HYDRAULIC JACK FOR TRAILERS

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Filed: July 21, 1972

Appl. No.: 273,929

U.S. Cl. 254/86 R
Int. Cl. B64F 7/26

Field of Search 254/86 R, 86 H, 45;
280/150.5

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ABSTRACT

A jack for supporting a standing vehicle that is composed of a hydraulic cylinder swingable on a horizontal pivot between an up and retracted position and a vertical down position. Positioned alongside the cylinder is a link mounted on a horizontal pivot offset fore-and-aft and beneath the pivot carrying the cylinder. The lower end of the link carries a lock that engages the ram when it is retracted and engages and locks the cylinder when it moves to its vertical position. Due to the lock and the relative position of the pivots, the cylinder is forced to swing downwardly as it starts its extension stroke and is locked in vertical position after initial extension of the ram.

12 Claims, 7 Drawing Figures
HYDRAULIC JACK FOR TRAILERS

BACKGROUND OF THE INVENTION

This invention relates to jacks or adjustable stands for use with a house- or camping-type trailer or motor home and for the purpose of leveling and maintaining the trailer or motor home in a level disposition. It has heretofore been known to provide hydraulic jacks for use with such vehicles and to adjust the hydraulic jacks to the positions that maintain the vehicle body level. It has also heretofore been known to provide a type of hydraulic jack that utilizes a cylinder and ram for jacking purposes and to mount the hydraulic cylinder to swing vertically about a horizontal axis. It has also been known to provide an arm mounted on an axis parallel to the cylinder pivotal mounting but offset thereto and to have a portion of the arm connected to the ram of the cylinder. Thus, as the cylinder and the ram extend relative to one another, the arm forces the entire cylinder to swing from its normal retracted or horizontal position to a vertical or operating position. Such a structure is shown in U.S. Pat. No. 3,362,683.

The problem existing with such an arrangement occurs when the trailer or vehicle is moved accidentally or when forgetting to retract the jacks. It is desirable to lock the jacks in their vertical position and to do so automatically when the jacks are being positioned in their operating positions. In the structure shown in the aforementioned 3,362,683 patent, there is no provision for locking the cylinders in their vertical position and obviously none to do so automatically.

SUMMARY OF THE INVENTION

With the above in mind, it is the primary object of the present invention to provide a hydraulic jack for a trailer-type vehicle or motor home which supports the vehicle. It is also the object of the present invention to provide a locking device that is associated with the jack and which operates to hold the jack in its upper or horizontal position when the jack is not in use and to automatically force the jack to its vertical position and then lock it in its vertical position as the jack is extended.

It is still a further object of the invention to provide with the means for locking the jack in its vertical position an overload release which permits the jack to swing vertically upon the trailer or vehicle being pulled accidentally without retraction of the jacks. The release is such that there will be no damage to the jack.

More specifically, it is the purpose of the present invention to provide a link that is mounted on the vehicle underside to swing vertically on a horizontal axis that is parallel to that which mounts the hydraulic cylinder on the vehicle. The link extends from its pivot alongside the hydraulic cylinder and has a lower end thereof that has a first part disposed adjacent the ram and a second part thereof disposed adjacent the cylinder. The ram is provided with a recessed portion that receives a part of the link that is adjacent thereto and the cylinder has a rigidly connected part thereon that is adapted to engage the part of the link that is adjacent the cylinder only when the cylinder is in vertical disposition. The engagement of these latter two parts will lock the cylinder in its vertical position. However, the portion on the cylinder that locks against the lower end portion of the link is biased into its locking position and consequently may upon extreme pressure being applied thereto release the lower end portion of the links so that the cylinder may swing upwardly. Thus, should a force sufficiently large to swing the cylinder on its axis when the jack is in standing position occur, the locking connection between the cylinder portion and the part of the link that is adjacent thereto will break or be released thereby permitting the cylinder and ram structure to swing about the axis of the cylinder and thereby prevent possible damage to the trailer or vehicle as well as the jack.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side perspective view of a trailer in which the jacks or stands are shown in operating position.

FIG. 2 is a plan view of the jacks when in a horizontal or up position.

FIG. 3 is a side view of the jack shown in FIG. 2.

FIG. 4 is a view similar to FIG. 3 but showing the jack in a standing or vehicle-supporting position and with portions broken away to show hidden mechanism.

FIG. 5 is a view of a portion of the jack shown in FIGS. 3 and 4 showing that which would occur if the vehicle was moved without retracting the jack.

FIG. 6 shows a view similar to FIG. 3 but showing a modified form of the invention in which a single-acting cylinder is used and a spring is provided for the purpose of retracting the cylinders.

FIG. 7 is a view similar to FIG. 2 but showing the modified form of the invention shown in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The jacks of the present invention are preferably used to support a vehicle possibly of the type shown in FIG. 1 but not necessarily limited in detail to that type. It should here be understood the jack may be used equally well on a motor home and the fact that such is shown on a trailer vehicle is for purposes of convenience and it is not intended to limit the invention to such a unit. The trailer consists of a house or living quarters portion 10 that is supported on a pair of tandem wheels 11, 12 in the center portion of the trailer. The jacks, such as shown at 13, are provided on the front of the vehicle portion 10 and the rear of the vehicle 10. Referring now to FIGS. 2 and 3, the jacks 13 are carried on a jack support 14 that may be welded, riveted or otherwise fixed to the lower portion of the vehicle. The support 14 includes a pair of fore-and-aft oppositely disposed plates 15, 16 with transversely aligned and horizontal pivot openings 17, 18 respectively. The jack is composed of a hydraulic cylinder 19 having a cylinder structure 20 and a ram structure 21. The ram structure 21 has at its outer end ground-engaging portions or pads 22 that are U-shaped members with the bight portion adapted to rest on the ground. The cylinder structure 20 has welded to opposite sides thereof threaded members or nuts 23, 24 that may be axially aligned with the openings 17, 18 so as to receive the threaded ends of pivot bolts 25, 26 that extend through the respective plates 15, 16 and are threadedly received in the nuts 23, 24 respectively. Thus, the cylinder 19 may swing vertically on the shanks of the bolts 25, 26. The ram structure 21 is of a conventional type having a piston portion (not shown) retained in the cylinder 19 that is rigidly fixed to that portion projecting out of the cylinder. The ram
3,817,493

2 also has an annular recess 27 at its outer end. The cylinder structure 20 has a pair of upright fore-and-aft extending plates 29, 30 that has fixed thereto an upper horizontal pin 31. A central pin or rod 32 is positioned vertically centrally of upper and lower ends of the plates 29, 30 and edge recesses 33, 34 cut in the plates 29, 30. The outermost ends of the plates 29, 30 have slots 35, 36 that receive a horizontal element or pin 37. A torsion spring 38 is carried on the rod 32 and has leg portions 39, 40 that extend to the rods 31, 37 respectively and serves to bias the rod 32 into the recesses 33, 34 and also serves to resist movement of the rod 37 upwardly in the slots 35, 36. In normal operating position, the rods 31, 32 and 37 rest in the disposition shown in Figs. 2 and 3. In the form of the invention shown in Figs. 1–5, the cylinder 20 is a double-acting type having a fluid inlet 41 at its upper end and a fluid inlet 42 at its lower end that connects to a pipe 43 extending toward the upper or head end of the cylinder 19. The pipe 43 and the inlet 41 are connected to suitable hydraulic hoses, not shown.

A rod structure in the form of a pair of parallel rods or links 50, 51 are provided on opposite sides of the cylinder 19, with each rod or link 50, 51 being composed of an upper portion 52 and a lower portion 53 threaded together so that minute adjustment may be made between the portions 52, 53. The upper portions 52 have outwardly projecting leg portions 54 that project through the plates 15, 16 and form a second horizontal pivot that is parallel to the pivot holes 17, 18 but which are offset beneath and forwardly of the pivot holes 17, 18. The rods or links 50, 51 extend alongside the cylinder 19 and between the cylinder 19 and element 37. Fixed to the outer ends of the links 50, 51 are locking elements or devices 55 that are composed of upright plates 56 welded to the inner sides of the rod portions 53 and which carry between them and at their outer ends a roller 57, such being mounted by a rod 58 that extends between the respective plates 56. As can best be seen in Figs. 2 and 3, the roller 57 may rest in the recessed portion 27 of the ram structure.

The jack or supporting stand device operates in the following manner. Assuming the jack is in the upper or horizontal position as shown in Figs. 2 and 3, and if desired to move the jack to its vertical or supporting position with respect to the vehicle, fluid is introduced into the head end of the cylinder 19. However, the roller 57 being seated in the annular recess 27 will cause the cylinder 19, upon extension of the ram structure, to swing about the pivotal axis of the openings 17, 18. Due to the offset relation between the two pivotal axes, the cylinder will be forced to its vertical position as shown in Fig. 4. While swinging to the vertical position, the pin 37 which operates as a latch against the locking device 55, will move along the edges of plates 56 toward the inclined edges 59. Upon the jack reaching the vertical position, as shown in Fig. 4, the pin 37 will then move behind the edges 59. To a degree, therefore, the edges 59 and outer edges of the plate 56 operate as a cam for positioning the lock device. Again looking at the location of the pivots defined by the openings 17, 18 and the portions 54 in relation to the pin 37 (as shown in Fig. 4), it will be noted that the pin 37 thereupon operates to lock or latch the locking device so that the cylinder is locked in its vertical position. Also, as the pin 37 reaches the edges 59, the entire locking device is permitted to move away from the cylinder 19 so that the roller 57 disengages the annular recess 27 and consequently the cylinder is free to continue to extend. Thus, the links 50, 51 may move to an inner position to lock the ram structure and an outer position to lock the cylinder in its vertical position. By extending the ram portion 21 of the cylinder 19, it first forces the jack from its horizontal to its vertical position and then causes the jack to lock in the vertical position against movement toward the retracted position.

When it is desirable to retract the jack, the ram portion 21 is retracted by suitable use of hydraulic fluid. As the recess 27 moves opposite the roller 57, the action of the rod or element 37 on the inclined edges 59 will force the roller into the recess. Thus, the rod 37 will be free to move adjacent the outer edge of the plates 56 and the cylinder will then not be blocked against vertical movement. Further retraction of the ram will force the entire jack to swing about both the aforesaid first and second horizontal pivots supporting the cylinder 19 and rods 50, 51 respectively and to retract into a horizontal position, much in reverse fashion to the manner in which it moved to the vertical position when the ram was extended. When in the horizontal position, as shown in Fig. 3, the rod 37 will again act as a latch to hold the locking device in its locked position with respect to the annular recess 27.

Often when the stands are in the vertical position as shown in Fig. 4 and quite accidentally, the vehicle 10 is driven to the right. When this occurs, and referring now to Fig. 4, there will be a tremendously large force trying to swing the jack toward the horizontal. The rod 37, in the manner previously described, locks the jack in the vertical position and against movement to the left. However, when a very large force occurs, there is provided means for permitting release of the rod 37 from engagement with the shoulder or edge 59. Such is in the form of a pair of parallel outer links 60 that extend between the rods 32, 37 and a pair of inner parallel links 61 that extend between the rods 31, 32. The spring 38 will normally operate to bias the rod 32 into the position shown in Figs. 3 and 4. However, should an extremely large load occur, such that would tend to break the jack when it is in the vertical position, the spring 38 will permit the rod 32 to move out of the recesses 33, 34 in the side plates 29, 30 and linkages 60, 61 to collapse as shown in Fig. 5 and this in turn permits the entire jack mechanism to swing from its vertical disposition. Thus, there is an overload type of release for permitting the jack to leave its vertical position. Since four jacks are being used per vehicle, they may be staggered to be locked vertically against shifting in different directions. For example, the front jacks may be locked against shifting to the right and the rear jacks against shifting to the left. Thus, the vehicle would be stable and locked against shifting.

Referring now to the modification shown in Figs. 6 and 7, there is provided a single-acting cylinder 19a which, of course, has only a single fluid inlet 41. Fixed to the outer surfaces of the plates 15, 16 are a pair of spring supports 65 carrying a pair of springs 66 that extend downwardly and connect to a pair of rods 67 fixed to opposite sides of the pad 22. The spring supports 65 curve downwardly adjacent the horizontal pivot formed by the openings 17, 18. The relationship of the spring to the jack is best shown in Figs. 6 and 7. The lock and latching mechanism of the one-way cylinder operates in substantially the same manner as it did in
the previous form of the invention. However, when the jack is in its vertical or supporting position, the springs 66 extend and wrap partially around the arcuate jack supports 65. When fluid is released from the outlet 41, the spring operates to return the cylinder to its horizontal or up position.

What is claimed is:

1. A jack mounted on and for supporting a vehicle comprising: a jack support on the lower portion of the vehicle and having a first horizontal pivot; a hydraulic cylinder including a cylinder structure and a ram structure, the latter having ground-engaging means, said cylinder being supported at its closed end on the first pivot to move between a vertical position in which the ram structure is directed toward the ground and an upper more horizontally disposed position in which the ram structure is normally retracted; a link pivotally supported at one end on the jack support about a second horizontal pivot offset beneath and to one side of the first pivot and extending therefrom alongside the cylinder; a locking device on the opposite end of the link lockable with the ram structure for locking the cylinder in its horizontally disposed position when the ram structure is substantially fully retracted and lockable with the cylinder structure for locking the cylinder in its vertical position upon the ram structure being extended sufficiently to force the cylinder to its vertical position.

2. The jack as set forth in claim 1 in which the locking device is composed of an elongated rigid structure with a first portion thereof disposed along one side of the cylinder and with a part thereof engageable with and for locking itself to the ram structure and a second portion with a part thereof engageable with and for locking itself to the cylinder structure; and said cylinder structure has means thereon for forcing the first portion into locking engagement with the ram structure when the latter is retracted, and releases the first portion to permit it to move out of engagement with the ram structure when the cylinder moves toward vertical position, and forces said second portion into locking engagement with the cylinder structure when the latter is in vertical position.

3. The jack as set forth in claim 2 further characterized by said means on the cylinder structure being releasable upon overload so that the cylinder may move from its vertical position.

4. The invention defined in claim 1 in which the locking device is shiftable about its second pivot toward and away from the cylinder and between inner and outer positions with respect to the cylinder and when the device is in its inner position it locks the ram to the link and when in its outer position it locks the cylinder to the link; and further characterized by structure on the cylinder that causes the locking device to shift to its inner position as the ram structure is substantially fully retracted and to shift to its outer position when the cylinder is substantially vertical.

5. A jack carried on and for supporting a vehicle comprising: a jack support mounted on the lower portion of the vehicle and having a first horizontal pivot; a hydraulic cylinder including a ram structure and ground-engaging means, said cylinder being supported at its closed end on the first pivot to move between a vertical position and an upper more horizontally disposed position in which it is normally retracted; a link pivotally supported on the support for disposition alongside the cylinder and about a second horizontal pivot offset but parallel to the aforesaid horizontal pivot; a lock on the link movable in and out of engagement with the cylinder for locking and unlocking itself to the cylinder; and a latch on the cylinder engageable with the link for holding the link in engagement with the cylinder when the cylinder is retracted and until the cylinder is extended sufficiently to swing said cylinder from its more horizontally disposed position to its vertical position.

6. A jack for use on a vehicle comprising: a hydraulic cylinder including a ram structure supported on the vehicle to depend therefrom and to swing about a first horizontal pivot between a vertical operating position and an up position in which it is more horizontally disposed; a link carried on the vehicle alongside the cylinder and swingable at its upper end on a second horizontal pivot parallel to but offset from the first horizontal pivot and having at its lower end lock means for locking it to the cylinder whereby extension or retraction of the cylinder will force the cylinder to swing about the first pivot; and means on the cylinder operatively connected to the link to hold the lock means in locking position upon the cylinder being in a vertical disposition.

7. The structure defined in claim 6 in which the ram structure of the cylinder extends therefrom and has ground-engaging means thereon so that upon extension the ground-engaging means moves from the cylinder and toward engagement with the ground.

8. The structure defined in claim 7 in which the means on the cylinder includes an element transverse to but offset from the cylinder and said link extends between the cylinder and element; and said link has a cam surface means thereon engageable with the element which causes the lock means to engage the ram structure when the cylinder is swinging between vertical and horizontal and to disengage the ram structure when the cylinder is in vertical disposition.

9. The structure defined in claim 8 further characterized by said cam surface means having an area thereon that receives said element upon the cylinder being in a vertical disposition and said element when in said area locks the link against movement.

10. The structure defined in claim 9 in which said link may move about the second pivot toward and away from the cylinder between an inner position in which said lock means engages the ram structure and an outer position in which said lock means is out of engagement with the ram structure, and when in said outer position said cam surface means has its aforesaid area in receiving relation with the element.

11. The structure as set forth in claim 10 in which said element has overload release means for permitting said link to shift longitudinally with respect to the cylinder upon an overload being applied to said jack.

12. The structure as set forth in claim 6 in which said cylinder is a single-acting cylinder and further characterized by spring means extending from said vehicle to said structure for effecting retraction of said ram structure.