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(54) **A DEVICE FOR COILING A METAL STRIP INTO A COIL**

(57) A device for coiling a metal strip into a coil, comprising: a cylindrical chamber (20) for coiling the metal strip (1); entry rollers (30) located in front of the chamber (20) for feeding the metal strip (1) into the chamber (20); wherein a side wall of the chamber (20) is formed by a plurality of rotating rollers (21) arranged around a circumference of the chamber (20). Two gripping mechanisms (40) are located inside the chamber (20) at the sides of the chamber (20), wherein the gripping mechanisms (40) comprise rotatable grippers (41). A number of the rotating rollers (21) is mounted on a swivel arm (22). The device

is configured to operate at: a loading configuration, wherein the grippers (41) are configured to grip the front edge of the metal strip (1); a coiling configuration, wherein the swivel arm (22) is closed and the grippers (41) are configured to rotate around an axis of the chamber (20) along with the gripped metal strip (1) to coil the metal strip; an unloading configuration, wherein the swivel arm (22) is open and the grippers (41) are moved aside out of the chamber (20), so that the coil can be removed from the chamber (20).

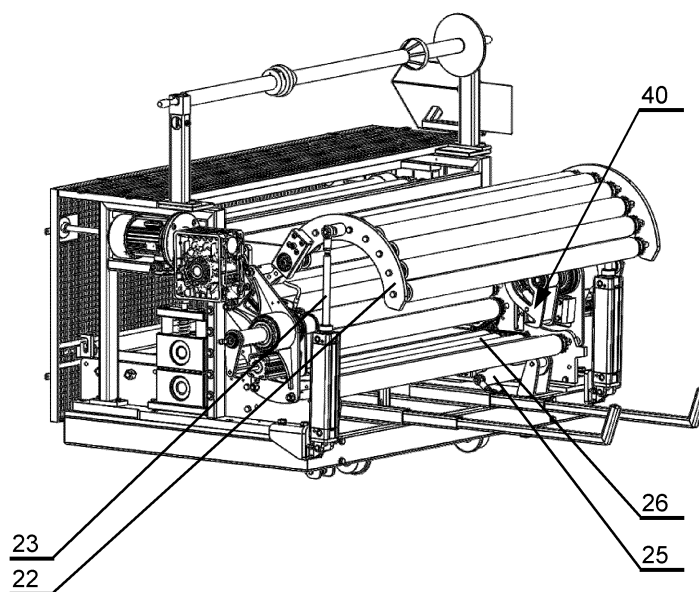


Fig. 1B

Description

TECHNICAL FIELD

[0001] The object of the invention is a device for coiling a metal strip into a coil.

BACKGROUND

[0002] In known devices for coiling a metal strip into a coil, a metal strip is wound on a rotating drum and pressed against the rotating drum by means of rollers tangential thereto. Coils can be easily transported and conveniently stored.

[0003] Usually, coils contain considerably lengthy metal strip and are used for mass production at industrial plants. Sometimes, however, there is a need to form a coil from a relatively short metal strip, in accordance with needs of a particular client. For this purpose, rewinding devices are used, so-called rewinders, in which the strip is rewound from a larger coil to smaller coils.

[0004] For example, US2212243A discloses a strip coffer for rolling mills comprising a mandrel, rollers adjacent thereto adapted to urge a strip progressively thereabout in forming a coil thereon, one of said rollers having a peripheral groove, means for supporting the rollers, and a finger carried by and extending from said means, into said groove and partially about the roller in the direction of its operative rotation and thence bridging the gap between said roller and an adjacent roller to thereby deflect the leading end of the strip away from said gap and toward the mandrel.

SUMMARY

[0005] There is a need for provide an alternative device for coiling metal strip into a coil.

[0006] The object of the invention is a device for coiling a metal strip into a coil, comprising: a cylindrical chamber for coiling the metal strip; entry rollers located in front of the chamber for feeding the metal strip into the chamber; wherein a side wall of the chamber is formed by a plurality of rotating rollers arranged around a circumference of the chamber. Two gripping mechanisms are located inside the chamber at the sides of the chamber, wherein the gripping mechanisms comprise rotatable grippers. A number of the rotating rollers is mounted on a swivel arm. The device is configured to operate at:

- a loading configuration, wherein the grippers are configured to grip the front edge of the metal strip;
- a coiling configuration, wherein the swivel arm is closed and the grippers are configured to rotate around an axis of the chamber along with the gripped metal strip to coil the metal strip;
- an unloading configuration, wherein the swivel arm is open and the grippers are moved aside out of the chamber, so that the coil can be removed from the

chamber.

[0007] The grippers may comprise a locking element that is movable between a locking position that holds the metal strip in the gripper and an open position.

[0008] The grippers can be mounted on rotating axles that are slidably mounted within a body.

[0009] The rotating rollers can be longitudinal and are arranged in parallel to each other and in parallel to the axis of the chamber.

[0010] The device may further comprise a collecting platform for collecting the coil moved out from the chamber.

[0011] The rotating rollers can be connected to each other by a drive chain and are driven by a gear motor.

[0012] The device may further comprise a profiling mechanism with an actuator connected to a pressure roller for imparting an initial bending radius to the metal strip.

[0013] The device may further comprise a shaft for mounting a reel of foil to wrap the coil and feed rollers for feeding the foil from the reel.

[0014] The device may further comprise a cutter for cutting the foil, wherein the cutter is mounted on a toothed belt and is controlled by a gear motor.

[0015] The use of two gripping mechanisms with the grippers, one at each side of the chamber and of the coil being formed, allows the width of the device to be reduced because, in order to remove the coil from the device, it is not necessary to slide the drum, out of the coil, with a length equal to the length of the coil onto which the sheet is normally wound.

BRIEF DESCRIPTION OF FIGURES

[0016] The object of the invention has been shown by means of an example embodiment in the drawing, where:

Fig. 1 shows a perspective view of a device;
 Fig. 2 shows a cross-sectional view of the device;
 Fig. 3 shows a perspective view of the device in another embodiment;
 Fig. 4 shows a perspective view of a gripping mechanism;
 Fig. 5 shows a gripper in an open position;
 Fig. 6 shows the gripper in a closed position;
 Fig. 7 shows the gripping mechanism with the gripper in a working position;
 Fig. 8 shows the gripping mechanism with the gripper in a position extended from a coiling chamber.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0017] Fig. 1A is a perspective view of the device for coiling a metal strip in a closed position, and Fig. 1B in an open position. Fig. 2 is a cross-sectional view of the device. The device comprises a cylindrical chamber 20 for coiling the metal strip and entry rollers 30, located in front of the chamber 20, for feeding the metal strip 1 into

the chamber 20. Preferably, the device comprises a frame 10 on which the chamber 20 and the entry rollers 30 are mounted. The side wall of the chamber 20 constitutes of a plurality of rotating rollers 21 distributed around the circumference of the chamber 20. Preferably, the rotating rollers 21 are longitudinal and are arranged in parallel to each other and in parallel to the axis of the chamber 20. For example, the device may comprise 20 rotating rollers 21 with a diameter of 70mm. Furthermore, the device comprises two gripping mechanisms 40 located inside the chamber 20 on its both sides, wherein the gripping mechanisms 40 comprise rotatable and extendable grippers 41, wherein part of the rotating rollers 21 is mounted on a swivel arm 22. The device is adapted to operate: in a loading configuration wherein the grippers 41 grip the front edge of the metal strip 1, in a coiling configuration wherein the swivel arm 22 is closed and the grippers 41 rotate around an axis together with the gripped metal strip 1, while guiding the edge of the metal strip 1 along the circumference of the chamber 20 as the metal strip is being coiled, and in an unloading configuration where the swivel arm 22 is open (as in Fig. 1B) and the grippers 41 are extended beyond the formed coil, allowing the coil to be removed from the chamber 20. Preferably the swivel arm 22 is controlled by an actuator 23. In a first embodiment (Figs. 1, 2A, 2B), the retracting of the actuator 23 causes the arm 22 to rise and the chamber 20 to open, allowing the removal of the coil from the chamber 20. In a second embodiment (Fig. 3), the actuator 23 is mounted so that extending thereof causes the arm 22 to rise and the chamber 20 to open. The raised arm 22 forms an opening in the chamber 20 with a height equal to its diameter.

[0018] As the sheet is coiled, its surface contacts at least some of the rotating rollers 21 which are driven and guide the metal strip to form it into a coil.

Preferably, the rotating rollers 21 are connected by a chain to each other and to a gear motor that drives them. Preferably, the entry rollers 30 have the same linear speed as the rotating rollers 21 of the chamber 20.

[0019] Preferably, the device comprises a profiling mechanism 60 that is in the form of an actuator 61, connected to a pressure roller 62, that, after gripping the metal strip by the grippers 41, presses the pressure roller 62 against the metal strip, between the entry rollers 30 and the grippers 41, in order to give it an initial bending radius. Whereas, during the coiling step, the pressure roller 62 is in a position remote from the surface of the metal.

[0020] Preferably, the device comprises a shaft for mounting a reel of foil 70, wherein the formed coil is wrapped by the foil in order to pack it, and preferably comprises feed rollers 71 for feeding the foil from the reel. Preferably, in the final phase of coiling the metal strip, the foil is entered between the metal strip being coiled by activating the rollers 71 that feed the foil.

[0021] Preferably, the device comprises a cutter 72 for cutting the foil, that is mounted on a toothed belt and is

controlled by a gear motor that moves it in a direction transverse to the foil feed in order to cut a section of foil after wrapping the coil.

[0022] Fig. 4 is a perspective view of the gripper mechanism. The gripper 41 is mounted on a rotating axle 43 which is slidably mounted in a body 46. Preferably, the rotating axle 43 of one of the rotatable grippers is connected to a drive motor by means of a belt transmission, while the drive to the rotating axle of the gripper 41 located on the other side of the device is transmitted by means of a drive shaft 48 (Fig. 1).

[0023] Each gripper 41 has a locking element 42 that is movable between a position (Fig. 6) locking the metal strip 1 in the gripper 41 and an open position (Fig. 5) in which the metal strip can be freely slid in and out of the gripper 41. Preferably, the position of the locking element 42 is changed by means of an actuator 44. Preferably, the axle 43 is constructed to allow delivery of compressed air for controlling the actuator 44.

[0024] Fig. 7 shows the gripping mechanism with the gripper 41 in a working position. Fig. 8 shows the gripping mechanism with the gripper 41 in a position extended from the coiling chamber 20. The gripping mechanism 40 comprises an extendable element, preferably an actuator 45 that controls the extension of the axle 43 on which the gripper 41 is mounted. In the working position, the gripper 41 is located inside the chamber 20, in particular so as to grip the edge of the metal strip 1 fed by the entry rollers 30, and the actuator 45 controlling the extension of the gripper 41 is in the retracted position. After the actuator 45 is extended, the gripper 41 is located outside the formed coil, in a particular case it is located outside the chamber 20, thus allowing the removal of the coil in a direction transverse to the axis of the coil.

[0025] In the unloading configuration, when the grippers 41 are located outside the chamber 20 and when the swivel arm 22 is raised, the coil is rolled out by means of a shaft 26, controlled by actuators 25, onto a collecting platform 50 from which it is then collected. Thereby, irrespective of whether the coil has already been collected or whether it is still on the collecting platform 50, the device returns to the loading configuration and is ready for further operation. Due to the fact that the coil is removed from the chamber 20 in the direction transverse to the coil axis, i.e. also in the direction transverse to the axis of the chamber 20, it is not necessary to collect it immediately (e.g. by means of a forklift truck), and thus the time for unloading the chamber 20 and for preparing the device for the next coiling cycle is reduced. Furthermore, the device does not require the use of complicated elements for pushing the coil along the axis of the chamber, and only optionally comprises a short-stroke element in order to push the coil in the direction transverse to its axis. Preferably, the collecting platform 50 may be adapted to receive more than one coil.

Claims

1. A device for coiling a metal strip into a coil, comprising:

- a cylindrical chamber (20) for coiling the metal strip (1);
- entry rollers (30) located in front of the chamber (20) for feeding the metal strip (1) into the chamber (20);
- wherein a side wall of the chamber (20) is formed by a plurality of rotating rollers (21) arranged around a circumference of the chamber (20);

characterised in that:

- two gripping mechanisms (40) are located inside the chamber (20) at the sides of the chamber (20), wherein the gripping mechanisms (40) comprise rotatable grippers (41);
- a number of the rotating rollers (21) is mounted on a swivel arm (22);
- wherein the device is configured to operate at:

- a loading configuration, wherein the grippers (41) are configured to grip the front edge of the metal strip (1);

- a coiling configuration, wherein the swivel arm (22) is closed and the grippers (41) are configured to rotate around an axis of the chamber (20) along with the gripped metal strip (1) to coil the metal strip;

- an unloading configuration, wherein the swivel arm (22) is open and the grippers (41) are moved aside out of the chamber (20), so that the coil can be removed from the chamber (20).

2. The device according to claim 1, wherein the grippers (41) comprise a locking element (42) that is movable between a locking position that holds the metal strip (1) in the gripper (41) and an open position.

3. The device according to any of previous claims, wherein the grippers (41) are mounted on rotating axles (43) that are slidably mounted within a body (46).

4. The device according to any of previous claims, wherein the rotating rollers (21) are longitudinal and are arranged in parallel to each other and in parallel to the axis of the chamber (20).

5. The device according to any of previous claims, further comprising a collecting platform (50) for collecting the coil moved out from the chamber (20).

6. The device according to any of previous claims, wherein the rotating rollers (21) are connected to each other by a drive chain and are driven by a gear motor.

7. The device according to any of previous claims, further comprising a profiling mechanism (60) with an actuator (61) connected to a pressure roller (62) for imparting an initial bending radius to the metal strip.

8. The device according to any of previous claims, further comprising a shaft for mounting a reel of foil (70) to wrap the coil and feed rollers (71) for feeding the foil from the reel (70).

9. The device according to claim 8, further comprising a cutter (72) for cutting the foil, wherein the cutter (72) is mounted on a toothed belt and is controlled by a gear motor.

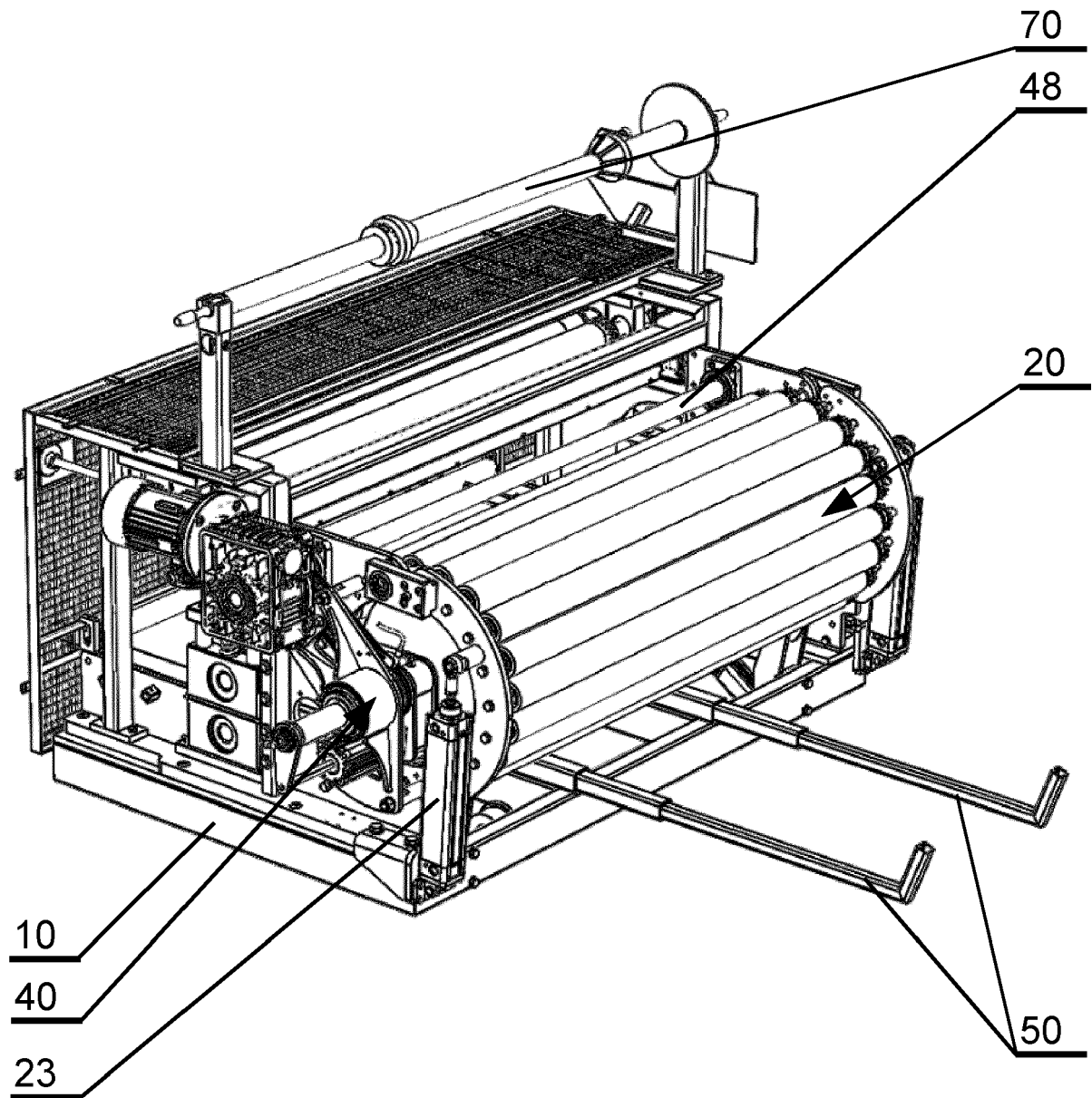


Fig. 1A

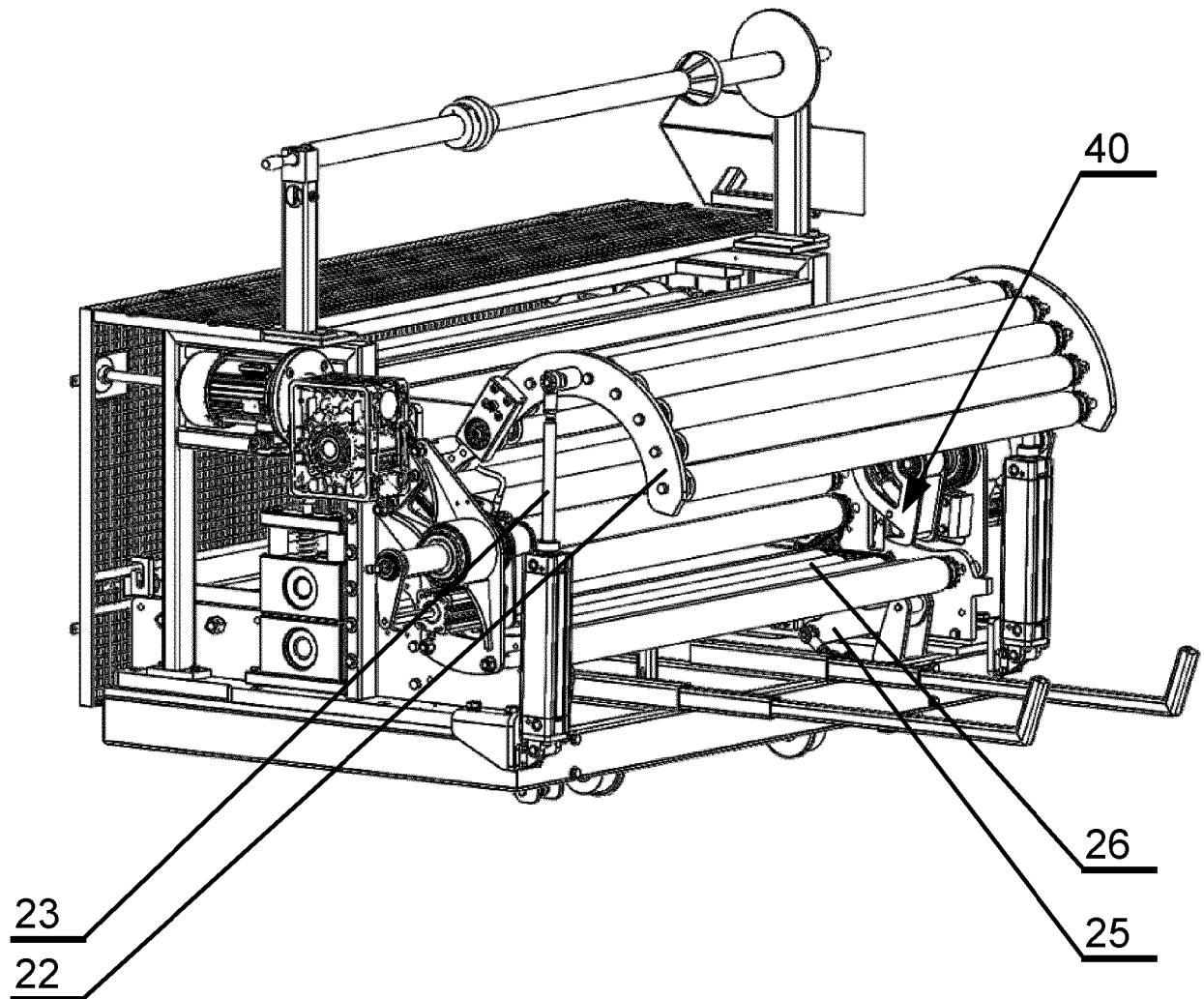


Fig. 1B

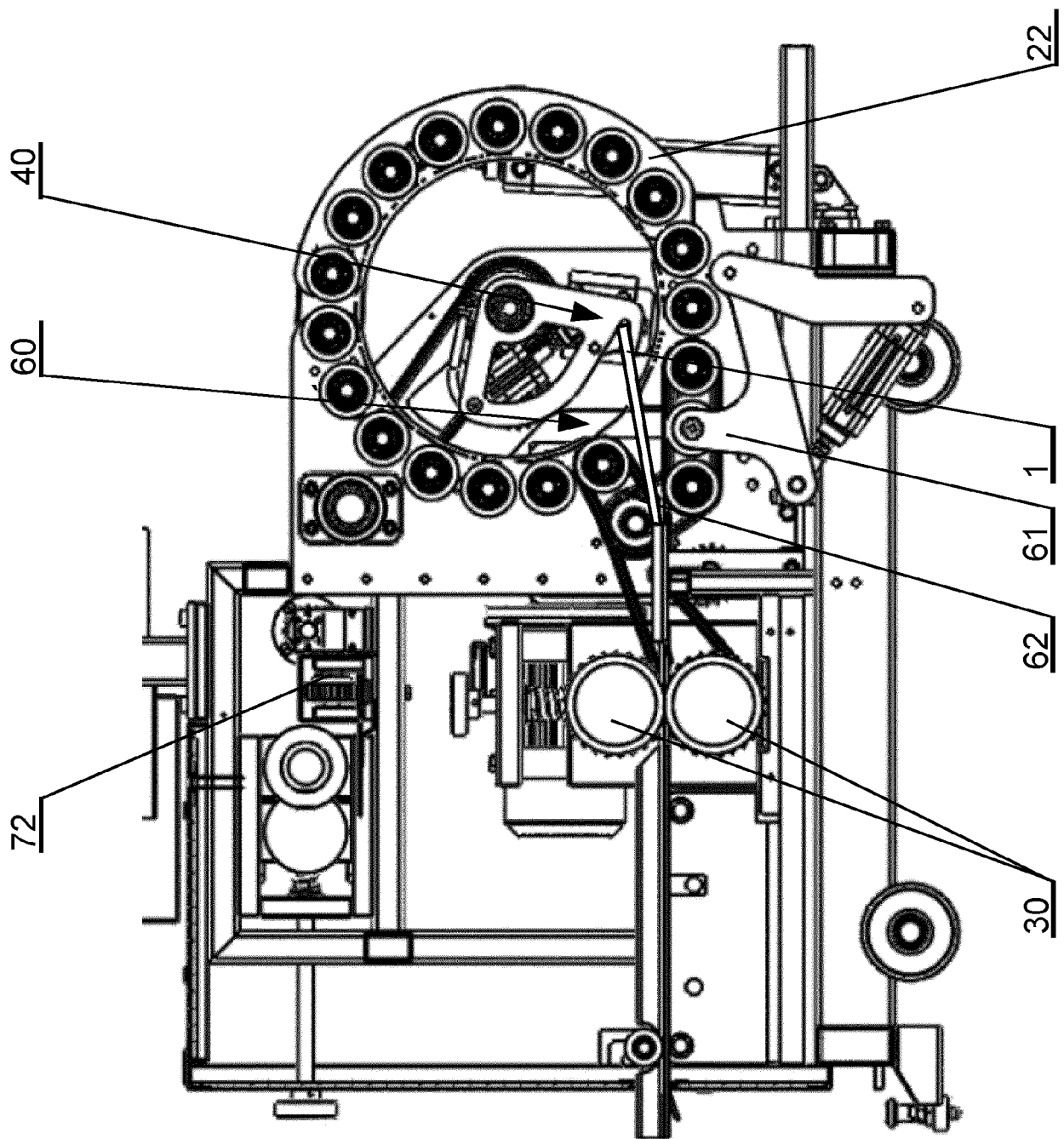


Fig. 2

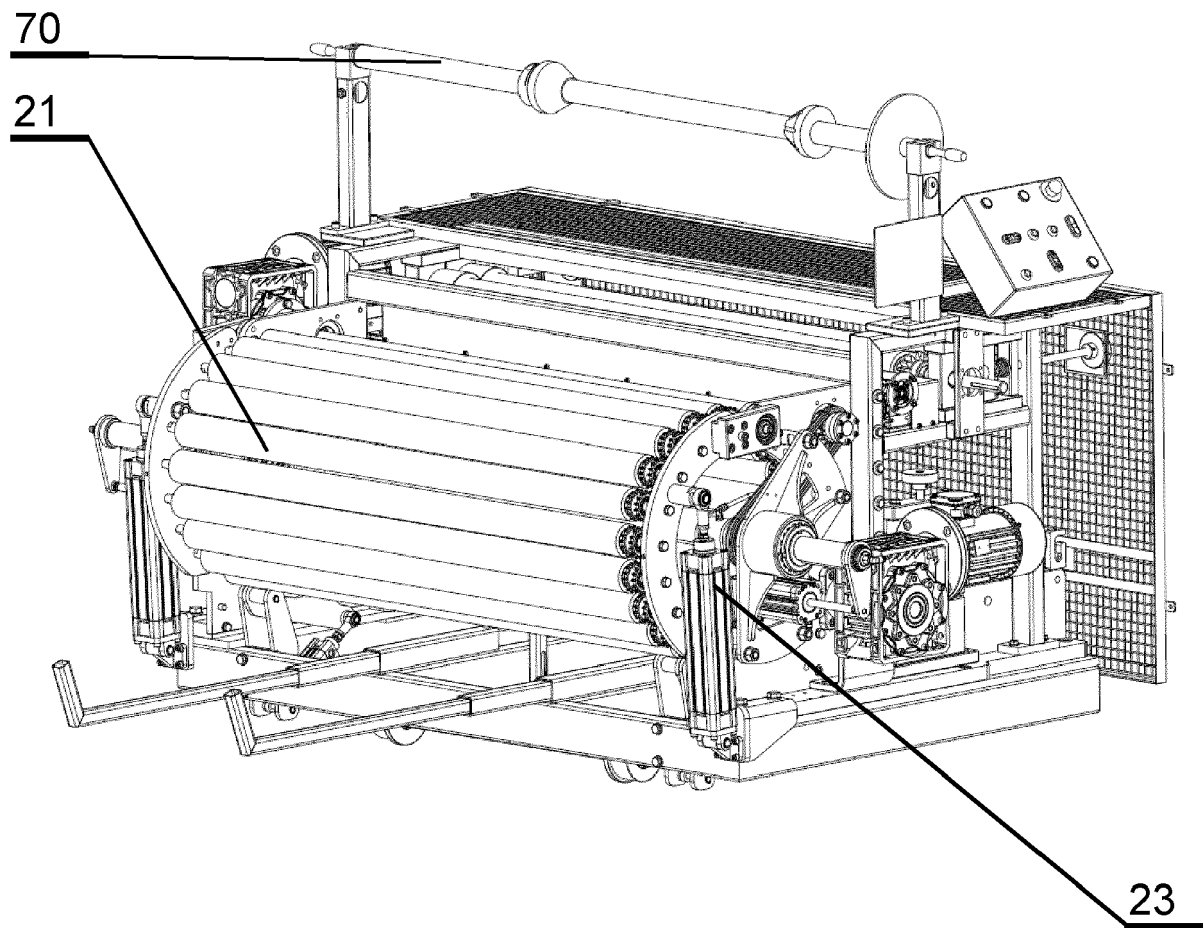


Fig. 3

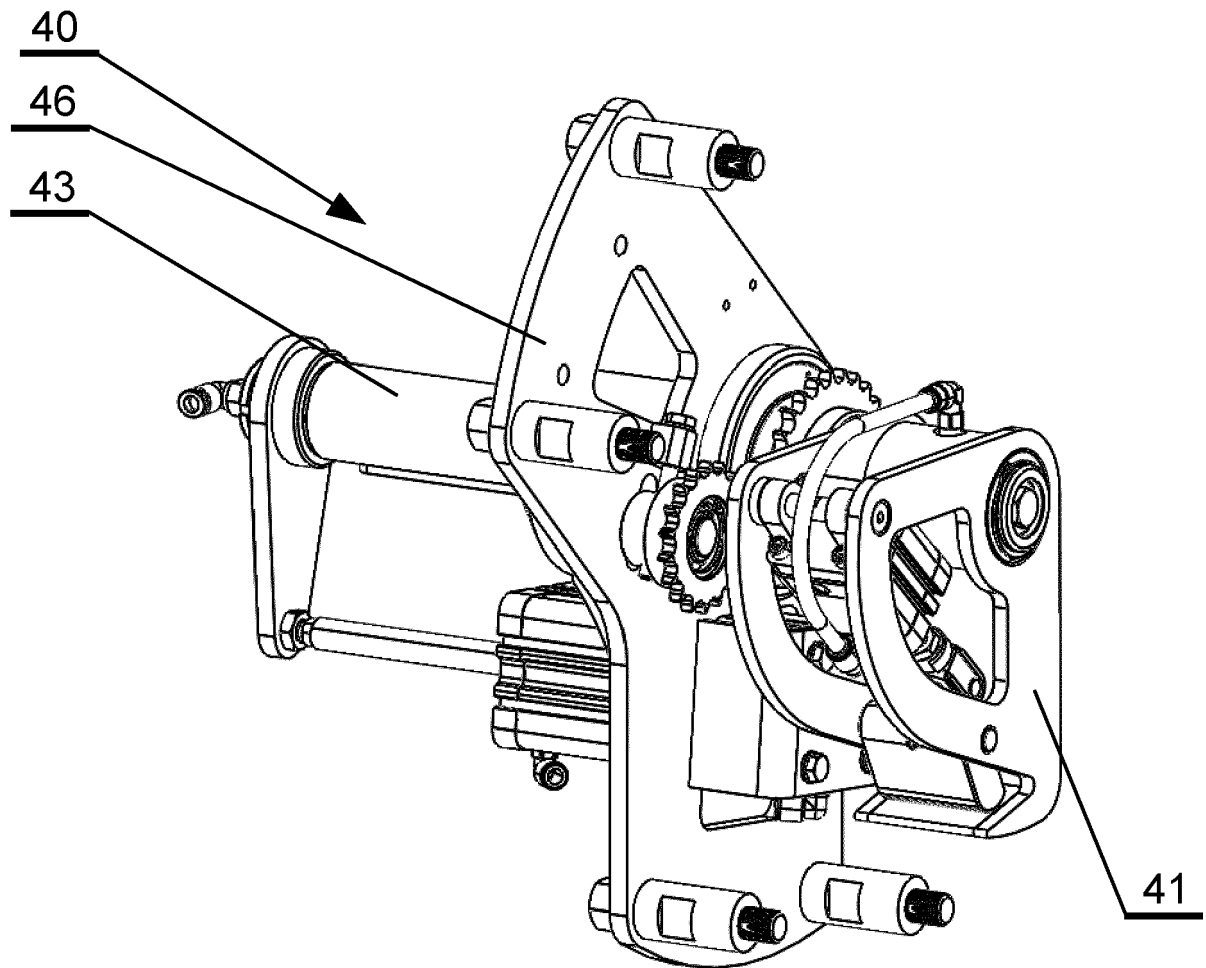


Fig. 4

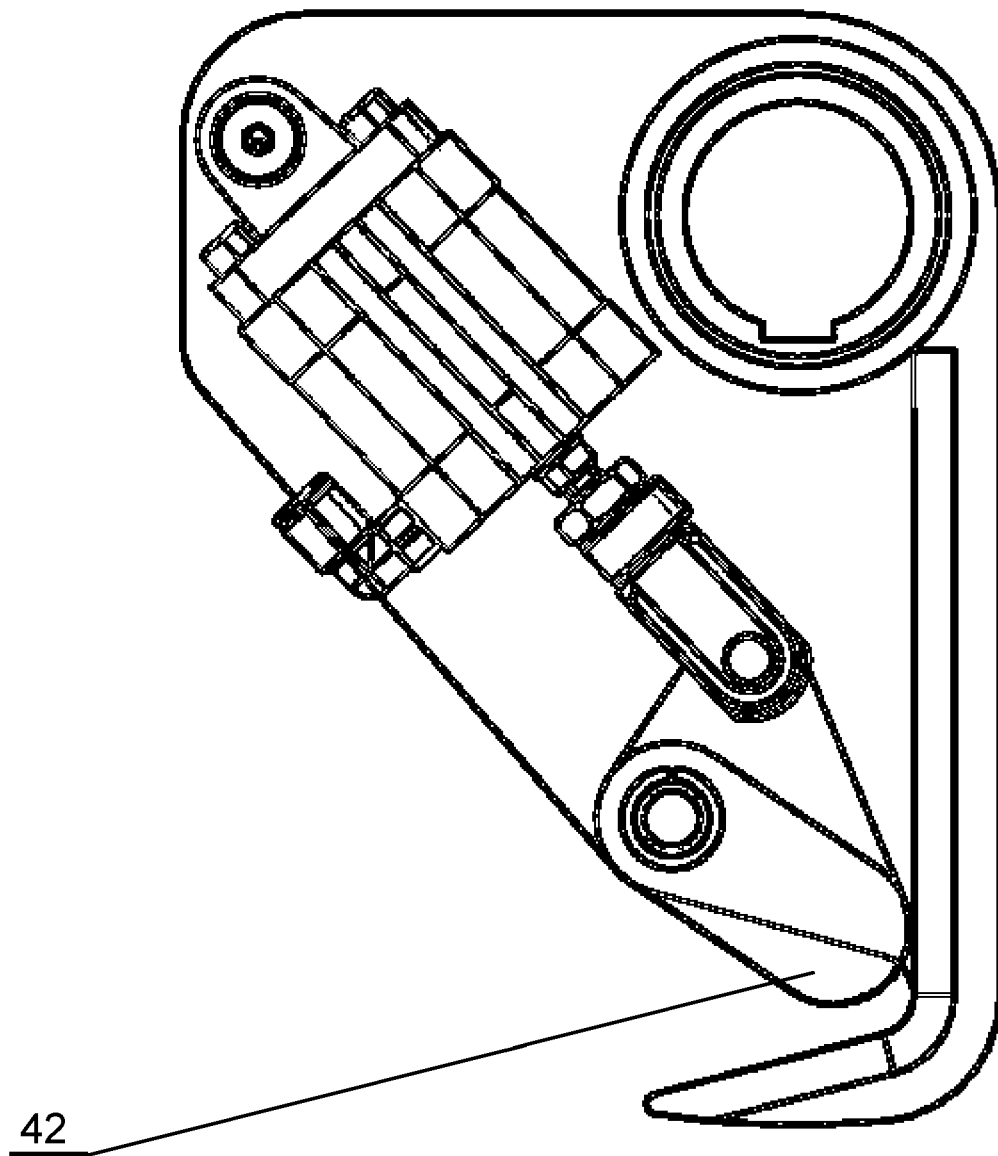


Fig. 5

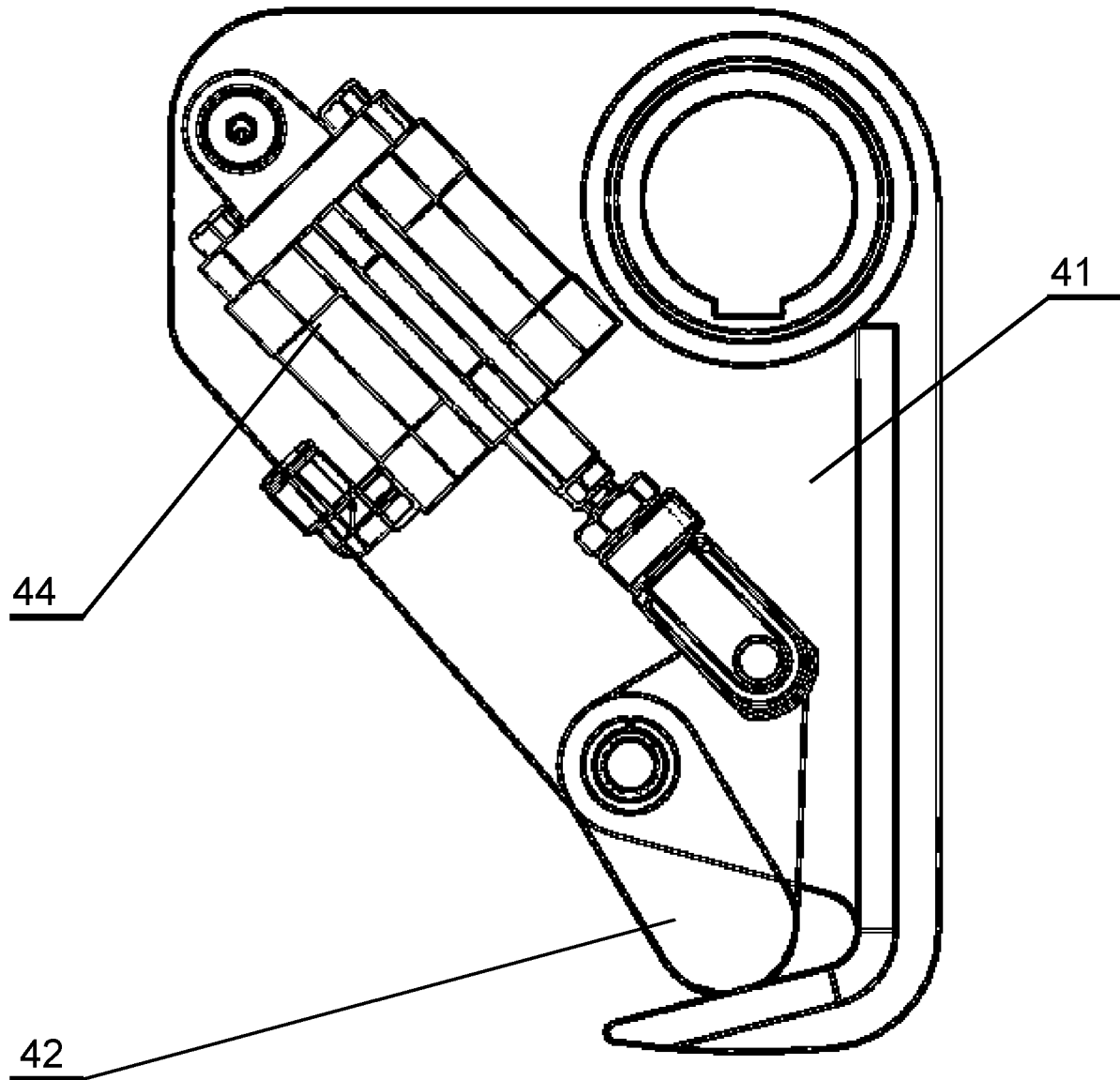


Fig. 6

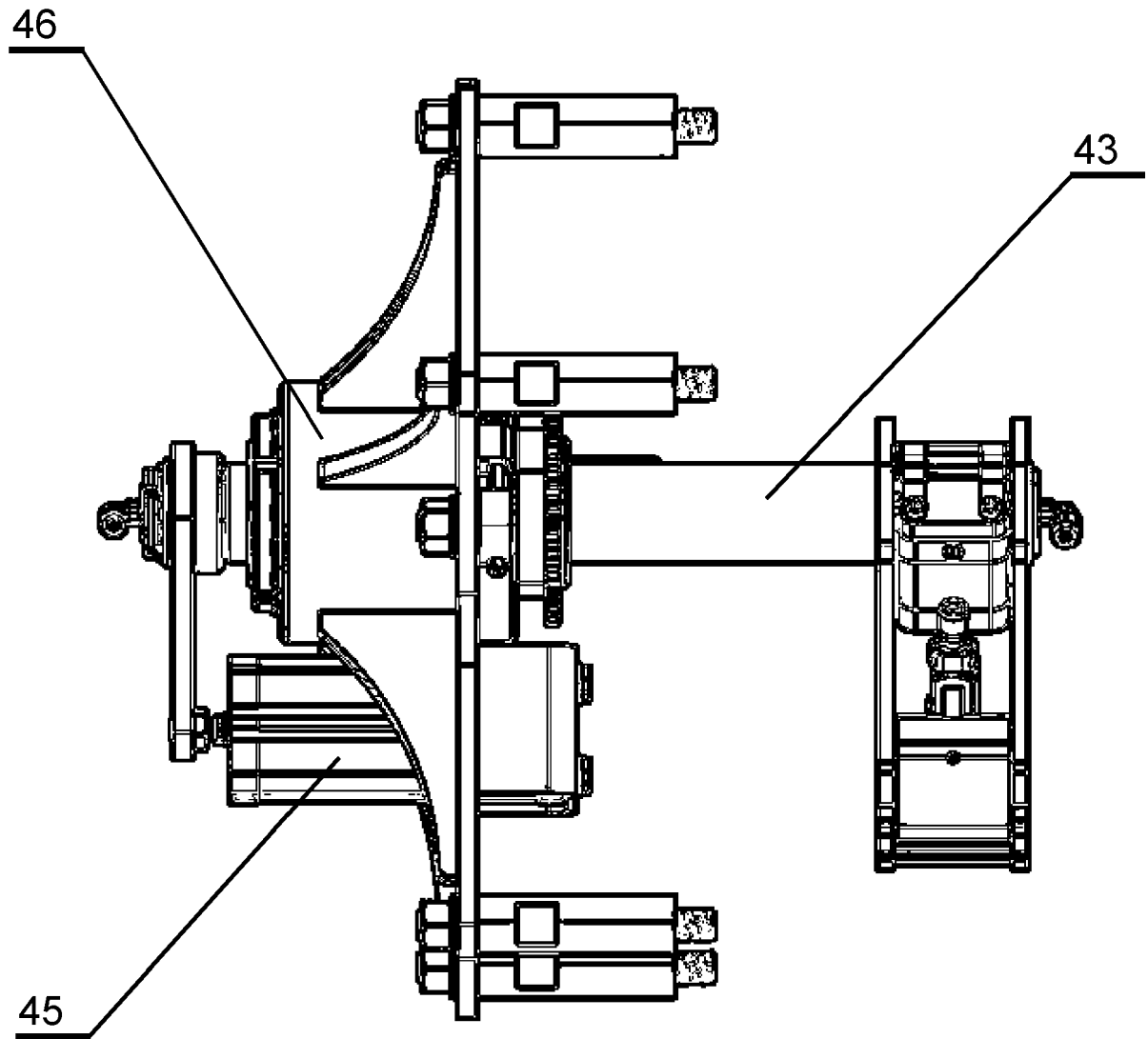


Fig. 7

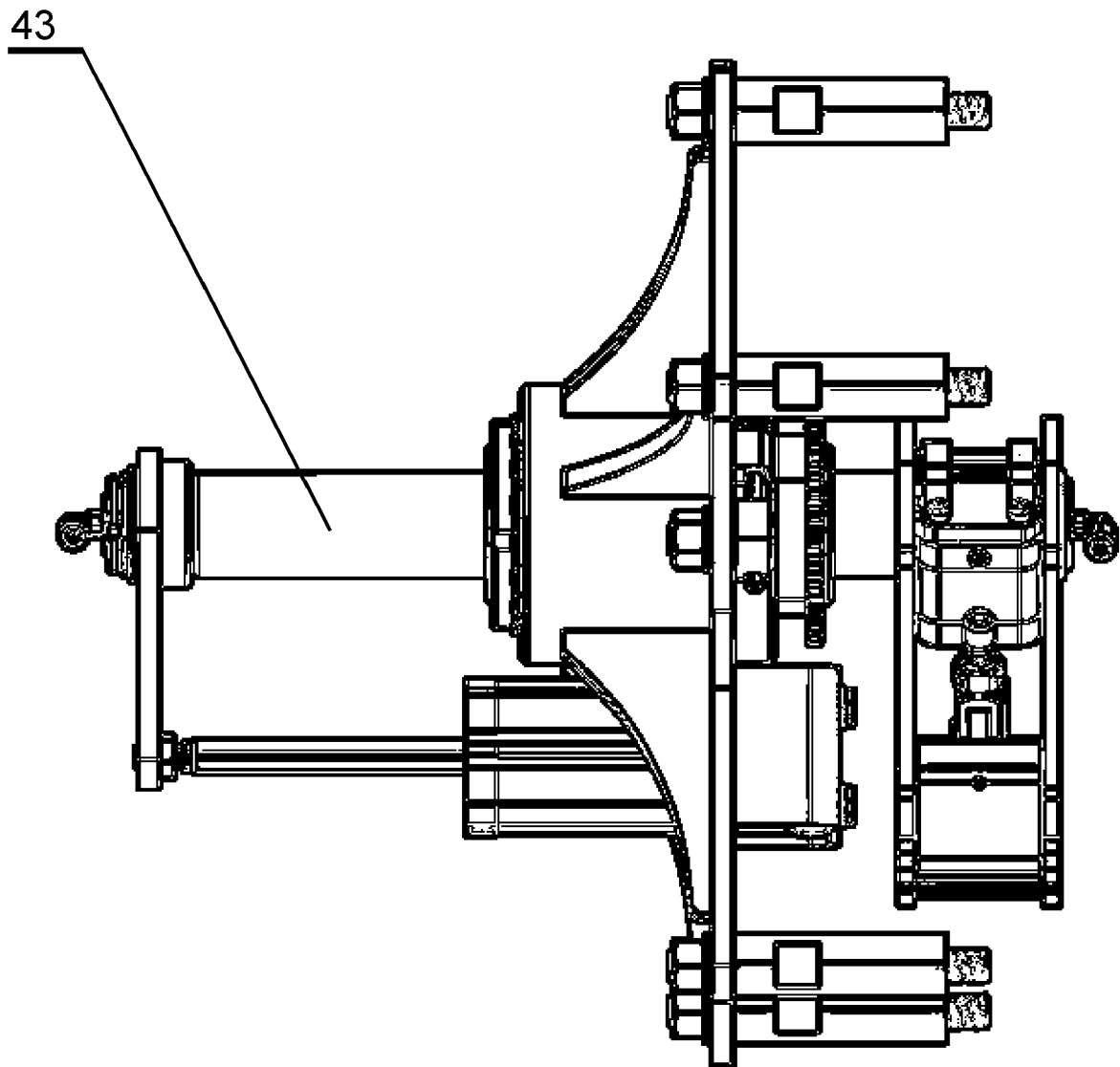


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 21 16 8781

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 1 882 219 A (HARWOOD PAISLEY B ET AL) 11 October 1932 (1932-10-11) * figures *	1-9	INV. B21C47/04 B21C47/24 B21C47/26 B21C47/28 B21C47/32 B65H18/02 B65H75/36 B21C47/08 B21C47/10
A	US 4 005 830 A (SMITH WILLIAM) 1 February 1977 (1977-02-01) * figures *	1-9	
A	US 5 361 618 A (STEFANELLI JOSEPH M [US]) 8 November 1994 (1994-11-08) * figures *	1-9	
A	EP 2 416 902 A2 (HPL NEUGNADENFELDER MASCHINENFABRIK GMBH [DE]) 15 February 2012 (2012-02-15) * figures *	1-9	
A	US 3 905 218 A (GALLETTI CESARE) 16 September 1975 (1975-09-16) * figures *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B21C B65H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 September 2021	Examiner Charvet, Pierre
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 21 16 8781

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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28-09-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1882219 A	11-10-1932	NONE	
US 4005830 A	01-02-1977	AR 208695 A1 AT 345228 B AU 8057075 A BE 828779 A BR 7502717 A CA 1017173 A CA 1029582 A CS 199587 B2 DD 119145 A5 DE 2519988 A1 ES 437480 A1 FR 2270020 A1 GB 1507827 A IT 1036893 B JP S5245304 B2 JP S50158553 A NL 7505193 A SE 414125 B SU 1156586 A3 US 4005830 A ZA 752507 B	28-02-1977 11-09-1978 04-11-1976 01-09-1975 16-03-1976 13-09-1977 18-04-1978 31-07-1980 12-04-1976 20-11-1975 01-04-1977 05-12-1975 19-04-1978 30-10-1979 15-11-1977 22-12-1975 10-11-1975 14-07-1980 15-05-1985 01-02-1977 31-03-1976
US 5361618 A	08-11-1994	CA 2119321 A1 US 5361618 A	02-10-1994 08-11-1994
EP 2416902 A2	15-02-2012	DE 102009029918 A1 EP 2416902 A2 WO 2010115635 A2	14-10-2010 15-02-2012 14-10-2010
US 3905218 A	16-09-1975	DE 2418316 A1 IT 983929 B US 3905218 A	31-10-1974 11-11-1974 16-09-1975

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2212243 A [0004]