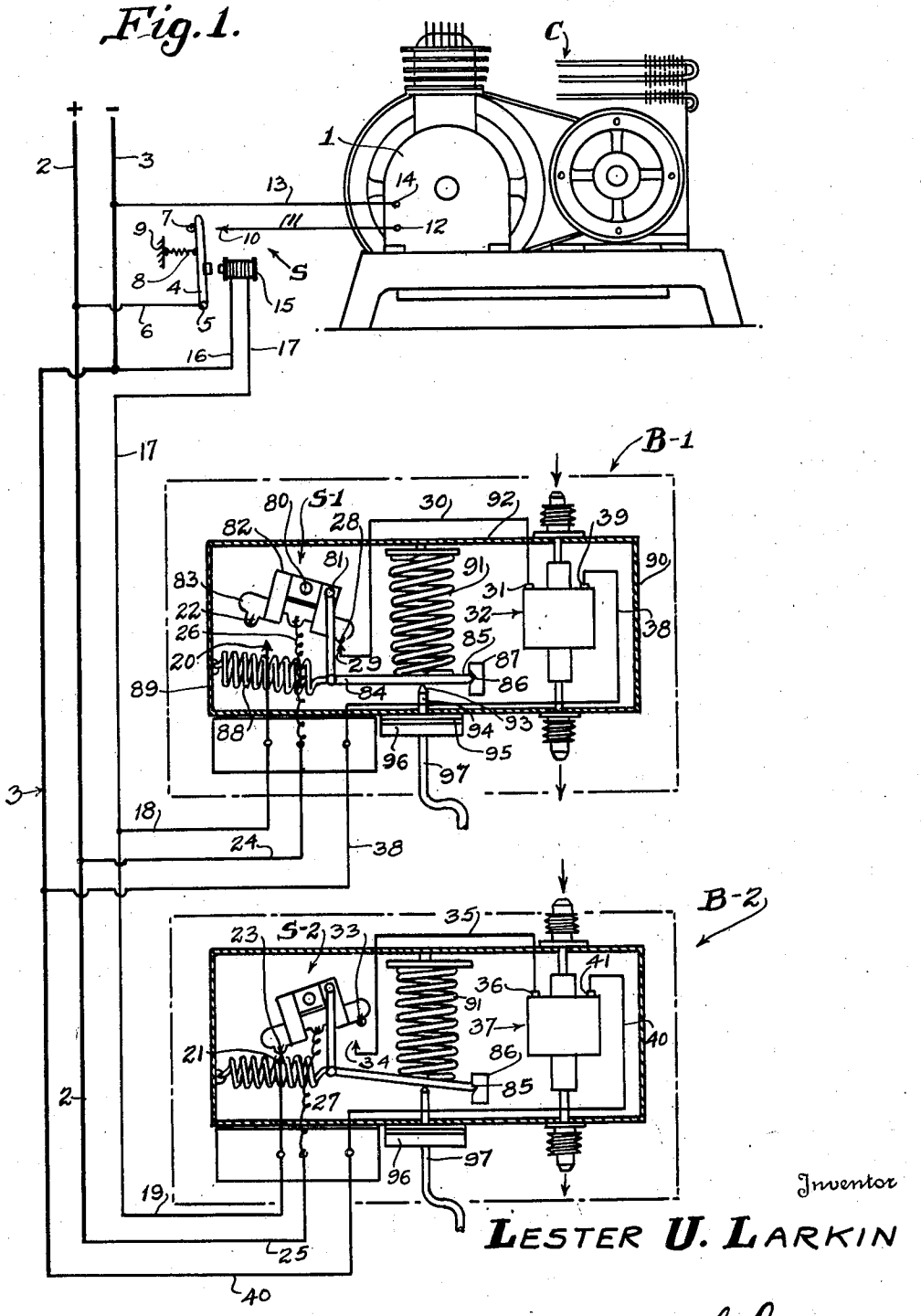
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REFRIGERATING SYSTEM

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Fig. 1.



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Fig. 2.

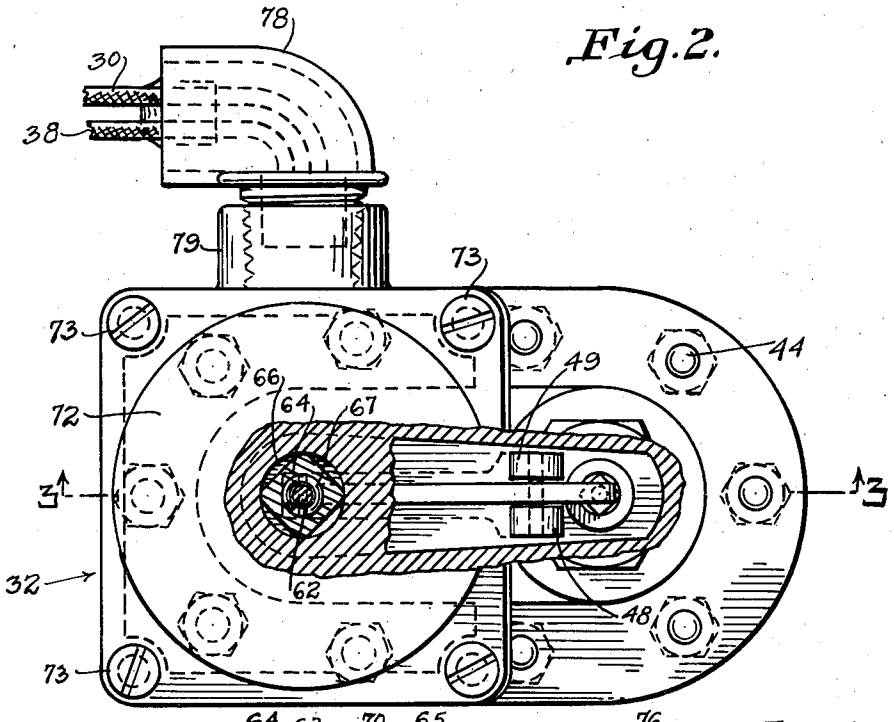
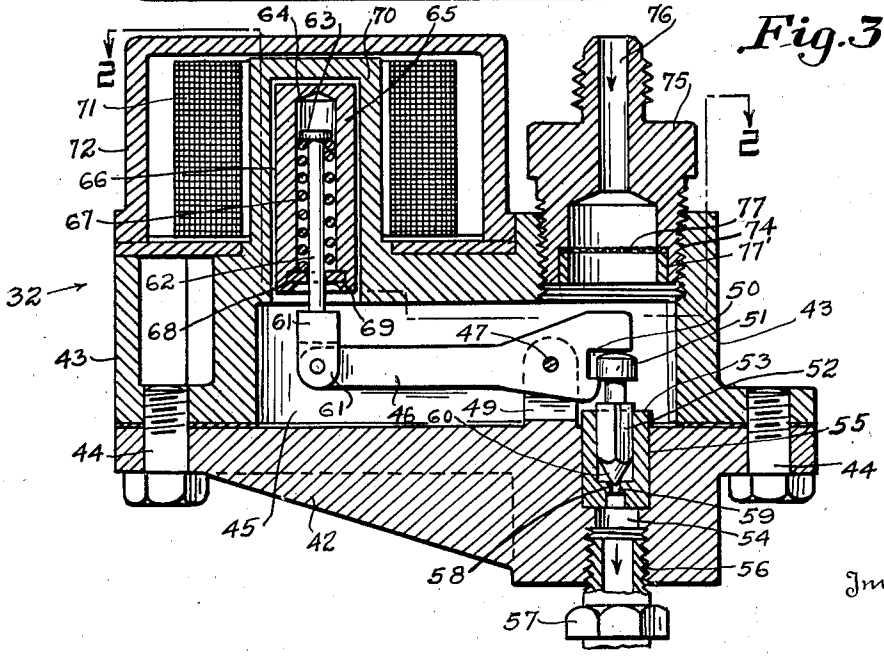


Fig. 3.



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Patented Feb. 5, 1935 1,990,290

UNITED STATES PATENT OFFICE

1,990,290

REFRIGERATING SYSTEM

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Application September 20, 1932, Serial No. 634,049

3 Claims. (Cl. 62—2)

The invention forming the subject matter of this application is a refrigeration liquid control system in which a single compressor is used to supply refrigerating liquid to evaporating coils or units in a plurality of refrigerator showcases or boxes.

The main object of the invention is to provide a system of this character in which the motor operating the compressor is thermostatically controlled so as to operate constantly when the temperature in any or all of the boxes exceeds a predetermined maximum; and in which the operation of the motor will be stopped only when the temperature in all of the boxes falls below the predetermined maximum.

Another object of the invention is to provide in each control unit an electromagnetically operated valve to stop the circulation of refrigerant liquid through any of the boxes in which the temperature has fallen below a predetermined temperature selected as a maximum for that particular box.

Other objects of the invention will become apparent as the detailed description thereof proceeds.

In the drawings:

Figure 1 is a diagrammatic layout of the invention as applied to a plurality of refrigerating showcases or boxes;

Figure 2 is a horizontal section taken on the irregular line 2—2 of Figure 3; and

Figure 3 is a central vertical section taken on the line 3—3 of Figure 2.

As shown in Figure 1 of the drawings, the invention includes a compressor C of any well known construction. The electric motor 1 of the compressor is operated from the mains 2 and 3 through a relay switch designated generally by the reference character S. This relay switch S comprises a conducting rod 4 mounted to swing about a pivot 5 electrically connected by a wire 6 to the main 2. The rod 4 is normally held out of operative position against a stop 7 by means of a tension spring 8 having one end secured to the rod 4 and its other end secured to a suitable fixed part 9.

The rod 4 closes the circuit from the mains 2 and 3 through the motor 1 when it is drawn over from the stop 7 into contact with a contact 10 connected by wire 11 to one of the terminals 12 of the motor 1. The return from the motor 12 is effected by a wire 13 connecting the other terminal 14 of the motor to the ground wire 3. The rod 4 is operated by the energization of an electromagnet 15 having one of its terminals connected by a wire 16 to return wire 3. The other terminal of the electromagnet 15 is connected by a wire 17 to wires 18 and 19 leading to contacts 20 and 21, respectively, arranged in the path of movement of contacts 22 and 23 of 3-contact mercury bulb switches S—1 and S—2 in the boxes B—1 and B—2, respectively. The main 2 is connected by wires 24 and 25 through "pigtails" 26 and 27, respectively, to the center contact elements of the switches S—1 and S—2, respectively.

The remaining contact 28 of the switch S—1 is adapted to swing against a contact 29 at one end of the line 30, having its other end connected to the terminal 31 of a solenoid switch 32. The remaining contact 33 of the switch S—2 is adapted to swing into and out of contact with the terminal 34 connected by a line 35 to the terminal 36 of a solenoid switch 37. The return line 38 of the switch 32 is connected at one end to the terminal 39 of the switch 32 and at its other end is connected to the return wire 3. The return of the switch 37 is effected by a wire 40 connected at one of its ends to the terminal 41 of the solenoid switch 37 and at its other end to the wire 3.

Since the electromagnetically operated switches are the same in all the control units, it will be sufficient to describe switch 32 in detail. As shown in Figures 2 and 3, the switch 32 comprises a base plate 42, having a casing 43 suitably secured thereto by means of the machine screws 44. The casing 43 is shaped to form with the base 42 a closed chamber 45, in which a lever 46 is mounted to rock about a fulcrum pivot 47 suitably fixed in standards 48 and 49 (see Figure 2) extending up from the base 42.

The short arm of the lever 46 is provided at its end with a notch 50, the opposite walls of which engage the opposite sides of the head 51 of a needle valve 52 mounted for reciprocation in a casing 53. The base 42 has a bore 54, and the base is drilled from opposite sides to provide the countersinks 55 and 56.

The countersink 55 forms a seat for the cylindrical casing 53; and the countersink 56 is tapped to receive the screwthreads of a refrigerant liquid outlet connection 57. The valve casing 53 is provided between its ends with a partition 58 centrally bored to form a passageway 59 adapted to be closed by the conical end 60 of the valve 52. As usual in devices of this kind, the body of the valve 52 is polygonal in cross section in order to permit liquid to flow freely from the chamber 45 to the conical end 60 of the valve.

The other end of the lever 46 is pivotally connected to the bifurcated lower end 61 of a rod 62 having a cylindrical head 63 at its upper end. The head 63 slides freely in the cylindrical bore 64 of an inverted cup-like armature 65 which is slidably mounted in a cylindrical recess 66 formed in the top casing 43. A spring 67 surrounds the rod 62 and has its opposite ends in contact with the head 63 and a split ring washer 68 suitably

secured in a groove 69 formed in the wall of the bore 64.

The extension 70 of the top of casing 43 is shaped externally as a cylinder coaxial with the bore 66. A solenoid 71 is wound around the extension 70; and has its terminals (not shown) suitably connected to the wires 30 and 38. A cap 72 is secured to the top of the casing 43 by machine screws 73 to form a protective cover for the solenoid.

The top of casing 43 is provided with an internally screwthreaded bore 74, substantially coaxial with the bore 54, to receive the externally screwthreaded end of an inlet fitting 75 having a bore 76 countersunk to receive a screen 77 suitably secured therein by any suitable friction ring 77'. An elbow fitting 78 screwthreaded into a boss 79 projecting laterally from the cap 72, receives the wires 30 and 38 connecting the solenoid terminals 30 and 39 to the contact 29 and main 3, respectively.

The mercury switch S—1 is rocked about a fixed pivot 80 by means of a link 81, having its upper end pivoted to the bracket 82 in which the bulb 83 is mounted. The lower end of link 81 is pivoted to rod 84 near one end thereof. The other end of the rod 84 is bevelled to a knife-edge 85 which is seated in a notch 86 formed in a fixed member 87. The other end of rod 84 is pivoted to a loop formed in one end of a compression spring 88, the other end of which is suitably secured to the end wall 89 of a casing 90 in which the switch mechanism is mounted. A second compression spring 91 has its upper end suitably fixed to the top 92 of the casing 90; and has its lower end pressing against the rod between the ends thereof.

Directly below the axis of spring 91, the rod 84 is supported by the pointed end 93 of a rod 94 secured to the diaphragm 95 forming the flexible head of a gas filled casing 96. The bottom wall of casing 96 is connected to a tube 97 leading to a capillary bulb (not shown) clamped to the outlet pipe of the refrigerating coil in the box B—1. The details of this thermostatic control form no part of the present invention, as they are well known in this art.

The spring 88 is mounted so as to give a "snap-over" action to the movements of the rod 84, and to hold the rod 84 steady in either raised or lowered positions. The spring 91 forms a yielding cushion stop for the movement of the rod 84 in one direction; while the diaphragm supported rod 94 forms a yielding support for rod 84 in the opposite direction.

In Figure 1 of the drawings, the elements of the switch S—1 are shown in the box B—1 in the position they occupy when the temperature in box B—1 is at or below the predetermined maximum. In this position, the circuit through the starting motor relay 15 is broken by the separation of the contacts 20 and 22. At the same time, the circuit through the solenoid 71 is closed by contacts 28 and 29. The closing of this solenoid circuit raises the armature 65 to pull up the long arm of lever 46 (see Figure 3) thereby moving the needle valve 52 into closing position. This, of course, stops circulation of refrigerant liquid through the cooling coils of box B—1.

In box B—2, the mercury switch S—2 is illustrated in the opposite position to that of S—1. The circuit through the motro relay 15 is closed by engagement of contacts 23 and 21; and is broken through the solenoid switch 37 by separation of contacts 33 and 34. The motor 1 therefore remains in operation to force refrigerant through the solenoid switch chamber 45 and the cooling unit connected thereto in the box B—2.

It is immaterial how many cooling units are connected to the compressor condenser source of refrigerant liquid. So long as the temperature of any of these units exceeds the predetermined maximum for which it is set, the compressor motor will run and the solenoid of that unit be cut out to effect circulation of refrigerant through that unit. It is only when all cooling units are at or below the permissible maximum temperature that the circuit from the mains through relay 15 is broken to stop the motor 1 and cut off circulation of refrigerant through all of the cooling units.

It will be apparent that the stopping of circulation through units not requiring it, will greatly increase the rate of circulation through those units above the maximum temperature and will decrease the time necessary to lower their temperatures to proper cooling temperature. This will effect substantial savings in the wear of the apparatus and in the energy required to operate the system as a whole.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of my invention or sacrificing any of its attendant advantages; the form herein described being a preferred embodiment for the purpose of illustrating my invention.

What I claim is:

1. In a refrigerating system, a base, a casing detachably mounted on said base and having a chamber formed therein, a lever arranged in said chamber and pivoted between its ends to said base, an inlet and an outlet formed in said casing and base, respectively, an armature pivoted on one end of said lever, a solenoid fixed in said casing around said armature, and a needle valve controlling the flow of liquid through said outlet, said lever being operable by gravity to hold the needle valve in open position and operable by the energization of said solenoid acting on said armature to force said needle valve into closed position.

2. In a refrigerating system, a base, a casing detachably mounted on said base and having a chamber formed therein, an inlet and an outlet connected to said casing and base, respectively, a valve controlling the flow of liquid through said outlet, gravity operated means supported by said base in said chamber for holding said valve normally open, and magnetically operated means controlling the gravity operated means to close said valve.

3. In a refrigerating system, a base, a casing detachably mounted on said base and having a chamber formed therein, an inlet and an outlet connected to said casing and base, respectively, a valve controlling the flow of liquid through said outlet, gravity operated means supported by said base in said chamber for holding said valve normally open, magnetically operated means controlling the gravity operated means to close said valve, and means for damping the vibration of the valve operating means.

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