

[54] **PLATFORM LIFT**

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[51] Int. Cl. **E04g 1/22**

[58] Field of Search **182/141, 148, 63, 115, 182/17; 280/43.23, 43.17, 43.2, 1506; 49/147, 183; 254/122**

[56] **References Cited**

UNITED STATES PATENTS

1,892,340	12/1932	Guth	160/147
3,131,753	5/1964	Dixon	160/183
3,135,401	6/1964	Schramm	280/43.23
3,259,369	7/1966	Gridley	182/141
3,373,844	3/1968	Schafer	182/141
3,464,519	9/1969	Whisler	182/115
3,485,321	12/1969	Smith	182/141

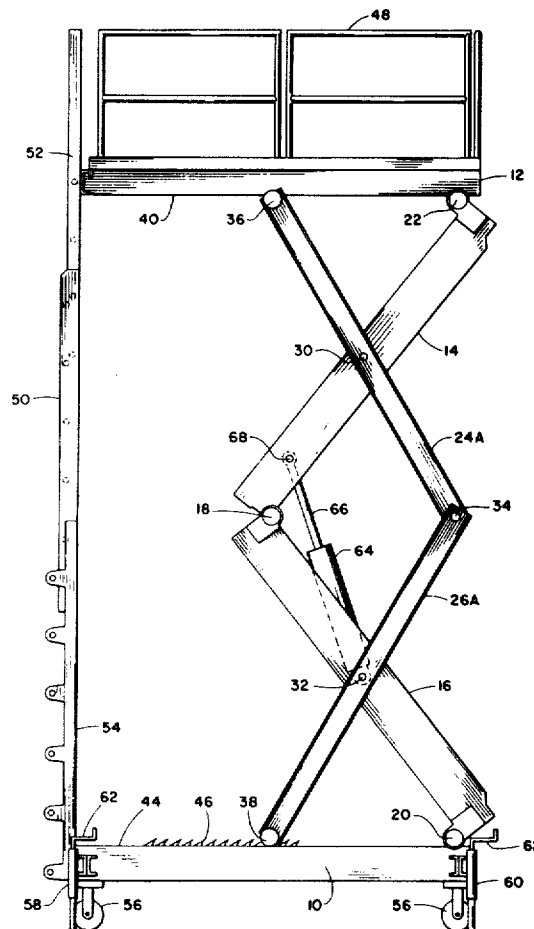
Primary Examiner—Reinaldo P. Machado

[57] **ABSTRACT**

This disclosure describes a scissors type platform lift

device which comprises a narrow rectangular base and a corresponding narrow rectangular platform substantially parallel to and above the base. The platform is supported by two pairs of scissors which comprise a pair of rectangular tubular structural members which are hinged together at a first end and are hingedly supported respectively on the base member and the platform at their other ends. There are two pairs of channel struts which are of equal length with the members, and are supported on a horizontal shaft through the centers both the members and the struts. One strut on each side of the member in the top scissors and one strut on each side of the member in the bottom scissors. A first end of the pairs of struts are hinged together and the free ends of the struts carry shafts with rollers, which respectively roll on the top of the base member and on the undersurface of the platform member. A hydraulic cylinder and piston means is connected between the two hinged members. Ratchet means on the base is provided to restrain the longitudinal moment of the bottom rollers so that once lifted into elevated position by the hydraulic cylinder, the scissors can be locked. A collapsible ladder means is provided in a vertical position at one end of the base with a corresponding part of the ladder attached to the platform.

15 Claims, 8 Drawing Figures



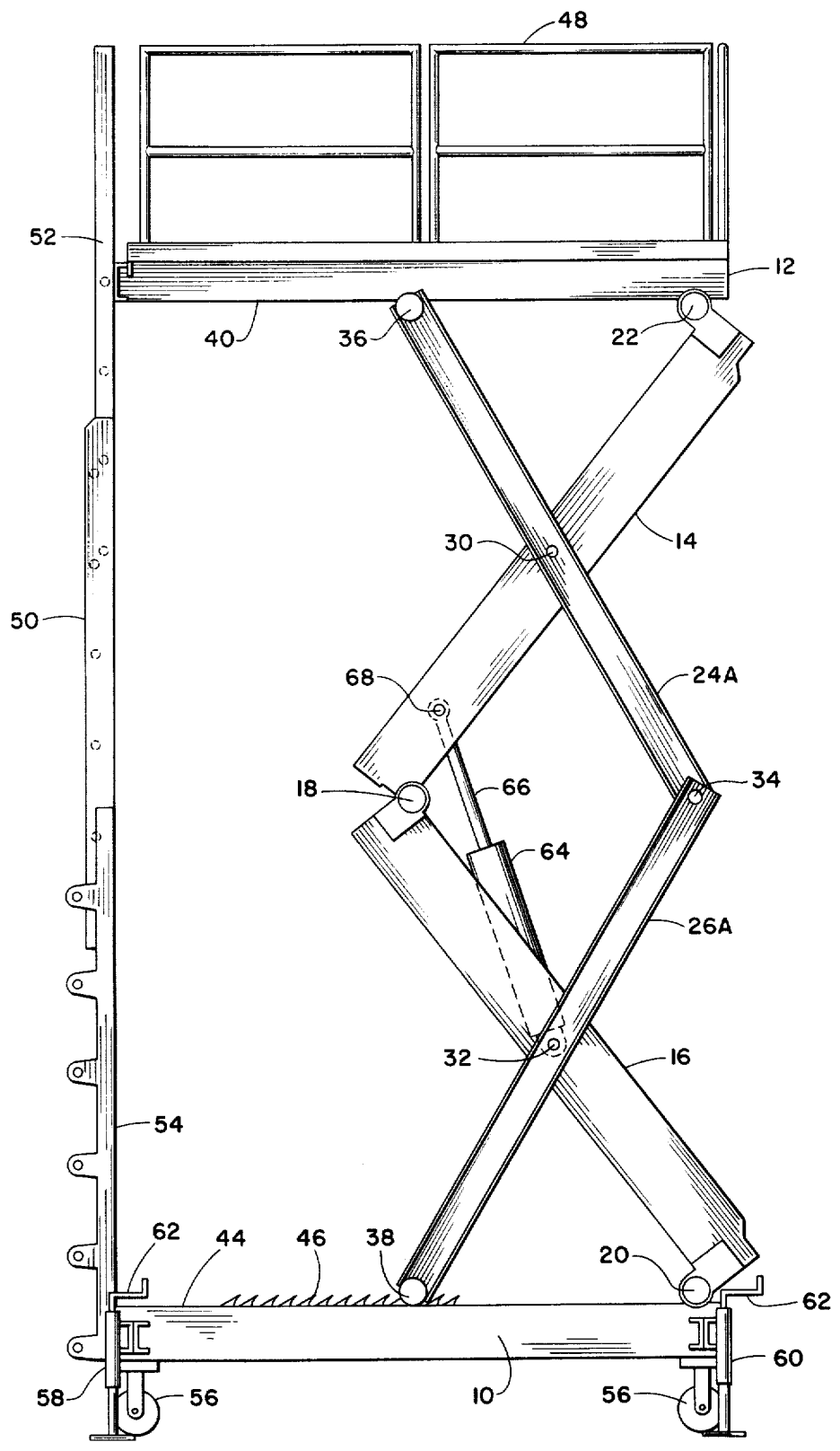


Fig. 1

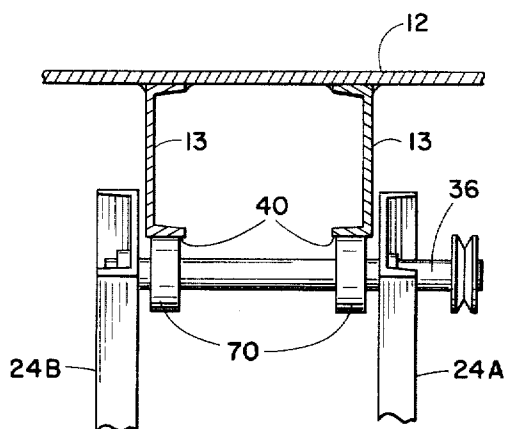


Fig. 2

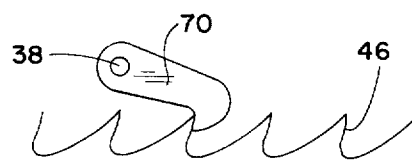


Fig. 3A



Fig. 3B

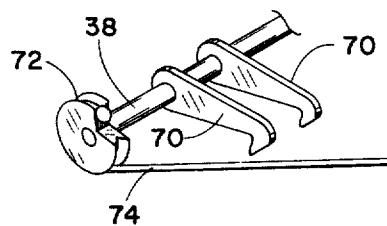


Fig. 4

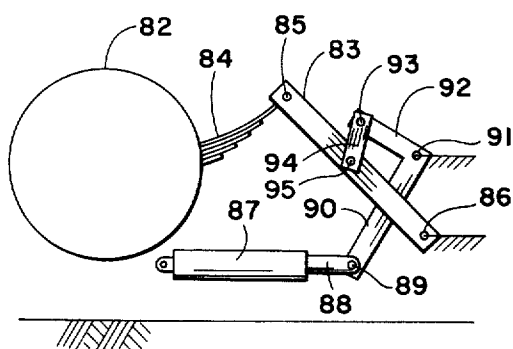


Fig. 6

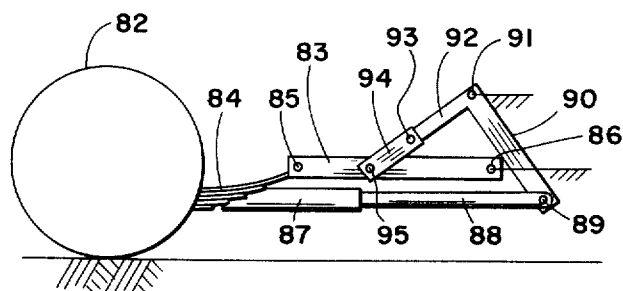


Fig. 7

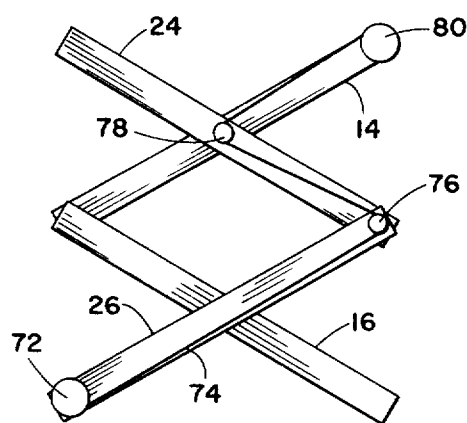


Fig. 5

PLATFORM LIFT

BACKGROUND OF THE INVENTION

This invention lies in the field of platform lift devices. More particularly it concerns the design of a platform supported on a pair of scissors system operated by hydraulic cylinder means.

In the prior art there are a number of platform lift devices using hydraulic cylinders and linkage means of various sorts. Most of these provide a set of hinged members on each side of the longitudinal base member to give it lateral stability. However, this provides for a relatively wide design and is not adapted to a narrow construction, for operation in narrow spaces.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide a hydraulic platform lift of a design that is adapted to very narrow lateral dimensions so that it can be introduced into small available space.

This and other objects are realized and the limitations of the prior art are overcome in this invention by providing a scissors type lift mechanism of great structural rigidity and small size. This is provided by the use of a structural tube member hinged to a corresponding member, the opposite ends of the two members are hinged together respectively to the base and to the platform. The attachment to the base and the platform are by means of horizontal shafts and bearings. Because of the box section there is great rigidity relative to lateral sway and twist. The corresponding members of the scissors are two sets of channel struts, one on each side of the box section members. All struts and members are of equal length and are hinged together by means of a horizontal shaft at the precise center of each part. The two pairs of channels are hinged together at one end, and their free ends are provided with shafts carrying rollers, which roll respectively along the top of the base portion, and on the undersurface of the platform. A hydraulic cylinder and piston is connected between the two box section members to lift the platform. Ratchet means, with dogs supported by the shaft at the lower end of the bottom pair of struts engages with a ratchet on the top of the base portion to lock the platform at any desired elevation.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of this invention and a better understanding of the principles and details of the invention will be evident from the following description taken in conjunction from the appended drawings in which:

FIG. 1 represents an overall side view of the hydraulic platform lift device.

FIG. 2 illustrates a detail of the upper end of the top scissors struts and the shaft that carries rollers to roll on the undersurface of the platform.

FIGS. 3A, 3B, 4 and 5 illustrate details of the ratchet mechanism.

FIGS. 6 and 7 illustrate details of the wheel lift mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and in particular to FIG. 1, there is shown in side view a diagram of the platform lift device in extended vertical position. The

device comprises a base 10 which is of rectangular structural construction of generally narrow lateral dimensions. The platform 12 comprises a structural shape corresponding to that of the base and is substantially parallel to the base.

The principle support to the platform is a pair of box section members 14 and 16 which are fabricated of steel plate in the form of a square tubular structural shape. This is of substantial lateral dimensions and therefore of considerable strength in lateral bending and in twisting. One end of each of the two members is hinged together at 18 and the free ends of the two members are hinged respectively to one end of the base at 20 and one end of the platform at 22. The vertical plane passing through the two members is aligned substantially with the longitudinal axis of the base and the platform.

There are two sets of struts 24, 26. One set 24 is hinged to member 14 at axis 30, the other set 26 is hinged to member 16 at axis 32, to form two pairs of scissors or cross members. The struts and the members are of equal length between axis fastenings at each end, and they are hinged together by means of a horizontal axis through their centers. These struts are formed of structural steel channels for additional rigidity. The dimensions of 34 to 30, 30 to 36, 22 to 30 and 18-30 are all equal, and equal to the dimensions 34 to 32, 38 to 32, 18 to 32 and 20 to 32.

In the prior art devices the structure of the lift mechanism generally comprises two sets of scissors devices, one on each side of the base member. This is to provide lateral stability. However, as a result of the lateral spacing of the scissors devices, they require a rather wide dimension to the entire device. By making a single structural system, of sufficient rigidity, the lateral dimension of this platform and base can be reduced to a relatively small value, which provides a great flexibility in positioning the device in crowded spaces.

The main structural members 14, 16 are provided with a hydraulic cylinder and piston 64 and 66 such that by the application of hydraulic pressure the two hinged members 14, 16 can be rotated with respect to each other (about axis 18), whereby the high end of the top member rises above the fixed position of the bottom end of the lower member. As this happens the two sets of struts elongate and the rollers attach to the top end of the top strut and the bottom end of the bottom strut roll along respectively the top surface of the base and the under surface of the platform.

Although the hydraulic pressure is used to raise the platform it is undesirable to maintain the position of the platform solely on the use of the hydraulic fluid. Consequently a ratchet 46 is provided along the axis of the base and a pair of dogs 70, shown in FIGS. 3A, 3B and 4 are attached to the shaft 38 supporting the lower rollers, so that once the platform is raised to a desired position, the dogs can be made to engage the ratchet and to lock the scissors in that existing configuration.

The base structure can be provided with casters or wheels of other nature, such as 56. It can also be provided with hinged outrigger arms 58 and 60 with screw type devices 62 to tighten down to the floor so as to provide additional lateral stability to the entire structure. As desired, the outriggers can be brought in to a lesser lateral position in order to move the device into a narrow space.

Any type of superstructure such as the railing system, indicated in FIG. 1, can be provided. Also an extensible ladder, with portions 52, 50 and 54 indicated in FIG. 1, can be provided with the top portion 52 attached to the platform and the bottom portion 54 attached to the base, by means not shown but well understood in the art.

In FIG. 2 there is shown a cross section of the platform 12 with the base of the platform having two longitudinal channels 13, which provide for stiffening of the platform, and also provide a surface 40 against which the rollers 70 can run. The rollers 70 are carried on shaft 36 which passes through the upper ends of the two struts 24A and 24B.

FIGS. 3A and 3B indicate the ratchet 46 which is supported on the base member and the dogs 70 which are supported on the shaft 38 which passes through the lower ends of the lower struts 26A and 26B. FIG. 3A shows the dog in locking position and FIG. 3B shows the dog in lifted position such that by relaxing pressure in the hydraulic cylinder 64 the piston is allowed to move in and lower the platform. At the same time, the rollers which are attached to shaft 38 roll to the left along the base. FIG. 4 shows further detail of the pair of dogs 70 supported on horizontal shaft 38. Shaft 38 is journaled in the bottom ends of the struts 26A and 26B, and carries a pulley 72 on one side with a cable 74 fastened at one end to the pulley and wrapped around the pulley in a counterclockwise direction. This is shown in greater detail in FIG. 5 where schematically the structural members 14, 16, 24 and 26 are shown and the pulley 72 is at the lower end of the lower strut. The cable 74 goes from pulley 72 to a smaller pulley 76 to another smaller pulley 78 and then to a larger pulley 80 of the same dimensions as 72. The purpose of the pulley system is to prevent a change in rotation of the shaft 38 as the scissors mechanism is raised or lowered. The wrapping around of the cable about the pulleys 72 and 80 is compensated by unwrapping around of the cable about the pulleys 76 and 78. Diameter of pulleys 72 and 80 are double the diameter of pulleys 76 and 78 which are of equal diameter.

In FIGS. 6 and 7 there are shown two views of a linkage mechanism and hydraulic cylinder which is used to raise and lower one end 85 of a spring 84 which supports the axle and wheel 82 of the conventional trailer type. There are two springs, one on each side of the frame 10 and the other end of the spring 84 (not shown) is supported in a shackle in a conventional manner. When the wheel is to be lowered into a position so that the base is raised above the ground level the cylinder 87 is supplied with high pressure liquid which pushes out the piston 88 which rotates arm 90 counterclockwise about the axis 91. There is an arm 92 set at a fixed angle with respect to arm 90 attached to the hinge 91. As the piston 88 is pulled into the cylinder, hinge point 89 is moved to the left and arms 90 and 92 are rotated clockwise about the axle 91. There is an arm 94 which is hinged at point 93 to the arm 92, and as arm 92 rotates clockwise the arm 94 rotates counterclockwise and moves upward. As it does, due to the hinge 95 it lifts the supporting arm 83 which holds the spring at 85 and is rotated about hinge point 86. When the piston has moved completely to the left the configuration of the linkages is as shown in FIG. 6 and the wheel is lifted above the ground and the base then can rest on the casters 56, etc. When it is to go into road

traveling position the cylinder is pushed out to the position shown in FIG. 7 and the arms 94 and 92 are pushed beyond center, where they lock in a more or less linear arrangement and therefore prevent the upward movement of arm 83 and therefore lock the spring in its lower position.

The principal feature of this invention lies in the structural design of the single double scissors mechanism which is constructed of the highly rigid tubular construction indicated.

The ratchet mechanism is novel in that the pulley and cable system provides a means by which the position of the dogs can be controlled independently of the elevation of the platform. Another important feature of the invention is the hydraulic linkage mechanism for raising and lowering the wheels.

While the invention has been described with a certain degree of particularity, it is manifest that many changes may be made in the details of construction and the arrangement of components. It is understood that the invention is not to be limited to the specific embodiment set forth herein by way of exemplifying the invention, but the invention is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element or step thereof is entitled.

What is claimed:

1. A vertically adjustable work platform, comprising:
 - a. base structure means of rectangular configuration adapted to be used in a substantially horizontal plane;
 - b. top work platform means of rectangular configuration substantially parallel to said base means;
 - c. a pair of rectangular tubing structural members each of length L, hinged together at one end in a vertical plane, the second end of the lower member hinged to a first end of said base means, the second end of the upper member hinged to a first end of said platform means;
 - d. a first pair of channel struts of length L, one on each side of said lower member, rotatable about a transverse shaft through said lower member at the midpoints of said member and said struts;
 - e. a second pair of channel struts of length L, one on each side of said upper member rotatable about a transverse shaft through said upper member at the midpoints of said member and said struts;
 - f. the first ends of each pair of struts hinged together;
 - g. roller means attached to the second ends of said struts, those on the lower pair of struts adapted to roll along the top surface of said base means, and those on the upper pair of struts adapted to run on the underside of said platform means;
 - h. hydraulic cylinder and piston means connected between said two hinged members; and
 - i. ratchet means between said base means and the second ends of said lower pair of struts; and including cable means wound around pulley means on selected ones of the shafts forming the hinges for said struts, and means responsive to said cable means for operating said ratchet means to permit lowering said platform under control of said hydraulic cylinder and piston means.
2. The vertically adjustable work platform means as in claim 1 including vertical, extensible ladder means, one end fastened to said base means and the other end fastened to said platform means.

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3. The vertically adjustable work platform means as in claim 2 in which said ladder means is placed at the second ends of said base means and said platform means.

4. The vertically adjustable work platform means as in claim 1 including outrigger support means attached to said base means.

5. The vertically adjustable work platform means as in claim 1 including wheels on said base means.

6. The vertically adjustable work platform means as in claim 1 including two spring means, one on each side of the longitudinal axis of said base means, supporting an axle and wheels to transport said platform, one end of each of said springs hinged to said base means, and including means to raise and lower the other ends of said springs.

7. The vertically adjustable work platform means as in claim 6 in which said means to raise comprises hydraulic cylinder and piston means.

8. The platform means as in claim 7 in which said means to raise and lower said other ends of said springs comprises:

- a. first lever means connected to said springs;
- b. second lever means connected to said first lever means;
- c. hydraulic piston and cylinder means for operating said second lever means; and
- d. means to lock said springs in the lowered position.

9. A vertically adjustable work platform, comprising:

- a. base structure means of rectangular configuration adapted to be used in a substantially horizontal plate;
- b. top work platform means of rectangular configuration substantially parallel to said base means;
- c. a pair of rectangular tubing structural members each of length L, hinged together at one end in a vertical plane, the second end of the lower member hinged to a first end of said base means, the second end of the upper member hinged to a first end of said platform means;
- d. a first pair of channel struts of length L, one on each side of said lower member, rotatable about a transverse shaft through said lower member at the midpoints of said member and said struts;
- e. a second pair of channel struts of length L, one on each side of said upper member rotatable about a transverse shaft through said upper member at the

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midpoints of said member and said struts;

f. the first ends of each pair of struts hinged together;

g. roller means attached to the second ends of said struts, those on the lower pair of struts adapted to roll along the top surface of said base means, and those on the upper pair of struts adapted to run on the underside of said platform means;

h. hydraulic cylinder and piston means connected between said two hinged members; and

i. two spring means, one on each side of the longitudinal axis of said base means, supporting an axle and wheels to transport said platform, one end of each of said springs hinged to said base means, and including means to raise and lower the other ends of said springs, comprising:

first lever means connected to said springs;

second lever means connected to said first lever means;

hydraulic piston and cylinder means for operating said second lever means; and

means to lock said springs in the lowered position.

10. The vertically adjustable work platform means as in claim 9 including ratchet means between said base means and the second ends of said lower pair of struts; whereby said second ends can be locked at any selected position along said base means.

11. The vertically adjustable work platform means as in claim 9 including vertical, extensible ladder means, one end fastened to said base means and the other end fastened to said platform means.

12. The vertically adjustable work platform means as in claim 11 in which said ladder means is placed at the second ends of said base means and said platform means.

13. The vertically adjustable work platform means as in claim 9 including outrigger support means attached to said base means.

14. The vertically adjustable work platform means as in claim 9 including wheels on said base means.

15. The platform means as in claim 11 including cable means wound around pulley means on selected ones of the shafts forming the hinges for said struts, and means responsive to said cable means for operating said ratchet means to permit lowering said platform under control of said hydraulic cylinder and piston means.

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