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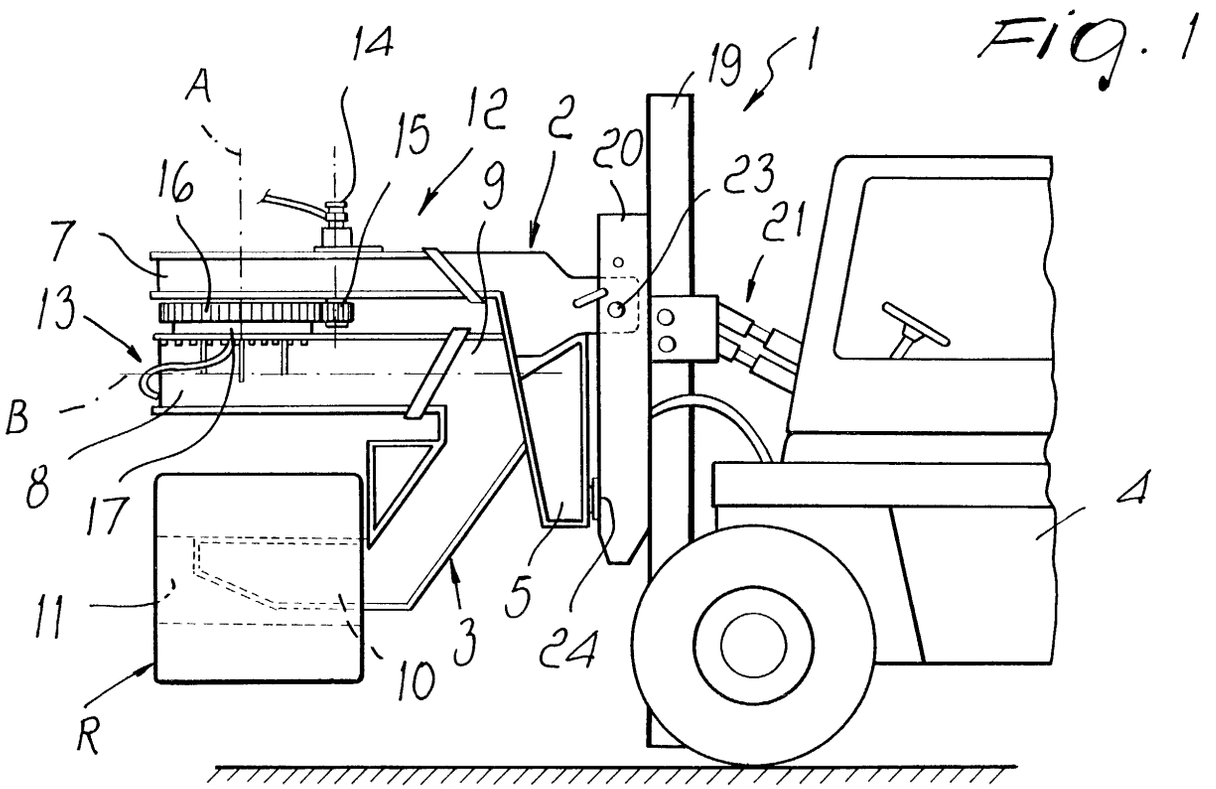
(54) Apparatus for handling hollow cylindrical bodies, particularly sheet metal coils

(57) An apparatus (1) for handling hollow cylindrical bodies, particularly sheet metal coils, comprises a frame (2) for supporting means (3) for gripping the body, which are associated therewith so as to rotate and perform a translational motion respectively about a substantially vertical axis (A) and along a substantially horizontal axis (B), and first and second actuation means (12, 13), the frame (2) being associable with self-propelled lifting and transport means (4).



EP 1 195 347 A1

Description

[0001] The present invention relates to an apparatus for handling hollow cylindrical bodies, particularly sheet metal coils.

[0002] It is known that bulky cylindrical bodies such as sheet metal coils or the like are currently handled by using apparatuses provided with grip elements of various kinds (bridge cranes, free-standing cranes, fork-lift trucks) that lift and carry the coils both for loading and unloading them on and from means of transportation, such as trains, ships or trucks, and for their movement within an industrial processing area.

[0003] However, with particular reference to the case in which such coils must be individually and occasionally moved among multiple stations of a processing cycle, known apparatuses are difficult to use owing to their very limited maneuverability and/or their significant space occupation.

[0004] Known apparatuses in fact require the frequent intervention of qualified operators, who manually push and roll said coils in order to move them proximate to said apparatuses and arrange and orientate them, so as to allow them to be gripped, and fix the coils to the grip elements with which the apparatuses are provided.

[0005] It is noted that sheet metal coils or the like have considerable dimensions and weight, said weight being able to reach values close to 40 tons, and their manual handling is therefore not only difficult and slow but also tiring and dangerous for operators.

[0006] The aim of the present invention is to eliminate the above noted drawbacks of known types of handling apparatuses, by providing an apparatus for handling hollow cylindrical bodies, particularly sheet metal coils, that allows easy and improved maneuverability and allows to handle the coils simply, safely and rapidly within an industrial area and to limit the intervention of qualified operators and consequently contain labor costs and improve workplace safety.

[0007] Within this aim, an object of the present invention is to achieve the above aim with a structure that is simple, relatively easy to provide in practice, safe in use, effective in operation, and relatively low in cost.

[0008] This aim, this object and others that will become better apparent hereinafter, are achieved by the present apparatus for handling hollow cylindrical bodies, particularly sheet metal coils, characterized in that it comprises a frame for supporting means for gripping said body, which are associated therewith so as to rotate and perform a translational motion respectively about a substantially vertical axis and along a substantially horizontal axis, and first and second actuation means, said frame being associable with self-propelled lifting and transport means.

[0009] Further characteristics and advantages of the present invention will become better apparent from the detailed description of a preferred but not exclusive embodiment of an apparatus for handling hollow cylindrical bodies, particularly sheet metal coils, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a side view of an apparatus according to the invention associated with self-propelled means, such as a lift truck, in the configuration for lifting and carrying a coil;

Figure 2 is a schematic front view of the apparatus according to the invention, associated with a lift truck in the configuration for resting the coil on the ground;

Figure 3 is a schematic front view of the apparatus of Figure 2 in the configuration for releasing the rested coil;

Figure 4 is a schematic side view of an apparatus according to the invention;

Figure 5 is a schematic front view of the apparatus of Figure 4;

Figure 6 is a schematic plan view of the apparatus of Figure 4.

[0010] With reference to the figures, the reference numeral 1 generally designates an apparatus for handling hollow cylindrical bodies, particularly sheet metal coils R.

[0011] The apparatus 1 comprises a frame 2 that supports, in a suspended configuration, means for gripping the coil R, which are constituted by a fork 3; the fork 3 is associated with the frame 2 so that it can rotate and perform a translational motion respectively about a vertical axis A and along a horizontal axis B.

[0012] The frame 2 is anchored to self-propelled lifting and transport means 4, such as for example a lift truck.

[0013] The frame 2 is constituted by two mutually spaced and parallel uprights 5, which are connected by cross-members 6 and from which a bracket 7 protrudes forward.

[0014] The bracket 7 is arranged substantially horizontally and the fork 3 is suspended below it.

[0015] The vertical axis A is formed by a pivot, not shown because of a known type, which is supported by the bracket 7; rectilinear guiding means, constituted by a tubular body 8, are associated below said pivot so that they can rotate about the vertical axis A.

[0016] The body 8 forms the horizontal axis B.

[0017] The fork 3 is substantially C-shaped: the upper portion 9 of the C-shape is telescopically inserted in the body 8 so as to be parallel thereto and able to slide with a reciprocating rectilinear motion along the horizontal axis B, while the lower portion 10 of the C-shape is suitable to enter the cavity 11 of the coil R.

[0018] The apparatus 1 further comprises first and second means 12 and 13 for actuating the rotation of the body 8 about the vertical axis A and the translational motion of the fork 3 along the horizontal axis B.

[0019] The fork 3, being coupled to the body 8, rotates rigidly with it about the vertical axis A.

[0020] The first actuation means 12 comprise a vertical motor shaft 14, which is supported by the bracket 7, with respect to which it protrudes downward, and is connected to the body 8 by way of conventional means for transmitting rotary motion, such as gears, which are constituted by a sprocket 15 and a toothed wheel 16 that are mutually coupled.

[0021] The sprocket 15 is keyed to the lower end of the motor shaft 14 and the toothed wheel 16 is fixed, so as to be coaxial to the vertical axis A (pivot), to a plate 17 that is in turn monolithically mounted at the top of the body 8.

[0022] Means for free rotation, such as axial and radial bearings of the conventional type, are interposed between the pivot that forms the vertical axis A, the toothed wheel 16 and the body 8, and allow the rotation of the body 8 with minimal friction.

[0023] The second actuation means 13 comprise a hydraulic cylinder 18, which is arranged substantially coaxially inside the body 8 and acts on the upper portion 9 of the fork 3.

[0024] Advantageously, a side-fit coupling is provided between the body 8 and the upper portion 9 and their mutual sliding along the axis B is guided by sliding blocks and rails.

[0025] The apparatus 1 further comprises rectilinear guides 19, which are substantially vertical and are mounted monolithically with respect to the self-propelled means 4; the uprights 5, and therefore the frame 2, are coupled to the guides so that they can slide with a reciprocating rectilinear motion.

[0026] Conveniently, if the self-propelled means 4 are constituted by a lift truck, the rectilinear guides 19 are constituted by the rectilinear guides with which the truck itself is provided and along which a slider 20 can slide; such guides are usually provided with inclination adjustment means 21 of the hydraulic type.

[0027] In this case, the frame 2 is mounted monolithically with respect to the slider 20; for this purpose, to the rear of the uprights 5 there are upper lugs 22, in each of which there is a hole for the passage of a supporting pivot 23 that is anchored to the slider 20.

[0028] Moreover, to the rear of the uprights 5 lower plates 24 for coupling and fixing to the slider 20 are also provided.

[0029] As an alternative, the frame 2 can be raised by means of the forks with which a lift truck is usually provided; for this purpose, the frame 2 is provided to the rear with slots in which the forks are inserted.

[0030] Finally, the apparatus 1 is provided with means for actuating the first and second activation means 12 and 13, which comprise for example electric valves that are connected to buttons or levers that are arranged inside the cab of the self-propelled means 4 and can thus be reached and operated easily by the operator assigned to handling the coil R.

[0031] The rotation of the body 8 about the axis A allows to align the lower portion 10 with the cavity 11 of the coil R, while sliding along the axis B of the upper portion 9 allows to insert and extract the lower portion 10 from the cavity 11 respectively to pick up and release the coil R.

[0032] The sliding of the frame 2 along the rectilinear guides 19 instead allows to lift and rest the coil R with respect to the ground or any other supporting surface, while the self-propelled means 4 with which the apparatus 1 is associated allow to transport the coil R in any industrial processing area.

[0033] In practice, it has been found that the described invention achieves the intended aim and objects, i.e. that is provides an apparatus 1 that can be maneuvered easily and allows to handle coils of sheet metal easily and simply.

[0034] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

[0035] All the details may further be replaced with other technically equivalent ones.

[0036] In practice, the materials used, as well as the shapes and the dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0037] The disclosures in Italian Patent Application no. MO2000A000212, from which this application claims priority, are incorporated herein by reference.

[0038] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. An apparatus for handling hollow cylindrical bodies, particularly sheet metal coils, **characterized in that** it comprises a frame for supporting means for gripping said body, which are associated therewith so as to rotate and perform a translational motion respectively about a substantially vertical axis and along a substantially horizontal axis, and first and second actuation means, said frame being associable with self-propelled lifting and transport means.

2. The apparatus according to claim 1, **characterized in that** said substantially vertical axis is formed by a pivot that is supported by said frame, and **in that** said substantially horizontal axis is formed by rectilinear guiding means that are associated, so that they can rotate about said substantially vertical axis, with the lower end of said pivot and to which said grip means are coupled so that they can slide with a reciprocating rectilinear motion, the guiding means and the grip means rotating monolithically

and being respectively connected to said first and second actuation means.

3. The apparatus according to one or more of the preceding claims, **characterized in that** said frame comprises uprights that are mutually connected by cross-members and from which a bracket, for supporting said pivot and for supporting said guiding and grip means in a suspended configuration, protrudes forward.

4. The apparatus according to one or more of the preceding claims, **characterized in that** said first actuation means comprise a motor shaft that is supported by said bracket and is connected to said rectilinear guiding means with means for transmitting rotary motion interposed.

5. The apparatus according to one or more of the preceding claims, **characterized in that** said transmission means comprise a sprocket that is keyed to said motor shaft and meshes with a toothed wheel that is mounted substantially coaxially to said pivot and is monolithic in an upward region with respect to said guiding means.

6. The apparatus according to one or more of the preceding claims, **characterized in that** free rotation means are interposed between said guiding means and said pivot.

7. The apparatus according to one or more of the preceding claims, **characterized in that** said grip means comprise at least one substantially C-shaped fork, the upper portion of the C-shape being mounted so that it is parallel and able to slide with a reciprocating rectilinear motion along said guiding means, the lower portion being suitable to enter the cavity of said body.

8. The apparatus according to one or more of the preceding claims, **characterized in that** said rectilinear guiding means are constituted by a tubular body, at one end of which said upper portion of the fork is telescopically inserted.

9. The apparatus according to one or more of the preceding claims, **characterized in that** said second actuation means comprise at least one hydraulic cylinder that is arranged substantially coaxially to said guiding means and is connected to said upper portion.

10. The apparatus according to one or more of the preceding claims, **characterized in that** it comprises rectilinear guides that are arranged substantially vertically and to which said uprights are slidingly coupled, said guides being associated with said self-propelled means.

11. The apparatus according to one or more of the preceding claims, **characterized in that** it comprises means for actuating said first and second activation means that can be associated with said self-propelled means.

Fig. 1

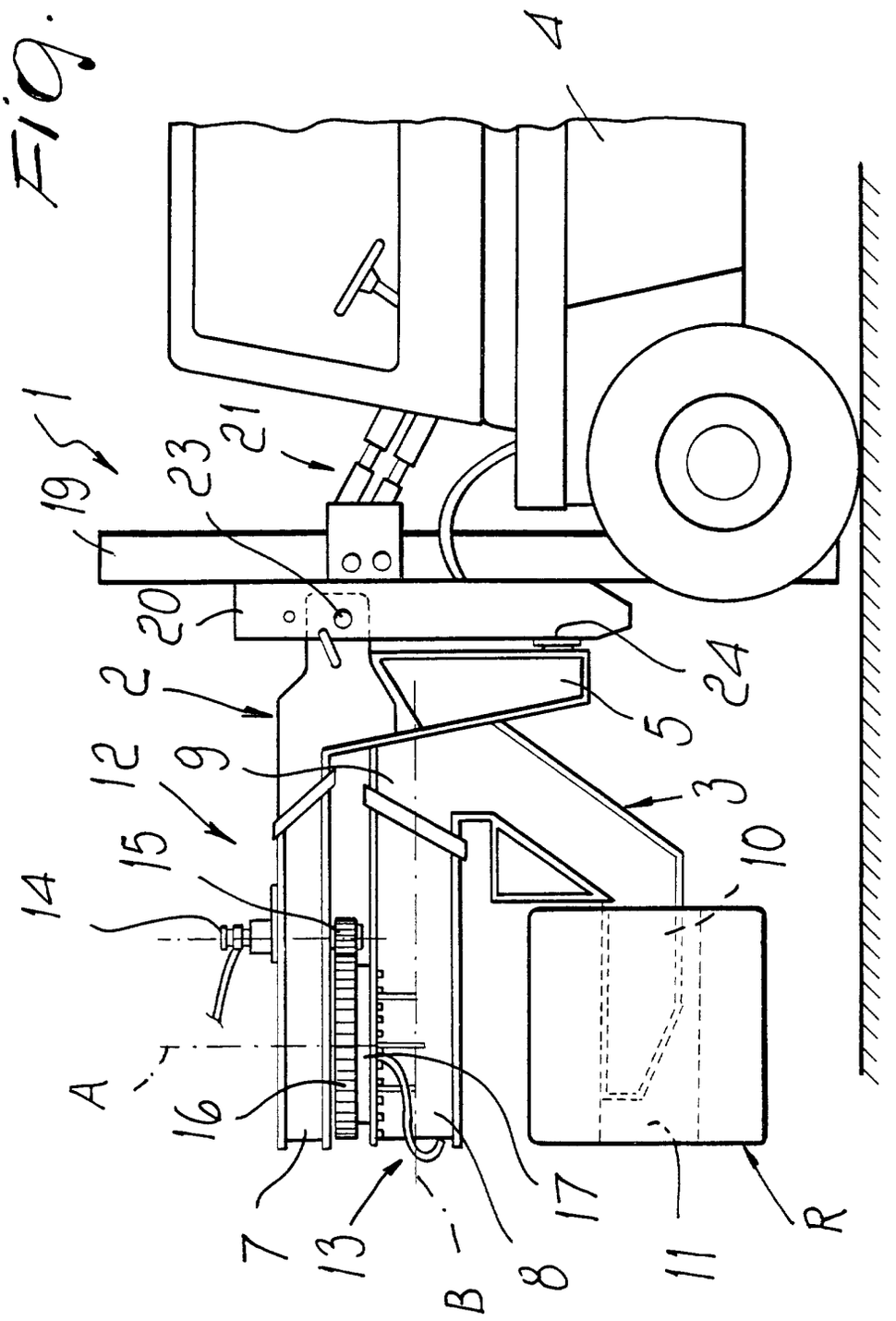


FIG. 2

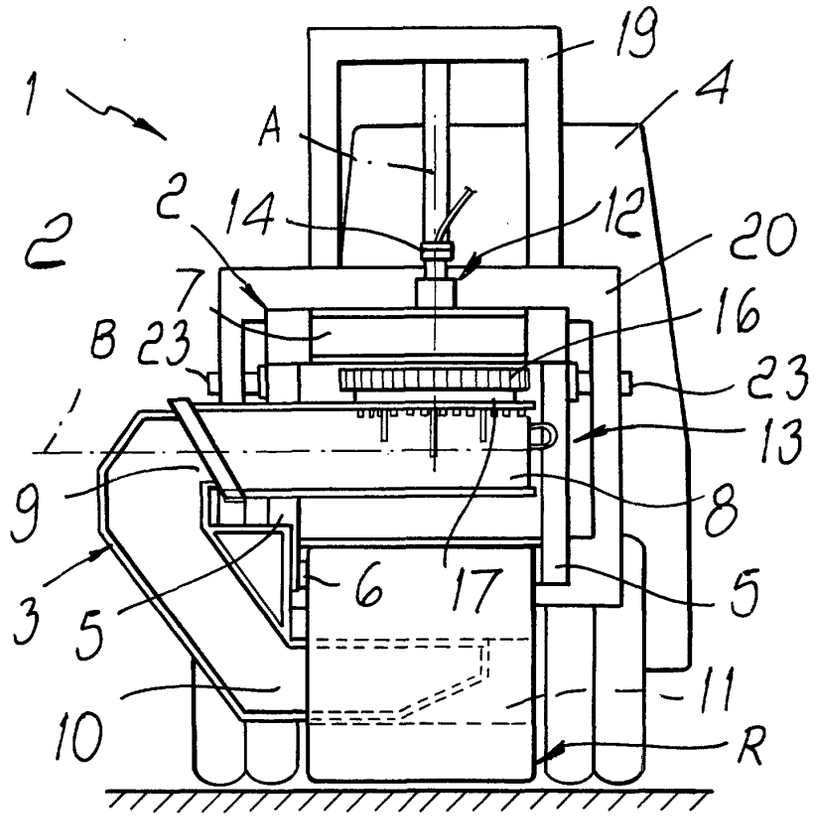

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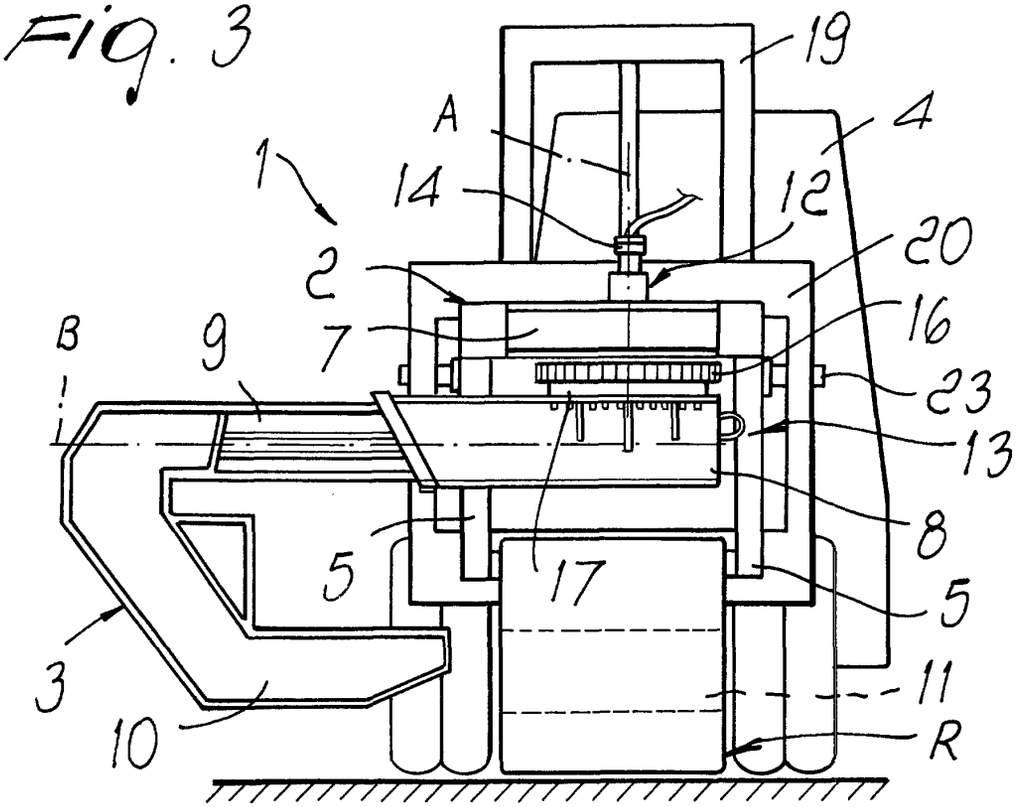
FIG. 3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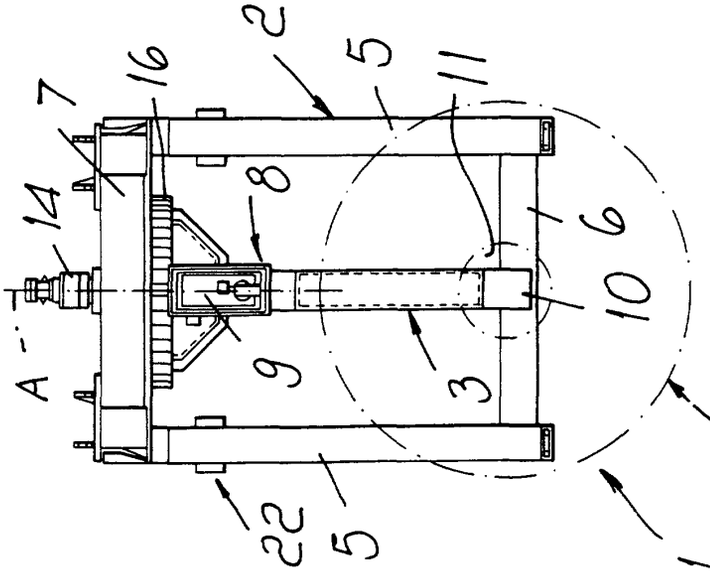

Fig. 5

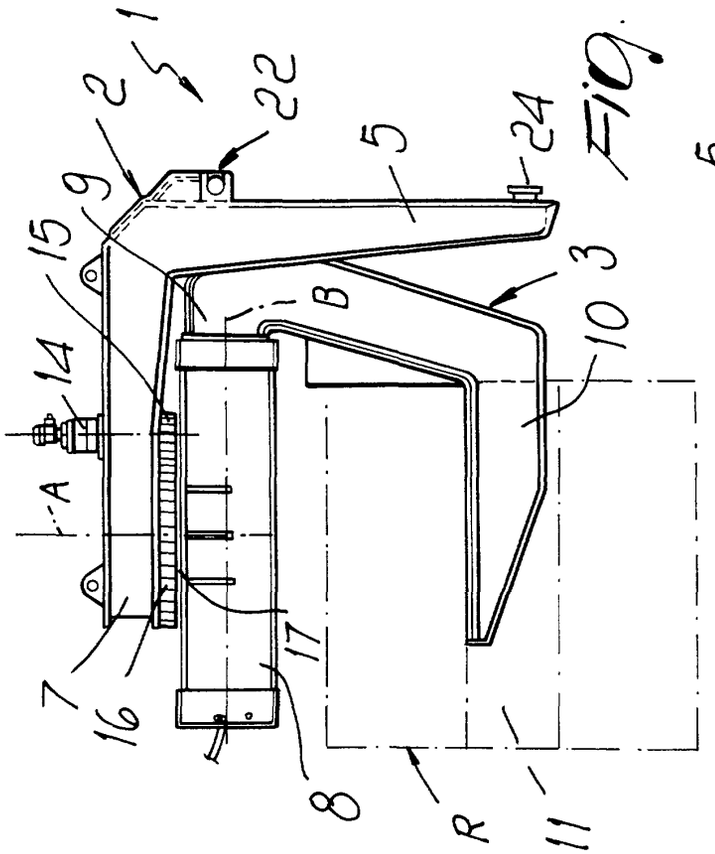

Fig. 4

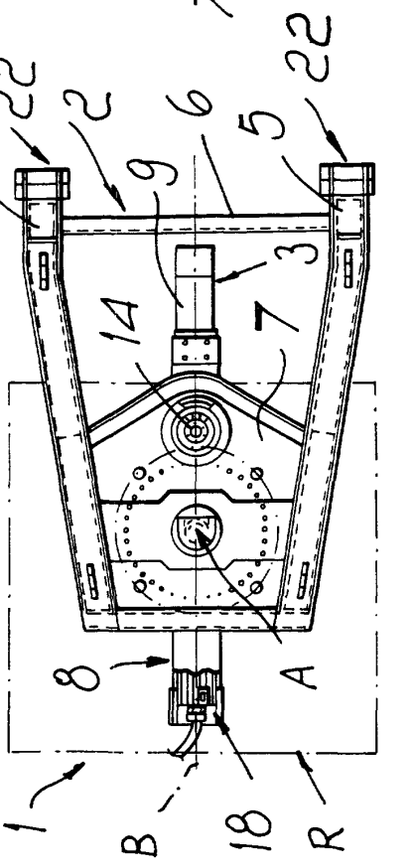

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 3214

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 09, 30 September 1996 (1996-09-30) -& JP 08 133694 A (TOYO UMPANKI CO LTD;NIPPON STEEL CORP), 28 May 1996 (1996-05-28) * abstract * * figures 1,5,9,10 *	1,11	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B66F B21C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 January 2002	Sheppard, B

CATEGORY OF CITED DOCUMENTS

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