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(54) **PASSENGER HOIST**

(57) The invention relates to a passenger hoist comprising support elements (3a), a frame structure (4), a substantially vertically movable working platform (2), an elevating member (4c) for elevating and lowering the working platform (2) and moving means (5) disposed in connection with the work platform (2) with driving members (3d) for moving the passenger hoist (1) horizontally. The passenger hoist (1) comprises means for changing the distance between the supporting points of the support elements (3a) to the operating position and to the transport position.

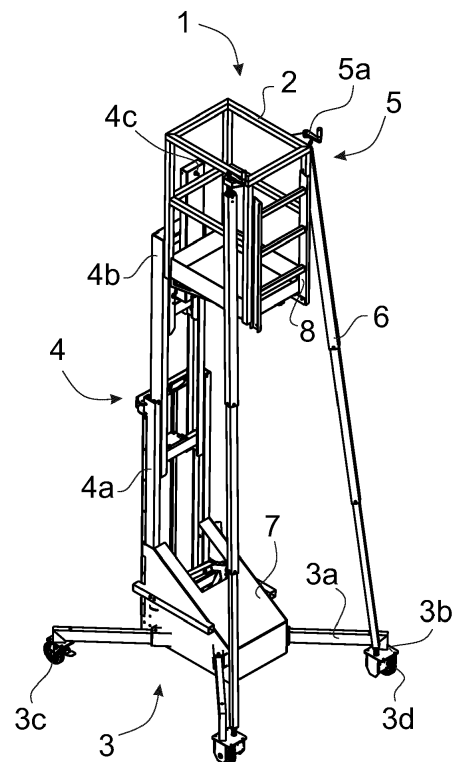


Fig. 1

Description

[0001] The invention relates to a passenger hoist, as defined in the preamble of claim 1.

[0002] The passenger hoist according to the invention, is very suitable for use on an even, hard ground at small construction sites, shelf warehouses, shops, or for cleaning at heights in premises, and for light bulb changing, for example. The passenger hoist according to the invention is categorized as belonging to the group of aerial work platforms.

[0003] The current passenger hoists intended for an even, hard ground vary greatly in type. The passenger hoists replace ladders, staircases and building scaffolds and are safe as well as quick to use. In Finland, for example, the building regulations forbid or restrict the use of ladders in professional construction, and other countries have similar, or even more strict, regulations for the use of ladders.

[0004] The most common lift type intended for an even, hard ground is the so-called scissor lift. Scissor lifts come with batteries/electric motors or diesel engines, and also without a motor. The largest scissor lifts reach heights up to 25 meters. The lifting mechanics of the scissor lifts is mainly based on hydraulics. Another group of aerial work platforms are hydraulic passenger hoists where the lift platform is elevated and lowered from the lift platform. The hydraulic passenger hoists often have a transport machinery driven by a battery or an electric motor. Generally, the lifting height of the hydraulic passenger hoists is over 5 meters. In addition to the above-mentioned passenger hoists, there are other passenger hoists in use, such as the gas-spring actuated passenger hoist disclosed in WO2017174877 (A1).

[0005] The above-mentioned widely used passenger hoists suffer from the problem that they have a bulky and heavy structure. In scissor lifts, their scissor platform technology requires a lot of sturdy steel structures and material for the lifting mechanics to work. Even the smallest scissor lifts weigh several hundreds of kilos. The hydraulic solutions add a lot of weight to the lifts as well. The added weight from the motorization, other mechanics and/or counterweight make the passenger hoists so large and/or heavy that one person is not enough to move a passenger hoist, in a transport state, from a transportation vehicle to a working spot, for example, or, in a building, to different working floors along a staircase. Due to its large size, the passenger hoist does necessarily fit into an elevator of the building, or into vans generally used by maintenance or construction workers.

[0006] All the passenger hoists available on the market that can be horizontally moved/driven from the working platform comprise some sort of motor and power source to be able to work. The motor and the power source, such as a battery, inevitably add complexity, weight, manufacturing costs and maintenance costs to the structure. Besides, the motor-driven passenger hoists are subject to more strict safety regulations.

[0007] The simplest and lightest vertically lifting passenger hoists cannot be horizontally moved by the worker when up on the working platform. Every time that the worker must change to a new working spot, he must step down from the lift, move the lift to the new working spot, lock the lift in place and climb up onto the lift. These actions make the work substantially slower and harder.

[0008] This invention aims at eliminating the above-mentioned drawbacks and providing a lightweight, compact, reliable and inexpensive apparatus for facilitating working at different heights, the apparatus being horizontally movable by the worker, when up the working platform, in a safe way, and so compact in its transport state that one person is enough to move the apparatus, along staircases in buildings, as well as between a van and a working spot, and to lift it into the van.

[0009] The passenger hoist according to the invention is characterized in what is set forth in the characterizing part of claim 1. Other embodiments of the invention are characterized in what is set forth in the rest of the claims.

[0010] The passenger hoist according to the invention comprises support elements, a frame structure, a substantially vertically movable working platform, an elevating member for elevating and lowering the working platform and moving means disposed in connection with the work platform with driving members for moving the passenger hoist horizontally. The passenger hoist comprises means for changing the distance between the supporting points of the support elements to the operating position and to the transport position.

[0011] The passenger hoist according to the invention is somewhere in between an A-ladder and a scissor lift. Therefore, one of its benefits is that it has the compact and lightweight structure of a passenger hoist, in a transport state, allowing the apparatus to be transported in an ordinary van, for example, and one person is enough to move the apparatus between the van and the operation site of the apparatus, and to move the apparatus into the van. This compact apparatus can also be moved through regular doors as well as in common passenger elevators, and along staircases by one person only.

[0012] Another advantage of the invention is that the support surface of the apparatus, such as the passenger hoist, on the ground can be extended, by means of telescopically spreadable support elements, such as support legs or wheels. Alternatively, the area needed on the ground can be reduced by providing the lower part of the passenger hoist with a counterweight that can be filled and emptied, such as with a liquid-filled counterweight that is easy to fill and empty for use or transportation.

[0013] Another advantage of the invention is that the working platform of the passenger hoist according to the invention can be steplessly elevated and lowered by the worker, when up the working platform, manually or by means of a cordless drill, for example. The capacity of the battery of an ordinary cordless drill, which is in a normal condition, easily suffices for elevating and lowering

the working platform as many times as needed during one working day. The use of a commercial cordless drill as a means for lifting the working platform decreases the manufacturing costs and reduces the weight of the passenger hoist since no heavy scissor lift arrangements nor hydraulic arrangements are needed.

[0014] Still another advantage of the passenger hoist according to the invention is that it allows the worker, when up on the working platform, to manually move the passenger hoist in the horizontal direction on the ground. When up on the working platform, the worker is able to move the passenger hoist in a desired direction and to lock the passenger hoist in place. The moving is carried out by hand, by means of two different manually rotatable actuators, such as rotatable crank handles. This manual moving mechanism of the passenger hoist gives the passenger hoist a very lightweight and simple structure which is inexpensive to manufacture and maintain. In other embodiments of the invention, the moving of the passenger hoist on the ground can also be carried out by the worker, when up on the working platform, by means of electrical power produced by a crank generator or a cordless drill.

[0015] In the following, the invention will be described in more detail by means of exemplary embodiments with reference to the accompanying simplified drawings wherein

- Figure 1 is an oblique top and lateral view of a passenger hoist according to the invention, elevated to an upper position,
- Figure 2 is a lateral view of a passenger hoist according to the invention, elevated to the upper position,
- Figure 3 is an oblique top and lateral view of a passenger hoist according to the invention, lowered to a lower position,
- Figure 4 is a top view of a passenger hoist according to the invention, lowered to the lower position and with the support elements retracted,
- Figure 5 is an oblique bottom view of a rotatable actuator of a passenger hoist according to invention, and
- Figure 6 is a front and partial cross-sectional view of a driving device of a passenger hoist according to invention.

[0016] Figure 1 is an oblique top and lateral view of a passenger hoist 1 according to the invention, elevated to an upper position, while Figure 2 is a lateral view of the same passenger hoist, elevated to the upper position.

[0017] The passenger hoist 1 comprises a working platform 2 with handrails, a base structure 3, a frame

structure 4, moving means 5, a counterweight 7 and a ladder 8. The base structure 3 comprises four telescopically spreadable support elements 3a, two driving devices 3b with driving members 3d and two ordinary wheels 3c. The frame structure 4 consists of a first frame part 4a, a second frame part 4b and a frame elevating member 4c. The moving means 5 are two in number. The moving means 5 comprises a rotatable actuator 5a with a locking member 5c, universal joints 10a, 10b, a transmission element 6 and a driving device 3b with a gear system, such as a bevel gear system, as well as a with driving member 3d, such as a sprocket.

[0018] The working platform 2 of the passenger hoist 1 is elevated to its upper position by the elevating member 4c, by means of a cordless drill, for example. Correspondingly, the working platform can also be lowered by the elevating member 4c. The elevating member 4c can also be actuated by means of a manual crank handle. As the elevating member 4c is actuated, the second part 4b of the frame structure 4 slides overlap-pingly into the first part 4a and out of it. The transmission mechanism is constituted by chain sprockets and a chain, for instance. The ladder 8, which that can be pulled up and down, is provided on one side of the working platform 2 to allow a person to climb up onto the working platform 2 or to climb down from the working platform 2.

[0019] The base structure 3 provides a sturdy and safe support to the passenger hoist. The telescopic solution allows each of the four support elements 3a to be extended and/or retracted diagonally, whereby the support elements (3a) of the passenger hoist 1 are distanced and / or converged in both width vice and length vice. Wheels are provided at the extremities of the support elements 3a, such as support legs, enabling the passenger hoist 1 to be effortlessly moved on the ground. Two of the four wheels are driving members 3d of the driving devices 3b to which a force is transmitted by the operator, by means of the moving means 5. The driving members 3d of the driving devices 3b can be locked in place by locking the rotatable actuators 5a by means of a locking member 5c provided on the working platform 2. The two other wheels 3c are freely rotatable wheels to be locked when necessary.

[0020] In another preferred embodiment, the distance between the support points of the passenger hoist 1 is varied by means of hinged support elements 3a, where the support elements 3a are turned forward or backward in the transport position or on the side of the passenger hoist 1 so that the passenger hoist 1 can be transported, for example, from door openings. In its operating position, the support legs 3a are turned open and locked in place, whereby the support points of the passenger hoist 1 are as far apart as possible in both width vice and length vice. There may be several locking positions in the operating position.

[0021] The base structure 3 comprises a counterweight 7 that can be filled, normally with a liquid, such as water, and emptied. When filled, the counterweight 7

transfers the center of gravity to the lower part of the passenger hoist 1, making the passenger hoist 1 stable and safe. As the passenger hoist 1 is moved away from the working site, the counterweight 7 can be unloaded to allow the passenger hoist 1 to be moved easily and effortlessly. Preferably, the volume of the counterweight 7 is 50 to 100 liters.

[0022] The manually rotatable actuators 5a are attached to the upper handrail of the working platform 2 and can be rotated by the operator when up on the working platform 2. The rotation of the rotatable actuator 5a rotates the transmission element 6 around its longitudinal axis. The transmission element 6 is comprised of members that are telescopically slidable into each other. These members are freely slidable into and out of each other depending on how the working platform 2 is elevated or lowered. The moving means 5 move and guide the passenger hoist 1 in a substantially horizontal plane on the ground. When the rotatable actuator 5a is rotated in a first direction, the driving member 3d of the driving device 3b rotates in the first direction. When the rotatable actuator 5a is rotated in a second direction, the driving member 3d of the driving device 3b rotates in the second direction. Thus, when only one rotatable actuator 5a is operated, only one driving member 3d of the driving device 3b rotates, making the passenger hoist 1 to turn in place. When two rotatable actuators 5a are operated concurrently, the passenger hoist 1 moves in a desired direction on the ground.

[0023] In another embodiment, the rotatable actuators 5a act as electricity generators producing enough electricity for electric motors provided in the driving device 3b and rotating the driving members 3d, resulting in that no separate transmission elements 6 are needed.

[0024] Figure 3 is an oblique top and lateral view of a passenger hoist 1 according to the invention, lowered to a lower position. In this lower position, the passenger hoist 1 can be moved through ordinary doors and elevator doors. The support elements 3a are set in the operating position, i.e. the four support points of the passenger hoist 1 are as far apart as possible and the working with the passenger hoist 1 is safe.

[0025] Figure 4 is a top view of a passenger hoist 1 according to the invention, lowered to the lower position and with the support elements 3a retracted. The passenger hoist 1 is folded into a transport state to give it an appropriately reduced transportation width and to allow the passenger hoist 1 to be effortlessly moved through standard wide door openings, and in elevators as well as into an ordinary van, in an upright position and/or lying on its side. Besides, the passenger hoist 1 is made suitably lightweight to allow the passenger hoist 1 to be moved between a van and an operation site, as well as to allow the passenger hoist 1 to be moved into the van, by one person only.

[0026] Figure 5 is an oblique bottom view of a rotatable actuator 5a of a passenger hoist 1 according to the invention, which, in this exemplary embodiment, is a rotat-

able crank handle. The rotatable actuators 5a are fastened to fastening lugs 9 integrated with the working platform 2. The shaft 5b of the rotatable actuator 5a extends through the fastening lug 9 in such a way that the passenger hoist's moving means 5, attached to the first end of the shaft 5b, is located on the first side of the fastening lug 9, i.e. above it, while a universal joint 10a is connected to the second end of the shaft 5b, i.e. below it. The universal joint 10a connects the shaft 5b of the rotatable actuator 5a and the transmission element 6 to each other. The universal joint 10a allows the angle of the transmission element 6 to be effortlessly altered when changing the height of the frame structure 4 and when extending and retracting the telescopic support elements 3a. The rotatable actuator 5a can be locked by means of a locking member 5a, such as a locking pin. The locking member 5c is used for locking the rotatable actuator 5a in place by pressing the locking member 5c down in order to insert the locking pin provided in the first end of the locking member 5c into a locking hole 9a of the fastening lug 9. Correspondingly, the locking member 5c is released by lifting the locking member 5c to its upper position. The locking of the rotatable actuator 5a also locks the driving members 3d of the passenger hoist 1 in place.

[0027] Figure 6 is a front and partial cross-sectional view of a driving device 3b of the passenger hoist 1 according to the invention. The driving device 3b is integrated with a support element 3a of the base structure 3. A force generated by the operator, by means of the rotatable actuator 5a, is transmitted, via the transmission element 6 and a universal joint 10b provided at the end thereof, to the shaft 12 of the driving device. Preferably, the driving device 3b comprises a gear system 11 consisting of two bevel gears and translating the rotational movement of the shaft 12 of the driving device to the shaft 13 of the driving member, and, thus, to the driving member 3d. The gear ratio of the gear system 11 can be changed by varying the bevel gear sizes. The mechanisms of the driving device 3b are shielded by a durable housing structure 3e.

[0028] It is obvious to a person skilled in the art that the various embodiments of the invention are not restricted to the above-described examples but may vary within the scope of the accompanying claims. Thus, the size and dimensions of the components of the apparatus may differ from those stated in the exemplary embodiments.

[0029] It is also obvious to the person skilled in the art that the spreadable support elements according to the invention can also be implemented in a manner other than telescopic. For example, the support elements can be turned to the side of the device to be folded ready for use and locked.

[0030] It is also obvious to the person skilled in the art that the cranks of the rotatable actuators according to the invention can be replaced, for example, by rotatable wheels, small screwdrivers or cordless drills for guiding and moving the apparatus.

Claims

1. A passenger hoist, which passenger hoist (1) comprising support elements (3a), a frame structure (4), a substantially vertically movable working platform (2), an elevating member (4c) for elevating and lowering the working platform (2) and moving means (5) disposed in connection with the work platform (2) with driving members (3d) for moving the passenger hoist (1) horizontally, **characterized in that** the passenger hoist (1) comprises means for changing the distance between the supporting points of the support elements (3a) to the operating position and to the transport position. 5
2. A passenger hoist defined in claim 1, **characterized in that** the passenger hoist (1) comprises means for changing the length of the support elements (3a) telescopically to the operating position and the transport position. 10
3. A passenger hoist defined in claim 2, **characterized in that** the passenger hoist (1) comprises means for changing the distance of the support points of the support elements (3a) diagonally to the base structure (3) of the passenger hoist (1) in the operating position and the transport position. 15
4. A passenger hoist as defined in claim 1, 2 or 3, **characterized in that** the moving means (5) comprise two manually rotatable actuators (5a) 20
5. A passenger hoist defined in claim 4, **characterized in that** the passenger hoist (1) is adapted to be guided and moved on a ground, in a desired way, by the rotation speeds of the moving means (5). 25
6. A passenger hoist as defined in claim 4 or 5, **characterized in that** the rotatable actuator (5a) is a manually rotatable crank handle. 30
7. A passenger hoist as defined in any of claims 4 to 6, **characterized in that**, for locking the driving member (3b), the passenger hoist (1) has a locking member (5c) to lock the rotatable actuator (5a) unrotatably. 35
8. A passenger hoist as defined in any of claims 4 to 7, **characterized in that** the moving means (5) comprise transmission elements (6) adapted to transmit the forces generated by the rotatable actuators (5a) to the driving members (3d) of the moving means (5). 40
9. A passenger hoist as defined in any of claims 4 to 8, **characterized in that** the transmission elements (6) are provided with at least one universal joint (10a, 10b). 45
10. A passenger hoist as defined in any of claims 4 to 9, **characterized in that** the rotatable actuator (5a) is a manually driven electricity generator, and **in that** the moving means (5) has an electric motor receiving its driving power from the electricity generator. 50
11. An apparatus as defined in any of the preceding claims, **characterized in that** the passenger hoist (1) comprises a counterweight (7) that can be filled and emptied. 55
12. An apparatus as defined in any of the preceding claims, **characterized in that**, when folded, the total height of and the width of the smaller side of the passenger hoist (1) are less than the 2.2 meters and 1.0 meter, respectively.

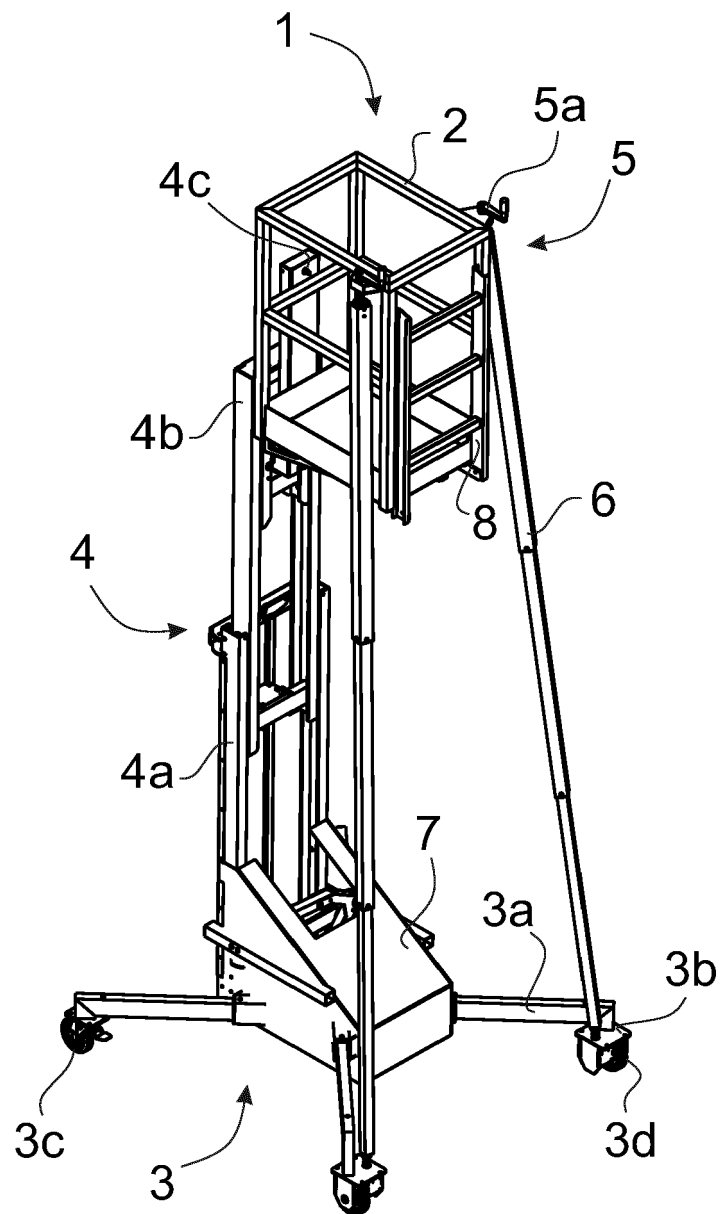


Fig. 1

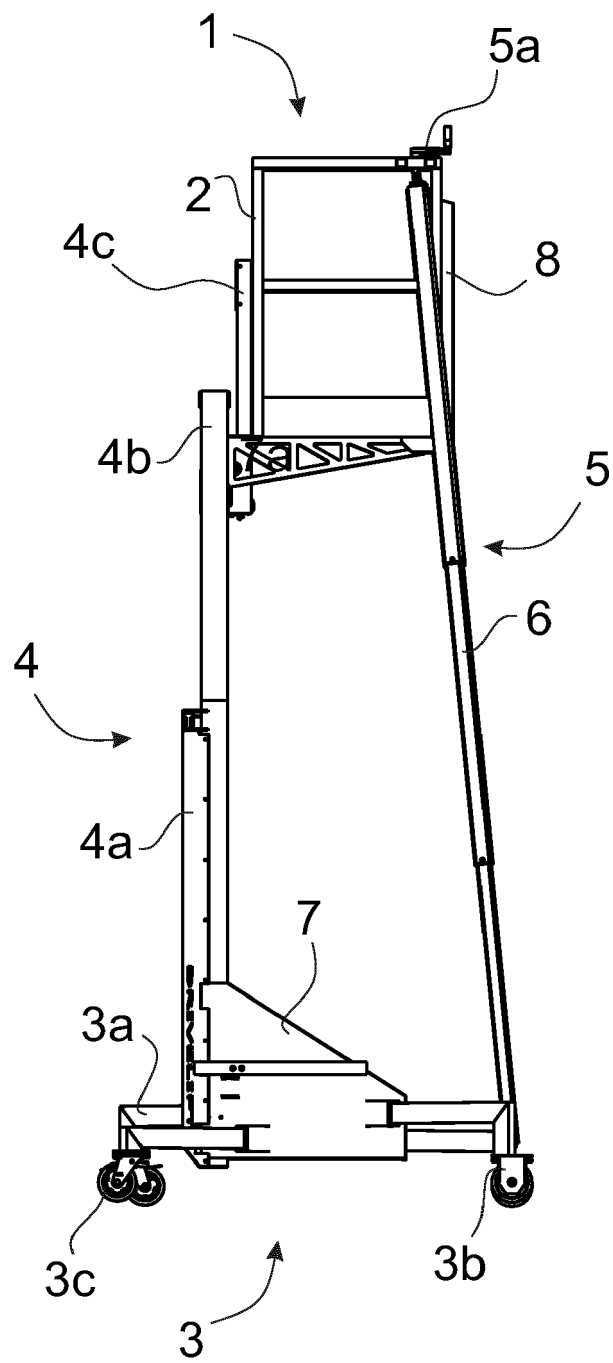


Fig. 2

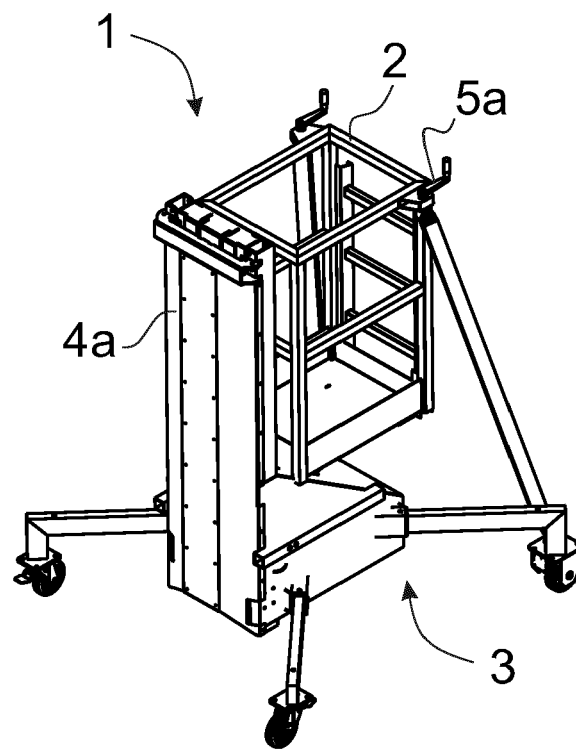


Fig. 3

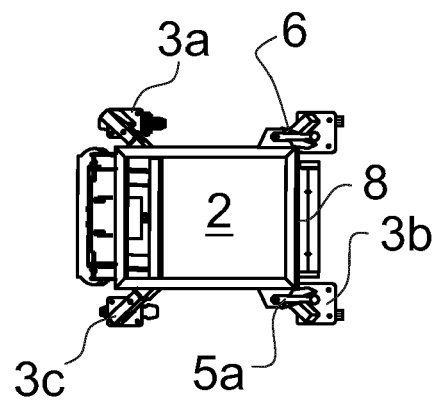


Fig. 4

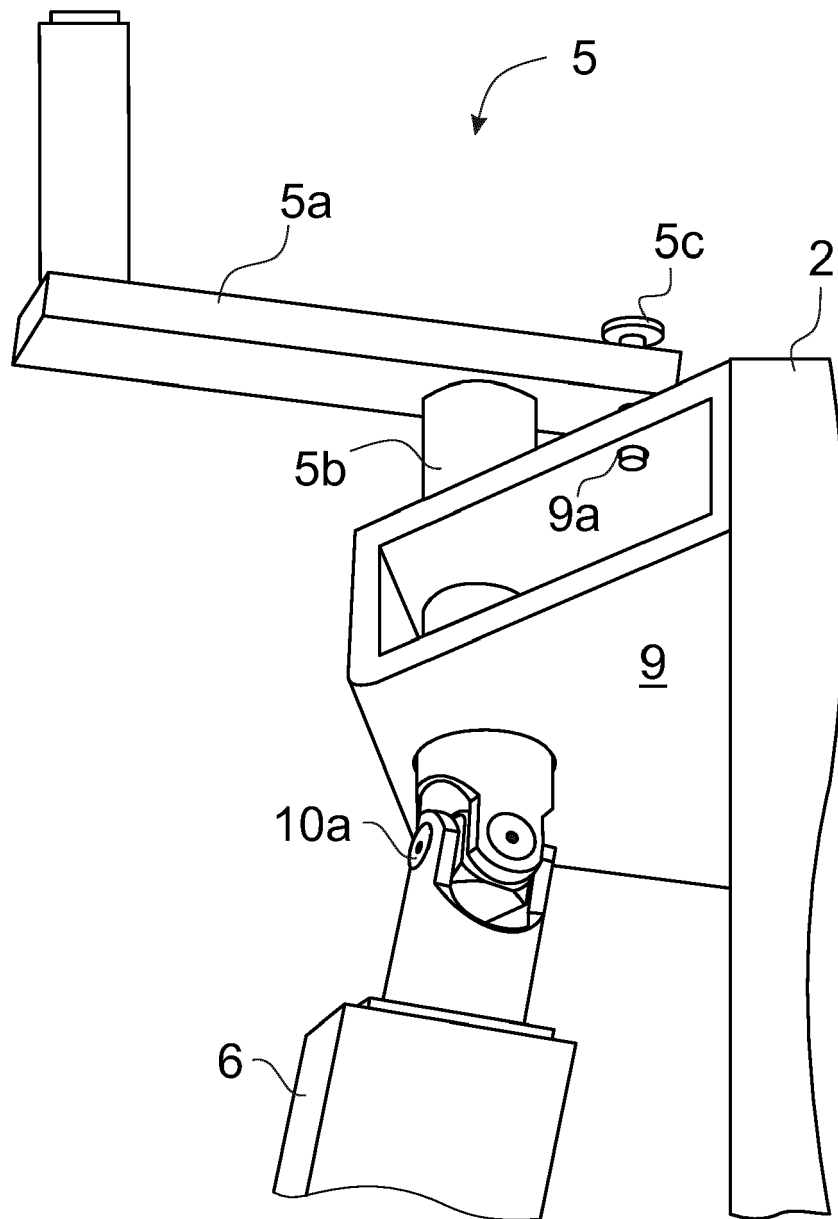


Fig. 5

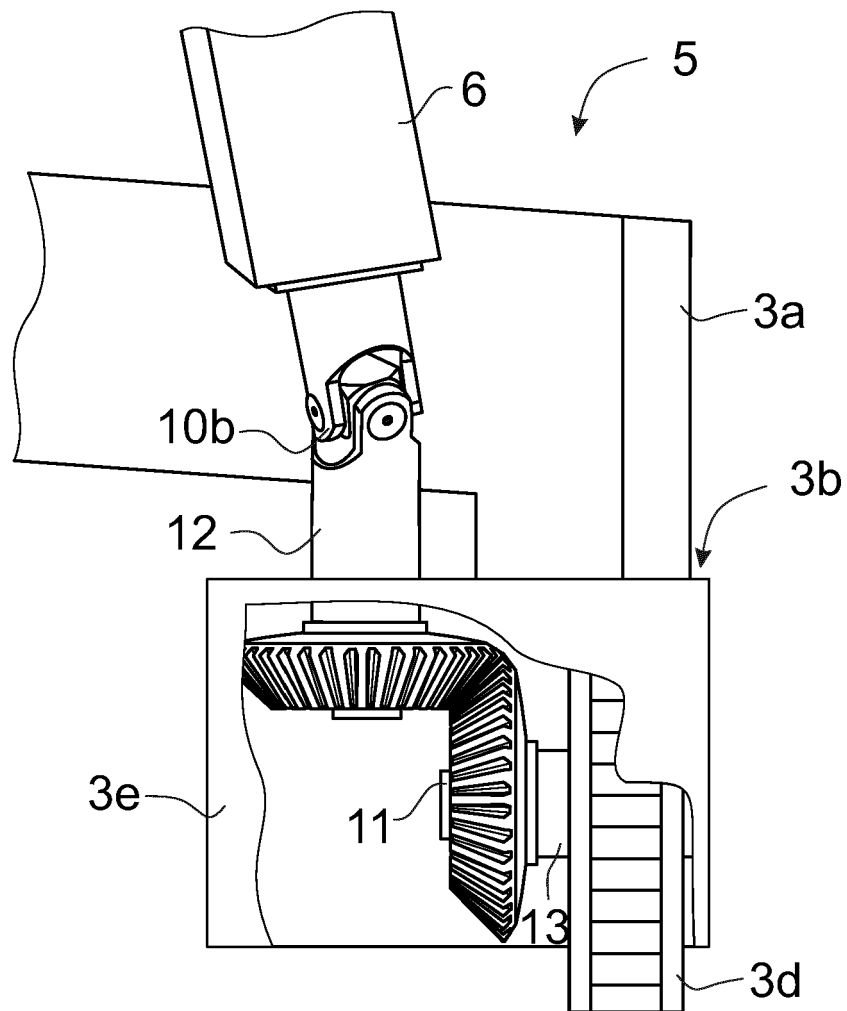


Fig. 6



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Application Number
EP 19 39 7513

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 September 2019	Examiner Popescu, Alexandru
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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