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REFRIGERATING APPARATUS

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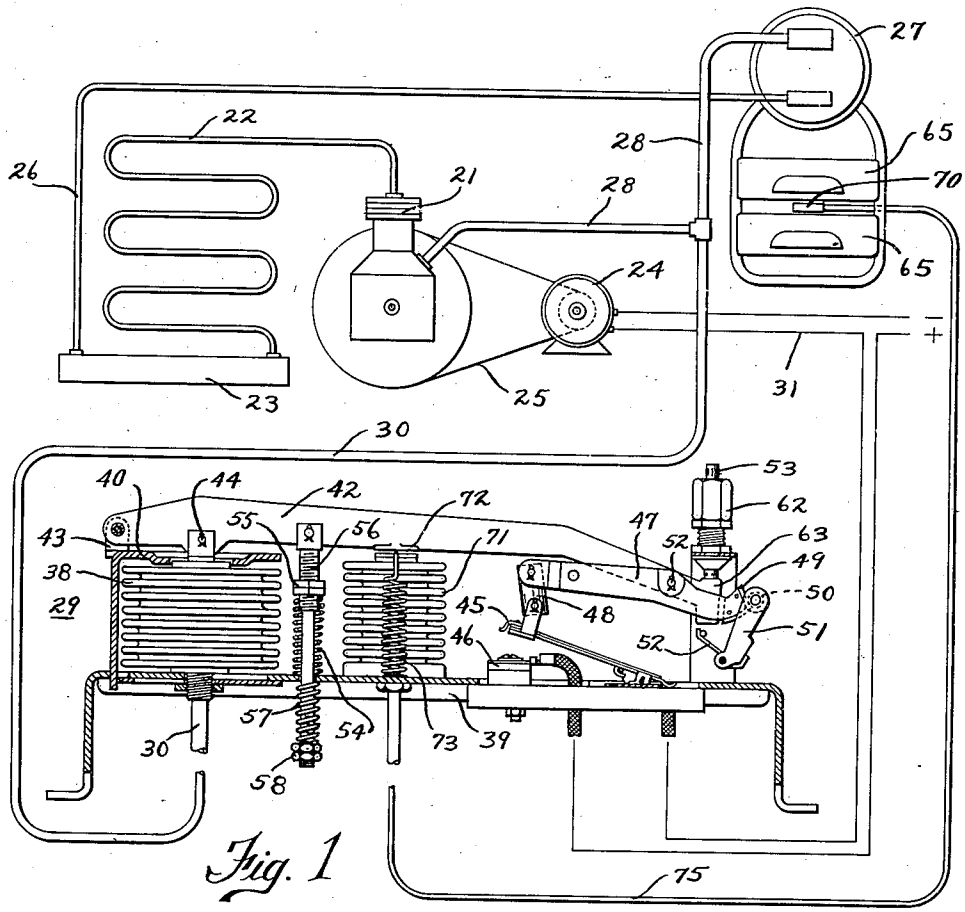


Fig. 1

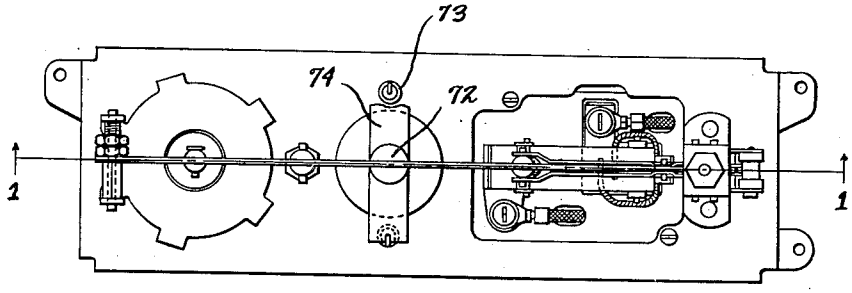


Fig. 2

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REFRIGERATING APPARATUS

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10 Claims. (Cl. 62—4)

This invention relates to refrigerating apparatus and more particularly to refrigerating apparatus of the household type in which ice trays are provided for congealing comestibles which are often used for desserts or refreshments.

One of the objects of the present invention is to provide a refrigerating system which normally maintains the desired refrigerating temperature for general refrigerating purposes and which will provide increased cooling automatically when it is desirable, such as when ice cubes are to be frozen or comestibles are to be congealed.

In carrying out this object, it is a further object to control the refrigerating system normally in response to normal requirements of the system and to control the system to provide increased cooling in direct response to a substance, such as water, which is to be frozen quickly.

Another and more specific object of the invention is to provide an improved switch for an intermittent compressing refrigerating system having means to operate the compressor continuously when it is desired to congeal comestibles in ice trays in the cooling unit of the system.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a sectional view of a switch mechanism illustrating one embodiment of the invention taken on the line 1—1 of Fig. 2 together with a diagrammatic representation of the remaining portions of a compression refrigerating system; and

Fig. 2 is a top view of the switch mechanism shown in Fig. 1.

Referring to the drawing, there is shown diagrammatically a refrigerating system which, for the purpose of illustrating the invention, is shown as a system of the compressor, condenser, expander type including a compressor 21 for compressing the refrigerant, preferably sulphur dioxide, and for forwarding it to the condenser 22 where it is liquefied and collected in the receiver 23. A supply conduit 26 supplies refrigerant from a receiver 23 to the cooling unit herein shown as an evaporator 27 where the liquid refrigerant vaporizes because of the absorption of heat and is returned to the compressor through the return conduit 28. This evaporator, of course, is placed in a refrigerator cabinet (not shown) for maintaining the food storage compartment of the cabinet at a desired refrigerating temperature.

The actuating means for the compressor 21 preferably comprises an electric motor 24 connected by pulley and belt means 25 to the compressor. Pressure responsive control mechanism 29 is connected to the return conduit 28 through the conduit 30 for opening and closing the circuit 31 of the electric motor 24 which drives the compressor 21 to provide alternating operative and idle periods of the compressor according to the pressure and consequently the temperature of the evaporator.

The pressure responsive means of the control mechanism 29 comprises a hollow metallic bellows 38 which is sealed at the top and which is connected at the bottom by means of the conduit 30 to the return conduit 28 of the refrigerating system. An operating lever 42 pivoted on ears 43 of the elevated platform 40 follows the movements of the bellows 38 by being pivoted thereto by a pin 44. A double lever 47 straddles the lever 42 and is pivoted thereto by the pin 52. One end of the lever 47 is connected to one of the switch contacts 45 by a link 48. The cooperating switch contact 46 is mounted on the base 39 of the control mechanism. A snap action of the contact 45 with respect to the contact 46 is provided by a cam system which includes the hardened steel nose 49, fastened to the other end of the lever 47, against which a hardened steel roller 50 is biased by a carrier 51 and a spring 52.

As the pressure builds up within the flexible metallic bellows 38, the latter expands, and since the lever 42 is pivoted to this bellows by the pin 44 and fulcrumed to the supporting frame of the device as at 43, it is evident that the bellows will raise the operating lever 42.

The upward movement of the lever 42 is resisted by a yieldable adjustable system comprising a coil spring carried within an adjustable casing 62 and bearing against a plunger 53 which acts against the extremity 63 of the lever 42. When the pressure decreases and the bellows 38 collapses, the downward movement of the lever will be resisted by a coil spring 54 whose tension may be regulated by nuts 55 carried on a vertical threaded rod 56 pivoted to lever 42. A balancing spring 57 adjusted by nuts 58 is used on the opposite side of the base 39 of the device for resisting the tension of the spring 54.

The springs 54 and 57 and the resilient adjusting system comprising the plunger 53 and an adjustable cap 62 are provided for preferably so adjusting to produce what may be termed normal predetermined adjustment, that is for maintaining a pressure corresponding to a par-

ticular temperature which is ordinarily suitable for every day operation of the refrigerator in which the system is used. The extremity 63 of the lever 42 bears against the plunger 53 only on the upward action of the lever 42. After lever 42 begins to descend, the extremity 63 does not touch the plunger 53. Thus, the plunger 53 affects the starting pressure but not the stopping pressure. The cap 62 is therefore a starting adjustment. The temperature provided by the mechanism thus described is sufficient to cool to the desired temperature, the food stuffs stored in the usual compartments of the cabinets cooled by the cooling unit.

Ice trays 65 are provided within the lower portion of the cooling unit 27. In order to hasten the action of freezing within the ice trays 65, I have provided for modifying the operation of the system. In the present embodiment, I control the operation of the control means. The apparatus is usually adjusted at the factory or in the field by the service man for such normal operation by suitably tensioning the springs 54 and 57 as well as the resilient adjusting system 62 and 53 and in such condition the lever 42 will have its upward and downward movements resisted so that it will open and close the circuit of the driving motor 24 only at the maximum and minimum pressure temperature points for which the tension corresponds.

By interposing a resistance to the downward movement of the lever 42, the operation of the switch contacts will be delayed so that the system will continue operating for a longer period of time, thus prolonging the cooling cycle of the system. Likewise, if the resistance to the descent of the lever 42 is increased, it will require a greater effort on the part of the diaphragm 38 to pull the lever down into contact breaking position (the descent of the lever 42 causing the raising of contact 45 away from the contact 46, thus breaking the circuit).

According to the present invention, automatic thermostatic means are provided for interposing such a resistance. To this end a thermostatic bulb 70 is interposed between the ice trays 65 in the cooling unit 27. Also an auxiliary bellows 71 is fastened on a base 39 and positioned so as to contact when expanded for contact portion 72 on the lower side of the lever 42. The bellows 71 is normally held in position away from the abutment or contact portion 72 by a pair of springs 73 which have their lower ends connected to the base 39 and their upper ends connected to a cross strip 74 which rests and is fastened to the top of the bellows 71. Therefore, during normal operation, the bellows is ineffective. The thermostatic bulb 70 is connected by a conduit 75 to operate the bellows 71. When warm ice trays filled with substances to be frozen or congealed are inserted in the portion of the cooling unit 27 provided therefor, the heat from the warm ice trays 65 causes a volatile fluid within the thermostatic bulb 70 to expand and flow through conduit 75 and thus expand the bellows 71, forcing the lever 42 upwardly so that the contacts 45 and 46 will be closed to start the motor 24. When the contacts 45 and 46 are already in closed position, the bellows 71 will keep them in this position until the ice trays 65 have cooled. By operating the motor 24 and the compressor 21 continuously until the ice trays have been cooled, freezing within the ice trays 65 is accelerated.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerating apparatus, a cooling unit having a freezing zone, means for supplying refrigerant to and for withdrawing refrigerant from the cooling unit, control means responsive to pressures of the refrigerant within the cooling unit for controlling said last mentioned means, and means for modifying the operation of the control means including means responsive to the temperature adjacent the freezing zone of the cooling unit.

2. In a refrigerating apparatus, the combination of a closed circuit containing refrigerant and including a compressor, a condenser and a cooling unit, means to drive the compressor, controlling means responsive to the pressure of refrigerant within the cooling unit of the closed circuit for controlling the driving means for normal refrigerating requirements, and means for modifying the operation of the controlling means to provide additional cooling including means responsive to the temperature within a portion of the cooling unit.

3. In a refrigerating apparatus, the combination of a closed circuit including a compressor, a condenser, and a cooling unit containing a plurality of ice trays, driving means for the compressor, controlling means to intermittently operate the driving means in response to the pressure within a portion of the closed circuit, and means for modifying the operation of the controlling means including a thermostatic bulb positioned between the ice trays for operating the controlling means and for urging said controlling means into operative position.

4. Refrigerating apparatus including a compressor, a condenser, and a cooling unit containing a plurality of ice trays, means for driving the compressor, a switch having starting and stopping positions for starting and stopping the driving means, said switch having a switch arm, a bellows responsive to the pressure within a portion of the evaporator for operating said arm, a second bellows for urging the switch into starting position, and a thermostatic bulb positioned adjacent the ice trays and connected to the second bellows.

5. Refrigerating apparatus comprising in combination, an evaporator, means for circulating refrigerant medium through the evaporator, control means responsive to pressures of the refrigerant medium within the evaporator for automatically controlling the circulating means to maintain said evaporator at a normal predetermined mean temperature, and means for automatically modifying the operation of the control means in response to the temperature of a substance placed in thermal contact with the evaporator to be congealed thereby.

6. Refrigerating apparatus comprising in combination, an evaporator, means for cyclically circulating a refrigerating medium through said evaporator, control means responsive to pressures of the refrigerating medium within the evaporator for automatically controlling the circulating cycles of said first named means including means for adjusting same to normally maintain a predetermined mean temperature of the evaporator, and means operable automatically and independent of the adjustable means for modifying the operation of said control means, said last named

means being responsive to the temperature of a substance placed in thermal contact with the evaporator to be congealed thereby.

7. Refrigerating apparatus comprising in combination, an evaporator, mechanism for circulating a refrigerating medium through said evaporator to produce refrigeration therein, control means responsive to pressures of the refrigerating medium within the evaporator for automatically controlling said mechanism for maintaining the temperature of the evaporator within predetermined limits, auxiliary means for modifying the action of said control means to change the lower temperature limit of said evaporator while maintaining the upper temperature limit unchanged, said auxiliary means being operated automatically in response to the temperature of a substance placed in thermal contact with the evaporator to be congealed thereby.

8. Refrigerating apparatus comprising in combination, an evaporator, mechanism for circulating a refrigerating medium through said evaporator to produce refrigeration therein, control means responsive to pressures of the refrigerating medium within the evaporator for automatically controlling said mechanism for maintaining said evaporator at a normal predetermined mean temperature, resistance means on said control means for modifying the action thereof to cause the temperature of said evaporator to be lowered below its normal predetermined mean temperature limit, and a thermostat responsive to the temperature of a substance placed in thermal contact with the evaporator to be congealed, said thermostat having a portion thereof communicating with said resistance means for automatically rendering said resistance means effective.

9. In a refrigerating apparatus comprising in combination, a cooling element, means for circulating a refrigerant medium through said element, means for operating said first named means, a switch responsive to pressure of the refrigerating medium within the cooling element corresponding to the normal refrigerating requirements of the cooling element for controlling operations of said second named means, and means responding automatically to a different refrigerating requirement for changing the action of said switch to modify the operation of said second named means.

10. In a refrigerating apparatus comprising in combination, an evaporator, means for circulating liquid refrigerant to said evaporator and for withdrawing gaseous refrigerant therefrom, means for operating said first named means, a switch responsive to pressure of the refrigerant within the evaporator corresponding to the normal refrigerating requirements of said evaporator for controlling operations of said second named means, and means for changing the action of said switch to modify the operation of said second named means, said last named means being responsive automatically to the temperature of a substance placed in thermal contact with the evaporator to be cooled.

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