Jan. 19, 1937. H. J. DICK 2,068,007

REFRIGERATING APPARATUS

Original Filed March 17, 1933

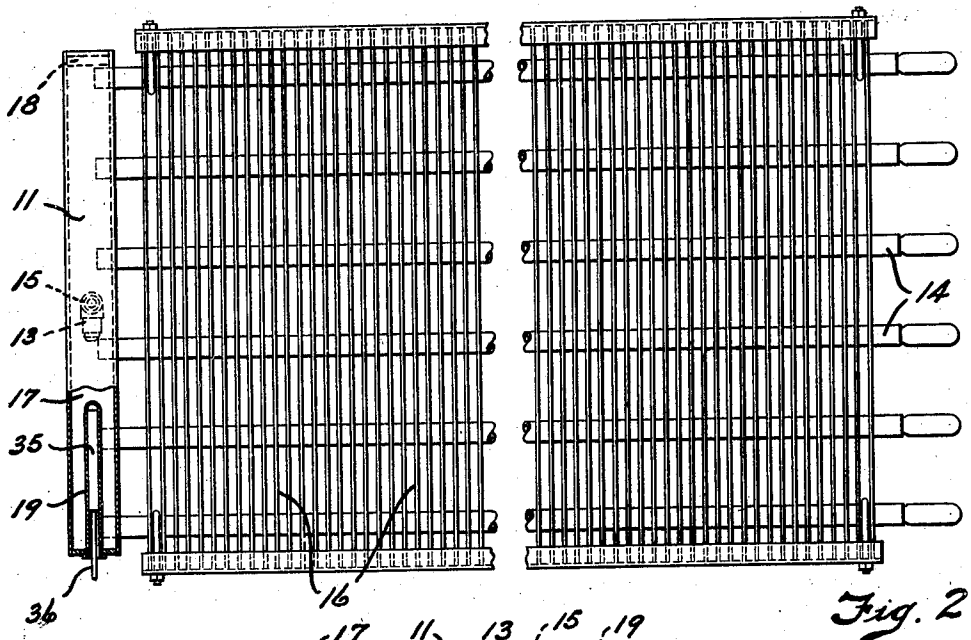


Fig. 2

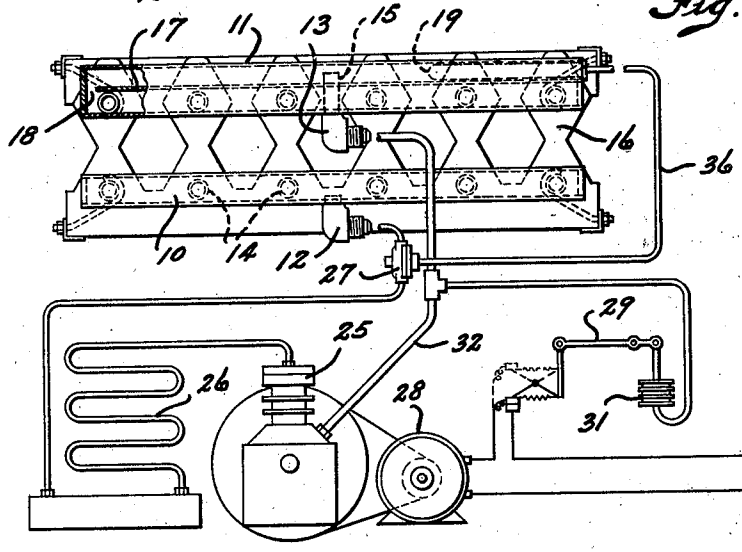


Fig. 1

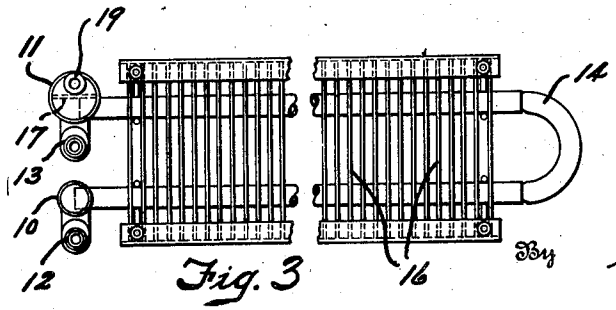


Fig. 3

Inventor
Herman J. Dick

By Spencer, Hardman, and Fehr.
his Attorneys.

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REFRIGERATING APPARATUS

Herman J. Dick, Dayton, Ohio, assignor, by mesne assignments, to General Motors Corporation, a corporation of Delaware

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1 Claim. (Cl. 62—3)

The present invention relates to refrigerating systems and to evaporators for such systems.

An object of my invention is to provide an improved refrigerating system and particularly a system employing an improved evaporator of the flooded type.

Another object of my invention is to provide an improved flooded evaporator for a refrigerating system, wherein the level of liquid refrigerant is maintained substantially constant by means of a valve actuated in response to temperatures, the evaporator having all the advantages of an evaporator employing a float operated valve.

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 discloses a diagrammatic showing of my improved refrigerating system connected with an evaporator constructed in accordance with my invention;

Fig. 2 is a top plan view of the evaporator disclosed in Fig. 1 and shows a portion of a header therefor in section; and

Fig. 3 is a front view of the evaporator shown in Figs. 1 and 2.

Referring to the drawing, my improved evaporator includes a pair of headers 10 and 11 shown as cylinders disposed one above the other. The lower header 10 is provided with an inlet connection 12 for receiving liquid refrigerant. Upper header 11 is provided with a gaseous refrigerant outlet connection 13. This connection includes an extension or stand pipe 15 which extends to a point near the top of header 11 (see Fig. 1) and is for a purpose to be later described. A plurality of refrigerant conveying or distributing conduits 14 are connected in parallel to headers 10 and 11. These conduits may be of any desired form and are preferably of the form as shown herein. The conduits 14 extend laterally from header 10, thence upwardly and horizontally to header 11. Each of these conduits may be constructed from a single length of tubing and bent into the required form or they may be provided by two straight lengths of conduit connected by a U-shaped end connection as desired. A plurality of fins 16 of any desired shape or form are secured to and bridge the horizontally extending portions of conduits 14 to increase the heat absorbing capacity of the evaporator. The particular shape and arrangement of the fins 16 form no part of my invention. The upper header 11 is provided with a baffle 17 which extends horizontally across the interior thereof and is secured to the inner walls of the cylindrical header 11. Baffle 17 is provided with an opening for receiving the extension or stand pipe 15 cooperating with the outlet connection 13. This baffle 17 is positioned above the point of communication of conduits 14 with header 11 and extends from the front wall of header 11 to a point spaced from the rear wall thereof. The space between the end of baffle 17 and the rear wall of header 11 provides a passage 18 for permitting refrigerant to flow from below the baffle to the outlet connection 13 of the header 11 (see Fig. 1). A tubular member 19 is sealed to the front wall of header 11 and extends into the header above the baffle 17 and is closed at its inner end to form a well for the reception of a thermostat bulb to be hereinafter more fully referred to.

Referring to Fig. 1, the refrigerating system or the refrigerant liquefying and condensing unit operatively connected to my improved evaporator includes the customary compressor 25, condenser 26, and an expansion valve 27 actuated in response to pressure of refrigerant contained in the evaporator. The compressor is driven by a motor 28 under the control of a switch 29 actuated by expansion and contraction of a bellows 31 in response to pressures of refrigerant within the evaporator or in the low pressure portion of the system. Evaporated or gaseous refrigerant is withdrawn from the evaporator, by the compressor, through the vapor return conduit 32. The expansion valve 27 of the system shown is preferably of the type disclosed in the patent to Harry B. Hull, No. 1,834,949 of December 8, 1931. In such systems the expansion valve controls the flow of liquid refrigerant into the evaporator in response to the pressure existing within the evaporator as is fully described in said patent to Hull.

In applicant's system, like in the Hull patent, there is employed means for modifying the action of the expansion valve to obtain certain results. Therefore, in order to keep liquid refrigerant distributed throughout the entire evaporator or to maintain a predetermined level of liquid refrigerant in the evaporator I employ a thermostat bulb 35 containing any suitable expansible and contractible fluid. Bulb 35 is mounted in the well 19 of the evaporator (see Fig. 2) and is connected with the expansion valve 27 by the conduit 36 (see Figs. 1 and 2). The expansion valve 27 is normally adjusted to maintain the level of liquid refrigerant within the evaporator at a

desired point, preferably immediately below the baffle 17 and within the header 11 of the evaporator. However, certain refrigeration demands upon the evaporator necessitate modified operation of the expansion valve 27 to insure that the level of liquid refrigerant will remain substantially constant in the evaporator and to insure that liquid refrigerant will not enter the outlet of the evaporator or the gaseous refrigerant connection 13 thereof.

As before stated, the expansion valve is adjusted to normally maintain the level of liquid refrigerant within the evaporator immediately below the baffle 17. The fluid content of thermostat bulb 35 is such that as long as no liquid refrigerant is present in the header 11 above the baffle 17 its influence on valve 27 is negligible and valve 27 operates normally to admit liquid refrigerant to the evaporator as needed in accordance with the rate of evaporation thereof in the evaporator. However, if and when during certain refrigeration demands upon the evaporator, liquid refrigerant enters the space above the baffle 17 in header 11, the refrigerant will contact with the wall of the well 19 and consequently the thermostat bulb 35 since the thermostat bulb is preferably in intimate thermal contact with walls of the well. The temperature of the bulb 35, and consequently its fluid content, will be lowered by the increased quantity of liquid refrigerant in the evaporator and the fluid in bulb 35 and conduit 36 will contract. Contraction of the fluid in bulb 35 and conduit 36 effects the operation of valve 27 in that it closes same to prevent further ingress of liquid refrigerant to the evaporator. This function of the thermostat to modify the operation of the expansion valve 27 is fully described in the patent to Hull heretofore referred to and for this reason it is believed to be unnecessary to herein describe the operation of valve 27 and the control thereof by thermostat 35 in detail. Obviously, after liquid refrigerant contained in the header 11 of the evaporator above the baffle 17 therein evaporates, the temperature of the thermostat will again rise and permit the expansion valve 27 to operate normally and to open and close in response to pressure within the evaporator. The extension or stand-pipe 15 cooperating with the outlet connection 13 of the evaporator serves to prevent liquid refrigerant from flowing into the suction line 32 of the system at all times and particularly during presence of liquid refrigerant in header 11 above baffle 17.

The arrangement of baffle 17 and its cooperation with the stand-pipe 15 further prevents liquid refrigerant from being splashed into the suction line 32 of the system during violent boiling of the refrigerant in the evaporator and thus enables the apparatus to operate efficiently to produce refrigeration only within the evaporator portion of the system. These features have been extremely difficult to obtain in evaporators for such systems wherein the refrigerant conveying or distributing conduits have been connected in parallel because of the fact that violent or abnormal evaporation of refrigerant may occur in certain of the conduits while normal evaporation occurs in other conduits. However, my improved evaporator structure eliminates all problems heretofore encountered in the construction of evaporators including conduits connected in parallel circuit relation and permits substantially the entire cooling conduit area of the evaporator to be flooded with liquid refrigerant.

From the foregoing, it can be determined that I have provided an improved evaporator for refrigerating systems wherein liquid refrigerant is admitted to the evaporator by a valve actuated in response to pressures of refrigerant in the evaporator. My improved evaporator is therefore of substantially the same efficiency in a system of the type disclosed as an evaporator wherein liquid refrigerant is admitted thereto by a valve actuated by a float responsive to a predetermined level of liquid refrigerant in the evaporator. That is, substantially the entire cooling surface of the evaporator is in intimate thermal contact with liquid refrigerant, and, at the same time, liquid refrigerant is prevented under all conditions of operation from entering the low pressure side of the system. My invention furthermore provides an improved refrigerating system in that, with the use of the evaporator disclosed and the particular arrangement and operation of the refrigerant flow control means, a system of the direct expansion type having operations of the refrigerant liquefying and condensing unit controlled in response to pressures within the evaporator or within the low pressure side of the system is provided.

While the form of embodiment of the 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 claim which follows.

What is claimed is as follows:

A refrigerating system comprising in combination, an evaporator, said evaporator including a header having a liquid refrigerant inlet, said evaporator also including another header disposed above said first named header and having a gaseous refrigerant outlet, said another header being larger than said first named header and lying parallel thereto, a plurality of refrigerant distributing conduits connected in parallel to said headers and extending outwardly therefrom, a plurality of fins secured to and disposed at right angles to said refrigerant distributing conduits for increasing the heat transference surface of the evaporator, means for circulating liquid refrigerant to said evaporator and for withdrawing gaseous refrigerant therefrom, a valve for controlling the flow of liquid refrigerant into said evaporator through the inlet provided in said first named header, a thermostat positioned within said another header and responsive to the temperature of refrigerant flowing from said conduits to said another header for modifying the action of said valve to maintain a quantity of liquid refrigerant in said headers and said conduits, and a baffle positioned in said another header below said thermostat.

HERMAN J. DICK.