

March 31, 1936.

H. F. SMITH

2,035,573

REFRIGERATING APPARATUS

Original Filed Dec. 30, 1930 2 Sheets-Sheet 1

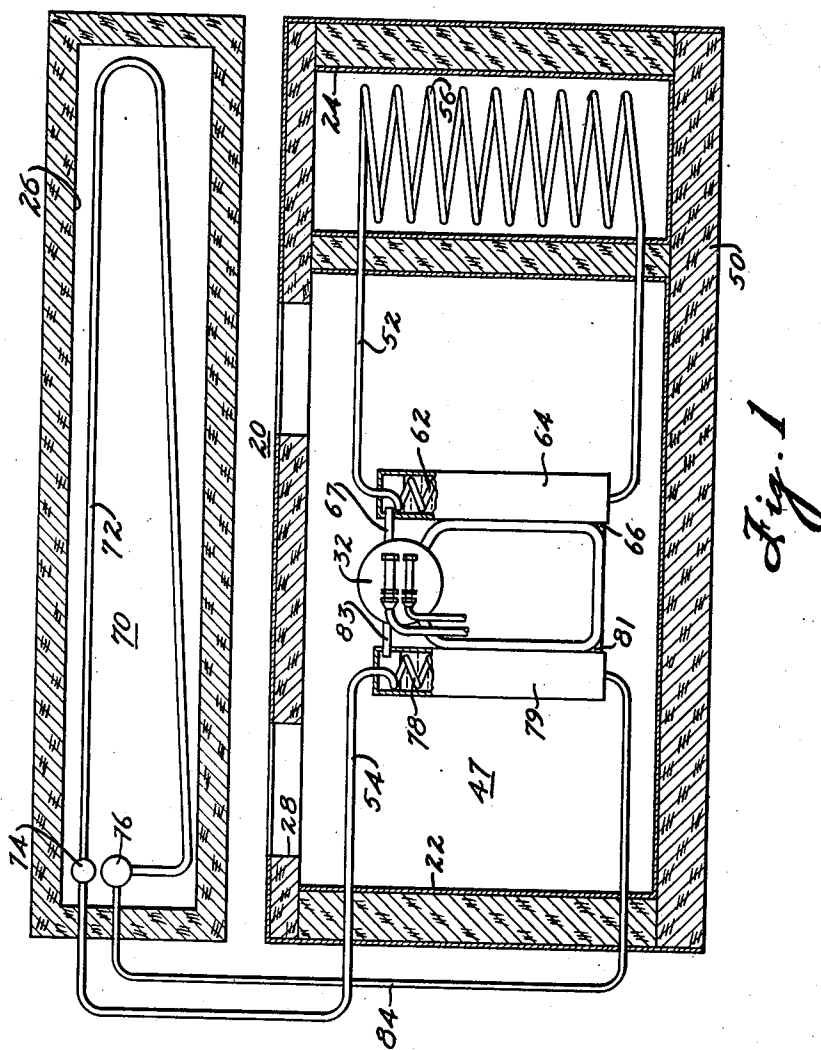


Fig. 1

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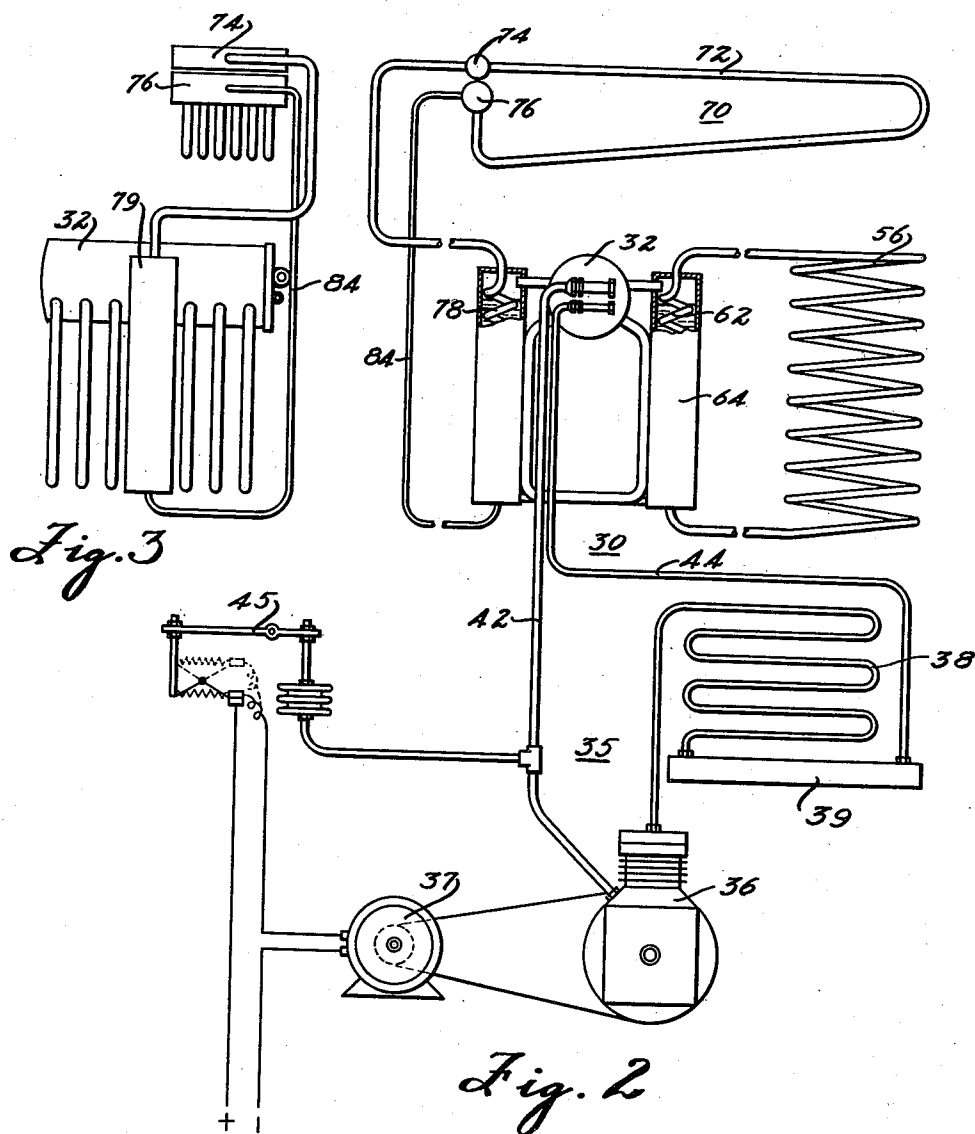
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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

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Renewed April 10, 1934

2 Claims. (Cl. 62—116)

This invention relates to refrigerating apparatus and more particularly to refrigerating apparatus utilizing a plurality of refrigerant circuits for cooling a plurality of zones or compartments.

One of the objects of this invention is to provide an improved refrigerating apparatus adapted to refrigerate a plurality of cooling zones or compartments, and to arrange said apparatus in such a manner so as to maintain individual predetermined temperatures in said zones or compartments.

Another object of this invention is to provide an improved mechanical refrigerating apparatus adapted to refrigerate a plurality of cooling zones or compartments and to supply refrigerant to, at least, one of said zones or compartments by percolatory-like lift.

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

In the drawings:

Fig. 1 is a diagrammatic view of a refrigerating apparatus embodying features of this invention;

Fig. 2 is a diagrammatic view of the refrigerating system employed for refrigerating the apparatus shown in Fig. 1; and

Fig. 3 is a side view of a portion of the system shown in Fig. 2.

Referring to the drawings the numeral 20 designates in general a refrigerating cabinet which includes a cooling compartment which is also used as a heat transfer receptacle designated 22, a liquid cooling compartment 24 and a cooling compartment 26. The cabinet 20 is commonly known as a soda fountain. The receptacle 22 is arranged in the cabinet for maintaining frozen foods, such as ice creams, in the frozen condition and is provided with a plurality of openings 28 for the reception of food containers. The liquid cooling compartment 24 is adapted to contain a quantity of sweet water to be cooled, and the compartment 26 is adapted for cooling the so-called sirup rail provided in soda fountain refrigerator cabinets.

A refrigerating system designated in general by the numeral 30 is connected to the receptacle 22 in order to maintain the receptacle below a predetermined temperature limit. In the chosen illustration the system includes the liquid cooling member or evaporator 32 of the flooded float controlled type similar to that shown in the patent to R. G. Osborne No. 1,556,708, issued October

13, 1925, and a refrigerant-liquefying unit 35. The unit 35 includes the compressor 36, motor 37, condenser 38 and receiver 39. The compressor withdraws the gaseous refrigerant from the evaporator 32 through the vapor conduit 42, compresses the gaseous refrigerant and delivers it to the condenser 38 wherein it is liquefied and from which it is delivered to the receiver 39 which has a supply conduit 44 connected therewith and leading to said evaporator. An automatic switch, responsive to pressure in the conduit 42, is adapted to control the starting and stopping of the motor 37. The receptacle 22 may be of any suitable means for maintaining foods in the frozen condition and for promoting the transfer of heat. As shown, the receptacle 22 includes a tank 47 adapted to be filled with any suitable non-freezing liquid such as calcium chloride brine or a solution of alcohol. The tanks 47 and 24 are provided with suitable insulation 50 which extends along all sides, top and bottom walls thereof and between the tank 47 and the compartment 24.

The heat transfer receptacle 22 is provided with a plurality of heat transfer systems 52 and 54 leading to a plurality of zones to be refrigerated, which may be the compartments 24 and 26. The heat transfer system 52 includes a coiled evaporator 56. A suitable connection is provided between the evaporator 56 and the heat transfer receptacle 22. This includes a coiled condenser 62. The heat transfer system 52 as shown comprises a closed refrigerating system in which is provided a volatile liquid refrigerant such as sulphur dioxide and includes the evaporator 56 wherein the liquid refrigerant is evaporated and from whence the gaseous refrigerant passes to the condenser 62. The condenser 62 is surrounded by a rectangular shaped housing 64 which is adapted to contain a predetermined quantity of liquid refrigerant for condensing the evaporated refrigerant in the coiled portion or condenser 62 of the heat transfer system 52. The housing 64 receives liquid refrigerant from the evaporator 32 of the primary refrigerating system 30 through a conduit 66 and returns the evaporated refrigerant to the evaporator 32 through a vapor conduit 67.

The heat transfer system 54 is adapted to supply refrigeration to the compartment 26 for cooling the sirup rail of the soda fountain. This system includes an evaporator 70 which comprises a plurality of elongated loops 72 joined on one end to a vapor manifold 74 and on their opposite ends to a liquid refrigerant manifold 76. The system 54 also includes a coiled con-

denser 78 located in a housing 79, the condenser 78 and the housing 79 corresponding to the condenser 62 and the housing 64 respectively. Liquid refrigerant is supplied to the housing 79 from the evaporator 32 of the primary refrigerating system through a liquid supply conduit 81 and the gaseous refrigerant is returned to the evaporator 32 through a vapor return conduit 83. The evaporated refrigerant from the evaporator 70 in compartment 26 is condensed in the condenser 78 whence the liquid refrigerant will be supplied to the evaporator 70 in a manner about to be described.

The heat transfer system 54 as shown in the drawing is a closed refrigerating system and since the zone or compartment to be refrigerated is located above the place where the liquefaction takes place in said system some means is provided for supplying liquid refrigerant to the evaporator 70. Thus, I have arranged the system 54 in such a manner so that a portion of the refrigerant supply conduit 84 is placed in the atmosphere outside of the cabinet 20. By this arrangement liquid refrigerant will be supplied to the evaporator 70 by a percolatory-like shift, that is, by a similar action as that which takes place in the well known coffee percolator and so called percolation, which percolator-like lift action is herein meant to be the action which takes place due to the boiling liquid in the supply conduit 84 wherein the gas bubbles provide a lift to raise liquid to the evaporator 70.

The primary refrigerating system 32 is adapted to maintain a predetermined temperature range within the receptacle 22 by means of the flooded float controlled evaporator which is maintained between constant temperature limits by control of the switch 45 and thus maintains predetermined constant temperature limits within the receptacle 22. The temperatures in the secondary systems or heat transfer systems 52 and 54 are maintained within predetermined limits for refrigerating the compartments 24 and 26 by providing temperature differential means between the evaporators 56 and 32 and between the evaporators 70 and 32. In order to control this differential a quantity of gas, such as air, non-condensable at temperatures prevailing in the secondary systems is injected into the secondary systems. In order to maintain a higher temperature in the compartment 26 which is adapted to cool the syrup rail for the soda fountain

the gas is injected into system 54 at a greater pressure to thus maintain a higher temperature in the evaporator 70 than the pressure or temperature in the evaporator 56. Thus by ejecting air in the secondary systems at different pressures the different temperatures will prevail in the compartments 24 and 26.

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. Refrigerating apparatus comprising in combination, means providing a plurality of compartments to be cooled, a primary cooling element disposed in one of said compartments, a refrigerant circuit including as elements thereof a condenser, an evaporator disposed in a second compartment and connections therebetween, said condenser being located in heat transfer relation with said primary cooling element and being in open communication with said evaporator whereby condensation and evaporation of refrigerant in said circuit takes place at substantially the same pressure, and a portion of said connections being exposed to atmosphere exteriorly of said compartments for overcoming the force of gravity of refrigerant in the circuit and to return liquid refrigerant collecting in said condenser to said evaporator.

2. Refrigerating apparatus comprising in combination, means providing a plurality of compartments to be cooled, a primary cooling element disposed in one of said compartments, a refrigerant circuit including as elements thereof a condenser, an evaporator and connections therebetween, said evaporator being disposed in a second compartment on a higher plane than said condenser, said condenser being located in heat transfer relation with said primary cooling element and being in open communication with said evaporator whereby condensation and evaporation of refrigerant in said circuit takes place at substantially the same pressures, and a portion of said connections being exposed to atmosphere exteriorly of said compartments for overcoming the force of gravity of refrigerant in the circuit and to return liquid refrigerant collecting in said condenser to said evaporator.

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