June 13, 1939. W. W. HIGHAM ET AL 2,162,083

EVAPORATOR

Filed Feb. 9, 1938 2 Sheets-Sheet 1

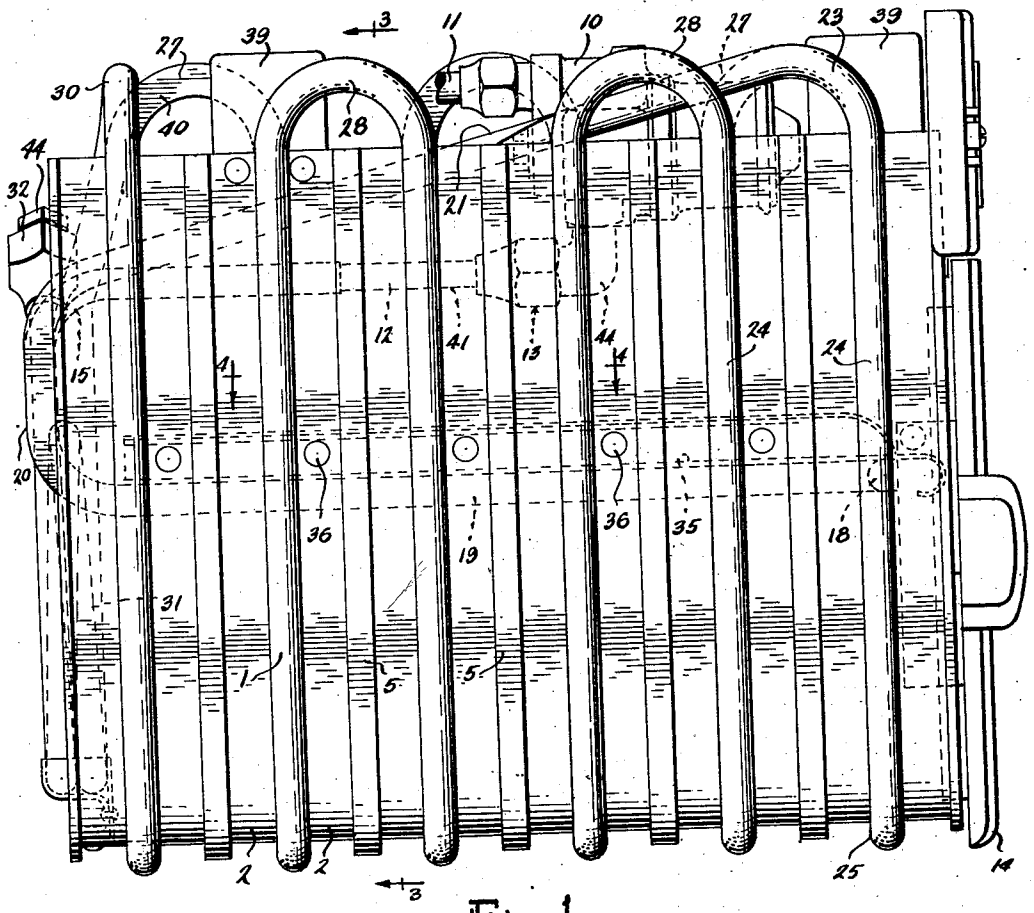


Fig. 1.

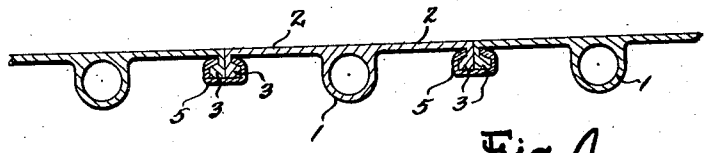
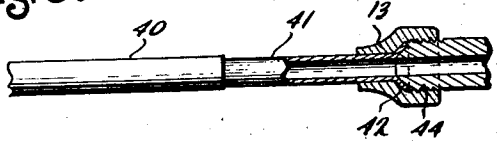


Fig. 4.

Fig. 5.



INVENTORS
William W. Higham
Stanley H. Morse

BY Barnes, Kisselle, Laughlin & Raisch
ATTORNEYS

June 13, 1939. W. W. HIGHAM ET AL 2,162,083

EVAPORATOR

Filed Feb. 9, 1938 2 Sheets-Sheet 2

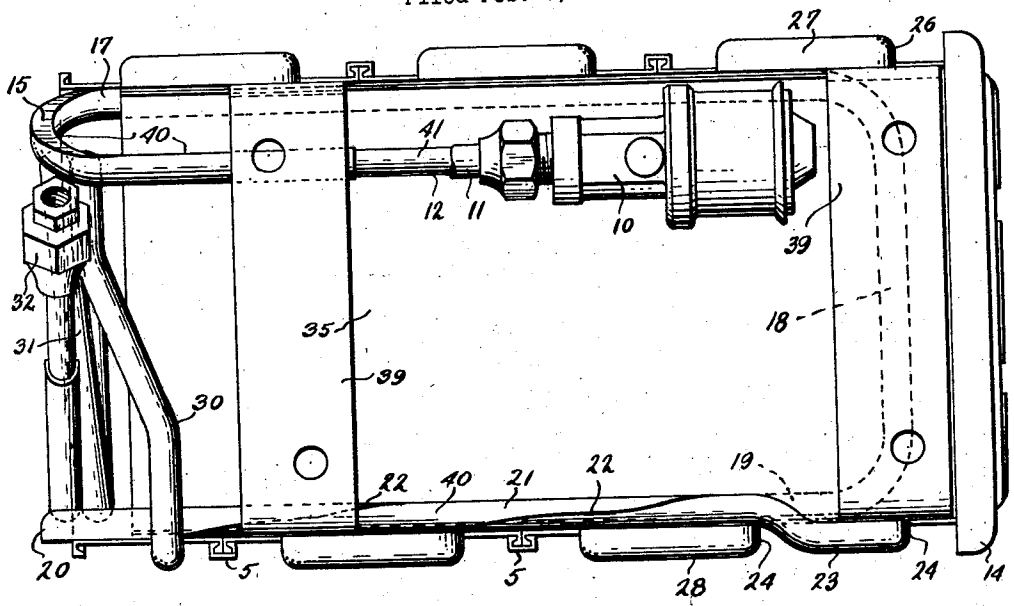


Fig. 2.

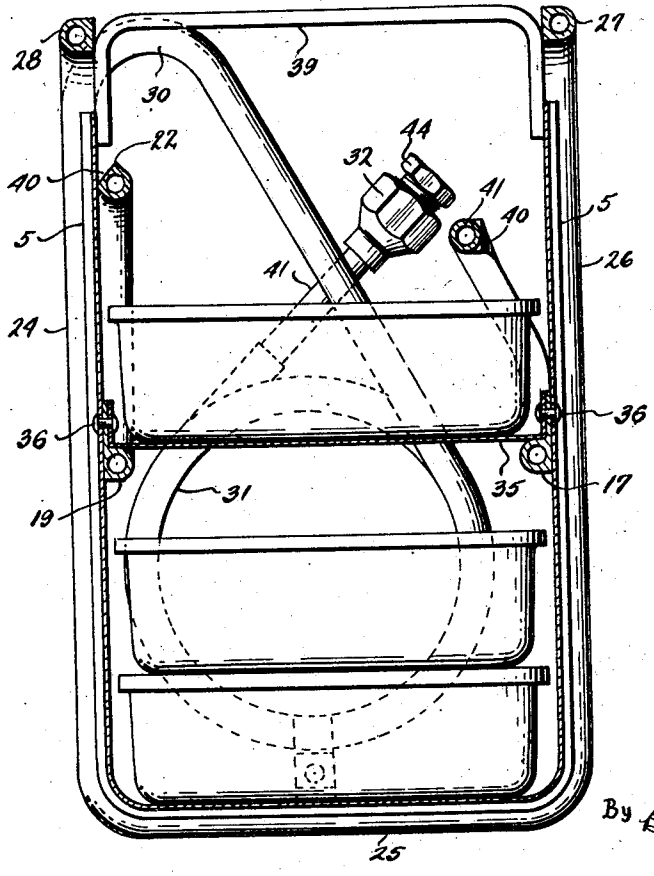


Fig. 3.

INVENTORS
William W. Higham
Stanley H. Morse
By Barnes, Kinzelle, Laughlin & Raisel
ATTORNEYS

Patented June 13, 1939

2,162,083

UNITED STATES PATENT OFFICE

2,162,083

EVAPORATOR

William W. Higham, Detroit, and Stanley H. Morse, Dearborn, Mich., assignors to Universal Cooler Corporation, Detroit, Mich., a corporation of Michigan

Application February 9, 1938, Serial No. 189,632

5 Claims. (Cl. 62—126)

This invention relates to an evaporator for a refrigerator. It has to do particularly with an evaporator construction formed in such a way that there are no joints or connections in the body of the evaporator.

The evaporator illustrated in the accompanying drawings is one of the type commonly used with household refrigerators wherein the evaporator defines a sharp freezing chamber for freezing water or foodstuffs. However, the invention is not limited to an evaporator of this shape, as other shapes and forms may be employed within the scope of the invention. In accordance with the invention the evaporator is fashioned from coils or runs of stock which is hollow in cross section and which stock is flanged so that successive runs or coils may be brought into contact with each other at the flange, or attached to each other, or overlapped. In addition to forming wall-like portions of an evaporator, tubular-like parts are provided by the stock, for which purpose one or both flanges are removed from the stock at desired locations. The purpose and objects of the invention will be better understood as the following detailed description is considered.

Fig. 1 is a side elevational view of an evaporator constructed in accordance with the invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is an enlarged sectional view taken substantially on line 4—4 of Fig. 1.

Fig. 5 is a view illustrating an end connection.

The stock from which the evaporator is made may have a cross sectional form as illustrated in Fig. 4. This stock has a hollow, tubular-like part 1 with oppositely extending flanges 2. The edges of the flanges may have enlargements or beads 3 and when two of such pieces of stock are positioned edge to edge, as shown, they may be secured together by a clamping strip 5 of suitable metal fashioned over the beads 3. This exemplifies the general form of stock from which the evaporator may be made and suffices for the present invention, although the flanges may take other forms. This structure may be aluminum or an aluminum alloy, or for that matter other metal, and is preferably extruded in the form shown in relatively great lengths or in a continuous length. The evaporator of the present invention may be made from one long piece of such stock.

The evaporator shown in Figs. 1, 2 and 3 is so fashioned, and the body of the evaporator is generally U-shaped in cross section constituted by a plurality of successive runs or coils. In describing the construction it is thought to be most convenient to progress in the direction of the flow of refrigerant through the tubular construction.

A suitable inlet device such as an expansion valve is illustrated at 10 and liquid refrigerant may enter the same from a refrigerant line 11. A long length of stock as shown in Fig. 4 has one end portion 12 from which both flanges have been removed. This is the inlet end for the refrigerant and connects to the expansion valve by means of a fitting 13. To set the environment it may be noted that the front end of the evaporator is at the right hand side as Figs. 1 and 2 are viewed, the front being suitably finished and completed by a closure or panel 14.

The portion 12 runs from the fitting 13 toward the rear of the evaporator where it is given a bend 15 and then extends toward the front of the evaporator in a run 17. This run is located intermediate the upper and lower boundaries of the evaporator. The run 17 has one flange completely removed as shown in Fig. 3, while the other flange remains on the run 17, although the bead 3 may be removed. The flat side of the tubular construction of the run 17 faces outwardly. Adjacent the front of the evaporator the tube extends crosswise as illustrated at 18, and both flanges may be removed from this section. Then the tube extends rearwardly in a run 19 as shown in Fig. 3, the run 19 having the flat side facing outwardly and having one flange thereon like the run 17.

At the rear of the evaporator the stock is provided with a bend 20 from which the flange is removed and then the stock again is extended toward the forward end of the evaporator, as illustrated at 21. In the course of the length 21 the tube is twisted through 180°, as illustrated by the somewhat helical lines 22 in Fig. 2, so that the flat face is turned inwardly. Adjacent the front of the evaporator the tube is given a bend formation as shown at 23, so that it extends downwardly.

The stock now extends downwardly in a run 24 and the flanges have not been removed from this section. At the bottom of the evaporator the stock is bent transversely to extend across the bottom as at 25, and then is bent to extend up the opposite side of the evaporator as at 26.

The flanges are removed from a section of the tube at this point, and the tubular construction is bent into a reverse curve 27 and the stock again extends downwardly in the run 26 and across the bottom at 25 and up the near side as Fig. 1 is viewed in another run 24. At the top of this run the flanges are removed and the tube bent into a reverse curve 28 to again extend downwardly. This formation continues until the evaporator has the proper or desired length with the evaporator constructed of successive coils or runs. The successive U-shaped sections are termed coils herein, and the flanges are removed from the strip in this body portion of the evaporator only where the bends 27 and 28 occur. At the rear end of the evaporator a considerable length of the strip has the flanges removed therefrom and the tube is given a downward bend as at 30 and may be fashioned into a loop 31. The end of the tube is provided with an outlet fitting 32 for the reception of a conduit for conveying the refrigerant back to the compressor.

With this construction a shelf 35 may be placed inside the U-shaped evaporator so as to rest upon the sections 17 and 19 as shown in Fig. 3, and then the sections 17 and 19 and the shelf are fastened to the side walls of the evaporator constituted by the flanges 2. This may be done by rivets 36 passing through flanges in the shelf, the flanges on sections 17 and 19, and the flanges on the coils. The side and bottom walls of the evaporator are thus provided by the meeting flanges of the tube, and these flanges may be secured together by the strips 5. The shelf 35 is for the reception of a tray or other container for freezing water or foodstuffs, and similar freezing trays may be placed inside the evaporator directly against the bottom wall thereof. Suitable holding brackets 39 may be secured to the upper portion of the evaporator for its attachment to a suitable support from which it may be suspended. The end connections for the strip may be made without using any separate pieces or soldered or welded joints. It will be noted that when the flanges are removed the resultant tubular structure has a flat side as illustrated at 40 in Fig. 5. The extreme end portions may be subjected to a machining or milling operation to shape the flat sided tube into a circular tube as illustrated at 41. This operation may be so calculated as to give the section 41 the outside diameter of a standard sized tube. Then by the use of a suitable flaring tool the end is flared as at 42, this being done after a suitable coupling member, such as the coupling 13 or 32, has been passed over the tubular end. This may be a standard coupling with an internal shoulder for engaging the flare and adapted to be screw threaded on a coupling member 44 which may be on the expansion valve or the conduit for expanded refrigerant leading to the compressor.

Thus it will be observed that although the evaporator takes the form of a length of material with a hollow cross section fashioned into a plurality of coils to provide the evaporator body with the flanges forming walls of the evaporator, yet the evaporator is an integral piece from the inlet end to the outlet end. The refrigerant which enters the tube first passes through the portions 17 and 18 and thus the shelf 35, and the tray resting thereon is subjected to the initial vaporizing action of the refrigerant and is efficiently chilled and cooled for sharp freezing purposes. The coil 31 adjacent the outlet end is provided for the purpose of forming a final evaporator section to insure complete vaporization of the refrigerant before the same returns to the compressor. The tubular-like end portions 12 and 31, and the tubular intermediate portions 17, 18 and 19, are integral with the hollow construction forming the body and walls of the evaporator. This eliminates the necessity of providing separate tubes for these parts. Also, the return bend portions 28 are integrally provided.

It might be said that in the manufacture of this evaporator the coils 24, 25 and 26, with intermediate loops 27 and 28, may all be fashioned with the stock in flat form and then simultaneously fashioned into U-shape. Of course, the extended ends 12 and 31 and runs 17, 18 and 19, may be fashioned and located subsequent to the shaping of the coils into the U-formation.

Some of the claims appended hereto specify that the ends of the stock are for connection to conduits for refrigerant. Some of the claims specify that the stock has inlet and outlet end extensions. The term "conduit" as thus used is to be construed in a broad sense so as to include closed devices for conducting and holding refrigerant, regardless of size or shape. For example, the expansion valve may be replaced with some other form of control at the inlet end; the outlet end of the stock may connect into a conduit in the form of a tube or pipe or receptacle. The terms "inlet" and "outlet" ends and extensions are to be considered in the sense that these are the ends of the strip stock and not the ends of the refrigerant passageway.

We claim:

1. An evaporator for refrigerant comprising a single length of stock having a hollow cross sectional shape with a projecting flange, said flanged stock being fashioned into a plurality of coils which form the body of the evaporator with the flanges on the coils cooperating to provide one or more substantially closed walls of the evaporator, end portions of the stock having the flanges removed therefrom and forming tubular-like end extensions for connection to conduits for refrigerant, and an intermediate portion of the stock having flange portions removed therefrom and some of the intermediate portion being fashioned into a sharp freezing coil.

2. An evaporator for refrigerant comprising a single length of stock having a hollow cross sectional shape with oppositely projecting flanges, said flanged stock being fashioned into a plurality of coils which form the body of the evaporator with the flanges on the coils cooperating to provide one or more substantially closed walls of the evaporator, end portions of the stock having flanges removed therefrom and forming tubular-like end extensions for connection to conduits for refrigerant, and an intermediate portion of the stock having sections with one flange removed and one flange retained, said sections being fashioned into a sharp freezing coil, and the retained flanges on said sections being secured to said wall or walls of the evaporator.

3. An evaporator for refrigerant comprising a single length of stock having a hollow cross sectional shape with oppositely extending flanges, said flanged stock being formed into a plurality of coils which form the body of the evaporator with the flanges on the coils cooperating to provide side walls of the evaporator, end portions of the stock having the flanges removed and forming tubular-like end extensions for connection to conduits for refrigerant, and an intermediate portion of the stock having one flange removed

therefrom and one flange remaining, said intermediate portion being fashioned into a cooling coil located inside the evaporator, and said remaining flange being united with the side walls of the evaporator.

4. An evaporator comprising a single length of stock of hollow cross sectional shape with oppositely extending flanges, said flanged stock being fashioned into a plurality of coils which form the body of the evaporator with the flanges on the coils cooperating to provide side walls of the evaporator, one end portion of the stock having the flanges removed therefrom and constituting an inlet end extension, one or more intermediate portions having one flange removed therefrom and the other remaining and fashioned into a coil inside the evaporator, means securing the remaining flanges of the said intermediate portions to the side walls of the evaporator, a section of the stock extending from said intermediate portions to one of the coils, said section having the flanges removed therefrom and being twisted through substantially 180°, the other end of the stock having the flanges removed therefrom and constituting an extended outlet end for refrigerant.

5. An evaporator comprising a single length of stock having a hollow cross sectional shape with two oppositely extending flanges, said flanged stock being fashioned into a plurality of coils which form the body of the evaporator with the flanges on the coils cooperating to provide side walls of the evaporator, ends of the stock having the flanges removed therefrom and constituting extended inlet and outlet ends, one or more intermediate portions of the stock having one flange removed therefrom and one remaining and being fitted against the side walls of the evaporator, a shelf resting upon the intermediate portions and having flanged edges lying substantially flush with the remaining flanges of said portions, and means for securing the flanges of the shelf and the remaining flanges of said portions to the side walls of the evaporator.

WILLIAM W. HIGHAM.
STANLEY H. MORSE.