Sept. 29, 1936. I. V. K. HOTT ET AL 2,055,690

FLUID PRESSURE SYSTEM

Filed Feb. 9, 1933 2 Sheets-Sheet 1

FIG. 1

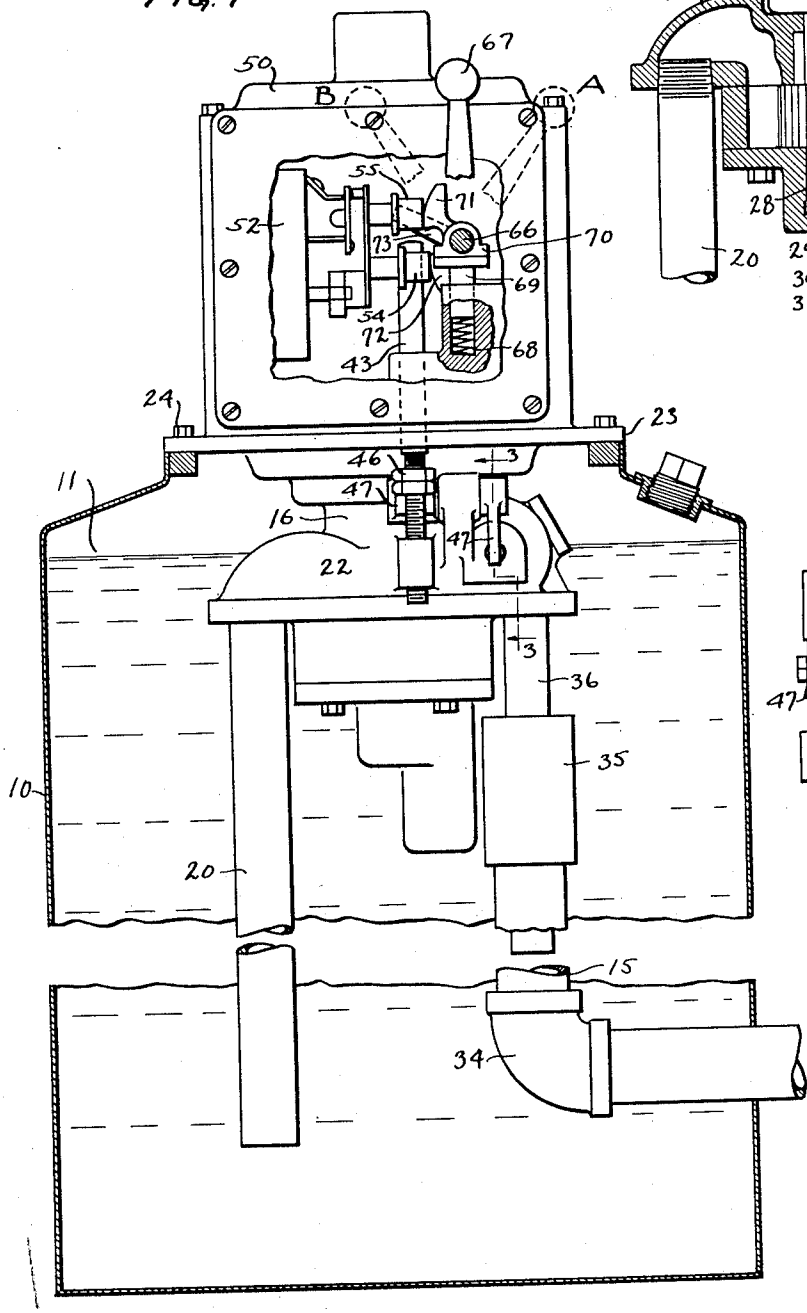


FIG. 4

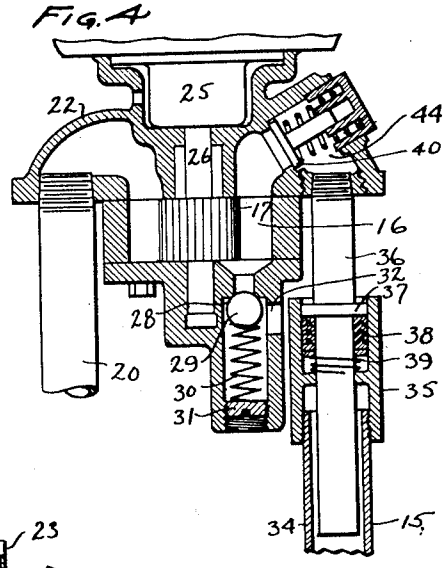
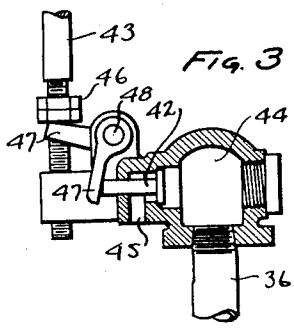


FIG. 3



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Sept. 29, 1936. I. V. K. HOTT ET AL 2,055,690

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Filed Feb. 9, 1933 2 Sheets-Sheet 2

Fig. 2

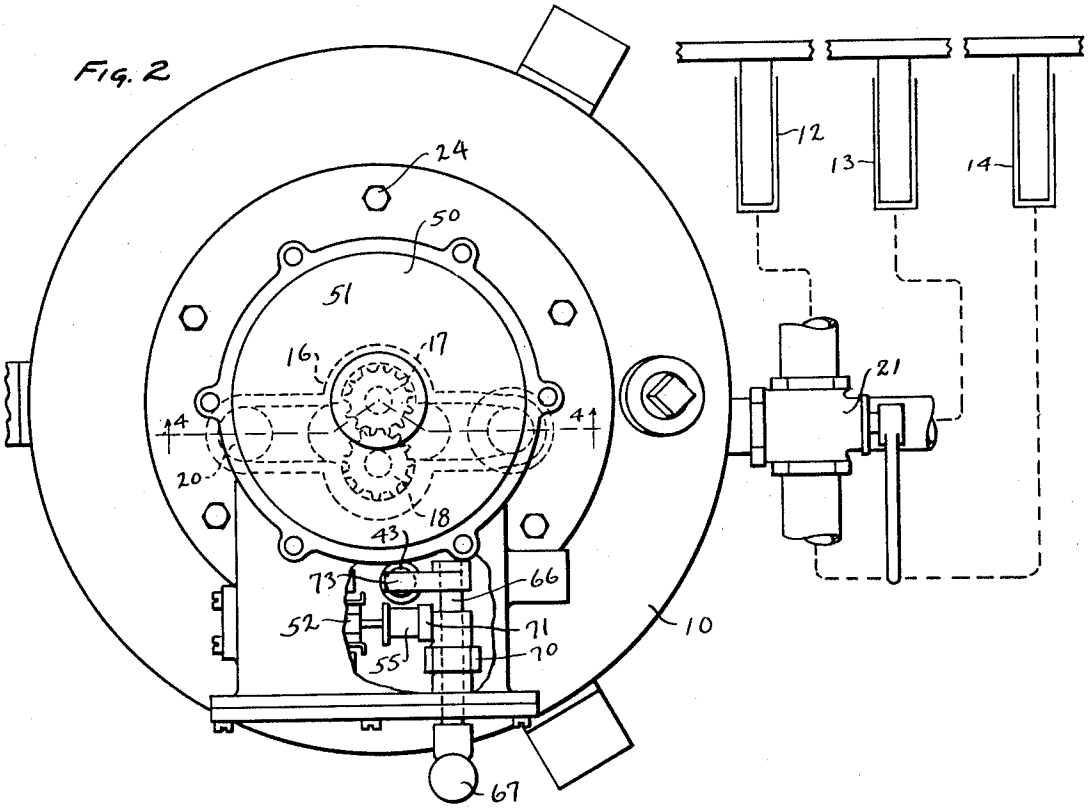
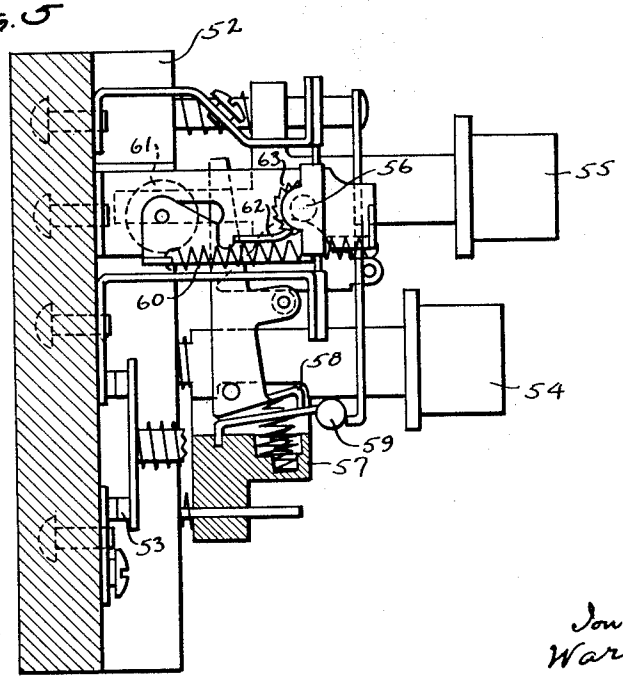


Fig. 5



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FLUID PRESSURE SYSTEM

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Application February 9, 1933, Serial No. 655,960

4 Claims. (Cl. 103—218)

This invention relates to fluid pressure systems such as are used in hydraulic lifts and the like.

One object of the invention is the provision of a fluid pressure system for hydraulic lifts and the like, in which a motor driven fluid pump is provided within a liquid tank, the motor and pump being mounted on a detachable portion of the tank so as to be readily removed from the main portion of the tank as a unit.

Another object of the invention is the provision of a fluid pressure system of the character mentioned, having a pump provided within the liquid tank, the construction being such as any leakage in the system between the pump and the pressure pipe extending from the tank is returned to the interior of the tank so that it is impossible for such leakage to find its way to the tank exterior.

Another object of the invention is the provision of a hydraulic lifting device having a motor driven pump for supplying liquid from a liquid supply tank under suitable pressure, and embodying a single manually operable member which is movable for the control of switch means to start and stop the motor and which also controls the operation of a return valve which permits the return of liquid to the tank and the lowering of the load.

Another object of the invention is the provision of a compact readily assembled hydraulic pumping system in which the possibility of leakage is minimized and in which the parts are arranged for effective operation and convenient control.

Further objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawings, in which—

Fig. 1 is a side elevation shown partly in central section and illustrating a fluid pressure lift system embodying the present invention;

Fig. 2 is a top plan view of the liquid tank and its associated apparatus;

Fig. 3 is a detailed sectional view showing the return valve and taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical section on the line 4—4 of Fig. 2; and

Fig. 5 is a side view, shown partly in a diagrammatic manner, of the motor control switch means and thermal overload device.

Referring more particularly to the drawings by reference numerals, 10 designates the body portion of a liquid tank in which is a quantity of a suitable liquid 11. This liquid may be oil or the like of suitable viscosity and with a sufficiently low freezing point to be used effectively for the transmission of power to a controlled element or elements such as the hydraulic lift devices 12, 13 and 14. The hydraulic lift devices each embodies a cylinder containing a lift piston on which may be provided an automobile supporting skeleton frame or the like. As shown, three of such lift cylinders are provided for operation by the fluid pressure system although only one or any other desired number of cylinders may be similarly arranged.

Liquid is supplied under pressure to the various lift devices or to a selected lift device through a fluid pressure passage 15 which communicates with the outlet side of a pump designated generally by the reference numeral 16. This pump is preferably provided within the tank 10 and as shown embodies two intermeshing impeller gears 17 and 18. The inlet side of the pump is connected by means of a pipe 20 to a low portion of the tank. It will now be apparent that when the pump 16 is operated some of the liquid 11 in the supply tank 10 will be drawn up through the pipe 20 and forced out through the pressure supply passage 15 to one of the lift cylinders 12, 13 or 14 dependent upon the position of the valve 21 which selectively places any one of these lift cylinders in communication with the passage 15. The fluid supplied through the passage 15 will cause the automobile or other load to be lifted vertically where it is in a convenient and accessible position.

The pump gears 17 and 18 operate in a pump housing 22 which is supported from and on the lower side of a cover plate 23 which is detachably connected by bolts or screws 24 at the top of the tank 10. Rotatably supported in the cover 23 is the end 25 of a motor shaft which is connected to the shaft 26 of the pump gear 17.

The pump, as is evident from Fig. 1, has its inlet and outlet openings both provided a suitable distance above the level of the top of the impelling gears so that pump casing will always remain full of liquid, thus obviating the necessity of priming after periods of inactivity. While the liquid level is preferably near the top of the tank it will be obvious that when the lift cylinders are full of oil the liquid level in the supply tank 10 may be considerably below the bottom of the pump, but even under such conditions the pump will remain full of oil for an indefinite period as above explained.

Provided in the pump housing at a point adjacent the pump outlet is a bypass valve 28 preferably comprising a ball 29 held against its seat by means of a spring 30, the tension of which is readily controllable by an adjusting screw 31. The spring 30 is so tensioned that the valve remains closed during normal operations, but if too great a load is on the lift or if the lift is positively stopped at the upper end of its limit of movement the pressures on the outlet side of the pump will increase and automatically open the valve, returning the liquid through a passage 32 directly to the main body of liquid in the tank.

The fluid pressure passage 15 comprises separable pipe sections. The lower pipe section 34, which is permanently fixed in a liquid-tight manner in the wall of the tank, extends upwardly and at its upper end is provided with a sleeve extension 35 in telescopic relation with the downwardly projecting end of the upper pipe section 36, the top of which is secured to the pump housing. On the pipe section 36 is a flange 37 below which is a pressure-tight packing gland or gasket 38. The gasket 38 preferably embodies a series of disks of oil treated rubber normally placed under sufficient compression by means of the spring 39 to prevent loss of fluid through the joint between the pipe sections. When the pressure in the passage 15 is high, as when the pump is in operation, the increased tendency for leakage past the gasket is prevented by the compression forces tending to hold and expand the gasket and therefore more effectively sealing the joint. The connection between the two pipe sections, however, is such that the upper pipe section 36 may be readily withdrawn upwardly or may be readily inserted merely by moving it downwardly. As previously mentioned the pump housing is secured on the cover 23, so that it will be apparent that when the cover 23 is removed, the pump together with the upper pipe section 36 are withdrawn from the tank as a unit.

In the passage 15 extending from the outlet side of the pump is a spring pressed check valve 40 which serves to prevent return flow of liquid to the pump but which permits flow from the pump out through the pipe section 36. Beyond the check valve 40 is a return valve 42, see Figs. 1 and 3. This valve is normally seated by the pressure of the liquid in the supply passage 15, but is adapted to be opened by means of a plunger 43 in order to place the chamber 44 in direct communication with a passage 45 extending to the main liquid supply in the tank 10.

When the valve 42 is opened it will be apparent that a return flow is permitted from the lift cylinders through the passage 15 back to the tank so that the load can descend. The plunger 43 which controls this valve is guided for endwise reciprocatory movement in the cover 23 and is provided with an abutment 46 engaging a double armed lever 47 fixed to a rotatable shaft 48. It will be apparent that when the rod 43 is depressed the valve 42 will be opened and vice versa.

The pump impelling means is driven directly from an electric motor 50 which is supported on the upper side of the cover 23 externally of the tank. The motor 50 is preferably a high speed single or multiple-phase motor having an armature rotatable on a vertical axis so that the motor shaft extends vertically downwardly and is directly connected to one of the pump gears. The motor is provided in an explosion resisting casing 51 suitably sealed against the entrance of explosive gases.

The operation of the motor 50 is controlled by the switch means and the thermal overload device of the controller 52. The controller 52 comprises a plurality of switches 53 which can be connected in parallel to a single-phase supply line or which can be connected to two of the phases of a three-phase supply. The switches 53 are adapted to be closed and the motor started when the element 54 is moved to the left from its position shown in Fig. 1 to the position indicated in Fig. 5. The motor is deenergized and the switches 53 opened when the switch opening element 55 is moved to the left from the position shown in Fig. 4 to that shown in Fig. 1. The thermal over load device 56 is reset when the switch opening element 55 is moved to its extreme left-hand position, after the parts cool.

When the element 54 is moved to the left to start the motor it forces the switch closing member 57 to closed position through the operation of the pivoted lever 58 which is pivotally mounted on the closing member 57 and held in a notch on the element 54 by means of a spring so that 54 and 58 normally move together. A spring pressed holding lever 59 keeps the switch closed as shown in Fig. 5, but is released to permit the switch to open when the element 55 is moved to the left and cams downwardly on a projection on the lever 58, thus forcing the holding lever 59 outwardly. This same action obtains if the spring 60 pulls the release block 61 to the right although normally the block 61 is held in the retracted position illustrated by a stop 62 engaging the toothed element 63 of the thermal overload release 56. The toothed element 63 is fixed to a shaft which is held rigidly to a support by solder or other normally solid material capable of melting when subjected to excess heat. Melting the solder permits the toothed element 63 to rotate freely and releases the block 61 which automatically opens the switch. When the solder cools and solidifies the block 61 can be forced back and the stop 62 reengaged with toothed element 63 by forcing the element 55 fully to the left.

Rotatably supported in the housing 65 in which the motor controlling devices are sealed in an explosion resisting manner is a shaft 66 on the projecting end of which is fixed a hand lever 67. The hand lever 67 normally stands in an upright position as shown in Fig. 1, being yieldingly maintained in that position by a spring 68 which holds a plunger 69 yieldingly against the flat lower side of an element 70 fixed on the shaft 66. When the handle 67 is moved away from its normal position illustrated the spring 68 will tend to return it. Fixed on the shaft 66 is a cam 71 engageable with the switch opening element 55. A second cam 72 on the shaft 66 is engageable with the element 54. An arm 73 is also provided on the shaft 66 adapted for engagement with the upper end of the plunger 43 which controls the return valve. The lever 67 may be moved to the right to the dotted line position as shown at A so as to force the element 54 to the left and cause the motor to start operating. The element 67 normally stands as shown in full lines, in which position the stop element 55 is held far enough to the left so that the switch is opened. It may be moved further to the left to the dotted line position shown at B (the element 55 moving back further) so as to bring the arm 73 into engagement with the plunger 43, depressing the plunger and thus opening the return valve 42. When the arm 67 is moved to the dotted line position shown at B the thermal overload device will be reset if it has been operated and interrupted the motor circuit. It will be apparent that when the handle 67 is upright in its normal position the lift device or load will be held in whatever position it is in, as the motor under such conditions is stationary and the return valve 42 is closed.

It will now be apparent that due to the manner in which the motor and pump are supported from the cover 23, and by reason of the arrangement of the parts as previously described, the entire motor and pump assembly can be readily detached and removed as a unit without disturbing the driving connection between the motor and the pump and

without disturbing the various valves and the operating means of the return valve. The various motor and pump elements and the controlling devices therefor are arranged as a compact readily assembled mechanism of comparatively few moving parts. The single manually controlled handle provides for convenient operation of the lift, being arranged to start the motor, to stop the motor, to reset the thermal overload devices, and to cause lowering of the load by operation of the return valve in the fluid pressure passage, as desired.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A fluid pressure supply unit adapted for connection to a hoist comprising a stationary reservoir tank for liquid, having a body portion and a removable top cover plate therefor, a pump mounted within the upper portion of the tank on the lower side of said cover plate, said pump having an inlet pipe in communication with the lower end of the tank, a vertical electric motor mounted on said cover plate on the outside of said tank and having a direct driving connection with said pump, a pressure supply pipe extending from the outlet side of said pump to a point in the tank below the pump, a pipe section fixed in the body portion of the tank and extending from said point to the exterior of the tank and having a telescopic connection with said supply pipe, said motor, pump and supply pipe being removable as a unit with said cover plate from the body portion of the tank, a motor starting switch and an operating handle therefor supported on said tank, and a lowering valve having a mechanical connection with said operating handle for placing said pressure supply pipe in direct communication with the interior of the tank, said operating handle having means normally holding it and returning it to a neutral position in which the motor starting switch is open and the lowering valve is closed.

2. In a fluid pressure system of the character described, a stationary liquid tank, a liquid pump having its inlet side in communication with the lower portion of said tank, an electric motor for operating said pump, a fluid pressure pipe extending from the outlet side of said pump, a check valve in said passage preventing return flow to the pump, a return valve provided in said passage beyond said check valve for returning liquid to the tank, a bypass valve ahead of said check valve and returning liquid to the tank from the outlet side of the pump when a predetermined pressure is obtained, switch means controlling the starting and stopping of the motor, a thermal overload device associated with said switch means for automatically interrupting the motor circuit when the motor is thermally overloaded, a single manually operable control member adjustable about a fixed axis to various positions, means for yieldingly holding said control member in a normal one of said positions, means for operating said switch means to start the motor when said member is moved about its axis to a second position, means for operating said switch means to stop the motor when said member is moved about its axis to its normal position, means for resetting said thermal overload device when said member is moved about its axis to a third position, and means mechanically connected to said return valve for opening said return valve when said member is moved to its third position.

3. A self-contained fluid pressure supply unit adapted for installation in any location and for connection to a remote hoist, comprising a stationary reservoir tank for liquid having a removable top cover plate, a liquid pump mounted in the upper portion of the tank on the lower side of said cover plate, said pump having an inlet pipe in communication with the lower portion of the tank interior, an electric motor mounted on said cover plate on the outside of said tank and having a direct driving connection with said pump, said pump and motor being removable as a unit with said cover plate, a fluid pressure supply passage extending from the outlet side of said pump to the exterior of the tank, a check valve in said passage preventing return flow to the pump, a return valve provided in said passage beyond the check valve for returning liquid to the tank, a bypass valve in said passage for returning liquid to the tank from the outlet side of the pump when a predetermined pressure is obtained, switch means supported by said unit and controlling the starting and stopping of said motor, and a manually operable control means provided on said unit for selectively operating said switch means to start the motor, operating said switch means to stop the motor, and opening said return valve.

4. A self-contained fluid pressure supply unit adapted for installation in any location and for connection to a remote hoist, comprising a stationary reservoir tank for liquid, having a removable top cover plate, a liquid pump mounted within the upper portion of the tank on the lower side of said cover plate and having its inlet side in communication with the lower portion of the tank interior, an electric motor mounted on said cover plate on the outside of said tank and having an operating connection to said pump, a pressure supply pipe extending from the outlet side of said pump to the exterior of the tank, a check valve in said passage preventing return flow to the pump, a return valve providing in said passage beyond said check valve for returning liquid to the tank, a bypass valve for said passage and provided ahead of said check valve for returning liquid direct to the tank from the outlet side of the pump when a predetermined pressure is obtained, a single manually operable member adjustable to various positions and supported for movement on said unit, switch means mounted on said unit and operable when said member is moved to one position to start the motor and operable when said member is moved to a second position to stop the motor, means operated by said member when moved to another position for operating said return valve, and means for normally urging said member to the said second position so that the motor is normally deenergized and the return valve is normally closed.

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