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(54) **Device for collecting ferrous materials**

Vorrichtung zur Sammlung eisenhaltiger Materialien

Dispositif de collecte de matériaux ferreux

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## Description

### TECHNICAL SCOPE OF THE INVENTION

[0001] The present invention relates to the field of devices or tools for collecting ferrous materials coupled to the hook of lifting equipment such as cranes, cranes on vehicles, travelling cranes, winches, capstans, hoists, etc.

### BACKGROUND TO THE INVENTION

[0002] Various devices or tools which are coupled to lifting equipment for selective handling of objects of ferrous materials are known.

[0003] These devices commonly have an arm for clamping to the lifting equipment fixed to an electromagnetic plate which may incorporate a plurality of auxiliary articulated arms in the form of radial blades for clamping, during lifting and transport, the ferromagnetic material previously attracted by the electromagnetic plate. The radial blades are actuated by hydraulic cylinders.

[0004] For example, German utility model No. 20 2012 100579 discloses a gripping device comprises a base, claws, cylinders, and an electrical-operated magnetic disk. 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 operation machine. Each claw is pivotally coupled to a first location of a vertical plate of the base. Each cylinder is pivotally coupled to one of the claws. When the claws hold together, an accommodating space can be defined, in which the electrical-operated magnetic disk is mounted. Thereby, large pieces of metal can be gripped by the claws, whereas small pieces of iron can be picked up by the electrical-operated magnetic disk, so that one machine employing the gripping device can take large pieces of metal and small pieces of iron.

[0005] U.S. Patent No. 6,168,219 discloses a grapple includes a ferrous body with a plurality of tines pivotally connected thereto. A magnetic coil is disposed within the ferrous body. When the magnetic coil is energized, it creates a magnetic field within the area defined by the tines. The tines are also magnetized by the field. Additional magnetic coils may be added to one or more of the tines.

[0006] These tools for collecting ferrous metals of prior art may also include a rotary mechanism that enables said tool to rotate about its vertical axis, thereby facilitating the positioning of the load, i.e. the objects of ferrous materials it transports.

[0007] However, these rotary mechanisms are normally coupled to the upper part of the clamping arm of the tool, which substantially increases its total height, thereby impeding the handling of said tool.

[0008] The applicant knows of no solution, in the state of the art, which resolves the problems previously described and which, in turn, displays features similar to those displayed by the invention advocated here.

### DESCRIPTION OF THE INVENTION

[0009] The present invention is established and characterised in the independent claims, whilst the dependent claims describe other features of the same.

[0010] In the light of the above, the present invention refers to a device for collecting ferrous materials such as those which are coupled to lifting equipment.

[0011] The device comprises a central body fixed to an electromagnetic plate. A plurality of radial blades actuated by several hydraulic cylinders pivots on the edge of the electromagnetic plate, the cylinders being arranged between each radial blade and the central body.

[0012] For its part the central body is fixed to a rotary mechanism suitable for rotating the device about the vertical axis of the hook of lifting equipment.

[0013] Similarly, the central body comprises a plurality of pairs of radial flanges between which are arranged the hydraulic cylinders. That is to say, two flanges for each hydraulic cylinder comprising the device and arranged on both sides of each hydraulic cylinder and orientated radially relative to the electromagnetic plate.

[0014] For their part, the upper ends of the pairs of radial flanges are fixed to an upper cylindrical ring for coupling to the rotary mechanism, and lower ends of the pairs of radial flanges are fixed to the upper face of the electromagnetic plate, the rotary mechanism being arranged on the inside of the central body.

[0015] This enables the rotary mechanism to be incorporated in the device, thus facilitating the positioning of the loads without this increasing the height of the device, which in turn facilitates their handling.

### BRIEF DESCRIPTION OF THE FIGURES

[0016] The present specification is supplemented by a set of figures illustrating the preferred embodiment and never exhausting the scope of the invention.

Figure 1 shows a partial exploded perspective view of the device for collecting ferrous materials, with the radial blades in the closed position.

Figure 2 shows a perspective view of the device in Figure 1, with the radial blades in the open position.

### DETAILED EXPLANATION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0017] The present invention is a device for collecting ferrous materials such as those coupled to lifting equipment.

[0018] As shown in Figures 1 and 2, the device comprises a central body (1) fixed to an electromagnetic plate (2). A plurality of radial blades (3), actuated by several hydraulic cylinders (4) arranged between each radial blade (3) and the central body (1) pivots on the edge of the electromagnetic plate (2).

**[0019]** For its part the central body (1) is fixed to a rotary mechanism (5) capable of rotating the device about the vertical axis of the hook of lifting equipment (not shown in the figures).

**[0020]** The central body (1) comprises a plurality of pairs of radial flanges (1.1) between which are arranged the hydraulic cylinders (4). That is to say a pair of radial flanges (1.1) is arranged through each hydraulic cylinder (4) incorporated in the device. Said radial flanges (1.1) are orientated in the radial direction relative to the electromagnetic plate (2) on both sides of the hydraulic cylinders (4), acting as lateral protection for the same.

**[0021]** Similarly, the upper ends (1.11) of the pairs of radial flanges (1.1) are fixed to an upper cylindrical ring (1.2) for coupling to the rotary mechanism (5). The upper ends (1.11) of the pairs of the flanges (1.1) are preferably fixed to the upper cylindrical ring (1.2) by means of lugs (1.21), and a pin (1.22) of said upper cylindrical ring (1.2).

**[0022]** Similarly, it is preferable for the upper ends (1.11) of the pairs of radial flanges (1.1) to form upper clamping projections (1.4) of the hydraulic cylinders (4) to the central body (1). Thus the pin (1.22) is also used to fix in an articulated manner the upper end of the hydraulic cylinders (4) both between the radial flanges (1.1) and the lugs (1.21) of the upper cylindrical ring (1.2).

**[0023]** On the other hand, the lower ends (1.12) of the pairs of radial flanges (1.1) are fixed to the upper face of the electromagnetic plate (2), the rotary mechanism (5) being arranged in the interior of the central body (1). That is to say, the radial flanges (1.1) between the upper cylindrical ring (1.2) and the electromagnetic plate (2) form an interior space which accommodates the rotary mechanism (5). Between the upper (1.11) and lower ends (1.12) the radial flanges (1.1) may comprise an internal central slot (1.13) which increases the interior space of the central body (1).

**[0024]** This avoids having to arrange the rotary mechanism (5) above the central body (1) which has been arranged in the interior of said central body (1), thus avoiding increasing the total height of the device and facilitating its handling.

**[0025]** For example, the rotary mechanism (5) may comprise a hydraulic rotor (5.1) which is fixed to the upper cylindrical ring (1.2) of the central body (1) by means of a clamping flange (5.2).

**[0026]** In addition, the rotary mechanism (5) may comprise an electric collector (5.3) which guarantees the continuity of electricity supply to the electromagnetic plate (2) during its 360° rotation both in one direction and the other. In other words, the device can be rotated to one side or the other without any risks that the cables supplying the electromagnetic plate may be shortened and the load may become detached.

**[0027]** Other elements required for both supplying the electromagnetic plate (2) electrically, and the rotor (5.1) and the hydraulic cylinders (4) hydraulically, may also be arranged in the interior of the central body (1), for example a central tube (6) through the interior of which are

channelled the hoses of the hydraulic system (not shown in the figures) to the rotor (5.1), a distributor (7) which supplies the oil-hydraulic fluid to each of the hydraulic cylinders (4), the electric cables from the collector (5.3) to the electromagnetic plate (2), etc.

**[0028]** To ensure that the interior of the central body (1) is not exposed to external damage it is preferable that said central body (1) comprises removable housing plates (1.6) arranged between the pairs of radial flanges (1.1), thus covering and protecting the interior of the central body (1). Said housing plates (1.6) can be removed from the device so that maintenance or repair work can be carried out on the elements housed in the interior space of the central body (1).

**[0029]** On the other hand it is preferable for the lower ends (1.12) of the pairs of radial flanges (1.1) to form external vertical slots (1.5) which act as a stop for several lower clamping projections (3.1) of the hydraulic cylinders (4) to the radial blades (3). The lower end of the hydraulic cylinders (4) should preferably be fixed to the projections (3.1) of the radial blades (3) by means of a second pin (3.2).

**[0030]** In addition it is preferable for the external vertical slots (1.5) to comprise several reinforcing parts (1.6) for the stop of the lower clamping projections (3.1). These reinforcing parts (1.6) may be fixed, for example, to the outside of the vertical slots (1.5), thus increasing the area of contact of the edge of the slots (1.5) as a stop for the lower clamping projections (3.1) when the radial blades (3) are in their most open position, see Figure 2.

**[0031]** Similarly, it is preferable for the hydraulic cylinders (4) to comprise an external protection formed by a removable tube (4.1). The removable tube (4.1) is arranged in the lower portion of the hydraulic cylinders (4), thus protecting their stems when the radial blades (3) are in their most closed position, see Figure 1.

## Claims

1. A device for collecting ferrous materials, which comprises a central body (1) fixed to an electromagnetic plate (2), wherein a plurality of radial blades (3) actuated by several hydraulic cylinders (4) arranged between each radial blade (3) and the central body (1) pivots on the edge of the electromagnetic plate (2) and wherein the central body (1) is fixed to a rotary mechanism (5) capable of rotating the device about the vertical axis of the hook of lifting equipment, **characterised in that** the central body (1) comprises a plurality of pairs of radial flanges (1.1) between which are arranged the hydraulic cylinders (4), wherein upper ends (1.11) of the pairs of radial flanges (1.1) are fixed to an upper cylindrical ring (1.2) for coupling to the rotary mechanism (5), and lower ends (1.12) of the pairs of radial flanges (1.1) are fixed to the upper face of the electromagnetic plate (2), the rotary mechanism (5) being arranged

in the interior of the central body (1).

2. The device according to Claim 1, wherein the upper ends (1.11) of the pairs of radial flanges (1.1) form upper clamping projections (1.4) of the hydraulic cylinders (4) to the central body (1).
3. The device according to Claim 1, wherein the lower ends (1.12) of the pairs of flanges (1.1) form external vertical slots (1.1) which act as a stop for several lower clamping projections (3.1) of the hydraulic cylinders (4) to the radial blades (3).
4. The device according to Claim 3, wherein the external vertical slots (1.5) comprise several reinforcing parts (1.6) for the stop of the lower clamping projections (3.1).
5. The device according to Claim 1, wherein the rotary mechanism (5) comprises a hydraulic rotor (5.1) which is fixed to the upper cylindrical ring (1.2) of the central body (1) by means of a clamping flange (5.2).
6. The device according to Claims 1 or 5, wherein the rotary mechanism (5) comprises an electric collector (5.3) which guarantees the continuity of the electricity supply to the electromagnetic plate (2) during its 360° rotation both in one direction and the other.
7. The device according to Claim 1, wherein the central body (1) comprises removable housing plates (1.6) arranged between the pairs of radial flanges (1.1), thereby covering and protecting the interior of the central body (1).
8. The device according to Claim 1, wherein the hydraulic cylinders (4) comprise an external protection formed by a removable tube (4.1).

#### Patentansprüche

1. Vorrichtung zum Sammeln von Eisenwerkstoffen, die einen an einer elektromagnetischen Platte (2) befestigten Zentralkörper (1) umfasst, wobei eine Vielzahl von radialen Schaufeln (3), die von mehreren zwischen jeder radialen Schaufel (3) und dem Zentralkörper (1) angeordneten Hydraulikzylindern (4) betätigt wird, an der Kante der elektromagnetischen Platte (2) verschwenkt, und wobei der Zentralkörper (1) an einem Drehmechanismus (5) befestigt ist, der in der Lage ist, die Vorrichtung um die vertikale Achse des Aufhängers der Hebeeinrichtung zu drehen, **dadurch gekennzeichnet, dass** der Zentralkörper (1) eine Vielzahl von Paaren von radialen Flanschen (1.1) aufweist, zwischen denen die Hydraulikzylinder (4) angeordnet sind, wobei obere Enden (1.11) der Paare von radialen Flanschen (1.1) an einem oberen zylindrischen Ring (1.2) zum Ankoppeln an den Drehmechanismus (5) befestigt sind, und untere Enden (1.12) der Paare von radialen Flanschen (1.1) an der Oberseite der elektromagnetischen Platte (2) befestigt sind, wobei der Drehmechanismus (5) im Inneren des Zentralkörpers (1) angeordnet ist.

2. Vorrichtung nach Anspruch 1, wobei die oberen Enden (1.11) der Paare von radialen Flanschen (1.1) obere Klemmvorsprünge (1.4) der Hydraulikzylinder (4) zu dem Zentralkörper (1) bilden.

3. Vorrichtung nach Anspruch 1, wobei die unteren Enden (1.12) der Paare von Flanschen (1.1) äußere vertikale Schlitze (1.1) bilden, die als Anschlag für die mehreren unteren Klemmvorsprünge (3.1) des Hydraulikzylinders (4) zu den radialen Schaufeln (3) wirken.

4. Vorrichtung nach Anspruch 3, wobei die äußeren vertikalen Schlitze (1.5) mehrere Verstärkungsteile (1.6) für den Anschlag der unteren Klemmvorsprünge (3.1) umfassen.

5. Vorrichtung nach Anspruch 1, wobei der Drehmechanismus (5) einen Hydraulikrotor (5.1) umfasst, der mittels eines Klemmflansches (5.2) an dem oberen zylindrischen Ring (1.2) des Zentralkörpers (1) befestigt ist.

6. Vorrichtung nach Anspruch 1 oder 5, wobei der Drehmechanismus (5) einen elektrischen Kollektor (5.3) umfasst, der die Kontinuität der Elektrizitätsversorgung an die elektromagnetische Platte (2) während ihrer 360°-Drehung sowohl in einer Richtung als auch in der anderen gewährleistet.

7. Vorrichtung nach Anspruch 1, wobei der Zentralkörper (1) zwischen den Paaren von radialen Flanschen (1.1) angeordnete abnehmbare Gehäuseplatten (1.6) umfasst, wodurch das Innere des Zentralkörpers (1) abgedeckt und geschützt wird.

8. Vorrichtung nach Anspruch 1, wobei die Hydraulikzylinder (4) einen äußeren Schutz umfassen, der durch ein abnehmbares Rohr (4.1) gebildet ist.

#### Revendications

1. Dispositif destiné à collecter des matériaux ferreux, qui comprend un corps central (1) fixé à une plaque électromagnétique (2), dans lequel une pluralité de pales radiales (3) actionnées par plusieurs cylindres hydrauliques (4) agencés entre chaque pale radiale (3) et le corps central (1) pivote sur le bord de la plaque électromagnétique (2) et dans lequel le corps

central (1) est fixé à un mécanisme rotatif (5) susceptible de faire tourner le dispositif autour de l'axe vertical du crochet de l'équipement de levage, **caractérisé en ce que** le corps central (1) comprend une pluralité de paires de brides radiales (1.1) entre lesquelles sont agencés les cylindres hydrauliques (4), des extrémités supérieures (1.11) des paires de brides radiales (1.1) étant fixées à un anneau cylindrique supérieur (1.2) pour un accouplement au mécanisme rotatif (5), et des extrémités inférieures (1.12) des paires de brides radiales (1.1) étant fixées à la face supérieure de la plaque électromagnétique (2), le mécanisme rotatif (5) étant agencé à l'intérieur du corps central (1).

2. Dispositif selon la revendication 1, dans lequel les extrémités supérieures (1.11) des paires de brides radiales (1.1) forment des saillies supérieures de serrage (1.4) des cylindres hydrauliques (4) vers le corps central (1).

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3. Dispositif selon la revendication 1, dans lequel les extrémités inférieures (1.12) des paires de brides (1.1) forment des fentes verticales externes (1.1) qui font office de butée pour plusieurs saillies inférieures de serrage (3.1) des cylindres hydrauliques (4) vers les pales radiales (3).

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4. Dispositif selon la revendication 3, dans lequel les fentes verticales externes (1.5) comprennent plusieurs parties de renforcement (1.6) pour la butée des saillies inférieures de serrage (3.1).

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5. Dispositif selon la revendication 1, dans lequel le mécanisme rotatif (5) comprend un rotor hydraulique (5.1) qui est fixé à l'anneau cylindrique supérieur (1.2) du corps central (1) au moyen d'une bride de serrage (5.2).

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6. Dispositif selon les revendications 1 ou 5, dans lequel le mécanisme rotatif (5) comprend un collecteur électrique (5.3) qui garantit la continuité de l'alimentation électrique vers la plaque électromagnétique (2) pendant sa rotation à 360° dans une direction et dans l'autre.

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7. Dispositif selon la revendication 1, dans lequel le corps central (1) comprend des plaques de logement amovibles (1.6) agencées entre les paires de brides radiales (1.1), ce qui permet de recouvrir et de protéger l'intérieur du corps central (1).

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8. Dispositif selon la revendication 1, dans lequel les cylindres hydrauliques (4) comprennent une protection externe formée par un tube amovible (4.1).

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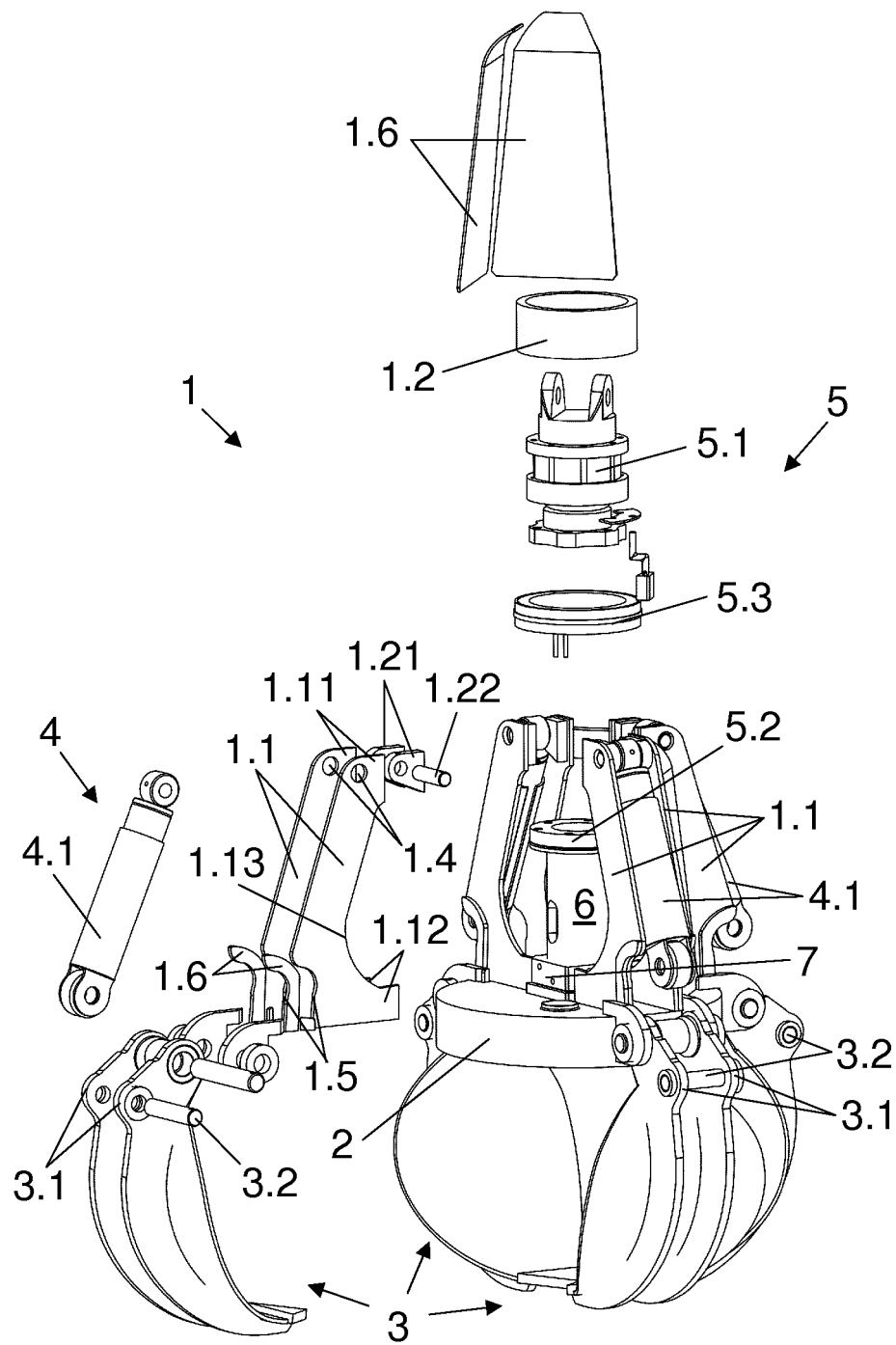


**Fig.1**

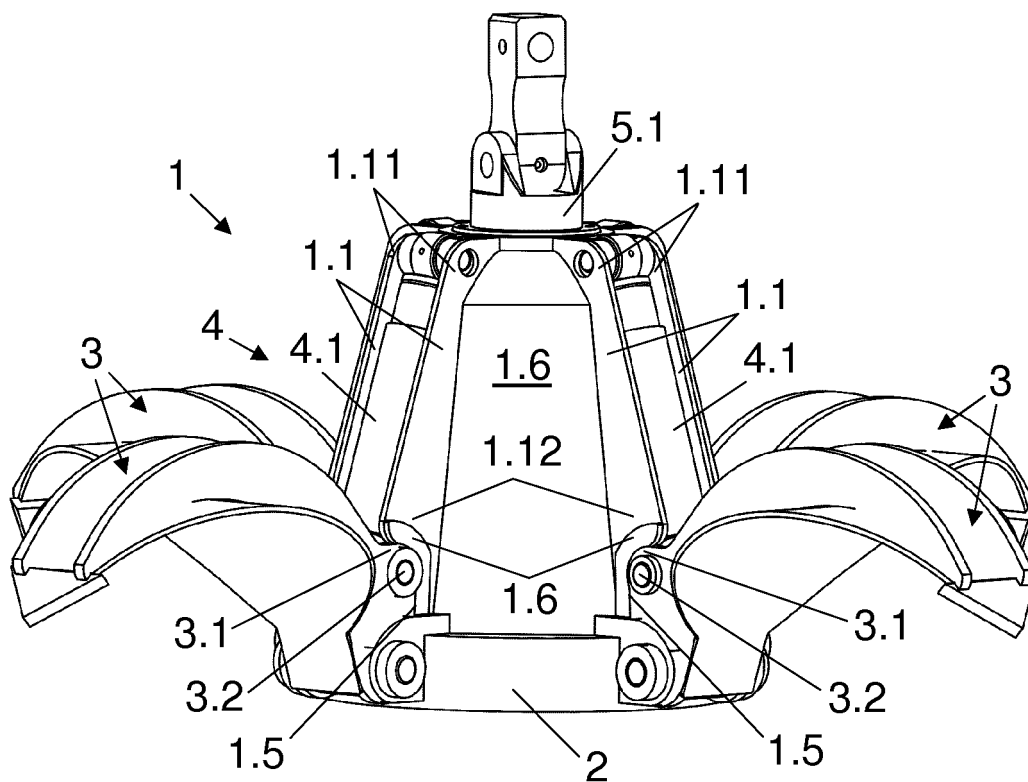


**Fig.2**

**REFERENCES CITED IN THE DESCRIPTION**

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