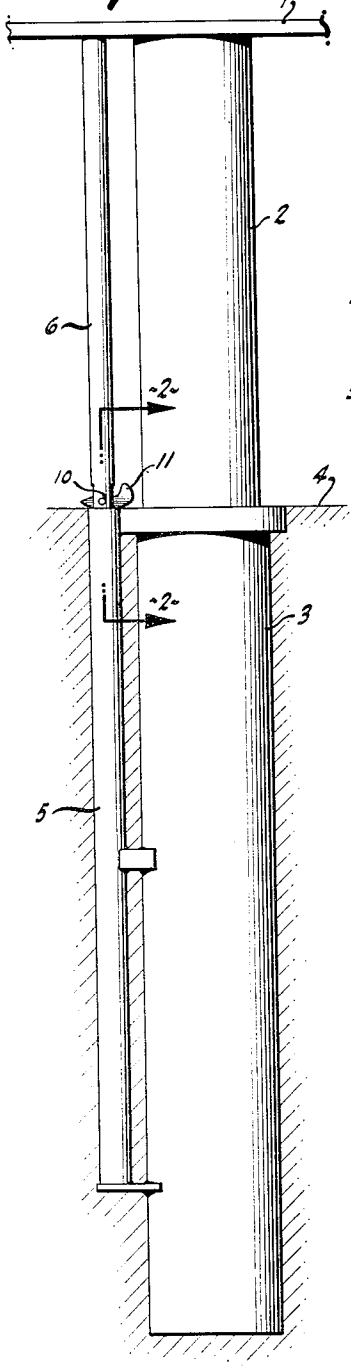
Oct. 18, 1960 J. H. HALSTEAD 2,956,643

AUTOMATIC SAFETY LEG

Filed July 2, 1957

FIG-1



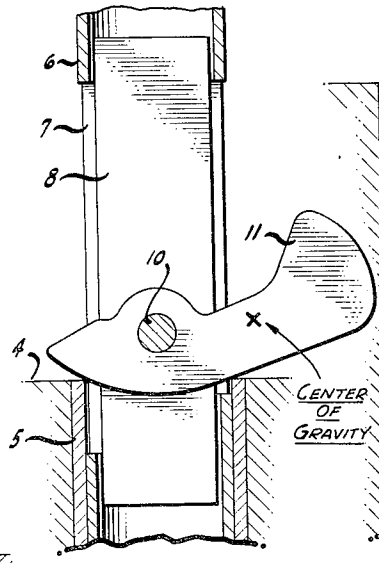


FIG-3

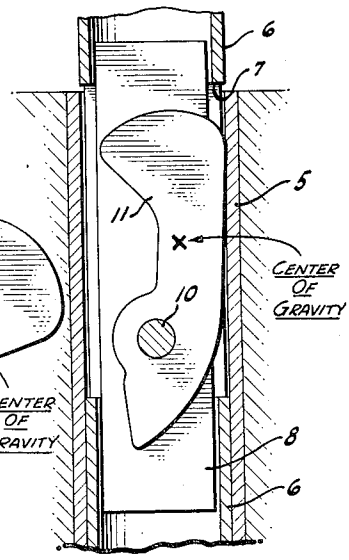


FIG-5

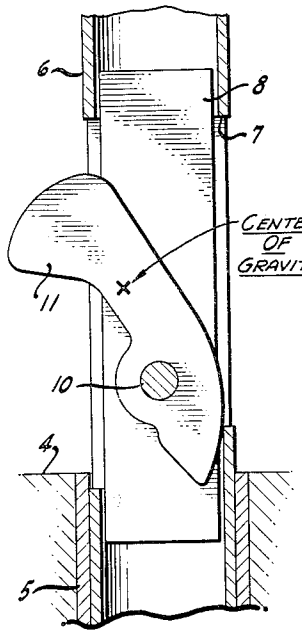


FIG-4

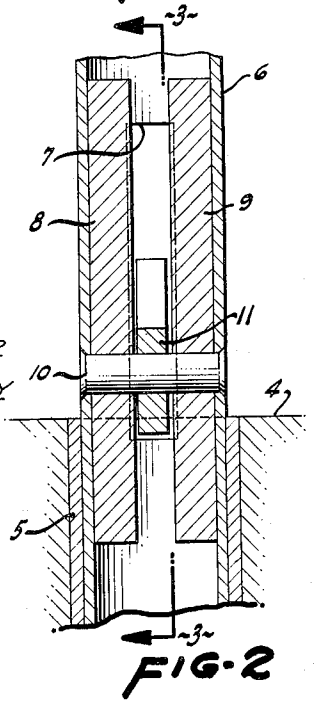


FIG-2

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AUTOMATIC SAFETY LEG

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This invention relates to automatic safety legs for use with automobile lifts, and the like, to prevent accidental falling of the lift, and for other purposes.

When a hydraulic lift is employed to raise automobiles, trucks or other vehicles for service or repair, there is some danger that the lift may fall accidentally due to failure of the hydraulic mechanism. Heretofore, such lifts have sometimes been provided with safety legs having a mechanism that stops the falling of the lift in such cases. The safety leg may also act as a non-rotator to prevent rotation of the lift. However, prior to the present invention such safety legs suffered from various defects and disadvantages, such as relatively complex and expensive construction, lack of reliability, lack of complete safety, and operating inconvenience.

Briefly stated, according to certain aspects of this invention, an automatic safety leg and non-rotator includes a vertically mounted tubular casing and an elongated piston fitting together in sliding telescopic relation, and a latching bar for holding the piston in a raised, extended position relative to the tubular casing. The piston is attached to, and moves up and down with the lift, while the casing remains stationary. The latching bar is rotatively mounted in a diametric slot in the piston so that the latching bar can be rotated through an obtuse angle between a latched position, substantially horizontal and perpendicular to the axis of the piston, and a reset position, slanted with respect to the longitudinal axis of the piston. In the course of rotation between its horizontal, latched position and its slanted, reset position the latching bar passes through an unlatched position, substantially vertical and parallel to the longitudinal axis of the piston.

In the latched position the latching bar extends outward from both sides of the diametric slot in the piston, above the top end of the tubular casing. If the lift begins to fall the two projecting ends of the latching bar abut on opposite sides of an end of the tubular casing. This prevents retraction of the piston into the tubular casing and stops the falling of the lift. In the unlatched position the latching bar lies substantially wholly within the slot in the piston and fits into the tubular casing so that the piston can be retracted into the casing. In the reset position only an upper end of the latching bar extends out of the slot in the piston so that, as the piston is retracted into the casing, the casing rotates the latching bar from its reset position to its unlatched position.

In its unlatched position within the casing, the latching bar is unbalanced with respect to its rotative mounting within the slot of the piston. However, the casing holds the latching bar in the unlatched position as long as the piston is in a retracted position. When the piston is moved to an extended position relative to the casing, by raising the lift for example, the latching bar rotates under the influence of gravity from its unlatched position to its latched position. Therefore, the latching operation is fully automatic and takes place each time that

the lift is raised. Before the lift can be lowered, the latching bar must be rotated from its latched position to its reset position. This can be done simply by kicking, pressing or otherwise applying rotational force to the latching bar. The latching bar will remain in its reset position until the lift is lowered and the piston is retracted into the tubular casing. As the piston is retracted, the casing automatically rotates the latching bar from its reset position to its unlatched position, ready for another cycle of operation.

Thus, an automatic safety leg is provided with a simple, convenient, latching mechanism that is fully automatic in operation except for the manual reset required before the lift can be lowered. Because the latching operation is automatic, workmen cannot forget to use the safety device. The construction is simple, and requires no springs or the like. Therefore, the construction is not only relatively inexpensive but is also highly reliable and provides maximum safety. Although intended primarily for use with vehicle lifts, it is evident that the improved safety leg can be used advantageously in many other environments.

The foregoing and other aspects of this invention may be better understood from the following illustrative description and accompanying drawings. The scope of the invention is defined by the appended claims.

In the drawings:

Fig. 1 is a schematic fragmentary view of an hydraulic vehicle lift and novel safety leg;

Fig. 2 is a fragmentary vertical section of the safety leg, taken along the line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken along the line 3—3 of Fig. 2, showing the latching bar in the latched position;

Fig. 4 is a section generally similar to Fig. 3 but showing the latching bar in the reset position; and

Fig. 5 is a section generally similar to Fig. 3 but showing the piston partly retracted into the tubular casing with the latching bar in the unlatched position.

Referring to Fig. 1 of the drawings, a vehicle lift includes a horizontal frame 1 that can be raised and lowered by a conventional hydraulic mechanism comprising a piston 2 fitting in telescopic sliding relation into a cylinder 3. The cylinder is usually buried in the ground or is otherwise mounted below the floor level. In the drawings, the floor level is represented by horizontal line 4. Frame 1 is raised and lowered in the customary manner by injecting and withdrawing oil into and from the interior of cylinder 3 below the bottom of piston 2, by conventional means not illustrated in the drawings. In the event of a failure of the hydraulic mechanism (for example, due to the supply of oil being low, or a broken oil supply or air line) there is some danger that the lift may fall accidentally and crush anyone or anything below it, as well as possibly damage the vehicle supported on the lift. This is prevented by the automatic safety leg that will now be described. The safety leg also serves as a non-rotator for preventing undesired rotations of frame 1.

The automatic safety leg includes a vertical tubular metal casing 5 that is rigidly attached to cylinder 3, or is otherwise mounted in fixed position, usually below the floor level. The top end of casing 5 is open and preferably is located at the floor level, as shown. An elongated piston 6 preferably is made from a rigid length of metal tubing. The piston fits in vertically sliding, telecopic relation into the top end of casing 5, so that piston 6 can be moved selectively to raised, extended and to lowered, retracted positions relative to casing 5. The upper end of piston 6 is attached to frame 1 so that piston 6 is raised to an extended position when frame 1 is raised by the hydraulic lift mechanism, and

piston 6 is lowered to a retracted position when frame 1 is lowered. The lower end of piston 6 always remains inside of casing 5. Consequently, casing 5 and piston 6, in addition to their other functions herein described, serve as a non-rotator for preventing rotation of frame 1, in a horizontal plane.

Piston 6 is provided with a diametric slot 7, as is best shown in Figs. 2 through 5. Strengthening members 8 and 9 may be welded inside of tubular piston 6 on each side of slot 7, as shown, to strengthen the piston in the vicinity of the diametric slot. Members 8 and 9 are spaced apart so that slot 7 extends completely through the diameter of the piston. In an extended position of piston 6, slot 7 lies substantially above and outside of casing 5. In retracted positions of piston 6, slot 7 lies inside of casing 5. A horizontal pin is attached to piston 6 and extends transversely across slot 7, as shown. In the drawings, pin 10 is slightly off-center with respect to the vertical axis of the piston, but this is not an essential feature of the invention.

A latching bar 11 is rotatively mounted on pin 10 in such a way that bar 11 can be rotated through an obtuse angle between the substantially horizontal position shown in Figs. 1, 2 and 3, and the slanted position shown in Fig. 4. In the course of rotation between the positions shown in Figs. 3 and 4, respectively, latching bar 11 passes through the substantially vertical position that is shown in Fig. 5. For reasons that will become clearer as the description proceeds, the substantially horizontal position of bar 11, shown in Fig. 3, is herein called the latched position of the latching bar. The slanted position of bar 11, shown in Fig. 4, is herein called the reset position of the latching bar. The substantially vertical position of bar 11, shown in Fig. 5, is herein called the unlatched position of the latching bar.

When latching bar 11 is in its substantially horizontal latched position, as shown in Figs. 1 through 3, opposite ends of the latching bar extend outward from opposite sides of slot 7, as shown. If frame 1 starts to fall while latching bar 11 is in its latched position, the latching bar abuts on opposite sides of the upper end of casing 5, as is best shown in Fig. 3, and holds piston 6 in a raised, extended position relative to casing 5. This prevents frame 1 from falling accidentally while latching bar 11 is in its latched position.

When latching bar 11 is in its reset position, as shown in Fig. 4, the lower end of the latching bar lies fully within slot 7 and fits into casing 5, so that piston 6 can move downward relative to casing 5. The upper end of latching bar 11 extends outward from one side of slot 7, as shown. As piston 6 is lowered into casing 5, the casing engages the outwardly extending upper portion of bar 11 and automatically rotates bar 11 to the substantially vertical unlatched position shown in Fig. 5.

When bar 11 is in the unlatched position shown in Fig. 5, the latching bar lies substantially wholly within slot 7 and fits into casing 5, as shown, so that piston 6 can move downward to a lowered, retracted position in casing 5.

Pin 10 passes transversely through latching bar 11 at a location that is displaced from the center of gravity of the latching bar in such a way that the center of gravity is horizontally displaced to the same side of pin 10 in both the latched position (Fig. 3) and the unlatched position (Fig. 5) of the latching bar. The approximate position of the center of gravity of the latching bar is marked by an X in the drawing. Therefore, the latching bar in its unlatched position is unbalanced with respect to its rotative mounting in slot 7, so that latching bar 11 tends to fall automatically from its unlatched position to its latched position whenever piston 6 is moved upward from a retracted position to an extended position relative to casing 5. As long as piston 6 is in a retracted position, casing 5 holds latching bar 11 in its unlatched position. Rotation of bar 11 substantially beyond the latched position shown in Fig. 3 is prevented by the abutment of bar 11 on the lower edge of slot 7, so that bar 11 will not fall substantially below its normal latched position, no matter how far piston 6 may be raised vertically above the top end of the casing 5.

In the reset position of bar 11, shown in Fig. 4, the center of gravity of the latching bar is displaced horizontally to the other side of pin 10 so that gravity inhibits the rotation of bar 11 from its reset position toward its latched position. Rotation of bar 11 beyond the reset position is prevented by abutment of the lower end of the latching bar on the inner wall of tubular piston 6.

Thus, stop means is provided for limiting the rotation of bar 11 within slot 7 to an obtuse angle slightly greater than 90 degrees. The total angular rotation of bar 11 between its latched and reset positions is not critical, so long as the center of gravity of the latching bar lies to the same side of pin 10 in the unlatched and latched positions of the bar and lies to the other side of pin 10 in the the reset position of the bar. Furthermore, in the reset position the lower end of bar 11 must lie within slot 7 so that piston 6 can move downward into casing 5, and this requirement generally limits the total allowable rotation of bar 11 to something less than 180 degrees. Therefore, the allowable rotation of latching bar 11 will generally be something between 90 and 180 degrees, or an obtuse angle.

The shape of the latching bar is not critical, provided the operating relationships herein explained are achieved. The shape shown in the drawings has been found to provide exceptionally good operation and is considered to be the preferred shape. The curved bottom edge of the bar in its latched position, as best shown in Fig. 3, has the advantage that the latch automatically drops to the latched position upon movement of piston 6 upward by only a small amount above the position shown in Fig. 3.

The automatic safety leg operates as follows: When frame 1 is substantially at floor level, piston 6 is in a lowered retracted position relative to casing 5, slot 7 lies within casing 5, and latching bar 11 is held by the casing substantially in the unlatched position shown in Fig. 5. When frame 1 is raised by the hydraulic lift mechanism, piston 6 is drawn upward to a raised extended position relative to casing 5, and slot 7 moves outside of casing 5. In the fully raised position of the lift, latching bar 11 is usually about 2 inches above the top end of casing 5. As soon as slot 7 and the latching bar mounted therein are drawn out of casing 5, latching bar 7 falls automatically under the influence of gravity to its substantially horizontal latched position. If the hydraulic mechanism should now fail, and the lift began to fall, frame 1 could fall a distance of only about 2 inches, whereupon the lower edge of latching bar 11 would abut on opposite sides of the upper end of casing 5, as shown in Fig. 3, to prevent piston 6, and therefore the entire lift, from falling any further. Thus, an effective automatic safety device is provided, which safely and reliably prevents the accidental falling of frame 1.

Now assume that the lift is in its fully raised position, with the latching bar slightly above the position shown in Fig. 3, and that it is desired to lower the lift by normal operation of the hydraulic lift mechanism. Latching bar 11 is moved from its latched position to its reset position. This can be done simply by kicking, pressing upon, or otherwise applying rotative force to latching bar 11. When the latching bar is in its reset position, piston 6 can move downward to a retracted position within casing 5, and the lift can be lowered. As the lift is lowered, the casing automatically rotates latching bar 11 from its reset position to its unlatched position, whereupon the apparatus is automatically conditioned for another automatic cycle of operation.

It is evident that the improved safety leg herein described is of an exceedingly simple and economical con-

struction. Because of this simple construction, and the fact that no springs or the like are required in the latching mechanism, the new safety leg is extremely reliable in operation. Of course this is of great importance in a safety device. Furthermore, because of the automatic nature of the locking action, the operator cannot forget to use the safety device. Consequently, the utmost safety is provided and, at the same time, use of the new safety leg is exceptionally simple and convenient.

It should be understood that this invention in its broader aspects is not limited to the specific example herein illustrated and described. The following claims are intended to cover all changes and modifications within the true spirit and scope of the invention.

What is claimed is:

1. An automatic safety leg for vehicle lifts, comprising a vertical, tubular casing having an open top end, an elongated, cylindrical piston fitting in vertically sliding, telescopic relation into said casing and extending a slidably adjustable distance upward above said open top end, said piston containing a diametric slot that rises above the top end of said casing as the piston slides upward and moves into the casing as the piston slides downward, a latching bar, means rotatively supporting said bar within said slot for rotation therein about a horizontal axis, and the piston having means limiting such rotation to an obtuse angle between a substantially horizontal position of the latching bar and an oblique position of the latching bar, the bar in rotation passing through a substantially vertical position between said horizontal position and said oblique position, the center of gravity of said bar being both above and to one side of the axis of rotation when the bar is vertical, and to the same side when the bar is horizontal, so that the latching bar rotates automatically from said vertical position to said horizontal position under the influence of gravity whenever said slot rises above the top end of said casing, the center of gravity of said bar passing over to the other side of the axis of rotation when said bar is rotated from said vertical position to said oblique position, the heavier end of said bar being sufficiently long and wide to project outward from said slot in one direction when the latching bar is in said horizontal position and to project outward from said slot in the opposite direction when the latching bar is in said oblique position, the width of said heavier end being approximately equal to the inside diameter of said casing, whereby said bar is automatically rotated to said vertical position whenever said slot moves into said casing, the lighter end of said bar being of such length and width that it projects outward from said slot opposite said heavier end only when the latching bar is in said horizontal position, the two projecting ends of said bar in the horizontal position extending over diametrically opposite portions of the upper end of said casing and thus restricting downward movement of the piston, whereby the piston is automatically latched in a raised position whenever said slot is raised above the top end of said casing, and may thereafter be released for lowering by rotating said bar to said oblique position.

2. An automatic safety leg for vehicle lifts, comprising a vertical, tubular casing having an open top end, an elongated, cylindrical piston fitting in vertically sliding, telescopic relation into said casing and extending a slidably adjustable distance upward above said open top end, said piston containing a diametric slot that rises above the top end of said casing as the piston slides upward and moves into the casing as the piston slides downward, a horizontal pin attached to said piston and extending across said slot, and a latching bar disposed in said slot and rotatively mounted upon said pin, said bar being sufficiently long that its two ends project outward from opposite sides of said slot when the bar is horizontal, extending over diametrically opposite portions of the upper end of said casing and thereby limiting downward motion of said piston, one end of said bar being longer and heavier than the other, said longer end having a substantially straight lower edge and the shorter end having an upwardly curved lower edge as viewed with the bar horizontal, a part of said piston at the bottom of said slot being in contact with the lower edge of the longer end of said latching bar when said bar is substantially horizontal, thereby limiting rotation of said bar in one direction, said slot having sufficient vertical length that both ends of said bar can enter the slot when the bar is turned to a vertical position by raising its longer end, a part of the piston at the lower end of said slot contacting the curved edge of the shorter end of said bar as the bar is turned past the vertical to an oblique position, whereby rotation of said bar about said pin is limited to an obtuse angle between said horizontal and oblique positions, the longer end of said bar having an outer portion that is substantially as wide as the inside diameter of said casing, whereby the latching bar is automatically rotated from its oblique position to its vertical position whenever said slot moves into said casing, the upper edge of the latching bar, as viewed in the horizontal position of the bar, being partially cut away sufficiently that the center of gravity of the latching bar lies to the same side of said pin when the bar is vertical as when the bar is horizontal, whereby the bar falls automatically, under the influence of gravity, from its vertical to its horizontal position whenever said slot is raised above the top of said casing, said center of gravity passing over to the other side of said pin when the latching bar is rotated to its oblique position.

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