United States Patent

Herbst et al.

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[54] **VEHICLE HOIST**

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[21] Appl. No.: **30,672**

[52] **U.S. Cl.** **187/8.59,** 187/8.41, 214/16.1

[51] **Int. Cl.**.....**B60s 13/00**

[58] **Field of Search**.....187/8.41, 8.59; 214/16.18 D

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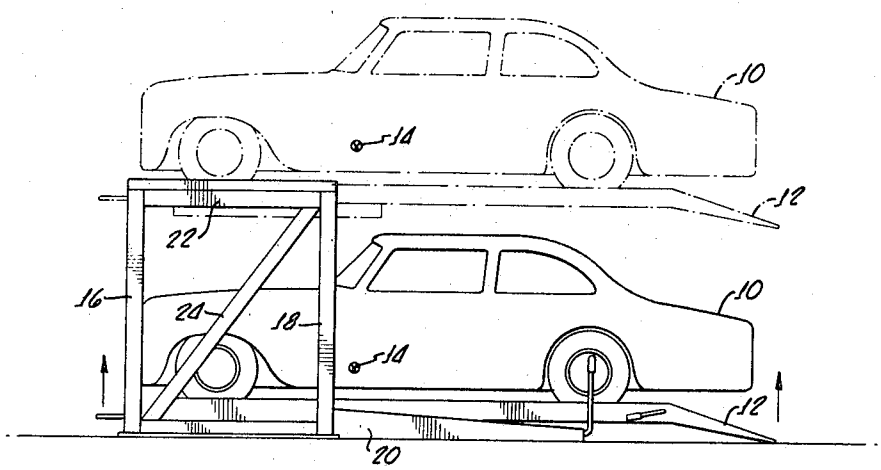
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[57] **ABSTRACT**

A vehicle hoist for vertically reciprocating vehicles while supporting the vehicle in cantilever fashion. The vehicle is maintained essentially horizontal during the reciprocation and may be selectively elevated to a variety of heights.

1 Claim, 9 Drawing Figures



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SHEET 1 OF 6

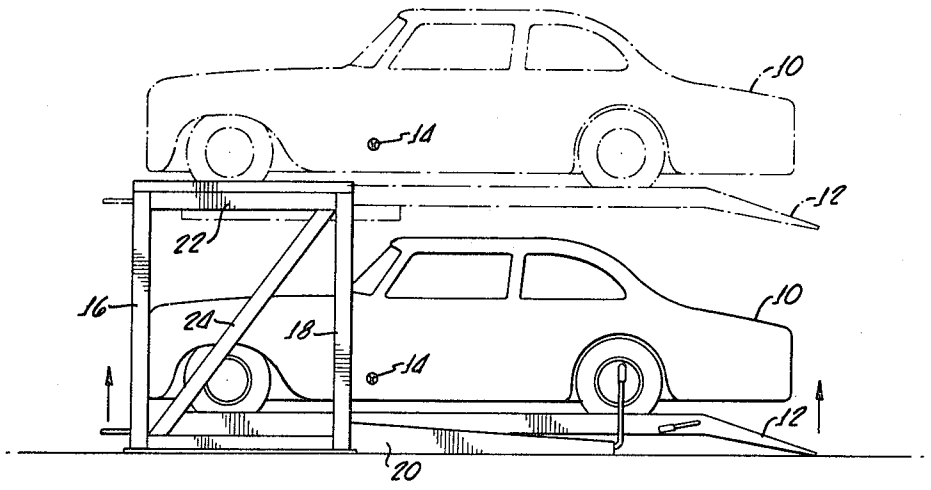
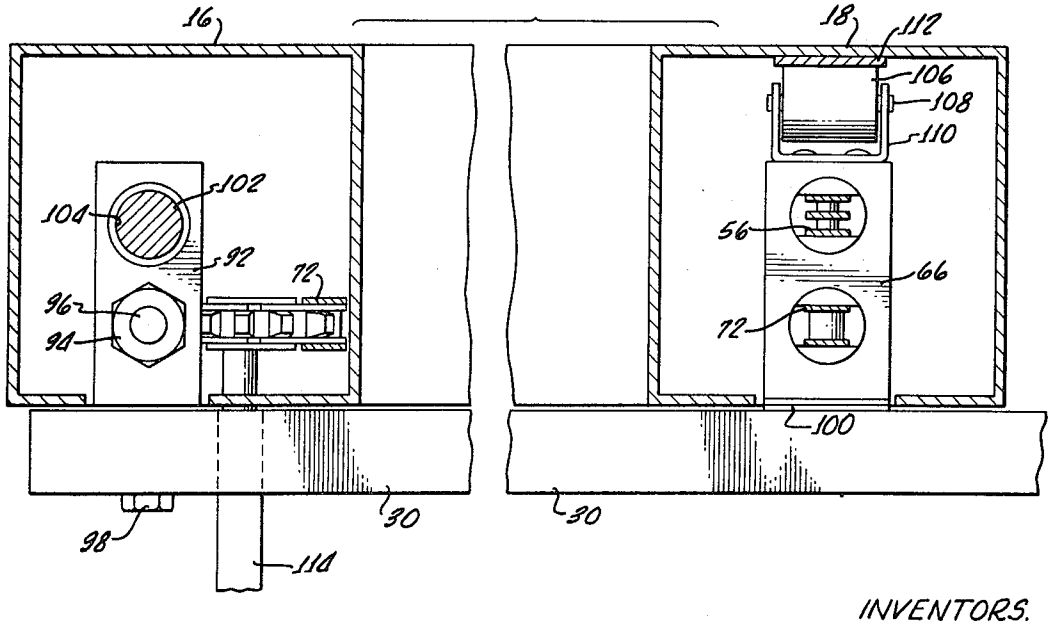


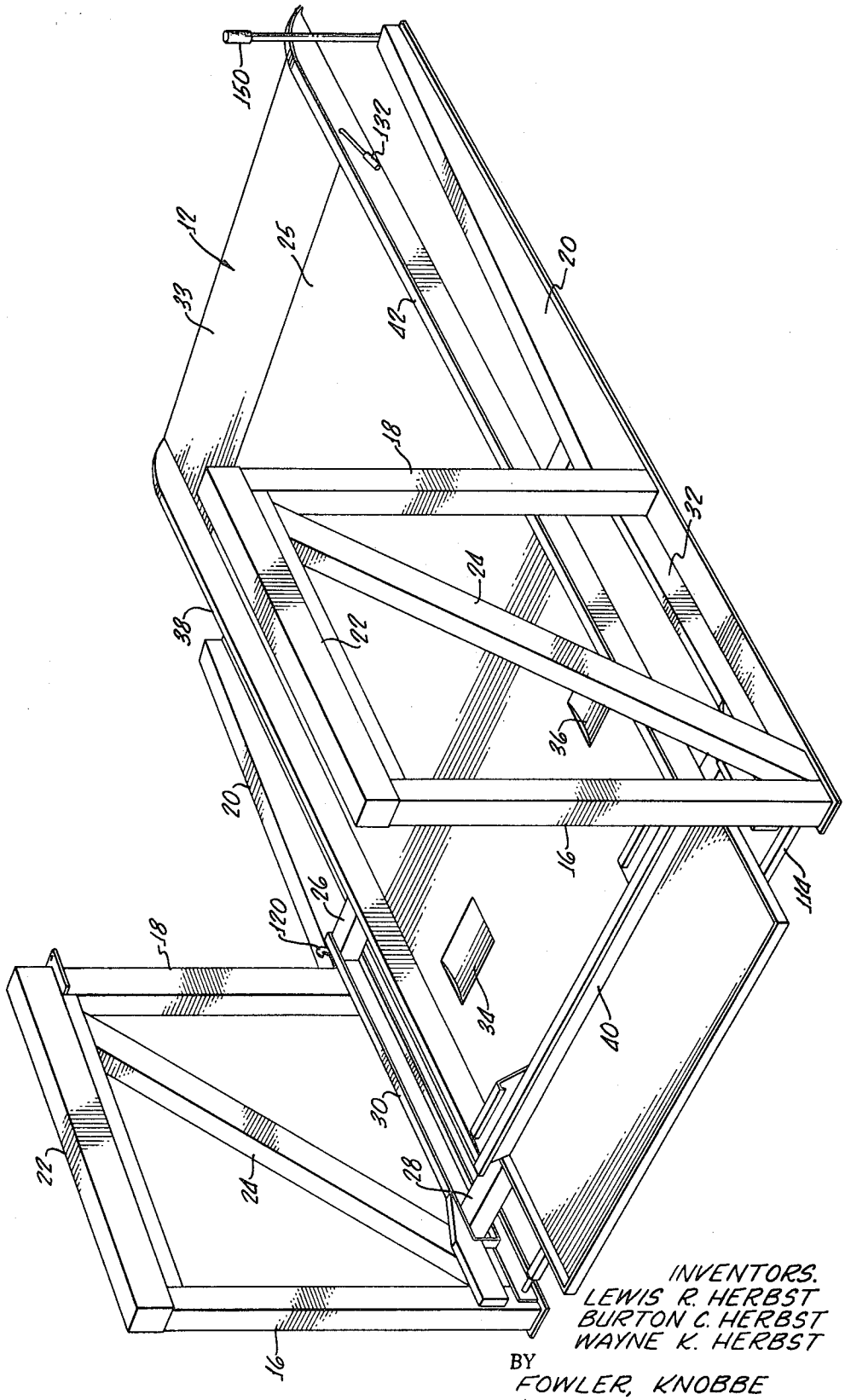
FIG. 1.

FIG. 6.



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FIG. 2.



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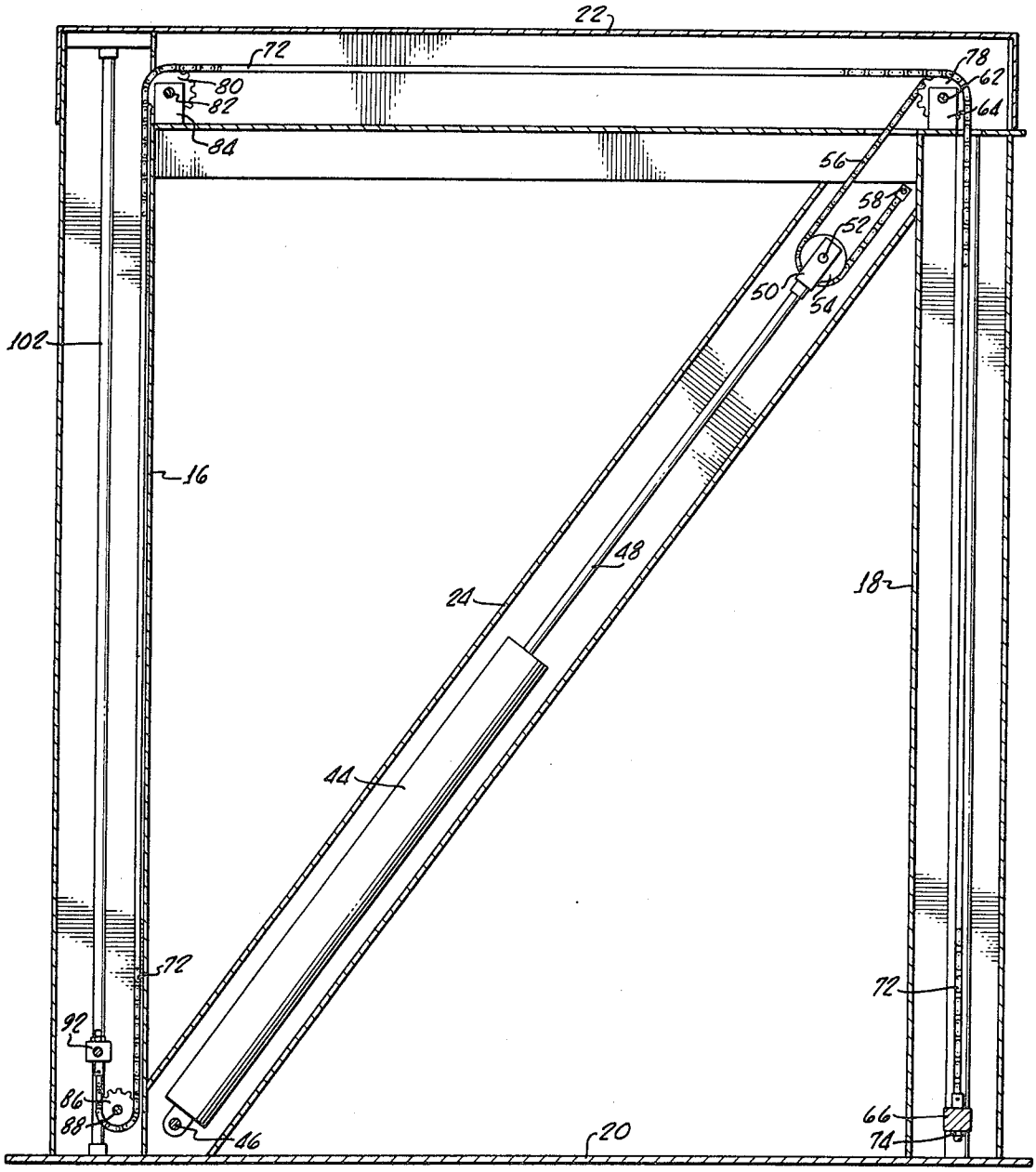


FIG. 3.

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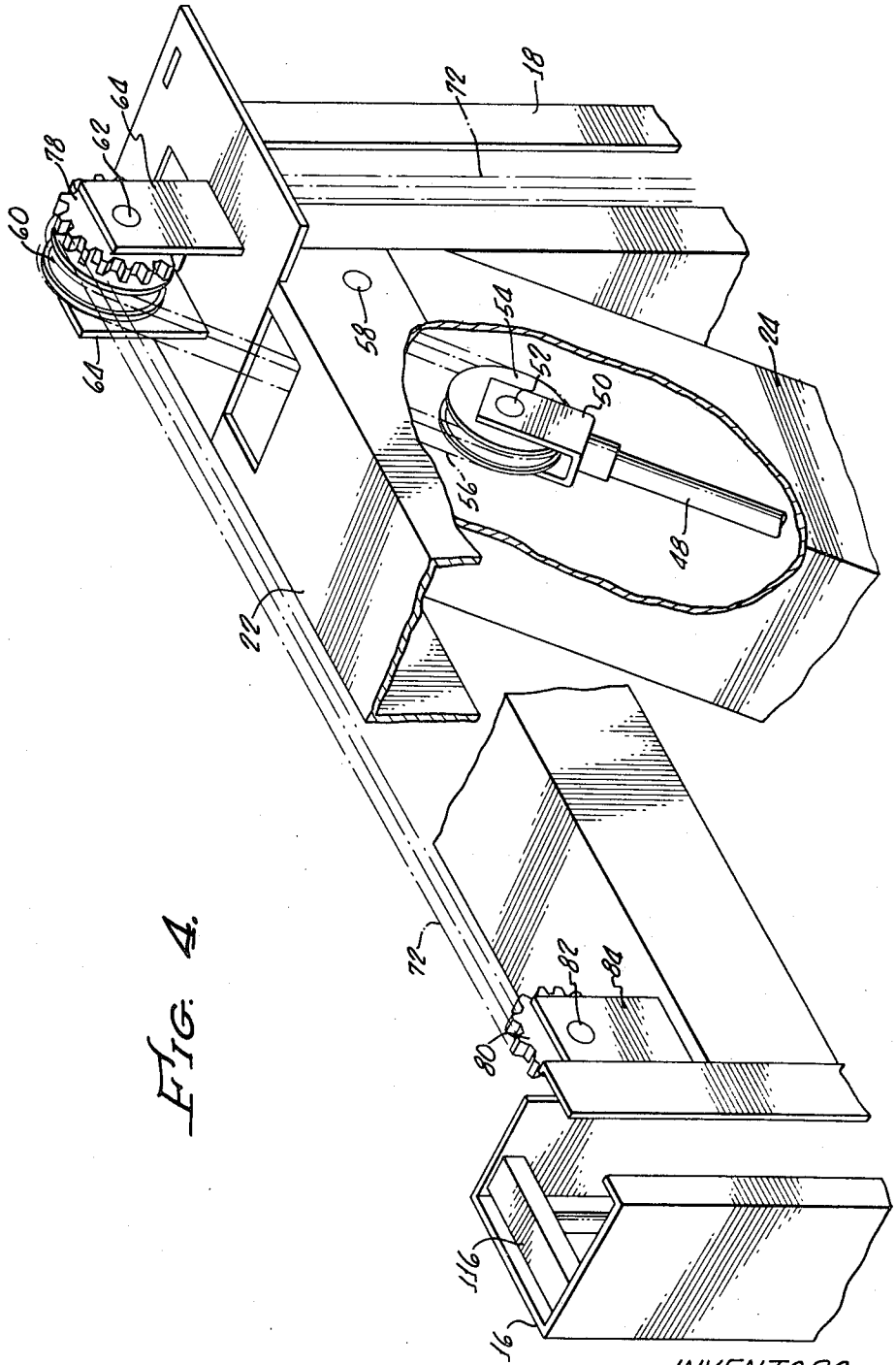


FIG. 4.

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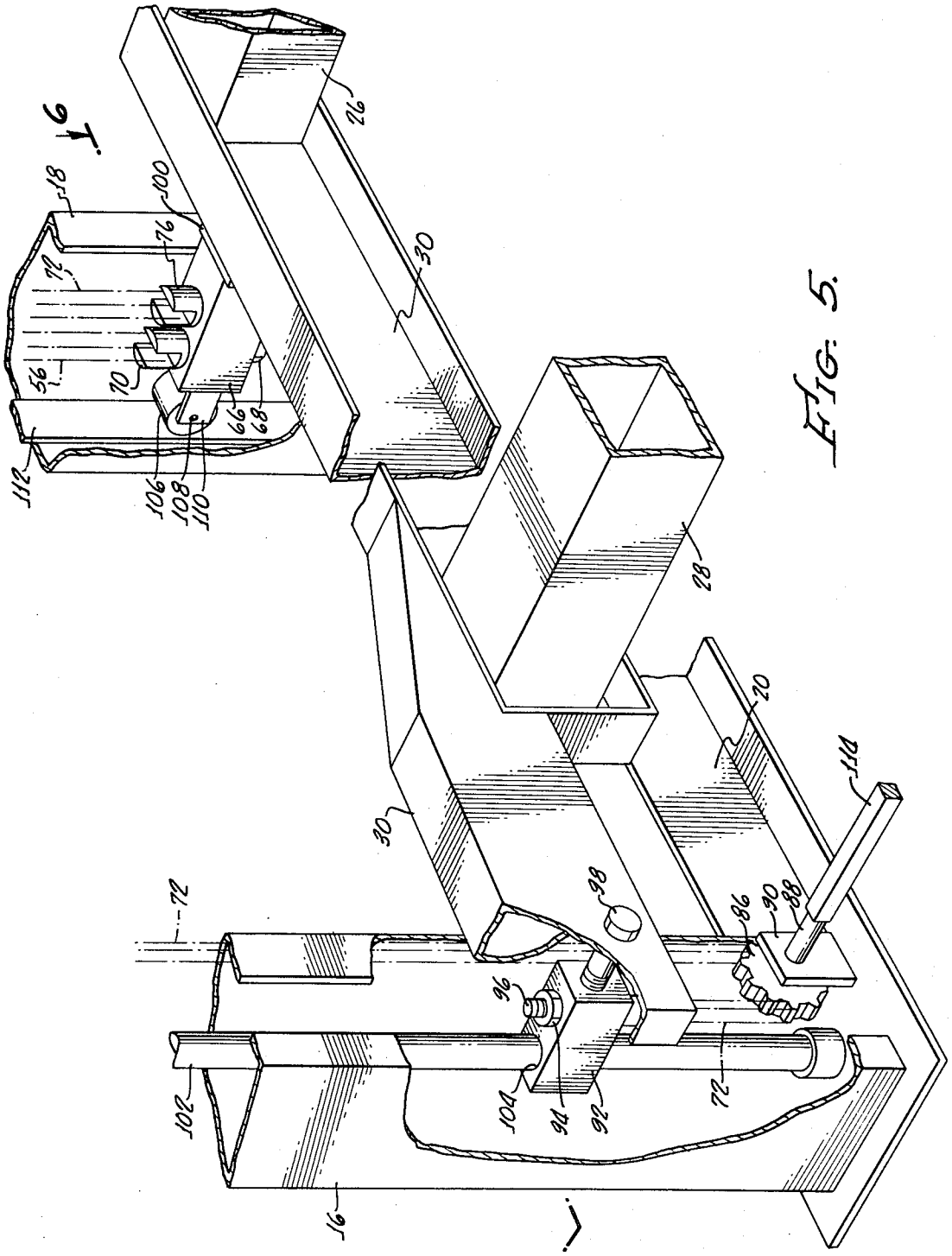


FIG. 5.

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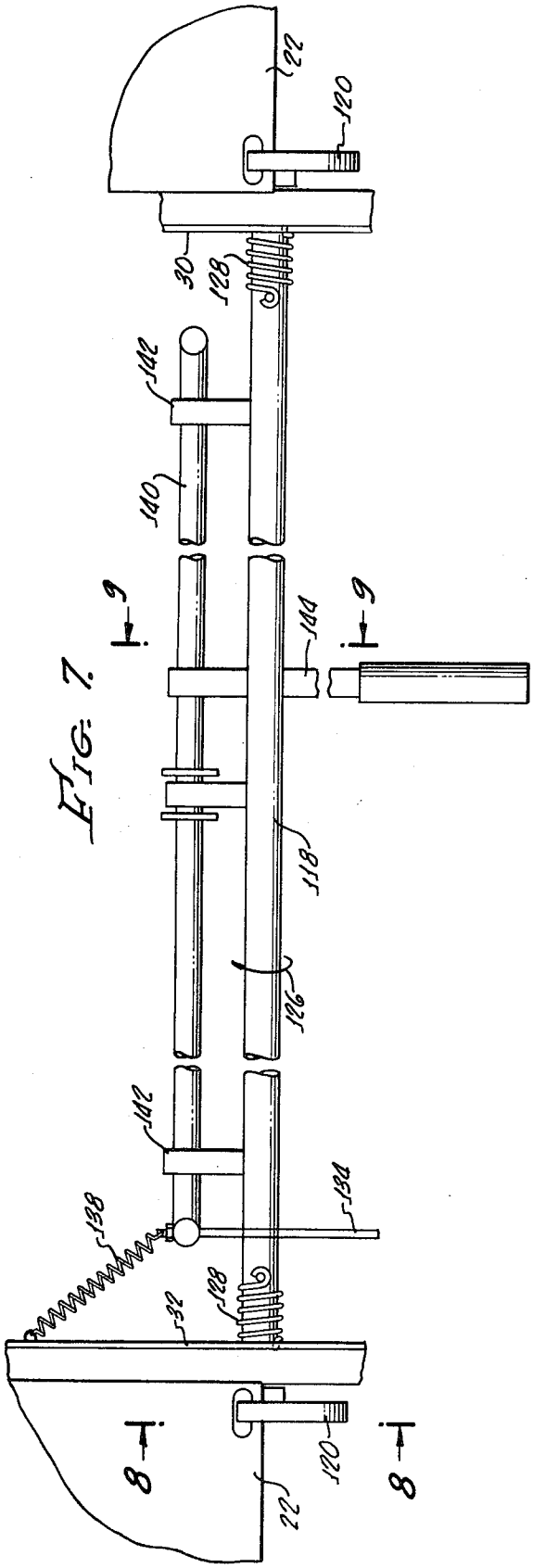


FIG. 7.

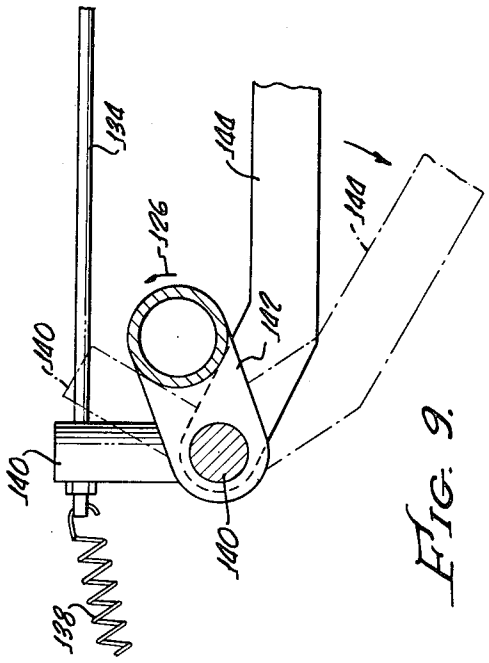


FIG. 9.

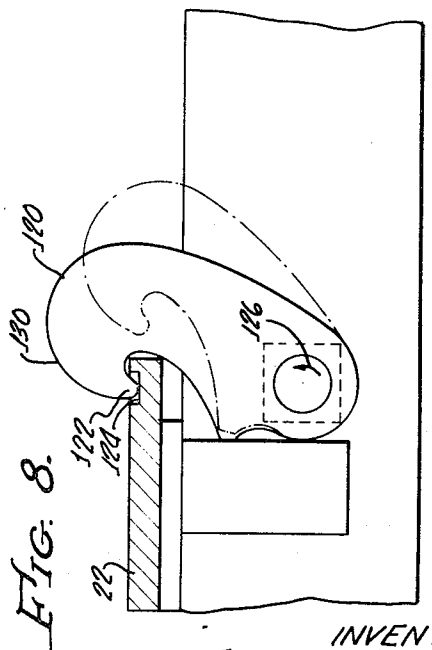


FIG. 8.

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VEHICLE HOIST

BACKGROUND OF THE INVENTION

This invention relates to vehicle hoists and in particular to a vehicle hoist which is adapted to elevate a vehicle to permit mechanical work to be done on the vehicle or to allow a second vehicle to be parked beneath the elevated vehicle.

Prior art devices have realized the advantages of raising vehicles, while supporting them in cantilever fashion, i.e. from one side of the center of gravity of the vehicle. When the vehicles are raised for the purpose of doing mechanical work on the vehicle, the cantilever support allows extremely open access to the lower portions of the vehicle. When the vehicle is raised for the purpose of parking another vehicle beneath the first vehicle the cantilever support allows easy entrance and exit from the apparatus and allows unobstructed opening of the vehicle doors. Similarly, when the vehicle is an airplane, cantilever support allows the vehicle to enter the device without interfering with the airplane wings.

Many prior art devices which are designed primarily for parking vehicles in vertical pairs, while supporting them in a cantilever manner, are not adaptable for use as hoists for doing mechanical work on the vehicles, since the vehicle is tilted during elevation. It is therefore not possible to partially raise the vehicle and work beneath the end of the vehicle opposite the cantilever supports. Even when these devices are used solely as a parking apparatus, the vehicle is unstable when it is tilted and therefore somewhat unsafe even though elaborate wheel blocking mechanisms are incorporated.

BRIEF SUMMARY OF THE INVENTION

The apparatus of the present invention is designed for use as either a vehicle hoist for allowing vehicle access for mechanical work, or as a means for parking vehicles, such as automobiles, trucks, or airplanes in vertically aligned pairs. The vehicles are supported in a cantilever manner and are raised vertically to an elevated position while maintaining the vehicle and the platform on which it rests in horizontal alignment during the elevation. The elevation of the vehicle may be discontinued at any height to facilitate mechanical work on the vehicle, or the vehicle may be raised to the maximum elevation to allow parking of another vehicle beneath the first vehicle.

The apparatus is semi-portable, in that it requires no foundation in the roadway where it is utilized and may be moved. The advantages of this invention are best described in reference to the drawings of a preferred embodiment of the invention in which:

FIG. 1 is an elevation view showing in solid lines a vehicle positioned in the device before elevation, and in broken lines the same vehicle after elevation.

FIG. 2 is a perspective view of the device showing the mechanical system for raising and lowering the platform.

FIG. 3 is a vertical section through the structural supporting components on one side of the apparatus and showing the elevating mechanism.

FIG. 4 is a perspective view, partially cut away, of the upper portion of one side of the supporting mechanism.

FIG. 5 is a perspective view, partially cut away, of the lower portion of one side of the supporting mechanism.

FIG. 6 is a sectional view taken along line 6-6 in FIG. 5.

FIG. 7 is a detailed plan view of the safety latching mechanism incorporated in the device.

FIG. 8 is a sectional view of the safety latching system taken along lines 8—8 of FIG. 7.

FIG. 9 is a sectional view of the safety latching system taken along lines 9—9 of FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. 1, the preferred embodiment of the present invention raises a vehicle **10**, such as an automobile, from a first position shown in full lines in FIG. 1 to a second position shown in dashed lines in FIG. 1. The vehicle **10** is raised vertically while maintaining it, and a platform **12** on which it rests, horizontal. During the raising of the vehicle **10** and its platform **12**, and after the elevation is completed, the vehicle is supported solely from one side of the center of gravity **14** of the vehicle **10**. To accomplish this cantilever supporting of the vehicle **10**, two vertical supports **16** and **18** are each positioned relative the platform **12** such that when a vehicle **10** is present on the platform **12** each of the posts **16** and **18** will lie forward of the center of gravity **14** of the vehicle **10**.

The supports **16** and **18** are each rigidly attached to a base member **20** which extends toward the rear of the vehicle beyond a point vertically below the center of gravity **14** of the vehicle, thus providing stable support for the vehicle while allowing the hoist to be semi-portable, i.e. the hoist need not be permanently secured to the roadway on which it is placed. An upper horizontal structural member **22** is rigidly attached between the upper extremities of the supports **16** and **18**, and a diagonal support member **24** is rigidly attached between the base structural member **20** and the upper horizontal structural member **22** to lend rigidity to the structure.

Referring to FIG. 2, the supporting structure is adapted to vertically reciprocate the platform **12** which includes a flat bed **25** which is supported on a pair of transverse horizontal support members **26** and **28**. These members, in turn, are rigidly fixed to a pair of longitudinal support members **30** and **32**. An inclined ramp **33** allows access to the slightly-raised platform **12** from the roadway when the panel is in its lowest position.

The flat bed **25** preferably has means for restraining movement of a parked vehicle such as the detents **34** and **36** in which the wheels of the vehicle may be located. A full flat bed **25** such as that shown in FIG. 2 best adapts the device for use as a vertical-pair parking apparatus, since the flat bed **25** will catch any oil, grease or debris which falls from the upper vehicle. However, in the instance where the device is to be used as a mechanic's hoist, the flat bed **25** may be replaced by a pair of longitudinally extending, parallel troughs, each of which receives two wheels of the vehicle. These troughs are attached to the horizontal transverse support members **26** and **28** in a manner similar to that by which the flat bed **25** is attached.

When the full flat bed **25** is utilized, it is advantageous to surround three sides of this flat bed **25** with wall members **38**, **40** and **42**, which assure that a vehicle may not be driven off the side of the flat bed **25** as it is placed on the apparatus, and help to strengthen the flat bed **25**.

Referring to FIGS. 3, 4, 5 and 6, the mechanism for raising the vehicle platform 12 may be described as follows:

The mechanism which is shown in these figures exists within the structural members on one side of the hoist. An identical mechanical assembly functions in the structural members on the other side of the hoist. Each of the structural members 16, 18, 22 and 24 is preferably a hollow rectangular member so that the lifting mechanism can be enclosed therein.

Situated within the diagonal support member 24, is a single action hydraulic cylinder 44 which is attached to the wall of the diagonal support member 24 by a pin 46 about which the cylinder 44 is free to rotate about a lateral horizontal axis. When hydraulic fluid is channeled under pressure to the cylinder 44, the cylinder 44 will retract, drawing a piston rod 48 into the cylinder 44. A clevis 50 is rigidly attached to the outlying end of the rod 48 and carries, by way of an axle pin 52, a rotating sheave 54 which guides a lifting flexible tension member, such as a chain 56. This lifting chain 56 is preferably a leaf chain since it must support one-half the vehicle weight, and is attached to the diagonal support member 24 by means of a pin 58 such that one extremity of the chain 56 is rigidly attached to the upper end of the diagonal support member 24. From this rigid attachment at the pin 58, the chain 56 circulates around the sheave 54 and extends to a second sheave 60 which rotates about a pin 62, which pin 62 is in turn supported from a pair of brackets 64 which are rigidly attached to the upper horizontal support member 22. The sheave 60 is free to rotate within the brackets 64 about a horizontal lateral axis, and the chain passes from this sheave 60 vertically downward to its other extremity which is attached to a lifting block 66. The attachment to the lifting block 66 is adjustable, in that the length of chain between the sheave 60 and the block 66 may be lengthened or shortened by the adjustment of a nut 68 which draws a bolt 70 which is rigidly attached to the extremity of the chain 56.

A horizontal stabilizing flexible tension member 72, preferably a link chain, is likewise adjustably attached to the block 66 and is adjustable by threading a nut 74 onto a bolt 76 which is rigidly attached to the extremity of the chain 72. The horizontal stabilizing chain 72 extends vertically upward from the block 66 to a sprocket 78 which is mounted to rotate on the pin 62. This sprocket 78 and the sheave 60 are free to rotate relative one another on the pin 62. From the sprocket 78, the chain 72 extends horizontally forward to a second sprocket 80 which is rotatably mounted on an axle pin 82 which is mounted in a pair of brackets 84 which are rigidly attached to the upper horizontal support member 22. The chain 72 extends vertically downward from the sprocket 80 to a third sprocket 86 which is rigidly mounted on an axle pin 88. The axle pin 88 is rotatably mounted on a bracket 90, which is rigidly attached to the lower horizontal member 20. The chain 72 extends vertically upward from the sprocket 86 to a support block 92 on which the extremity of the chain 72 is adjustably attached by a bolt 96 which is rigidly attached to the extremity of the chain 72 and threaded into a nut 94.

The lifting block 66 and the support block 92 are each connected to the platform 12 to raise and stabilize the platform 12 and the vehicle 10. The support block 92 is attached by means of a bolt 98 to the longitudinal support member 30 on one side of the vehicle hoist. On the opposite side of the vehicle hoist, a similar support block 92 is attached to the longitudinal member 32. Likewise the lifting block 66 is rigidly attached by means of a plate 100 to the longitudinal support member 30. The interior face of the vertical support members 16 and 18 are slotted so that the support block 92 is free to vertically reciprocate within the vertical support member 16, and the lifting block 66 is free to vertically reciprocate within the vertical support member 18. The support block 92 is guided during this vertical reciprocation by a vertical rod 102 which is attached to the upper horizontal support member 22 and the base member 20, and which passes through a hole 104 in the block 92. The support block 66 is guided during reciprocation within the vertical support member 18 by a roller 106 which is rotatably mounted on an axle 108, which axle 108 is affixed to the lifting block 66 by means of support brackets 110. This roller 106 engages a guide track 112 opposite the open slot in the vertical support member 18. It should be noted that, since a similar roller 106 is positioned to engage a similar track 112 in each of the vertical support members 18, these rollers 106 prohibit the platform 12 and its supporting structural members 26, 28, 30 and 32 from moving in a lateral horizontal direction between the vertical support members 18.

Likewise the reciprocation of the support blocks 92 along the vertical rods 102 in each of the vertical support members 16 prohibits longitudinal and lateral horizontal motion of the forward end of the panel 12.

The platform 12 and the vehicle 10 resting thereon are lifted by this apparatus as follows: The hydraulic cylinder 44 is pressurized to draw the piston rod 48 and its associated clevis 50 toward the cylinder 44. The chain 56, being rigidly attached at its extremity 58, reacts by traveling over the sheave 60 and drawing the lifting block 66 upward. Since the lifting block 66 is rigidly attached to the longitudinal support 30 of the platform 12, this action raises the platform 12 along the vertical support members 18. Since each of the diagonal support members 24 encloses a similar mechanism, the platform 12 is raised equally on both sides. As the platform 12 and vehicle 10 resting thereon are raised, since the center of gravity is behind the vertical support members 18, the vehicle 10 and platform 12 would tend to tilt so that the front portion is raised higher than the rear portion. However, the chain 72, which is attached to the support block 92 and the lifting block 66 allows the support block 92 to raise vertically only at the same rate which the lifting block 66 raises vertically by applying a downward force to support block 92. Since each upward motion in the vertical direction of the support block 92 requires motion of the chain 72 vertically downward from the sprocket 80, and therefore requires an upward vertical motion of the chain 72 toward the sprocket 78, the vehicle 10 and platform 12 are raised by the chain 56 acting on the block 66 and are maintained in horizontal alignment during elevation by the chain 72 acting on the blocks 92 and 66.

In order to assure that the right and left sides of the vehicle 10 are raised or lowered by the same amounts at the same times, the sprockets 86 on either side of the

vehicle hoist are restricted to rotate in unison by attaching their respective axles **88** through a horizontal bar **114**. Since these sprockets **86** are attached to rotate in accordance with one another, the chains **72** on either side of the vehicle hoist prohibit motion of the blocks **66** and **92** on one side of the vehicle hoist without similar motion of the blocks **66** and **92** on the other side of the vehicle hoist. The motion of the vehicle **10** and the supporting platform **12** is therefore restricted so that during vertical elevation of the vehicle and the platform **12**, horizontal alignment both longitudinally and laterally are maintained and the vehicle therefore does not tilt or pivot about any horizontal axis during vertical motion.

A safety stop **116** shown in FIG. **4**, is rigidly attached to the upper ends of the vertical support members **16** to span the opening in the member **16** in which the block **92** reciprocates. This stop **116** is adapted to contact the support block **92**, should the chain **72** break, although the safety stop **116** is not engaged by the blocks **72** during normal operations, i.e. the maximum height of the platform **12** is reached before engagement of the blocks **92** with the safety stops **116**.

Referring to FIGS. **7** through **9**, the operation of the safety catch mechanism may be explained. Rotatably mounted on the longitudinal support members **30** and **32** is a rod **118** which is rigidly attached at each of its ends to a safety catch member **120** which has an extending lip **122** which is designed to engage a groove **124** in the upper horizontal support member **22**. This safety catch **120** is designed to insure that, once the vehicle **10** and the platform **12** have been raised to their highest level, release of hydraulic pressure in the cylinders **44** will not cause the vehicle to be lowered. The rod **118** is biased for rotation in the direction of an arrow **126** by a pair of springs **128** which are attached at their opposite extremities to the rod **118** and the longitudinal support members **30** or **32**, respectively. As the vehicle is raised, the upper forward surface **130** of the catch **120** acts as a camming surface which engages the rear end of the upper horizontal support member **22** to rotate the catch **120** in a direction opposite the arrow **126**, allowing the lip **122** to pass above the horizontal support member **22**. The spring **128** then rotates the catch **120** to place the lip **122** above the groove **124**, thereby engaging these members when hydraulic pressure in the cylinder **44** is released. In order to release the catch **120** so that the vehicle may be lowered, the platform **12** is first raised so that rotation of the rod **118** in a direction opposite the arrow **126** can rotate the catch **120** to clear the rear extremity of the horizontal support member **22**. A handle **132**, shown in FIG. **2**, is rotatably mounted on the wall **42** and is adapted on rotation to draw a rod **134** shown in FIGS. **7** and **9**, which rod **134** is attached to one extending arm of a U-shaped lever **140**. This U-shaped lever **140** is free to rotate within a pair of brackets **142**, each of which is rigidly attached to the rod **118**. Rotation of the lever **140** is limited in one direction by contact between the extremities of the U-shaped lever **140** with the rod **118** as shown in dashed lines in FIG. **9**, and in the other direction by contact between a sensing bar **144**, which is rigidly attached to the U-shaped lever **140**, and the rod **118** as shown in full lines in FIG. **9**. The sensing bar **144** will rotate to its lowest position, i.e. the position in which the extremity of the U-shaped lever **140** is in contact with the rod **118** only if there is no vehicle below the elevated platform **12**. If such a vehicle exists in the lower stall, the sensing bar **144** stops rotation of the U-shaped lever **140** and therefore rotation of the handle **132** will not disengage the safety catch **120**. If, however, the sensing bar rotates to its lower most position, the upper extremities of the U-shaped lever **140** will engage the rod **118** and further tension on the rod **134** caused by rotation of the handle **132** will cause the rod **118** to rotate against the bias of the springs **128**, thereby releasing the safety catch **120**. Once this catch has been released, the operator, by using a lever arm **150**, as shown in FIG. **2**, can control the hydraulic system to release fluid from the cylinders **44** and lower the vehicle **10** and its platform **12**.

What is claimed is:

1. A vehicle hoist for elevating a level vehicle to allow access beneath said vehicle while supporting and guiding said vehicle only at one end, comprising:

a base frame;

a vehicle platform for supporting said vehicle;

means mounted on said base frame for guiding said vehicle platform for vertical reciprocation, all of said guiding means positioned forward of the center of gravity of said vehicle when said vehicle is positioned on said vehicle platform; said platform guiding means comprising:

a first pair of substantially vertical structural members rigidly attached to said base frame adjacent the forward end of said vehicle platform, one of said first pair of structural members on each side of said vehicle platform;

a second pair of substantially vertical structural members rigidly attached to said base frame between the center of gravity of said vehicle and said first pair of structural members, one of said second pair of structural members on each side of said vehicle platform; and

a pair of diagonal support members each connected to the base of one of said first pair of vertical structural members and to the top on one of said second pair of vertical support members on each side of said vehicle platform;

means attached to said base frame and said vehicle platform for vertically raising said vehicle platform along said guide means, said vertically raising means coupled to said platform only forward of said vehicle center of gravity, said vertically raising means comprising a pair of hydraulic cylinders, one of which is attached to each of said diagonal support members; and

means attached to said base frame and said vehicle platform for maintaining said vehicle horizontal during operation of said means for raising, said maintaining means coupled to said platform only forward of said vehicle center of gravity.

* * * * *

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(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,706,356 Dated December 19, 1972

Inventor(s) Lewis R. Herbst, Burton C. Herbst, and Wayne K. Herbst

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 62 insert the following:

--2. A vehicle hoist as defined in Claim 1 wherein said vertically raising means additionally comprises: a pair of sheaves, rotatably connected to said platform guiding means adjacent the top of each of said second pair of vertical support members, and a pair of flexible tension members, each attached to one of said pair of hydraulic cylinders and guided by one of said pair of sheaves, each of said tension members connected to said vehicle platform ahead of the center of gravity of said vehicle.--

Signed and sealed this 22nd day of May 1973.

(SEAL)
Attest:

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Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents