May 6, 1952 L. U. LARKIN 2,595,472

HEAT EXCHANGER

Filed May 3, 1949

Fig. 1

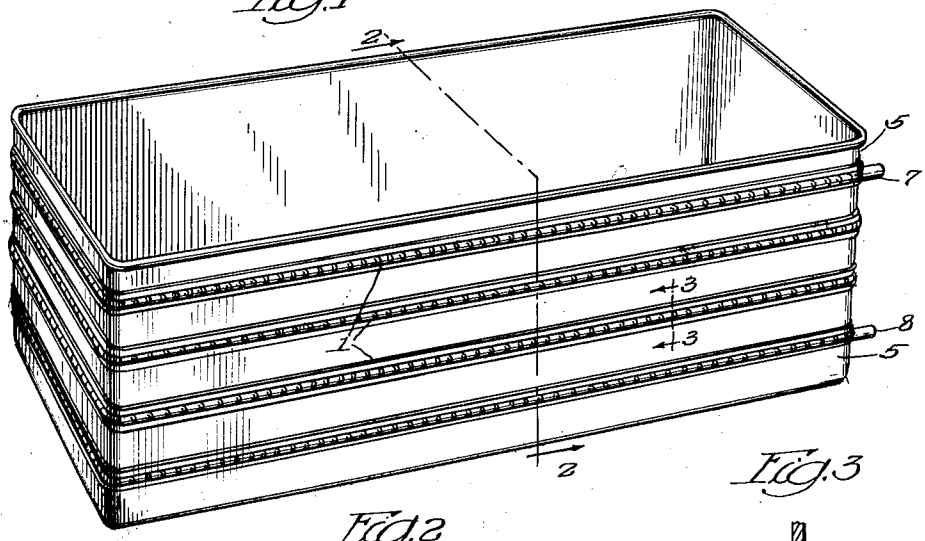
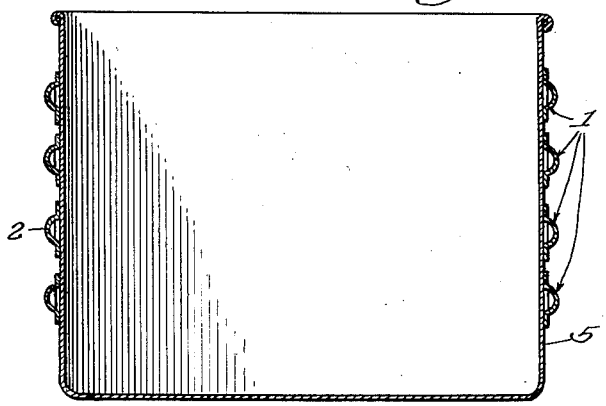


Fig. 3

Fig. 2



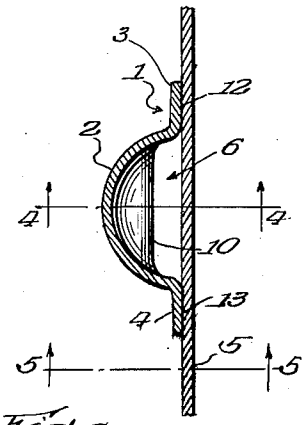


Fig. 4

Fig. 5

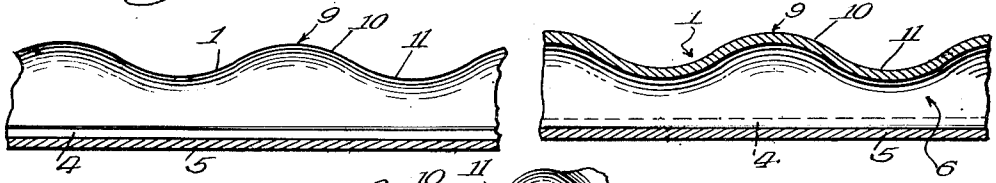
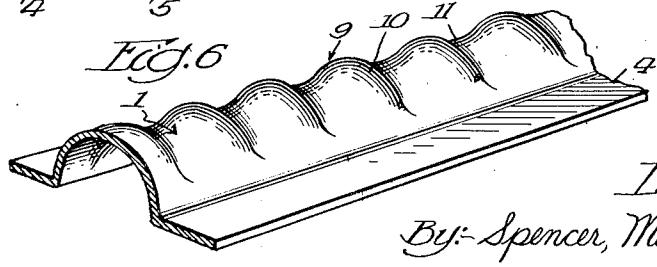


Fig. 6



Inventor
Lester U. Larkin
By:- Spencer, Marzall, Johnston & Cook
Attys

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HEAT EXCHANGER

Lester U. Larkin, Harvey, Ill., assignor to Lincoln M. Larkin, Libertyville, Ill.

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4 Claims. (Cl. 257—256)

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This invention relates to heat exchangers in general and includes all such evaporators, condensers and other similar apparatus and equipment which employ a conduit for fluid, this fluid either absorbing or emitting heat during operation of the equipment. More specifically, the invention relates to a conduit of a particular type and formation which is adapted to be wound about a container such as an evaporator whereby one side of the container or evaporator acts as a closure part for the conduit.

An important object of the present invention is the provision of a heat exchanger employing a new and novel conduit formed of an element which is relatively semi-circular or hat-shaped in cross section, this element having outwardly extending relatively short attaching legs adapted to be secured to the surface of a container or other structure such as a condenser, the said element being corrugated at its crown to provide alternate ridges and furrows to effect greater efficiency of the fluid which passes through the conduit.

Another object of the invention resides in the formation of a flexible element in strip form which has an outwardly extending body with relatively short attaching legs for the attachment of the element to a surface of a body such as an evaporator, the strip body at the crown or apex thereof being corrugated in the form of alternate ridges and furrows so as to effect greater efficiency of the fluid which passes through the conduit when the strip is secured to a body such as an evaporator.

Numerous other objects and advantages will be apparent throughout the progress of the specification which follows.

Referring to the drawings:

Fig. 1 is a detail perspective view of one form of heat exchanger or evaporator embodying the invention;

Fig. 2 is a detail transverse sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a detail vertical sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a detail longitudinal sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a detail side elevational view of the improved strip which is employed for forming the conduit; and

Fig. 6 is a detail perspective view of the improved strip.

The particular construction herein shown for the purpose of illustrating the invention comprises an elongated strip 1 of metal or other suitable material, this strip being provided with an outer dome-shaped part 2 which is relatively semi-circular in cross section. The dome-shaped part 2 terminates in outer legs or flanges 3 and 4 which are adapted to be secured to the body 5 of certain refrigerator equipment such as an evaporator. When the legs or flanges 3 and 4 are secured to the body 5, a hollow tubular conduit 6 is provided by a part of the body and the dome-shaped part 2 of the strip 1. The hat-shaped strip 1 is adapted to be wound spirally about the body 5 and terminates at its upper end in an inlet 7 and at its lower end in an outlet 8.

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The strip 1 is secured to the body 5 by seam welding the legs 3 and 4 directly to the body whereby the conduit 6 is formed for receiving liquid which flows in the inlet 7 and out of the outlet 8. The bulged or dome-shaped part 2 of the strip is preferably formed with corrugations 9 comprising alternate ridges 10 and furrows 11 whereby a turbulence is provided as the fluid is passing through the conduit. The turbulence thus created provides for increased efficiency of the refrigerant and provides for greater coverage of the refrigerant because the refrigerant is directed against the walls of the conduit including particularly the enclosing walls of the body 5. The greater turbulence of the fluid passing through the conduit also tends to wipe off any oil which may engage the surfaces of the strip or the body and therefore provide for greater heat exchange capabilities.

The strip is adapted to be rolled in the configuration shown sectionally in Fig. 3 and then provided with the corrugations at the crown, or the corrugations may be formed in the crown while the strip is being formed during the rolling operation.

It is desirable that the material from which the strip is made be continuous and of sheet metal preferably not greater than 25-gauge thickness. However, on larger devices a heavier gauge material may be used, excellent results having been obtained from rolling the strip of 22-gauge sheet metal so that the dome-shaped part at its greatest dimension will be about $\frac{7}{16}$''. The overall width of the strip is preferably 1⅜'' for a conduit of the size indicated. The legs 3 and 4 may each be ¼'' wide, the width of the dome-shape part between the legs being ⅞''. However, the various dimensions of the strip may be varied as desired, depending upon the type, kind and size of structure for which the material is to be used.

The strip is adapted to be applied to the walls

of the body 5 so that the walls will act as one side of the conduit, the other side being closed by the dome-shaped part 2 and the legs 3 and 4 as clearly shown in Fig. 3. The legs 3 and 4 are seam welded to the body 5 as indicated at 12 and 13, respectively.

In Fig. 1 the strip of conduit material is shown as starting at an upper corner of the body 5 at the inlet 7 and then winding helically about the walls to provide the surrounding fluid conduit. The helical passage is such that fluid within the conduit will flow by gravity from the inlet 7 to the outlet 8, whereupon all danger of oil being dripped within the line is definitely overcome. The corrugations 9 which form the alternate ridges and furrows 10 and 11, respectively, cause a turbulence of the fluid as it passes through the conduit and create greater efficiency by causing the fluid to definitely contact the walls of the container as well as wiping off any oil which may appear at the inner surfaces. The corrugations 9 also permit the strip 1 to be bent or flexed more easily around the corners of the body 5, thereby preventing excessive internal strains from developing in the strip at the points where the strip is so bent.

The strip of material preferably is applied by a continuous seam welding operation in the manner disclosed in application Serial No. 546,827, filed July 27, 1944 now abandoned. The manner in which the material is spirally wound about the body 5 consists in rotating the body 5 while raising or lowering the body during the time the material is applied to the body. One means of seam welding the strip material continuously about the body in helical form is disclosed in applicant's co-pending application Serial No. 130,036, filed November 29, 1949.

The invention provides an extremely inexpensive evaporator or other device by winding about the walls thereof a strip of preformed material having a dome-shaped part with legs or flanges for attaching the strip to the body. The dome-shaped part of the strip is provided with corrugations by means of alternate ridges and furrows so as to create turbulence of the refrigerant as it flows in a spiral path about the container. The conduit material herein described is for the purpose of receiving fluid, and the term "fluid" is used herein in its broadest sense and includes both liquids and gases.

The strip forming the conduit is capable of being quickly and economically manufactured and quickly and economically attached to its cooperating container or structure.

The strip is applied so that the opposite walls of the structure will be left smooth and clean and therefore will be capable of being enameled if desired.

Changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fall clearly within the scope of the following claims.

The invention is hereby claimed as follows:

1. A heat exchanger comprising a sheet metal panel, a sheet metal strip having side walls and an integral top wall disposed upon and secured to said panel to form a fluid passage between said panel and said strip, the edges of the side walls of said strip being sealed directly to the panel, the top wall of said strip being transversely corrugated throughout the length thereof.

2. A heat exchanger comprising a sheet metal body forming enclosing walls, a sheet metal strip having side walls and an integral top wall disposed helically upon and secured to said enclosing walls to form a fluid passage between said enclosing walls and said strip, the edges of the side walls of said strip being sealed directly to the enclosing walls of the body, the top wall of said strip being formed with transverse corrugations, to promote turbulence in liquid refrigerant flowing in the passage.

3. A turbulent fluid flow device comprising a sheet metal panel, a strip of sheet metal applied upon the sheet metal panel to form a conduit between said strip and panel, the strip comprising a channel-shaped element having side walls and an integral top wall, said side walls having outstanding flanges adapted to be sealed upon the panel, and the top wall of the strip being formed with transverse corrugations along the strip.

4. A turbulent fluid flow device comprising a sheet metal panel, a sheet metal strip configurated transversely to provide an elongated channeled element having side walls and an integral top wall whereby the marginal edges of the side walls may be sealed, therealong, to the sheet metal panel to provide a conduit between the strip and the panel, the top wall being alternately ridged and furrowed transversely of the strip substantially throughout its entire length to provide successive constrictions and enlargements in the conduit for turbulating fluid flowing therethrough.

LESTER U. LARKIN.

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