Dec. 13, 1949 H. M. DUNLAP 2,490,861

ELECTROHYDRAULIC LIFT SYSTEM FOR REFRIGERATORS AND THE LIKE

Filed Nov. 15, 1946 2 Sheets-Sheet 1

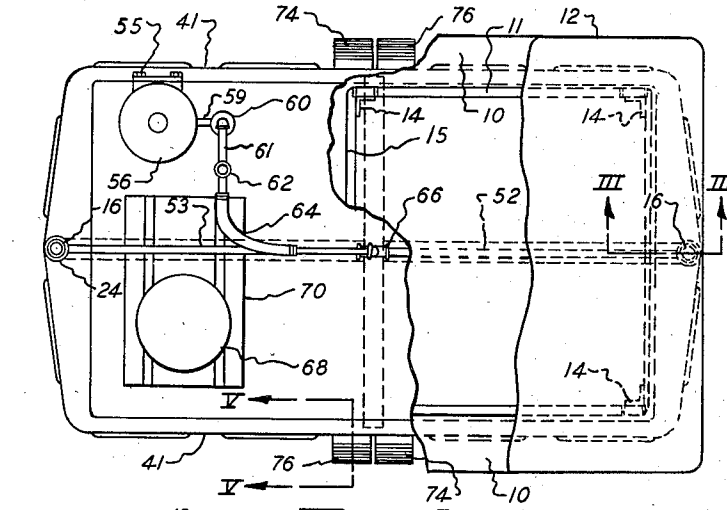


FIG. I.

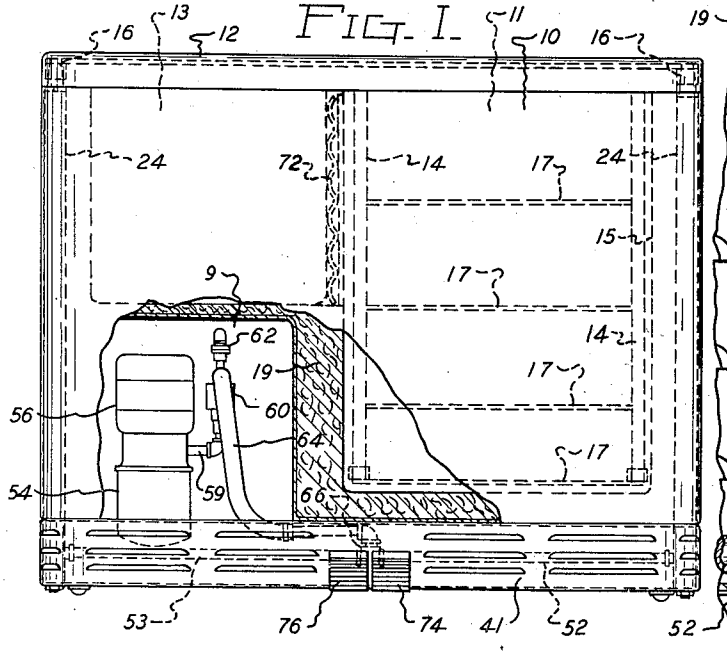


FIG. II.

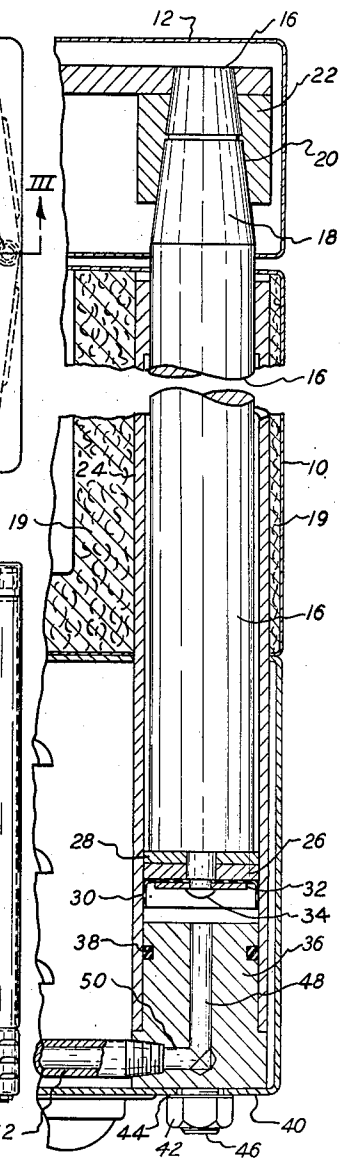


FIG. III.

Inventor

HOBERT M. DUNLAP

By Beaman & Patch

Attorneys

Dec. 13, 1949

H. M. DUNLAP

2,490,861

ELECTROHYDRAULIC LIFT SYSTEM FOR REFRIGERATORS AND THE LIKE

Filed Nov. 15, 1946

2 Sheets-Sheet 2

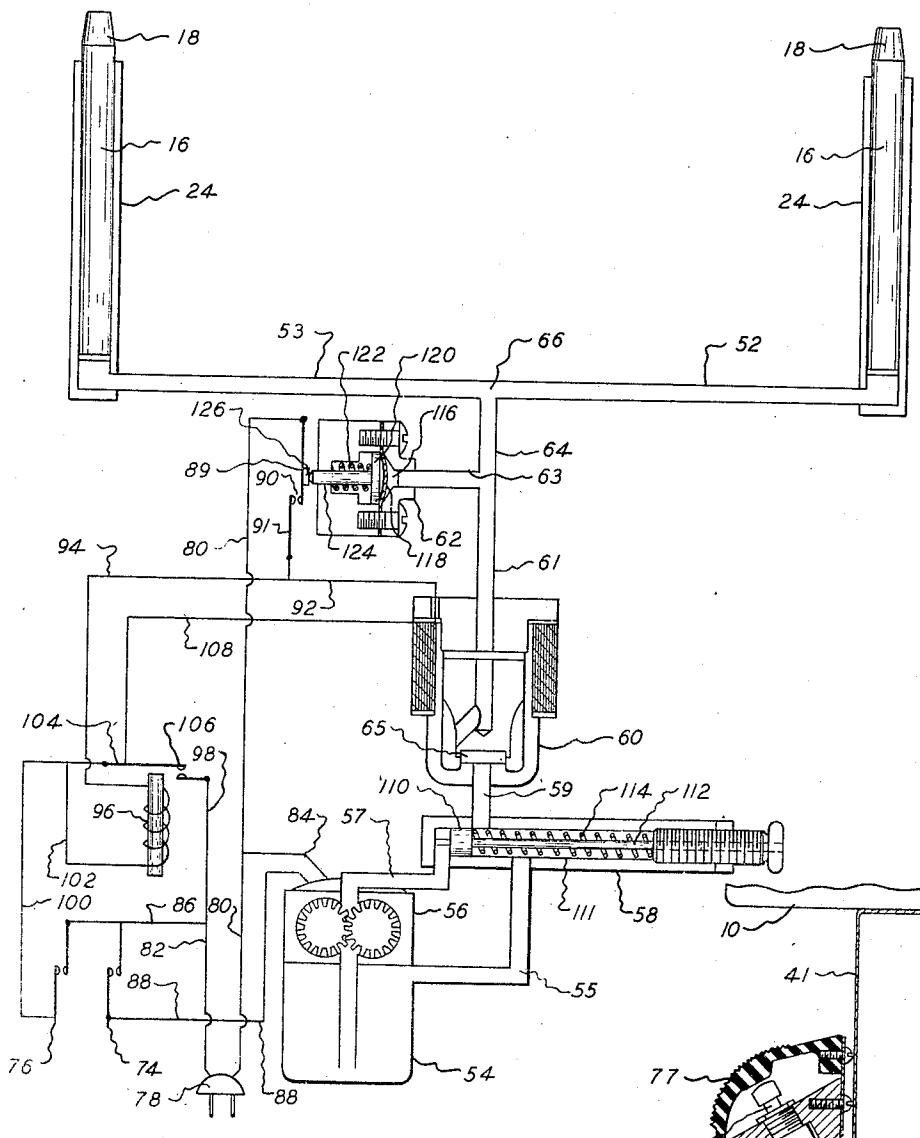


FIG. IV.

FIG. V.

Inventor

HOBERT M. DUNLAP

By Braman & Patch

Attorneys.

Patented Dec. 13, 1949

2,490,861

UNITED STATES PATENT OFFICE

2,490,861

ELECTROHYDRAULIC LIFT SYSTEM FOR REFRIGERATORS AND THE LIKE

Hobert M. Dunlap, Jackson, Mich., assignor to The Sparks-Withington Company, Jackson, Mich., a corporation of Ohio

Application November 15, 1946, Serial No. 710,011

5 Claims. (Cl. 62—89)

1

This invention relates to improvements in domestic refrigerators and frozen food dispensers, and more particularly to the newer table top refrigerators, and to other apparatus of a like design, appearance and requirement.

It has been long known that a great disadvantage lies in the conventional front-opening refrigerator. The spilling out of refrigerated air each time the door of the refrigerator is opened causes the compressor and associated mechanism to run, in order to bring the temperature back down to the desired level. This added working of the refrigerating mechanism results in a very inefficient operation in the normal front-opening refrigerator. The obvious solution to this problem of the spilling out of refrigerated air would be the construction of a refrigerator cabinet with an opening on the top. Such a top-opening refrigerator cabinet would not permit the spilling out of refrigerated air but would retain such air in the refrigerating compartment of said cabinet. However, up to this time, there are certain very definite disadvantages in a top opening refrigerator, the foremost of which is that it is very inconvenient to get the refrigerated articles out of the cabinet. In spite of much effort being put into organizing and placing of the articles in such a cabinet, the one article desired at any particular time usually seems to have found its way to the bottom of the compartment, underneath many other articles which must be moved to get at the desired article.

It is an object of this invention to provide an efficient and usable table top refrigerator, in which the lid and the entire contents of the refrigerator may be lifted mechanically from the compartment, thereby exposing the contents within easy reach.

Another object is to provide a fluid pressure elevating system for raising the top and its associated contents.

A further object is to provide an assembly consisting of the base structure of such a refrigerator cabinet, lifting mechanism, and refrigerating mechanism, so designed that the insulating cabinet may be dropped down on this assembly during the final manufacturing phase, the top placed in position, and the whole thing sent to the shipping room of the factory.

A further object is to provide a system or combination whereby the top and associated contents may be lifted any given distance in the presence of the operator and then the assembly may be closed by once energizing an electrical switch, and the operator leaving the assembly.

2

A still further object is to provide a safety device incorporated in the lifting mechanism which will assure the stopping of the lowering operations in case any article, such as a dish or a hand gets in the way of the lowering top.

Other objects and improvements in my invention will appear from the following specification and the accompanying drawings, in which,

Fig. I is a top view in broken section of a refrigerator embodying the invention and showing a possible arrangement of part of the lifting mechanism,

Fig. II is a front view in broken section of the refrigerator, omitting the refrigerating mechanism,

Fig. III is a broken vertical sectional view taken on line III—III of Fig. I,

Fig. IV is a schematic diagram of the electrical, mechanical and hydraulic parts of the elevating assembly, and

Fig. V is a view in sections along the line V—V of Fig. I, showing details of the foot switch which actuates the lifting mechanism.

In the drawings, the cabinet 10 is constructed with a flat lid 12, enclosing for access a normal temperature refrigeration compartment 11 and a frozen food storage compartment 13, positioned at one side of the compartment 11. A compartment 9, below the compartment 13 is arranged to contain the refrigerating mechanism and the power unit associated with the lifting mechanism.

Secured to lid 12 and suspended therefrom are guide posts 14, which engage the inner liner 15 of the compartment 11 and serve to steady the lid 12 in the raising and lowering operation, as well as to support shelves 17 contained within the cabinet 11. The lid 12 is removably carried by the piston posts 16 in any suitable manner such as by tapered ends 18 engaging tapered holes 20 in a supporting member 22, constructed as part of the lid 12. Piston posts 16 are telescopically mounted in cylinders 24 and are of such a length that when the piston posts 16 are fully extended a considerable amount of their length is still encased within the cylinders 24, thereby providing guiding and supporting means for piston posts 16. The lower ends of the piston posts 16 are provided with sealing means such as by an oil resisting rubber gasket 26 held in position between circular metal plates 28 and cup-shaped metal retainers 30 which are in turn held in place by washers 32 and screws 34. Cylinders 24 are contained within the insulating wall 19 of the cabinet 10, and are sealed at their lower end by means

of plugs 36, fitted with oil resisting rubber rings 38 and held in position on the base 40 by means of nuts 42 and washers 44 engaging studs 46. Means for introducing fluid under pressure to the base of the pistons 16 are provided by passages 48 and 50 in plugs 36, the holes 50 terminating in threaded apertures to receive fluid pressure lines 52.

Fluid for furnishing power to the lifting mechanism is stored in the reservoir 54, from which it is pumped out under pressure by the pump 56 through by-pass pump valve 58 and the solenoid valve 60 into the line 61, past the diaphragm operated safety switch 62, into the line 64, thence to the T fitting 66, and from there into pressure lines 52 and 53. Pressure lines 52 and 53 will cause fluid to flow through the passages 48 and 50 and build up pressure against metal cups 30 on the ends of the piston posts 16, causing the piston posts 16 to extend out of the cylinders 24, thereby raising the lid 12, guide posts 14, and shelving 17.

From this, it can be seen that I have provided a lifting mechanism for the lid and the interior contents of a normal temperatured refrigerator compartment having a top opening.

In manufacturing such a refrigerator, I contemplate the placing of the base 40 in position and then assembling component parts of the lifting mechanism as well as the component parts of the refrigerating mechanism on it. In order to accomplish this result, the reservoir 54 and the pump 56 are secured to the base 40 by means of the bracket 55, and the associated line 59, solenoid switch 60, safety switch 62, line 64, the T fitting 66, pressure lines 52 and 53 and the complete cylinder assembly 24, with the piston posts 16, are all mounted in place. At the same time, the compressor 68, condenser 70 and the heat exchange evaporator 72 can also be mounted on the base 40. With this much of the assembly accomplished, the cabinet 10 may then be lowered on to base 40 and then the lid 12 may be lowered on top of the cabinet 10 and engaged with lifting posts 16, thereby completing the assembly. Foot switches 74 and 76 which I suggest should be used to control the up and down movement of lid 12, guide posts 14 and shelving 17, are preferably of a spring loaded plunger type, and are mounted on base 40 and recessed against the kick plate 41 in an angular block 75. Rubber foot pads 77 are formed so that a natural stepping on the pads 77 will close the switch 76.

The electrical system used to control the lifting mechanism is also novel. Plug 78 supplies power from the domestic power sources and is divided between conductors 80 and 82. Conductor 84 is taken off conductor 80 and goes into one side of the motor of the pump 56. Conductor 86 leads off the conductor 82 to the up-switch 74 which is connected into the other side of the motor of the pump 56, through the conductor 88. This is the complete electrical circuit for the up or lifting side of the system. When up-switch 74 is closed, current flows from conductor 86 into conductor 86 and from there into one side of motor of the pump 56, thereby closing the circuit into conductor 84, and causing the pump 56 to run to supply fluid into the line 57, through the by-pass pump valve 58, into line 59, through solenoid 60, line 61, past the diaphragm-operated safety valve 62, into line 64, into the T fitting 66, through the pressure lines 52 and 53, thereby causing the piston posts 16 to rise out of cylinders 24. In order to lift lid 12 it is necessary that the operator hold switch 74, which is spring loaded, in a closed position.

The lowering side of the system is equipped with means to make the lowering automatic, and with safety means which will prevent the breaking of dishes and hands by reason of having lid 12 smash them in the downward movement. Conductor 80 comes off the plug 78 and runs to the breaker side 89 of contact 90. The contact 90 normally is maintained in a closed position by hydraulic pressure in the safety switch 62. When the contact 90 is closed, current may flow through the contact 91, through conductor 92, and into one side of the hydraulic solenoid valve 60, as well as through conductor 94, to one side of relay 96. From the other side of plug 78, conductor 82 splits into conductor 86 and 98, with conductor 86 connected with one side of the down switch 76 and then feeds through conductors 100 and 102 into the other side of the relay 96. Conductor 104 which also comes off conductor 100 feeds into one side of the contact 106 controlled by the relay 96. Conductor 96 which comes off the conductor 82 feeds into the opposite side of contact 106, while conductor 108 comes off the first side of contact 106 and connects with the remaining terminal of the solenoid valve 60.

By-pass pump valve 58 is constructed with a sliding valve 110 mounted on a shaft 112 and maintained in position by a spring 114. When pressure is built up by the pump 56 and fluid is forced through line 57 against valve 110, valve 110 is forced back in the cylinder 111, past valve 110, into line 59, thereby allowing the fluid to pass from the pump 56 into the solenoid valve 60. When the pump 56 is no longer operating, spring 114 returns valve 110 to its seat at the end of the cylinder 111; when the lowering operation is started and valve 65 is lifted off its seat in solenoid 60, hydraulic fluid will flow into the line 59, through valve cylinder 111, back into reservoir 54, through line 55.

The operation of the diaphragm operated safety valve is also very simple. When pressure is built up in line 61, it likewise builds up pressure in line 63, causing fluid to flow into chamber 116 and to press against diaphragm 118, thereby moving piston 120 against spring 122, causing shaft 124 to push against block 126, thereby closing contact 90.

In order to set the automatic closing system into operation, downswitch 76 is pressed, thereby energizing relay 96 which closes contact 106 and puts current on one side of the solenoid valve 60. The other side of solenoid valve 60 already has current by reason of the fact that hydraulic pressure is keeping contact 90 closed through action in the safety switch 62. This causes valve 65 to lift from its seat and the hydraulic fluid starts to flow back through the line into solenoid valve 60, into line 59, through cylinder 111, in the by-pass pump valve 58, through line 55, and into reservoir 54. Contact 106 is maintained in a closed position by relay 96 as long as foot switch is engaged, thereby allowing current to flow from line 98 through contact 106 and into line 108. The current will also flow through contact 106, into conductor 104, to conductor 102, and into the other side of relay 96, thereby keeping relay 96 in a closed position. It is this hooking up of three conductors into a single pole relay which causes the lowering operation to be accomplished automatically after switch has been closed, even though switch 76 is later opened. Once the automatic closing has been set in operation, it is the

function of safety switch 62 to stop that closing at any time anything gets in the way of lid 12 as it is making its downward travel. This is accomplished by having spring 122 set at such a tension that the slightest change of pressure in line 63 will cause spring 122 to force the diaphragm out into chamber 116, thereby breaking contact 90 and cutting off current to solenoid valve 60, thereby closing valve 65.

From the foregoing, it can be seen that I have provided a mechanism for lifting the top and contents of a table top refrigerator. I have also provided an easy to produce assembly of a table top refrigerator and the associated lifting mechanism and refrigerator machinery which will considerably reduce the assembly problem as appears more fully in my copending application, Serial No. 710,009, filed November 15, 1946, entitled Kick plate and lifting mechanism unit for refrigerators. I have also produced a lifting mechanism for a table top refrigerator which incorporates an automatic lowering electrical system as well as a safety device which will make the automatic lowering operation possible without the danger of smashing dishes or hands. I recognize that many changes can be made in some of the parts disclosed herein, without departing from the spirit of my invention.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A refrigerator cabinet enclosing top opening refrigeration space, inner liners defining said space, a lid on said cabinet, a base structure on which said cabinet is mounted, guide posts suspended from said lid and engaging said inner liners to stabilize said lid in vertical movement, internal shelving mounted on said guide posts and movable with said guide posts and said lid, elevating devices associated with said lid and comprising two telescoping members with a seal on the inner member and the outer member mounted on said base structure and inside said cabinet, means for introducing fluid under pressure to the sealed end of said outer member to cause said inner member to move out of said outer member and to lift said lid, guide posts and internal shelving, means for releasing said fluid to cause said inner member to telescope within said outer member and to lower said lid, guide posts and internal shelving, and electrical means for controlling said pressure means and said releasing means.

2. A table top refrigeration cabinet enclosing refrigeration space, an inner liner defining said space, a lid on said cabinet, guide posts suspended from said lid and engaging said inner liner to stabilize said lid during vertical movement thereof, tapered apertures defined by structure within said lid, taper end piston posts removably received in said tapered apertures for lifting said lid, lifting cylinders mounted within the insulating walls of said cabinet and positioned to telescopically receive said piston posts, sealing means between said piston posts and said cylinders, pump means for introducing fluid under pressure to the sealed ends of said cylinders, the pressure causing said piston posts to move out of said cylinders thereby lifting said lid, valve means for releasing said fluid from said cylinders, thereby causing said piston posts to move back into said cylinders and closing said lid, and electrical means for controlling and powering said pump means and said valve means.

3. A table top refrigeration cabinet enclosing refrigeration space an inner liner defining said space, a lid on said cabinet, guide posts suspended from said lid and engaging said inner liner to stabilize said lid during vertical movement thereof, apertures defined in the under side of said lid and by structure within said lid, piston posts engaging said apertures for lifting said lid, lifting cylinders mounted within said cabinet and positioned to telescopically receive said piston posts, sealing means between said piston posts and said cylinders, means for introducing fluid under pressure to the sealed ends of said cylinders to cause said piston posts to move out of said cylinders thereby lifting the lid, valve means for releasing said fluid from said cylinders to cause said piston posts to move back into said cylinders and closing said lid, and electrical means for controlling and powering said pump means and said valve means.

4. In a top opening refrigerator cabinet, a fluid pressure pump, pressure lines connecting said fluid pressure pump and the sealed ends of said cylinders, an electrically operated drain valve in said pressure lines, an electrical contact maintained closed by fluid pressure operating against a diaphragm, spring means pressing against said fluid pressure and said diaphragm such that a slight reduction in fluid pressure will allow said spring means to open said contact thereby closing said electrically operated drain valve and stopping the lowering of the lid.

5. In a top opening refrigerator cabinet having a lid, elevating means for lifting the lid on said cabinet, fluid pressure means operating said elevating means, a fluid pressure safety switch incorporated in said fluid pressure means such that constant fluid pressure will maintain an electrical contact in a closed position while any lowering of said fluid pressure will allow said safety switch to break said contact.

HOBERT M. DUNLAP.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,060,435	Vincent	Nov. 10, 1936
2,077,739	Bryant	Apr. 20, 1937
2,302,051	Philipp	Nov. 17, 1942
2,390,030	Paulson	Nov. 27, 1945
2,429,638	McKellar	Oct. 28, 1947