Nov. 22, 1938. O. A. STRASSMAN 2,137,743

AUTOMOBILE LIFT

Filed April 10, 1936 2 Sheets-Sheet 1

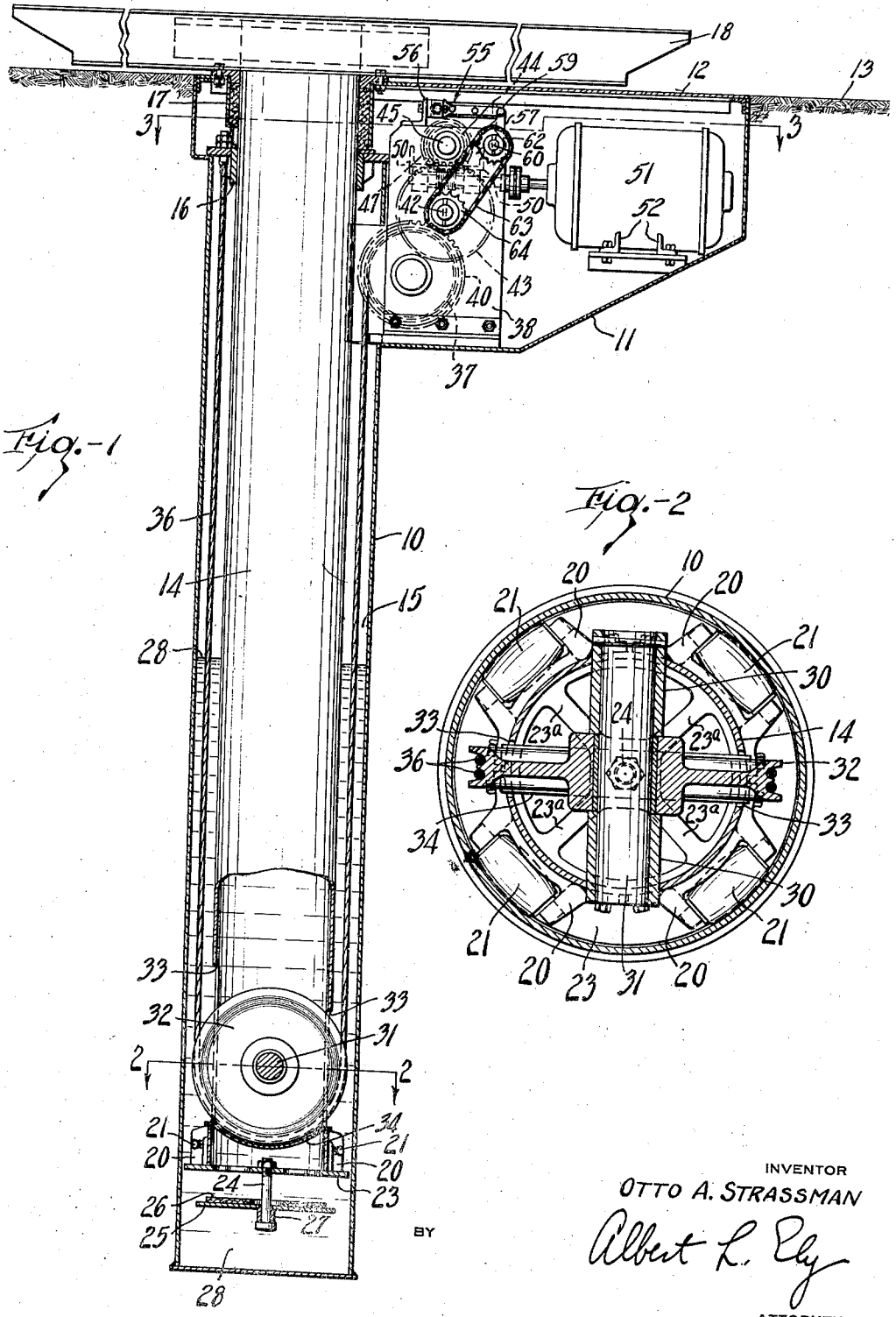


Fig.-1

Fig.-2

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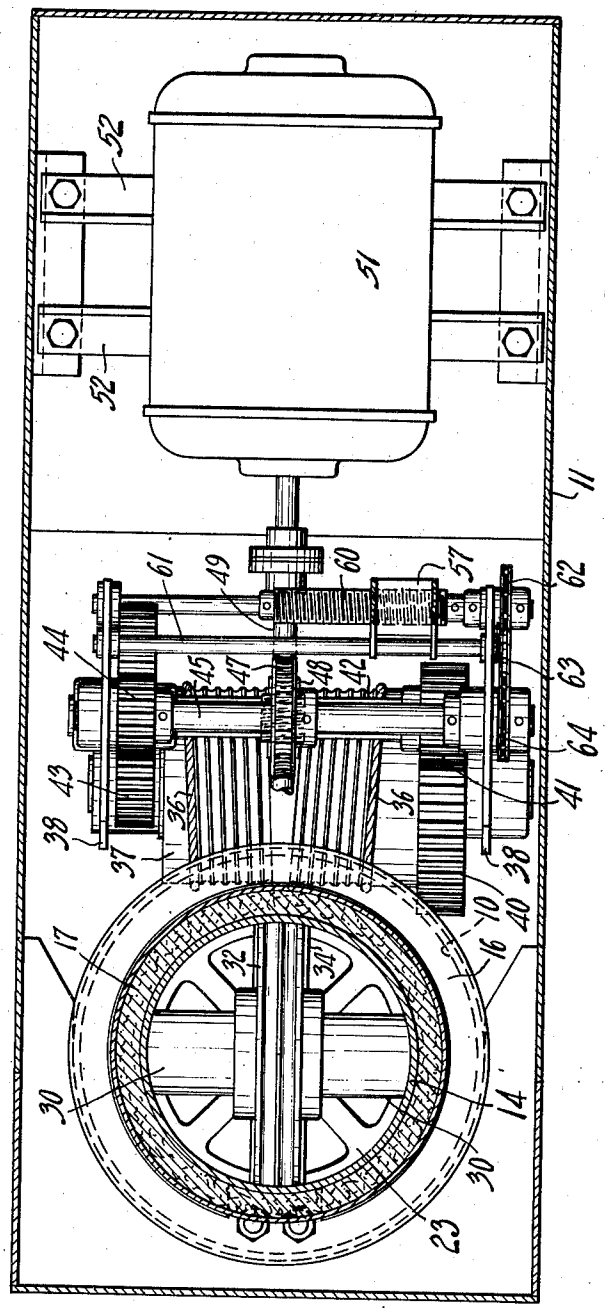


Fig.-3

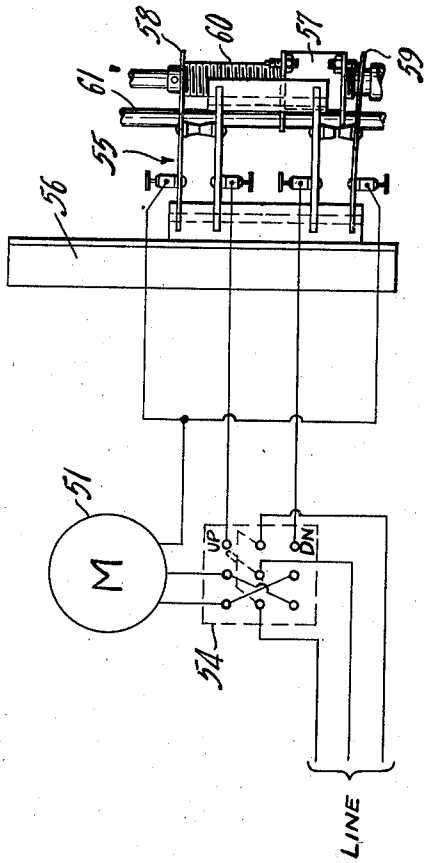


Fig.-4

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UNITED STATES PATENT OFFICE

2,137,743

AUTOMOBILE LIFT

Otto A. Strassman, Akron, Ohio, assignor of one-third to Fred C. Hardwick, Hartville, Ohio, and one-third to Perry R. Cannon, Canton, Ohio

Application April 10, 1936, Serial No. 73,675

2 Claims. (Cl. 254—148)

This invention relates to lifts or jacks such as are used, for example, for elevating motor vehicles to facilitate inspection, repair or greasing of the same, and more especially it relates to mechanically operated automobile lifts as distinguished from those operated by pneumatic or hydraulic power.

The chief objects of the invention are to provide a lift at relatively low cost as compared with the cost of hydraulic or pneumatic lifts; to provide safety mechanism operating automatically upon the failure of the lifting means for preventing rapid descent of the lift; to provide automatically for stopping the movement of the lift when it attains fully elevated or fully lowered position; and in general, to provide a simple, compact and safe power-operated lift. More specifically, the invention aims to provide hydraulically operated safety mechanism in combination with mechanical means for raising and lowering the lift; and limit switches for stopping the rotation of a reversible operating motor after the latter has made a determinate number of revolutions in either direction as a means for stopping the lift at each extremity of its range of movement. Other objects will be manifest as the specification proceeds.

Of the accompanying drawings,

Figure 1 is a vertical section through a lift embodying the invention, in its preferred form, parts thereof being shown in elevation;

Figure 2 is a section, on a larger scale, on the line 2—2 of Figure 1;

Figure 3 is a section, on a larger scale, on the line 3—3 of Figure 1, parts being broken away for clearness of illustration; and

Figure 4 is an enlarged detail plan view of the limit switches of the device, and wiring diagram showing how said switches automatically control the stopping of the motor.

Referring now to Figure 1 of the drawings, there is shown at 10 a tubular cylinder or casing that has a closed bottom and which is embedded or sunk into the ground in a garage or other suitable location, the upper end of the casing opening into a generally rectangular housing or receptacle 11. The latter has a removable cover 12 over the major portion of its structure, said cover being flush with the ground or floor designated 13. Concentrically positioned within the casing 10 is a tubular piston or post 14 that is spaced from the inner wall of the casing 10 so as to provide a substantial space or chamber 15 therebetween. At its upper end portion the piston 14 extends through a guide ring or bearing 16 and stuffing box 17, both of which are carried by the housing 11. Upon its upper end, above the ground, the piston carries a head piece or framework, generally designated 18, that is adapted to engage the undercarriage of an automobile positioned thereover, when the piston is caused to rise, for elevating said automobile.

For guiding the lower end of the piston 14, a plurality of journal brackets 20, 20 are secured to the lower end portion thereof, at equally spaced points about its periphery, and respective crowned rollers 21, 21 are journaled in said brackets, said rollers engaging the inner surface of the casing 10. The rollers 21 also assist in preventing angular movement of the piston about its axis for the reason that such movement would create sliding friction between the rollers and casing.

Secured to the bottom end of the piston 14, as by welding, is a spider 23 that has an imperforate annular marginal portion that extends like a flange beyond the outer periphery of the piston, and has but a slight clearance, (about $\frac{1}{32}$ inch) with the inner periphery of the casing 10. As is most clearly shown in Figure 2, the spider 23 comprises four symmetrically arranged spokes 23^a, 23^a, and at the intersection of said spokes, coaxially of the piston and spider, the latter is provided with a downwardly projecting stud 24 having an enlarged head at the lower end thereof. Slidably mounted upon the stub 24 and adapted for vertical movement toward and from the spider 23 is a metal disc 25 having a facing of leather 26 upon its top face and a short tubular guide-bushing 27 projecting downwardly from its lower face, about the stud 24. The disc 25 is considerably smaller in diameter than the spider 23, and the leather facing 26 is of such size as to cover the open, central portion of the spider when it is positioned thereagainst. Thus the disc 25 and facing 26 constitute a valve, which valve controls the flow of fluid past the lower end of the piston, upon occasion, as subsequently will be explained. The fluid mentioned is oil 28 with which the casing 10 is substantially half filled.

Fixed in the lower end portion of the piston 14, above spider 23, are coaxial, radially disposed sleeves 30, 30, in which sleeves a spindle 31 is non-rotatably mounted, and journaled upon said spindle, between the adjacent ends of sleeves 30, is a sheave or pulley 32. The latter is formed with two peripheral cable-grooves, and is of such diameter as to extend about half-way across the space 15 between casing and piston on each side

of the latter, the walls of the piston being longitudinally slotted at 33, 33 to permit the pulley to project therethrough. As shown, one of the slots 33 is of considerably greater length than necessary to accommodate the pulley, and said slot permits the oil 28 to flow freely between the inside and outside of the piston during axial movement of the latter. An arcuate cable-guard 34 extends transversely of the piston close to the perimeter of the pulley 32, at the bottom of the latter.

Secured at fixed points on the bearing 16 is a pair of cables 36, 36 that extend downwardly in the space 15, pass about pulley 32, and extend upwardly therefrom to a drum 37 located in the housing 11, the drum being positioned with a portion of its perimeter overhanging space 15 so that it receives the cables directly from the pulley 32 to the end that power is conserved. The perimeter of the drum 37 is formed with the usual cable-receiving grooves arranged in right and left hand helices, as shown in Figure 3. The drum is journaled in suitable bearings carried by a pair of spaced-apart vertical bearing plates 38, 38 mounted on the bottom of the housing 11.

For driving the drum 37, one end thereof is provided with a gear 40 that is meshed with a pinion 41 that is mounted upon one end of a countershaft 42 that is journaled in bearings carried by bearing plates 38. At its other end the countershaft 42 carries a gear 43 that is meshed with a pinion 44 carried upon one end of a main drive shaft 45 that is journaled in the bearing plates 38. Mounted upon the drive shaft 45, in the medial region thereof, is a worm gear 47 that is meshed with a worm 48 on a transversely disposed shaft 49, the latter being journaled in bearings carried by respective supports 50, 50, Figure 1, that are supported at their ends by the bearing plates 38. At one end the worm shaft 49 is coupled to the shaft of a reversible electric motor 51, said motor being supported upon cross-beams 52, 52 secured to the opposite sides of housing 11. The gearing described provides about a 273 to 1 speed reduction between the motor 51 and drum 37, and the speed of the motor is such that the drum makes between 6 and 7 revolutions a minute, which interval is sufficient to raise the piston 14 from the completely lowered position shown in Figure 1, to the desired position of maximum elevation (not shown).

Starting of the motor 51 is manually effected by means of a three-pole, double throw reversing switch 54, Figure 4, that may be conveniently positioned adjacent the lift, the stopping of the motor being automatically effected, after the motor has made a determinate number of revolutions, by a limit switch generally designated 55. The limit switch 55 is mounted upon a cross-beam 56 supported by the bearing plates 38, and comprises two pairs of make-and-break contacts, one blade of each of the latter projecting into the path of movement of a traveler 57. Said blades are designated 58 and 59 respectively and are so positioned that when engaged by the said traveler the respective contacts are caused to open. The traveler 57 is mounted upon a screw 60 that is journaled at its ends in the bearing plates 38, said traveler also engaging a guide-rod 61 carried by said bearing plates, parallel to screw 60. One end of the shaft of screw 60 extends through its bearing plate and is provided with a sprocket 62 that is connected by sprocket chain 63 with a sprocket 64 that is mounted upon the projecting end portion of countershaft 42.

The arrangement is such that the screw 60 is rotated in opposite directions accordingly as the reversible motor 51 is driven in opposite directions to raise or lower the head piece or framework 18, and the length and pitch of the screw is such that the traveler 57 is moved into engagement with switch-contact blades 58, 59 alternatively as said head piece reaches its maximum elevated or lower positions.

The drawings show the lift in fully lowered position, in which position the motor 51 was stopped when the traveler 57 engaged contact blade 59 of the limit switch to open the contact and thereby to open the circuit to the motor 51, as will be evident from reference to Figure 4. To elevate the lift it is only necessary to throw switch 54 to its opposite position, whereby current is delivered to the motor 51 through the closed limit switch contact 58, and the motor thereby driven in reverse direction to the direction in which it rotated during its immediately previous operative cycle. As the head piece 18 reaches its maximum elevation, traveler 57 automatically engages switch-blade 58 and opens the switch contacts, thus shutting off current to the motor and bringing the apparatus to rest. This completes a cycle of operation, which is repeated, by manual reversing of the master switch 54, when it is desired to lower the lift.

The raising of the lift is accomplished in about one minute of time, and it may be lowered in the same length of time. When the piston is rising the oil 28 in the casing 10 flows freely through the slot 33 in the piston, through the spider 23 at the bottom thereof, and around the perimeter of the valve-plate 25 suspended at the lower end of stud 24. When the piston is descending at normal speed, the oil flows in the reverse direction, the weight of the valve-plate 25 being sufficient to prevent it from being lifted by the hydrostatic pressure of the oil, the latter being very light due to the relatively slow descent of the piston. In the event, however, that the piston 14 should descend rapidly, due to breakage of the cables 36 or for any other cause, the oil will be sufficiently retarded in its passage through the piston to build up substantial hydrostatic pressure, which pressure is sufficient to force the valve plate 25 upwardly on stud 24 so that it closes the opening through the spider 23. The result is to shut off passage of the oil through the piston, which oil thereafter is forced to pass solely through the small annular passage between the periphery of the spider 23 and the casing 10. This produces a dash-pot effect which retards the descent of the piston to a safe speed.

The invention is of relatively simple construction and may be manufactured and sold more cheaply than similar lifts that are hydraulically or pneumatically operated. Moreover, it is not affected by extremes of temperatures as are hydraulic or pneumatic lifts. The safety mechanism operates automatically to protect the apparatus and operator from injury. The limit switch reduces the human factor of operation to the minimum, and the invention achieves the other advantages set out in the foregoing statement of objects.

Modifications may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A lift comprising a vertically arranged tubular casing, a cylindrical piston mounted therein and spaced from the wall thereof, mechanical

means for raising and lowering the piston, and means for guiding the lower end of the piston in the casing, said means comprising crowned rollers carried by the piston and engaging the inner surface of the casing, said rollers being spaced apart from each other, and being mounted on axes disposed at right angles to the piston so as substantially to prevent angular movement of the piston about its axis, relatively of said casing.

2. A lift comprising a vertically positioned casing closed at its lower end and partly filled with a liquid, a hollow piston slidably mounted therein and spaced from the wall thereof, the wall of said piston being apertured to permit liquid to pass therethrough, mechanical means comprising a pulley journaled in the piston upwardly of its lower end and projecting through the wall thereof for raising and lowering said piston, a spider mounted upon the lower end of said piston, said spider comprising a perforate portion of relatively large area disposed within the perimeter of the piston wall and an imperforate portion extending radially of the piston wall to close proximity of the casing wall, a valve adapted to close the central perforate portion of the spider, said valve normally being retained by gravity at a distance below said spider, and a plurality of crowned rollers carried by said piston, immediately above said spider, and engaging the inner face of the casing, said rollers being spaced apart from each other to permit the passage of liquid therebetween, and being mounted on axes disposed at right angles to the axis of the piston so as substantially to prevent angular movement of the piston relatively of the casing.

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