

[54] **LIFT DEVICE**

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[52] U.S. Cl. 214/75 R, 214/75 T, 214/730

[51] Int. Cl.**B60p 1/44**

[58] Field of Search.....214/75 R, 75 G, 75 H, 75 T, 214/701 P, 730, 731, 750

[56] **References Cited**

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Assistant Examiner—Lawrence J. Oresky

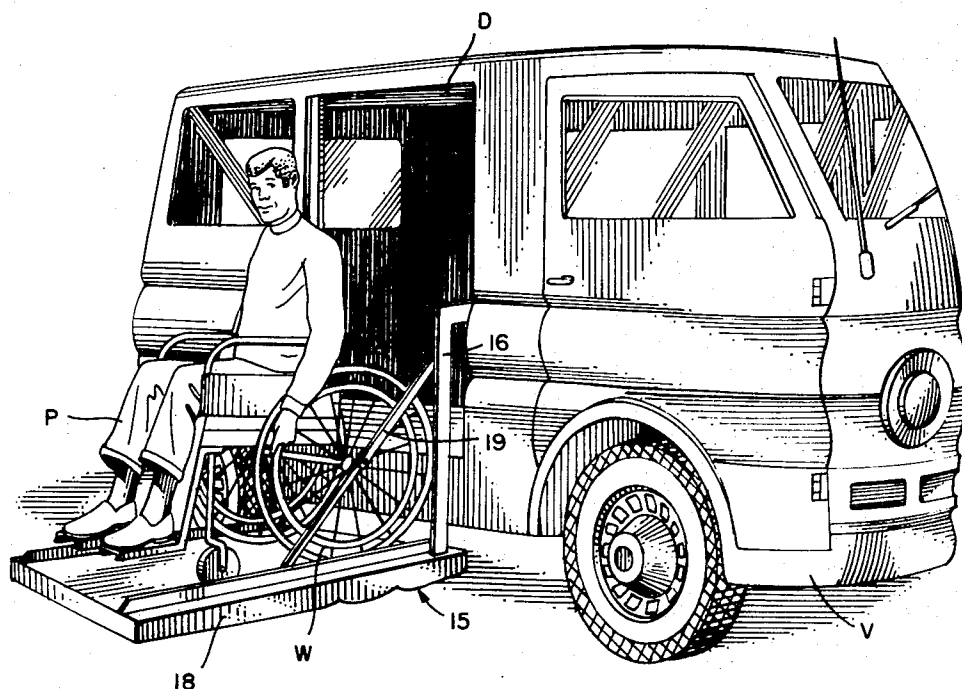
Attorney—Dawson, Tilton, Fallon & Lungmus

[57]

ABSTRACT

A lift device particularly suitable for lifting wheel chairs and the like into a vehicle. The lift device includes a platform which can be used to raise and lower objects between the ground and the floor of the vehicle, and when the lift device is not being used, the platform can be automatically raised to a vertical position to close the doorway provided in the vehicle. The platform is pivotally supported at the ends of a pair of generally L-shaped lift arms, and the other end of each of the lift arms is slidably secured to a housing which is mounted for vertical sliding movement on a generally vertical support post. A hydraulic motor is operatively connected to each of the housings for sliding the housings along their respective support posts to raise and lower the platform between the ground and the vehicle, and another hydraulic motor is operatively connected between each of the slide housings and the lift arms for moving the lift arms horizontally inwardly and outwardly with respect to the vehicle. A cable extends from the platform to an electrically operated wind-up pulley for pivoting the platform about the lift arms between horizontal and vertical positions.

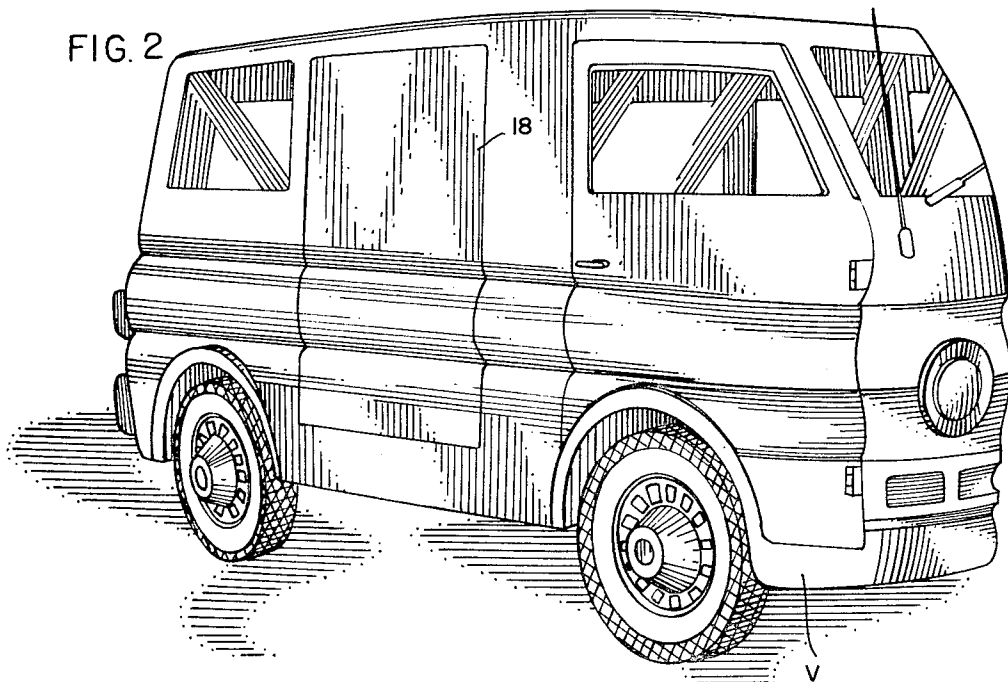
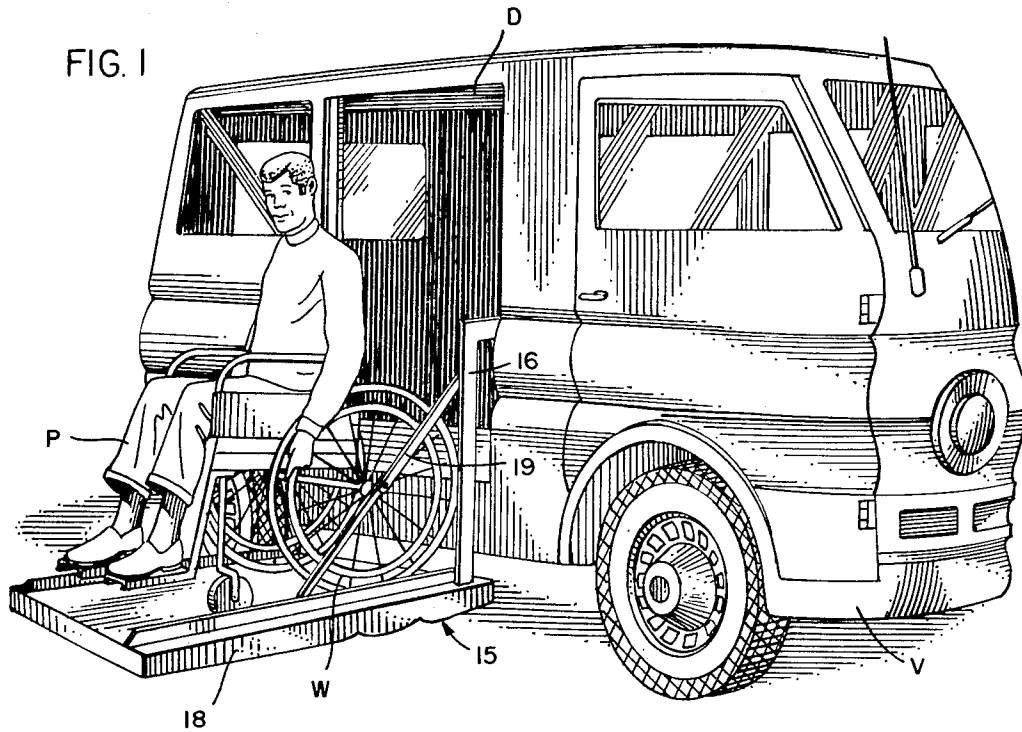
9 Claims, 10 Drawing Figures



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FIG. 7

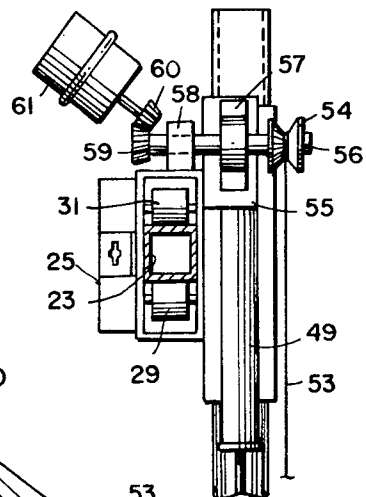


FIG. 8

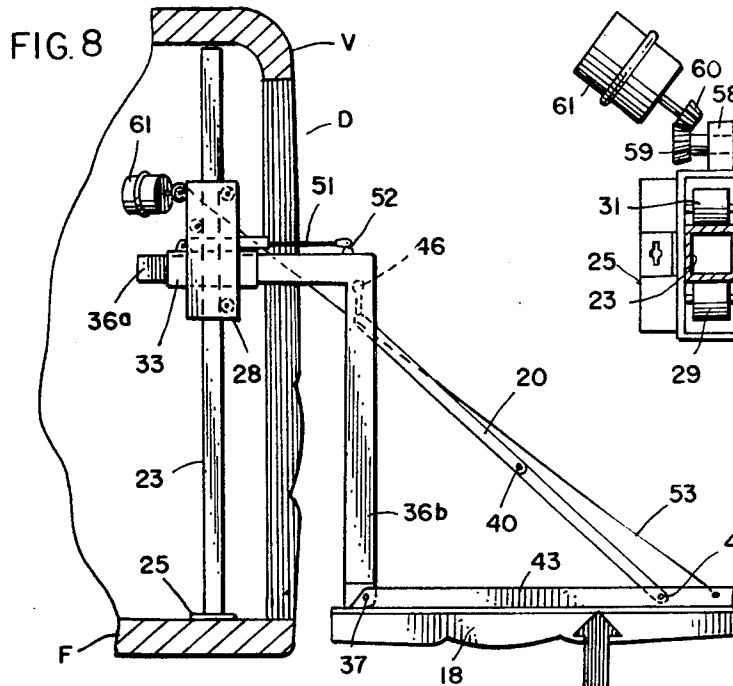


FIG. 9

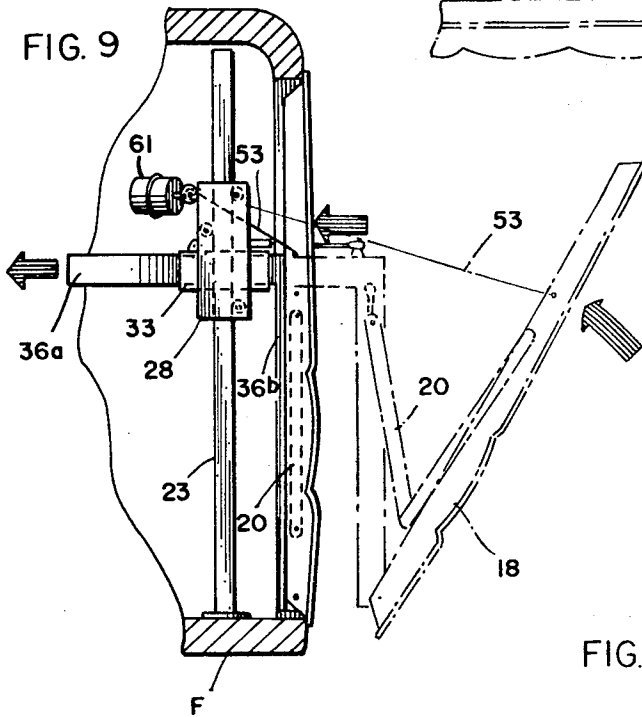
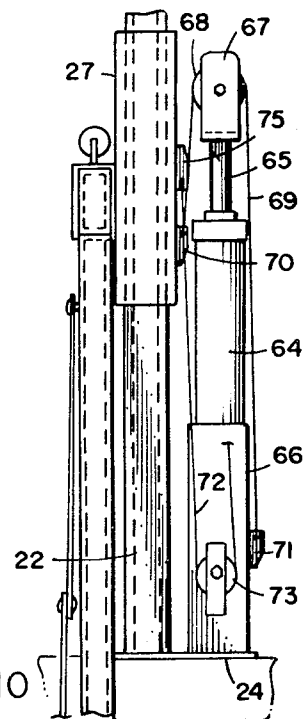


FIG. 10



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LIFT DEVICE

RELATED APPLICATION

This application is a continuation-in-part of my prior co-pending application entitled "Lift Device," Ser. No. 874,273, filed Nov. 5, 1969, now U.S. Pat. No. 3,613,917.

BACKGROUND AND SUMMARY

This invention relates to lift devices, and, more particularly, to lift devices particularly suitable for lifting wheel chairs and the like into vehicles.

This invention is a variation of the lift device disclosed in my said prior application. As discussed in my prior application, there is a need for automatic lift devices for raising invalids and other persons confined to wheel chairs between the ground and transport vehicles. It is desirable that such devices be relatively compact, and the lift device should be completely contained within the vehicle when the vehicle is in motion.

My prior application disclosed such a device. After the wheelchair is lifted into the vehicle, the device may be folded and pivoted completely within the vehicle where it occupies a minimal amount of space.

The lift device which is the subject of this application operates in a similar manner to lift the wheelchair or other object from the ground to the floor of the vehicle. Thereafter, the lift arms can be automatically moved to a position completely within the interior of the vehicle and the platform is automatically raised to close the doorway provided in the vehicle.

DESCRIPTION OF THE DRAWING

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawing, in which

FIG. 1 is a perspective view showing the inventive lift device being used to lift a wheelchair into a vehicle;

FIG. 2 is a view similar to FIG. 1 showing the platform of the device raised to a vertical position to close the doorway of the vehicle;

FIG. 3 is a front elevational view of the lift device with the vehicle shown in phantom;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 3;

FIG. 6 is an enlarged fragmentary view taken along the line 6—6 of FIG. 3;

FIG. 7 is a sectional view taken along the line 7—7 of FIG. 6;

FIG. 8 is a view similar to FIG. 4 showing the platform in the raised position;

FIG. 9 is a view showing the steps of moving the platform and lift arms into the interior of the vehicle; and

FIG. 10 is an enlarged fragmentary view of a portion of FIG. 3.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to FIG. 1, the numeral 15 designates generally a lift device which is seen to be mounted within a doorway D of a familiar van-type vehicle V. A wheelchair W carrying a patient P is supported by the lift device and is shown about to be lifted into the interior of the vehicle.

The lift device 15 includes a pair of lift arms 16 and 17 (see also FIG. 3) which pivotally support a generally rectangular platform 18. The platform is held in the generally horizontal position illustrated in FIG. 1 by a pair of support straps 19 and 20 which extend, respectively, from the lift arms 16 and 17. As will be explained more fully hereinafter, the lift arms and the platform can be raised vertically from the position shown in FIG. 1 to permit the patient to move the wheelchair into the interior of the vehicle, after which the lift device can be operated to bring the platform 18 into the generally vertical position illustrated in FIG. 2 in which it closes the doorway of the vehicle.

Referring now to FIGS. 3-5, the lift device includes a pair of generally vertically extending support posts 22 and 23 which extend adjacent the opposite sides of the doorway D. The support posts are advantageously formed of square tubing, and each of the support posts includes a base plate 24 and 25, respectively, which may be bolted to the floor F of the vehicle. A cross piece 26, also of square tubing, extends between the upper ends of the support posts adjacent the top of the doorway and is secured to the support posts.

A slide housing or sleeve 27 is slidably carried by the support post 22 for sliding movement therealong, and a slide housing 28 is slidably carried by support post 23. Each of the slide housings are generally rectangular in transverse cross section, and, as can be seen best in FIGS. 6 and 7, the housing 28 is positioned on the support post 23 by a pair of upper and lower rollers 29 and 30, respectively, which are rotatably mounted in the housing and which engage the outer side of the support post, i.e., the side facing toward the outside of the vehicle, and a roller 31 which is also rotatably mounted within the housing and which engages the inner side of the support post. The housing 27 is similarly mounted on the support post 22.

Each of the slide housings 27 and 28 carry a generally tubular sleeve 32 and 33, respectively, the axis of which extends generally perpendicular to the axis of the slide housing, or generally horizontally. Slide housing 32 slidably or telescopically receives a generally L-shaped lift arm 34 having a generally horizontally extending portion 34a received by the sleeve 32 and a generally vertically extending portion 34b which is pivotally secured to the rear end of the platform 18 by pin 35.

Similarly, an L-shaped lift arm 36 includes a horizontal portion 36a slidably received in the sleeve 33 and a vertical portion 36b pivotally secured to the support platform by pin 37.

The platform is held in the open or horizontal position illustrated in FIGS. 3-5 by support straps 38 and 39 which extend, respectively, from the lift arms 34 and 36. Each of the support straps are formed of two pivotally connected halves which are connected by pins 40, and the lower end of each strap is pivotally connected to the forward portion of the platform by pins 41. In the particular embodiment illustrated, the platform is provided with a pair of side walls 42 and 43 to which the straps and lift arms are secured. The upper end of each of the support straps 38 and 39 carries a pin 44 which is slidably mounted in one of the vertical slots 45 and 46 provided in the lift arms 34 and 36, respectively, and the upper end of each of the slots ter-

minates in an enlarged opening through which the enlarged head and the pin may be withdrawn if desired.

The slide assemblies 27 and 28 carry hydraulic motors 47 and 48, respectively, for moving the lift arms inwardly and outwardly with respect to the vehicle. Referring to FIG. 6, the hydraulic motor 48 includes a cylinder 49 secured to the sleeve 33 by means of a lug 50 and a piston 51 secured to the horizontal portion 36a of the lift arm 36 by a lug 52. Similarly, the hydraulic motor 47 includes a cylinder secured to the sleeve 32 and a piston secured to the lift arm 34. The hydraulic motors are advantageously double-acting, and fluid can be supplied through suitable hoses (not shown) to extend and retract the pistons as desired to move the lift arms horizontally.

The platform may be pivoted from the open or horizontal position to a vertical position by cable 53 which is secured to the forward portion of the side wall 43 of the platform and which extends to a pulley 54 (FIGS. 6 and 7), which is rotatably mounted on a bracket 55 secured to the housing 28. Referring to FIG. 7, the pulley 54 is carried by an axle 56 which is journaled in a bushing 57 secured to the bracket 55 and a bushing 58 secured to the housing 28. The other end of the shaft 55 carries a gear 59 which meshes with a beveled gear 60 driven by an electric motor 61.

The means for raising and lowering the support arms and platforms can be seen best in FIG. 3. A hydraulic motor 64 extends upwardly adjacent the support post 22 and is also supported by the base plate 24. The motor includes a hydraulic piston 65 which extends upwardly from a cylinder 66 and terminates in a bifurcated bracket 67 which rotatably carries a roller 68. A first cable means represented schematically by the line 69 passes over the roller 68 and has one end thereof secured to the lug 70 (FIG. 10) on the slide housing 27 and the other end secured to the lug 71 on the cylinder 66 adjacent the base thereof. If desired, the lower end of the cable 69 may be anchored to the base plate 24 or to some other fixed location. A second cable means represented schematically by the line 72 passes over a roller 73 rotatably mounted adjacent the base of the cylinder 66 by bracket 74. One end of the cable means 72 is secured to lug 75 on the slide housing 27, and the cable thereafter extends downwardly around the roller 73 and then upwardly to a roller 76 rotatably mounted on one end of the upper box channel 26. The cable 72 extends through the hollow box channel 26 over a roller 77 rotatably mounted in the other end of channel 20 and thereafter extends downwardly adjacent the support post 23 where it is secured to lug 78 attached to the slide housing 28. The lug 75 is positioned forwardly or outwardly of the lug 70 as viewed in FIGS. 3 and 10, so that the two cable means will not interfere with each other. In the particular embodiment illustrated the cable means 69 and 72 are conventional link chains, portions of which are illustrated. It will be understood that other cable means may also be used.

OPERATION

In FIGS. 3-5, the platform 18 is illustrated in a lowered position below the floor F of the vehicle and generally level with the ground. In this position, the occupant of the wheel chair can readily wheel himself onto the platform illustrated in FIG. 1. The fluid motors

47, 48 and 64 and the electric motor 61 are all operatively connected to a suitable control panel, and, if desired, a pair of identical control panels can be provided, one accessible from outside of the vehicle and one accessible from inside the vehicle. After the patient wheels himself onto the platform, he can use the control to operate the fluid motor 64 to raise the lift arms and the platform vertically.

Referring to FIGS. 2 and 10, as the piston 65 is raised, the end of the cable means 69 attached to the lug 70 is pulled upwardly, thereby raising the slide housing 27 and lift arm 34. As the slide housing 27 moves upwardly, the lug 75 pulls the cable 72 about the rollers 73, 76 and 77 and causes the slide housing 28 to move upwardly substantially simultaneously with the slide housing 27. A substantially uniform lifting force is therefore applied to both sides of the platform 18.

When the platform reaches the level of the floor F, upward movement of the piston 65 is stopped, and the occupant may wheel the wheel chair into the interior of the van. It will be appreciated that the patient can thereby be lifted from the ground into the vehicle without any discomfort or exertion on his part.

After the wheel chair has been moved into the van, the fluid motors 47 and 48 can be operated to retract the pistons thereof to move the vertical portions 34b and 36b of the lift arms into the interior of the vehicle. Either before or after the fluid motors 47 and 48 are operated, the electrical motor 61 can be actuated to rotate the pulley 54, thereby causing the platform to pivot about its connection to the lift arms from a horizontal position to a generally vertical position as illustrated in FIG. 9. When the lift arms are retracted into the vehicle and the platform is raised to a generally vertical position, the platform, which is sized to close the doorway D of the vehicle, will seal the vehicle, and the vehicle will be ready for travel. As can be seen best in FIG. 2, the bottom or outer surface of the platform 18 has the same contour as the adjacent panel portions of the vehicle, and even though the vehicle is specially equipped with the lift device, this will not be apparent when the platform closes the doorway.

When it is desired to remove the wheel chair from the vehicle, substantially the reverse operation is employed. The electric motor 61 is operated to rotate the platform downwardly through a generally vertical position, and the fluid motors 47 and 48 may be operated to slide the lift arms outwardly. The occupant can thereafter wheel himself onto the platform and then operate the fluid motor 64 to lower the platform.

Although the inventive lift device has been described specifically for use in lifting wheel chairs into vehicles, it will be understood that the use of the lift device is not so limited. The device may be used for lifting a variety of objects and need not be mounted in a vehicle.

While in the foregoing specification, a detailed description of a specific embodiment of my invention was set forth for the purpose of illustration, it is to be understood that many of the details herein given may be varied considerably by those skilled in the art without departing from the spirit and scope of my invention.

I claim:

1. A lift device comprising a pair of generally vertically extending spaced-apart support posts, slide means

slidably carried by each of said support posts, first power means for sliding said slide means vertically along the support posts, a pair of elongated lift arms, each of said lift arms having a generally horizontally extending portion slidably secured to one of said slide means for sliding movement generally perpendicularly to the support posts and a downwardly extending portion, second power means for sliding the support arms generally perpendicularly to the support posts, a generally rectangular platform carried between said lift arms and pivotally secured thereto adjacent the lower ends of the downwardly extending portions thereof, said platform being pivotable between a lowered generally horizontal position and a raised generally vertical position, strap means extending from each of said lift arms to said platform for supporting the platform in the lowered position, and cable wind-up means mounted on one of the slide means, a cable secured to the platform and extending from the platform to the wind-up means whereby the wind-up means can move the platform between the raised and lowered positions.

2. The lift device of claim 1 in which said slide means includes a housing slidably carried by each of the support posts, said power means including a cylinder and piston assembly for raising and lowering at least one of the slide housings along the associated support post.

3. The lift device of claim 2 in which said power means includes cable means extending between said one slide housing and the other slide housing for raising and lowering the other slide housing as said one slide housing is raised and lowered by said cylinder and piston assembly.

4. A lift device adapted for lifting objects into a vehicle comprising a pair of generally vertically extending spaced-apart support posts adapted to be mounted on the vehicle, a slide housing slidably carried by each of said support posts for generally vertical movement therealong, a pair of generally L-shaped lift arms, each of said lift arms having a generally horizontally extending portion and generally vertically downwardly extending portion, the horizontally extending portion of each lift arm being slidably secured to one of the slide housings for sliding movement generally perpendicularly to the support posts, a generally rectangular platform carried between said lift arms and being pivotally secured thereto adjacent the lower ends of the vertically extending portions of the lift arms, said platform being pivotable between a lowered position in which the platform extends generally horizontally and a raised position in which the platform extends generally vertically, strap means extending between each of the lift arms and the platform for supporting the platform in the lowered position, power lift means operatively connected to at least one of said slide housings for raising and lowering said one slide housing whereby the platform may be raised and lowered, power slide means mounted on at least one of the slide housings and operatively connected to the associated lift arm for moving the lift arms generally horizontally whereby the vertically extending portions of the lift arms can be moved into and out of the interior of the vehicle, pulley means rotatably mounted on one of the slide housings, power means for rotating the pulley means, and a cable extending between the platform and the pulley means and secured thereto whereby the platform can be moved between the raised and lowered positions.

5. The lift device of claim 4 including cable means extending between said one slide housing to which the power lift means is attached and the other slide housing for raising and lowering the other slide housing as the one slide housing is raised and lowered by the power lift means.

6. The lift device of claim 4 in which said power lift means includes a generally vertically extensible hydraulic motor adjacent one of the support posts, first roller means carried by the upper end of the hydraulic motor, first cable means having one end connected to the slide housing on said one support post, said first cable means extending over said roller means and having the other end thereof secured against movement, second cable means having one end thereof connected to the slide housing associated with said one support post, said second cable means extending downwardly from the slide housing and extending about second roller means rotatably mounted on the lift device, said second cable means extending upwardly from said second roller means and passing over third roller means rotatably carried adjacent the upper end of said one support post and fourth roller means rotatably carried adjacent the upper end of the other support post, said second cable means extending downwardly from said fourth roller means and having the other end thereof connected to the slide housing on said other support post whereby said first cable means pulls the slide housing on said one support post upwardly as said hydraulic motor extends upwardly and said second cable means pulls the slide housing on said other support post upwardly as the slide housing on said one support post moves upwardly.

7. The lift device of claim 4 including an elongated generally tubular sleeve secured to each of the slide housings with the axis of the sleeve extending generally horizontally, the horizontally extending portion of each of the lift arms being telescopically received in one of the sleeves.

8. The lift device of claim 4 in which the power slide means comprise a horizontally extensible hydraulic motor, one end of the hydraulic motor being secured to the slide housing and the other end being secured to the associated lift arm.

9. A vehicle having a doorway in combination with a lift device adapted for lifting objects into said vehicle, comprising a pair of generally vertically extending spaced-apart support posts mounted on the vehicle at opposite sides and immediately adjacent of the doorway, slide means slidably carried by each of said support posts, a pair of elongated lift arms extending from the support posts in one direction, the vehicle having a floor storage area extending from the support posts in the opposite direction, each of said lift arms having a generally horizontally extending portion slidably secured to one of said slide means for sliding movement generally perpendicularly to the support posts and a downwardly extending portion, power means for sliding the support arms generally perpendicularly to the support post, a generally rectangular platform carried between said lift arms and pivotally secured thereto adjacent the lower ends of the downwardly extending portions thereof, said platform being pivotable between a generally horizontal position and a generally vertical position, strap mean extending from each of said lift arms to said platform for supporting the platform in the

position, and power lift means operatively connected to at least one of the slide means for raising and lowering said one slide means whereby the platform may be moved between raised and lowered positions and objects may be moved from the platform through the doorway of the vehicle and between the support posts and onto said storage floor area when the platform is in the raised position.

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