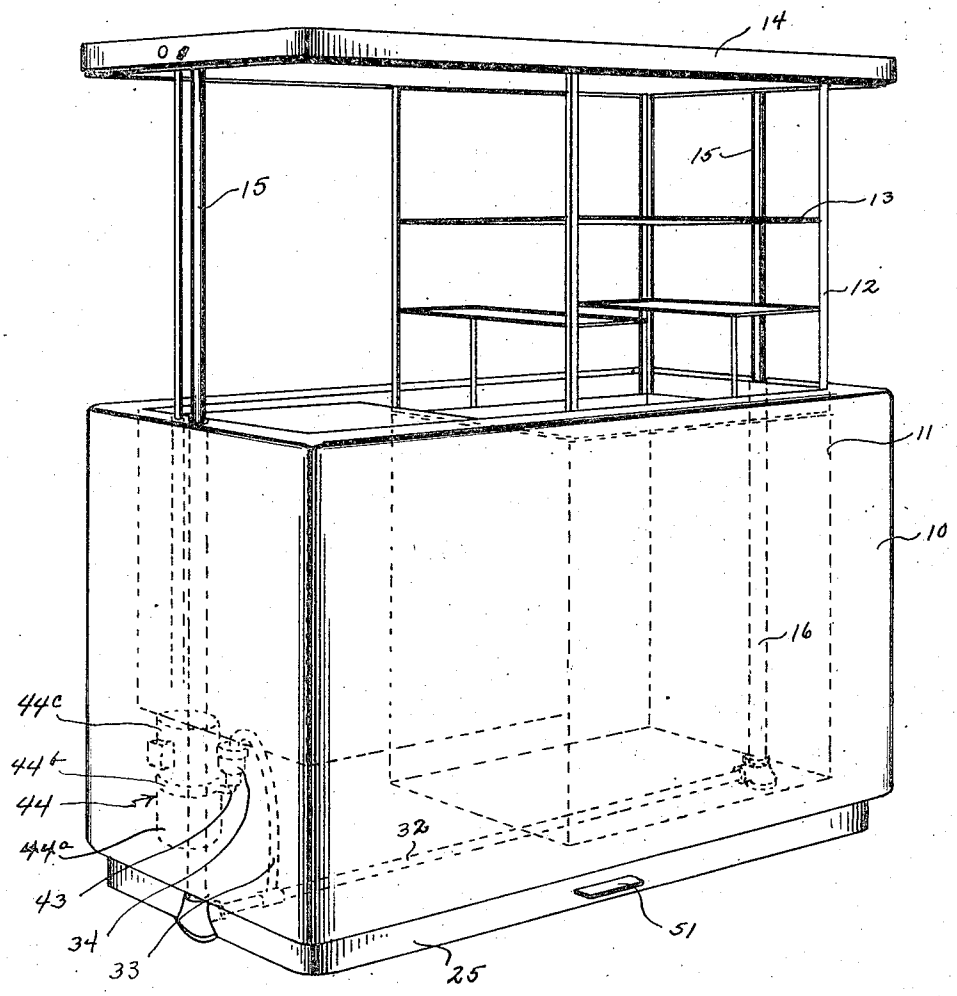
Dec. 14, 1948. J. B. PARSONS 2,456,429

ACTUATING MECHANISM FOR REFRIGERATOR TOPS OR THE LIKE

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Fig. 1.



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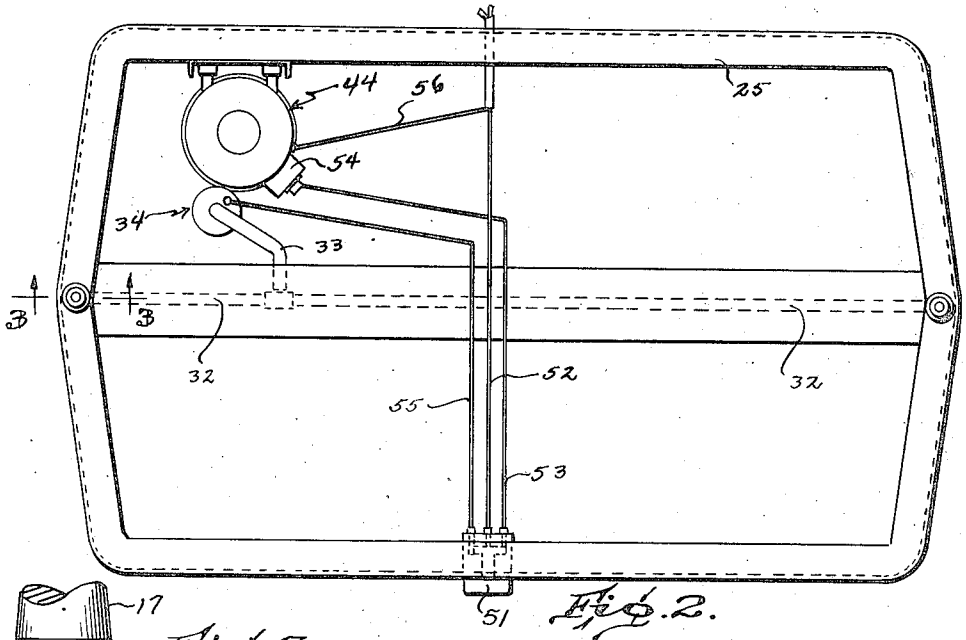


Fig. 2.

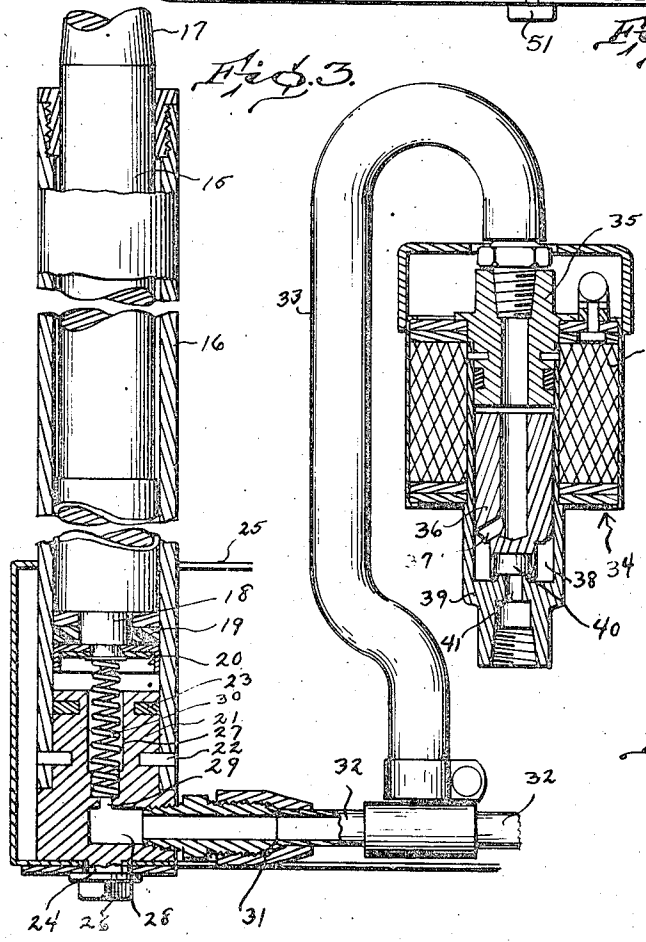


Fig. 3.

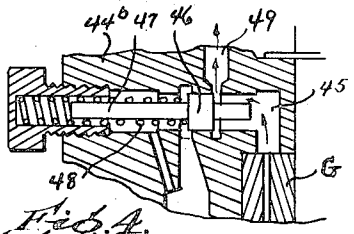


Fig. 4.

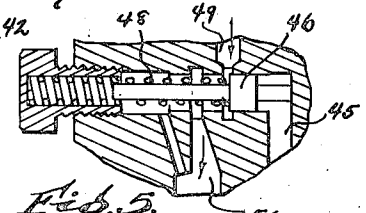


Fig. 5.

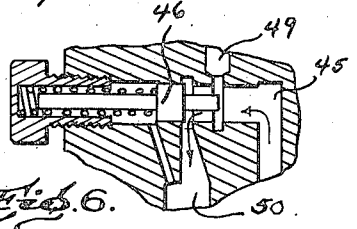


Fig. 6.

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ACTUATING MECHANISM FOR REFRIGERATOR TOPS OR THE LIKE

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Application October 18, 1944, Serial No. 559,214

2 Claims. (Cl. 60—97)

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This invention relates to operating mechanism for refrigerators or the like having a compartment adapted to contain food which can be moved out of its box or housing into convenient position revealing the contents, and an object is to produce simple and efficient mechanism of this character which is fluid-operated and so constructed and arranged that by manipulation of a control element the compartment and associated parts may be readily moved either upwardly to position of use or downwardly into its concealed position within the box.

Another object is to militate against the parts binding when a greater force or weight is imposed upon one side of the movable structure than upon the other.

A further object is to produce new and improved valve means for such mechanism which is seated by liquid pressure and unseated electrically, thereby to control the flow of liquid to and from the lifting device.

Other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings in which

Figure 1 is a perspective view of a refrigerator with the cover or top panel and a depending food compartment shown in elevated position, the refrigerating unit being omitted;

Figure 2 is a bottom plan view of the refrigerator of a slightly different form from that shown on Figure 1;

Figure 3 is an enlarged vertical sectional elevation taken partly on line 3—3 of Figure 2, showing one of the piston and cylinder assemblies, the electro-magnetically operated valve and associated conduits; and

Figures 4, 5 and 6 are fragmentary sectional views showing the valve associated with the pump and the three positions respectively which the valve may assume.

The illustrated embodiment of the invention comprises a refrigerator having a rectangular box or housing 10 of any suitable construction and formed in one end portion thereof is a well 11 within which is slidably mounted a fabricated unit 12 containing suitable shelves 13 for food or the like to be refrigerated. The unit 12 depends from and is secured to a top panel or control 14 which, in this instance, is of sufficient size to cover the entire top of the box 10. Thus it will be understood that the cover 14 is adapted to move up and down relative to the box 10 and the structure 12 moves along with it. Thus when the cover

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14 is in its raised position such as shown on Figure 1, the food shelves are in a conveniently accessible position. After the food has been removed from or placed in the unit 10, the entire structure is lowered with the cover 14 resting on top of the box 10.

To effect such vertical movement of the cover 14 and shelf-containing unit 12, a pair of piston rods 15 are provided, one piston rod being arranged at each end of the cover 14, suitably attached thereto and depending therefrom. The piston rods 15 extend through suitable openings in the end walls of the box 10 and extend into cylinders 16 carried by the box 10. As indicated on Figure 3, the upper end of each piston rod 15 has a tapered portion 17 which fits into a suitable socket in the under portion of the cover 14. The opposite end of the piston rod 14 is formed with a reduced end portion 18 and on which are mounted a pair of washers 19, the lower end of which may be of rubber or similar material snugly to engage the walls of the cylinder. A leather cup 20 is suitably fixed to the shouldered end of the piston rod to effect a liquid seal with the cylinder walls. The lower end of each cylinder 16 is closed by a plug 21 which is secured in place by pins 22. A rubber ring 23 securely seals the plug against the walls of the cylinder 16. The bottom end of the plug 21 has a screw-threaded lug 24 which extends through an aperture in a base portion 25 for the box 10 and a nut 26 securely clamps the plug in place, thereby retaining the cylinder in the desired position. The plug 21 is formed with a vertical passage 27 which communicates with a lateral passage 28 and intermediate these passages is a constricted orifice 29, the purpose of which will hereinafter be described.

It is desirable that the cover 14 be cushioned just prior to its engagement with the top of the box 10 and for this purpose, a coil spring 30 is seated within the vertical passage 27 in the plug 21 and extends upwardly beyond the upper end of the plug. It will thus be apparent that before the lower end of the piston rod has completed its downward movement, it will engage the spring 30. The strength of the spring 30 is so chosen as to support the static weight of the piston and associated parts.

Suitable fittings 31 are connected to the plug 21, providing communication with the lateral passage 28 and connected to the fittings 31 is a tube 32 from which a branch tube or pipe 33 extends to the solenoid operated valve assembly 34. It will be understood that the tube 32 is common to both of the cylinders 16 so that the branch

tube 33 thus communicates with both cylinders and liquid forced through the tube 33 will thus enter both cylinders for actuating the piston rods 15 conjointly.

The solenoid operated valve assembly 34 comprises a relatively stationary tubular member 35, which is connected by a suitable screw fitting to the tube 33, and a valve member 36 which has a longitudinal bore communicating with the bore of the member 35 and a lateral port 37 opening into a chamber 38 within the guide member 39 attached to the member 35. At the lower end of the valve member 36 is a rubber seating element 40 which is adapted to seat against an annular shoulder in the guide member to seal off the port 41. Surrounding the guide member 39 is a solenoid coil 42, it being understood that when the coil 42 is energized, the valve member 36 is moved upwardly to move the member 40 away from its seat to allow the flow of liquid through the valve member and associated parts. Thus it will be understood that the valve 36 is seated by liquid under pressure, the weight of the piston rods 15 and parts associated therewith being sufficient to hold the valve 36 on its seat. In order to unseat the valve member 36, the solenoid coil 42 is energized, thereby to enable the flow of liquid in one direction or the other through the valve and the adjacent parts.

As indicated on Figure 1, the solenoid operated valve 34 is connected by a tube 43 to a motor-pump-reservoir unit 44. The unit 44 includes a liquid reservoir 44*a*, an intermediate block or casting 44*b* containing a suitable pump driven by an electric motor 44*c* which is arranged thereabove. The particular construction of the unit 44 forms no part of the present invention so that detail illustration and description thereof is not deemed necessary. However, reference is hereby made to my United States Patent 2,393,406, dated January 22, 1946 and entitled "Motor pump unit," in which the same is fully shown and described. Suffice it here to say that upon energizing the electric motor 44*c*, a pump carried by the casting 44*b* is operated to draw liquid from the reservoir 44*a* and force it through the tube 43, past the solenoid operated valve 34, through the tube 33 and tube 32 to the respective cylinder 16, thereby to force the piston rods upwardly and accordingly elevate the tray containing compartment 13 and cover 14.

It will be understod that the pressure of the liquid passing toward the cylinder 16 is sufficient to unseat the valve 36 and hold it in unseated position throughout the operation of the motor. However, as soon as the motor 44*c* stops or is deenergized, the valve 36 will be seated due to the difference in pressures therein. Thus the valve 36 retains the cover as well as the tray containing compartment 13 in the desired position of adjustment. When it is desired to lower the cover and the shelf-containing unit, the solenoid coil 42 is energized in order to unseat the valve 36. Thereupon the weight of the pistons and associated parts is sufficient to force the liquid from the cylinders 16 back into the reservoir 44*a*, utilizing the same tubes through which liquid was forced by the pump to the cylinders.

Figures 4, 5 and 6 illustrate different positions of a valve associated with the pump and carried by the casting 44*b*. As indicated in Figure 4, G represents a portion of a well-known Gerotor pump which operates to draw liquid from the reservoir 44 and forces it through an outlet passage 45 into which a head 46 of a piston valve having a stem 47, is normally held by a coil spring 48. However, the liquid pressure is sufficient to move the piston head 46 to the left to the position shown in Figure 4 so that liquid may pass the face thereof and flow out through the passage 49 which communicates with the tube 33. Thus so long as the pump G is operating, the valve remains in the position shown in Figure 4. However, when the pump G is stopped, the spring 48 moves the valve to the right to the position shown in Figure 5. In this position, the rear face of the piston head 46 uncovers the passage 49 and allows liquid in the passage 49 and tubes with which it communicates to flow back into the reservoir through a downwardly extending drain passage 50. Thus when the valve 36 is unseated by the solenoid coil 42, the liquid from the cylinders 16 may return to the reservoir 44*a* since the valve head 46 is at that time in the position shown in Figure 5. In the event that the pistons 15 encounter an obstruction or reach the limit of travel and the motor 44*c* continues to operate, then the valve head 46 may move to the position shown in Figure 6, in which the front face of the valve uncovers the passage 50 enabling the liquid to be pumped back into the reservoir 44*a*. In this manner, damage or injury to the parts due to the building up of an excessive pressure, is obviated.

As shown in Figure 2, a simple form of switch 51 is illustrated, the same being mounted for rocking movement about a horizontally disposed axis. As shown, a lead 52 from a suitable source of electric current is interposed between a lead 53 extending to a relay 54 for operating the electric motor 44*c*, and a lead 55 extending to the solenoid coil 42. It will be manifest that by rocking the foot operated switch 51 in one direction, the electric motor 44*c* is energized through the medium of the relay switch 54 and rocking of the switch 51 in the opposite direction energizes the solenoid coil 42. 56 indicates a suitable ground. The particular construction of the switch forms no part of the present invention and further illustration and description thereof is not considered necessary.

The constricted orifice 29 in the plug 21 provided in the lower end of each cylinder 16 performs an important function because it militates against one of the pistons 15 moving downwardly substantially ahead of the other piston and thereby impedes the flow of liquid from the cylinder so that the liquid pressure in the opposite cylinder can not materially be increased. For example, assume that the cover 14 and the associated food receiving unit is being lowered and someone pulls down on one side of the cover. Normally that force would increase the liquid pressure in the adjacent cylinder and the pressure of liquid on the other side would thus be increased. This would normally result in binding of the pistons within the cylinders. However, by constricting or impeding the flow of liquid from the cylinders by employing a constricted orifice 29 of a size substantially less than that of the outlet or return tubes through which the liquid can flow relatively free, the pressure of liquid in the opposite cylinder will not be increased to such point that binding of the pistons within the cylinders will result. This simple expedient has proved most satisfactory in obviating an otherwise troublesome condition. However, it is to be understood that the particular location of the constricted orifice is not vital because it may be located elsewhere to advantage.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What I claim is:

1. An apparatus comprising a housing, a structure adapted for up and down movement in relation to said housing, supporting means for said structure including two piston rods connected to the structure, cylinders for said piston rods respectively and retained by said housing, hydraulic means associated with said cylinders for controlling the conjoint movement of said pistons, said hydraulic means including a closed system comprising a motor driven pump, a reservoir associated with said pump, means providing passages from said pump to the lower ends of said cylinders, whereby in the operation of said pump, liquid is forced from said reservoir to said cylinders for raising said pistons, a valve adapted to be seated by the pressure of liquid in the cylinders thereby to retain said piston rods in position of adjustment, electro responsive means for unseating said valve thereby to allow the liquid from said cylinders to return to said reservoir, a ported plug secured to the lower end of each cylinder through which liquid flows to and from the respective cylinders, and resilient means on said plug and against which the piston rod abuts immediately prior to engagement of the housing by said structure.

2. A structure adapted for up and down movement, supporting means for said structure including two pistons connected to said structure, cylinders for said piston rods respectively, hydraulic means associated with said cylinders for controlling the conjoint movement of said pistons, said hydraulic means including a closed system comprising a motor driven pump, a reservoir associated with said pump, means providing passages from said pump to the lower ends of said cylinders, whereby in the operation of said pump, liquid is forced from said reservoir to said cylinders for raising said pistons, a valve adapted to be seated by the pressure of liquid in the cylinders thereby to retain said piston rods in position of adjustment, electro responsive means for unseating said valve thereby to allow the liquid from said cylinders to return to said reservoir, a ported plug secured to the lower end of each cylinder through which liquid flows to and from the respective cylinder, and resilient means on said plug and against which the piston rod abuts immediately prior to the lower limit of movement of said structure.

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