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HYDRAULIC HOIST FOR VEHICLES
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This invention relates to hoisting means attachable to vehicles and more particularly to a form thereof constituting an improvement over the hoist described and claimed in my application Serial No. 652,860, filed April 15, 1957, now Patent No. 2,837,227.

An object of the present invention is to provide a platform type hoisting apparatus attachable as a unit to a motor truck or like vehicle in which the load carrying platform of the apparatus is so mounted that it can be folded up and moved to a position beneath the plane of the vehicle bed in which it is out of the way and does not interfere with the normal use of the vehicle and in which the lifting means includes a single hydraulic cylinder and piston apparatus.

Another object of the invention is to provide a platform type hoisting apparatus attachable as a unit to motor trucks or like vehicles including hydraulically actuated means for lifting the platform and in which the power means is mounted on the main frame member for the hoist whereby the entire hoist and its power unit form a complete assembly or unit for attachment to the vehicle.

With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention comprises the construction, combination and arrangement of parts described, by way of example, in the following specification of a presently preferred embodiment of the invention, reference being had to the accompanying drawings which form a part of said specification and in which drawings:

FIG. 1 is a side elevational view of the rear end of a truck showing a hoist embodying the present invention mounted thereon, the hoist being shown in lowered, load receiving or delivering position in full lines and in a position parallel to the truck bed in broken lines.

FIG. 2 is a top plan view of the hoist apparatus shown in FIG. 1.

FIG. 3 is a rear elevational view of the apparatus shown in FIG. 1 and including some details of the portions of the truck structure to which it is attached and/or with which it cooperates.

FIG. 4 is a side elevational, sectional view taken on the line 4—4 of FIG. 2.

FIG. 5 is a view also taken on the line 4—4 of FIG. 2 but showing the platform folded up against the lifting linkage means by which it is connected to the supporting frame member.

FIG. 6 is a side elevational view similar to FIG. 1 but showing the hoist with the platform folded thereon raised to extreme upper position and also showing in broken lines the hoist with the platform folded over thereon and raised to a horizontal position for use as a step or as a bumper.

FIG. 7 is a front elevational view of the main supporting frame and power unit component of the device.

FIG. 8 is a diagrammatic view of the electrical and hydraulic systems of the device, and FIGS. 9 and 10 are views showing optional installations of the device in off center positions at the rear end of a truck and at the side of a truck, respectively.

Referring to FIGS. 1 through 8 of the drawings, the illustrated embodiment of the invention includes a base assembly 1 extending transversely beneath the rear end of the vehicle and comprising a main frame member 2 preferably formed from a length of heavy angle iron disposed with the top leg 3 thereof extending horizontally toward the front of the vehicle and secured to the under side of the truck frame members F by brackets 4, 4 and having the other leg 5 thereof depending therefrom. The rear face of the leg portion 5 carries two pairs of spaced, vertically extending inner and outer bracket members 6, 6 and 7, 7 between which the upper end of duplicate parallel rule linkages comprising each one each of a pair of lifting bar members 8, 8 and one each of a pair of lazy bar members 9, 9 are pivotally connected. The opposite ends of the pairs of said bars are disposed between and pivotally connected to pairs of upstanding brackets 10, 10 mounted on the opposite ends of a platform supporting member 11, the lazy bars being connected to the brackets 10 by hinge pins 12 and the lifting bars being similarly connected by hinge pins 13.

The platform supporting member 11 is formed from a length of angle iron and is disposed with one leg thereof extending vertically upwardly from the other leg and the said other leg disposed to contact the ground when the device is lowered and to extend forwardly from the junction with the vertical leg. The platform supporting member is further provided with hinge brackets 14, 14 disposed parallel to and spaced inwardly from the innermost of each of the brackets 10 and the bolts 12, 12 are each sufficiently long to extend through their respective pairs of the brackets 10 and the interposed end of the associated bar and also through the adjacent one of the brackets 14. The spaces between each of the said innermost of the brackets 14 and the adjacent one of the brackets 14 is occupied by one each of a pair of platform supporting arm members 15, 15 which are hinged to the platform supporting member by the portion of the bolts 12 extending between the bracket 10 and the bracket 14. It is to be noted that the bolts 12 are aligned and are disposed above the upper edge of the vertical leg of the platform supporting member a distance which is equal to the distance from the lower edge of the arm members 15 to the holes therein through which the bolts 12 extend wherefore, when the arms are swung on the bolts so as to extend rearward, they will be supported above the plane of the ground or other surface on which the platform supporting member may rest when lowered or when the platform supporting member is elevated by power means to be presently described, to be supported in a horizontal plane. The arms 15, 15 support a platform comprising a plate 16 welded or otherwise secured to the arms 15, 15 and extending from the distal ends thereof toward the hinged ends of said arms; said plate having a clearance notch 17 at the end thereof opposite the hinged end and the notched end being reinforced by ribs 18, 18 extending from the midlengths of the arms 15, 15 diagonally to the sides of the notch 17 and thence along the end of the plate to the arms.

The lifting bars 8, 8 are interconnected to form an integral frame structure by cross members which include an I-beam member 19 extending between them adjacent to the ends thereof hingedly connected to the main frame member 2 and disposed with the web portion thereof ly ing parallel to a plane containing the longitudinal dimension of both lifting bars, a second cross member 20 inter connecting the lifting bars adjacent their opposite ends, and diagonally extending braces 21, 21 extending from the juncures of the cross member 20 with the lifting bars to points spaced from the midlength of the I-beam member 19, all of said members being preferably welded to each other to effect a rigid structure for lifting the platform.

The I-beam member 19 at its midlength carries two up standing car members 22, 22 welded thereto and having aligned holes extending therethrough for reception of a
hinge pin 23 which also extends through the head 24 of an upwardly extending piston rod 25 mounted for reciprocation in the lower end of a cylinder 26 having its upper end pivotally connected by a hinge pin 27 to the upper end of a supporting A-frame structure 28 extending upwardly from the top surface of the main frame member. Said piston rod within the cylinder carrying a piston 29 and said cylinder adjacent the lower end thereof having a nipple 30 affording connection with a source of pressure fluid injected beneath said piston for moving the piston upwardly with consequent lifting of the platform by its supporting means as will be later explained in detail. It will be noted from FIGS. 1 and 5 that the platform may occupy either of two positions relative to the lifting means therefor. In FIG. 1 it is shown extended or opened out for reception of a load. In FIG. 5 the platform has been swung about the hinged mounting therefor and rests between the lazy bars 9, 9 in inverted position on the outer ends of the ear members 22, 22. In that figure it will also be noted that the length of the platform is only slightly less than the length of the lifting and lazy bars 8 and 9 and that the notch 17 in the platform provides the required clearance for the piston rod. In an installation of the hoist, the main frame member is so located longitudinally of the truck frame that when the platform lifting means is raised by the cylinder and piston, the forward edge of the platform is in close juxtaposition to the rear edge of the beam B which forms the rear end of the truck bed. Generally, this beam is an angle iron and it is necessary to cut notches N, N in the depending leg thereof to afford clearance for the outer ends of the lazy and lifting bars. The under face of the rearwardly extending horizontal leg of the beam B serves as a stop for the upper ends of the brackets 10, 10 thus positioning the raised platform in the plane of the truck bed as shown in FIG. 1 or with the platform folded over on the lifting means, moving it out of the way of the normal use of the truck as shown in FIG. 6. Additionally, with the platform folded over, the lifting means can be moved to a horizontal position as shown in broken lines in FIG. 6. In this position the platform can serve as a rear step for the truck and the hoist in this position can also serve as a bumper for the safer backing of the truck in the close proximity of passenger vehicles.

The actuating means for the hoist is mounted on the main frame member 2 and comprises a fluid reservoir 31, a pump 32, a pump actuating motor 33, and a solenoid actuating switch 34 which controls the supply of operating current to the motor. The reservoir 31 is formed as an integral part of the main frame member by employing the surface thereof as two sides of the reservoir, the other two sides being formed by a short length of angle iron 35 having the edges thereof welded to the inner faces of the main frame member and having the ends 36, 36 formed by rectangular portions of steel plate welded to the joined angle iron members. A threaded opening in the top face of the main frame member closed by a plug 37 affords means for supplying fluid to the reservoir. The pump 32 and motor 33 are mounted in end to end relation to a bracket 38 bolted to the under face of the horizontal leg 3 of the main frame member and the solenoid switch 34 is mounted on the vertical leg 5 of the main frame member by a bracket 39.

The hydraulic circuitry includes a hose 40 extending from a connecting nipple 41 in the lower portion of the reservoir to the intake 42 of the pump and the discharge orifice of the pump is connected with a check valve 43 which terminates in a T 44. A hose 45 extends between one end of the T and the nipple 30 on the cylinder 26. A hose 46 extends from the other end of the T to one side of a manually operable valve 47 mounted on a bracket 48 secured to the side of the truck adjacent to the rear end thereof, and a hose 48 extends from the other side of the valve to the return nipple 49 in the side wall of the reservoir 31. Normally, the valve 47 is closed and therefore actuation of the pump 32 will deliver fluid from the reservoir to the cylinder below the piston and thus cause the piston to move upwardly lifting the lifting and lazy bars and platform, the check valve 43 preventing return of the fluid through the pump. When it is desired to lower the hoist, the valve 47 is opened and the load on the platform and lazy bars causes the piston to expel fluid through the hose 45 to the T 44 and since the check valve 43 prevents flow into the pump, the fluid flows through the hose 46, valve 47 and hose 48 to the reservoir so long as the valve 47 is opened or the platform supporting member is in contact with the ground or a floor. It will be evident that by closing the valve 47 after the hoist means has descended to any desired extent short of contact with the ground or a floor, the hoist will be held in the position at which it is thus stopped. Conversely, upon stopping the pump at any desired point in the elevation of the hoist, the hoist will be automatically locked at the point of stopping the pump.

The control for the motor includes a normally open push button switch 50 located in close proximity to the valve 47 and interposed between a source of energy such as the truck battery and associated electrical system 51 and the circuit of the solenoid actuating switch 34. Interposed between the truck electrical system 51 and the motor 33, the other side of the solenoid coil and motor circuits being grounded. When it is desired to elevate the hoist, the push button switch 50 is held closed with resultant closing of the switch 34 and actuation of the motor and pump so long as the switch 50 is held closed. When pressure on the switch 50 is released, it opens and allows the switch 34 to open stopping the motor.

It is to be noted that the power unit and control means except the valve 47 and switch 50 are mounted on the main frame member so that a hoist of a unit which can be applied to the truck in any desired location. While the device will most generally be applied in the center at the rear of a truck, it can also be mounted at one side of the rear end as indicated in FIG. 9 or at the side of the truck as indicated in FIG. 10. Further, while the device will most generally be mounted on a truck, it is equally applicable to the side or end of a trailer. The control means comprise only the push button switch and the valve 47 and these can be readily located at any convenient place on the vehicle. Whether the hoist is mounted on the end or side of the vehicle, when not in use, it can be moved to a position that places the hoist and pump completely off the way and in which it does not add to the width or length of the vehicle or interfere with the normal loading or unloading of the vehicle from loading docks or the like which are disposed at the level of the vehicle bed.

While in the foregoing specification there has been disclosed a presently preferred embodiment of the invention, it is not to be inferred therefrom that the invention is limited to the exact details thereof which have been described by way of example, and it will be understood that the invention embraces all such changes and modifications in the parts and in the construction, combination and arrangement of parts as shall come within the purview of the appended claims.

I claim:

1. In a load hoisting means attachable as a unit to a vehicle frame, a main frame member attachable to a vehicle frame below the plane of the load carrying bed of the vehicle, a parallel rule linkage means having one end thereof pivotally mounted on said main frame member and the other end thereof so pivotally connected to a platform supporting member that movement of said platform supporting member deriving from movement of said linkage means does not effect angular movement of said platform supporting member relative to said frame member, a load receiving platform hingedly mounted on said platform supporting member and movable optionally about said hinged mounting to either an extended, load
receiving position or to a position inverted and superimposed on said linkage means, and power means including a motor and devices actuated by said motor and carried by said main frame member and connected to said linkage means at a point therein affording clearance for movement of said platform to said inverted position; said motor and devices actuated thereby being operable to swing said linkage means upwardly about said pivotal connection with said main frame member with consequent elevation of the extended platform to the plane of the vehicle bed or of the inverted platform to a position beneath the vehicle bed.

2. A load hoisting means as claimed in claim 1 in which said power means comprises a motor, a pump, a hydraulic cylinder hydraulically connected to said pump and a fluid supply source connected to said pump and said cylinder, said cylinder being pivotally connected to said main frame member and having a reciprocable piston means engaging said cylinder and including a piston rod pivotally connected to said linkage.

3. A hoisting means as claimed in claim 2 in which said platform is provided with a clearance notch in the edge thereof remote from the edge hinged to said platform supporting member effective to provide for the piston rod of said cylinder when said platform is moved to said inverted position on said linkage.

4. In a load hoisting means attachable as a unit to a vehicle frame, a main frame member, a load receiving platform, a parallel rule linkage connecting said platform to the main frame member, means for lifting said platform comprising a hydraulic cylinder and piston means connected to and extending between said main frame member and said linkage and effective upon application of fluid pressure within said cylinder to swing said linkage upwardly with consequent elevation of the platform, means for applying fluid pressure to said cylinder comprising a fluid reservoir, a pump, a motor operatively connected to said pump, a manually operable switch for connecting said motor with a source of energy, fluid conduit means connecting said pump with said reservoir and with said cylinder, fluid conduit means affording a passage for fluid from said cylinder to said reservoir and by-passing said pump, and a manually operable valve in said last named fluid conduit means operable to by-pass fluid to said reservoir and consequently allow said linkage and platform to descend with resultant expulsion of fluid from said cylinder; said connection between said linkage and said front form includes a platform supporting member attached to the free ends of said linkage, hinge means pivotally connecting said platform to said platform supporting member, and stop means effective to prevent said platform from movement beyond a horizontal position extending outwardly beyond said linkage, said hinge means allowing said platform to be swung into inverted position upon said linkage; said cylinder and piston means in said platform being constructed and arranged to prevent interference therebetween when said platform is swung into said inverted position.

5. A hoist means as claimed in claim 4 in which said platform is provided with a recess affording clearance for said piston and cylinder when said platform is disposed in said inverted position.

6. In a load hoisting device for vehicles, a unitary main frame attachable to a vehicle frame and serving as the sole mounting means for a vertically movable load carrying platform and for power means for effecting said vertical movement; means connecting said platform to said main frame comprising two pairs of link members arranged one pair at each side of said platform and each pair comprising a lower link subjected to longitudinal compressive forces and an upper link member subjected to longitudinal tension forces and said members being effective to maintain said platform in substantially parallel relation to the plane of the load carrying surface of the vehicle bed during movement of said platform from ground level to the plane of the vehicle bed, and said power means including a motor operably connected to a pump and a hydraulic cylinder and piston assembly having fluid transmitting connections with said pump and mechanical force transmitting connections with said main frame and with said means connecting said platform with said main frame.

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