

Nov. 1, 1932.

L. C. STUKENBORG

1,886,253

MULTIPLE PLUNGER LIFT

Filed Feb. 24, 1930

2 Sheets-Sheet 1

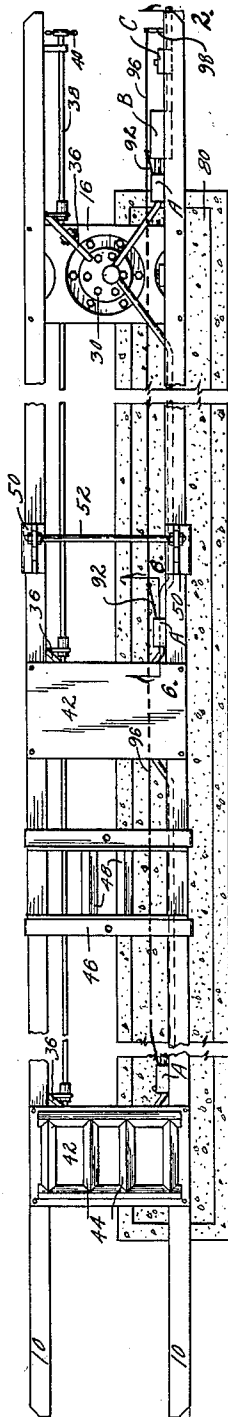


Fig. 1.

Witness
H. J. Mungerman

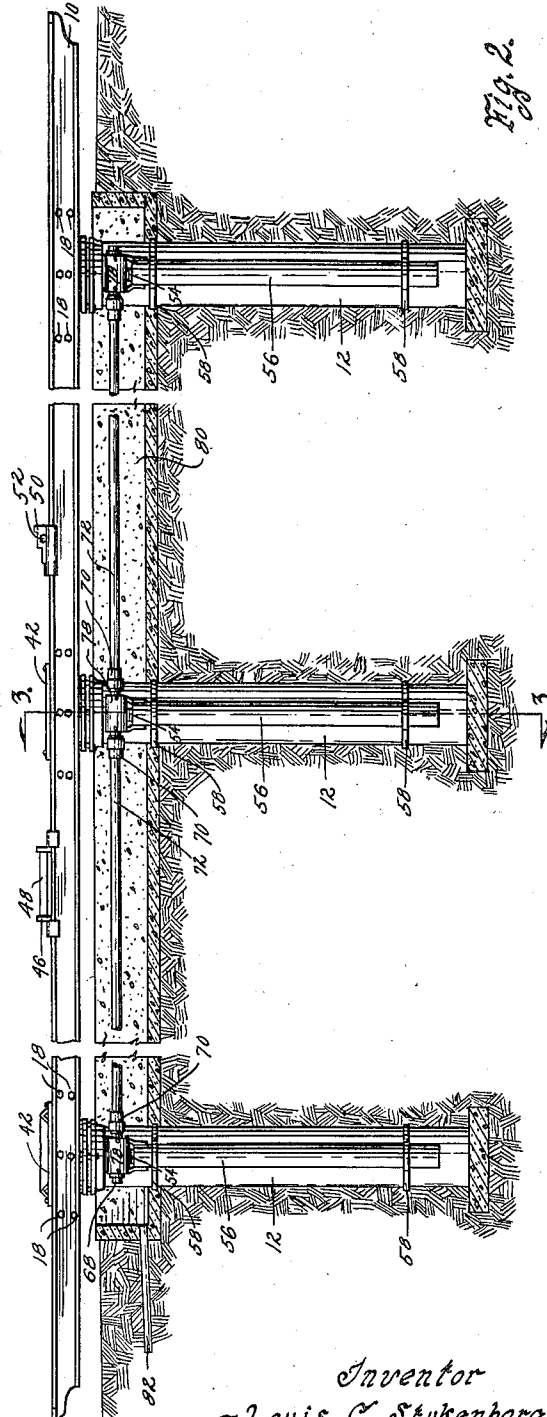


Fig. 2.

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2 Sheets-Sheet 2

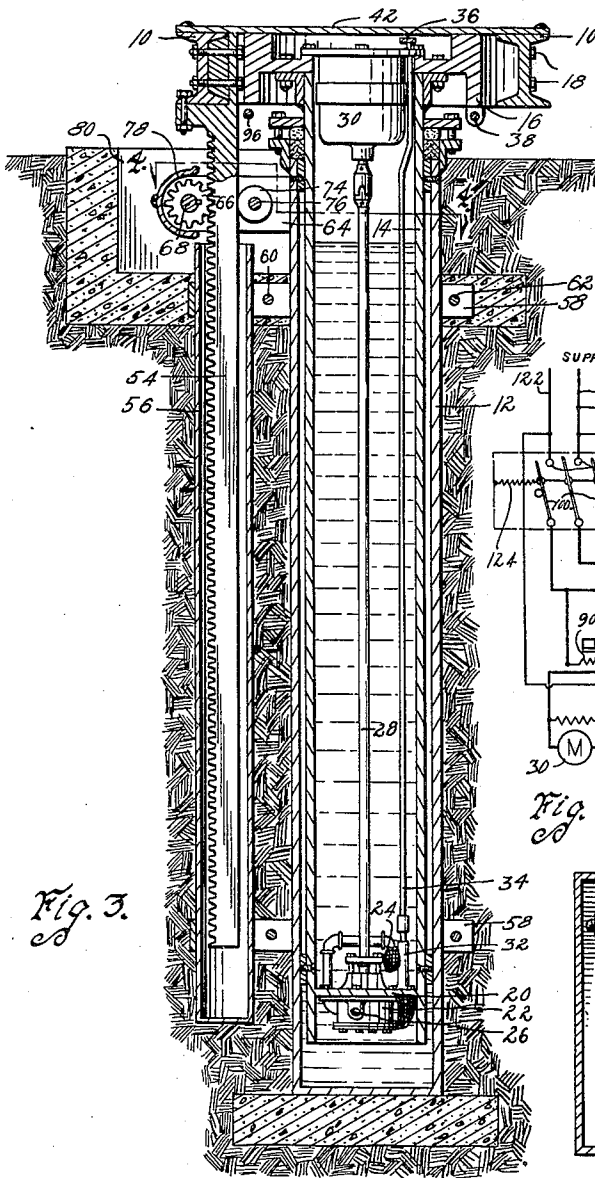


Fig. 3.

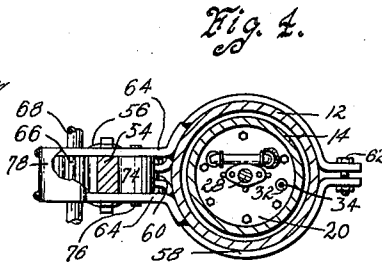


Fig. 4.

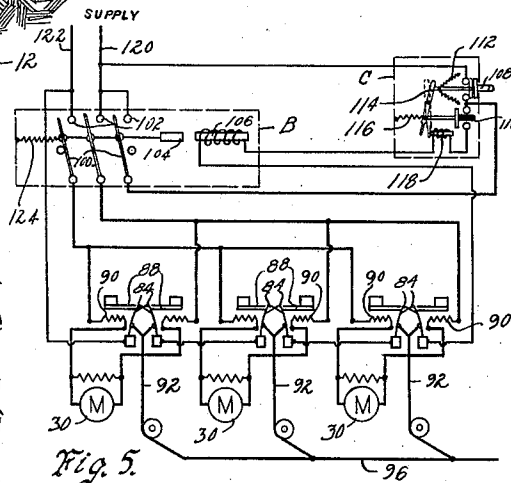


Fig. 5.

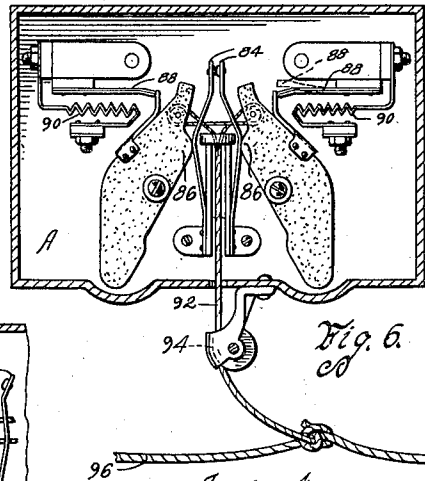
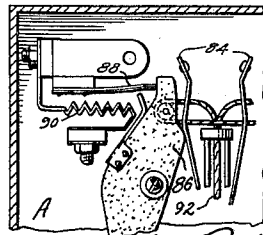


Fig. 6.

Fig. 7.



UNITED STATES PATENT OFFICE

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MULTIPLE PLUNGER LIFT

Application filed February 24, 1930. Serial No. 430,585.

10 An object of my invention is to provide a lift for busses and other large vehicles, the lift being of the multiple plunger type and being comparatively simple and durable and inexpensive to manufacture.

15 A further object is to provide a lift consisting of a vehicle support with a plurality of lift devices such as those of the hydraulic type for lifting the vehicle support, each lift device being preferably secured to the vehicle support for raising the same.

20 A further object is to provide a means for synchronizing the motion of the plurality of lift devices regardless of the weight distribution on the vehicle support, such synchronizing means being of a mechanical nature for positively insuring equal travel of each of the lift devices to prevent buckling or twisting of the vehicle support.

25 A further object is to provide in a multiple plunger lift having a motor for each lifting device, a safety means to prevent overloading of one or more of the motors so as to prevent damage to the motors due to overloading the vehicle support and distributing the weight on the support in an exceptionally uneven way.

30 Still a further object is to provide a series of plunger lifts with a motor for each lift and an overload relay for each motor, the relays being so connected that all of the motors are thrown out of circuit when any one of them is overloaded.

35 With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings. Although the invention is susceptible of a variety of embodiments, it is unnecessary to fully describe and illustrate more than one 45 in order to give a full understanding of the invention both from its structural and functional standpoints. Accordingly, I have illustrated a preferred and desirable embodiment of the invention in the accompanying drawings in which:

Figure 1 is a plan view of a multiple plunger lift embodying my invention.

Figure 2 is a sectional view of the same on the line 2—2 of Figure 1.

Figure 3 is a vertical sectional view on an enlarged scale and taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is an electrical diagrammatical view of the lift motors and controlling circuit therefor.

Figure 6 is a sectional view through an overload relay for one of the motors as taken on the line 6—6 of Figure 1 and

Figure 7 shows a fragmentary part of Figure 6 with the parts in a different position.

On the accompanying drawings I have used the reference numeral 10 to indicate the side rails of a vehicle support. The rails 10 are of substantial length for coaction with a long vehicle such as a motor bus. A plurality of lift devices each including a cylinder 12 and a plunger 14 are associated with the side rails 10 for lifting them.

A head 16 is secured to each plunger 14 and extends between the side rails 10. The heads 16 are connected with the side rails by means of cap screws 18 (see Figure 3) or may be welded to the side rails as desired.

The specific construction of the lifting devices is set forth in detail in my co-pending application, Serial Number 366,889, filed May 29, 1929. Briefly each lift device includes a partition 20 in the plunger 14 to which an oil pump 22 is secured. The oil pump 22 is adapted upon operation to draw oil through a strainer 24 from the interior of the plunger 14 which constitutes an oil reservoir and discharge it through an opening 26 below the partition 20. A shaft 28 extends from the pump 22 to an electric motor 30 mounted in the top of the plunger 14. Upon operation of the motor 30, oil will be pumped from the top of the partition 20 to the cylinder 12 below the partition for raising the supporting rails 10.

When it is desired to lower the supporting rails, oil may be released from below the par-

tition 20 to the reservoir space above the partition by opening a normally closed release valve 32 located in each plunger 14. A rod 34 extends upwardly from each release valve 32 and is adapted to be engaged by a pivoted arm 36 which in turn is operated by a rock shaft 38 and handle 40. Thus it will be seen that when the release valves 32 are opened, the weight of the lift will force oil from below the partitions 20 to the reservoir spaces above the partitions.

Each head 16 is covered with a cover plate 42 and one of the cover plates 42 as shown at the left end of Figure 1 may be provided with angles 44 welded to the cover plate to act as a seat for the differential of the bus. The remaining angles on this plate are for reinforcing purposes. An adjustable seat for the differential is provided in the form of cross bars 46 and angles 48 welded together. This device is slidable with respect to the side rails 10. Stepped castings 50 may be provided for the front axle of the bus and these are preferably connected together with a tie rod 52. This device is also slidable longitudinally with respect to the side rails 10.

When more than one plunger is used in a lift of the character herein disclosed, the problem of causing all of the plungers 14 to move with equal speed and to equal heights is involved. The problem must be especially overcome where the weight distribution of the vehicle on the side rails 10 is uneven. In the present instance I have provided for synchronization of all of the plungers 14 in the matter to now be described.

A rack bar 54 is secured adjacent each head 16 of the plungers 14 to one of the side rails 10 as best shown in Figure 3. A casing 56 is provided for each rack 54 and may be supported relative to the cylinder 12 by means of encircling bands 58 and clamp bolts 60 and 62. A pair of bearing brackets 64 is secured to each cylinder 12 as best shown in Figure 4 and the rack bar 54 extends between these brackets. A pinion 66 is mounted between the brackets and secured to a stub shaft 68. The stub shafts 68 are connected by coupling members 70 with intermediate shafts 72. The pinions 66 mesh with the rack bars 54 whereby it will be obvious that a movement of any one of the rack bars 54 will cause corresponding movement of the other rack bars and consequent equal movement of all the lift plungers 14.

A roller 74 mounted on a stub shaft 76 serves to maintain the rack bars in mesh with the pinions. A cover 78 is provided for each pinion. A pit 80 is provided extending longitudinally with respect to the lift and the intermediate shafts 72 as well as the pinions 66 and associated mechanism are located in this pit which may be suitably covered as desired. A drain pipe 82 is provided for the pit 80.

In connection with each motor 30 I provide a relay switch indicated generally by the reference character A. In connection with all the motors a main switch B and a manually operable starting and stopping switch C is provided. Each relay switch A includes a pair of contacts 84 held in closed position by cams 86 which in turn are held in the position shown in Figure 6 by thermostatic strips 88. Heating coils 90 are provided for flexing the thermostatic strips 88 to the dotted line position (or the full line position shown in Figure 7) whereupon the resilient contact strips 84 will spring apart as shown in Figure 7. A reset cord 92 is provided for each relay switch and these cords extend over pulleys 94 and are connected with a reset cord 96. The reset cord 96 may be connected with a bracket 98 adjacent the switch C for convenience of the operator in resetting the overload relays.

The main switch consists of a plurality of switch arms 100 coactable with contacts 102 upon an armature 104 being drawn toward an electro magnet 106. The manually operable starting and stopping switch C includes a starting button 108 and a stopping button 110. The button 108 is held in extended position by springs 112 and contacts with an armature arm 114 when pressed inwardly.

The stopping button 110 is connected with the armature 114 which is held normally in one position by a spring 116. An electro magnet 118 is provided for holding the armature 114 in "on" position after the button 108 has been pressed.

Practical operation

In the operation of my device when it is desired to actuate the lift for raising a vehicle, the button 108 is pressed which establishes a circuit from a supply wire 120 through the button 108, the button 110, the electro magnets 118 and 106, all of the contacts 84 of the relay switches A and back through a supply wire 122. The electro magnet 118 will then hold the stopping button 110 closed even after the starting button 108 is released. The current from the wire 120 will then flow through the right hand switch 100 and through the stopping button 110 due to the pull of the electro magnet 106 on the armature 104 so that the starting button 108 when released does not break the circuit.

The pull of electro magnet 106 on the armature 104 will also close the left and center switch arms 100 for establishing a circuit through all of the motors 30.

If the load is so distributed that it is greater on one motor than on another, then the other motors (through the rack bar and pinion interconnections) will assist the loaded motor. In the event that one motor is overloaded to such an extent that it becomes overheated, increased current flow through

it will cause the heating coils 90 of its particular relay A to flex the thermostat strips 88 and open the electric circuit through the electro magnets 106 and 118 whereupon the main switch will be opened by the spring 5 124 for cutting off the current supply to all of the motors 30 and the armature 114 will be released in the switch C to restore this switch to normal position. After conditions have been adjusted for proper operation of 10 the lift, the reset cord 96 may be pulled for resetting the relay which was opened by the overload.

Some changes may be made in the construction and arrangement of the parts of 15 my device without departing from the real spirit and purposes of my invention, and it is my intention to cover by my claims, any modified forms of structure of use of mechanical equivalents, which may be reasonably 20 included within their scope.

I claim as my invention:

1. In a multiple plunger lift, a plurality of cylinders and a plurality of plungers constituting lift devices, a vehicle support to 25 be lifted by all of said devices and an operative connection between said plungers for synchronizing their lifting motion regardless of the weight distribution on the vehicle support, said operative connection comprising 30 a bracket supported on each cylinder, an equalizer shaft journaled in said brackets, a rack bar movable with each plunger and each adjacent one of said brackets and an equalizer pinion meshing with each rack bar 35 and connected with said equalizer shaft.

2. In a multiple plunger lift, a plurality of cylinders and a plurality of plungers constituting lift devices, a vehicle support to be 40 lifted by all of said devices and an operative connection between said plungers for synchronizing their lifting motion regardless of the weight distribution on the vehicle support, said operative connection comprising 45 a bracket supported on each cylinder, an equalizer shaft journaled in said brackets, a rack bar movable with each plunger and each adjacent one of said brackets, a rack bar casing supported on each cylinder for 50 encasing said rack bars and an equalizer pinion meshing with each rack bar and connected with said equalizer shaft.

LOUIS C. STUKENBORG.

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