Jan. 23, 1951 L. A. PHILIPP 2,539,099

REFRIGERATING APPARATUS

Filed Nov. 4, 1947

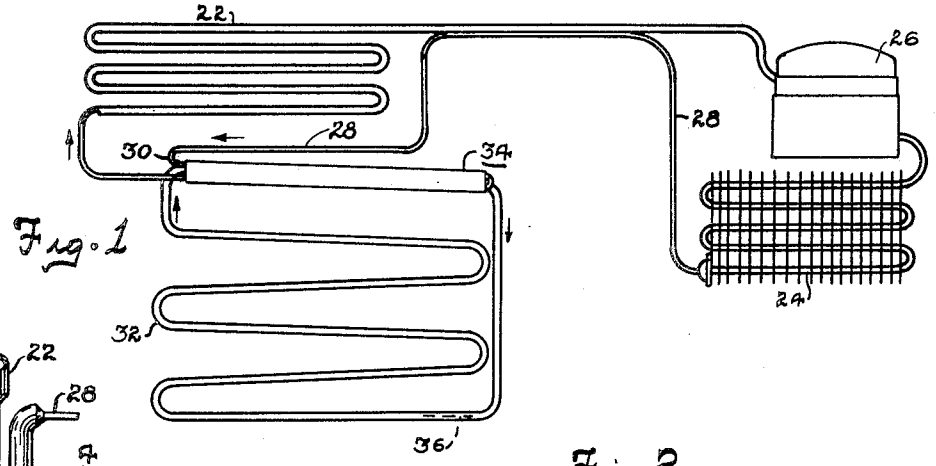

Fig. 1

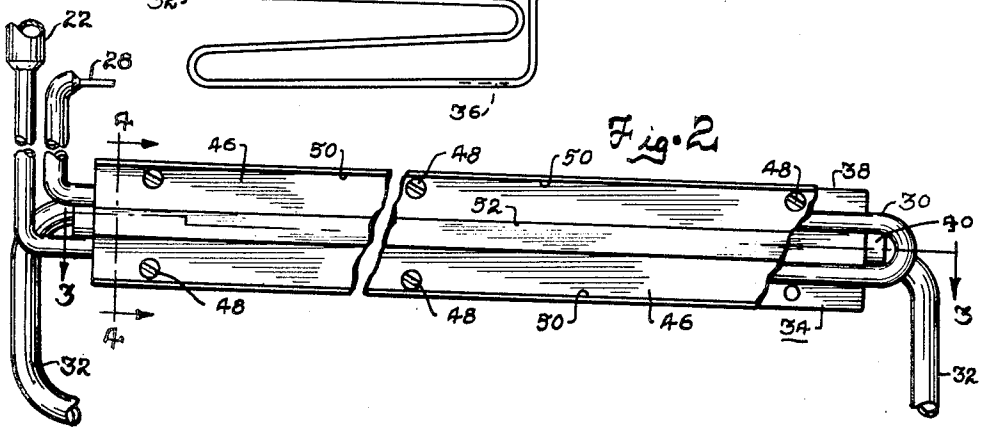

Fig. 2

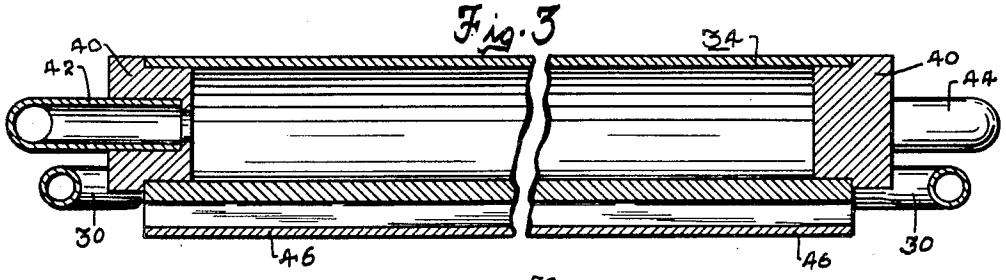

Fig. 3

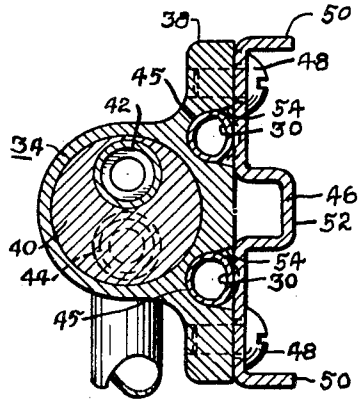

Fig. 4

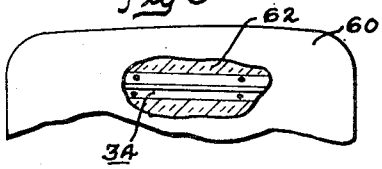

Fig. 5

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Patented Jan. 23, 1951

2,539,099

UNITED STATES PATENT OFFICE

2,539,099

REFRIGERATING APPARATUS

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Application November 4, 1947, Serial No. 784,035

6 Claims. (Cl. 62—125)

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This invention relates generally to multiple temperature refrigerating apparatus and more particularly to heat exchange devices therefor.

One of the objects of the present invention is to provide for primary and secondary refrigerating systems an improved heat exchange device of a character improving heat transfer relationship between the systems.

Another object of the invention is to provide an improved heat exchange device which facilitates assembly of primary and secondary refrigerating systems and at the same time insures proper surface contact therebetween for adequate heat exchange purposes.

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 diagrammatical view of a two temperature refrigerating apparatus embodying features of my invention;

Fig. 2 is an enlarged, fragmentary view of the refrigerating apparatus including my heat exchange device;

Fig. 3 is a sectional view of the heat exchange device taken longitudinally thereof along the line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view of the heat exchange device taken along the line 4—4 of Fig. 2; and

Fig. 5 is a fragmentary view of the upper rear portion of a refrigerator, partly broken away, showing my improved heat exchange device installed therein on an incline.

Referring to the drawings and first to Fig. 1, the refrigerating apparatus shown has a primary system which comprises, in general, a refrigerant evaporator 22, a refrigerant condenser 24 and a motor compressor unit 26. Liquid refrigerant is delivered from the condenser 24 to the evaporator 22 by a conduit comprising a capillary tube portion 28 and an enlarged conduit portion 30. The capillary tube 28 is adapted to meter and thereby control flow of refrigerant therethrough so as to deliver to the evaporator 22, the proper amount of refrigerant necessary to obtain desired temperatures. The enlarged conduit portion 30 is a refrigerant evaporator or heat absorbing portion of my heat exchange device; refrigerant entering the enlarged portion 30 expanding therein to absorb heat.

A secondary refrigerating system of the apparatus comprises, an evaporator 32 and a heat

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exchange element 34. The secondary heat exchange element 34 and the heat absorbing portion 30 of the primary system cooperate in the transfer of heat from the secondary to the primary system. An ebullator 36 is provided in the secondary evaporator 32 to insure circulation of refrigerant through the system. For a detailed description of the construction and function of the ebullator 36, reference may be had to my patent entitled "Refrigerating Apparatus," No. 2,361,792. The present system described herein may be installed in a refrigerator of the type disclosed in said patent.

The secondary system heat exchange element 34 is preferably a cylinder or tube having a flange 38 extending longitudinally and substantially coextensive thereof. In opposite ends of the tube 34 are closure plugs 40 which are bored to receive respectively the opposite ends 42 and 44 of the evaporator conduit 32. The ends 42, 44 of the evaporator conduit 32 may be suitably sealed and secured in the plugs 40. Preferably the outer face of the flange 38 presents a flat clamping surface as shown and in this surface is provided a pair of spaced grooves or recesses 45 to receive the heat absorbing portion 30 of the primary system. The grooves 45 extend longitudinally of the conduit portion 34, preferably to the opposite ends thereof. To insure good surface contact between the conduit 30 and the wall of the grooves 45, I make the depth of these grooves 45 less than the diameter of the conduit 30 and deform and crowd the conduit 30 into the grooves by tightening down a clamp 46 against the conduit 30. The clamp 46 may be drawn tightly against the flat surface of the flange 38 by means of screws 48 screwthreaded into the flange of the heat transfer portion 34. In the present construction, the clamp 46 is in the form of a plate which is preferably reinforced by out-turned flanges 50 and by a centrally located rib 52. To allow for deformation and crowding of the conduit 30 into the grooves 45, I form the grooves so that their sides taper outwardly, as at 54. Thus, when the clamp 46 is tightened down, a large surface area of the conduit 30 is forced into intimate contact with a correspondingly large surface of the grooves and their tapered sides whereby good heat transfer between the parts is obtained.

The heat absorbing portion 30 of the primary system may be made of an efficient heat conducting material, such as annealed copper, aluminum or other metal, which will not crack when deformed and crowded into the grooves. Also, the heat transfer element 34 of the secondary sys-

tem is preferably made of aluminum and may be inexpensively made by the extrusion process.

To induce and insure circulation of refrigerant through the secondary system, I arrange the heat transfer device at a slight angle to the horizontal with the inlet end 42 of the conduit disposed above the outlet end 44 to establish a pressure flow head. Also I connect the conduit ends 42, 44 in relative, vertical offset relation as shown in Fig. 4 to increase the flow head. Thus in Fig. 5 I have shown my improved heat exchange device 34 installed in a refrigerator 60 which may be the same as the refrigerator disclosed in the above mentioned patent. The device 34 is positioned in the insulation 62 of the refrigerator 60 and placed on an incline to insure proper flow therethrough and drainage therefrom.

From the foregoing description it will be noted that I have provided an improved system for the transfer of heat between primary and secondary evaporators of a refrigerating apparatus. It will be appreciated that by providing a groove or grooves in one heat exchange conduit and deforming the other heat exchange conduit to crowd it into the grooves that good intimate contact between the portions is assured. In addition, my system of heat exchange lends itself to ready assembly of the heat exchange portions and generally to an inexpensive product to manufacture.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. In a heat exchange device for the transfer of heat from a secondary refrigerating system to a primary refrigerating system comprising, a refrigerant conduit having an enlarged flow capacity portion, said enlarged portion being inclined longitudinally at an angle closer to the horizontal than to the vertical, a groove in the outer surface of said enlarged portion inclined in a direction corresponding to the inclination of said enlarged portion, and a second refrigerant conduit having a portion thereof engaging said enlarged portion in said groove.

2. In a heat exchange device for the transfer of heat from a secondary refrigerating system to a primary refrigerating system, a refrigerant conduit having an enlarged portion, an external groove of predetermined depth in said enlarged portion, a second refrigerant conduit having a portion engaging said enlarged portion in said groove, said second named portion having an initial diameter greater than the depth of said groove, and means drawn down to said enlarged portion deforming and crowding said second named portion into intimate contact with substantially the entire surface of said groove.

3. In a heat exchange device for the transfer of heat from a secondary refrigerating system to a primary refrigerating system, a refrigerant conduit having an enlarged portion, an external groove of predetermined depth in said enlarged portion, a second refrigerant conduit having a portion engaging said enlarged portion in said groove, said second named portion having an initial diameter greater than the depth of said groove, and a clamp drawn down to said enlarged portion deforming and crowding said second-named portion into intimate contact with the surface of said groove.

4. In a heat exchange device for the transfer of heat from a secondary refrigerating system to a primary refrigerating system, a relatively large capacity refrigerant conduit having a laterally disposed flange extending longitudinally thereof, a pair of longitudinally extending external grooves in said flange, a relatively small capacity refrigerant conduit in heat transfer engagement with said first conduit in said grooves, said grooves having a depth less than the diameter of said second conduit, and a plate clamped against said flange deforming and holding said second conduit in intimate heat contact with the surfaces of said grooves.

5. Refrigerating apparatus comprising, a primary system evaporator having a refrigerant inlet, an elongated heat exchanger refrigerant evaporator communicatively connected to said primary system evaporator anterior of said inlet and being longitudinally inclined at an angle with the axis of inclination closer to the horizontal than to the vertical, said heat exchanger evaporator having a flow capacity less than the flow capacity of said primary system evaporator, a refrigerant delivery conduit of less flow capacity than said heat exchanger refrigerant evaporator to deliver refrigerant thereto, and an elongated heat exchanger refrigerant condenser of a secondary refrigerating system extending longitudinally of and in heat exchange relationship with said heat exchanger evaporator.

6. In a heat exchange device for transfer of heat from a secondary refrigerating system to a primary refrigerating system, a refrigerant conduit enlarged portion inclined at an acute angle to the horizontal, a pair of grooves in the outer surface of said enlarged portion extending longitudinally thereof and a refrigerant flow conduit loop engaging said enlarged conduit portion in said grooves.

LAWRENCE A. PHILIPP.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,329,141	Scullen	Sept. 7, 1943