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(54) Lift device

(57) The invention relates to a lift device comprising a base, a post placed on the base, the post having a hoist device and comprising a guiding device extending along the post and having a support member movable along it, wherein the hoist device is attached or coupled to the support member, and a drive device having a carrier, wherein the carrier is driveable along the guiding device, wherein the support member rests freely on the carrier.

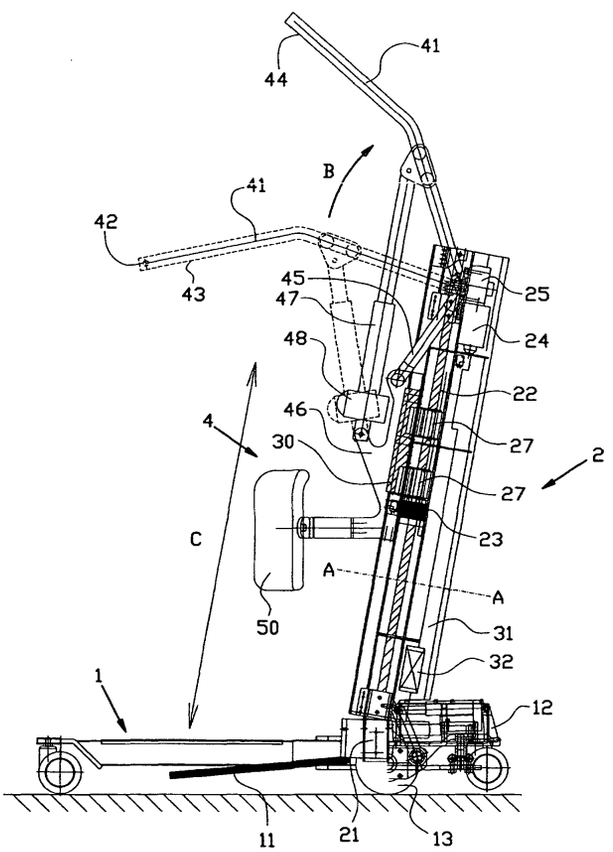

FIG. 1

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Description

[0001] The invention relates to a lift device. The invention particularly relates to a column for a lift device for lifting transporting or manoeuvring a person requiring care.

[0002] Such lift devices, also called transfer lifts, are usually used in health care to reduce the physical load of persons giving care. In order to further reduce said physical load, lift devices are equipped with a drive device for driving the hoist mechanism of the lift device for lifting or placing down the person requiring care, such as for instance a disabled or sick person.

[0003] A drawback of the known drive devices is that, optionally via a transmission, they are directly coupled to the hoist mechanism. As a result the hoist mechanism on the one hand is only movable by a drive device of the drive device and on the other hand a drive device of the drive device provides an imperative movement of the hoist mechanism. As a result, for instance in case of an error in the operation of the drive device, situations may arise that are unsafe to both the person giving care and the person requiring care.

[0004] A further drawback of the known lift devices is that said lift devices are specifically designed for one particular lifting operation and/or one specific care request. For instance there are specifically designed lift devices for lifting a person requiring care from a sitting to a substantially standing position, for lifting a person requiring care from a recumbent position to a sitting position or for lifting and horizontally moving a person requiring care such as for instance moving from bed to bath, to a wheelchair or to a toilet. In addition there are specifically designed lift devices for for instance youngsters and adults requiring care.

[0005] It is an object of the invention to improve on at least one of the drawbacks mentioned above.

[0006] To that end the invention provides a lift device comprising a base, a post placed on the base, the post having a hoist device and comprising a guiding device extending along the post and having a support member movable along it, wherein the hoist device is connected to the support member, and a drive device having a carrier, wherein the carrier is driveable along the guiding device, wherein the support member is adapted to rest freely on the carrier.

[0007] When the carrier is driven it will move along the guiding device. As the support member is placed so as to be movable along the guiding device and rests on the carrier, the support member is taken along by the carrier in the upward movement of the carrier. In a downward movement of the carrier, the support member, under the influence of its own weight, will follow the carrier, on which the support member freely rests.

[0008] As the support member at least at one side of the carrier is placed so as to be freely movable along the guiding device, and is able to rest freely on the carrier, a safeguard against overloading is achieved. If for instance in a downward movement of the carrier the downward movement of the hoist device is blocked, the carrier can move further down wherein the support member does not need to follow this movement.

[0009] In an embodiment the support member is provided with means for detecting a separation between the support member and the carrier.

[0010] In an embodiment said means comprise a sensor, for instance in the form of a switch, for detecting the free resting of the support member on the carrier and/or the release of the support member from the carrier. In case the movement of the support member is blocked and the support member no longer follows the movement of the carrier, the support member will no longer rest freely on the carrier and a further movement of the carrier is not necessary or even undesirable. In this embodiment the sensor will detect the fact that the support member no longer rests freely on the carrier, and send a signal to the drive of the carrier, or its control, to switch off the drive. An advantage of this embodiment is that the carrier remains close to the support member so that the carrier can resume the supportive function once the blockage of the support member is ended. As the carrier remains close to the support member it will only need to move over a small distance in order to be supported by the carrier again.

[0011] In a further embodiment the carrier or a part of the support member resting on the carrier is provided with a safety switch, for instance in the form of a so-called "reed"-switch, wherein the part of the support member resting on the carrier or the carrier is provided with a magnet for exciting the "reed"-switch. Naturally other types of known sensors or switches may also be used for achieving the same functionality as described below.

[0012] If the support member rests on the carrier the safety switch will close the circuit for exciting the drive device, as a result of which it is excitable for driving the carrier. If the support member no longer rests on the carrier, that means when the support member and the carrier are separated, the safety switch will interrupt the circuit for exciting the drive device, as a result of which an excitation of the drive device is blocked for a further drive of the carrier.

[0013] In a further embodiment the safety switch is connected to a control device for the drive device. The control device controls the drive of the carrier in dependence on a signal from the safety switch. Apart from switching the drive device on and off, the control device may also be adapted for moving and/or keeping the carrier towards the support member after both parts have been separated.

[0014] In a further embodiment the lift device is provided with alarm means, for instance acoustic and/or visual, for giving an alarm signal when the support member no longer rests on the carrier.

[0015] In an embodiment the hoist device is detachably connected to the support member. Thus various

hoist devices can be attached to, or be detachably coupled to the support member. As a result the support member is suitable to be provided with various hoist devices. In this way a multi-deployable lift device is created which according to need can be provided with the desired hoist device. This may for instance result in advantages in the production of lift devices according to the invention, as for lift devices for a specific lift operation, a base including post according to the invention can be started from, wherein a hoist device for the specific lift operation is attached to the support member, optionally via an adapter plate. In addition this embodiment may offer advantages to the user. For instance in a lift device according to the invention, a hoist device for a youngster requiring care can be changed if so desired for a hoist device for an adult requiring care. As a result it is no longer necessary that an entirely new lift device has to be bought when the person requiring care grows up.

[0016] In an embodiment a drive of the drive device is placed at an end of the post that faces away from the base. Preferably the drive device extends up to near the end of the post that faces the base. As a result the support member can be placed up to near the end of the post facing the base, as a result of which the lift device can for instance also be used for lifting persons lying or sitting on the floor.

[0017] In an embodiment the support member comprises one or more guide blocks that are placed in the guiding device so as to be slidable. Preferably the guide blocks, at least the part thereof that is capable of sliding in the guiding device, comprise a synthetic slide surface. This results in a noiseless drive.

[0018] In another embodiment the one or more guide blocks are provided with a through-opening for fully or partially surrounding the drive device or at least a part of the drive device. The drive device and the guiding device can be combined here resulting in the occupation of less space.

[0019] In an embodiment the post comprises a hollow section in which the drive device is placed and wherein the hollow section is provided with a through-slot placed parallel to and near the guiding device. The hollow section thus forms a tubular post. At least a part of the support member extends through the through-slot, wherein a part of the support member situated within the hollow section is placed so as to be slidable within the guiding device, and wherein a part of the support member situated outside of the hollow section is adapted for attaching a hoist device thereto.

[0020] In an embodiment the control means and/or energy storage means for the drive device are fully or partially placed in the hollow section. In this way a post is created in which both drive and control and energy storage are housed. Thus said post can be placed as one unity on a known base and be provided with the desired hoist device. This results in a modular system wherein the post according to this embodiment can be combined with several bases and hoist devices.

[0021] Preferably the section in cross-section comprises a first part in which the drive device is placed and a second part in which the control means and/or the energy storage means are placed, wherein the first part and the second part are separated from each other by a wall part.

[0022] In a simple embodiment the drive device comprises a spindle and the carrier comprises a spindle nut driveable by the spindle. Preferably the spindle comprises a self-decelerating spindle. As a result the spindle nut will only translate along the spindle in case of a rotation of the spindle. Thus the spindle nut is able to support the support member and the hoist device attached thereto at any position along the spindle.

[0023] Preferably the drive device comprises an electromotor, wherein the electromotor is coupled to the spindle by means of at least one right-angled transmission. Preferably the electromotor is coupled to the spindle by means of two right-angled transmissions that are placed in series. In this way the shaft of the electromotor can be placed substantially parallel to the spindle, wherein the electromotor is mounted against the post or is fully or partially integrated in the post.

[0024] In an embodiment the support member comprises one or more guide blocks that are slidably placed in the guiding device. Preferably the one or more guide blocks are provided with a through-opening for fully or partially surrounding the spindle. In this case the spindle is placed in the guiding device which entails less occupation of space.

[0025] In one embodiment the base is provided with running wheels. Preferably the base comprises a base drive for driving a movement of the base. The base drive preferably is provided with a wheel that is at least adjustable as to height and which can be brought in and out of contact with the bottom or floor as described in Dutch patent 1011530.

[0026] In one embodiment the hoist device comprises a hoisting arm provided with a tilting yoke. Such a tilting yoke is for instance used for lifting a person requiring care from a recumbent to a sitting position.

[0027] In a further embodiment the hoist device comprises a hoisting arm, knee rests and a foot rest. Such a hoist device is for instance used for lifting a person requiring care from a sitting to a substantially standing position.

[0028] In an further embodiment the hoist device comprises a platform for carrying a person requiring care, wherein the platform comprises a railing, the railing being adapted for offering support to the person requiring care when in the standing position and wherein the platform at a side facing away from the post comprises an access opening for giving care to the patient positioned on the lift device. In this way the opportunity is given for in an ergonomically responsible manner tending to the lower half of a person requiring care. This embodiment may for instance be used for changing mentally handicapped patients that are still capable of walking.

[0029] According to a further aspect the invention provides a lift device comprising a base, a post placed on the base, the post having a hoist device, wherein the post comprises a support member driveable along the post, wherein the hoist device is detachably connected to the support member. In this way a multi-deployable lift device is achieved which according to need can be provided with the desired hoist device.

[0030] According to a further aspect the invention provides a post for a lift device, wherein the post comprises coupling means at a first end thereof for coupling the post to a base, a guiding device extending along the post and a support member movable along the guiding device for connecting a hoist device to the support member, and a drive device having a carrier, wherein the carrier is driveable along the guiding device, wherein the support member rests freely on the carrier. Preferably the support member comprises a detachable connection for connecting the hoist device to it. Thus the hoist device can be detachably attached to, or detachably coupled to the support member.

[0031] Preferably the post at a second end thereof facing away from the first end comprises an electric drive for the drive device. Preferably the post comprises control means and/or energy storage means for said drive device. Preferably the drive device comprises a spindle and the carrier comprises a spindle nut driveable by the spindle. In this way a modular post is created that can be combined with various bases and hoist devices.

[0032] According to a further aspect the invention provides a post for a lift device, wherein the post comprises coupling means placed at a first end thereof for coupling the post to a base, a drive device extending along the post having a support member driveable along the drive device for connecting a hoist device to the support member, wherein the post comprises a hollow section, wherein the drive device and the control means and/or energy storage means for the drive device are fully or partially placed in the hollow section.

[0033] The invention will be elucidated on the basis of exemplary embodiments shown in the attached drawings, in which:

Figure 1 shows a schematic view, partially in cross-section, of a first exemplary embodiment of the lift device according to the invention;

Figure 2 shows a schematic view in cross-section along the line A-A in figure 1 ;

Figure 3 shows a schematic view of a second exemplary embodiment of the lift device according to the invention;

Figure 4 shows a schematic view of a third exemplary embodiment of the lift device according to the invention; and

Figure 5 shows a schematic view of an exemplary embodiment of a drive device with safety device for a lift device according to the invention.

[0034] The exemplary embodiment of a lift device for lifting a person requiring care from a sitting to a substantial standing position, as schematically shown in figure 1, comprises a mobile base 1 provided with a post 2.

[0035] The post 2 is coupled to the base 1 by means of the coupling means 21. Furthermore the post 2 is provided with a spindle 22 placed in the post and extending over the length of the post. The spindle 22 is bearing mounted in the post 2. The spindle 22 is provided with a spindle nut 23 which is driveable by the spindle 22. By rotating the spindle 22 the spindle nut 23 will move up and down along the spindle 22 along the post 2. For that purpose an electromotor 24 is placed at an end of the post 2 extending away from the base 1, which electromotor 24 is coupled to the spindle 22 by means of two right-angled transmissions 25 placed in series. The electromotor 24 for driving the spindle 22 is in this case integrated into the post 2.

[0036] Figure 2 shows a cross-section of the post 2 along the line A-A in figure 1. The post 2 according to this exemplary embodiment is formed from a hollow section having an elliptic cross-section. The hollow section of the post 2 comprises a guiding device 26 extending over the length of the post 2, in which guiding device one or more guide blocks 27 can be placed. The guide blocks 27 of this exemplary embodiment are substantially made of synthetic material and are capable of sliding freely in the guiding device 26. The guide blocks 27 may furthermore be provided with a part 28 projecting beyond the hollow section of the post 2, for forming or coupling to a support member 30.

[0037] In the exemplary embodiment as shown in figure 2 the guide device 26 has a substantially square cross-section, in which guide blocks 27 can be placed having a shape that largely corresponds to the square cross-section of the guiding device 26. The guiding device further comprises a through-slot 29 through which the projecting part 28 of the guide blocks 27 extends. The guide blocks 27 are furthermore provided with a through-opening that surrounds the spindle 22. The spindle 22 is placed in the guiding device 26 as shown in figure 2.

[0038] The hollow section of the post 2 furthermore comprises a space 31 extending over the length of the post 2, in which space the motor 24 and the right-angled transmissions 25 are fully or partially placed. Control electronics and energy storage means 32, such as a battery, are furthermore placed in this space 31 .

[0039] As shown in figure 1 the support member 30 according to this exemplary embodiment is provided with two guide blocks 27 that are placed above one another and are spaced apart. As a result the support member 30 is thus supported at two spaced apart locations by the guide blocks 27 and the support member

30 is stably connected to the post 2 and slidable along said post 2. In the exemplary embodiment as shown in figure 1 the lowermost guide block 27 is placed on the spindle nut 23 so as to rest freely thereon. In an alternative exemplary embodiment the spindle nut 23 can also be placed between the two guide blocks 27, wherein the uppermost guide block 27 rests freely on the spindle nut 23. Said alternative exemplary embodiment thus is provided with a limited clearance. Said clearance length is namely limited by the distance between the two guide blocks 27.

[0040] The lift device as shown in figure 1 is provided with a hoist device 4. The hoist device 4 is provided with hoisting arms 41. The hoisting arms 41 are adjustable between a first position 43 and a second position 44. For that purpose an end of the hoisting arms 41 situated close to the post 2 is placed so as to hinge from an arm 45, which in turn is connected to a part 46 of the hoist device 4 which part is placed on the support member 30. In an alternative exemplary embodiment the arm 45 and the hoisting arms 41 can be formed as one unity, wherein no hinging connection is placed between the arm 45 and the hoisting arms 41. The hoisting arms 41 are furthermore connected to the part 46 by means of extendable support arms 47. By extending the support arms 47 the hoisting arms 41 are moved upwards (along arrow B). The support arms 74 and thus the hoisting arms 41 are preferably driven by means of an electromotor 48, optionally provided with a battery.

[0041] The hoisting arms 41 are furthermore provided with connection points 42 for attaching a sling (not shown) thereto that can be placed passing behind the back and under the arms of the person requiring care.

[0042] The hoist device 4 is furthermore provided with knee rests 50. The knee rests 50 preferably are able to move towards the legs of the person requiring care. In the exemplary embodiment as shown in figure 1 the knee rests 50 are disposed on the part 46 of the hoist device 4 which part is placed on the support member 30.

[0043] The hoist device 4 is adjustable as to height by moving the support member 30 (along arrow C).

[0044] The base 1 of the lift device as shown in figure 1 is provided with a foot rest 11 placed close to the lower side of the post 2. Said foot rest 11 is adjustable as to height if so desired.

[0045] Said base 1 is also provided with a base drive 12 comprising one or more wheels 13 that are adjustable as to height. If said wheels 13 have been adjusted downward and contact the floor they are capable of driving the base 1 and thus the lift device according to this exemplary embodiment.

[0046] A second exemplary embodiment of a lift device, as schematically shown in figure 3, is also provided with a mobile base 1, a post 2 and a hoist device 5 for lifting a person requiring care from a recumbent to a substantially sitting position. The hoist device 5 is attached to the support member 30, and can be moved up and down with the support member along the post 2 (along arrow D) between a highest position I and a lowest position II.

[0047] The hoist device 5 comprises an arm 60 and a yoke 70 attached thereto. The yoke 70 comprises shoulder rests 71 and pelvic rests 72 that extend in opposite direction. Preferably the yoke 70 is placed at the arm 60 so as to be rotatable about a substantially vertical axis.

[0048] The ends of the shoulder rests 71 and the pelvic rests 72 are provided with connection points 73 for attaching a sling (not shown) thereto in which a person requiring care can be placed. When lifting a person requiring care from a recumbent position (on the floor) the lift device wherein the hoist device is placed in the lowest position II, is placed close to the person requiring care. The sling is placed under the person requiring care wherein the part carrying the shoulder area of the person requiring care is connected to the shoulder rests 71 and wherein the part supporting the pelvic area of the person requiring care is connected to the pelvic rests 72.

[0049] In the exemplary embodiment as shown in figure 3 the hoist device is provided with two shoulder rests 71 placed parallel that can each be placed near one of the shoulders of the person requiring care. The mutual distance between the shoulder rests 71 preferably is adapted to the shoulder width of the person requiring care.

[0050] The pelvic rests 72 comprise a first part 74 and a second part 75 that is attached thereto so as to hinge freely. The first part 74 is coupled to a drive, for instance in the form of an electromotor, for swinging the pelvic rests 72 from a first position III for supporting the person requiring care in a recumbent position, to a second position IV for supporting a person requiring care in a siting position, or vice versa, in the direction E.

[0051] A third exemplary embodiment of a lift device, as schematically shown in figure 4, also comprises a mobile base 1, a post 2 and a hoist device 6 for lifting a person requiring care from a recumbent position to a substantially sitting position. The hoist device 6 comprises an arm 61 that is connected so as to hinge near an end 62 of the post 2 extending away from the base 1. The arm 61 is furthermore coupled to the support member 30 by means of a supporting arm 63. By moving the support member 30 up and down along the post 2 (along arrow F) the arm 61 and thus the hoist device 6 can be swung between a highest position I and a lowest position II.

[0052] The hoist device 6 comprises yoke 70 attached to the arm 61, as shown before in figure 2 and described above.

[0053] An exemplary embodiment of a drive device with safety device is schematically shown in figure 5. The drive in the post 2 has two directions of movement, namely an upward and downward movement. The movement is driven by a motor 241 provided with worm/worm wheel transmission 251 which is coupled to a spindle 221.

[0054] The drive of the lifting part at the support mem-

ber 301 takes place by means of the spindle nut 231, which is coupled to the spindle 221. The support member 301 comprises two guides 271, 272 that are not coupled to the spindle 221. The spindle nut 231 which is placed under the support member 301 pushes the guide 271 resting freely on the spindle nut 231 upwards. In a downward movement of the spindle nut 231 the support member 301 follows the spindle nut 231, wherein the guide 271 rests freely on the spindle nut 231.

[0055] When the support member 301 is stopped the spindle nut 231 will continue the downward movement until a safety switch 232 is operated, for instance after reaching a mutual distance between the support member 301, at least its guide 271 resting on the spindle nut 231, and the spindle nut 231 of approximately 10 mm. The function of the switch 232 is to detect a mutual distance between the support member 301 and the spindle nut 231 that is larger than approximately 10 mm.

[0056] In actual practise the cause often is an obstacle or person stopping the yoke. To prevent personal injuries, damage to the obstacle or the lift device getting out of balance, a control (not shown) in the post 2 switches the direction of rotation of the motor 241 and the control retains this direction of rotation until the mutual distance between the support member 301 and the spindle nut 231 is substantially ended. In this case the support member 301 can only be moved upward, irrespective of the direction selected on the control.

[0057] If the mutual distance between the support member 301 and the spindle nut 231 is substantially ended, the drive can be continued again in the selected direction.

[0058] Furthermore the spindle nut 231 towards the support member 301, at least at its guide 271 resting on the spindle nut 231, may be provided with a bolt 233 extending through said guide 271, as shown in figure 5. The bolt 233 limits the free stroke of the guide 271 for instance to approximately 20 mm.

[0059] In the exemplary embodiment as shown in figure 5 the guide 271 of the support member 301 resting on the spindle nut 231 is provided with safety switch 232 in the form of a "reed"-switch that is connected to a control unit (not shown) via connection cable 234 in a cable chains 235. The spindle nut 231 is provided with a magnet 236 at a side facing the "reed"-switch 232 for exciting said switch.

[0060] In an alternative embodiment the safety switch can be placed on the spindle nut 231. When a "reed"-switch is used, the magnet for exciting said switch has to be placed at the guide 271 resting on the spindle nut 231.

Claims

1. Lift device comprising a base, a post placed on the base, the post having a hoist device and comprising
   a guiding device extending along the post and having a support member movable along it, wherein the hoist device is connected to the support member and
   a drive device having a carrier, wherein the carrier is driveable along the guiding device,
   wherein the support member rests freely on the carrier.

2. Lift device according to claim 1, wherein the support member comprises means for detecting a separation between the support member and carrier, wherein said means preferably comprise a sensor for detecting the resting of the support member on the carrier and/or the release of the support member from the carrier.

3. Lift device according to claim 1 or 2, wherein the post is detachably connected to the support member, and wherein a drive of the drive device preferably is placed at an end of the post that faces away from the base.

4. Lift device according to claim 1, 2 or 3, wherein the support member comprises one or more guide blocks that are placed in the guiding device so as to be slidable, wherein the guide blocks, at least the part thereof that is capable of sliding in the guiding device, preferably comprise a synthetic slide surface, and wherein the one or more guide blocks preferably are provided with a through-opening for fully or partially surrounding the drive device or at least a part of the drive device.

5. Lift device according to any one of the preceding claims, wherein the post comprises a hollow section in which the drive device is placed and
   wherein the hollow section is provided with a through-slot placed parallel to and near the guiding device, wherein the control means and/or energy storage means for the drive device preferably are fully or partially placed in the hollow section, and wherein the section in cross-section preferably comprises a first part in which the drive device is placed and a second part in which the control means and/or the energy storage means are placed, wherein the first part and the second part are separated from each other by a wall part.

6. Lift device according to any one of the preceding claims, wherein the drive device comprises a spindle and wherein the carrier comprises a spindle nut driveable by the spindle, wherein the spindle preferably comprises a self-decelerating spindle, wherein the drive device preferably comprises an electromotor, wherein the electromotor is coupled to the spindle by means of at least one right-angled transmission, and wherein the electromotor is coupled to the spindle preferably by means of two right-

angled transmissions that are placed in series.

7. Lift device according to the preceding claim 6 when depending on claim 4, wherein the one or more guide blocks are provided with a through-opening for fully or partially surrounding the spindle.

8. Lift device according to any one of the preceding claims, wherein the hoist device is detachably attached to or detachably coupled to the support member.

9. Lift device according to any one of the preceding claims, wherein the hoist device comprises a hoisting arm provided with a tilting yoke, or wherein the hoist device comprises a hoisting arm, knee rests and a foot rest, or wherein the hoist device comprises a platform for carrying a person requiring care, wherein the platform comprises a railing, the railing being adapted for offering support to the person requiring care when in the standing position and wherein the platform at a side facing away from the post comprises an access opening for giving care to the person requiring care positioned on the lift device.

10. Post for a lift device, wherein the post comprises coupling means at a first end thereof for coupling the post to a base,

a guiding device extending along the post and a support member movable along the guiding device for connecting a hoist device to the support member, and

a drive device having a carrier, wherein the carrier is driveable along the guiding device, wherein the support member rests freely on the carrier,

wherein the support member preferably comprises a detachable connection for connecting the hoist device to it.

11. Post according to claim 10, wherein the post at a second end thereof facing away from the first end comprises an electric drive for the drive device, wherein the post comprises control means and/or energy storage means for said drive device, and wherein the drive device preferably comprises a spindle and wherein the carrier comprises a spindle nut driveable by the spindle.

12. Post for a lift device, wherein the post comprises

coupling means placed at a first end thereof for coupling the post to a base,

a drive device extending along the post and a support member driveable along the drive device for connecting a hoist device to the support member,

wherein the post comprises a hollow section, wherein the drive device and the control means and/or energy storage means for the drive device are fully or partially placed in the hollow section.

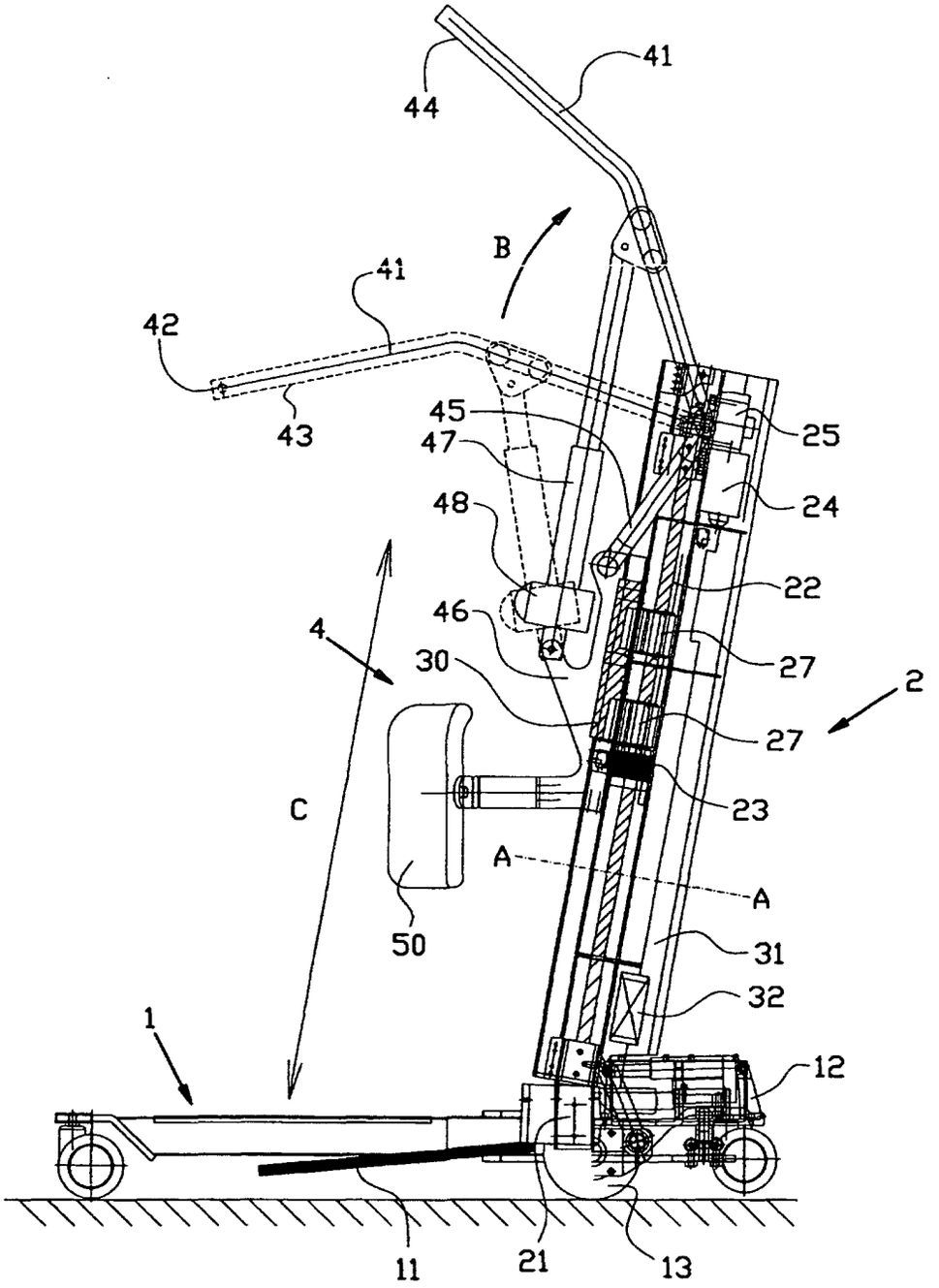
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FIG. 1

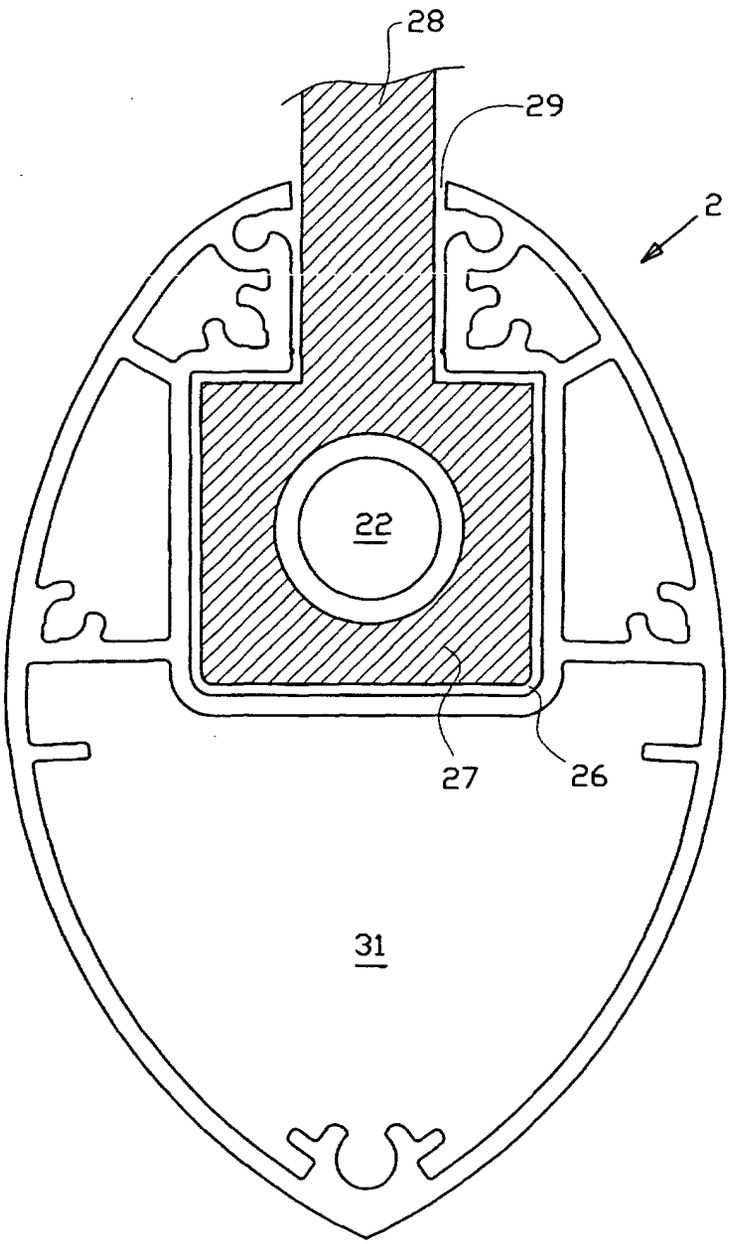

FIG. 2

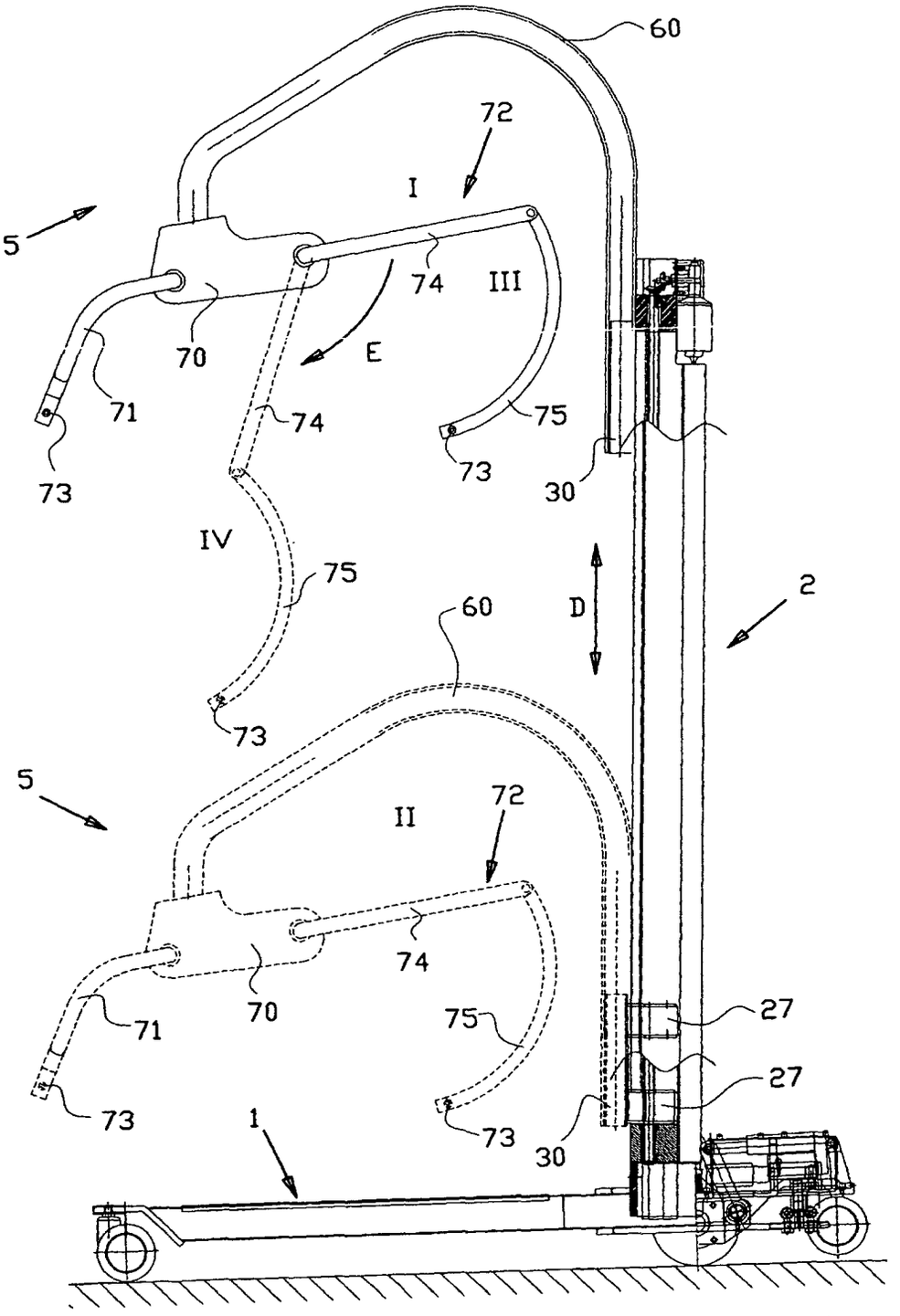
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FIG. 3

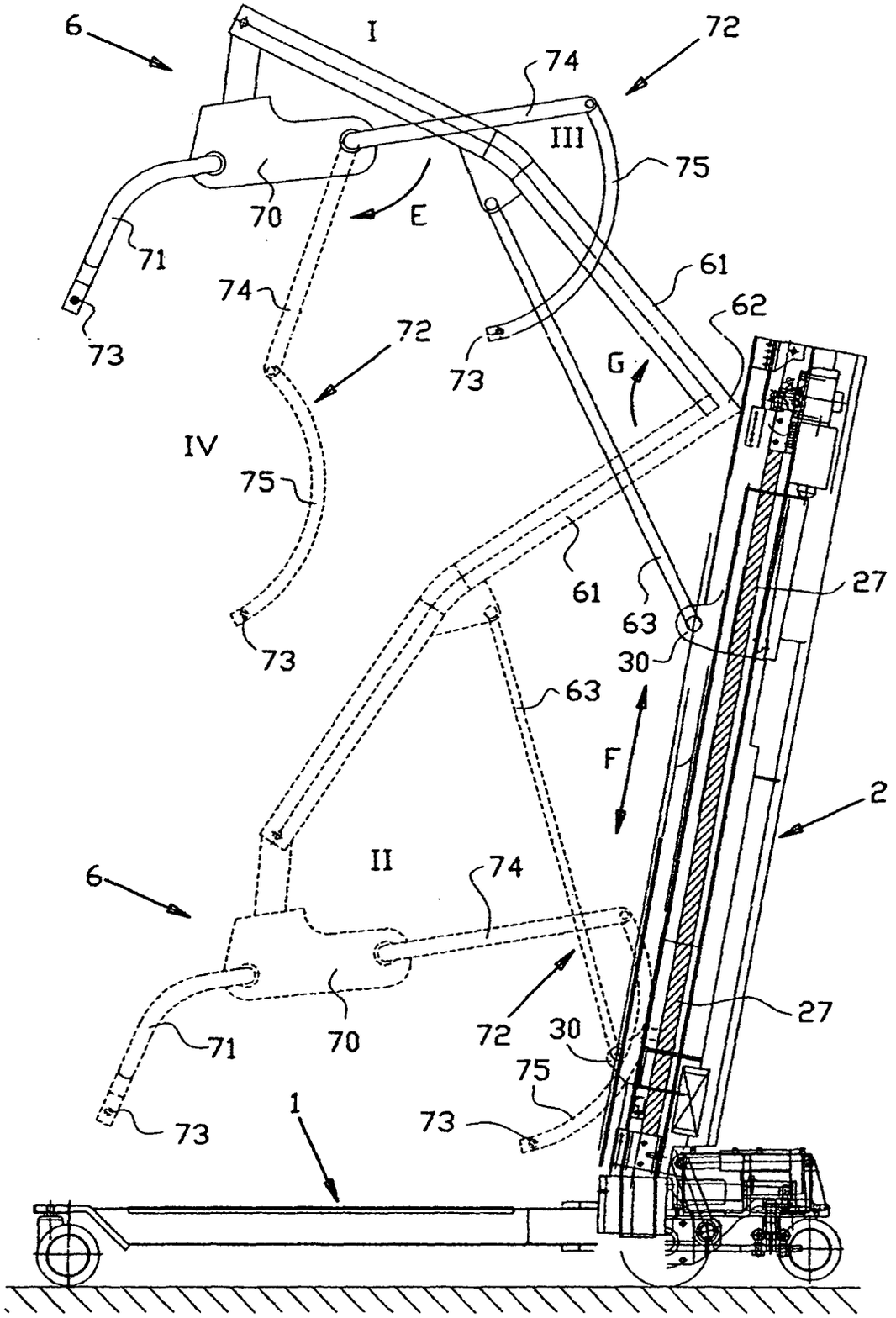
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FIG. 4

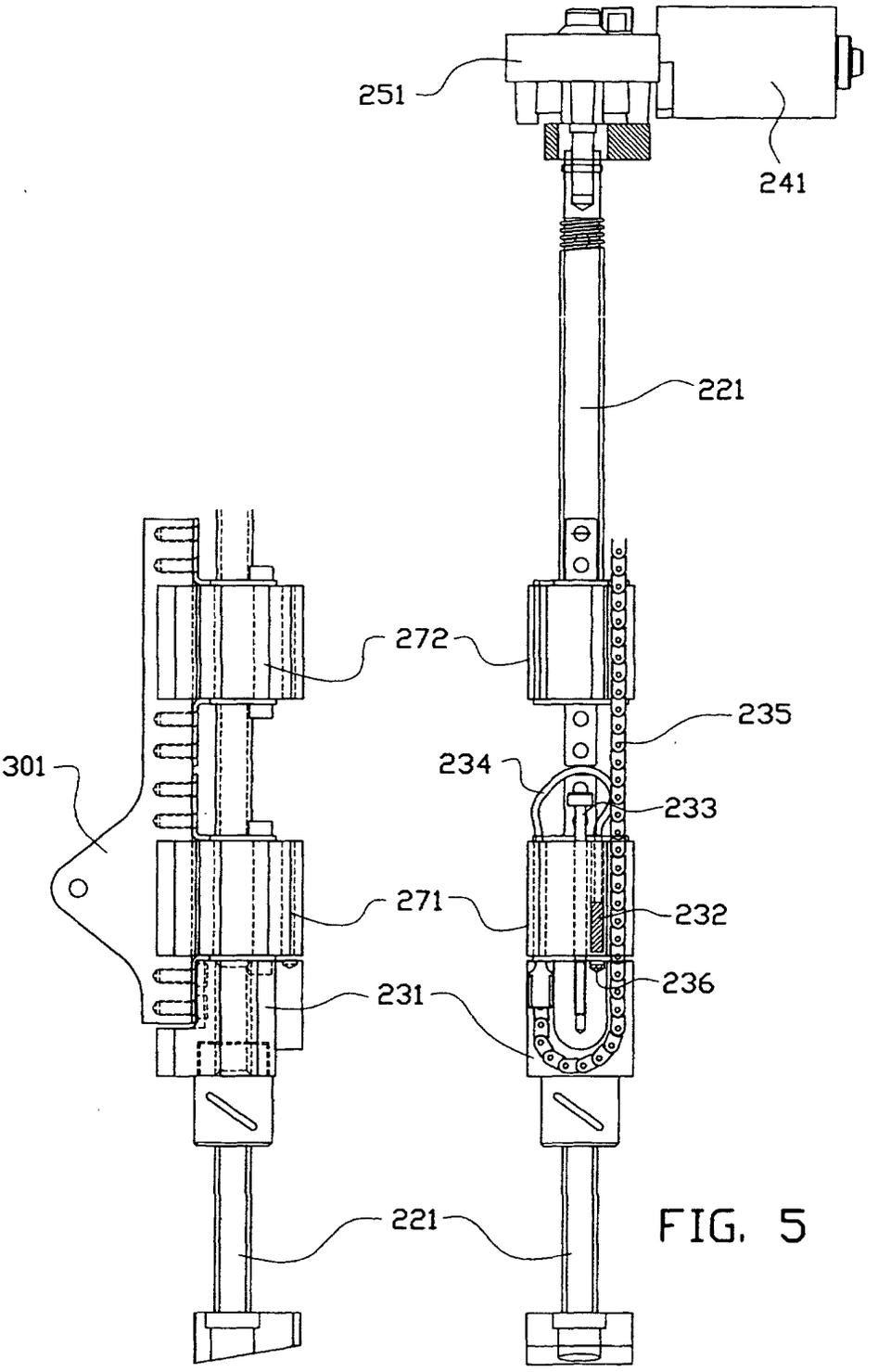

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 07 6086

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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