine is a spinning machine that spins a sliver into a yarn using a rotor cup rotated at a high speed. The yarn spun by the rotor cup is guided out and wound onto a bobbin to form a yarn roll. After the yarn on the bobbin is wound to a predetermined length, it is called as full yarn. The bobbin with the full yarn needs to be taken off, and then a replacement with a new empty bobbin is performed manually or by a doffing carriage to continue spinning.

[0003] The existing rotor spinning machine includes a fully automatic rotor spinning machine and a semi-automatic rotor spinning machine. The fully automatic spinning machine uses a touring doffing carriage to replace the bobbin. In the current semi-automatic rotor spinning machine a full yarn roll is removed and replaced with a new empty bobbin manually by a person. The fully automatic rotor spinning machine has a high cost due to the complicated control and structure of the touring doffing carriage, while the manual replacement of the bobbin in the semi-automatic rotor spinning machine is low in efficiency and labor intensive. Therefore, it is necessary to propose a new semi-automatic rotor spinning machine which automatically replaces the bobbin, and can reduce the cost while improving the efficiency.

[0004] An objective of the present invention is to provide an automatic bobbin replacing device of a rotor spinning machine.

[0005] Another objective of the present invention is to provide a rotor spinning machine having an automatic bobbin replacing device.

[0006] Still another objective of the present invention is to provide a bobbin replacing method for a rotor spinning machine.

[0007] In order to achieve the above objectives, the present invention provides an automatic bobbin replacing device of a rotor spinning machine, comprising a support frame that is mountable on a spinning machine frame, a bobbin holder for storing an empty bobbin and rotatably mounted on said support frame, and a driving mechanism capable of driving the bobbin holder to rotate to a predetermined position.

[0008] According to one embodiment of the present invention, said support frame comprises a transverse beam, and said bobbin holder is rotatably mounted on the transverse beam; said support frame comprises a connecting member fixed on the transverse beam, and the bobbin holder is rotatably and pivotally connected with the connecting member; the connecting member is welded on the transverse beam, or the connecting member is a U-shaped connecting member that is adjustably snap-fitted on the transverse beam, or the connecting member is fixably sleeved on the transverse beam.

[0009] According to one embodiment of the present invention, the bobbin holder comprises a bottom wall, two side walls vertically bent from both sides of the bottom wall, top sides bent from ends of the two side walls away from the bottom wall, rear ends of the two side walls extend backward to form pivot joint ends which are pivotally connected with the support frame.

[0010] According to one embodiment of the present invention, the bobbin holder is formed by bending a plate material, or formed by a plurality of rod materials jointing together, or molded by plastics directly.

[0011] According to one embodiment of the present invention, the bobbin holder further includes a support plate provided in the front of the bobbin holder, the support plate including a rotating shaft, a torsion spring provided on the rotating shaft and a support pad covering the rotating shaft and the torsion spring.

[0012] According to one embodiment of the present invention, the bobbin holder further includes a stopper set in front of the bobbin holder, wherein the stopper is a bent rod with two ends of which are fixed with the bobbin holder, the bent rod and a front end of the bobbin holder form a hollow bobbin clamping space.

[0013] According to one embodiment of the present invention, the bobbin holder further includes a stopper set in the front end of the bobbin holder, wherein the stopper is set at a top of the bobbin holder to stop the empty bobbin from above side, or the stopper is controlled by a control device to open and close.

[0014] According to one embodiment of the present invention, the driving mechanism includes a cylinder that is driven by a pneumatic system, wherein one end of the cylinder is fixed on the support frame, and the other end of the cylinder is fixed on the bobbin holder.

[0015] According to one embodiment of the present invention, the driving mechanism is driven by a step motor, wherein the step motor drives a transmission shaft to drive the bobbin holder, or the step motor drives a driving mechanism via gearing box to drive the bobbin holder, or the step motor drives the bobbin holder through a synchronous belt.

[0016] In order to achieve the another objective, the present invention provides a rotor spinning machine, comprising a plurality of spinning units arranged side by side, wherein each spinning unit includes a spinning box unit which comprises a combing roller and a rotor cup for spinning yarn from fiber sliver, a clamping mechanism for clamping a bobbin, and a winding unit for winding the yarn that is guided out from the spinning box unit onto the bobbin; each spinning unit is individually set with the aforementioned automatic bobbin replacing device.

[0017] In order to achieve the still another objective, the present invention provides an automatic bobbin replacing method of the aforementioned rotor spinning machine; the method includes, when in normal spinning, the bobbin holder locates at a first position; when it needs to change the bobbin, the bobbin holder is driven by the driving mechanism to rotate around a pivot to a prede-

terminated second position, and the bobbin on the bobbin holder arrives at a predetermined position of the clamping mechanism; the clamping mechanism clamps the bobbin on the bobbin holder; the driving mechanism drives the bobbin holder to return to an original position, and the bobbin leaves the bobbin holder and is kept on the clamping mechanism.

[0018] The rotor spinning machine of the present invention is provided with an automatic bobbin replacing device on each spinning unit. When the yarn is wound up to a predetermined length of full yarn, a full yarn roll is removed, and the automatic bobbin replacing device automatically replaces the bobbin. As compared with the fully automatic rotor spinning machine, the rotor spinning machine of the present invention has a lower cost, and as compared with the existing semi-automatic rotor spinning machine, the rotor spinning machine of the present invention can improve the efficiency and reduce the labor intensity.

Fig. 1 is an illustrative perspective view of an automatic bobbin replacing device of the present invention.

Fig. 2 is an illustrative perspective view seen from another viewpoint of an automatic bobbin replacing device of the present invention.

Fig. 3 is a structural diagram of an automatic bobbin replacing device of the present invention in an original position on a spinning machine.

Fig. 4 is a structural diagram of an automatic bobbin replacing device of the present invention in a bobbin replacement position.

Fig. 5 is a structural diagram of a bobbin holder of an automatic bobbin replacing device of the present invention during return to an original position.

[0019] Please refer to Figs. 1 and 2, which illustrate structural diagrams of an automatic bobbin replacing device of the present invention. As shown in Figs. 1 and 2, the automatic bobbin replacing device 100 of the present invention includes a herringbone support frame 1, a transverse beam 2 which is formed at the front end of the herringbone support frame 1 and vertical to support frame 1, a U-shaped connecting member 3 which is welded at each end of the transverse beam 2, and an opening (not numbered) is provided at one end of the connecting member 3 away from the transverse beam 2. The opening at a rear end of the connecting member 3 is fixed with an empty bobbin holder 4 by means of a pivot 31.

[0020] Please refer to Figs. 1 and 2, the bobbin holder 4 of the automatic bobbin replacing device 100 of the present invention is formed by bending a plate material, and it includes a bottom wall 41, two side walls 42 vertically bent from both sides of the bottom wall 41, top sides

43 bent from ends of the two side walls 42 away from the bottom wall 41, rear ends of the two side walls 42 extend backward to form pivot joint ends 44 which are provided with openings (not numbered), the pivot 31 as mentioned above extends through the connecting member 3 and the opening on the pivot joint end 44 of the rear end of the side wall of the bobbin holder 4, so as to connect the bobbin holder 4 with the connecting member 3, and the bobbin holder 4 is rotatable about the pivot 31. Upper portions of front ends of the two side walls 42 protrudes forward to form a tab 45 having a width narrower than that of the side wall 42.

[0021] A cylinder 5 is provided at a bottom of the empty bobbin holder 4. One end of the cylinder 5 is fixed to the transverse beam 2 vertical to the herringbone support frame 4, and the other end is fixed to a lower surface of the bottom wall 41 of the empty bobbin holder 4. The cylinder 5 can be controlled by a pneumatic system (not illustrated) for performing a telescopic movement, which telescopic movement can drive the empty bobbin holder 4 to rotate about the pivot 31.

[0022] A pair of support plates 46 are formed to extend vertically downward from the bottom wall 41 at positions on a lower surface of a front end of the empty bobbin holder 4 close to the two side walls 42, respectively; a rotating shaft 47 with an axial direction vertical to the support plate 46 is provided between each pair of support plates 46 to extend through each pair of support plates 46; the rotating shaft 47 is provided with a torsion spring (not illustrated internally) thereon; a layer of support pad 6 is wound around the torsion spring, a width of the support pad 6 is equivalent to a distance between two support plates 47, one end of the support pad 6 is wound around the torsion spring of the rotate shaft between the support plates 47, and the other end thereof extends forward. At the normal position, the front end of the support pad 6 extends under an action of the torsion spring against the bottom wall 41 of the empty bobbin holder, the support pad 6 can be rotated downward around the rotate shaft 47 under a force, and when the force disappears, the support pad 6 returns to the normal position under the action of the torsion spring.

[0023] A stopper 7 is provided at the front end of the empty bobbin holder 4, and it is a bent rod. As illustrated, a body portion 71 of the bent rod 7 is located in front of the two support pads 6, two ends of the body portion 71 are respectively bent upward and then bent back toward the bobbin holder to form blocking portions 72, the blocking portions 72 are vertically bent toward the two sides to form end portions 73, through-holes are formed in the forwardly projecting tabs 45 of the side walls 42 of the empty bobbin holder, and two ends of the stopper 7 extend through the through-holes in the tabs 45. A width of the body portion 71 of the stopper 7 is smaller than a width of the bobbin holder 4, and a length of the bobbin placed in the bobbin holder 4 is equivalent to the width of the bobbin holder 4, so a length of the bobbin is larger than a width of the stopper 7, such that the stopper 7 can

block the bobbin from falling off from the front end of the bobbin holder 4. In addition, the stopper 7 is a bent rod, a hollow clamping space 8 is formed between the front end of the side wall 42 of the bobbin holder and the stopper 7, and the bobbin clamping mechanism on the spinning machine is capable of holding the bobbin from both ends of the hollow clamping space 8.

[0024] Please refer to Fig. 3, which illustrates a structural diagram of an automatic bobbin replacing device 100 of the present invention mounted on a frame of a rotor spinning machine. The rotor spinning machine of the present invention includes a plurality of spinning units arranged side by side, wherein each spinning unit is a spinning machine that uses a combing roller in a spinning box unit to comb the fiber sliver into individual fibers, which are arranged in a groove of a rotor cup in a high-speed rotation and wound into a yarn through introducing a yarn into the rotor cup. Fig. 3 only illustrates a partial structure diagram of the rotor spinning machine of the present invention. Each spinning unit includes a clamping mechanism 9 for clamping a bobbin, and a winding unit for winding the yarn that is guided out from the spinning box unit onto the bobbin 10.

[0025] A transfer passage 12 for transporting a package 11 with a full yarn that is pushed off is provided behind each row of the spinning units. The above herringbone support frame 1 of the automatic bobbin replacing device 100 is fixed to both sides of the package transfer passage 12. When the spinning machine is in a spinning state, the cylinder 5 is in a stretched state, the bobbin holder 4 is supported and lifted by the cylinder 5, and the bobbin 10 on the bobbin holder 4 will not fall off since it is blocked by the stopper 7 in front of the bobbin holder 4.

[0026] When each spinning unit is in the normal spinning state, the cylinder 5 is stretched. At that time, the bobbin support frame 4 is in a first position illustrated in Fig. 3. When the yarn on the bobbin of the spinning machine reaches a predetermined length and the bobbin is in a full yarn state, the bobbin needs to be replaced. At that time, the full yarn package 11 is manually or automatically pushed off from the bobbin clamping mechanism. As illustrated in Fig. 4, the pneumatic system drives the cylinder 5 to retract to cause the bobbin holder 4 to rotate such that the empty bobbin 10 at the most front of the bobbin holder 4 is just located at a second position between clamping arms 91 of the bobbin clamping mechanism 9, and then the clamping arms 91 of the clamping mechanism (cradle) 9 clamp a new empty bobbin 10 from both sides.

[0027] Next, as illustrated in Fig. 5, the pneumatic system drives the cylinder to stretch. Since the bobbin 10 is clamped by the clamping arms 91, when the bobbin holder 4 is rotated upward, the bobbin 10 forces the support pad 6 to rotate, and the bobbin holder 4 continues rotating upward. As a result, the clamped empty bobbin 10 is separated from the support pad 6, and a new empty bobbin rolls off to the above of the support pad 6 of the bobbin holder 4.

[0028] In the rotor spinning machine of the present invention, one of the automatic bobbin replacing devices is provided separately in each spinning unit. Thus, the bobbin is automatically replaced after the package of a certain spinning unit is full of yarn, without affecting the spinning of other spinning units, and the dismounting and repairing are also convenient.

[0029] In the foregoing embodiment, the bobbin holder is welded to the transverse beam by a U-shaped connecting member. In other embodiments, the transverse beam may be cylindrical, and the bobbin holder may directly sleeve the transverse beam to rotate around the transverse beam. Alternatively, in other embodiments, the U-shaped connecting member is not welded to the transverse beam but is adjustably snap-fitted on the transverse beam, or the U-shaped connecting member is fixably sleeved on the transverse beam, so as to facilitate the adjustment of the position of the bobbin holder and the dismounting of the automatic bobbin replacing device.

[0030] In the foregoing embodiment, the bobbin holder is pivotally fixed to the connecting member by means of a pivot. In other embodiments, the connecting member is plate-like, a rear end thereof has an opening; a pivot joint end at the rear end of the bobbin holder may not need to be provided with a pivoted shaft, but directly stamped to form a bead extending through the opening at the rear end of the connecting member to rotatably fix the bobbin holder to the connecting member.

[0031] In the foregoing embodiment, the bobbin holder 4 is driven to rotate by the cylinder 5. In other embodiments, a step motor may be adopted to drive a transmission shaft to drive the bobbin holder 4, or the step motor drives the bobbin holder 4 by means of a driving mechanism having a gearing box, or the step motor drives the bobbin holder 4 by means of a synchronous belt. The bobbin holder 4 may not be formed by bending a plate material, and may be formed by a plurality of rod materials jointing together, or molded by plastics directly. The stopper 7 may be located at a top of the bobbin holder 4 to stop the empty bobbin from above side, or other stoppers may be adopted to control opening and closing. The foregoing herringbone support frame is only a specific embodiment of the present invention, and it may also be in the form of a triangular support frame or a parallel support frame, etc. Those described above are only descriptions of some specific embodiments of the technical solutions of the present invention, and the inventor cannot enumerate all the embodiments. It only requires that an automatic bobbin replacing device is set in each spinning unit of the rotor spinning machine, and the automatic bobbin replacing device drives the bobbin holder to automatically place a bobbin between the bobbin clamping arms when the bobbin needs to be replaced in case of full yarn. The scope of the claims of the present invention is not limited to the specific embodiments described above, and any modification made by those skilled in the art based on the specific embodiments of the specification, without

paying any creative labor, should fall within the scope of the claims of the present invention.

Claims

1. An automatic bobbin replacing device of a rotor spinning machine, comprising a support frame that is mounted on a spinning machine frame, a bobbin holder for storing empty bobbin and is rotatably mounted on said support frame, and a driving mechanism for driving the bobbin holder to rotate to predetermined position. 5
2. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, said support frame comprises a transverse beam, said bobbin holder is rotatably mounted on the transverse beam. 10
3. The automatic bobbin replacing device as claimed in claim 2, which is **characterized in that**, said support frame comprises a connecting member fixed on the transverse beam, the bobbin holder is rotatably and pivotally connected with the connecting member, the connecting member is welded on the transverse beam, or the connecting member is a U shape connecting member that is adjustably snap-fitted on the transverse beam, or the connecting member is fixably sleeved on the transverse beam. 15 20 25 30
4. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, the bobbin holder comprises a bottom wall, two side walls vertically extending from both side of the bottom wall, two top walls formed by bending the ends of the two side walls opposite to the bottom wall toward each other, the rear end of the two side walls extend backward to form two pivot joint ends, which are pivotally connect with the support frame. 35 40
5. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, the bobbin holder is formed by bended plate material, or formed by a plurality of rod material jointing together or molded by plastics directly. 45
6. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, it further comprises a support plate provided at the front end of the bobbin holder, the support plate comprises a rotating shaft, a torsion spring around the rotating shaft and a support pad configured on the outside of the rotating shaft and the torsion spring. 50 55
7. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, it further comprises a blocking member provided at the front end of the bobbin holder, wherein the blocking member is a bent rod with two ends of which are fixed with the bobbin holder, the bent rod and the front end of the bobbin holder form a hollow space for clamping a bobbin. 5
8. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, it further comprises a blocking member provided at the front end of the bobbin holder, the blocking member blocks the top of the empty bobbin at the top of the bobbin holder, or the blocking member is controlled by a control device to open and close. 10
9. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, the driving mechanism comprises a cylinder that is driven by a pneumatic system, one end of the cylinder is fixed on the support frame, another end of the cylinder is fixed on the bobbin holder. 15 20
10. The automatic bobbin replacing device as claimed in claim 1, which is **characterized in that**, the driving mechanism drives the bobbin holder via a transmission shaft driven by a step motor, or the step motor drives the bobbin holder by means of a driving mechanism having a gearing transformation, or the step motor drives the bobbin holder via a synchronous belt. 25 30
11. A rotor spinning machine, comprising a plurality of spinning units arranged side by side, each spinning unit comprises a spinning box unit which comprises a combing roller and a rotor cup for spinning yarn from fiber sliver, a clamp mechanism for clamping bobbin, and a winding unit for winding the yarn that guided out from the spinning box unit onto a bobbin, which is **characterized in that**, each spinning unit is individually provided with a bobbin replacing device claimed in any claims of claim 1-10. 35 40
12. An automatic bobbin replacing method of the rotor spinning machine claimed in claim 11, the method includes, when in normal spinning status, the bobbin holder at a first position; when the bobbin needs to be replaced, the driving mechanism drives the bobbin holder to rotate around a pivot to a second predetermined position, such that the bobbin on the bobbin holder arrives at predetermined clamping position; the clamping mechanism clamps the bobbin on the bobbin holder; and then the driving mechanism drives the bobbin holder to return to an original position, the bobbin is separated from the bobbin holder and retained on the clamping mechanism. 45 50 55

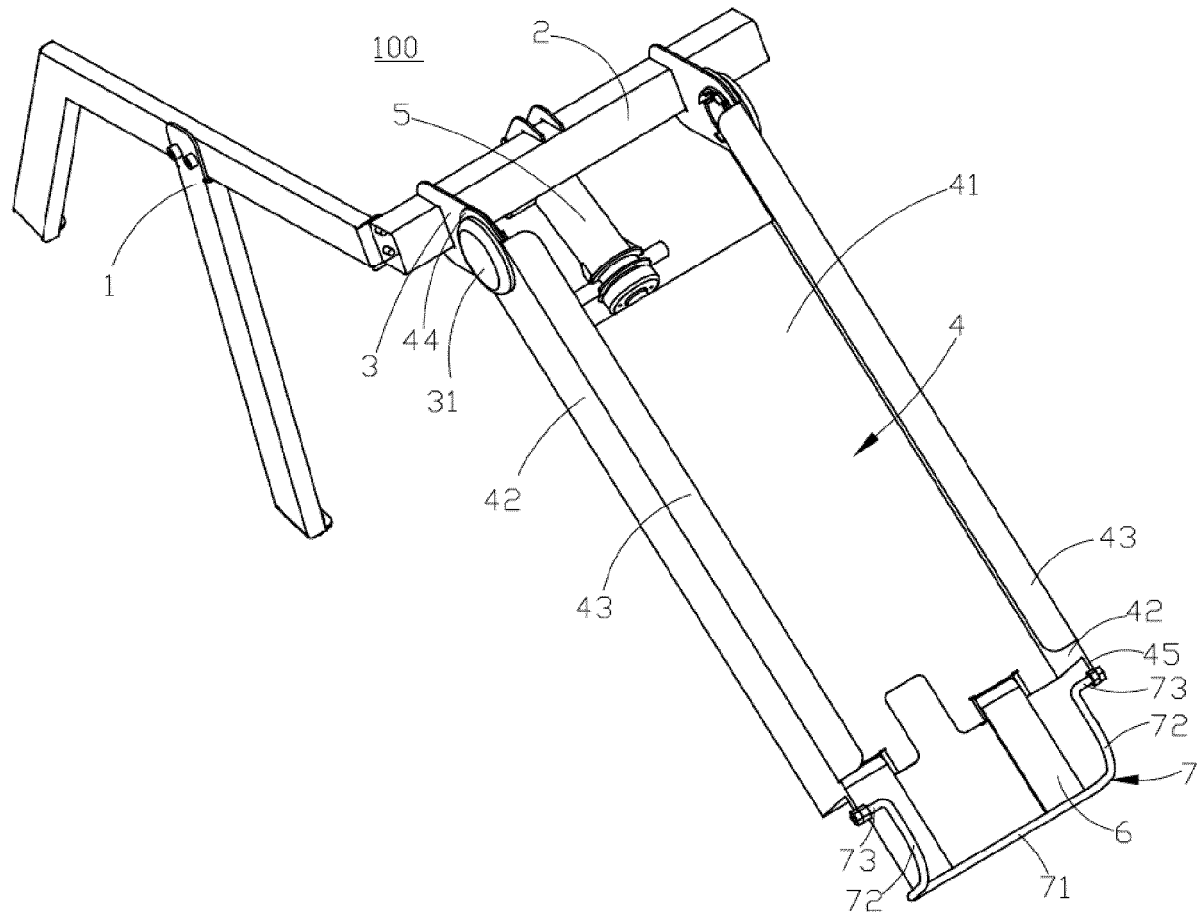


Fig. 1

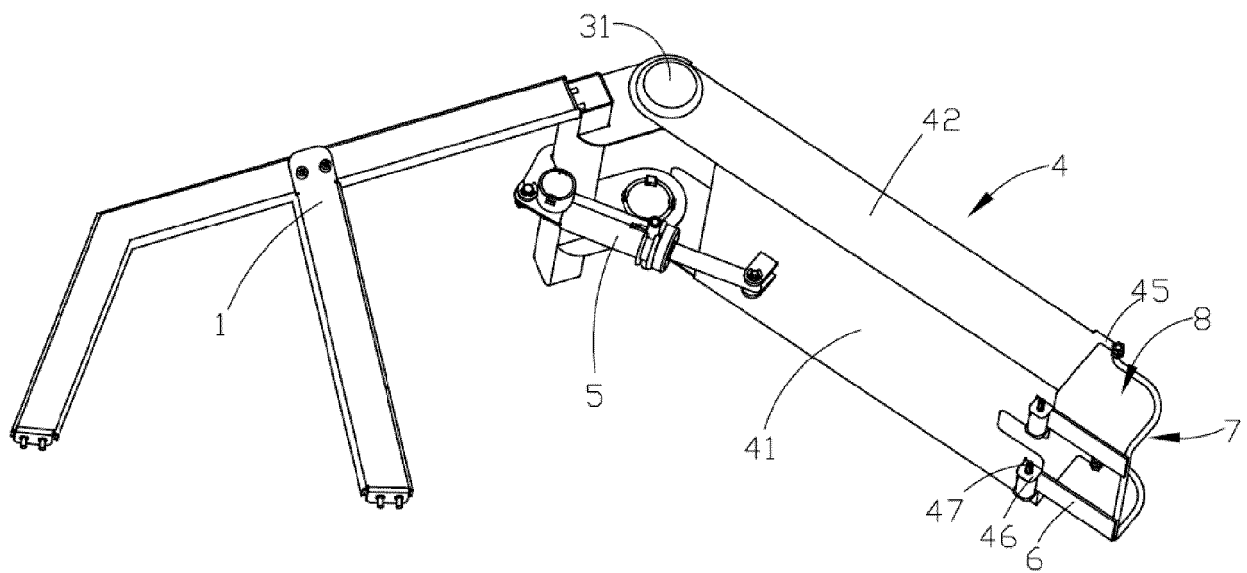


Fig. 2

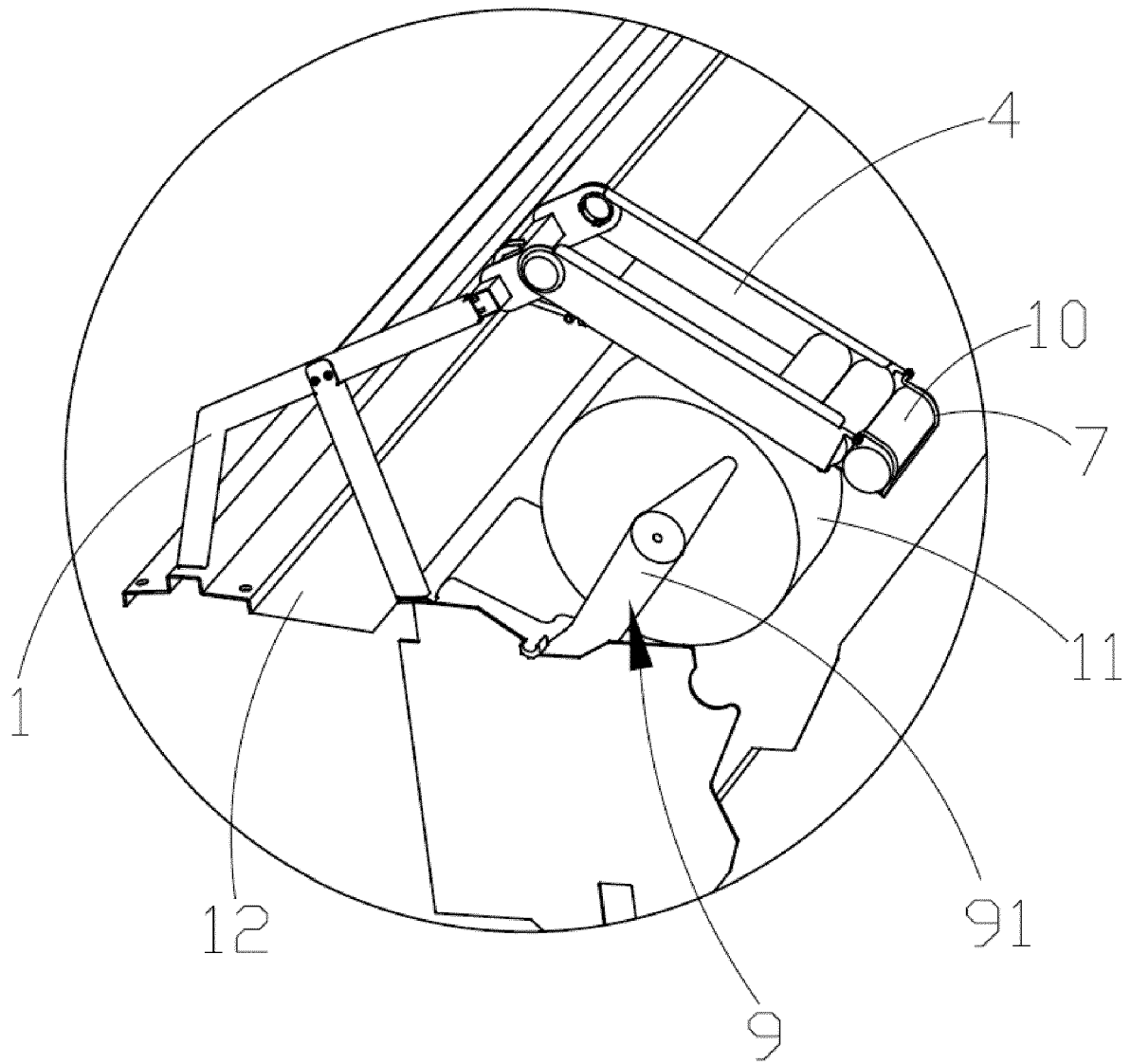


Fig. 3

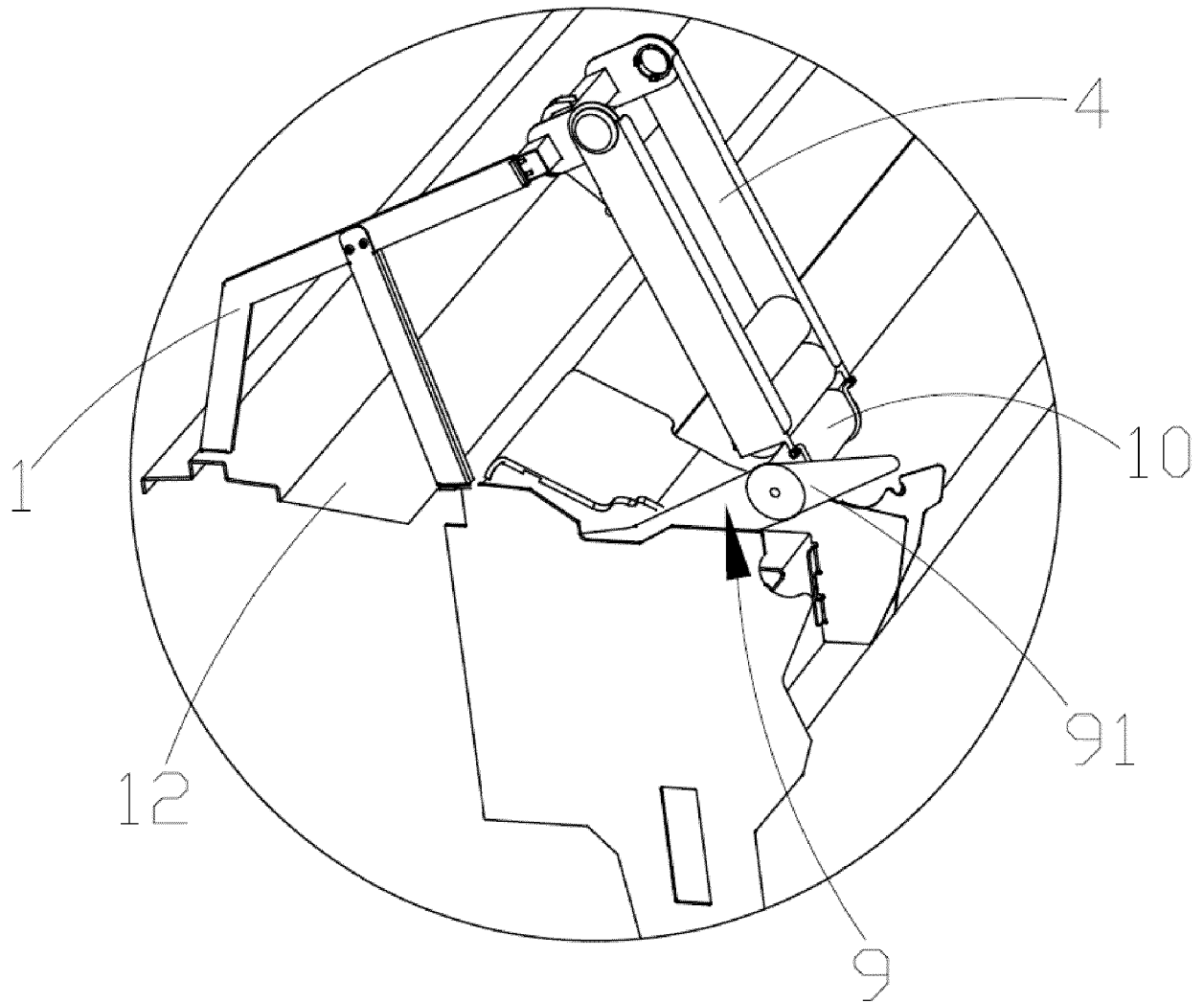


Fig. 4

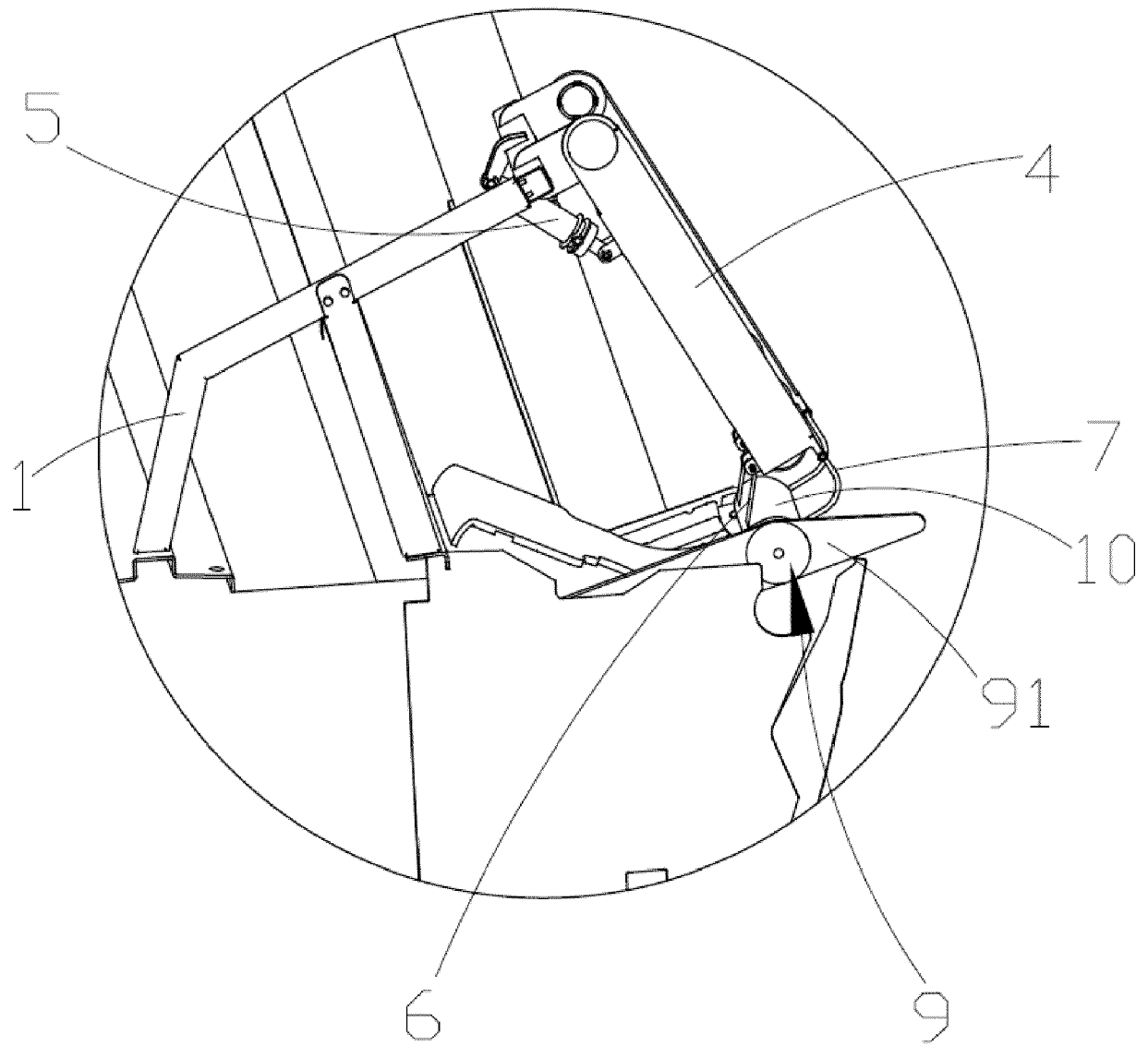


Fig. 5



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 19 2002

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 29 15 533 A1 (ELITEX ZAVODY TEXTILNIHO) 25 October 1979 (1979-10-25) * pages 5-7 * * figure *	1-12	INV. B65H67/04
X	US 3 901 456 A (PRADIER RENE) 26 August 1975 (1975-08-26) * column 7, line 54 - column 8, line 4 * * figures 1,2,4,5 *	1-5,9-12	
A	EP 0 919 505 A1 (WALMAR ESTABLISHMENT [LI]) 2 June 1999 (1999-06-02) * paragraph [0189] - paragraph [0019] * * figures 4,5 *	6-8	
X	GB 2 179 066 A (RIETER AG MASCHF) 25 February 1987 (1987-02-25) * page 8, line 32 - line 69 * * figure 8 *	1-6,9-12	
A		6-8	TECHNICAL FIELDS SEARCHED (IPC)
			B65H D01H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 January 2020	Examiner Guisan, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 19 2002

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-01-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2915533 A1	25-10-1979	CS 198729 B1 DE 2915533 A1	30-06-1980 25-10-1979
US 3901456 A	26-08-1975	NONE	
EP 0919505 A1	02-06-1999	AT 262473 T CA 2252954 A1 CN 1225891 A DE 69822592 T2 EP 0919505 A1 IT MI972668 A1 JP H11228028 A	15-04-2004 02-06-1999 18-08-1999 03-03-2005 02-06-1999 02-06-1999 24-08-1999
GB 2179066 A	25-02-1987	NONE	