Aug. 14, 1934. L. C. SMITH 1,970,106

REFRIGERATION EVAPORATOR

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Fig. 1.

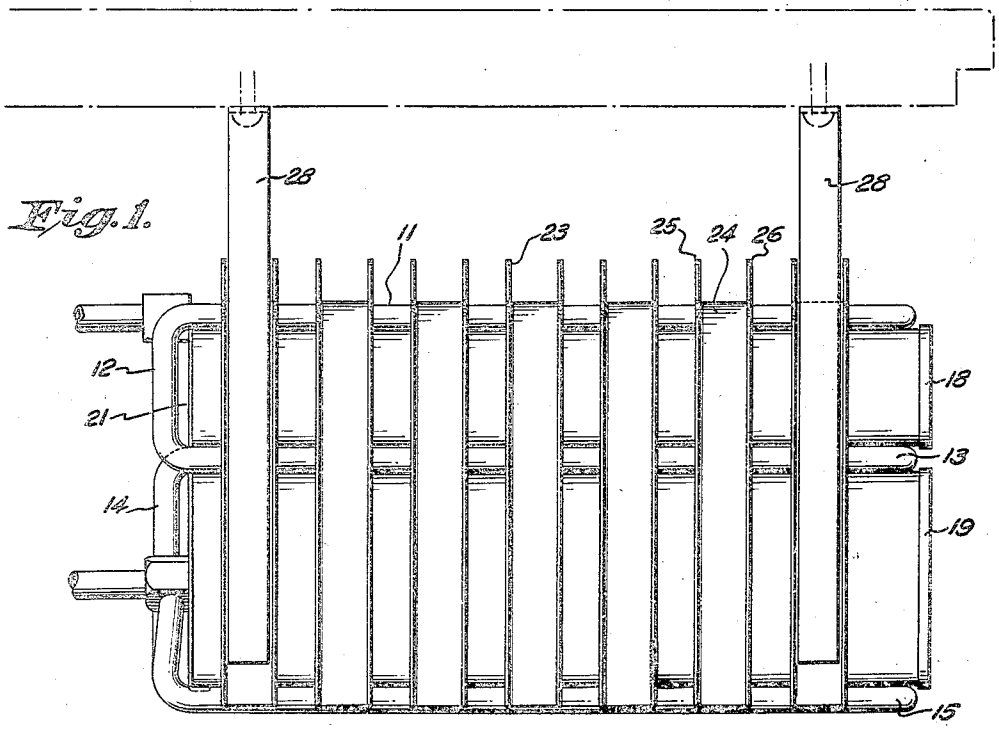


Fig. 2.

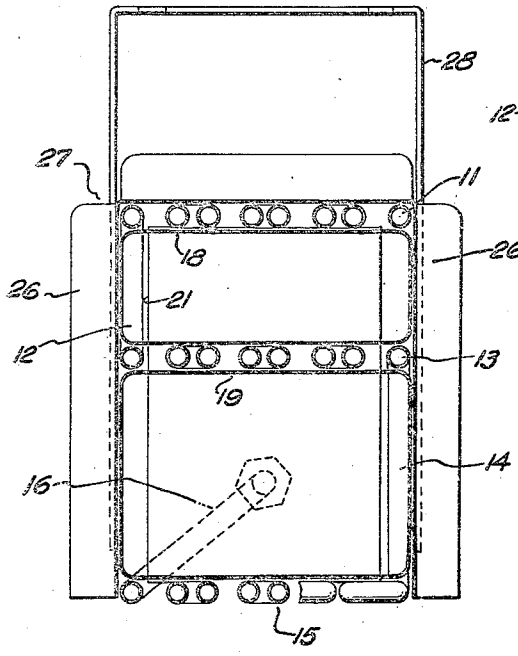
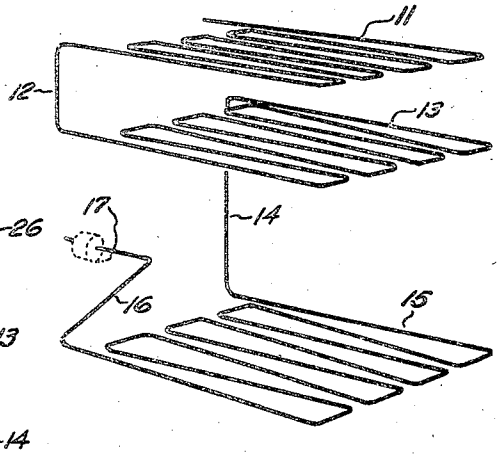


Fig. 3.



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REFRIGERATION EVAPORATOR

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5 Claims. (Cl. 62—95)

This invention relates to evaporators for refrigeration apparatus and has particular reference to an evaporator unit for a domestic mechanical refrigerator.

The invention has as its object the provision of an evaporator which, while simple in design and inexpensive to construct, is nevertheless highly efficient in that it is compact when compared to the size of the refrigerator box and to units heretofore used for similar purposes, and which serves to cool the box and also to provide a sharp freezing zone for forming ice cubes or the like from liquid positioned in trays in the evaporator.

A typical embodiment of the principles of the invention is illustrated in the accompanying drawing wherein:

Fig. 1 is a side elevation of the evaporator mounted in a refrigerator box;

Fig. 2 is a front elevation; and

Fig. 3 is a schematic perspective of the expansion coil.

In forming the evaporator illustrated in the drawing, a length of continuous tubing is first bent into coil formation, as illustrated in Fig. 3. It will be noted that this coil comprises a series of return pipe bends 11 which lie in one plane, and, after the bends 11 have been built up to a suitable length and width, the coil is turned downwardly through a portion 12 to form an underlying series of co-planar bends 13. The coil is then extended through a portion 14 to a third series of co-planar coils 15 which underlie the coils 11 and 13, and the entire expansion coil terminates in a rearwardly extending portion 16 to which may be connected an expansion valve indicated by the numeral 17. With this construction, it will be observed that there are formed two sharp freezing zones between the pairs of coils 11 and 13, and 13 and 15, each of which is adapted to encompass a sharp freezing zone in which a tray may be positioned.

A rectangular sleeve 18 is inserted between the coils 11 and 13, and it is adapted to fit snugly against the respective loops or lengths of pipe forming these coils. A similar sleeve 19 which, in the present embodiment of the invention is somewhat larger than the sleeve 18, is positioned between the coils 13 and 15 to form a second sharp freezing zone. The sleeves 18 and 19 are partially sealed at the rear of the unit by a plate 21, shown in Fig. 1, which is positioned between the downwardly extending tube portions 12 and 14. All of the tube bends 11, 13, and 15, are secured to the contacting portions of the sleeves 18 and 19 in intimate thermal contact by soldering or brazing, or a like operation.

It will be understood that trays containing water may be inserted in the sleeves 18 and 19, and that, by virtue of the intimate thermal contact between the sleeves and the expansion coil, sharp freezing chambers are provided to convert the water in the trays into ice cubes. While the unit as thus far described is effective to make ice at a rapid rate, it is not as effective as is desired to cool the contents of the refrigerator box. Accordingly, to provide for efficient box cooling while maintaining the over-all dimensions of the evaporator at a minimum, the several pipe coils and the sleeves are partially encompassed by metallic ribs or flanges indicated generally by the reference numeral 23.

Each of the ribs 23 consists of a continuous plane web portion 24 of sheet metal which fits snugly against the side walls of the sleeves 18 and 19 and which contacts the upper traces of the pipe coils 11. Each rib 23 is also provided with outwardly extending flanges 25 and 26 which are integral with the web 24 and which are formed by taking a straight length of sheet metal, and cutting it at two places so that when the sheet 23 is bent to the proper configuration, the flange portions 25 and 26 break away to form open corners 27 as illustrated best in Fig. 2. It will thus be seen that there are six outwardly extending flange portions for each unit of ribbon 23, and that these flanges extend in pairs from each of the sides and the top of the evaporator. There is thus provided an extensive finned surface for the evaporator unit which is in intimate thermal contact with the sleeves 18 and 19 and with the coils of the evaporator unit, and accordingly an adequate heat exchange medium is provided for transmitting the heat from the air in the refrigerator to the cooling medium in the evaporator coils.

The flanges 25 and 26 may, of course, be made as extensive as desired, even to the point where the temperature drop is so small as to avoid the formation of excessive quantities of frost on the evaporator and the spaces between pairs of flanges 25 and 26 also serve as flues to accelerate the movement of air around the coil. By this means, effective cooling of the box contents may be obtained without the necessity of including in the expansion unit a separate coil for the express purpose of cooling the air.

The evaporator is suspended or mounted in the refrigerator by means of strap members 28

which may be soldered to the web portions 24 of some of the flange units.

In service, it has been found that a unit of this character, even though restricted to limited dimensions, as, for example, an over-all width of about 6 inches and an over-all depth of about 12 inches, effectively cools a domestic refrigerator having a cubical capacity of at least 5 cubic feet. The freezing time compares favorably with that of other units of larger size and more complicated design which have been proposed heretofore. Attention is also invited to the fact that there are flues extending longitudinally of the unit between the several bends of the coils 11, 13, and 15, and observation indicates that these flues are also useful in maintaining the temperatures and rates of cooling desired.

While the invention has been illustrated and described with reference to one specific embodiment, it will be understood that modifications may be resorted to within the scope of the following claims.

I claim:

1. An evaporator comprising a plurality of return tubing bends disposed in a common horizontal plane, a second group of return tubing bends disposed in a common plane positioned below the first named bends, a sleeve interposed between said first and second bends and in intimate thermal contact therewith, and a plurality of ribs encompassing said bends and sleeve, said ribs contacting the side walls of said sleeve and the tubing bends on at least one side thereof, said ribs being formed of continuous contacting web portions having integral flanges extending outwardly therefrom.

2. An evaporator comprising a plurality of connected return bends of tubing disposed in a plurality of superimposed horizontal planes to define between said planes a sharp freezing zone, a sleeve positioned between said bends in said planes and in intimate thermal contact with said bends, and rib members encompassing said bends and sleeve and in intimate thermal contact therewith, said rib members being formed with web portions united to the side walls of said sleeve and the tubing bends in at least one of said planes and with pairs of flanges extending outwardly from opposite sides of said webs to form air ducts along said webs and between adjacent pairs of said webs.

3. An evaporator unit comprising a plurality of return bends of tubing disposed in a common horizontal plane and connected to a subsequent series of return bends disposed in a second common plane underlying said first plane, a sleeve disposed between said planes and thermally united to the tubing bends in said planes, said sleeve having plane vertical side walls, and a plurality of ribs thermally united to said side walls and contacting the bends in at least one of said planes, said ribs being formed of unitary strips of metal having web portions and pairs of spaced flange members disposed perpendicularly to said webs, and a cover plate at one end of said sleeve.

4. An evaporator comprising a pair of substantially rectangular sleeves having vertical side walls and a closure member at one end thereof and adapted to receive ice trays, an expansion coil embracing said sleeves on the top and bottom sides thereof, said coil being formed of a plurality of return tubing bends disposed in a common plane and contacting the top side of one of said sleeves and communicating through a connecting portion with a second series of tubing bends interposed between and contacting said sleeves, said second series of bends being connected to a third series of tubing bends contacting the bottom side of the other of said sleeves, a plurality of spaced ribs encircling said sleeves, said ribs being formed with web portions contacting the vertical sides of said sleeves and the coils in at least one of said planes and with spaced flanges disposed vertically to said webs.

5. An evaporator comprising planar coils and rectilinear sleeves disposed alternately on each other to form a multi-layer structure, and means cooperating to retain the structure in assembled relation comprising a plurality of spaced members each extending laterally about three sides of the structure and secured to the sleeves thereof, said members being formed with radially extending portions providing fin surfaces.

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