Lifting appliance, especially for a patient lifting device.

Priority: 17.10.89 SE 8903411

Date of publication of application: 24.04.91 Bulletin 91/17

Publication of the grant of the patent: 14.12.94 Bulletin 94/50

Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

References cited:
EP-A- 0 267 888
DE-A- 3 602 105
SE-A- 8 604 809

Proprietor: ARJO HOSPITAL EQUIPMENT AB
Verkstadsvägen 5
S-241 21 Eslov (SE)

Inventor: Sandell, Anders Lennart
Gränsvägen 19
S-261 51 Landskrona (SE)

Sankt Mikael väg 4
S-241 46 Eslov (SE)

Inventor: Sonesson, Leif Bertil
Domarevägen 11
S-240 21 Löddeköpinge (SE)

Representative: Wallin, Bo-Göran et al
AWAPATENT AB,
Box 5117
S-200 71 Malmö (SE)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).
Description

The present invention relates to a lifting appliance having a telescopic column and a lifting means mounting which is supported by said column and which, during telescopic extension and retraction of the column, can be set in optional vertical positions.

Such lifting appliances are frequently used in care of the sick and aged as patient lifting devices which are usually mounted on an undercarriage to enable the patient carried by the lifting appliance to be moved between different locations. The patient lifting appliance is, in a prior art design, to be compared to a crane where the lifting means mounting is rigidly attached to the placeable part of the telescopic column, thereby following the vertical motions of the placeable part. In other prior art lifting appliances, use is made of an unextendable column provided with a carriage serving as the lifting means mounting, said carriage being reciprocable, by means of a driving motor, in the longitudinal direction of the column. The last-mentioned type of prior art appliances suffers from the drawback that the length of the column must be sufficient for the entire desired hoisting motion of the carriage, whereas a disadvantage of the first-mentioned type using a telescopic column is that the stroke of the telescopic column corresponds to the maximum lifting distance of the lifting means, which results in, inter alia, a considerable overall height also in the completely retracted state. To eliminate these drawbacks, DE-A-3,602,105 and EP-A-0,267,888 suggest a lifting appliance, especially for a patient lifting device, comprising a column having two telescopically cooperating column elements and a driving motor for adjusting the length of said column and having a lifting means mounting consisting of a carriage which is movable to optional positions along one column element by means of a belt attached to said carriage and running over a deflecting roller mounted on one column element, to a belt attachment on the other column element. This prior art design gives the lifting appliance a small overall height and great vertical adjustability of the lifting means mounting. Yet there are some drawbacks with respect to safety in operating the lifting appliance. Thus, it is necessary to arrest the telescopic motion of the column in case of defects in the power train, or in case the carriage or a lifting means connected therewith should be stopped by some object in its downward movement.

The Swedish Patent Application SE-A-9604809-7 discloses a patient lifting device which partly solves the problem of safety. This lifting device has a column having two telescopically cooperating column elements and a driving motor for adjusting the length of said column. A carriage serving as a lifting means mounting which is movable to optional positions along one column element, and belt means attached to said carriage runs over deflecting roller means mounted on one column element to a belt attachment on the other column element. This belt attachment is in the form of a spring-loaded belt tension sensing means exerting a pulling force to the belt. The belt tension sensing means is connected to a driving motor control means adapted to stop the driving motor in case of insufficient belt tension. However, this known lifting device does not offer sufficient safety in case of belt break.

One object of the present invention therefore is to eliminate the drawbacks of prior art lifting appliances, especially for patient lifting devices, and to provide a lifting appliance having built-in safety means for arresting the hoisting motion in case of any interruption in the power transmission between the driving motor of the lifting appliance and the lifting means mounting.

To sum up, the invention relates to a lifting appliance, especially for a patient lifting device, said lifting appliance comprising a telescopic column provided with a carriage which is reciprocable in the longitudinal direction of said column under the action of the telescopic extension and retraction motions of the column. The appliance comprises safety means which are adapted to stop the telescopic motion of the column, in case of defects in the power transmission between the carriage and a driving motor which produces the telescopic motions of the column, or if the carriage or a lifting means connected therewith should be stopped by some object in its downward movement.

The characteristic features of the invention are stated in the main claim. The subclaims define particularly preferred embodiments of the invention.

The invention will now be described in more detail with reference to the accompanying drawings illustrating some preferred embodiments of the invention.

Fig. 1 is a side view, partly in section of an embodiment of a lifting appliance according to the invention.

Fig. 2 is a cross-section along the line II-II in Fig. 1, with certain parts removed.

Fig. 3 is a cross-section along the line III-III in Fig. 1.

Fig. 4 is a schematic cross-section along the line IV-IV in Fig. 1.

Fig. 5 is a schematic view of certain parts of the appliance in Fig. 1, as seen in the direction of the arrow V-V.

Fig. 6 is a schematic view of certain parts of the appliance in Fig. 1, as seen in the direction of the arrow V-V.
The embodiment of a lifting appliance according to the present invention, as illustrated in Figs. 1-6, comprises a telescopic column 10 consisting of a first column element 11 and a second column element 12. The column element 11 can be mounted on an undercarriage (not shown) for making the lifting appliance movable. In this embodiment, the two column elements 11, 12 are designed as tubular sections. A nut means 13 is mounted at the upper end of the column element 11. The nut means cooperates with an adjusting screw 14 which is non-displaceably connected to the column element 12 and extends downwardly through the column elements. The upper end of the adjusting screw 14 is connected to a driving motor 15 having a worm gear 16 for rotating the screw 14. The driving motor 15 is reversible. A power pack 17 is also mounted on the column element 12, but the appliance should also be drivable by an external source of power. A control handle 18 and a cord 19 make it possible to control the operation of the motor 15 at a distance from the lifting appliance.

For guiding the column elements 11, 12 relative to one another, a key 26 is attached to the column element 11 and slides in an undercut key groove 21 formed in the column element 12 (see Fig. 3).

In the embodiment of the appliance as illustrated, a lifting means mounting is designed as a carriage 22 which by two pairs of wheels 23 is guided in grooves 24 on opposite sides of the column element 12. In this embodiment, the carriage 22 is provided with two belt attachments 25 for regulating belts 26 which are, at the other end, connected to belt attachments 27 mounted on the nut means 13 and which run over deflecting rollers 28. The deflecting rollers are each rotatable about a shaft 29 and supported by the column element 12. By this arrangement, a telescopic motion of the column elements 11, 12 which has a certain length of stroke will cause a displacement of the carriage 22 relative to the column element 11 by a length of stroke which is twice as long. This arrangement makes the lifting motion quicker than the telescopic motion.

Fig. 3 illustrates angular sections 58, one leg 59 of which is secured in a groove 60 formed in the column element 12 and the other leg 61 of which is resiliently pressed against the column element 12 and the carriage 22 on the other side of the groove 24. The rollers 23 of the carriage travel in the grooves 24, but the roller mountings project between the column element 12 and the legs 61.

In the embodiment illustrated in Figs. 1-6, the shafts 29 of the deflecting rollers 28 are connected to the upper end of the column element 12 by guides 30. The guides extend between an upper end plate 31 and a motor mounting plate 32 at the upper end of the column element 12. The shafts 29 are formed with two through holes and are, at each end, passed over a guide 30. The shafts and the guides are further interconnected by a slide 33 which restricts the motion of the deflecting rollers in the longitudinal direction along the guides 30. A recess 34 in the form of a bottom hole is formed in the end of the slides 33 facing the plate 31. In this recess 34, a compression spring 35 is mounted. The compression spring 35 surrounds the guide 30 and actuates the slide 33 in the upward direction towards the plate 32. The shafts 29 are, at one end, interconnected by an arm 36 which is pivotally connected to the shaft ends. At least one end of the arm has an elongate hole for accommodating the corresponding shaft 29. The arm 36 supports a microswitch 37 whose sensing arm 38 is spring-loaded in the direction of the plate 31.

The microswitch 37 is connected in the regulating circuit of the driving motor 15 and serves to discontinue the motor drive, if one or both belts 26 should break, or if the downward motion of the carriage 22 should be stopped by some external obstacle.

The function of the safety means will now be explained in more detail with reference to Figs. 1-6. Figs. 1, 2 and 6 show the safety means under normal working conditions, i.e. when both belts 26 are not broken and when the carriage 22 has not been stopped in its downward motion. Fig. 5 illustrates the position of the deflecting rollers 28, if the carriage 22 or the lifting means attached thereto has been stopped by some stationary object during the downward motion of the carriage. In such case, the springs 35 press the slides 33 and, thus, the deflecting rollers upwards to a position where the slides 33 engage the plate 32. At the same time, the microswitch 37 is raised to such an extent that its control arm 38 leaves the plate 31. Now the motor drive is discontinued. As soon as the obstacle has been removed or the motion of the column element has been reversed, the safety means returns to the position shown in Fig. 6, where the compression springs 35 are compressed and the slides 33 engage the plate 31.

Fig. 4 shows the position of the different parts of the safety means in the case where one belt, i.e. the right-hand belt 26 in Fig. 4, is broken, whereby the compression spring 35 has pressed the shaft 29 of the right-hand deflecting roller to the upper position thereof. The arm 36 is pivoted upwards to such an extent that the microswitch 37 is operated, and thus, the motor drive is discontinued. The pivoting motion of the arm is rendered possible by the above-mentioned elongate hole formed in the arm for accommodating one shaft 29.

In the embodiment of the invention illustrated in Figs. 1-6, the deflecting rollers 28 thus serve on
the one hand as deflecting rollers and, on the other hand, as belt tension sensing means. Within the scope of the invention, it is however possible to use other types of belt tension sensing means for stopping the driving motor in case of insufficient belt tension. In the embodiment shown in Fig. 7, two deflecting rollers 39, 42 are thus used between the belt attachments 25 and 27. One deflecting roller 39 is rotatable about a shaft 40 which is fixedly mounted relative to a movable column element 41. The other deflecting roller 42 is mounted on a shaft 43 which is displaceable in an elongate hole 44 formed in the column element 41. The shaft 43 is, by means of a compression spring 45, actuated to the left in Fig. 7. The control arm 47 of a microswitch 46 is pressed against the shaft 43 to the left in Fig. 7. If the belt breaks or the downward motion of the carriage 22 is stopped, the spring 45 will press the shaft 43 to the left in Fig. 7. As a result, the control arm 47 is released and the microswitch will interrupt the motor drive.

Fig. 8 illustrates a further example of a belt tension sensing means which is usable for the lifting appliance according to the invention. In this case, the belt tension sensing means is designed as a microswitch 48 whose control arm 49 is, at its outer end, provided with a roller 50 which is pressed against the belt 26. If the belt 26 breaks or if the carriage 22 is stopped in its downward motion, the arm 49 will be pivoted counter-clockwise. Consequently, the motor drive will be discontinued.

In the embodiments according to Figs. 1-6 and 8, compression springs 35, 45 are used in the belt tension sensing means. However, it is possible to use other types of yieldable actuating means, such as tension springs, to produce the desired load on the sensing means.

Claims

1. Lifting appliance, especially for a patient lifting device, said lifting appliance comprising
   a column (10) having two telescopically cooperating column elements (11, 12; 41, 51);
   a driving motor (15; 54; 56) for adjusting the length of said column by adjusting the position of the column elements relative to each other;
   a lifting means mounting (22) comprising a carriage (22) which is movable to optional positions along one column element (12; 41);
   belt means (26) attached to said carriage (22) and running, over deflecting roller means (28; 39, 42) mounted on one column element (12; 41), to a belt attachment (27) on the other column element (11; 51);
   a belt tension sensing means (28, 35; 42, 45; 50) and
   a driving motor control means (37; 46) which is connected to said belt tension sensing means (28, 35; 42, 45; 50) and adapted to stop the driving motor (15; 54; 56) in case of insufficient belt tension;
   characterized in
   that said belt means (26) comprises two belts (28) connected to said carriage (22) and each running over its own deflecting roller means (28; 39, 42);
   that the belt tension sensing means (28, 35; 42, 45) comprises a connecting arm (36), two shafts (29) and two guides (30), each of the deflecting rollers (28) having a shaft (29) connected to one of the guides (30), the connecting arm (36) being pivotally connected to both shafts (29),
   that the shafts (29; 43) of said deflecting rollers (28; 42) are connected to spring means (35; 45) which are adapted to yieldingly actuate said shafts (29; 43) in a belt-tensioning direction along said guides (30; 44), and
   that the driving motor control means (37) is mounted on the connecting arm (36).

2. Lifting appliance as claimed in claim 1, wherein said guides (30) are interconnected at one end by an end plate (31), the driving motor control means (37) comprising a microswitch (37) with a sensing arm (38) engageable with the end plate (31), the sensing arm (38) being movable with the connecting arm (36) towards and away from the end plate, the sensing arm (38) being disengaged from the end plate (31) in response to insufficient belt tension, and the driving motor (15) being operable when the sensing arm (38) is engaged with the end plate (31) and being stopped when the sensing arm (38) disengages from the end plate (31).

3. Lifting appliance as claimed in claim 1 or 2, wherein said spring means (35) are arranged for biasing both of the shafts (29) in a belt-tensioning direction, the spring means (35) being mounted around the guides (30).

4. Lifting appliance as claimed in claim 2 or 3, wherein the driving motor control means (37) comprises a microswitch (37) mounted on the connecting arm (37) operatively connected to both of the belts (26), the connecting arm (37) being moved in a belt-tensioning direction in response to insufficient belt tension in at least one of the belts (26) and the microswitch (37) stopping the driving motor (15) upon pivoting or movement of the connecting arm (37) in the belt-tensioning direction.
5. Lifting appliance as claimed in any preceding claim, wherein said driving motor (15) is mounted on the same column element (12) as said carriage (22) and is adapted to drive and rotate an adjusting screw (14) which engages a nut means (13) on said other column element.

Patentansprüche

1. Hebevorrichtung, speziell für eine Patientenehevorrichtung, umfassend eine Säule (10) mit zwei teleskopisch zusammenwirkenden Säulenelementen (11, 12; 41, 51); einen Antriebsmotor (15; 54; 56) zum Einstellen der Länge der Säule durch Einstellen der Position der Säulenelemente relativ zueinander; eine Hebeeinrichtungshalterung (22) mit einem Schlitten (22), der in wahlweise Stellungen längs eines Säulenelements (12; 41) bewegbar ist; eine Gurteinrichtung (26), die am besagten Schlitten (22) befestigt ist und über Umlenkrollen (28; 39, 42), die an einem Säulenelement (12; 41) montiert sind, zu einer Gurtebefestigung (27) am anderen Säulenelement (11; 51) verläuft; eine Bandspannungsfeststelleneinrichtung (28, 35; 42, 45; 50) und eine Antriebsmotorsteuerung (37; 46), die mit der genannten Bandspannungsfeststelleneinrichtung (28, 35; 42, 45; 50) verbunden ist und geeignet ist, den Antriebsmotor (15; 54; 56) im Falle einer unzureichenden Bandspannung zu stoppen; dadurch gekennzeichnet, daß die genannte Gurteinrichtung (26) zwei Gurte (26) umfaßt, die jeweils mit dem genannten Schlitten (22) verbunden sind und jeweils über eigene Rollenumlenkeinrichtungen (28; 39, 42) laufen; daß die Gurteinrichtungsfeststelleneinrichtung (28, 35; 42, 45) einen Verbindungsarm (36), zwei Wellen (29) und zwei Führung (30) umfaßt, wobei jede der Umlenkrollen (28) einen Schaft (29) aufweist, der mit einer der Führungen (30) verbunden ist und der Verbindungsarm (36) schwenkbar mit beiden Wellen (39) verbunden ist, daß die Wellen (28; 43) der Umlenkrollen (28; 42) mit Federeinrichtungen (35; 45) verbunden sind, die geeignet sind, die Wellen (29; 43) in einer Bandspannrichtung längs der Führungen (30; 44) nachgiebig zu betätigen, und daß die Antriebsmotorsteuerung (37) auf dem Verbindungsarm (36) montiert ist.

2. Hebevorrichtung nach Anspruch 1, wobei die genannten Führungen (30) an einem Ende durch eine Endplatte (31) miteinander verbunden sind, die Antriebsmotorsteuerung (37) einem Mikroschalter (37) mit einem Tasterarm (38) aufweist, der in die Endplatte (31) eingreifen kann, der Tasterarm (38) mit dem Verbindungsschraube (36) auf die Endplatte zu und von dieser weg bewegbar ist, der Tasterarm (38) äußere Eingriff mit der Endplatte (31) infolge einer unzureichenden Bandspannung ist und der Antriebsmotor (15) betätigbar ist, wenn der Tasterarm (38) in die Endplatte (31) eingreift, und gestoppt wird, wenn der Tasterarm (38) äußere Eingriff mit der Endplatte (31) gelangt.

3. Hebevorrichtung nach Anspruch 1 oder 2, wobei die genannten Federeinrichtungen (35) so angeordnet sind, daß sie beide Wellen (39) in einer Bandspannrichtung vorspannen, wobei die Federeinrichtungen (35) um die Führungen (30) montiert sind.

4. Hebevorrichtung nach Anspruch 2 oder 3, wobei die Antriebsmotorsteuerung (37) einen Mikroschalter (37) umfaßt, der auf dem Verbindungsarm (37) montiert ist, der mit beiden Gurten (26) separat verbunden ist, wobei der Verbindungsarm (37) in einer Bandspannrichtung entsprechend einer ungenügenden Bandspannung in wenigstens einem der Gurte (26) bewegt wird und der Mikroschalter (37) den Antriebsmotor (15) beim Schwenken oder der Bewegung des Verbindungsarmes (37) in die Bandspannrichtung stoppt.

5. Hebevorrichtung nach einem der vorhergehenden Ansprüche, bei der der genannte Antriebsmotor (15) auf dem gleichen Säulenelement (12) wie der Schlitten (22) montiert und so ausgebildet ist, daß er eine Verstellschraube (14) drehend antreibt, die in eine Mutter (13) am anderen Säulenelement eingreift.

Revendications

1. Appareil élévateur, spécialement pour un dispositif élévateur de patient, ledit appareil élévateur comprenant une colonne (10) ayant deux éléments de colonne (11, 12; 41, 51) qui coopèrent télescopiquement ; un moteur d‘entraînement (15; 54 ; 56) servant à ajuster la longueur de ladite colonne en ajustant la position des éléments de la colonne l’un par rapport à l’autre ; une monture (22) de moyen élévateur comprenant un chariot (22) qui peut être amo-
né à des positions choisies le long d’un premier élément (12 ; 41) de la colonne ;
des moyens du type courroie (26) attachés audit chariot (22) et embrassant des moyens
(28 ; 39, 42) formant rouleaux de renvoi montés sur un premier élément (12 ; 41) de la
colle pour revenir à une attache de courroie (27) prévue sur l’autre élément (11 ; 51) de la
colonne ;
un moyen (28, 35 ; 42, 45 ; 50) capteur de tension de courroie et
un moyen (37; 46) de commande du mo-teur d’entraînement et qui est connecté audit
moyen (28, 35 ; 42, 45 ; 50) capteur de tension de courroie et adapté pour arrêter le moteur
d’entraînement (15 ; 54 ; 56) en cas de tension insuffisante de la courroie ;
caractérisé en ce que lesdits moyens (26) du type courroie comprennent deux courroies (26) reliées
audit chariot (22) et dont chacune embrasse son propre moyen (28 ; 39, 42) formant rouleau de renvoi ;
en ce que le moyen (28, 35 ; 42, 45) capteur de tension de courroie comprend un
bras de liaison (36), deux arbres (29) et deux guides (30), chacun des rouleaux de renvoi
(28) ayant un arbre (29) fixé à l’un des guides (30), le bras de liaison (36) étant articulé aux
deux arbres (29), en ce que les arbres (29 ; 43) desdits rouleaux de renvoi (28 ; 42) sont
reliés à des moyens à ressort (35 ; 45) qui sont adaptés pour actionner lesdits arbres (29 ;
43) de façon souple dans un sens de tension de la courroie le long desdits guides (30 ; 44),
et en ce que le moyen (37) de commande du moteur d’entraînement est monté sur le bras de liaison (36).

2. Appareil élévateur selon la revendication 1, dans lequel lesdits guides (30) sont intercon-
nectés à une première extrémité par une plaque d’extrémité (31), le moyen (37) de com-
mande du moteur d’entraînement comprenant
un micro-interrupteur (37) possédant un
bras capteur (38) qui peut être mis en prise
avec la plaque d’extrémité (31), le bras capteur
(38) pouvant se déplacer avec le bras de liai-
son (36) dans le sens qui le rapproche ou qui
l’éloigne de la plaque d’extrémité, le bras cap-
teur (38) se dégageant de la prise avec la
plaque d’extrémité (31) en réponse à une ten-
sion insuffisante de la courroie, et le moteur
d’entraînement (15) pouvant être mis en action
lorsque le bras capteur (38) est en prise avec
la plaque d’extrémité (31) et étant arrêté lors-
que le bras capteur (38) se dégage de la prise
avec la plaque d’extrémité (31).

3. Appareil élévateur selon la revendication 1 ou 2, dans lequel lesdits moyens à ressort (35)
sont agencés pour solliciter les deux arbres (29) dans le sens de la tension des courroies,
les moyens à ressort (35) étant montés autour des guides (30).

4. Appareil élévateur selon la revendication 2 ou 3, dans lequel le moyen (37) de commande
du moteur d’entraînement comprend un mic-
ro-interrupteur (37) monté sur le bras de liaison (37), connecté fonctionnellement aux deux
courroies (26), le bras de liaison (37) se dépla-
çant dans le sens qui tend la courroie en
réponse à une tension insuffisante dans au
moins une des courroies (26) et le micro-
interrupteur (37) arrêtant le moteur d’entraî-
nement (15) en réponse au pivotement ou mou-
vement du bras de liaison (37) dans le sens
qui tend la courroie.

5. Appareil élévateur selon une quelconque des
revendications précédentes, dans lequel ledit
moteur d’entraînement (15) est monté sur le
même élément (12) de la colonne que ledit
chariot (22) et est adapté pour entraîner et
faire tourner une vis de réglage (14) qui est en
prise avec un moyen (13) formant écrou prévu
sur ledit autre élément de la colonne.