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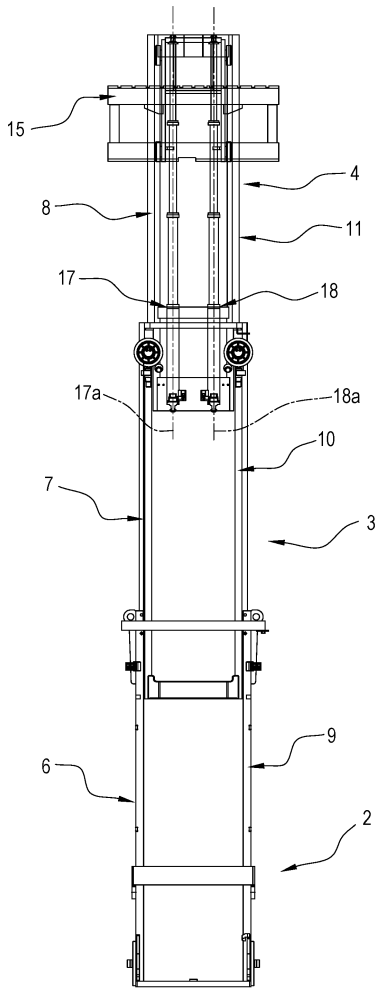
(54) DEVICE FOR LIFTING A LOAD FOR A LIFT TRUCK

(57) A device for lifting a load for a lift truck comprising a supporting frame (2) configured to support at least one upright unit (26);
the upright unit (26) is configured to support an element (15) for picking up a load;
first movement means (16) are configured for moving the picking-up element (15) at least from a first height to a second height, greater than the first height, and vice versa;
the first movement means (16) comprise a pair of telescopic cylinders (17, 18), a first telescopic cylinder (17) and a second telescopic cylinder (18), each configured to pass at least from a retracted configuration, corresponding to a respective first height of the picking-up element (15), to an extended configuration, corresponding to a respective second height of the picking-up element (15), and vice versa, forming a free lift of the picking-up element (15);the first telescopic cylinder (17) and the second telescopic cylinder (18) are configured for achieving a 1:1 transmission ratio for moving the picking-up element (15) from the retracted configuration to the extended configuration, and vice versa.

Fig. 4



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Description

[0001] This invention relates to a device for lifting a load for a lift truck.

[0002] By way of example, the device for lifting a load for a lift truck according to the invention is of the so-called "duplex" type or of the so-called "triplex" type, without thereby limiting the scope of the invention.

[0003] Generally speaking, a lifting device of the "triplex" type comprises a supporting frame, connected to the lift truck, a first upright, connected to the supporting frame and movable relative to it, and a second upright, connected to the first upright and movable relative to it.

[0004] Connected to the second upright there is an element for supporting the load, that is to say, the "fork-holder carriage".

[0005] First movement means move the fork-holder carriage relative to the second upright from a first loading position to a second position raised relative to the first loading position, thereby forming the so-called free lift. Second movement means move the first upright and the second upright, relative to the supporting frame, to a maximum sliding position of the lifting device.

[0006] As is known, the first movement means comprise a pair of single-acting hydraulic cylinders and, for each, a respective unit for transmitting the motion in the form of a pulley with a chain transmission.

[0007] The single-acting hydraulic cylinder and the respective transmission unit create a 2:1 transmission ratio.

[0008] The structure of the lifting device has a window which defines the field of vision of the operator of the lift truck both when driving and when moving the load.

[0009] The pair of single-acting hydraulic cylinders and the respective motion transmission unit are generally positioned inside the window, considerably limiting the field of vision of the operator, due to the overall dimensions of the transmission unit which, as mentioned above, is in the form of a pulley with chain transmission.

[0010] In this context, the need has been felt of extending the field of vision available in the window by providing a device for lifting a load for a lift truck which comprises a supporting frame configured to support at least one upright unit.

[0011] The upright unit is configured to support an element for picking up a load. First movement means are configured for moving the picking-up element at least from a first height to a second height, greater than the first height, and vice versa.

[0012] The first movement means are telescopic movement means configured to pass at least from a retracted configuration, corresponding to a respective first height of the picking-up element, to an extended configuration, corresponding to a respective second height of the picking-up element, and vice versa.

[0013] Advantageously, the telescopic movement means make it possible to increase the field of vision available inside the window defined by the structure of the lifting device relative to the prior art solutions, since there is no need for the transmission unit which has a size inside the field of vision which is not negligible.

[0014] A further advantage achieved is the direct actuation of the movement of the picking-up element, with a 1:1 transmission ratio rather than 2:1 as in the prior art, and a constructional simplicity.

[0015] A further advantage achieved by the telescopic movement means is an upward and upward damping of the stroke limit.

[0016] Further features and advantages of the invention are more apparent from the non-limiting description which follows of a preferred embodiment of a device for lifting a load for a lift truck as illustrated in the accompanying drawings, in which:

- Figure 1 shows a schematic side view of a first embodiment of a lifting device for a lift truck, in a retracted or closed position, according to the invention;
- Figure 2 shows a schematic perspective view of the device of Figure 1;
- Figure 3 shows a schematic side view of the device of Figure 1 in a free lift position;
- Figure 4 shows a schematic perspective view of the device of Figure 1 in a fully withdrawn position;
- Figure 5 shows a schematic cross-section view of a telescopic cylinder of the device of Figure 1 according to the invention;
- Figure 6 is a scaled-up view of a detail of Figure 5;
- Figure 7 shows a schematic front view of a second embodiment of a lifting device for a lift truck, in a retracted or closed position, according to the invention;
- Figure 8 shows a schematic side view of the device of Figure 7 in a free lift position;
- Figure 9 shows a schematic side view of the device of Figure 7 in a fully withdrawn position.

[0017] The reference numeral 1 denotes a device for lifting a load for a lift truck according to the invention.

[0018] The device 1 comprises a supporting frame 2 configured to support an upright unit 26.

[0019] The upright unit 26 is movable relative to the supporting frame 2.

[0020] The supporting frame 2 is configured to be connected to a lift truck 5, as schematically illustrated in Figure 1.

[0021] The supporting frame 2 has a viewing window 23.

[0022] The window 23 defines the field of vision of the operator of the lift truck 5. The upright unit 26 is configured to support an element 15 for picking up a load.

[0023] The picking-up element 15 is configured for passing at least from a first height to a second height, greater than the first height, and vice versa. First movement means 16 move the picking-up element 15 at least from the first height to the second height, and vice versa.

[0024] According to the invention, the first movement means 16 are telescopic movement means.

[0025] The first movement means 16 are hydraulic means.

[0026] Advantageously, compared with prior art systems, the first telescopic movement means 16 allow the movement of the picking-up element 15 to be controlled directly, that is to say, with a 1:1 transmission ratio, so that once the initial adjustment has been performed, there is no need for adjustments over time.

[0027] The first movement means 16 comprise a pair of telescopic cylinders 17, 18, a first telescopic cylinder 17 and a second telescopic cylinder 18, each configured to pass at least from a retracted configuration, corresponding to a respective first height of the picking-up element 15, to an extended configuration, corresponding to a respective second height of the picking-up element 15, and vice versa, as shown in Figures 1 and 3 and in Figures 7 and 8.

[0028] The stroke from the first height to the second height of the first movement means 16 is defined as a free lift of the lifting device 1.

[0029] The term "free lift", a term known to experts in the trade, means the lifting stroke of the picking-up element 15 along which the minimum dimensions of the lifting device 1 does not change.

[0030] The first telescopic cylinder 17 and the second telescopic cylinder 18 form the free lift of the picking-up element 15.

[0031] The first telescopic cylinder 17 and the second telescopic cylinder 18 are positioned at least partly inside the viewing window 23.

[0032] The first telescopic cylinder 17 has a longitudinal axis 17a.

[0033] The second telescopic cylinder 18 has a longitudinal axis 18a.

[0034] The first telescopic cylinder 17 and the second telescopic cylinder 18 are spaced from each other, defined by "d" the distance between the longitudinal axis 17a of the first telescopic cylinder 17 and the longitudinal axis 18a of the second telescopic cylinder 18, as shown in Figure 2 and Figure 7.

[0035] The first telescopic cylinder 17 and the second telescopic cylinder 18 each comprise a plurality of bodies 20 coupled to each other in succession in such a way that each body 20 is at least partly inserted in another.

[0036] The bodies 20 of the first telescopic cylinder 17 are movably coupled to each other to translate along a direction parallel to the longitudinal axis 17a, passing from a retracted configuration to an extended configuration, and vice versa.

[0037] The bodies 20 of the second telescopic cylinder 18 are movably coupled to each other to translate along a direction parallel to the longitudinal axis 18a, passing from a retracted configuration to an extended configuration, and vice versa.

[0038] The first telescopic cylinder 17 and the second telescopic cylinder 18 comprise a respective base body 19, defined as the first body 20 of the succession of bodies 20 coupled to each other, and an end body 21, defined as the last body 20 of the succession of bodies 20 coupled to each other.

[0039] Each body 20 of the respective first telescopic cylinder 17 and of the second telescopic cylinder 18 is in the form of a hollow tubular element, except for the end body 21.

[0040] The base body 19 has a diameter greater than the other bodies 20 which have a decreasing diameter relative to each other.

[0041] The end body 21 has a smaller diameter than all the other bodies 20. Advantageously, the reduction in the diameter of the bodies 20 of the first telescopic cylinder 17 and of the second telescopic cylinder 18 guarantees an excellent visibility through the window 23 of the device 1 in the extended configuration of the first telescopic cylinder 17 and of the second telescopic cylinder 18.

[0042] The first telescopic cylinder 17 and the second telescopic cylinder 18 comprise a respective piston 24 connected to the respective end body 21 by a rod 25.

[0043] The first telescopic cylinder 17 and the second telescopic cylinder 18 comprise a respective inner chamber in which the piston 24 is movable along a direction parallel to the respective longitudinal axis 17a, 18a.

[0044] The piston 24 is movable from at least a first end of stroke position, corresponding to the retracted configuration of the first telescopic cylinder 17 and of the second telescopic cylinder 18, and a second end of stroke position, corresponding to the extended configuration of the first telescopic cylinder 17 and of the second telescopic cylinder 18.

[0045] With reference to the first telescopic cylinder 17 and to the second telescopic cylinder 18, the respective base body 19 and end body 21 have respective end surfaces 19a, 21a shaped in the form of a cap.

[0046] The second upright 4 has a first contact portion 4a with at least part of the head surface 19a of the base body 19 and a second contact portion 4b with at least part of the head surface 21 a of the end body 21.

[0047] It should be noted that, preferably and according to the embodiment illustrated in Figure 5, the base body 19 is positioned at a height lower than the height of the end body 21 and consequently the first contact portion 4a is located at a height lower than the second contact portion 4b. Alternatively, if the base body 19 is positioned at a height greater than the height of the end body 21, consequently the first contact portion 4a is located at a height greater than the second contact portion 4b.

[0048] Each first contact portion 4a and second contact portion 4b is shaped to match the shape of a respective head surface 19a, 21a for making a spherical coupling, as shown in Figure 5.

[0049] Advantageously, this coupling allows the first telescopic cylinder 17 and the second telescopic cylinder 18 to operate in alignment without introducing bending moments whatever position the second upright 4 adopts in an operating condition for driving or working.

[0050] In order to dampen the movement of the bodies 20 of the first telescopic cylinder 17 and of the second telescopic cylinder 18 from the extended configuration to the retracted configuration, there is at least one damping element 22 interposed between at least two consecutive bodies 20. Preferably, there is a damping element 22 interposed between each body 20 and another body 20 consecutive to it, as shown in Figure 6.

[0051] Advantageously, the presence of damping elements 22 interposed between respective consecutive bodies 20 dampens down and prevents the operator from reducing the downward speed of the first movement means 16.

[0052] It should be noted that with reference to the first embodiment illustrated in Figures 1 to 6, the upright unit 26 comprises a first upright 3 and a second upright 4.

[0053] The supporting frame 2 is relatively fixed relative to the first upright 3 and to the second upright 4.

[0054] The first upright 3 is movably coupled to the supporting frame 2 in such a way as to translate according to a direction of vertical movement from a retracted configuration to a withdrawn configuration, and vice versa.

[0055] The second upright 4 is movably coupled to the first upright 3 in such a way as to translate according to a direction of vertical movement from a retracted configuration to a withdrawn configuration, and vice versa.

[0056] Each between the mounting frame 2, the first upright 3 and the second upright 4 comprises a respective first profile 6, 7, 8 and a respective second profile 9, 10, 11.

[0057] The first profile 7 and the second profile 10 of the first upright 3 are slidably constrained, respectively, to the first profile 6 and to the second profile 9 of the supporting frame 2.

[0058] The first profile 8 and the second profile 11 of the second upright 4 are slidably constrained, respectively, to the first profile 7 and to the second profile 10 of the second upright 3.

[0059] The mutual positioning of the first profile 6, 7, 8 and of the second profile 9, 10, 11 of the supporting frame 2, of the first upright 3 and of the second upright 4 defines the viewing window 23 (see Figure 2 and Figure 4).

[0060] Second movement means 12 are configured for moving the first upright 3 and the second upright 4 relative to the supporting frame 2 along a direction of vertical movement away from and towards the supporting frame 2, and vice versa.

[0061] The second movement means 12 comprise a pair of single-acting lifting cylinders 13 and a motion transmission unit 14, each associated with each single-acting hydraulic lifting cylinder 13, for moving the second upright 4 in response to the movement of the first upright 3.

[0062] The transmission unit 14 comprises a pulley and a chain element, engaged in the pulley, the ends of which are connected to the second upright 4 and to the supporting frame 2.

[0063] In this case, the motion transmission ratio is 2:1.

[0064] With reference to the second embodiment illustrated in Figures 7 to 9, the upright unit 26 comprises a first upright 3.

[0065] The supporting frame 2 is relatively fixed relative to the first upright 3.

[0066] The first upright 3 is movably coupled to the supporting frame 2 in such a way as to translate according to a direction of vertical movement from a retracted configuration to a withdrawn configuration, and vice versa.

[0067] Each between the supporting frame 2, the first upright 3 comprises a respective first profile 6, 7 and a respective second profile 9, 10.

[0068] The first profile 7 and the second profile 10 of the first upright 3 are slidably constrained, respectively, to the first profile 6 and to the second profile 9 of the supporting frame 2.

[0069] The mutual positioning of the first profile 6, 7 and of the second profile 9,10 of the supporting frame 2, of the first upright 3 forms the viewing window 23 (see Figure 7).

[0070] Second movement means 12 are configured for moving the first upright 3 relative to the supporting frame 2 along a direction of vertical movement away from and towards the supporting frame 2, and vice versa.

[0071] The second movement means 12 comprise a pair of single-acting hydraulic lifting cylinders 13 for moving the first upright 3.

[0072] In this case, the motion transmission ratio is 1:1.

[0073] The invention also relates to a lift truck 5 which comprises a device 1 for lifting a load according to the invention.

[0074] The first telescopic movement means 16 have, in a retracted position, a height lower than the height at which a seat 27 of the operator is positioned (see Figure 1).

[0075] Advantageously, the operator driving the lift truck 5 will have available a viewing window 23 without the presence of the first movement means 16.

Claims

1. A device for lifting a load for a lift truck comprising a supporting frame (2) configured to support at least one upright unit (26);

   the upright unit (26) is configured to support an element (15) for picking up a load;
   first movement means (16) are configured for moving the picking-up element (15) at least from a first height to a second height, greater than the first height, and vice versa;
   characterized in that
   the first movement means (16) comprise a pair of telescopic cylinders (17, 18), a first telescopic cylinder (17) and a second telescopic cylinder

(18), each configured to pass at least from a retracted configuration, corresponding to a respective first height of the picking-up element (15), to an extended configuration, corresponding to a respective second height of the picking-up element (15), and vice versa, forming a free lift of the picking-up element (15);
the first telescopic cylinder (17) and the second telescopic cylinder (18) are configured for achieving a 1:1 transmission ratio for moving the picking-up element (15) from the retracted configuration to the extended configuration, and vice versa.

2. The device according to claim 1, **characterised in that** the first telescopic cylinder (17) and the second telescopic cylinder (18) each comprise a plurality of bodies (20) coupled to each other in succession in such a way that each body (20) is at least partly inserted in another; the bodies (20) of the respective first telescopic cylinder (17) and second telescopic cylinder (18) are movably coupled to each other in such a way as to translate along a direction parallel to a respective longitudinal axis (17a, 18a) in order to pass from the retracted configuration to the extended configuration.

3. The device according to claim 2, **characterised in that** the first telescopic cylinder (17) and the second telescopic cylinder (18) comprise a respective base body (19), defined as the first body (20) of the succession of bodies (20) coupled to each other, and an end body (21), defined as the last body (20) of the succession of bodies (20) coupled to each other; the base body (19) is relatively fixed with respect to the succession of bodies (20) and has a diameter greater than the other bodies (20) which have a decreasing diameter relative to each other.

4. The device according to claim 3, **characterised in that** the respective base body (19) and the end body (21) have respective head surfaces (19a, 21a) shaped in the form of a cap; the second upright (4) has a first contact portion (4a) with at least part of the head surfaces (19a) of the base body (19) and a second contact portion (4b) with at least part of the head surfaces (21a) of the end body (21); each first contact portion (4a) and second contact portion (4b) is shaped to match the shape of the respective head surface (19a, 21a) of the base body (19) and of the end body (21) for making a spherical coupling.

5. The device according to claim 4 or 3, **characterised in that** it comprises at least one damping element (22) interposed between at least two consecutive bodies (20); preferably, there is a damping element (22) interposed between two consecutive bodies (20).

6. The device according to any one of claims 1 to 5, **characterised in that** the first telescopic cylinder (17) has a longitudinal axis (17a) and the second telescopic cylinder (18) has a longitudinal axis (18a); The first telescopic cylinder (17) and the second telescopic cylinder (18) are spaced from each other, defined by "d" the distance between the longitudinal axis (17a) of the first telescopic cylinder (17) and the longitudinal axis (18a) of the second telescopic cylinder (18).

7. The device according to any one of claims 1 to 6, **characterised in that** the upright unit (26) comprises a first upright (3) and second means (12) for moving the first upright (3) along a vertical movement direction away from and towards the supporting frame (2); the second movement means (12) comprise a pair of single-acting hydraulic lifting cylinders (13).

8. The device according to any one of claims 1 to 6, **characterised in that** the upright unit (26) comprises a first upright (3), a second upright (4) and second means (12) for moving the first upright (3) along a direction of vertical movement away from and towards the mounting frame (2); the second movement means (12) comprise a pair of single-acting lifting cylinders (13) and a motion transmission unit (14), each associated with a hydraulic lifting cylinder (13), for moving the second upright (4) in response to the movement of the first upright (3).

9. A lift truck comprising a device (1) for lifting a load according to any one of claims 1 to 8.

10. The truck according to claim 9, **characterised in that** the first movement means (16), in the retracted position, are lower than the height for positioning a driving seat (27).

Fig. 1

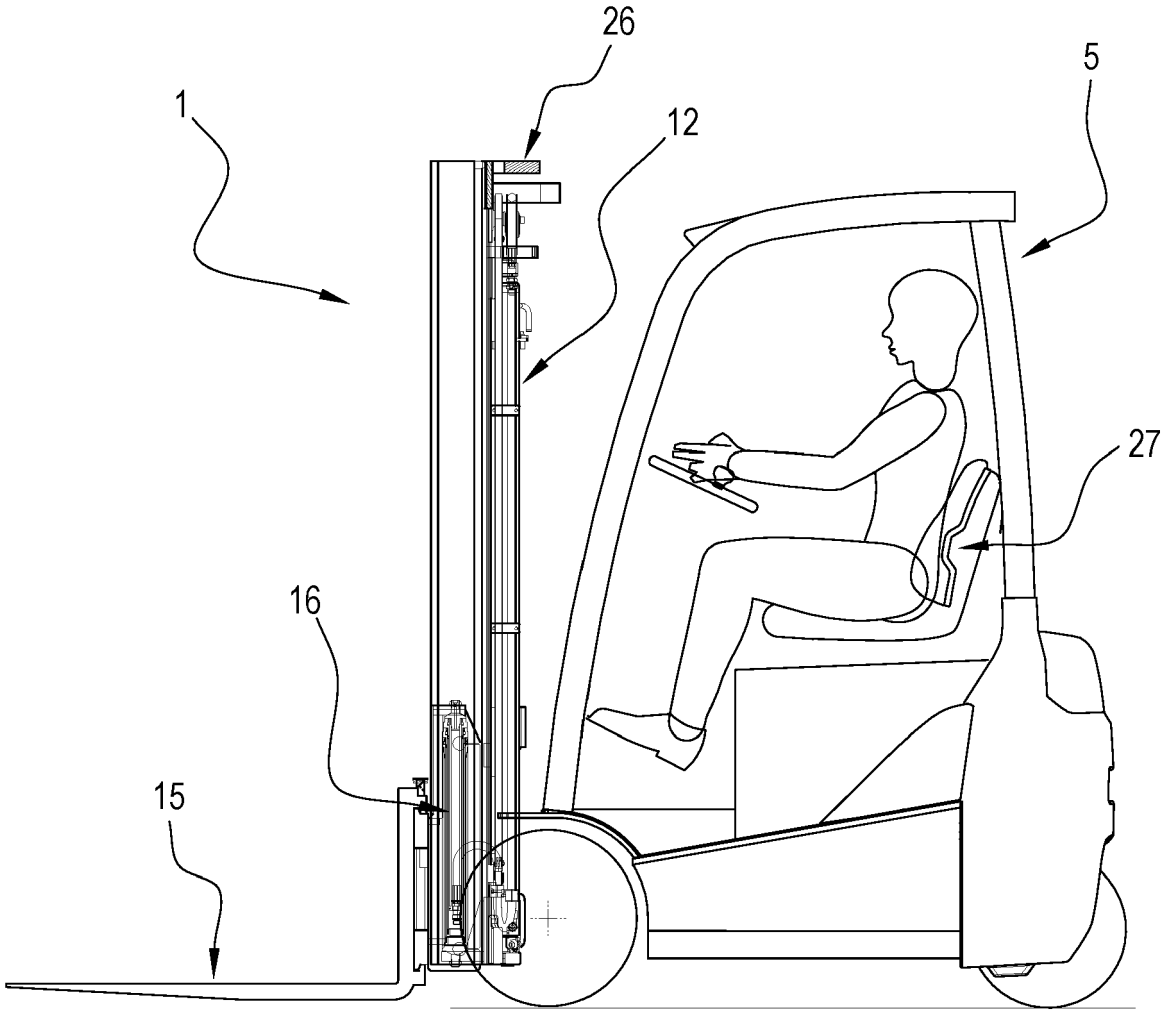


Fig. 3

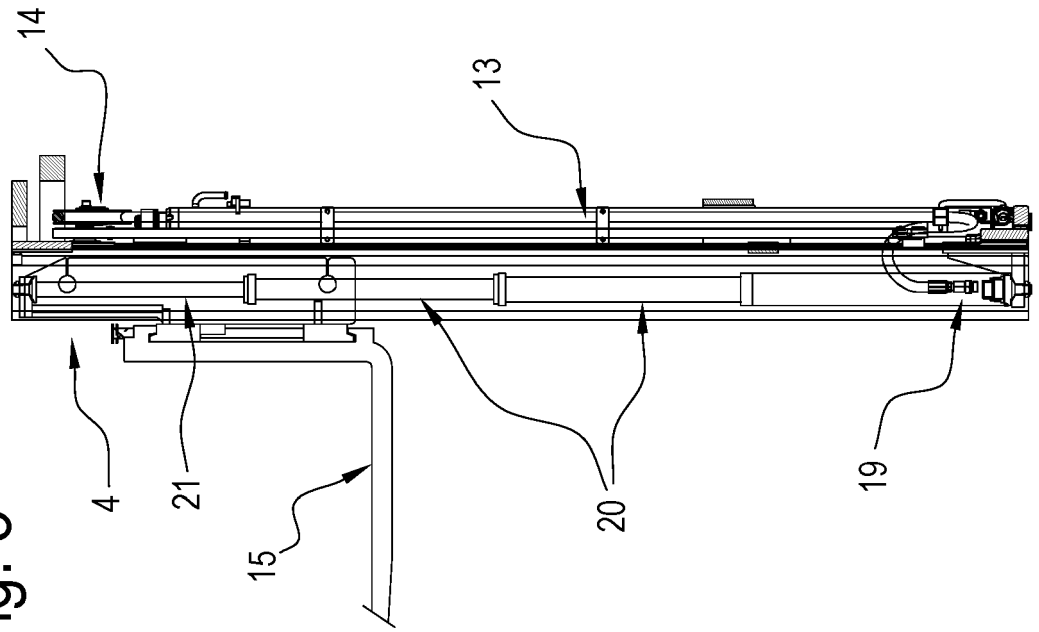


Fig. 2

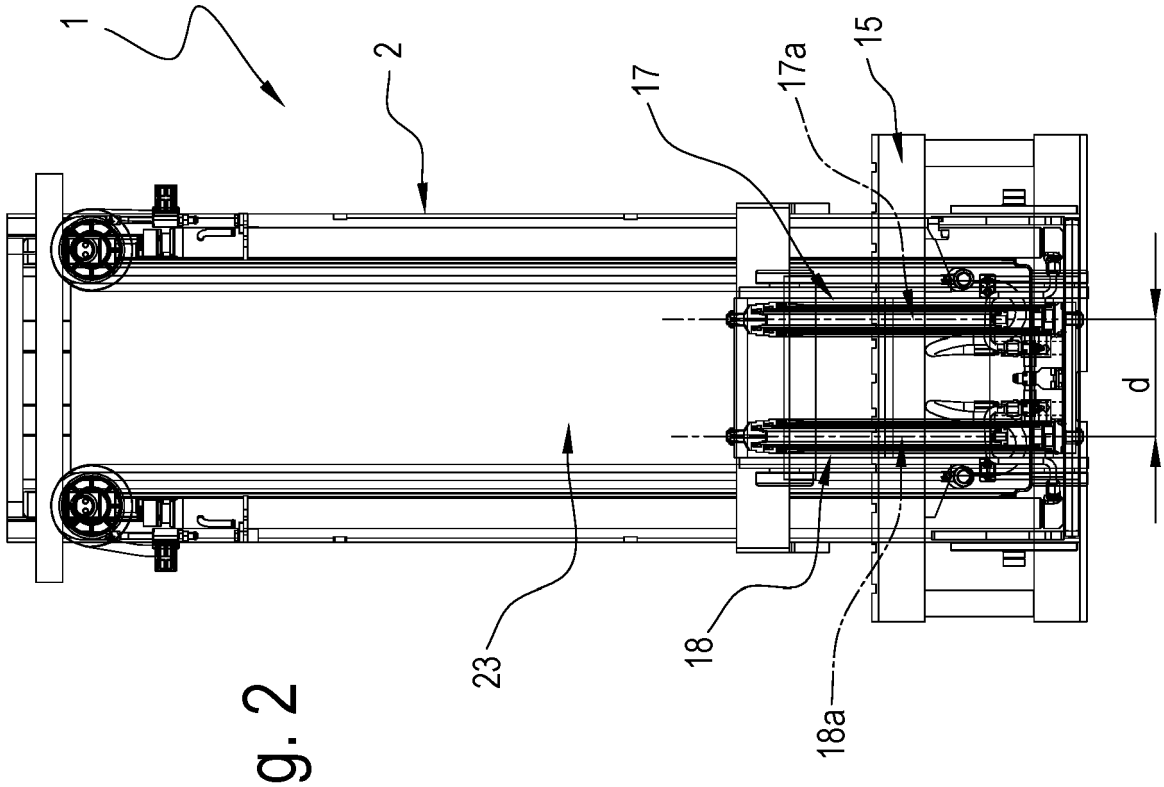


Fig. 4

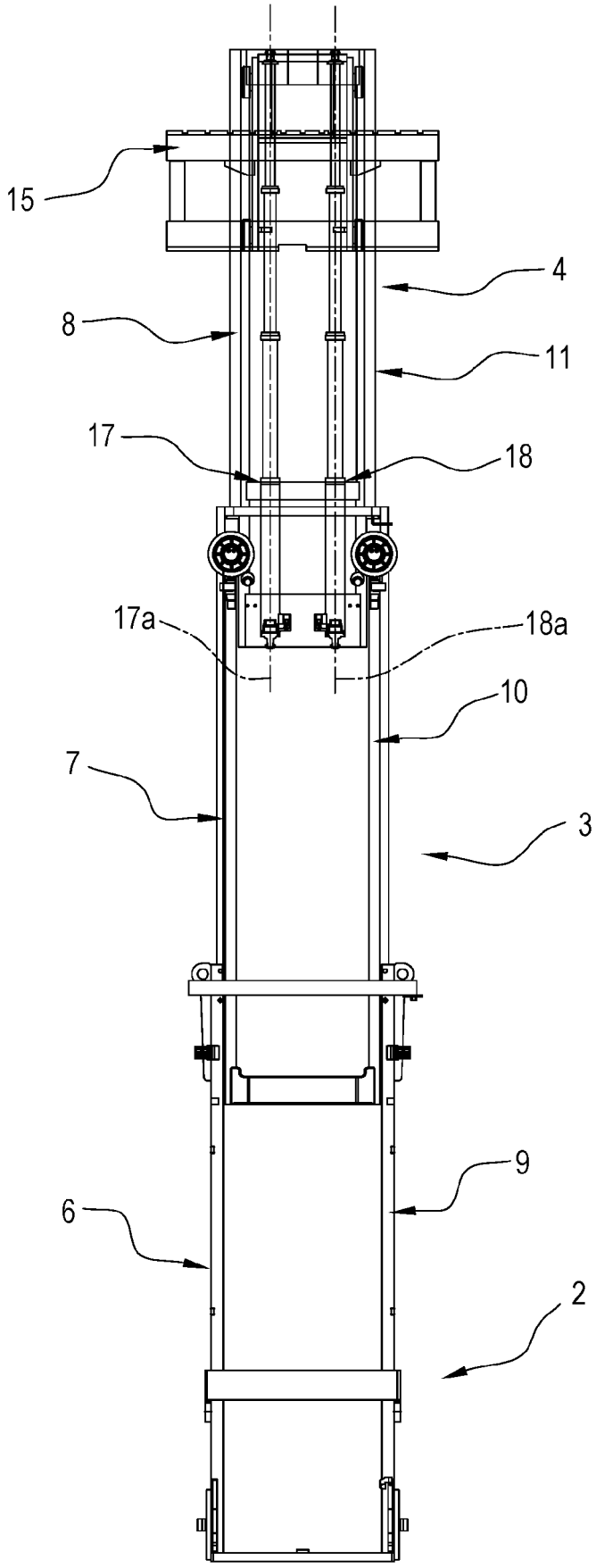


Fig. 5

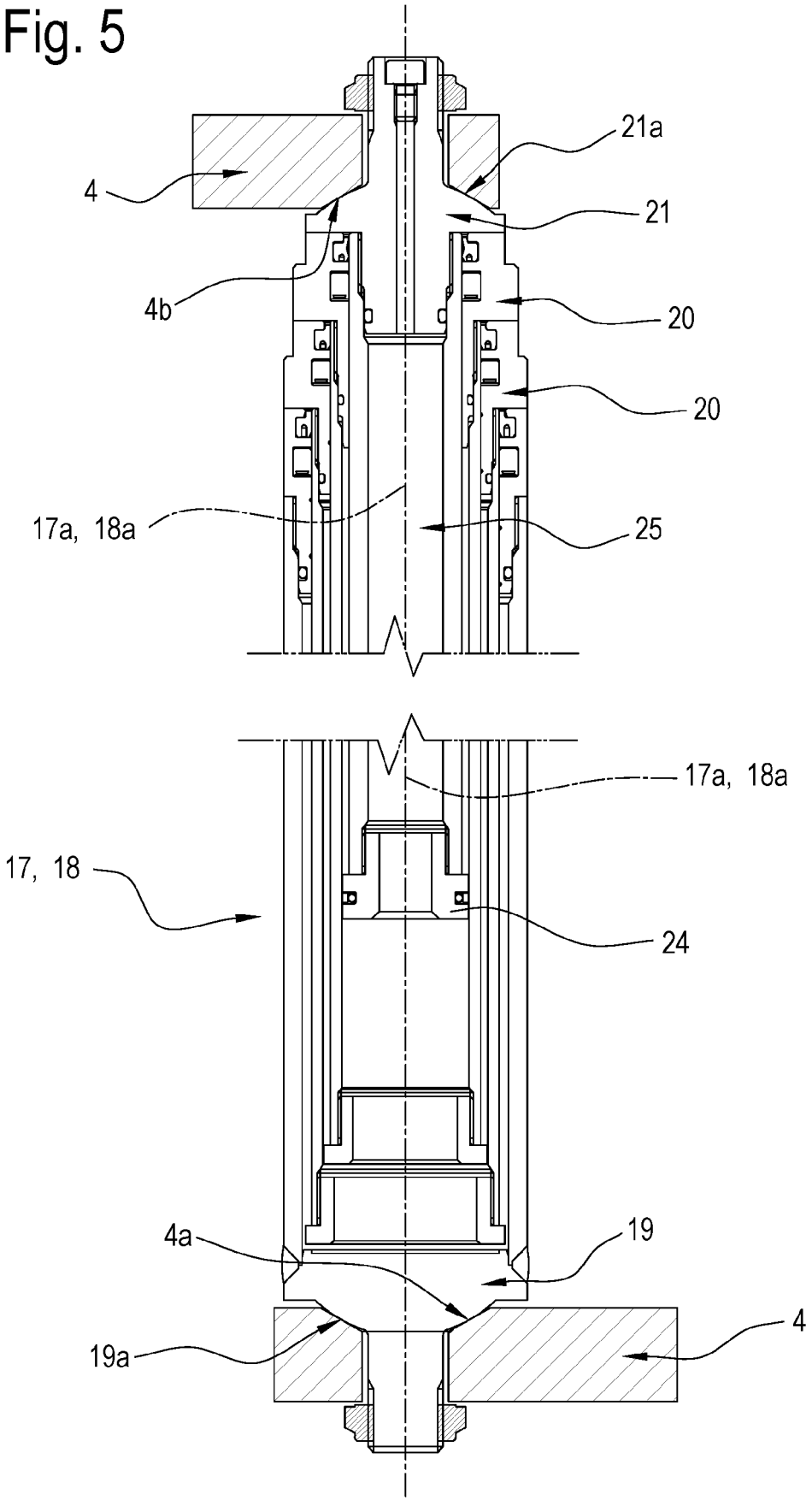


Fig. 6

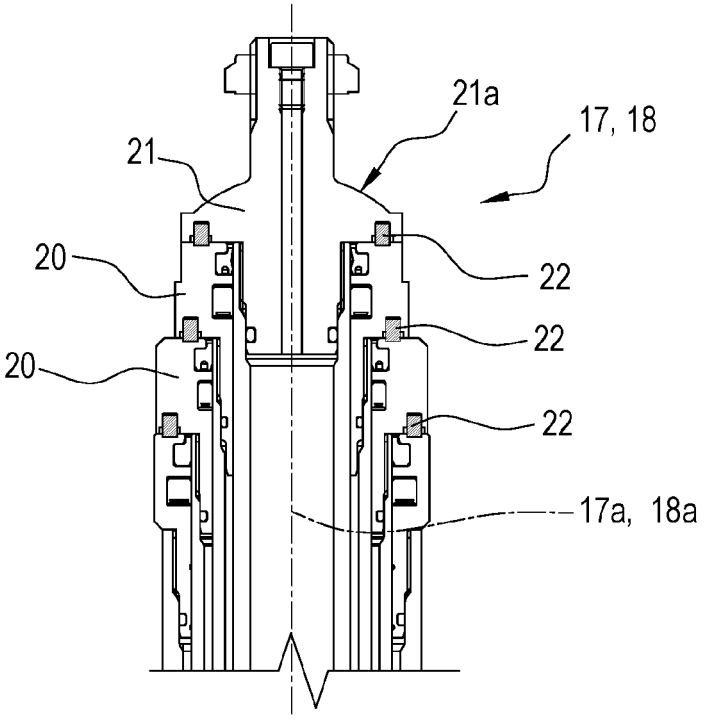


Fig. 7

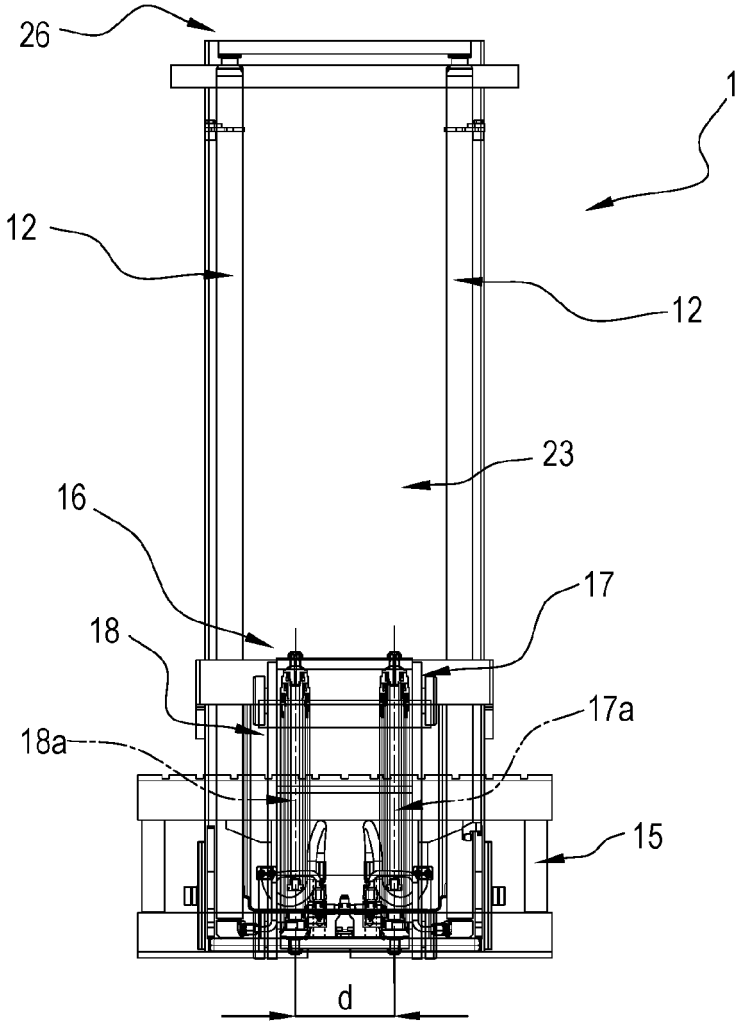


Fig. 8

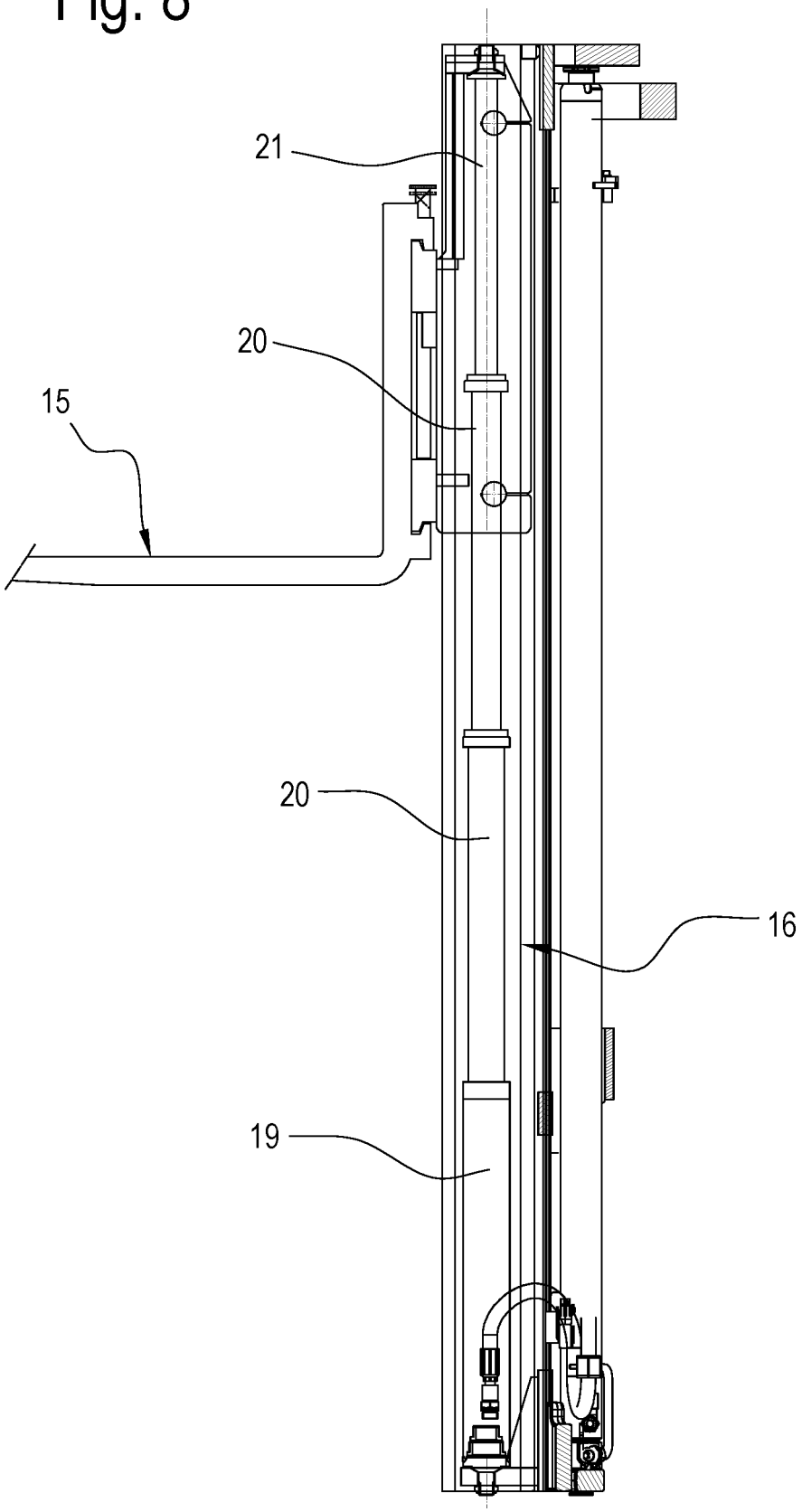
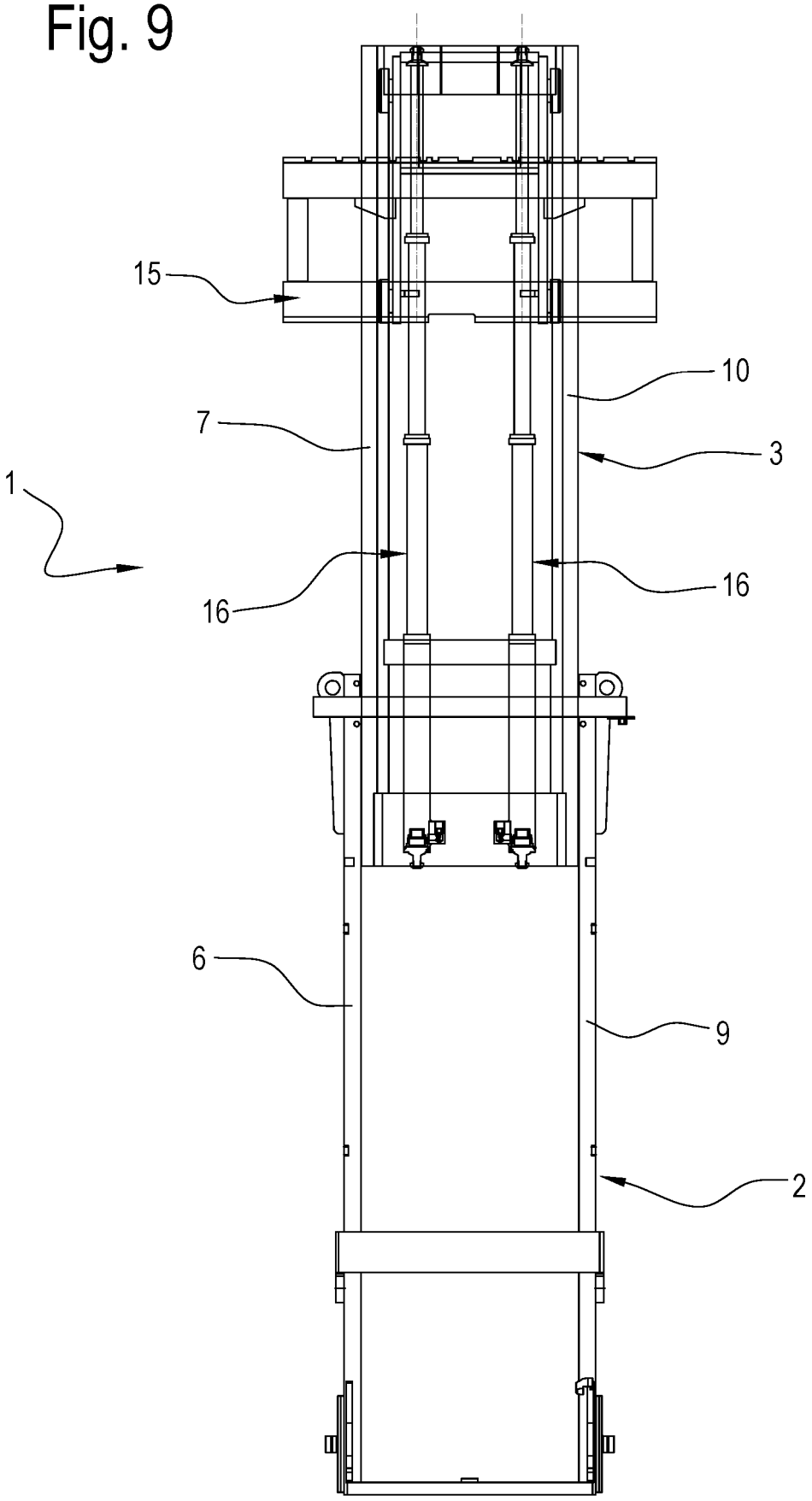


Fig. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 4023

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	CN 104 925 705 B (BYD CO LTD) 23 November 2016 (2016-11-23) * claim 1; figures 1,4 *	1-10	
A	JP H10 338488 A (NISSAN MOTOR) 22 December 1998 (1998-12-22) * figures 2,7 *	1-10	
A	US 4 356 893 A (JOHANNSON RICHARD J) 2 November 1982 (1982-11-02) * figures 3,3a *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC) B66F F15D F15B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 May 2022	Serôdio, Renato

CATEGORY OF CITED DOCUMENTS

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17-05-2022

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