(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 480 887 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.12.2024 Bulletin 2024/52

(21) Application number: **24183161.9**

(22) Date of filing: **19.06.2024**

(51) International Patent Classification (IPC):
B66F 7/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B66F 7/02

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **20.06.2023 IT 202300012657**

(71) Applicant: **Mechatronic Machine & Systems S.r.l.**
in forma abbreviata MMS S.r.l.
27010 Vellezzo Bellini PV (IT)

(72) Inventors:
- **BOLSIERI, Fabrizio**
  27010 Vellezzo Bellini PV (IT)
- **BOLSIERI, Giampiero**
  27010 Vellezzo Bellini PV (IT)
- **CARSENZUOLA, Marco**
  20002 Ossona MI (IT)

(74) Representative: **Rondano, Davide et al**
Società Italiana Brevetti S.p.A.
Via Carducci 8
20123 Milano (IT)

(54) LIFTING DEVICE TO BE ATTACHED TO A CEILING OR WALL

(57) A lifting device (10) for the vertical movement of loads (C) is described, comprising: a roller (12) having a longitudinal axis (x); a support structure (14) on which the roller (12) is supported in a rotatable manner about an axis of rotation coinciding with said longitudinal axis (x), said support structure (14) being provided with attachment means (16) enabling the support structure (14) to be attached to a ceiling or wall of a building in such a way that said longitudinal axis (x) is oriented horizontally; a sheet (18) which at one end thereof is attached to a lateral surface (12a) of the roller (12) so as to be able to be wound on, or unwound from, the roller (12) as a result of the rotation of the latter, and at the opposite end is provided with coupling means (20) which extend substantially over the whole width of the sheet (18) and are configured to enable the load (C) to be vertically moved to be coupled to the sheet (18); and actuating means (26, 28) operatively associated with the roller (12) to control rotation thereof in one direction or the other so as to cause winding of the sheet (18) onto the roller (12), and hence upward movement of said coupling means (20), or respectively unwinding of the sheet (18) from the roller (12), and hence downward movement of said coupling means (20).

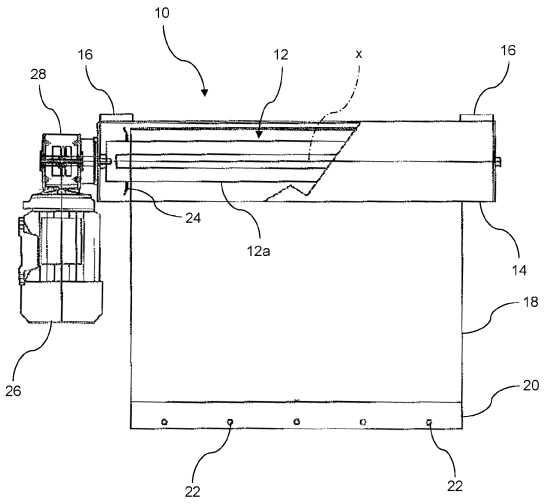

FIG.1

EP 4 480 887 A1

Description

Technical field of the invention

[0001] The present invention relates generally to a lifting device capable of vertically moving (thus not only lifting, but of course also lowering) loads of various kinds, in particular loads with masses between 50kg and 1000kg. More specifically, the present invention relates to a lifting device which can be fixed to a ceiling or wall, and which therefore does not require a supporting structure resting on the floor.

State of the art

[0002] Lifting devices are known which require a supporting structure resting on the floor. However, such lifting devices suffer from the drawback of taking up space on the floor and therefore needing sufficient free space on the floor for their installation. When it is necessary to lift loads in locations with limited space available on the floor, or in locations where the presence of supporting structures resting on the floor can be a problem, as it can hinder the movement of persons and vehicles, it is known to use lifting devices such as winches or hoists that can be mounted on the ceiling or wall. Such lifting devices, however, operate with ropes or chains, thus with essentially one-dimensional traction members. This can lead to problems in the stability of the load during vertical movement. In order to stabilise the load, particularly in the case of a load resting on a loading platform, it is therefore necessary to use several lifting devices, in particular four lifting devices with their respective traction members, whether ropes or chains, connected to the four corners of the loading platform on which the load to be vertically moved is placed.

Summary of the invention

[0003] It is therefore an object of the present invention to provide a lifting device which enables, alone or in combination with no more than one other similar lifting device, the lifting of loads of various kinds, including loads resting on loading platforms or similar load-supporting means.

[0004] This and other objects are achieved according to the invention by virtue of a lifting device as defined in the annexed independent claim 1.

[0005] Further advantageous aspects of the lifting device according to the invention are defined in the dependent claims, the subject-matter of which is to be understood as forming an integral part of the following description.

[0006] In summary, the present invention is based on the idea of providing a device comprising:

- a roller with a longitudinal axis;
- a support structure on which said roller is supported in a rotatable manner about an axis of rotation coinciding with the longitudinal axis of the roller, said support structure being provided with attachment means for enabling the support structure to be attached to a ceiling or wall of a building in such a manner that the longitudinal axis of the roller is oriented horizontally;
- a sheet which is attached at a first end thereof to the lateral surface of the roller so as to be able to be wound on, or unwound from, the roller as a result of the rotation of the latter, and is provided at its opposite end with coupling means which extend substantially over the whole width of the sheet and are configured to enable the load to be vertically moved to be coupled to the sheet; and
- actuating means operatively associated with the roller to control its rotation in one direction or the other so as to cause the winding of the sheet onto the roller, and thus the upward movement of said coupling means, or respectively the unwinding of the sheet from the roller, and thus the downward movement of said coupling means.

[0007] With a lifting device thus configured, in particular due to the fact that the traction member is formed by a sheet, i.e. a two-dimensional member, and due to the fact that the coupling means extend substantially over the entire width of the sheet, it is possible to vertically move loads of various kinds, in a stable and safe manner, using a single device or at most two devices operating in combination.

Brief description of the drawings

[0008] Further features and advantages of the present invention will become clearer from the following description, which is given purely by way of non-limiting example with reference to the accompanying drawings, where:

- Figure 1 is a front view schematically showing a lifting device according to an embodiment of the present invention;
- Figure 2 is a schematic side view of the lifting device of Figure 1, with a load attached to it;
- Figures 3 and 4 are side views showing schematically two lifting devices of the type shown in Figure 1, operating in combination to vertically move a loading platform; and
- Figure 5 is a side view showing schematically two lifting devices of the type shown in Figure 1, operating in combination to vertically move a stretcher.

Detailed description

[0009] With reference first to Figures 1 and 2, a lifting device according to an embodiment of the present invention is generally indicated 10.

[0010] The lifting device 10 comprises first of all a roller (or drum) 12, the longitudinal axis of which is indicated by x and the cylindrical lateral surface of which is indicated by 12a. The roller 12 is configured so as to have an axial size (width) greater than its diameter.

[0011] The lifting device 10 further comprises a support structure 14 on which the roller 12 is supported in a rotatable manner for rotation about an axis of rotation coinciding with the longitudinal axis x. The support structure 14 is advantageously formed by a box-like casing, for example of a parallelepiped shape, within which the roller 12 is accommodated. In this way, the support structure 14 has the function not only of support, but also of protection, for the roller 12. The support structure 14 is provided with attachment means for attachment of the support structure itself to a ceiling or wall of a building so that the axis of rotation of the roller 12 is oriented horizontally. Such attachment means are, for example, formed by a pair of plates 16, which in the present case are fixed to an upper face 14a of the support structure 14 so as to allow the support structure 14 to be attached to a ceiling. In case of attachment to a wall, the plates will instead be fixed to a vertical face 14b of the support structure 14. Each of the plates 16 has a series of through holes (not shown) for inserting screws or other suitable anchoring members, with which to anchor - preferably in a releasable manner - each plate 16 to the ceiling or wall on which the lifting device 10 is to be installed.

[0012] The lifting device 10 further comprises, as a traction member, a sheet 18 which is made, for example, of polyamide or another suitable material to ensure adequate tensile strength. The term 'sheet' is to be understood to mean in general a two-dimensional traction member, i.e. a traction member having one of the three dimensions (in this case the thickness) negligible in relation to the other two, unlike a one-dimensional traction member, such as for example a rope, cable or band. In particular, the sheet 18 has a width greater than the diameter of roller 12.

[0013] The sheet 18 is fixed at a first end thereof to the lateral surface 12a of the roller 12 so that it can be wound on, or unwound from, the roller as a result of the rotation of the latter about its axis of rotation. At the opposite end (free end), the sheet 18 is provided with coupling means which extend substantially over the whole width of the sheet 18 and are configured to enable a load C to be vertically moved (shown in Figure 2) to be coupled to the sheet. Preferably, such coupling means are formed by an elongated end plate 20 with a length substantially equal to the width of the sheet 18, said plate having a plurality of holes 22, for example arranged equally spaced from each other in the direction of the length of the end plate 20 (i.e. in the direction of the width of the sheet 18). The holes 22 serve to allow insertion of hooks or other suitable coupling members with which to couple the load C to be vertically moved to the end plate 20, and thus to the sheet 18.

[0014] In order to guide the sheet 18 during its winding onto the roller 12 or its unwinding from the roller 12, the roller 12 is advantageously provided with a pair of lateral guide discs 24 (one of which can be seen in Figure 1) positioned at the opposite axial ends of the roller.

[0015] Finally, the lifting device 10 further comprises actuating means operatively associated with the roller 12 to control its rotation in one direction or the other about its axis of rotation to cause the winding of the sheet 18 on the roller 12, and thus the upward movement of the end plate 20 (and of the load C coupled thereto), or respectively the unwinding of the sheet 18 from the roller 12, and thus the downward movement of the end plate 20 (and of the load C coupled thereto). Such actuating means include, for example, a motor 26, in particular an electric motor, which may be directly or indirectly connected to the roller 12 and may be mounted inside or outside the latter. In the embodiment proposed herein, the motor 26 is mounted outside the roller 12, in particular with the axis of rotation of its rotor oriented vertically, and an angle gear reducer 28 is interposed between the motor 26 and the roller 12. Alternatively, again in the case of mounting outside the roller 12, the motor may be arranged with the axis of its rotor oriented horizontally, in particular coinciding with the longitudinal axis x of the roller 12. Also in this case, a gear reducer may be provided between the motor and the roller. Advantageously, the aforesaid actuating means also include a special control member, such as a push-button (which may be either physical or virtual), to enable the operator to control the rotation of the motor 26, and thus of the roller 12, in one direction or the other and thus cause the lifting or lowering of the sheet 18, and therefore of the load C.

[0016] The lifting device 10 is designed to vertically move loads C of various kinds, in particular loads with masses between 50kg and 1000kg. As shown in Figure 2, the load C to be moved may be coupled directly to the end plate 20, using the holes 22 provided therein. However, it is possible to interpose one or more traction members between the load C and the end plate 20. Still with reference to Figure 2, the maximum stroke of the vertical movement of the load C that can be controlled with the lifting device 10 is indicated by D. Said maximum stroke will of course depend on the length of the sheet 18.

[0017] In the example of Figures 1 and 2, the load C is moved vertically using only one lifting device 10. However, it is possible to envisage the combined use of two lifting devices 10, as shown in Figures 3 and 4. With reference to Figures 3 and 4, a loading platform P is provided for supporting the load C to be vertically moved, which loading platform is coupled with two opposite sides thereof parallel to the end plates 20 attached to the sheets 18 of the two lifting devices 10. In this case, preferably the two lifting devices 10 have their motors

26 arranged horizontally, i.e. arranged so that the axes of rotation of the respective rotors are oriented horizontally. More specifically, in the present case the sheets 18 of the two lifting devices 10 face each other, while the motors 26 are arranged on opposite sides of each other. Figure 3 shows the condition in which the loading platform P is lowered, while Figure 4 shows the condition in which the loading platform P is at the maximum possible height (condition corresponding to the complete winding of the sheets 18 on the respective rollers 12). Of course, an appropriate synchronous control of the two motors 26 will be provided in this case to ensure that the loading platform P maintains a horizontal attitude during upward or downward movement. Finally, with reference to figure 5, through the combined use of two lifting devices 10 it is also possible to vertically move patients in healthcare facilities. It is in fact sufficient for this purpose to couple a stretcher B, or other suitable support means for receiving a person, to the end plates 20 of the sheets 18 of the two lifting devices 10. As an alternative to a stretcher, for example, it is possible to use a sheet attached at its two long parallel sides to the end plates 20 of the sheets 18 of the two lifting devices 10.

[0018] As it is evident from the description above, the lifting device of the present invention allows loads of various kinds to be moved vertically in a stable and safe manner using a single device or, at most, two devices operating in combination, without requiring a supporting structure resting on the floor and thus without taking up space on the floor.

[0019] The present invention has been described herein with reference to preferred embodiments thereof, but it is clear that other embodiments may be envisaged that share the same inventive core with those described herein, as defined by the appended claims.

Claims

1. Lifting device (10) for the vertical movement of loads (C), the device comprising:

- a roller (12) having a longitudinal axis (x);
- a support structure (14) on which the roller (12) is supported in a rotatable manner about an axis of rotation coinciding with said longitudinal axis (x), said support structure (14) being provided with attachment means (16) for enabling the support structure (14) to be attached to a ceiling or wall of a building in such a manner that said longitudinal axis (x) is oriented horizontally;
- a sheet (18) which is attached at a first end thereof to a lateral surface (12a) of the roller (12) so as to able to be wound on, or unwound from, the roller (12) as a result of the rotation of the latter and is provided at its opposite end with coupling means (20) which extend substantially over the whole width of the sheet (18) and are configured to enable the load (C) to be vertically moved to be coupled to the sheet (18); and
- actuating means (26, 28) operatively associated with the roller (12) to control rotation thereof in either direction so as to cause respectively winding of the sheet (18) onto the roller (12), and hence upward movement of said coupling means (20), or unwinding of the sheet (18) from the roller (12), and hence downward movement of said coupling means (20).

2. Device according to claim 1, wherein the roller (12) has an axial dimension, or width, greater than its diameter and wherein the sheet (18) has a width greater than the diameter of the roller (12).

3. Device according to claim 1 or claim 2, wherein the support structure (14) is formed by a box-like casing, in particular of parallelepiped shape.

4. Device according to claim 3, wherein said attachment means (16) include a pair of plates attached to an upper face (14a) or a lower face (14b) of the support structure (14) so as to allow the support structure (14) to be attached to the ceiling or wall, respectively.

5. Device according to any one of the preceding claims, wherein said coupling means (20) are formed by an end plate of elongated shape, with a length substantially equal to the width of the sheet (18), said end plate having a plurality of holes (22).

6. Device according to any one of the preceding claims, wherein said actuating means (26, 28) comprise a motor (26), in particular an electric motor, and a control member for allowing an operator to control the rotation of the motor (26), and hence of the roller (12), in either direction and thus cause upward or downward movement of the sheet (18).

7. Lifting unit comprising a pair of lifting devices (10) according to any one of the preceding claims, as well as loading platform (P) coupled with two opposite parallel sides thereof to the end plates (20) that are attached to the sheets (18) of the lifting devices (10).

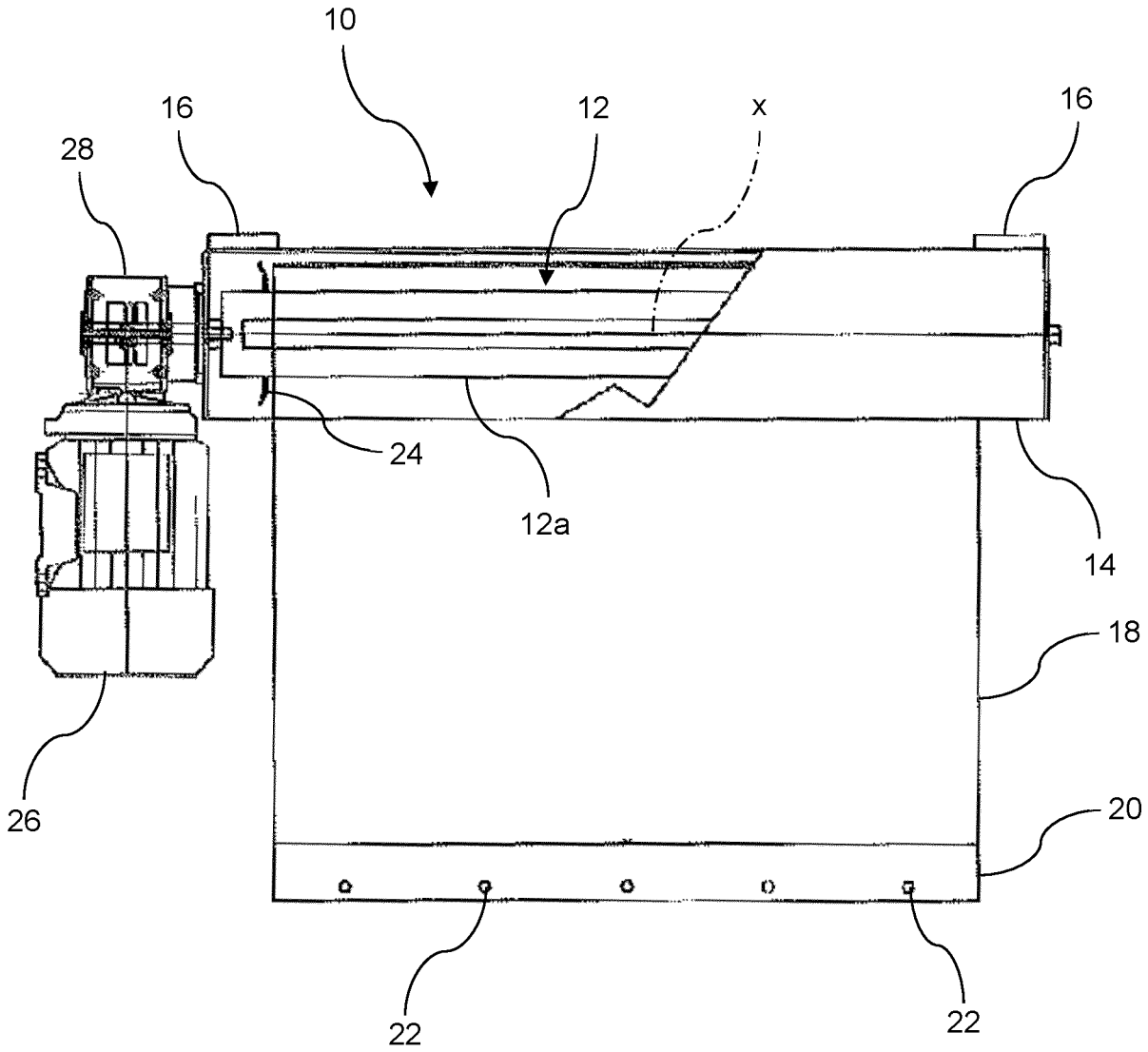

FIG.1

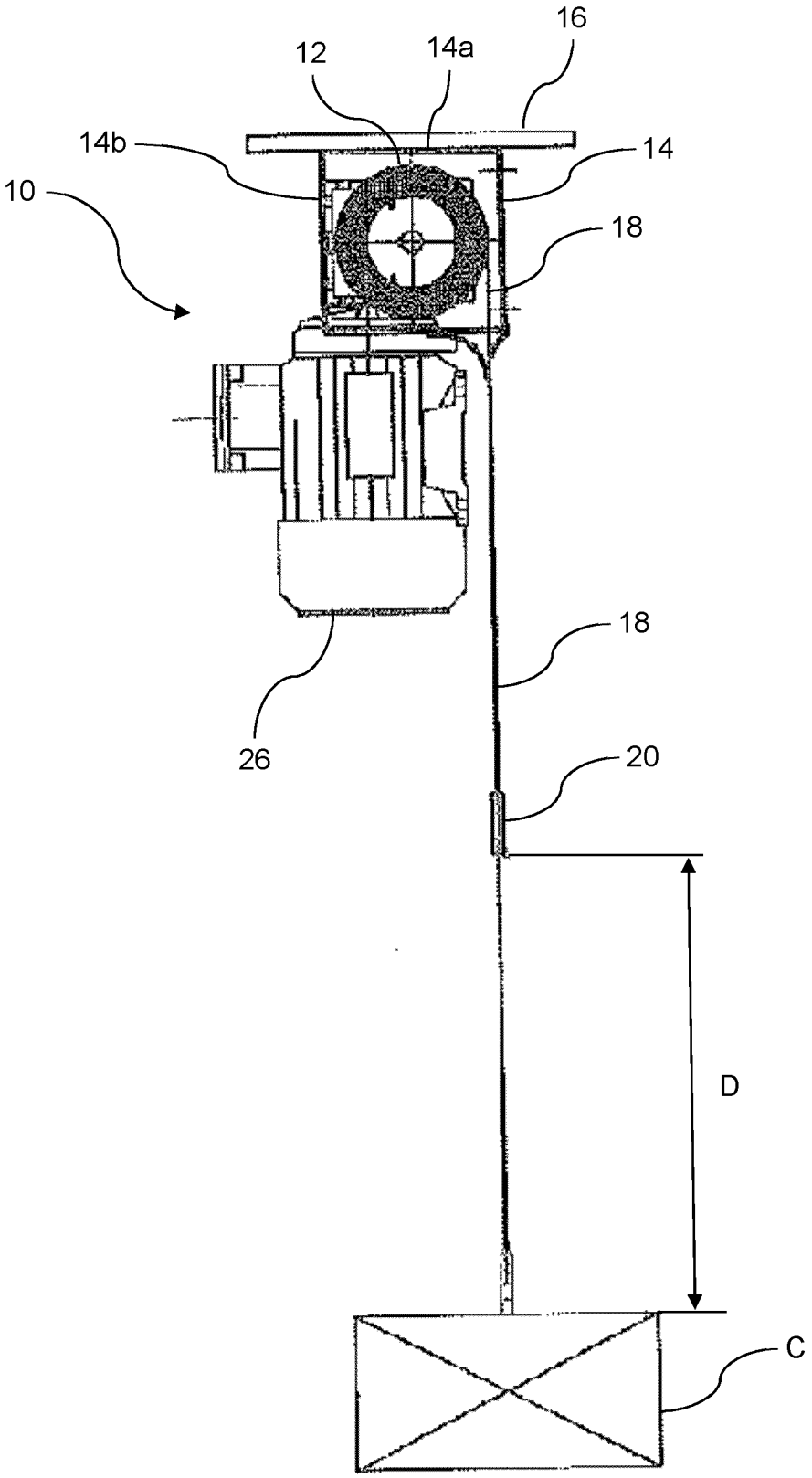

FIG.2

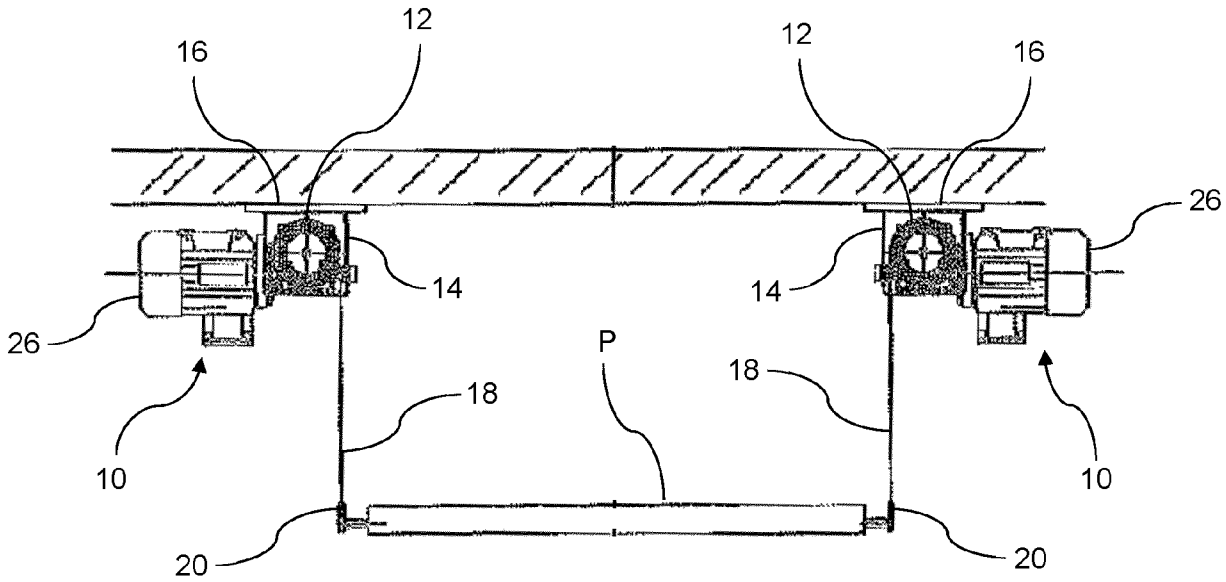
16
12
12
16
26
14
14
26
P
18
18
10
10
20
20

FIG.3

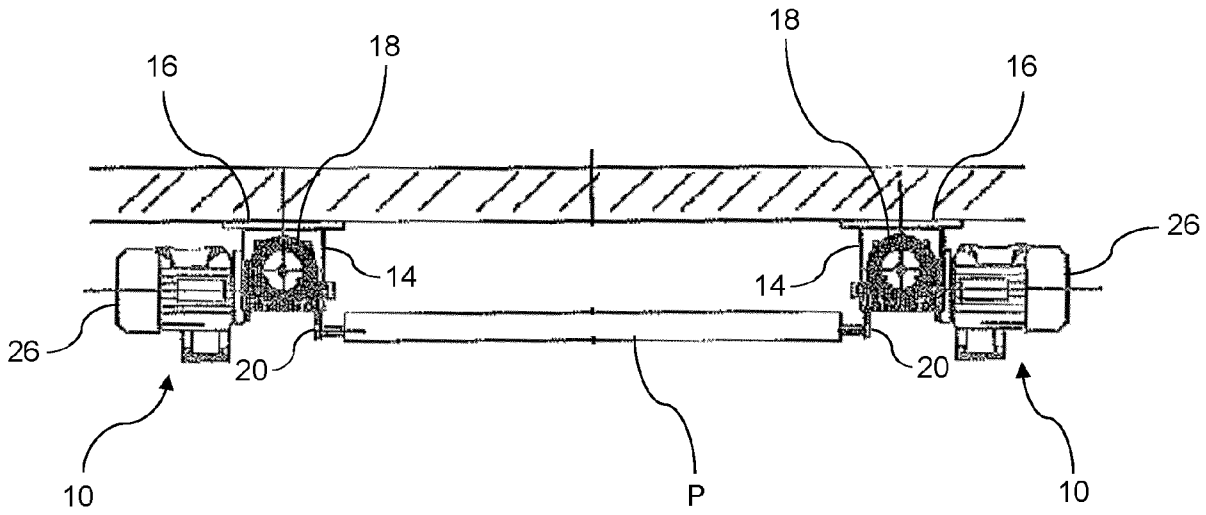
18
18
16
16
26
14
14
26
20
20
10
P
10

FIG.4

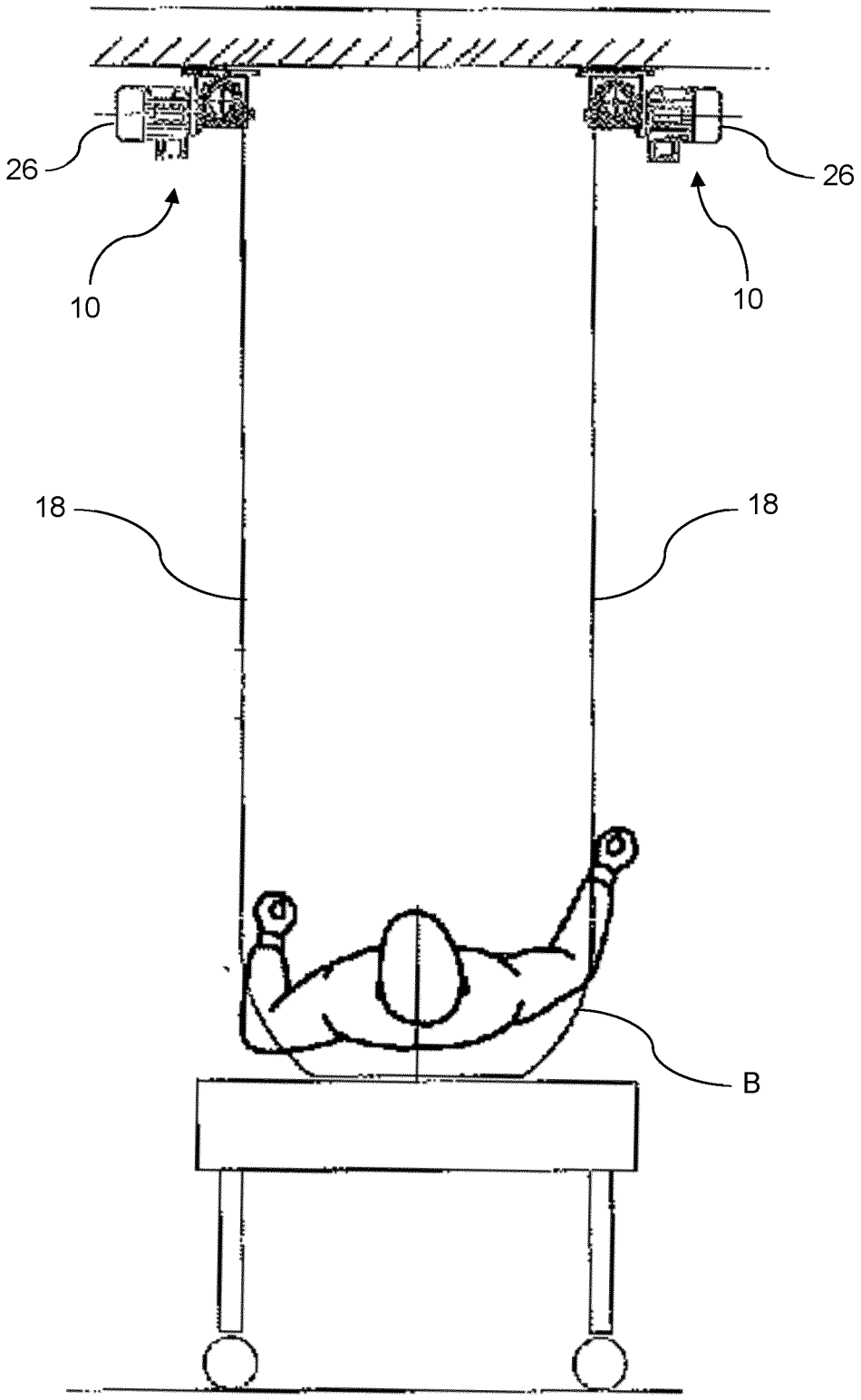

FIG.5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 18 3161

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 Y	US 2009/255889 A1 (GEFFE KURT [US]) 15 October 2009 (2009-10-15) * paragraphs [0012], [0017], [0049], [0050], [0052]; figures 1-8 *	1-6 7	INV. B66F7/02
X	US 5 667 035 A (HUGHES DOUGLAS J [US]) 16 September 1997 (1997-09-16) * column 4, line 35 - line 43; figure 1 * * column 5, line 33 - line 43 *	1,6	
Y A	ES 2 328 238 T3 (EISENMANN ANLAGENBAU GMBH & CO) 11 November 2009 (2009-11-11) * line 25 - page 4; figures 1, 2 *	7 1	
			TECHNICAL FIELDS SEARCHED (IPC) B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 November 2024	Verheul, Omiros

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 24 18 3161

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-11-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009255889 A1	15-10-2009	NONE	
US 5667035 A	16-09-1997	NONE	
ES 2328238 T3	11-11-2009	AT E435146 T1	15-07-2009
		CN 1504398 A	16-06-2004
		DE 10257108 A1	08-07-2004
		EP 1426275 A1	09-06-2004
		ES 2328238 T3	11-11-2009
		US 2005025612 A1	03-02-2005