

[54] **WHEEL CHAIR LIFT**
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[51] Int. Cl.**B66b 11/04**
[58] Field of Search.....**187/10, 12, 20, 51, 187/62, 98, 9, 94, 17, 8.52**

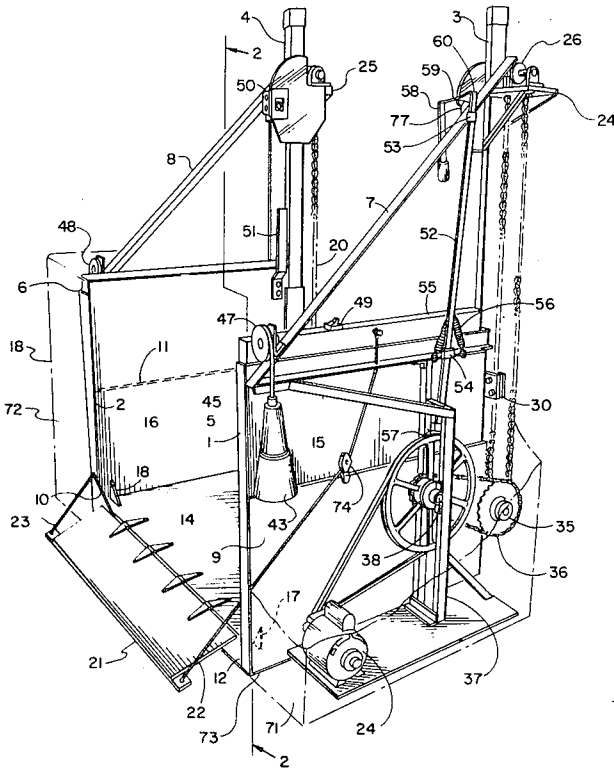
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[57] **ABSTRACT**
A lift is described which provides a convenient and safe means for lifting objects and/or personnel for a limited height. In particular, the lift provides a means whereby a person in a wheel chair may be raised a given distance, such as the height necessary to enter a trailer. In addition to the basic lifting mechanisms, the lift provides a safety feature whereby a lip, connected to the lifting platform and actuated by the upward movement of the platform, pivots upwardly and prevents an inadvertent roll-off of the wheel chair. The structure about the platform includes sheet material about three sides and a hinged flap across the fourth side. As the platform is raised, the hinged flap, normally urged into a horizontal position by a spring, is pivotally raised underneath the rising platform whereby the fourth side is sealed off to prevent children or pets from crawling under the raised platform with subsequent injury should the platform lower upon them. On descent, the frontal lip pivots forwardly and downwardly whereby, when the platform contacts the ground, the lip will provide a short ramp to the ground. Simultaneously, the flap, raised into an upright position on ascent, pivots to a horizontal position under force of the spring.

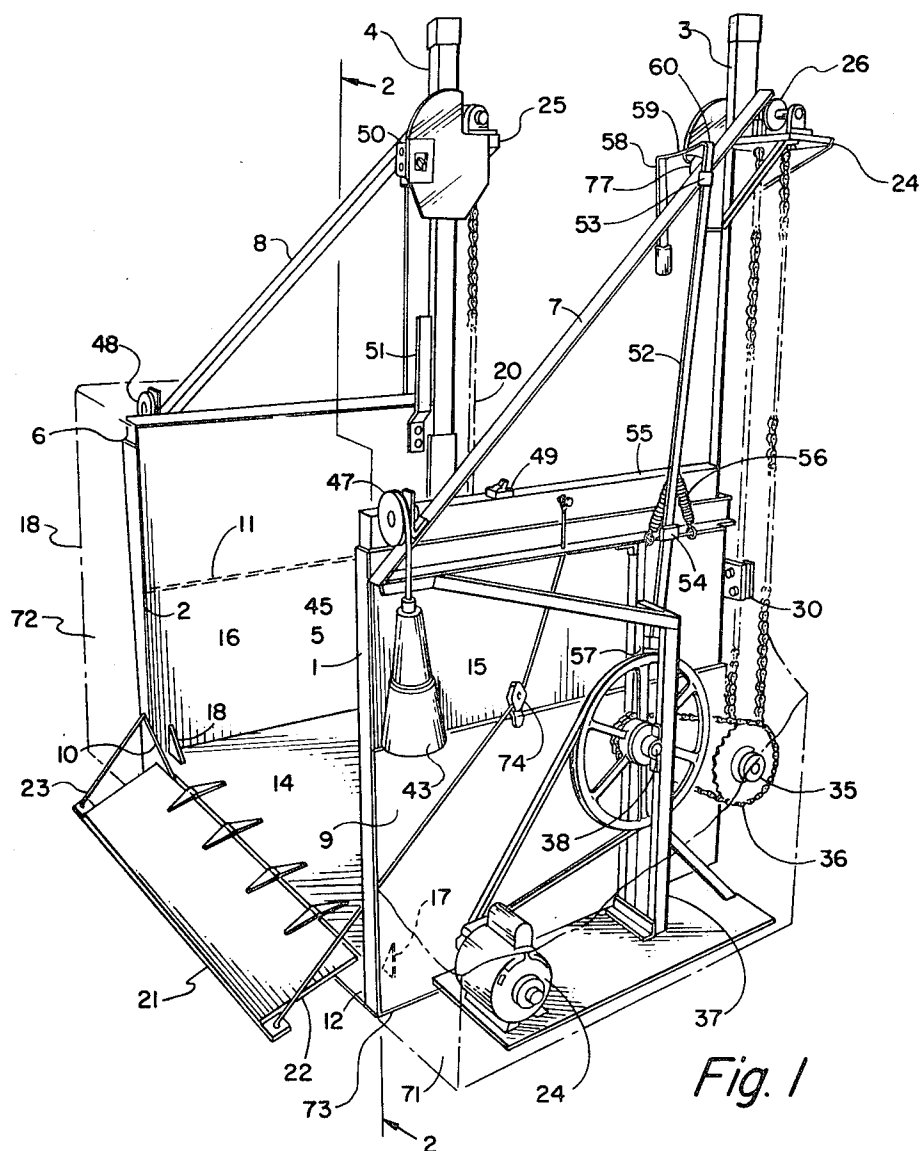
7 Claims, 4 Drawing Figures



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3 Sheets-Sheet 1



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Fig. 2

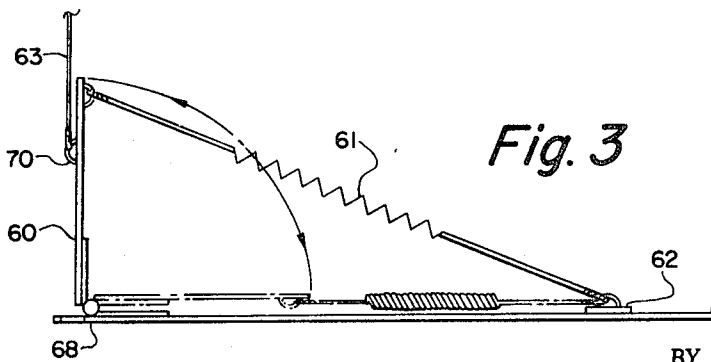
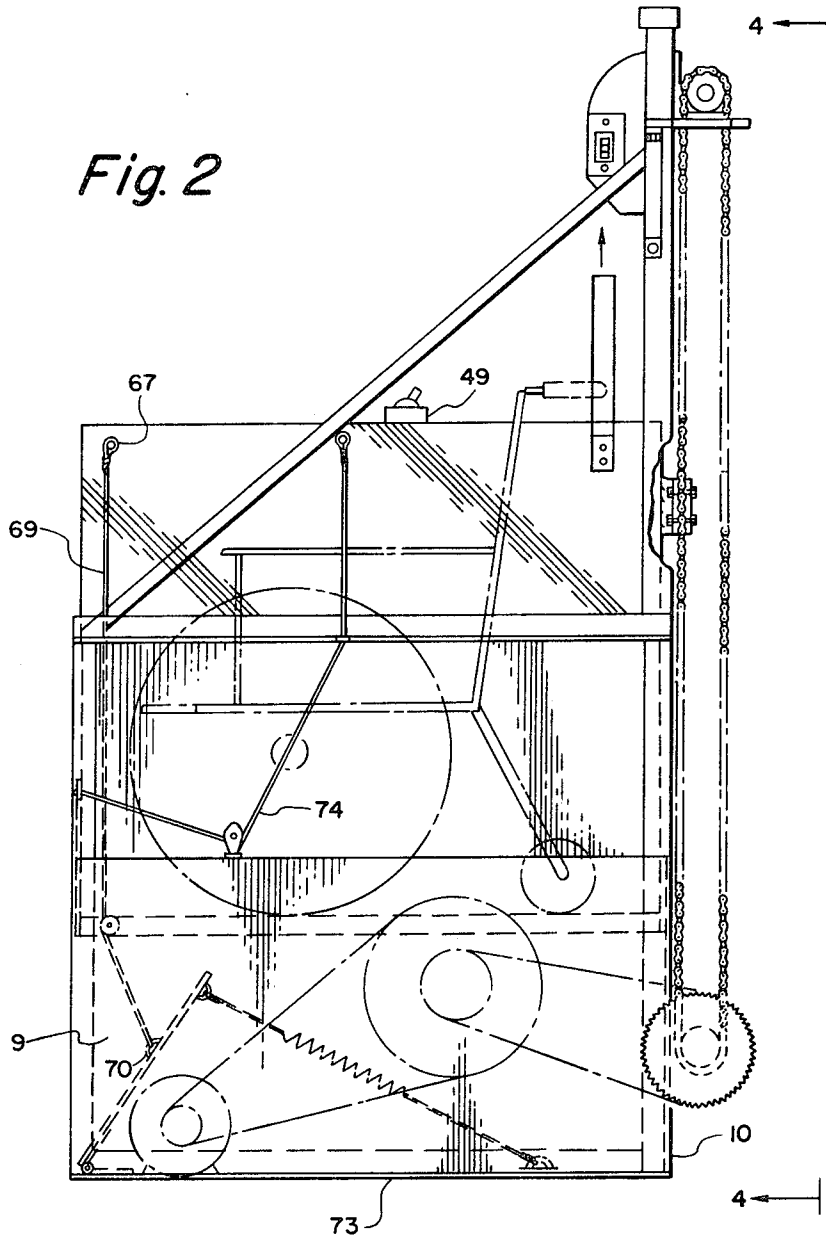


Fig. 3

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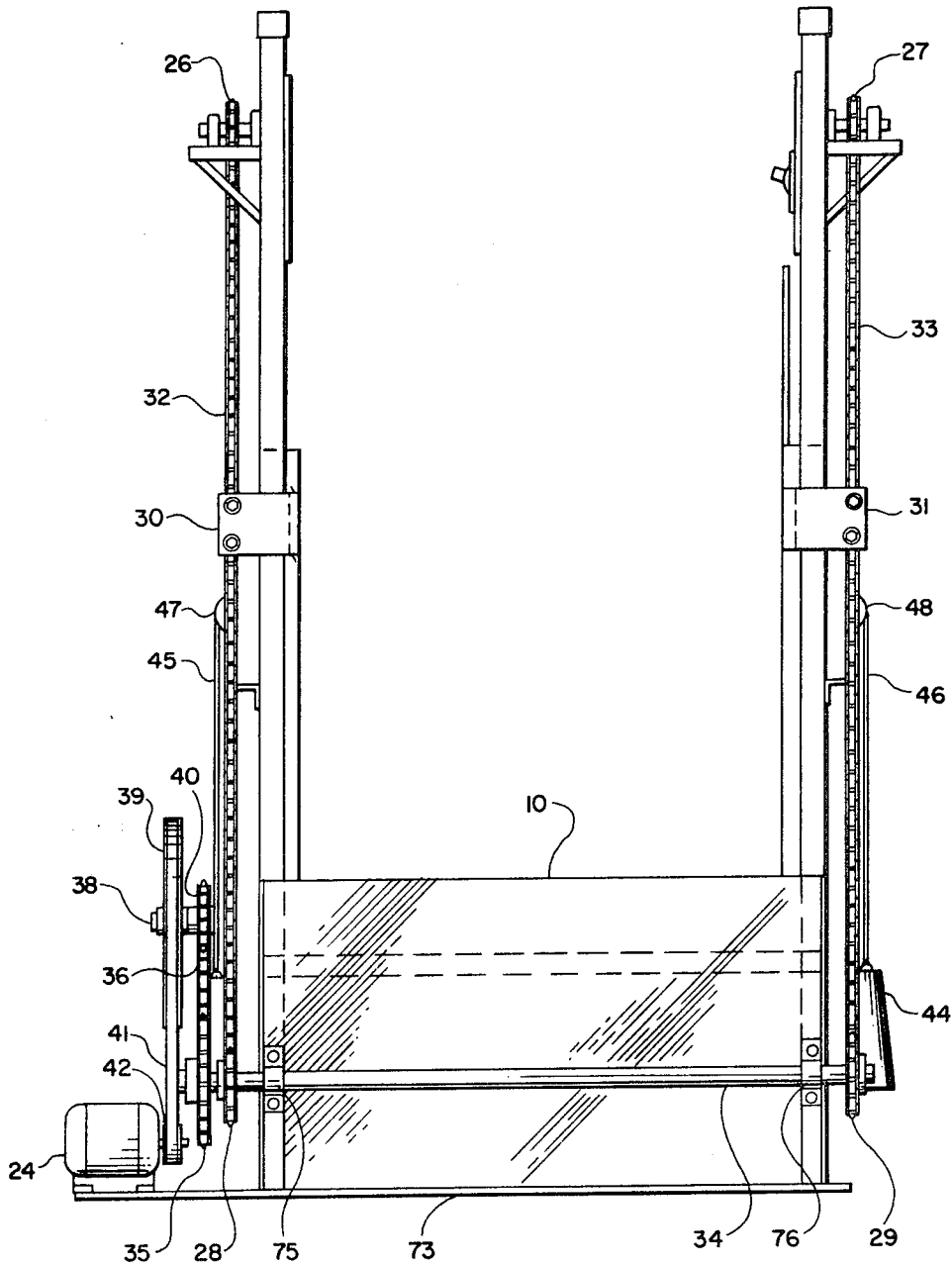


Fig. 4

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WHEEL CHAIR LIFT

This invention relates to that class of devices useful for raising loads for a limited distance.

Recently developing sociological and economical changes have made trailers and trailer courts extremely popular among the elderly, particularly those who lived on limited means, that is, on pensions or annuities. Many of these persons are physically handicapped because of senescence or injury and some may in fact be incapable of walking for any extended distance. For this class of persons, who are relegated to a wheel chair for mobility and who are incapable of ascending steps without aid, there is a serious problem in mounting the entrance steps to their trailer. The use of inclined ramps leading up the the trailer have been attempted; however, these suffer from two very serious disadvantages. First, the ramp requires an extended amount of ground surface area in order to maintain a gradual slope. This is an impossibility in a crowded trailer park. The second problem arises in that many of this class of persons are not physically powerful enough to propel themselves up even a gradual ramp. Thus, their mobility is dependent on the use of an electric or otherwise powered wheel chair. These wheel chairs are expensive and beyond the means of many persons within this class.

A solution in the past has been that of employing one of the commercially available lifts. This solution was unsatisfactory in that many of these lifts were either very expensive and beyond the means of the aforementioned class of persons, or else did not provide sufficient safety features to permit the user to employ the lift without fear of possible injury.

It is therefore a primary object of the present invention to provide a lift for a wheeled vehicle which incorporates interlocking safety features whereby the occupants may employ the lift without fear of personal injury.

Another object of the present invention is to provide a lift for a wheeled vehicle which does not present a safety hazard to crawling children or pets.

Another object of the present invention is to provide a raised lip to prevent wheeled loads from rolling off the raised platform.

Still another object of the present invention is to provide an interlocked pivotal side co-operating with three fixed sides to establish a surrounding barrier beneath the raised platform.

These and other objects of the present invention will become apparent to those skilled in the art as the description thereof proceeds.

In describing the invention with more specificity, reference will be made to the following drawings, in which:

FIG. 1 illustrates the basic structure taught in accordance with the teachings of the present invention.

FIG. 2 illustrates a cross section of the basic structure taken at line 2—2 of FIG. 1.

FIG. 3 illustrates the hinged flap forming the fourth side of the barrier surrounding the platform.

FIG. 4 illustrates a cross section of the basic structure taken at line 4—4 of FIG. 2.

Referring to FIG. 1, there is shown a lift assembly built according to the invention. The framework of the lift assembly includes four upright supports 1, 2, 3, and 4, which are attached to a flat rectangular base 73. The

front upright supports 1, 2 are connected by horizontal bars 5 and 6 to the rear extended upright supports 3 and 4, respectively. Supports 3 and 4 are braced by diagonal members 7 and 8 extending from points in proximity to the junction of support 1 and horizontal bar 5 and support 2 and horizontal bar 6 to the upper portion of supports 3 and 4, respectively. In this fashion, the uprights 1, 2, 3, and 4, including their respective connecting members, form three sides of the lift framework. Extending upwardly from the base 73 and along each of these three sides, defined by uprights 1 and 3, 3 and 4, and 4 and 2, there may be barriers 9, 10, 11, respectively, of sheet-like material or screening. The height above the base 100 of these barriers should be at least equal to the height of the raised position of the platform 14. If desired, the barriers 9, 10, and 11 may be designed to serve both as an additional support for uprights 1, 2, 3, and 4 and as a shroud about the platform 14. Additional bracing, such as triangles 12 and 13, may be welded to uprights 1 and 2 and the base 73, to add rigidity to the structure.

The vertically moving platform assembly includes a platform 14 and two vertical sides 15 and 16 extending upwardly from opposite sides of the platform 14. Triangular braces 17 and 18 may be welded to the platform 14 to secure the respective sides and provide additional rigidity. Channel members 19 and 20 are welded to the sides 15 and 16 respectively to co-operate with uprights 3 and 4, respectively, and act as guides when raising or lowering the platform 14. The remaining two sides of the platform 14 do not have any permanent barriers in order that a wheeled vehicle may be rolled onto the lowered platform 14 from the front and off the rear of platform 14 when the platform 14 is in the raised position.

A pivotable lip 21 is attached to and extends across the front portion of the platform 14. A cord or cable 22 is attached to the front corner of the lip 21 and extends therefrom through a pulley 74 attached to an upper portion of barrier 9 and then attaches to the upper portion of the side 15. In operation, the lip 21 functions as follows. When the platform 14 is in the lowered position, the lip 21 acts as a ramp to permit an easy entry for a wheeled vehicle onto the platform 14. As the platform 14 begins to rise, the effective cord length between the lip 21 and the upper portion of side 15 tends to be shortened due to the immobility of the pulley 74 through which the cord 22 must pass. Thus, the front of the lip 21 is forced to pivot upwardly toward platform 14. Thereby, the lip 21 pivots upwardly beyond horizontal to provide an upward incline for a vehicle carried on the platform 14; thus, the vehicle is inhibited from rolling off the platform 14. If desired, a second cord 23 may be used at the other side of the platform, operating in the previously described manner.

Each of the supports 3 and 4 includes shelf 24, 25 mounted in proximity to the top portion of the respective uprights. Each of these shelves 24, 25 supports a journaled sprocket 26, 27 respectively. The lower part of supports 3 and 4 include journalling means 75, 76 co-operating with an axle 34 extending beyond the side of either one of the supports. Attached to either end of axle 34 are sprockets 28, 29. A pair of chains 32, 33, which may be in the nature of bicycle chains, extend about sprockets 26, 28 and 27, 29 respectively. An extension 30 and 31 is attached to each of the platform sides 15 and 16, and clamped, or otherwise secured to

each of the chains 32, 33, such that the platform may not be raised nor lowered without causing sprockets 28, 29 and ultimately axle 34 to rotate. Thus, any rotation of axle 34 will cause the platform 14 to ascend or descend, depending on the direction of rotation. A sprocket 35 is rigidly attached to axle 34 in proximity to sprocket 28. A support structure 37 attached to the side of the lift framework supports a journalled axle 38. Pulley 39 and sprocket 40, operating as a rotating unit, are mounted on axle 38. Chain 36 connects sprocket 40 to sprocket 35 whereby any rotation of pulley 39 will necessarily cause some rotation of axle 34. An electric motor 24 having a pulley 42 attached to the armature thereof drives pulley 39 through a belt 41

In operation, rotation of the armature of motor 24 necessarily rotates pulley 39 and sprocket 40. Sprocket 35, through movement of chain 36, causes axle 34 to rotate. As sprockets 28 and 29 are firmly attached to axle 34, sprockets 26 and 29 will be rotatably driven through chains 32 and 33. Any movement of the chains 32, 33 will cause the platform 14 to move upwardly or downwardly due to the interconnection through attachments 30 and 31.

A pair of counterweights 43, 44 attached by cords 45, 46 to the platform 14 through pulleys 47, 48 are designed to place the platform 14 in a condition of near equilibrium. That is, without the application of an outside force, the platform 14 will neither ascend nor descend.

A switch 49, which may be conveniently placed on the upper edge of one side of the raised sides of platform 14, such as side 15 as shown, controls the power to the electric motor 24. The switch 49 is connected so that as it is placed in the "ON" position, the motor 24 will be actuated, causing the platform 14 to rise. A second switch 50, which may be placed upon one of the uprights, such as upright 4 as shown, operates to shut off motor 24. The switch 50 may either be manually operated or it may be automatically operated through arm 51 extending above the platform side 16. Thus, as the lift is set in motion by actuation of switch 49, platform 14 will continue to rise until upright arm 51 actuates switch 50 to turn the motor 24 off.

As previously mentioned, the platform 14 will neither ascend nor descend due to its own weight because of the counterweight system. The inclusion of passengers or goods will, however, upset this balance. The gearing arrangement used by the combination of pulleys and sprockets is designed such that in order for there to be movement of the platform 14, the armature of motor 24 must turn at a relatively high rate. This requirement, plus the inherent frictional resistance present in the lift insures that after the power to the motor 24 is turned off, the platform 14 descends relatively slowly. To lock the platform 14 at any given position, a brake may be utilized. This brake may be desired when motor 24 is shut off and the platform 14 is in its raised position. Thereby, the platform 14 will not suddenly or unexpectedly begin to descend during the loading or unloading operation. The design of the brake may be quite elaborate if desired or may be a simple go/no-go type of system. A simple but satisfactory brake system will be described. A brake shaft 52 may be journalled at 53 on diagonal support 7 and at 54 on horizontal support 5. One end of the shaft 52 includes a brake shoe arrangement 57, which under pressure of springs 55, 56, exerts a force upon the edges of pulley 39, thus

retarding or inhibiting rotation of the pulley. The other end of the shaft 52 may include a horizontally projecting extension 59 riding upon a cam or inclined plane 77 such that if the shaft 52 rotated within journals 53, 54, the horizontal extension 59 rides up the inclined plane 77 and releases the brake shoe 57 from the pulley 39. A handle 58 may be connected to extension 59 for ease in operating the brake. The effectiveness of the brake may be increased by aligning the shaft 52 off center of pulley 39 and counter to the expected direction of rotation. Thereby, any rotation of pulley 39 resulting from the load placed on platform 14 will tend to force the brake shoe 57 upwardly and increase the force of the brake shoe 57 on the edge of pulley 39.

In operation, an occupant of the lift would utilize the brake in the following manner. Upon reaching the higher elevation after the motor 24 is shut off through actuation of switch 50 by arm 51 and platform 14, the lift will stop. At this time, the occupant would be within easy reach of handle 58, and could then swing or rotate the handle 58 such that extension 59 interacted with the inclined plane 77 to set the brake shoe 57 on the edge of pulley 39. The platform 14 would then be immobile for all practical purposes and the occupant could leave the platform 14 without fear of it suddenly beginning to descend due to his weight. On re-entering the lift at the raised position, the occupant would begin his descent by simply rotating handle 58 so as to release the brake shoe 57 from contact with the edge of pulley 39 and calmly await descent of the platform 14.

As previously mentioned, the sheet material 9, 10, and 11 collectively act to create a barrier about the sides of the platform 14. A primary purpose of this barrier is to prevent pets, small children, or other things from crawling under or being placed beneath the platform 14 while the platform 14 is in the raised position. Subsequent descent by the platform 14 could conceivably cause irreparable damage to these children, pets, or other things. In order to provide a four-sided barrier, a fourth side may be used which is actuated by movement of the platform 14 itself.

Referring to FIG. 3, a flap 60, pivotally mounted at 68 coincident with the front edge of the fourth side of base 73 is spring-biased by spring 61 suitably attached at point 62 to either the base 73 or a portion of the base framework such that the flap 60 in its normal position lies horizontally and will not impinge upon or impede the movement of the platform 14. When the platform 14 is raised, a cord 69 attached to the flap 60 and a fixed point 67 on the raised side 15 of the platform 14 causes flap 60 to pivot into an upright position. The point of attachment 70 between the cord 69 and the flap 60 must, of course, be predetermined from the known height to which the platform 14 rises in order that the flap 60 obtain a vertical position at the apex of the platform 14 ascent. Thus, while the platform 14 is in the raised position, the base 73 of the lift framework is surrounded on all four sides by a barrier whereby foreign objects cannot be inadvertently or by design be placed beneath the platform 14. On descent, the flap 60 pivotally swings out of the way under force of spring 61 so that it will not interfere with the egress of the occupant from the platform 14.

As a further safety precaution, an enclosure 71, shown in cutaway view in FIG. 1, may be placed about the counterweight, motor, pulleys, and sprockets. Similarly, a second enclosure 72 may house the counter-

weight and sprockets on the opposite side of the lift framework.

I claim:

1. A vertically moving platform assembly within a supporting and guiding framework, including a base having a plurality of sides, a barrier extending upwardly from less than all the sides thus providing at least one open side, and power means for raising the platform, comprising:

a hinged lip pivoted to one edge of the platform for providing a ramp for ease of ingress and egress when the latter is in its lowered position,

flexible means connected between said lip and said platform for rotating said lip upwardly in response to an upward movement of the platform,

a hinged flap pivoted to said open side of the base of the framework about a horizontal pivot point for movement between a horizontal position beneath said platform when said platform is a lowered position and a raised vertical position upon elevation of said platform, said flap being at all times disposed beneath a plane defined by the platform, and

flexible means connected between said flap and said platform for pivoting said flap upwardly about said horizontal pivot point in response to an upward movement of the platform to form a continuous barrier about the raised platform, whereby a load elevated by the platform will be retained on said platform by said lip and the barrier will prevent ingress of foreign objects beneath the raised platform.

2. A vertically moving platform assembly as claimed in claim 1, comprising:

a counterweight system attached to the platform and co-operating with the framework, whereby vertical movement of an unloaded platform must be initiated by an outside force.

3. A vertically moving platform assembly as claimed

in claim 1, wherein said pivoting means comprises:

a spring connected between said flap and the framework for urging said flap to a horizontal position, and

a cord connected between said flap and the platform, whereby movement of the platform is translated through said cord into a pivotal movement of said flap counter to the spring force.

4. A vertically moving platform assembly as claimed

in claim 1, wherein said rotating means comprises:

a cord having one end attached to said lip and the other end attached to the platform assembly, and a pulley attached to the framework for engaging said cord, whereby movement of the platform relative to the framework will shorten the effective cord length causing said lip to rotate upwardly.

5. The power means as claimed in claim 1, comprising:

an electric motor attached to the framework, means for converting the rotary output of said electric motor into a vertically moving element, and means for connecting said element to the platform, whereby the rotary output of said electric motor is translated into a vertical movement of the platform.

6. The power means as claimed in claim 5, including: a manually operated switch for energizing said electric motor, and

an automatically operated switch for de-energizing said electric motor when the platform has reached its apex.

7. The power means as claimed in claim 6, wherein said manual switch is attached to the platform, and said automatic switch is actuated in response to a predetermined relative movement between the framework and the platform.

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