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(54) **ROTATION MECHANISM FOR FERROUS MATERIAL COLLECTION DEVICE AND FERROUS MATERIAL COLLECTION DEVICE INCLUDING SAID ROTATION MECHANISM**

(57) Rotation mechanism and ferrous material collection device including said rotation mechanism, the mechanism comprises a fixed part (1) that couples to hoisting equipment, a mobile part (2) that couples to the ferrous material collection device, and electrical connection means (3) of first cables (4) of the fixed part to second cables (5) of the mobile part, the connection means comprise a collector (3.1) and a connector (3.2) in permanent contact with the collector, so that an electrical connection between the first and second cables is ensured in any relative position between the fixed part and the mobile part, where the fixed part comprises an upper section (1.1) and a lower section (1.2) connected by a tubular element (1.3), and the mobile part is traversed by the tubular element so that it is arranged between the upper section and the lower section of the fixed part.

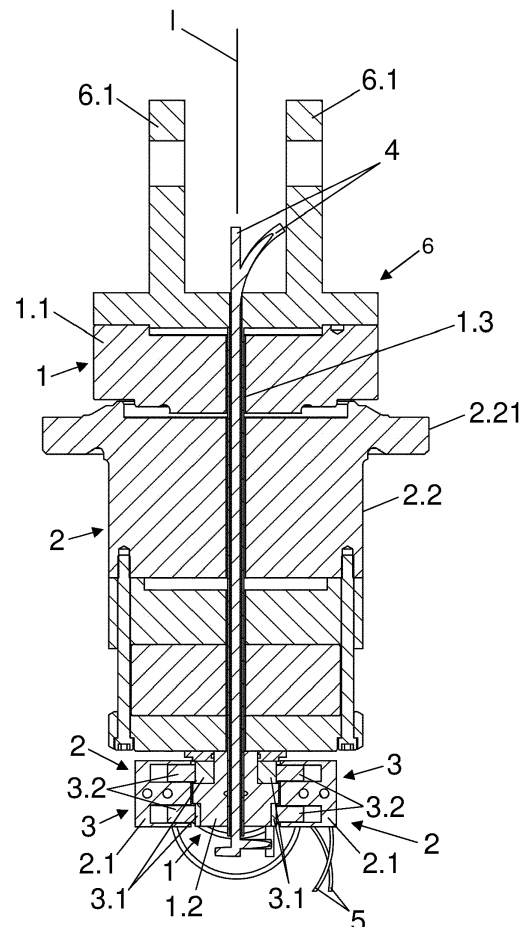


Fig. 1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention is included in the field of devices or tools for collecting ferrous materials, which are coupled to the hook of lifting equipment, such as cranes, vehicle cranes, overhead cranes, winches, derricks, hoists, etc.

[0002] Specifically, the invention relates to a rotation mechanism, which allows the ferrous material collection device to be rotated 360 ° both in one direction and the other, without there being any risk of cutting the cables that power the electromagnet plant of said device and causing detachment of the load. Also object of the invention is a ferrous material collection device that includes said rotation mechanism.

BACKGROUND OF THE INVENTION

[0003] Various devices or tools are known that are coupled to hoisting equipment to carry out the selective manipulation of objects made of ferrous materials.

[0004] For example, German Utility Model No. 20 2012 100579 explains a gripping device comprising a base, claws, cylinders, and an electromagnetic disc. At least two claws are pivotally coupled to the base. The base is provided with a coupling portion, which can be pivotally coupled to an arm of an operating machine. Each claw is pivotally coupled to a first location on a vertical base plate. Each cylinder is pivotally coupled to one of the claws. When the claws are held together, an accommodation space can be defined, in which the electromagnetic disc is mounted. In this way, the claws can grip large pieces of metal, while small pieces of iron can be collected by the electromagnetic disc, so that a machine employing the gripping device can pick up large pieces of metal and small pieces of iron.

[0005] US Patent No. 6,168,219 explains a clamp that includes a ferrous body with a plurality of prongs pivotally connected thereto. A magnetic coil is arranged inside the ferrous body. When the magnetic coil is activated, it creates a magnetic field within the area defined by the prongs. The prongs are also magnetised by the field. Additional magnetic coils can be added to one or more prongs.

[0006] As can be seen, it is common for these devices to have a lifting equipment holding arm fastened to an electromagnet plate that can comprise a plurality of auxiliary articulated arms in the form of radial blades for holding, during lifting and transport, the ferromagnetic material previously attracted by the electromagnet plate. Radial blades are usually actuated by hydraulic cylinders.

[0007] These additionally known devices or tools for collecting ferrous metals usually comprise a rotation mechanism that allows rotating said device around its vertical axis, thus facilitating the placement of the load, that is, the ferrous material objects that it transports.

These rotation mechanisms usually comprise an electrical collector-connector assembly, which allows the continuity of the electrical supply to the electromagnet plate of the device during the 360 ° rotation both in one direction and in the other. That is, the device can be rotated to one side or the other without there being any risk of cutting the cables that power the electromagnet plant of said device and causing detachment of the load. However, on the part of the applicant, the existence of any solution in the state of the art that shows a combination of characteristics similar to that presented by the rotation mechanism object of the invention recommended here is unknown.

DESCRIPTION OF THE INVENTION

[0008] The present invention is defined and characterised by the independent claims, while the dependent claims describe other characteristics thereof.

[0009] An object of the invention is a rotation mechanism for a ferrous material collection device, which comprises:

- a fixed part, adapted to be coupled to lifting equipment,
- a mobile part, adapted to be coupled to a ferrous material collection device and capable of rotating with respect to the fixed part in a horizontal plane, and
- connection means, arranged between the fixed part and the mobile part, configured to electrically connect first cables of the fixed part to second cables of the mobile part.

[0010] The connection means comprise a collector and a connector in permanent contact with the collector, so that an electrical connection between the first and second cables is ensured in any relative position between the fixed part and the mobile part.

[0011] Likewise, the fixed part comprises an upper section and a lower section connected to each other through a tubular element, and for its part, the mobile part is traversed by the tubular element, so that said mobile part is arranged between the upper section and lower section of the fixed part.

[0012] An object of the invention is also a ferrous material collection device that comprises the rotation mechanism mentioned above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present specification is complemented by a set of figures which illustrate a preferred embodiment, and which in no way limit the invention.

Figure 1 represents a front view of the rotation mechanism.

Figure 2 represents a perspective front view of an embodiment of the ferrous material collection device, based on an electromagnet plate, adapted for the rotation mechanism of Figure 1 to be coupled to it.

Figure 3 represents a front perspective view of another embodiment of the ferrous material collection device, based on an electromagnet plate with radial blades ("polyp grab with electromagnet"), adapted for the rotation mechanism of Figure 1 to be coupled to it.

DETAILED DESCRIPTION OF THE INVENTION

[0014] The present invention relates to a rotation mechanism for a ferrous material collection device, as well as a ferrous material collection device including said rotation mechanism.

[0015] As shown in Figure 1, the rotation mechanism object of the present invention comprises:

- a fixed part (1), adapted to be coupled to lifting equipment (not shown in the figures),
- a mobile part (2), adapted to be coupled to a ferrous material collection device (as the one shown in Figure 2 or the one shown in Figure 3), said mobile part (2) being capable of rotating with respect to the fixed part (1) in a horizontal plane, that is, in a plane perpendicular to the longitudinal plane (1) of the rotation mechanism, and
- connection means (3), arranged between the fixed part (1) and the mobile part (2), which are configured to electrically connect first cables (4) of the fixed part (1) to second cables (5) of the mobile part (2).

[0016] The connection means (3) comprise a collector (3.1) and a connector (3.2) in permanent contact with the collector (3.1), so that an electrical connection between the first and second cables (4, 5) is ensured in any relative position between the fixed part (1) and the mobile part (2).

[0017] Likewise, the fixed part (1) comprises an upper section (1.1) and a lower section (1.2) integrally connected to each other through a tubular element (1.3), and for its part, the mobile part (2) it is traversed by the tubular element (1.3) so that said mobile part (2) is arranged between the upper section (1.1) and the lower section (1.2) of the fixed part (1), the mobile part (2) being able to rotate to one side or the other, in the horizontal plane, around the vertical axis (longitudinal plane (1)) of the rotation mechanism that forms the tubular element (1.3), while both upper and lower sections (1.1, 1.2) of the fixed part (1) remain immobile or static.

[0018] Preferably, the collector (3.1) is arranged in the lower section (1.2) of the fixed part (1), while the connector (3.2) is arranged at a lower end (2.1) of the mobile part (2), so that, in use, the connector (3.2) is configured to slide on the collector (3.1) during the rotation of the

mobile part (2) with respect to the fixed part (1). For example, the lower section (1.2) of the fixed part (1) could form a track-holder and the collector (3.1) could be respective copper tracks or rings, supported by the track-holder, in electrical connection with the first cables (4); for its part, the lower end (2.1) of the mobile part (2) could form at least one brush-holder, arranged facing the track-holder laterally, and the connector (3.2) could be respective brushes, supported by the brush-holder, in electrical connection with the second cables (5).

[0019] Preferably, the upper section (1.1) of the fixed part (1) is fastened from below to a flange (6) with lugs (6.1), for example, screwed to the flange (6), or using any other fastening means known to be suitable for carrying out said fastening between the two pieces or elements (1.1, 6). Said lugs (6.1) being adapted to be fastened to the hoisting equipment. While an upper end (2.2) of the mobile part (2) can be adapted to be fastened to the ferrous material collection device to which the rotation mechanism is coupled.

[0020] For their part, the first cables (4) could be two two-phase power supply cables, coming from an electric generator (not shown in the figures), and advantageously arranged inside the tubular element (1.3), so that they electrically connect the copper tracks or rings of the collector (3.1) to respective power supply outputs of said electric generator.

[0021] In relation to the second cables (5), these could be two connection cables to an electromagnet plate (7) of the ferrous material collection device to which the rotation mechanism is coupled, such as the one shown in Figure 2 or the one shown in Figure 3, so that said second cables (5) electrically connect the brushes of the connector (3.2) to respective power supply inputs of said electromagnet plate (7).

[0022] Thus, it is possible to achieve the rotation of the ferrous material collection device around its vertical axis, in order to facilitate the placement of the load, that is, the ferrous material objects that it transports. Where, the proposed rotation mechanism allows the continuity of the electrical supply to the electromagnet plate (7) of the device during its rotation to one side or the other, without there being any risk of the first and second cables (4, 5), which power the electromagnet plate (7), being cut and the load being detached.

[0023] For its part, as shown in Figure 2, a possible embodiment of the ferrous material collection device also object of the present invention, with the rotation mechanism described above, can be based on an electromagnet plate (7), which, in turn, can comprise a tubular upper projection (7.1) adapted to be fastened to the outside of the upper end (2.2) of the mobile part (2) of the rotation mechanism. In other words, as can be understood, in use, the rotation mechanism would be fitted inside the upper tubular projection (7.1), so that the latter abuts an upper stop (2.21) of said upper end (2.2) of the part mobile (2); and for fastening the upper tubular projection (7.1) of the electromagnet plate (7) to the upper end (2.2) of

said mobile part (2) any known fastening means which are suitable for carrying out said fastening between the two pieces or elements (2.2, 7.1) could be used.

[0024] In another possible embodiment of the ferrous material collection device, commonly known as a "polyp grab with electromagnet" and shown in Figure 3, further to the electromagnet plate (7), said device can comprise a plurality of radial blades (8) configured to pivot on an edge of the electromagnet plate (7), where, preferably, the radial blades (8) are actuated by hydraulic cylinders (9) arranged between each radial blade (3) and a central body (10) of the device.

[0025] Additionally, the central body (10) could comprise a plurality of pairs of radial platens (10.1), among which, the hydraulic cylinders (9) could be advantageously arranged, where upper ends (10.11) of the pairs of radial platens (10.1) are fastened to an upper cylindrical ring (11), which is adapted to be fastened to the outside of the upper end (2.2) of the mobile part (2) of the rotation mechanism. In other words, as can be understood, in use, the rotation mechanism would be arranged inside the central body (10), so that the upper cylindrical ring (11) abuts the upper stop (2.21) of said upper end (2.2) of the mobile part (2); where, for fastening said upper cylindrical ring (11) to the upper end (2.2) of the mobile part (2) any known fastening means which are suitable to carry out said fastening between the two pieces or elements (2.2, 11) could be used.

Claims

1. Rotation mechanism for ferrous material collection device, comprising:

- a fixed part (1), adapted to be coupled to lifting equipment,
- a mobile part (2), adapted to be coupled to a ferrous material collection device and capable of rotating with respect to the fixed part (1) in a horizontal plane, and
- connection means (3), arranged between the fixed part (1) and the mobile part (2), configured to electrically connect first cables (4) of the fixed part (1) to second cables (5) of the mobile part (2),

where, the connection means (3) comprise a collector (3.1) and a connector (3.2) in permanent contact with the collector (3.1), so that an electrical connection between the first and second cables (4, 5) is ensured in any relative position between the fixed part (1) and the mobile part (2),

characterised in that the fixed part (1) comprises an upper section (1.1) and a lower section (1.2) connected to each other through a tubular element (1.3), and the mobile part (2) is traversed by the tubular element (1.3) so that it is

arranged between the upper section (1.1) and the lower section (1.2) of the fixed part (1).

2. Mechanism according to claim 1, wherein the collector (3.1) is arranged in the lower section (1.2) of the fixed part (1), and the connector (3.2) is arranged at a lower end (2.1) of the mobile part (2), so that, in use, the connector (3.2) is configured to slide on the collector (3.1) during a rotation of the mobile part (2) with respect to the fixed part (1).
3. Mechanism according to claim 2, wherein the collector (3.1) are copper rings in electrical connection with the first cables (4) and the connector (3.2) are brushes in electrical connection with the second cables (5).
4. Mechanism according to claims 1 or 3, wherein the first cables (4) are two two-phase power supply cables and are arranged inside the tubular element (1.3).
5. Mechanism according to claims 1 or 3, wherein the second cables (5) are two connection cables to an electromagnet plate (7) of the ferrous material collection device.
6. Mechanism according to claim 1, wherein the upper section (1.1) of the fixed part (1) is fastened from below to a flange (6) with lugs (6.1) adapted to be fastened to the hoisting equipment.
7. Mechanism according to claim 1, wherein an upper end (2.2) of the mobile part (2) is adapted to be fastened to the ferrous material collection device.
8. Ferrous material collection device, **characterised in that** it comprises a rotation mechanism according to any of the preceding claims.
9. Device according to claim 8, comprising an electromagnet plate (7).
10. Device according to claim 9, wherein the electromagnet plate (7) comprises an upper tubular projection (7.1) adapted to be fastened to the outside of an upper end (2.2) of a mobile part (2) of the rotation mechanism.
11. Device according to claim 9, comprising a plurality of radial blades (8) configured to pivot on an edge of the electromagnet plate (7), where the radial blades (8) are actuated by hydraulic cylinders (9) arranged between each radial blade (3) and a central body (10) of the device.
12. Device according to claim 11, wherein the central body (10) comprises a plurality of pairs of radial platens (10.1) with upper ends (10.11) that are fastened

to an upper cylindrical ring (11) adapted to be fastened to the outside of an upper end (2.2) of a mobile part (2) of the rotation mechanism.

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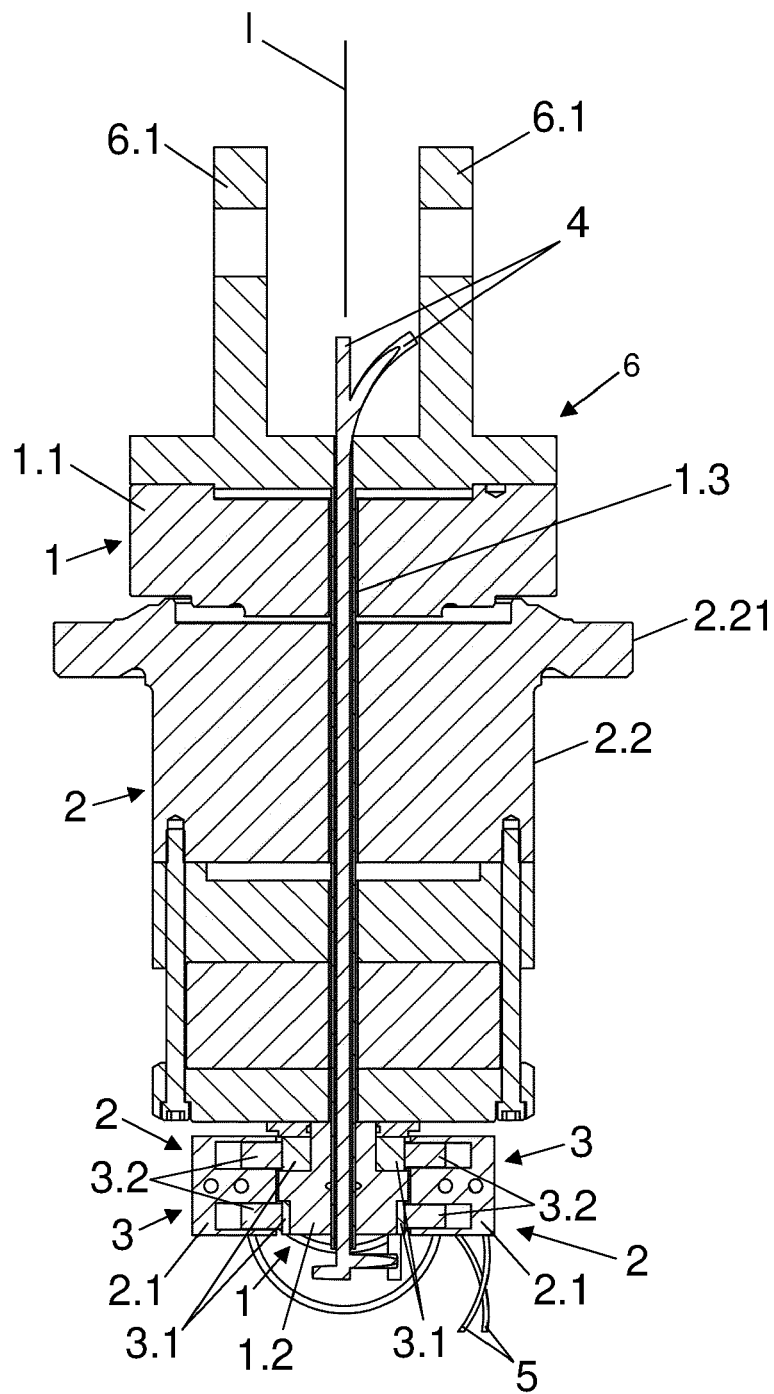


Fig. 1

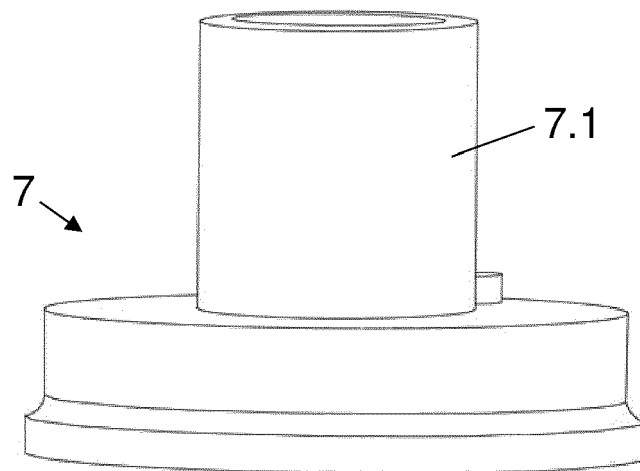


Fig. 2

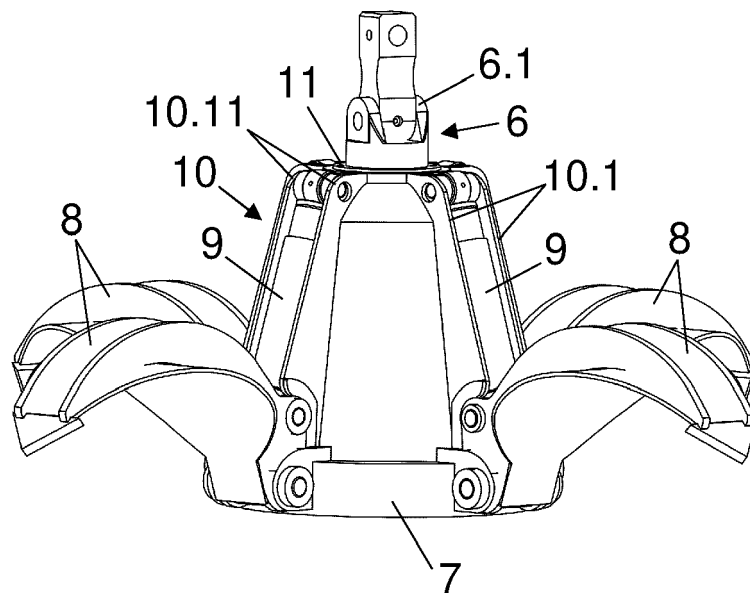


Fig. 3



EUROPEAN SEARCH REPORT

Application Number

EP 23 38 2245

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EPO FORM 1503 03.82 (P04C01)

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	US 7 311 489 B2 (KOMATSU FOREST AB [SE]) 25 December 2007 (2007-12-25)	1-8	INV. B66C1/06 B66C3/00 B66C3/04
Y	* abstract * * column 4, line 55 - column 6, line 51 * * figures *	9-12	
Y	----- EP 2 974 991 A1 (FERNIE S L [ES]) 20 January 2016 (2016-01-20)	9-12	
A	* abstract * * paragraph [0016] - paragraph [0029] * * figures *	1, 8	
A, D	----- DE 20 2012 100579 U1 (TSAI CHING HUI [TW]) 16 March 2012 (2012-03-16) * abstract * * figures *	1, 8	
A, D	----- US 6 168 219 B1 (FUTA DAVID [US]) 2 January 2001 (2001-01-02) * abstract * * figures *	1, 8	TECHNICAL FIELDS SEARCHED (IPC)
			B66C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 July 2023	Examiner Sheppard, Bruce
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	

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ON EUROPEAN PATENT APPLICATION NO.**

EP 23 38 2245

5

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 7311489	B2	25-12-2007	AT 494255 T	15-01-2011
			AU 2002367304 A1	24-07-2003
			CA 2468097 A1	17-07-2003
			EP 1448471 A1	25-08-2004
			US 2005017528 A1	27-01-2005
			WO 03057615 A1	17-07-2003

EP 2974991	A1	20-01-2016	EP 2974991 A1	20-01-2016
			ES 2658767 T3	12-03-2018

DE 202012100579	U1	16-03-2012	DE 202012100579 U1	16-03-2012
			FR 2979564 A3	08-03-2013
			GB 2494221 A	06-03-2013
			JP 3173182 U	26-01-2012
			TW M418911 U	21-12-2011
			US 2013057001 A1	07-03-2013

US 6168219	B1	02-01-2001	US 6168219 B1	02-01-2001
			US 2001015560 A1	23-08-2001

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 202012100579 [0004]
- US 6168219 B [0005]