

March 8, 1955

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CONDENSER COIL ASSEMBLY

2,703,702

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2 Sheets-Sheet 1

Fig. 1.

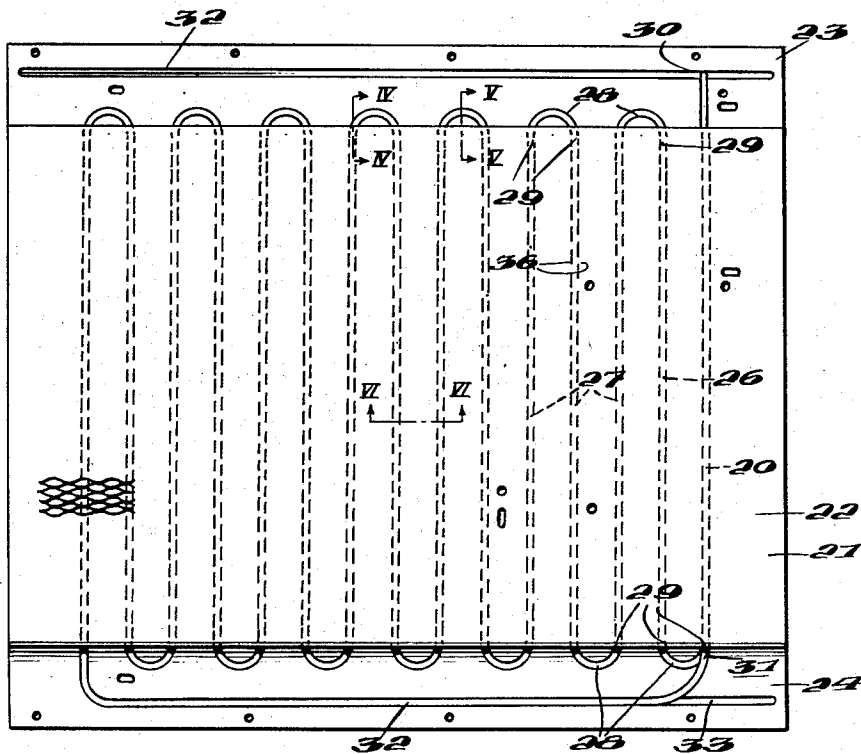


Fig. 3.

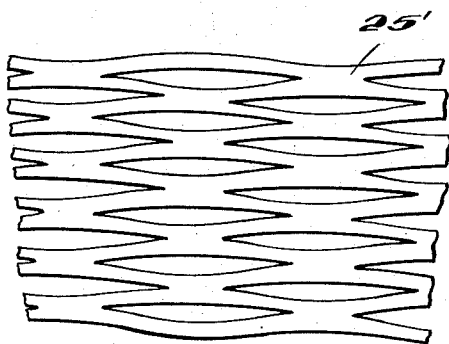
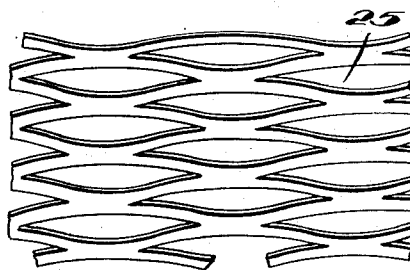


Fig. 2.



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Fig. 7. *Fig. 5.* *Fig. 4.*

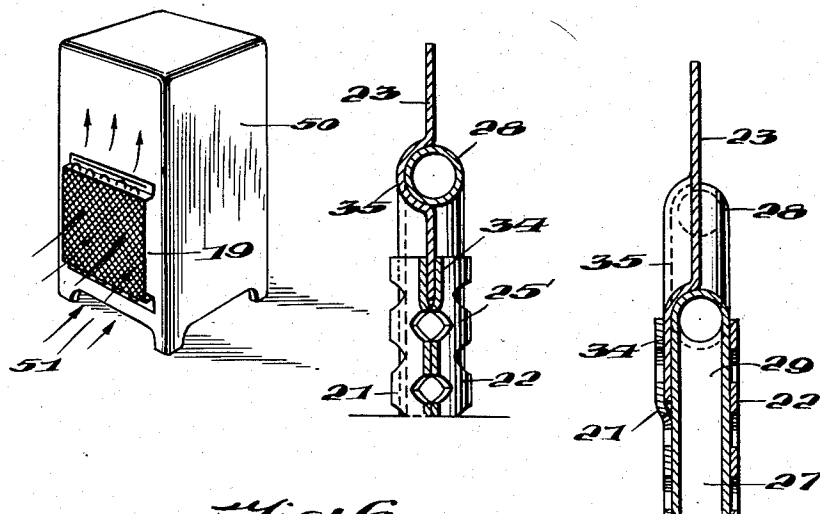
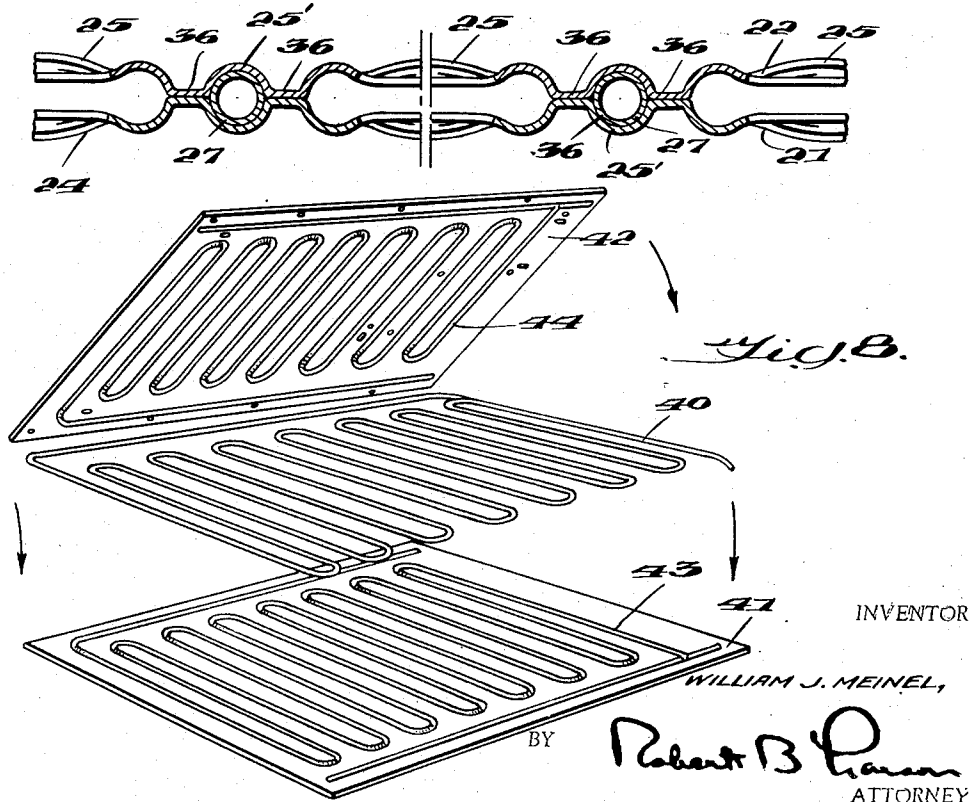


Fig. 6.



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CONDENSER COIL ASSEMBLY

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1 Claim. (Cl. 257—262.12)

This invention relates to heat exchangers, and more particularly to a heat exchanger wherein the tubes containing the heat transfer fluid are supported by an expanded metal backing. The heat exchanger thus constructed is well adapted for use as a condenser for a refrigerator.

Condensers used heretofore have had their efficiency impaired partly because of a surface air film or boundary layer of air surrounding the condenser. Such air film served to insulate the condenser and block the circulation of the air necessary for efficient operation. So pronounced was the effect of such insulating boundary layer of air that the desired circulation of air through the general plane of the condenser tubes could be only effected properly by forcing circulation of air with a blower or the like.

The present invention is designed substantially to eliminate the objectionable surface air film and to effect circulation of air through the general plane of the condenser tubes without the use of forced air. Both of these objectives are attained by supporting the condenser tubes on a backing of expanded metal which is generally of a louvered construction.

The louvered construction, in accordance with the invention, provides a rough angled surface which causes a turbulent flow of air immediately surrounding the condenser surface. This turbulence serves to break down or prevent the formation of any surface air film which otherwise would be present.

Moreover, the louvered construction serves to draw the circulating air through the plane of the condenser and at an angle which is substantially that of the louvers, and thus creates a natural draft which greatly aids the efficiency of the heat exchanger.

It is obviously important that a large surface area be presented to the circulating air to afford maximum heat dissipation. By using expanded metal, a substantial saving in metal is gained with no sacrifice in the amount of surface area for heat dissipation. The saving is effected since the metal when expanded has a substantially increased dimension in one direction which is several times the original dimension in that direction. Thus, a comparatively small metal sheet can be expanded and used in a condenser where heretofore a much larger sheet has been required.

The desired surface area is retained in the cutting of the metal prior to expanding which presents an increase in the original surface area compared to that of the solid sheet by exposing the plurality of cut edges.

With the expanding of the metal sheet, the problem of support for the condenser arises. The present invention provides the necessary support by utilizing two expanded metal sheets having the condenser tubes disposed therebetween. Additional support is obtained by placing the tubes in such a position with respect to the metal sheets that the lengths of tubing extend in the direction of the expansion of the metal, or, in a vertical direction when the condenser is attached to apparatus such as, for example, a refrigerator unit.

By utilizing the condenser construction described herein, many desirable objects are attained.

An object of this invention is to provide a heat exchanger having a rough meshed surface over and through which the circulating air passed, which rough surface will cause a turbulence in the circulating air, thus causing a breakdown of any insulating air film which might form around the surface of the heat exchanger.

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Another object of this invention is to provide a substantially increased surface area around the heat exchanger tubes and, in turn, to dissipate a greater amount of heat.

5 The invention has for a further object the provision of a louvered support for the heat exchanger tubes, thereby causing the circulating air to pass through the plane of the heat exchanger at an angle which is generally that of the louvered portions.

10 Moreover, the invention provides a heat exchanger of the type wherein the transfer of heat is effected by a flow of gas contacting the heat exchanger, comprising two supporting sheets of foraminous or meshed material including means for causing turbulent flow of said gas, and passageway means disposed in a plane parallel to the general plane of said sheets and in a heat exchange relation thereto.

15 Another object of the invention is to provide a heat exchanger in which the tubes containing the heat transfer fluid are supported between two expanded metal sheets, whereby the heat exchanger is given additional support, and a greater surface area aids in the dissipation of a greater amount of heat.

20 In the present invention, which attains these objects, the increase in the efficiency of heat transfer over conventional heat exchangers has been found to be as high as twenty per cent.

25 The above and other objects will become readily apparent from the following description when considered with the drawings in which:

Figure 1 is a face view of the heat exchanger;

30 Figure 2 is a fragmentary view of the expanded metal sheet;

Figure 3 is a similar fragmentary view of the expanded metal sheet in which the louvered portion has been flattened;

40 Figure 4 is a sectional view taken along lines 4—4 of Figure 1;

Figure 5 is a sectional view taken along lines 5—5 of Figure 1;

45 Figure 6 is a sectional view taken along lines 6—6 of Figure 1;

Figure 7 is a perspective view of a refrigerator using the invention.

50 Figure 8 is an exploded view of another embodiment of the invention.

While it will be obvious that the construction described herein will have numerous applications, for convenience, the description will be limited to the invention as embodied in a refrigerator as shown in Fig. 7.

55 As shown in Figure 1, the condenser 19 consists of the tubing 20 which carries the heat transfer fluid, the tubing being surrounded by two sheets 21, 22 of expanded metal backing. The top and bottom edges of the expanded metal sheets are supported by solid metal sheets 23 and 24.

60 The expanded metal can be made by any conventional method. One method of manufacture consists of forming, in the metal, parallel lines of slits, the space between the slits of one line being opposite the slits of the adjacent lines. The metal sheet is then stretched or expanded to form louvered openings as shown in Figure 2 and indicated generally by numeral 25.

65 The major part of the condenser consists of the two louvered expanded metal sheets 21, 22 between which the tubing 26 is disposed. The areas of the expanded metal sheets 21, 22 which immediately surround the tubing 26 are flattened as shown at 25' in Figure 3. The flattening of the expanded metal in such areas facilitates the crimping of the metal around the tubing and, in addition, provides a more intimate heat conducting contact between the tubing and the expanded metal.

70 The tubing consists primarily of parallel spaced straight sections 27 which are joined at their ends in a serpentine manner by arcuate sections of tubing 28. The arcuate sections 28 of tubing are welded to the straight sections 27 of tubing as at 29. The two ends of the tubing which are to be connected to the apparatus with which the heat exchanger is to be used are shown at 30 and 31. End 31 is connected to the tubing through a

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straight section 32 which rests in a groove 33 formed in the solid metal support piece 24.

As shown in Figures 4 and 5, the solid metal support piece 23 is welded to the expanded metal 21 at point 34. In a like manner, support piece 24 is welded to the expanded metal at the edge opposite from support piece 23.

The solid support pieces 23 and 24 are embossed to form grooves 35 to receive the arcuate sections 28 of the tubing. The flattened part 25' of the expanded metal is also embossed to form grooves which receive the straight sections 27 of the tubing.

Figure 6 shows the manner in which the straight portions 27 of the tubing are supported between the expanded metal sheets 21 and 22. Immediately surrounding the tubing, the expanded metal is flattened as shown at 25'. Grooves are then embossed in the flattened areas of the expanded metal sheets and raised portions are likewise formed by a stamping operation, so that between each pair of straight sections of tubing the expanded metal is raised as shown at 25. The tubing is then disposed in the grooves and between the sheets, and the sheets 21, 22 of expanded metal are then welded together at land contact portions 36 adjacent to the straight sections 27 of tubing.

A second embodiment of the invention is shown at Figure 8. In this embodiment, the serpentine tubing 40 is formed in one continuous piece. The two sheets of expanded metal 41 and 42 are embossed to form grooves indicated generally at 43 and 44, which grooves conform to the configuration of the tubing. The expanded metal sheets may contain raised portions between adjacent convolutions such as those in Figure 6. The two sheets of expanded metal 41 and 42 are placed around the tubing 40 and are then welded together in much the same manner as was done in the embodiment of Figures 1-7. Thus, the major portion of the condenser will have a configuration which in section is best illustrated by the section shown in Figure 6. The embodiment of Figure 8 has the advantage of being easy to assembly and uses a minimum number of individual parts.

As an illustration of use, the condenser is shown in Figure 7 as being placed on a refrigeration unit 50 upright in back of the refrigerator unit with the straight sections 27 of the tubing extending vertically, thereby providing support for the condenser. The circulating air

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indicated by the arrows 51 will be drawn through the condenser generally at an angle determined by the angle of the louvered portions of the expanded metal. In this way, the insulating air film which normally surrounds a condenser will be considerably diminished and the circulating air will contact a greater surface area than it would in conventional condensers.

It is to be understood that, while I have described what I believe to be the most practical and efficient embodiments of my invention, there are numerous variations which can be made without departing from the scope of the invention as set forth in the accompanying claim.

I claim:

As an article of manufacture, a heat exchanger comprising, two expanded metal thermally conductive sheets, each said sheet having a plurality of semi-cylindrical grooves, in registry when said sheets are assembled, and adjacent land contact portions, a tube for the passage of fluid disposed between said sheets, in said grooves, and in intimate heat conducting relation with said sheets, said tube having a serpentine configuration comprising parallel legs interconnected by return bends, each of said sheets engaging approximately half the circumference of said tube, and raised portions in said sheets between said grooves, forming enlarged passageways between said sheets, said sheet having webs in said raised portions and inclined to the plane of said sheets to form louvers on the walls of said passageways, whereby surrounding air passes turbulently through said walls and up said passageways to increase heat transfer.

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