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(54) APPARATUS AND METHOD FOR OVERTURNING COILS

VORRICHTUNG UND VERFAHREN ZUM ÜBERDREHEN VON SPULEN

APPAREIL ET PROCÉDÉ POUR RETOURNER DES BOBINES

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EP-A2- 0 180 814
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Description

Technical Field

[0001] The present invention concerns an apparatus for overturning coils.

Background art

[0002] It has been known that apparatuses for handling coils, for example of metal wire wound in rolls, for being worked and making in such way and in particular metallic structures of reinforcement for building industry, are currently used.

[0003] Usually some kinds of coils are transported to the building sites, or in sites anyway prearranged for their manufacturing, in suitable transport vehicles, on which they are arranged with their winding/unwinding axis oriented in horizontal way. On the contrary in the building sites the coils are usually unwound for making semi-processed products required by production needs, for example bars or similar products. Apparatuses for unwinding coils, arranged upstream to further apparatuses for example for cutting and folding the unwound metal wires, are currently known as well.

[0004] Unwinding apparatuses usually comprise a control pin vertically arranged, around which each coil is inserted for performing its unwinding. Handling of coils, in particular handling performed in different zones of the production line, as well as the overturning from the horizontal axis configuration, for transport, to the vertical configuration, for unwinding, is really dangerous, because of the weight of the same coil, as well as because of the space required by the overturning operation and inserting operation in the correspondent unwinding apparatus of the production line.

[0005] Known solutions, such as racks and hooks or vehicles equipped with mobile planes do not solve the cited problems in a satisfying way.

[0006] Patent application no. WO-A-90/15675 discloses a method and arrangement for handling a coil of metal packing wire, whereby a heavy coil of metal wire is transported in a horizontal attitude with the help of a lifting arrangement to an arrangement which has a central upright capable of being pivoted between a horizontal and a vertical end position. The coil is placed on the horizontal upright, and a reeling-off crown is also pushed onto the upright, whereupon the upright is pivoted up into its vertical working position for the reeling off of the wire from the coil. Nevertheless, the mentioned solution is not able to effectively overcome the aforesaid drawbacks.

Disclosure

[0007] The task of the present invention is that of solving the cited problems, devising an apparatus which allows to efficiently overturning coils for example of metallic wire.

[0008] Within such task, is a further scope of the present invention that of providing an apparatus which allows to perform the overturning of coils in a manner so as to optimize the production cycle.

[0009] A further scope of the invention is that of providing an apparatus which can be placed on already existing production lines.

[0010] A further scope of the invention is that of providing an apparatus for overturning coils of simple conception, with a securely reliable functioning and versatile use, as well as relatively economic cost.

[0011] Cited scopes are attained, according to the present invention, by the apparatus for overturning coils according to claim 1.

[0012] According to the invention, the apparatus comprises a carrying framework and a support structure articulated to the carrying framework according to a tilting axis substantially horizontal, the support structure comprising a first support plane and a second support plane substantially reciprocally orthogonal. The tilting structure comprises as well centering means, for example a pin substantially orthogonal to the cited first support plane, for centering and inserting inside a hollow pin of a bell-shaped reel support.

[0013] Thanks to the presence of such centering pin, the apparatus is suitable to perform the overturning of coils already inserted in respective bell-shaped reel supports, which are therefore already oriented and prearranged for the unwinding.

[0014] According to a preferred embodiment, the apparatus carries the insertion pin of a bell-shaped reel support in a removable way. Such solution makes the embodiment particularly versatile because it combines the possibility of overturning on the tilting support also coils without reel support.

[0015] Moreover it is important to notice that the apparatus can be made self-sufficient from the energetic point of view. As a matter of facts the overturning of the tilting structure can occur as a consequence of the same weight of the bell-shaped support reel and of the coil to be overturned, while the return stroke can be actuated by actuator members, elastic or pneumatic means suitably preset, previously loaded by the overturning active stroke.

[0016] Finally, a solution is particularly advantageous according which the carrying framework is provided for each working apparatus of the plant and, providing the use of coupling means rotatable between the centering means of the bell-shaped support and the tilting structure, it also provides the function of unwinding.

[0017] As an alternative, the apparatus can be displaced for reaching different operative sites placed in the production plant, through suitable transport means.

[0018] An important feature of the apparatus according to the invention consists in the fact that the tilting structure is preferably articulated to the top of the carrying framework. It allows the overturning of the bell-shaped reel supports and/or of the coils inside the space of the same apparatus, minimizing in such way the required manoeu-

vring distance. In particular, providing to articulate the tilting structure at the second support surface suitable to abut the lateral surface of the coil to be overturned, the loading of the overturning apparatus, with the second support surface substantially horizontal, can be made by placing the transport vehicle of the coil at the side of the uprights of the framework, instead of frontally to the base of the framework. It allows to place the apparatus at a minimum distance from the surrounding walls and therefore to optimize the production spaces. Moreover the arrangement of the articulation at the top of the carrying framework allows to place the wires unwound by the coils at a height sufficient for a possible immediate use, without interfering with other parts of the apparatus.

Brief description of drawings.

[0019] The details of the invention shall be more apparent from the detailed description of a preferred embodiment of the apparatus for unwinding coils, illustrated for indicative purposes in the attached drawings, wherein:

[0020] figures 1 and 2 show respectively a perspective exploded and rear view of the apparatus according to the invention, equipped with a bell-shaped reel support;

[0021] figures 3 and 4 show respectively a front and lateral view of the same apparatus equipped with the cited device.

Best Mode

[0022] With particular reference to figures 1 to 4, the apparatus for overturning coils according to the invention is indicated in its entirety with 1. The apparatus 1 comprises a carrying framework 2, a tilting support structure 3, centering means 4 for a bell-shaped reel support 5. Actuator members 6 can be usefully provided as well, suitable to positively operate at least one stroke of the tilting motion of the tilting support structure 3, as better described hereafter.

[0023] The bell-shaped reel support 5 comprises a platform 50 preferably shaped by a plurality of rods arranged radially and orthogonally to a central pin 51 constrained to them through a plurality of arms 52. A coil to be unwound is suitable to be inserted around the central pin 51 of the bell-shaped reel support 5, supported by the plane shaped by the rods of the platform 50. The bell-shaped reel support 5 comprises as well a perimetrical containment enclosure 53, which extends from the rim of the circular platform 5.

[0024] The framework 2, which can be constrained to the floor in fixed way or in removable way, for being for example lifted, comprises a base 20, for example made by a couple of horizontal supports, and a wall 21, for example made by one or more vertically arranged uprights 21. On the top of the vertical uprights 21 a shaft 22 is rotatably constrained suitable to define the tilting axis of the tilting structure 3.

[0025] The tilting structure 3 shapes a structure at right angles suitable to define through respective shelves a first support surface 30 and a second support surface 31 for a coil to be overturned or for a bell-shaped reel support 5. Preferably the first support surface 30 of the tilting structure 3 comprises a couple of mobile arms, while the second support surface 31 preferably comprises a curved wall, with its concave surface turned towards the first support surface 30. The first support surface 30 is suitable to receive in support or in abutment the base of a coil to be overturned or the platform 50 of a bell-shaped reel support 5.

[0026] The second support surface 31 preferably comprises a curved wall suitable to receive in support or in abutment a correspondent curved wall of a coil to be overturned or the containment enclosure 53 of the bell-shaped reel support 5.

[0027] The tilting structure 3 is constrained rotatable about the shaft 22 preferably on the back of the second support surface 31, so that the tilting structure 3 is mobile alternatively between a loading configuration in which the first support surface 30 is substantially vertical abutting the base of a coil or of the platform base of a bell-shaped reel support 5 and an overturned configuration in which the first support surface 30 is substantially horizontal and receives in support the above mentioned base or the above mentioned platform 50.

[0028] The tilting structure 3 comprises as well centering means 4 for a bell-shaped reel support 5. Preferably the centering means 4 shapes a centering pin interposed between the mobile arms 31 and orthogonally oriented to them. The centering pin 4 is constrained to the tilting structure 3 preferably in removable manner. The centering pin 4 allows to insert inside the hollow pin 51 of the bell-shaped reel support 5, for the firm positioning of the reel supports 5 on the apparatus 1. In particular the centering means 4 can be constrained to the tilting structure 3 through the interposition of bearing coupling means, of the type of rolling bearings or fifth wheel, for enabling the apparatus 1 to provide the function of unwinding apparatus, as well as that of overturning of the coils.

[0029] Finally, the apparatus comprises actuator members 6 comprising for example a pneumatic or hydraulic storage actuator member, suitable to store the actuator fluid during the overturning stroke, operated by the force of gravity, and to positively operate the back stroke towards the load configuration of the coil or of the bell-shaped reel support 5. The actuator member 6 is articulated in suitable way between the framework 2 and the tilting structure 3.

[0030] The functioning of the apparatus for overturning coils is easy to understand from the preceding description.

[0031] In an initial step, the reel support 5 is centred on the apparatus 1 through the centering caused by the insertion of the same reel support around the pin 4 integral with the tilting structure 3, the first surface 30 being

in substantially horizontal position.

[0032] Subsequently, the tilting structure 3 is operated preferably by the force of gravity, overturning the reel support 5 in an overturned configuration in which the central pin 51 is horizontally arranged.

[0033] The coil to be unwound is transported, with its axis horizontal, to the loading position in which the apparatus 1 is arranged, and loaded on the bell-shaped reel support 5 overturned in horizontal position, for inserting around the fixing arms 52 which surround the central pin 51, and with the curved lateral surface of the coil substantially supported by the first support surface 31, preferably thickened according to the size of the coil.

[0034] Finally, the tilting structure 3 in overturned configuration, with the first operative surface 30 substantially vertical, is again turned, preferably by force of gravity, for returning to the initial position, in which the first support surface 30 receives in support the bell-shaped reel support 5 and the coil inserted in its inside.

[0035] In such final configuration the coil is oriented with vertical axis, therefore it is correctly prearranged for being drawn with suitable lifting means and inserted on the rotating base of an unwinding reel of an operative machine.

[0036] As an alternative to a fixed loading station for the coils of the reel supports 5, it is possible to provide, as mentioned before, that the provided overturning apparatuses are a plurality, arranged at the place of each unwinding reel provided in the production line, in which overturning and discharging suitably the coils already prearranged for the next manufacturing. In such case the centering means 4 are constrained to the tilting structure through the interposition of rolling means, for example of the type of the fifth wheel.

[0037] Finally, as an alternative, it is possible to provide for loading, overturning and discharging only the coils directly supported on the tilting structure 3, removing the pin 4 before starting the correspondent operative cycle.

[0038] The described apparatus attains the scope of performing the overturning of the coils in an efficient way, in particular coils of metallic wire.

[0039] The apparatus, together with the previous disclosed advantages, has the further advantage of reducing the amount of space required for loading and discharging the coils, therefore allowing an overturning of the coils which minimizes the spaces required by the apparatus. More precisely the articulation of the tilting structure to the top of the uprights of the carrying framework allows an overturning rotation of the coil which occurs substantially inside the space of the apparatus. Moreover, the articulation of the tilting structure at the second support surface, suitable to abut the lateral surface of the coil, allows to access the apparatus, for the loading, from the uprights side, decreasing the minimum distance from the walls required for the installation of the apparatus.

[0040] In practice, the embodiment of the invention, the materials used, as well as the shape and dimensions, may vary depending on the requirements.

[0041] Should the technical characteristics mentioned in each claim be followed by reference signs, such reference signs were included strictly with the aim of enhancing the understanding the claims and hence they shall not be deemed restrictive in any manner whatsoever on the scope of each element identified for exemplifying purposes by such reference signs.

Claims

1. Apparatus for overturning coils comprising a carrying framework (2), a tilting support structure (3) articulated to said carrying framework (2) according to a substantially horizontal tilting axis, **characterized in that** said tilting support structure (3) is defined by a first support surface (30) and by a second support surface (31), said first support surface (30) and said second support surface (31) being arranged substantially orthogonal, and **in that** it comprises centring means (4) for centring and inserting inside a hollow pin of a bell-shaped reel support (5) supported on and/or contrasting against said first support surface (30), said support structure (3) being adapted to tilt about said tilting axis between a load configuration, wherein said first support surface (30) is substantially vertical and an overturned operating configuration wherein said first support surface (30) is substantially horizontal.

2. Apparatus according to claim 1, **characterized in that** said centring means (4) comprise an insertion pin for said bell-shaped reel support (5), constrained to said first support surface (30) and having an axis substantially orthogonal to said first support surface (30).

3. Apparatus according to claim 2, **characterized in that** said centring pin (4) is constrained to said first support surface (30) in a removable way.

4. Apparatus according to claim 2 or 3, **characterized in that** said centring pin (4) is constrained to said first support surface (30) through the interposition of bearing means.

5. Apparatus according to claim 3 or 4, **characterized in that** said framework (2) comprises a base (20) and one or more uprights (21), said tilting support structure (3) being constrained rotatable to said framework (2) at the top of said uprights (21).

6. Apparatus according to claim 4, **characterized in that** said framework (2) can be displaced.

7. Apparatus according to one of the previous claims, **characterized in that** it comprises an actuator member (6) articulated respectively to said framework (2)

and to said tilting structure (3), suitable to accumulate energy during said overturning, actuated by the force of gravity, and to actuate positively the return stroke to said load configuration.

8. Method for overturning coils comprising the steps of:

a. prearranging a coil in transport configuration with horizontal axis at a load and overturn station;
b. prearranging a bell-shaped reel support (5) with central unwinding axis oriented vertically;
c. prearranging a tilting structure (3) provided with a first support surface (30) in horizontal position and with a second support surface (31) in vertical contrasting position;
d. transferring said bell-shaped reel support (5) on said tilting structure (3), operating the centring thereof through centring means (4) constrained to said first support surface (30);
e. operating the overturning of said tilting structure (3) carrying said bell-shaped support (5) centred on said centring means (4), until an overturned configuration wherein said bell-shaped support (5) has a central unwinding axis substantially horizontal;
f. inserting said coil prearranged with horizontal axis about the unwinding axis of said overturned bell-shaped support (5);
g. operating the return tilting of said tilting structure (3) carrying said coil inserted in said bell-shaped support (5), in an operating configuration wherein said coil and said bell have respective unwinding axis arranged vertically.

Patentansprüche

1. Vorrichtung zum Kippen von Spulen, ein tragendes Gestell (2) und eine Neigestützstruktur (3) umfassend, die entsprechend einer im Wesentlichen horizontalen Neigungsachse an das tragende Gestell (2) angelenkt ist, **dadurch gekennzeichnet, dass** die Neigestützstruktur (3) durch eine erste Neigestützstrukturfläche (30) und eine zweite Neigestützstrukturfläche (31) definiert ist, wobei die erste Stützfläche (30) und die zweite Stützfläche (31) im Wesentlichen rechtwinklig angeordnet sind, und dadurch, dass sie Zentrierungsmittel (4) zum Zentrieren und Einsetzen in das Innere eines Hohlstiftes einer glockenförmigen Spulenkörperabstützung (5) umfasst, die auf der ersten Stützfläche (30) gestützt und/oder gegen diese gesetzt wird, wobei die Stützstruktur (3) dafür eingerichtet ist, sich zwischen einer Lastanordnung, in der die erste Stützfläche (30) im Wesentlichen vertikal liegt, und einer gekippten Betriebsanordnung, in der die erste Stützfläche (30) im Wesentlichen horizontal liegt, um die Neigungsachse zu neigen.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Zentrierungsmittel (4) einen Einsetzstift für die glockenförmige Spulenkörperabstützung (5) umfassen, der von der ersten Stützfläche (30) gehalten wird und eine Achse aufweist, die im Wesentlichen rechtwinklig zur ersten Stützfläche (30) liegt.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** der Zentrierungsstift (4) in einer abnehmbaren Weise von der ersten Stützfläche (30) gehalten wird.

4. Vorrichtung nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** der Zentrierungsstift (4) durch Einfügen von Lagermitteln von der ersten Stützfläche (30) gehalten wird.

5. Vorrichtung nach Anspruch 3 oder 4, **dadurch gekennzeichnet, dass** das Gestell (2) eine Basis (20) und einen oder mehrere Pfosten (21) umfasst, wobei die Neigestützstruktur (3) drehbar an der Oberseite der Pfosten am Gestell (2) gehalten wird.

6. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** das Gestell (2) versetzt werden kann.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie ein Betätigungselement (6) umfasst, das am Gestell (2) beziehungsweise an der Neigestruktur (3) angelenkt ist, und geeignet ist, während des Kippens Energie zu speichern, die durch Schwerkraft aktiviert wird, und positiv den Rückkehrtakt der Lastanordnung zu betätigen.

8. Verfahren zum Kippen von Spulen, folgende Schritte umfassend:

(a). vorheriges Anordnen einer Spule in Transportanordnung mit horizontaler Achse an einer Lade- und Kippstation,
(b) vorheriges Anordnen einer glockenförmigen Spulenkörperabstützung (5) mit zentraler, vertikal ausgerichteter Abwickelachse,
(c). vorheriges Anordnen einer Neigestruktur (3), die mit einer ersten Stützfläche (30) in horizontaler Position und mit einer zweiten Stützfläche (31) in vertikaler, dagegengesetzter Position versehen ist,
(d). Überführen der glockenförmigen Spulenkörperabstützung (5) auf die Neigestruktur (3), Betreiben von deren Zentrierung durch Zentrierungsmittel (4), die von der ersten Stützfläche (30) gehalten werden,
(e). Betreiben des Kippens der Neigestruktur (3), welche die auf den Zentrierungsmitteln (4)

zentrierte glockenförmige Spulenkörperabstützung (5) trägt, bis zu einer gekippten Anordnung, wobei die glockenförmige Abstützung (5) eine im Wesentlichen horizontale zentrale Abwickelachse aufweist,
(f). Setzen der Spule, die mit horizontaler Achse vorher angeordnet wurde, auf die Abwickelachse der gekippten glockenförmigen Abstützung (5),
(g). Betreiben des Zurückneigens der Neigestruktur (3), welche die in die glockenförmige Abstützung (5) eingesetzte Spule trägt, in eine Betriebsanordnung, wobei die Spule und die Glocke jeweils eine vertikal angeordnete Abwickelachse aufweisen.

Revendications

1. Appareil pour retourner des bobines comprenant un cadre porteur (2), une structure de support basculante (3) articulée sur ledit cadre porteur (2) avec un axe de basculement sensiblement horizontal, **caractérisé en ce que** ladite structure de support basculante (3) est définie par une première surface de support (30) et par une deuxième surface de support (31), ladite première surface de support (30) et ladite deuxième surface de support (31) étant agencées de manière sensiblement orthogonale, et **en ce qu'**il comprend un moyen de centrage (4) pour un centrage et une insertion dans une broche creuse d'un support de bobine en forme de cloche (5) supporté par ladite première surface de support (30) et/ou contrasté par rapport à celle-ci, ladite structure de support (3) étant adaptée pour basculer autour dudit axe de basculement entre une configuration de chargement, dans laquelle ladite première surface de support (30) est sensiblement verticale, et une configuration d'actionnement retournée dans laquelle ladite première surface de support (30) est sensiblement horizontale.

2. Appareil selon la revendication 1, **caractérisé en ce que** ledit moyen de centrage (4) comprend une broche d'insertion pour ledit support de bobine en forme de cloche (5), contrainte sur ladite première surface de support (30) et comportant un axe sensiblement orthogonal à ladite première surface de support (30).

3. Appareil selon la revendication 2, **caractérisé en ce que** ladite broche de centrage (4) est contrainte sur ladite première surface de support (30) de manière amovible.

4. Appareil selon la revendication 2 ou 3, **caractérisé en ce que** ladite broche de centrage (4) est contrainte sur ladite première surface de support (30) via l'interposition d'un moyen de soutien.

5. Appareil selon la revendication 3 ou 4, **caractérisé en ce que** ledit cadre (2) comprend une base (20) et un ou plusieurs montants (21), ladite structure de support basculante (3) étant contrainte de manière rotative par rapport audit cadre (2) au sommet desdits montants (21).

6. Appareil selon la revendication 4, **caractérisé en ce que** ledit cadre (2) peut être déplacé.

7. Appareil selon l'une des revendications précédentes, **caractérisé en ce qu'**il comprend un élément actionneur (6) articulé respectivement audit cadre (2) et à ladite structure basculante (3), adapté pour accumuler de l'énergie durant ledit retournement, actionné par la force de gravité, et pour actionner positivement la course de retour vers ladite configuration de chargement.

8. Procédé de retournement de bobines comprenant les étapes suivantes :

(a). pré-agencement d'une bobine en configuration de transport à axe horizontal dans une station de chargement et retournement ;
(b). pré-agencement d'un support de bobine en forme de cloche (5) à axe de déroulement central orienté verticalement ;
(c). pré-agencement d'une structure basculante (3) pourvue d'une première surface de support (30) en position horizontale et d'une deuxième surface de support (31) en position de contraste verticale ;
(d). transfert dudit support de bobine en forme de cloche (5) sur ladite structure basculante (3) en actionnant son centrage via le moyen de centrage (4) contraint sur ladite première surface de support (30) ;
(e). actionnement du retournement de ladite structure basculante (3) portant ledit support en forme de cloche (5) centré sur ledit moyen de centrage (4), jusqu'à une configuration retournée dans laquelle ledit support en forme de cloche (5) présente un axe de déroulement central sensiblement horizontal ;
(f). insertion de ladite bobine pré-agencée avec son axe horizontal autour de l'axe de déroulement dudit support en forme de cloche retourné (5) ;
(g). actionnement du basculement de retour de ladite structure basculante (3) portant ladite bobine insérée dans ledit support en forme de cloche (5), dans une configuration d'actionnement dans laquelle ladite bobine et ladite cloche présentent leur axe de déroulement respectif agencé verticalement.

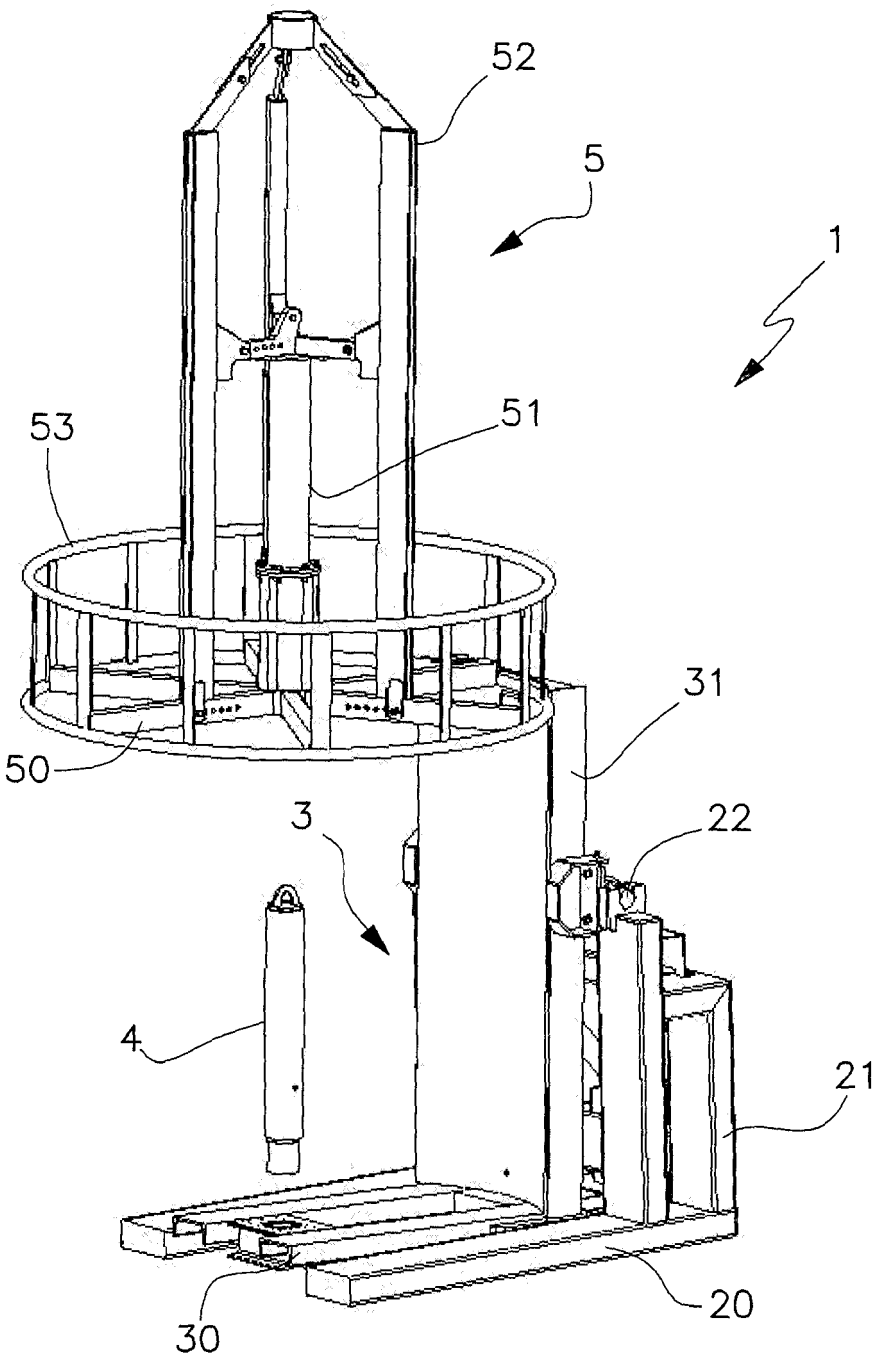


Fig.1

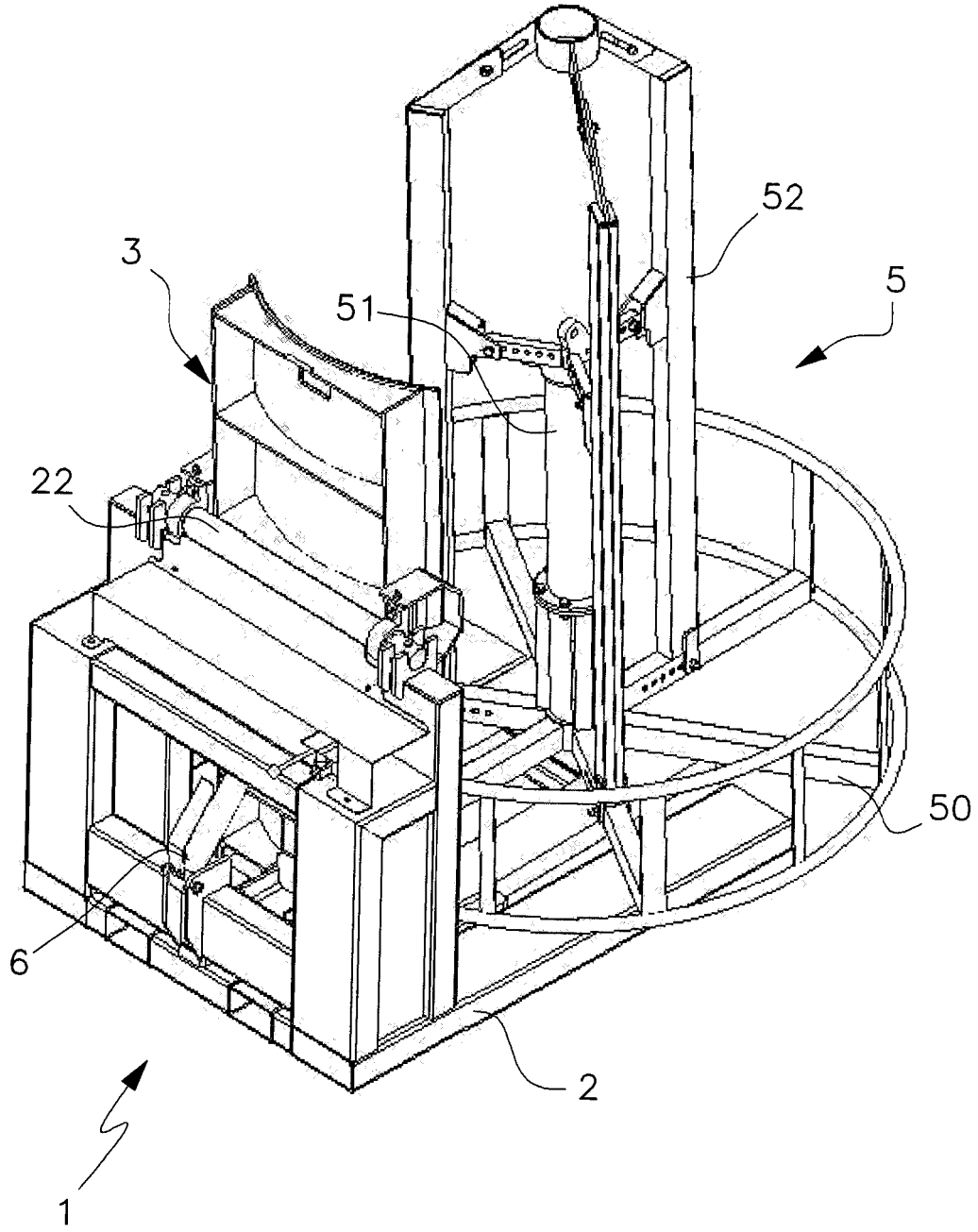


Fig.2

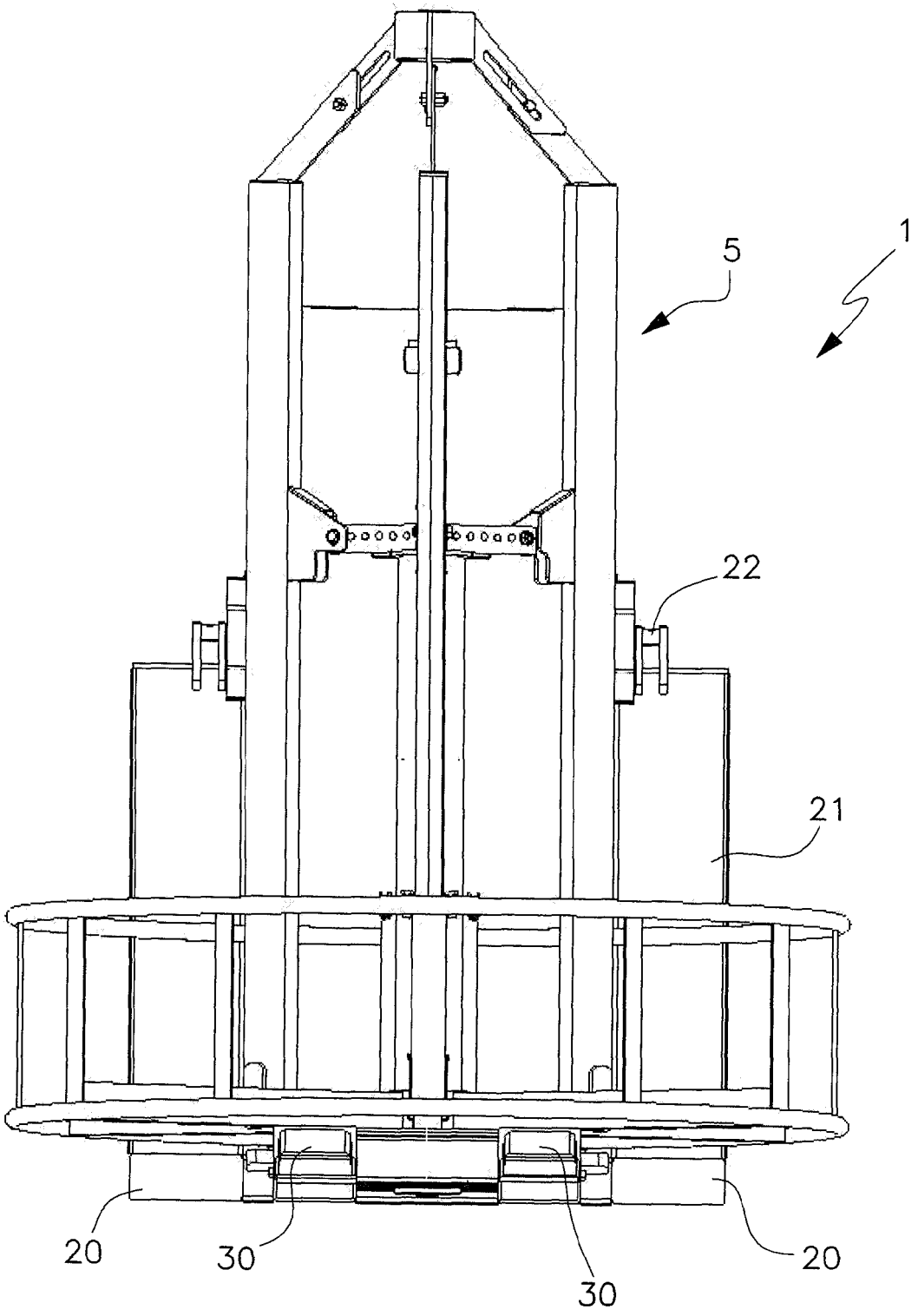


Fig.3

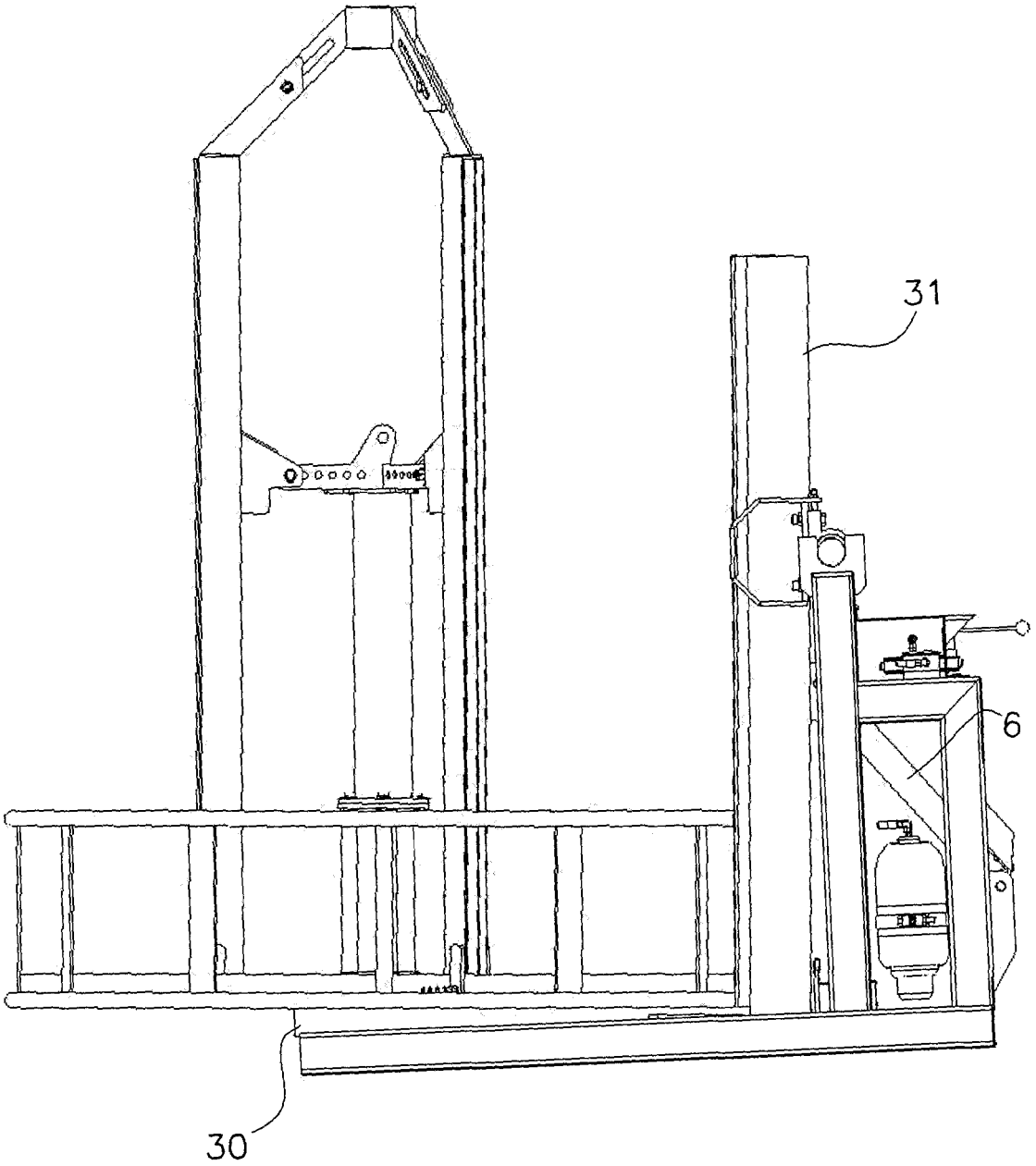


Fig.4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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