Feb. 28, 1956 C. L. WILSON 2,736,531

HYDRAULIC LIFTING JACK

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FIG.1.

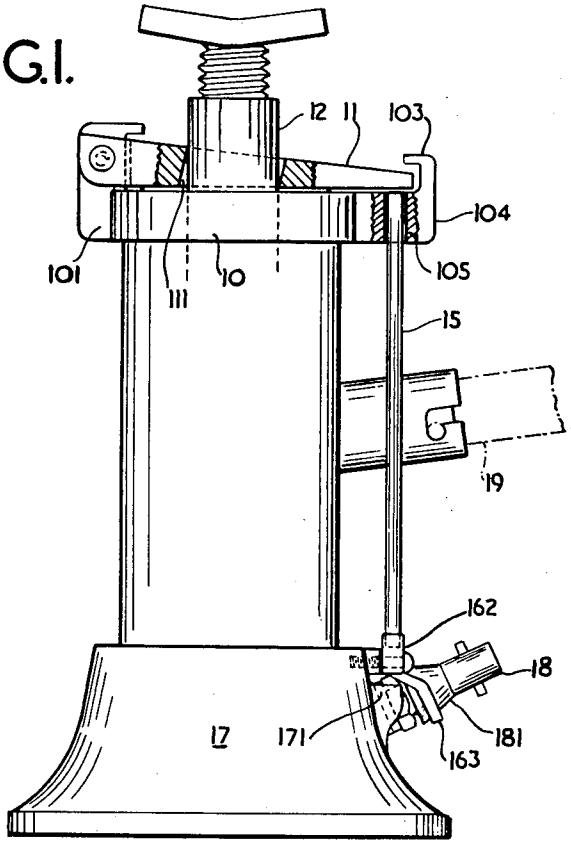
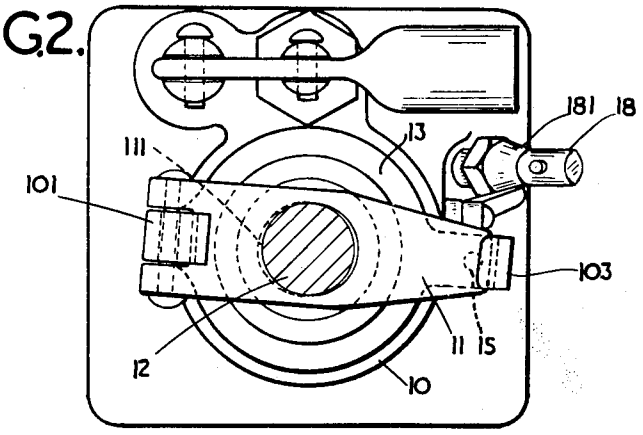


FIG.2.



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FIG.3.

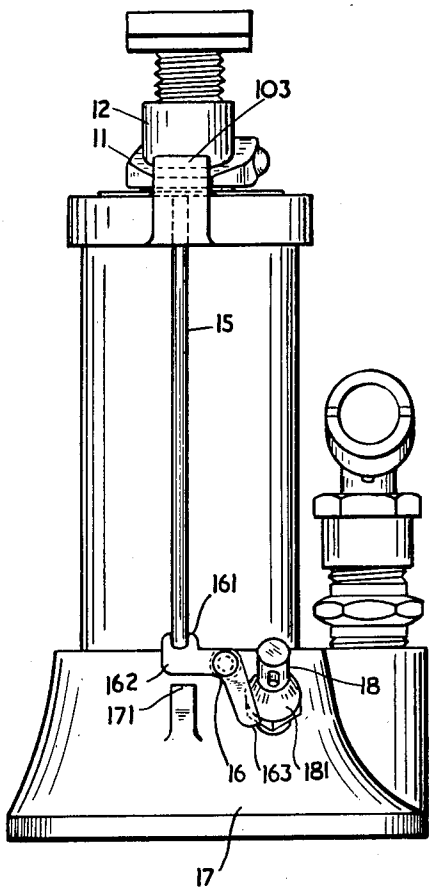
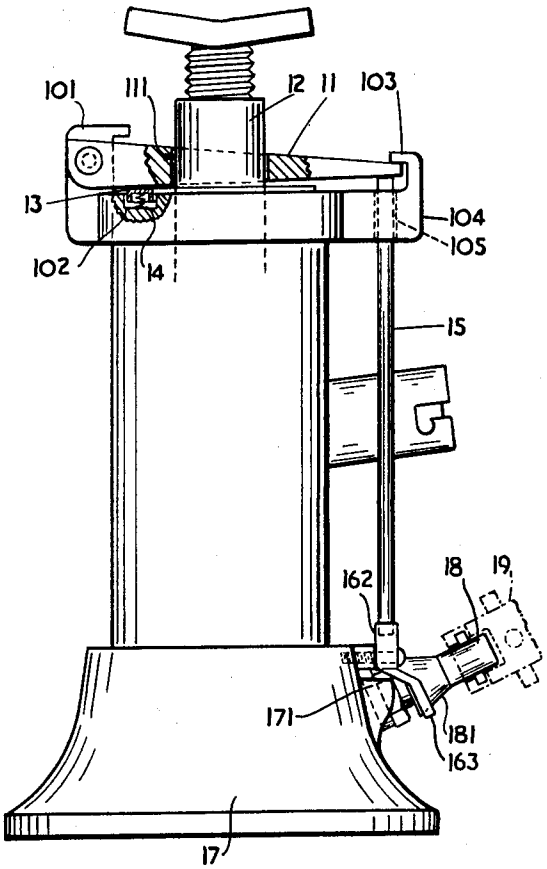


FIG.4.



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HYDRAULIC LIFTING JACK

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7 Claims. (Cl. 254—93)

This invention has reference to improvements relating to hydraulic lifting jacks.

Hydraulic lifting jacks are known sometimes to collapse under load due to leakage of hydraulic fluid past the ram and as such a collapse may be attended with serious consequences the present invention has for its object to provide new or improved means for preventing the inadvertent collapse of an hydraulic lifting jack when under load.

According to the invention an hydraulic lifting jack is characterized by the incorporation therewith of means which permits raising of the ram but which comes into action automatically to prevent inadvertent lowering of the ram whilst under load.

According to the invention also an improved hydraulic lifting jack as aforesaid is characterized further by the association with the said automatically operating means of means which can be actuated to permit of the lowering of the ram when required.

The invention also resides in an hydraulic lifting jack constructed, arranged and adapted for use substantially as will be described hereinafter.

An embodiment of the invention will now be described with particular reference to the accompanying drawings which illustrate the invention in its application to a lifting jack of known construction intended primarily for use with motor road vehicles for facilitating operations such as wheel changing.

In the drawings:

Figure 1 is a view mainly in side elevation but partly in section of the improved hydraulic lifting jack with the parts in the position assumed in the event of failure under load.

Figure 2 is a sectional plan the section being taken on the plane indicated by the line 2—2 Figure 1 looking in the direction of the arrow the said line.

Figure 3 is a front elevation of the jack and

Figure 4 is a similar view to Figure 1 but illustrating the manner of freeing the locking means.

In the drawings like numerals of reference indicate similar parts in the several views.

According to the said illustrated embodiment of the invention the cast upper end closure cap **10** of the jack is provided at one side with a bracket **101** to which is pivotally mounted one end of a lever **11** which is of triangulated shape in side elevation and which has the deeper end adjacent to the pivot and which extends across the top of the said closure cap **10**.

This lever **11** hereinafter termed the locking lever **11** is provided in the intermediate portion thereof with a hole **111** of slightly greater diameter than the diameter of the ram **12**.

Mounted in a recess **102** in the upper closure cap **10** is a concentrically disposed inverted channel section annulus **13** hereinafter termed the bearing ring **13** the undersurface of which cooperates with spring means **14** which tends to maintain the upper surface of the bearing ring **13** slightly above the upper surface of the said closure cap **10**.

The locking lever **11** tends to remain in the lowermost position under the action of gravity with the underside thereof resting on the bearing ring **13** (see Figure 1).

The free end of locking lever **11** engages beneath an overhanging projection **103** carried by a bracket **104** opposite to the pivot bracket **101**, said overhanging projection **103** acting as a stop to prevent the locking lever **11** being turned upwardly beyond a position in which the axis of the hole **111** in the locking lever **11** is coincident with the axis of the ram **12**.

When the locking lever **11** rests on the bearing ring **13** (see Figure 1) the axis of the hole **111** is inclined at an angle to the axis of the ram **12** with the wall bounding the hole **111** in the locking lever **11** in slight binding contact with the ram **12**.

Slidably mounted within a hole **105** formed in the bracket **104** carrying the overhanging projection **103** aforesaid is the upper end of a rod **15** the lower end of which rests in a cup **161** carried at the end of one arm **162** of a bell crank lever **16** which is pivotally mounted on the cast base **17** of the jack.

The other arm **163** of the bell crank lever **16** is located adjacent to and in contact with a frusto-conical enlargement **181** formed on the outwardly projecting portion of the relief valve control stem **18** which is required to be actuated for closing the ordinary relief valve not illustrated when lifting is required and for opening the said relief valve when it is required that the jack should be collapsed in a manner well known to those skilled in the art.

Disposed below the cup aforesaid is an abutment **171** formed integral with the base **17** of the jack, said abutment being spaced slightly from the underside of the cup **161** as and for a purpose to be described hereinafter.

The lifting jack is employed in the normal manner, namely for lifting purposes the relief valve stem **18** is screwed inwardly by means of the operating handle **19** (see Figure 4) until the relief valve is firmly located on its seating in the pressure cylinder and during this movement the wider end of the frusto-conical portion **181** also moves inwardly so that the co-acting arm **163** of the bell crank lever **16** is in slight frictional contact therewith under the weight of the rod **15** with the upper end of the lifting rod **15** clear of the underside of the locking lever **11**.

The handle **19** is then used to actuate the pump in the usual manner (see Figure 1).

The rising of the ram **12** occasions an upward turning movement of the free end of the locking lever **11** which continues until the said free end contacts the overhanging stop **103**.

In this raised position the hole **111** in the locking lever **11** becomes coincident with the axis of the ram **12** thus permitting unimpeded rising movement of the ram **12**.

When pumping ceases the locking lever **11** falls until it rests on the bearing ring **13** with the wall bounding the hole **111** in the locking lever **11** in light binding contact with the ram **12**.

When it is desired to lower the ram **12** the relief valve is opened by unscrewing the stem **181** by using the handle **19** in the normal manner and this operation simultaneously causes the under end of frusto-conical enlargement **181** of the stem **18** to move outwardly and to bear on the arm **163** of the bell crank lever **16** associated therewith thereby rocking the said bell crank lever **16** and through the rod **15** lifting the free end of the locking lever **11** to bring the axis of the hole **111** therein coincident with the axis of the ram **12** (see Figure 4) so that the ram **12** can collapse without being impeded by the locking lever **11**.

In the event of leakage of the hydraulic liquid past the ram packing and the consequential tendency of the ram 12 to collapse under load the downward movement of the ram 12 causes the locking lever 11 to assume its lowermost position in which the axis of the hole 11 therein becomes inclined to the axis of the ram 12, thus introducing a binding action which prevents lowering of the ram 12, the greater the load the greater the degree of binding exerted.

During the downward movement as aforesaid the locking lever 11 bears firstly on the resiliently supported bearing ring 13 when light binding occurs and any subsequent downward movement or tendency to such a movement under the load proportionally increases the binding effect.

When the maximum degree of binding is being exerted the underside of the locking lever 11 rests on or is in the closest proximity to the upper surface of the upper closure cap 10 with the spring means 14 compressed.

In the event of it being desired to lower the jack after binding as aforesaid an attempt is made first to unscrew the relief valve to occasion a rocking of the bell crank lever 16 to effect the raising of the rod 15 for lifting the free end of the locking lever 11, this operation being assisted by the energy stored in the spring means 14.

If however freeing of the locking lever 11 is not possible by the operation aforesaid a chisel shaped portion at the end of the handle is inserted between the underside of the cup 161 and the abutment 171 on the base 17 of the jack and used as a lever to effect the desired freeing of the locking lever 11 through the rod 15.

Although primarily the locking lever 11 is intended to prevent the inadvertent collapse of the jack in the event of leakage of hydraulic fluid past the ram 12 when the ram 12 is under load it will be appreciated that the locking lever 11 also permits of the use of a jack for lifting in the case where such leakage occurs but is of small extent since the desired lifting can be obtained by accentuating the rate of pumping.

It will be appreciated that other forms of one way mechanism may be substituted for the locking lever described for example ratchet and detent mechanism.

It will be appreciated also that by arranging for the release of the one way locking mechanism to take place simultaneously with the performance of the operation for effecting the opening of the relief valve and through the agency of the same means as is customarily employed for performing the said operation, the jack may be operated in accordance with existing practice.

It will be appreciated further that since during normal operation the ram is supported by hydraulic power when under load the one way locking mechanism is not itself under load so that displacement of the locking element of elements for freeing the ram is effected easily.

It is to be understood that in the event of the binding of the ram 12 and the load being so great as to prevent release of the locking mechanism by means as described hereinbefore for occasioning the lowering of the ram 12, the jack can be removed by effecting a backwards or forwards movement of the vehicle.

I claim:

1. An hydraulic lifting jack incorporating a relatively stationary hydraulic cylinder, a ram axially displaceable within said hydraulic cylinder, a lever provided in an intermediate portion with a hole through which the ram passes, the lever being pivoted at one end to the said hydraulic cylinder and when the ram is stationary assuming a position in which the axis of the hole is oblique to the axis of the ram, the degree of obliquity being such as to permit the said lever to assume a substantially horizontal position with the wall bounding the hole in a non-binding relationship with the ram when the ram is stationary but to permit the lever a limited degree of turning movement with the free end moving upwardly during the raising of the ram and to permit the lever a limited degree of turning movement with the free end moving downwardly under the falling tendency of the ram in the event of the inadvertent lowering of the ram due to failure of hydraulic pressure, to bring the wall bounding the hole in the lever into frictional binding contact with the ram so as to restrain continued lowering thereof and means cooperating with the free end of the lever for preventing continued upward movement of the free end of the lever during the raising of the ram when the axis of the hole has attained coincidence with the axis of the ram so that the ram cannot bind in the hole in the lever during raising of the ram.

2. An hydraulic lifting jack incorporating a relatively stationary hydraulic cylinder, a ram axially displaceable within said hydraulic cylinder, a lever provided in an intermediate portion with a hole through which the ram passes, the lever being pivoted at one end to the said hydraulic cylinder and when the ram is stationary assuming a position in which the axis of the hole is oblique to the axis of the ram, the degree of obliquity being such as to permit the said lever to assume a substantially horizontal position with the wall bounding the hole in a non-binding relationship with the ram when the ram is stationary but to permit the lever a limited degree of turning movement with the free end moving upwardly during the raising of the ram and to permit the lever limited degree of turning movement with the free end moving downwardly under the falling tendency of the ram in the event of the inadvertent lowering of the ram due to failure of hydraulic pressure to bring the wall bounding the hole in the lever into frictional binding contact with the ram so as to restrain continued lowering thereof, means cooperating with the free end of the lever for preventing continued upward movement of the free end of the lever during the raising of the ram when the axis of the hole has attained coincidence with the axis of the ram so that the ram cannot bind in the hole in the lever during raising of the ram, and resilient means located below the lever which normally tends to urge the lever into the horizontal position in which there is a non-binding relationship with the ram but which is stressed to allow the lever to assume the binding position when necessary.

3. An hydraulic lifting jack incorporating a relatively stationary hydraulic cylinder, a ram axially displaceable within said hydraulic cylinder, a lever provided with a hole through which the ram passes, the lever being pivoted at one end to the said hydraulic cylinder and when the ram is stationary assuming a position in which the axis of the hole is oblique to the axis of the ram, the degree of obliquity being such as to permit the said lever to assume a substantially horizontal position with the wall bounding the hole in a non-binding relationship with the ram when the ram is stationary but to permit the lever limited degree of turning movement with the free end moving upwardly during the raising of the ram and to permit the lever a limited degree of turning movement with the free end moving downwardly under the falling tendency of the ram in the event of the inadvertent lowering of the ram due to failure of hydraulic pressure to bring the wall bounding the hole in the lever into frictional binding contact with the ram so as to restrain continued lowering thereof, means cooperating with the free end of the lever for preventing continued upward movement of the free end of the lever during the raising of the ram when the axis of the hole has attained coincidence with the axis of the ram so that the ram cannot bind in the hole in the lever during raising of the ram and means for lifting the free end of the lever so as to bring the axis of the hole in the lever into coincidence with the axis of the ram after the lever has assumed the horizontal position aforesaid when the ram is stationary under load in order to facilitate the lowering of the ram when required.

4. An hydraulic lifting jack incorporating a relatively stationary hydraulic cylinder, a ram axially displaceable within said hydraulic cylinder, a lever provided with a hole through which the ram passes, the lever being pivoted at one end to the said hydraulic cylinder and when the ram is stationary assuming a position in which the axis of the hole is oblique to the axis of the ram, the degree of obliquity being such as to permit the said lever to assume a substantially horizontal position with the wall in a non-binding relationship with the ram when the ram is stationary but to permit the lever a limited degree of turning movement with the free end moving upwardly during the raising of the ram and to permit the lever a limited degree of turning movement with the free end moving downwardly under the falling tendency of the ram in the event of the inadvertent lowering of the ram due to failure of hydraulic pressure to bring the wall bounding the hole in the lever into frictional binding contact with the ram so as to restrain continued lowering thereof, means cooperating with the free end of the lever for preventing continued upward movement of the free end of the lever during the raising of the ram when the axis of the hole has attained coincidence with the axis of the ram so that the ram cannot bind in the hole in the lever during raising of the ram, means for lifting the free end of the lever so as to bring the axis of the hole in the lever into coincidence with the axis of the ram after the lever has assumed the horizontal position aforesaid when the ram is stationary under load in order to facilitate the lowering of the ram when required and resilient means located below the lever which normally tends to urge the lever into the horizontal position in which there is a non-binding relationship with the ram but which is stressed to allow the lever to assume the binding position when necessary.

5. An hydraulic lifting jack incorporating a relatively stationary hydraulic cylinder, a ram axially displaceable within said hydraulic cylinder, a lever provided with a hole through which the ram passes, the lever being pivoted at one end to the said hydraulic cylinder and when the ram is stationary assuming a position in which the axis of the hole is oblique to the axis of the ram, the degree of obliquity being such as to permit the said lever to assume a substantially horizontal position with the wall in a non-binding relationship with the ram when the ram is stationary but to permit the lever a limited degree of turning movement with the free end moving upwardly during the raising of the ram and to permit the lever a limited degree of turning movement

with the free end moving downwardly under the falling tendency of the ram in the event of the inadvertent lowering of the ram due to failure of hydraulic pressure to bring the wall bounding the hole in the lever into frictional binding contact with the ram so as to restrain continued lowering thereof, means cooperating with the free end of the lever for preventing continued upward movement of the free end of the lever during the raising of the ram when the axis of the hole has attained coincidence with the axis of the ram so that the ram cannot bind in the hole in the lever during raising of the ram, a screw operated pressure relief valve for the hydraulic valve means for lifting the free end of the lever so as to bring the axis of the hole in the lever into coincidence with the axis of the ram after the lever has assumed the horizontal position aforesaid when the ram is stationary under load in order to facilitate the lowering of the ram when required, said lifting means being brought into operation to effect lifting of the lever when the said pressure relief valve is unscrewed to relieve the hydraulic pressure and allowed to assume the non-binding position when the said pressure relief valve is screwed inwardly to render the hydraulic cylinder pressure-tight, and resilient means located below the lever which normally tends to urge the lever into the horizontal position in which there is a non-binding relationship with the ram but which is stressed to allow the lever to assume the binding position when necessary.

6. An hydraulic lifting jack according to claim 3 in which means is provided for actuating said lifting means by manual effort in the event of the jamming of the lever in the binding position.

7. An hydraulic lifting jack according to claim 5 in which the pressure relief valve is provided with a frusto conical section and in which the said frusto conical section cooperates with one arm of a bell crank lever the other arm of which cooperates with the free end of the lever for effecting the lifting thereof or for permitting the lowering thereof according as to whether the relief valve is being manipulated to assume the open or closed position.

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