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Neumann

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[54] **ELECTRO-MECHANICAL LIFTING DEVICE**

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[51] **Int. Cl.** **H01h 35/24**

[58] **Field of Search** ..... 318/481; 200/81 H, 200/81.4, 81.5

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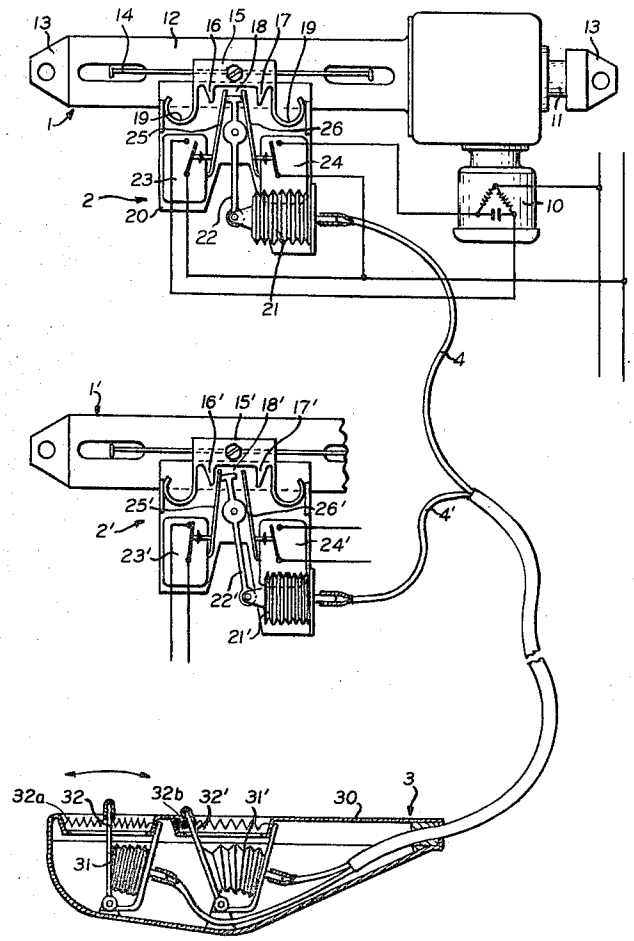
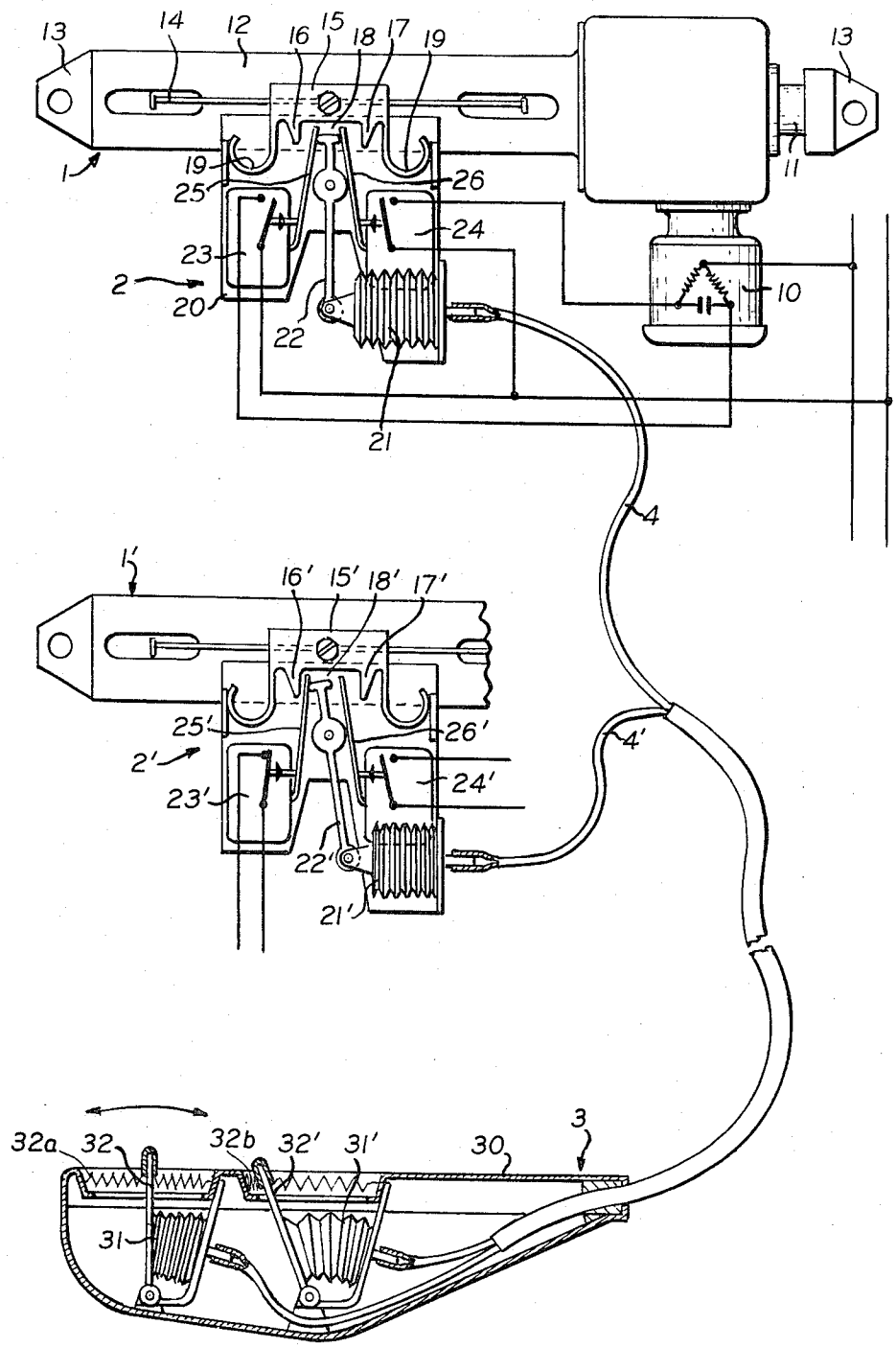
[57] **ABSTRACT**

An electro-mechanical lifting device, in particular for bed adjustments, which comprises a driving motor including switching and control means. A pressure source is received in a manual switch. Pneumatic means for operation of the switching and control means are provided by means of the pressure source. A switching device is connected by a hose conduit with the pressure source. The volume of the pressure source is capable of being enlarged and of being reduced. The switching device has a pressure converter responding to pressure below atmospheric pressure and to pressure above atmospheric pressure, with two end positions. The pressure converter is in operative connection selectively with a switch means for left-run and a switch means for right-run of the driving motor.

4 Claims, 1 Drawing Figure

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ELECTRO-MECHANICAL LIFTING DEVICE

The present invention relates to an electro-mechanical lifting device, in particular for bed adjustments, in which the switching and control of the driving motor is operated pneumatically by means of a pressure source disposed in a hand switch, which pressure source is connected by means of a hose conduit with a switching device.

In the lifting device, known by the German Gebrauchmuster, No. 7,029,143, two pressure sources are provided for the right run and the left run of the motor, each of which is connected with an air pressure switch by means of a hose conduit, which air pressure switch operates the contact for the right run and left run. Provisions must be made thereby, that only the one or the other pressure source can be operated. This means, that in a bed with a head-and-foot adjustment four pressure sources, four conduits and four pressure switches are necessary, to which still four end-limiting switches are to be added.

It is one object of the present invention to provide an electro-mechanical lifting device, which simplifies and improves the known electro-mechanical lifting device, so that only two pneumatic units are required and beyond that the switches to be operated for right-run and left-run can be combined with the end switches.

It is another object of the present invention, to provide an electro-mechanical lifting device, wherein the volume of the pressure source can be capable of being increased and reduced, respectively, from a center position, and wherein the switching device has a pressure transfer unit responding to pressure below atmospheric pressure and to pressure above atmospheric pressure, with two end positions in operative connection, either with a switch for a right run or a switch for a left run of the motor.

Advantageously the operative connection is brought about such, that the switching device has a transfer lever, which, on the one hand is pivoted to the pressure transfer and on the other hand, is within the range of two switching levers for the two switches for the right run and the left run.

It is still another object of the present invention, to provide an electro-mechanical lifting device, which makes it possible that the two switches can serve also as an end switch and wherein the switching device is secured on a protective tube of the lifting device and a joining member is secured on the lifting pivoting rod and wherein the switching levers are disposed within the operating range of the joining device.

The cooperation of the joining device and of the switching lever is made possible advantageously such, that on the joining device are provided two cams having a certain distance from each other, which cams provide a U-shaped recess of the joining device, into which the switching levers extend.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawing, in which the only FIGURE discloses a schematic elevation of a bed-adjusting unit.

Referring now to the drawing, the adjusting unit comprises a lifting device **1**, by example, for the adjustment of the head portion, a lifting device **1'** for the adjustment of the foot portion with a switching device **2** or **2'**, respectively, and a hand switch **3**.

The lifting devices **1** or **1'**, respectively, comprise substantially a motor **10**, which drives the spindle **11** over a drive (not shown) and over an axially immovable spindle nut. The spindle **11** is surrounded by a protective tube **12**, which is connected with the driving housing and the motor housing. At the free ends of the spindle **11** and of the protective tube **12** are provided fork heads **13**, on which is pivoted the rod arrangement (not shown) for the bed adjustment.

The essential parts belonging to the switching device **2**, namely, the pressure transfer **21** and the two switches **23** and **24** are secured in a switch housing **20**, which is equipped with a cover (not shown). The pressure transfer member **21** can be a piston disposed in a cylinder, or, as shown, a membrane housing similar to folding bellows. The axially immovable end wall of the membrane housing is secured at the housing **20**, while the axially movable end side is connected pivotally with the one end of the two-armed transmission lever **22** pivoted to the housing **20**. For the operation of the contact of the switches **23** or **24**, respectively, switching levers **25** and **26** are pivoted thereto, the free ends of which are arranged within the swinging range of the other end of the transfer lever **22**.

In the hand switch **3** the two pressure sources **31** and **31'** are provided, which in a shown embodiment are formed bellow-like, whereby the one side of the bellows is secured to the housing **30** of the manual switch, while the other end is equipped with an adjustment grip **32** and **32'**, respectively, which are retained in the center positions by springs **32*a*** and **32*b***, respectively. The pressure sources **31** and **31'** are connected with the pressure transfers by means of hose conduits **4** and **4'**.

The pressure sources **31** and the pressure transfer member **21** connected therewith are shown in the drawing in the center position. The transmission lever **22** receives thereby a position symmetrical to the two switching levers **25** and **26** in which the ends of the switching lever engage the thickened end of the transmission lever and the contacts of both switches **23** and **24** are open.

For the operation of the adjustment device and for switching on of the motor **10**, respectively, the adjustment grip **32** must now be turned only either towards the left or towards the right in arrow direction. In the shown example the adjustment grip =' swings towards the left, whereby the volume of the pressure source **31'** is enlarged and in the conduit **4'** a pressure below atmospheric pressure has been produced. The pressure transfer member **21'**, responding to this pressure below atmospheric pressure has accordingly reduced its volume and swings the transmission lever **22'** such, that also the switching lever **25'** swings out, the contacts of the switch **23'** are closed and the motor **10** has been switched on, by example, for left run. The motor is shut off, when the adjustment grip is brought again into a center position. Upon displacement of the adjustment grip towards the right the volume of the pressure source is reduced, a pressure above atmospheric pressure is produced in the conduit, the volume of the pressure tranfer is increased and by the cooperation of the levers **22** and **26** the motor is switched on in the other rotary direction.

In order that the switches **23** and **24** can serve simultaneously as end switches, on the one hand, the switch-

ing device 2 and the housing 20, respectively, is secured on the protective tube 12 and, on the other hand, a lifting rod means 14 is connected with a joining device 15. The latter is equipped with two cams 16 and 17, which have a certain distance from each other and which provide a recess 18 and in relation to the switching device 2 are arranged such, that the ends of the switching levers 25 and 26 extend into the recess 18, and thus enter the operating range of the cams 16 and 17. The joining device can be centered by two springs in the housing 20. The operation is easly determined from the drawing in the showing of the lifting device 1'. Since the switch 23' is closed, the spindle moves with the lifting limiting rod in the direction of the arrow towards the right, likewise in accordance with the setting of the lifting limiting rod of the joining members 15' with its cams, until the cam 16' engages the switching lever 25'.

Accordingly, the latter swings in clockwise direction as long, until the contact of the switch 23' is opened, and the motor is switched off. By the switching lever 25' however, also simultaneously the transfer lever 22 swings in the direction towards the center position, which has as a consequence a return guide of the setting grip 32' into the center position. An operation of the setting grip 32' from the center position into the shown position towards the left and the enlargement of the volume of the pressure source 32' is still possible not, however, the increase of the volume of the pressure transfer 21' and, thereby, the re-switching on of the switch 23', since the levers 22' and 25' are blocked by the cam 16'.

An operation of the setting grip in opposite direction thus towards the right and thereby the switching on of the motor in the other rotary direction is possible without any interference. By this arrangement due to the pneumatic, the transmission lever 22' swings in clockwise direction and, by the switching lever 26' the contact of the switch 24' is closed. The motor is thus switched on in the other rotary direction. If the motor is not switched off by the setting grip 32', it continues to run as long, until the switching off takes place upon reaching the end position by means of the cam 17'.

While I have disclosed several embodiments of the present invention, it is to be understood, that these embodiments are given by example only and not in a limiting sense.

I claim:

1. An electro-mechanical lifting device, in particular for bed adjustments, comprising

a driving motor including switching and control means,

a pressure soure received in a manual switch,

pneumatic means for operation of said switching and control means, by means of said pressure source,

a switching device connected by a hose conduit with said pressure source,

the volume of said pressure source being capable of being enlarged and of being reduced,

said switching device having a pressure converter responding to pressure below atmospheric pressure, and to pressure above atmospheric pressure, with two end positions,

said pressure converter being in operative connection selectively with a switch means for left-run and a switch means for right-run of said driving motor,

two switching lever means for actuating each of said switch means, respectively,

said switching device has a transmission lever,

said transmission lever is pivoted at one portion to said pressure converter, and has another portion disposed adjacently between and within the range of said two switching lever means for switch means, respectively.

2. An electro-mechanical lifting device, in particular for bed adjustments, comprising

a driving motor including switching and control means,

a pressure source received in a manual switch,

pneumatic means for operation of said switching and control means, by means of said pressure source,

a switching device connected by a hose conduit with said pressure source,

the volume of said pressure source being capable of being enlarged and of being reduced,

said switching device having a pressure converter responding to pressure below atmospheric pressure, and to pressure above atmospheric pressure, with two end positions,

said pressure converter being in operative connection selectively with a switch means for left-run and a switch means for right-run of said driving motor,

said switching device has a transfer lever,

said transfer lever is pivoted to said pressure converter, and disposed within the range of switching levers for said switches,

a protective tube of said lifting device,

a joining member,

lifting limiting rod means,

said switching means is secured to said protective tube,

said joining member is secured to said lifting limiting means,

and said switching levers are disposed within the operating range of said joining member.

3. The lifting device, as set forth in claim 2, which includes

two cams disposed on said joining member and having a predetermined distance from each other,

said cams defining a U-shaped recess of said joining member, and

said switching levers extend into said U-shaped recess.

4. The lifting device, as set forth in claim 1, wherein

said pressure source is equipped with a setting grip, and

spring means retaining said setting grip in its center position.

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