Feb. 19, 1957 E. C. SIMMONS 2,781,645

HEAT EXCHANGER

Filed Sept. 17, 1952

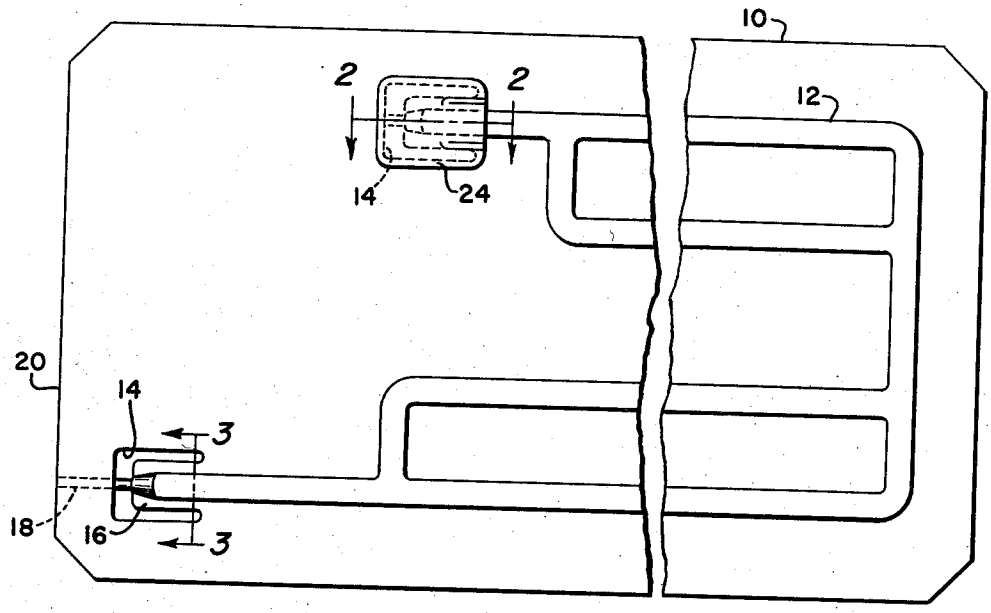


Fig. 1

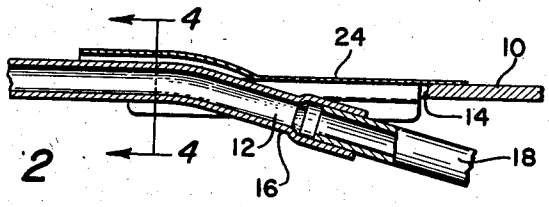


Fig. 2

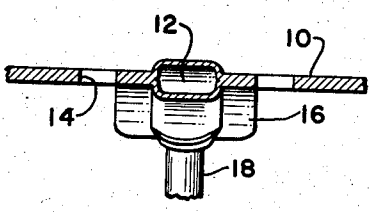


Fig. 3

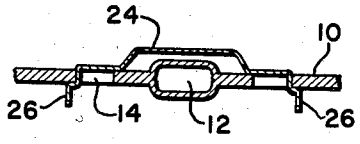


Fig. 4

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5 Claims. (Cl. 62—126)

This invention relates to refrigerating apparatus and more particularly to plate type evaporators or heat exchanger and the method of manufacturing the same.

One object of this invention is to provide an improved arrangement for attaching the inlet and outlet tubing to the heat exchanger.

More particularly it is an object of this invention to provide an improved method and arrangement for attaching tubing to a plate type heat exchanger at a point inside the outer periphery of the plate.

Another object of this invention is to provide a plate type heat exchanger wherein the connections are made to the passages of the heat exchanger from the back side thereof.

Still another object of this invention is to provide an improved arrangement for concealing from view the joint between the heat exchanger and the inlet and outlet tubing attached thereto.

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:

Figure 1 of the drawing is an elevational view showing a plate type evaporator constructed in accordance with this invention;

Figure 2 is a fragmentary sectional view taken substantially on line 2—2 of Figure 1;

Figure 3 is a sectional view taken substantially on line 3—3 of Figure 1; and,

Figure 4 is a fragmentary sectional view taken substantially on line 4—4 of Figure 2.

For purposes of illustrating this invention there is shown a plate type evaporator having an internal passage formed therein whereas certain aspects of this invention are equally applicable to other types of apparatus such as refrigerant condensers, heating radiators, etc. Evaporators of the type shown are used for cooling the food storage compartment of modern refrigerators and are normally placed adjacent the rear wall of the compartment.

In order to simplify this application the simplest type of an evaporator has been shown whereas the invention is equally applicable to more complicated types and shapes such as those used in forming the walls of a frozen food storage compartment or the like.

Referring now to the drawing wherein an illustrative embodiment of the invention has been shown, reference numeral **10** designates a plate type evaporator having an internal passage **12** formed therein. Evaporators of this type are currently being formed of a roll forging operation wherein a pair of plates are laid upon one another with a stop-weld material painted or otherwise coated on the surface of the one plate in a configuration corresponding to the configuration of the fluid passage to be formed between the two plates and wherein the plates are then passed between a pair of pressure rollers which reduce the thickness of the plates and cause the meeting surfaces of the plates to be forged together at all points except where coated with the stop-welded material. This roll forging process is now well known to those skilled in the art and therefore will not be described in greater detail. Certain aspects of the invention are equally applicable to plate type evaporators which have been made by other processes such as the straight pressure weld process.

One of the big problems in manufacturing evaporators and heat exchangers of the plate type is that of connecting tubing to the internal passages of the evaporator. A large number of different methods have been proposed for attaching the tubing but these have either necessitated making the connections at the edge of the composite plate or have required cutting into one side of the plate. The first method is objectionable in that in manufacturing refrigerators, for example, it is not always practical to make the connections to the evaporator at the edges thereof. The second method is objectionable in that it is difficult to cut into the one side of the plate without fragments of metal entering the internal passages. Any process wherein metallic chips are allowed to enter the internal passages is highly objectionable in a refrigerating system since the metallic particles can cause serious damage to the compressor or become lodged on the valve seat or in a refrigerant control passage so as to interfere with the proper control of the flow of refrigerant through the same.

I have discovered that it is possible to make a connection to the internal passage of a plate type evaporator without making the connection at the outer edge of the plate and without drilling a hole or otherwise cutting an opening into a side wall of the internal passage by any method which might permit the introduction of metallic chips or slivers into the passage. This may be done by cutting a slot, such as the C-shaped slot **14**, at the terminus of the internal passage and then offsetting the tongue **16** thus formed at a gradual angle as best shown in Figure 2 so as to expose the end of the passage and thereby make it possible to attach a tube **18** in direct alignment with the end of the internal passage **12**. The slots **14** are preferably cut after the internal passages **12** have been dilated but the walls of the passage adjacent the slot may be collapsed so as to close the end of the passage against the entrance of any chips during the cutting operation. It has been found practical to allow the one end of the passage **12** to extend all the way to the outer edge **20** of the plate **10** as indicated at **18** so as to make it possible to make connection to one end of the internal passage from the edge **20** for dilating the passage **12**. However, after the passage **12** has been dilated the extreme end **18** of the passage is flattened out again whereby the finished evaporator is completely flat adjacent the edge **20**. After the C-shaped slots have been cut, the ends of the passage **12** are pried open by insertion of a pointed tool.

Since the particular evaporator shown herein is of the type intended to be used in the food compartment of a home refrigerator, it is desirable from a sanitary and appearance standpoint to provide a relatively flat, easy to clean surface on front side of the evaporator. The C-shaped slot **14** may be concealed by means of a sheet metal clip-like escutcheon plate or element **24** which is held in place by means of the offset flanges **26** provided on opposite edges of the element as best shown in Figure 4 of the drawing.

By virtue of the above method and apparatus it is obvious that no metal chips or the like can enter the internal passages during the process of attaching the inlet and outlet tubes and the tubes can be attached at the back side of the plate within the confines of the outer periphery of the plate. The arrangement described not only provides a neat and practical arrangement for making connection to the back side of the evaporator but also has the advan-

tage that the joints are better protected against damage since the joints lie close to the rear side of the plate and the inlet and outlet tubes do not enter the evaporator at a sharp angle.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A plate type evaporator element having an internal passage formed therein, an offset tongue-like formation in said element adjacent one terminus of said passage and forming a hole in said plate element, and a tube secured to said offset with its internal passages arranged in alignment with said first named passage, an escutcheon plate overlying said offset so as to close said hole and provide a substantially smooth surface on the one side of said evaporator element, said escutcheon plate and said evaporator element having complementary surfaces formed thereon for frictionally and removably holding said plate in assembled relationship to said evaporator element.

2. A heat exchanger comprising a roll forged element having an internal passage formed therein, said passage having a terminus arranged at a point inside the outer periphery of said roll forged element and comprising a tongue portion struck away from the roll forged element, said passage extending to an edge portion of said tongue, and a conduit connected to said tongue portion and having a passage communicating with said internal passage.

3. A heat exchanger comprising a roll forged element having an internal passage formed therein, said passage having a terminus arranged at a point spaced from any edge of said roll forged element and comprising a tongue portion, a conduit connected to one edge of said tongue portion and having a passage communicating with said internal passage, the projecting end of said tongue portion and the adjacent portion of said roll forged element being offset relative to one another so as to provide access to said internal passage tangentially to the main plane of said roll forged element.

4. The method of manufacturing a plate type heat exchanger which comprises superimposing a pair of plates, forging said plates together throughout predetermined zones, forming a passage throughout other zones between said plates, cutting a C-shaped slot in said plate adjacent one end of said passage so as to form a tongue portion at the end of said passage, offsetting the free end of said tongue portion so as to form a bend in said passage, and attaching a conduit to the offset end of said passage.

5. The method of manufacturing a plate type heat exchanger which comprises superimposing a pair of plates, forging said plates together throughout predetermined zones, forming a passage throughout other zones between said plates, cutting a slot in said plate adjacent one end of said passage so as to form a tongue portion at the end of said passage defined by said slot, offsetting the free end of said tongue portion so as to form a bend in said passage, and attaching a conduit to the offset end of said passage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,143,169	Saler	Jan. 10, 1939
2,156,544	Raskin	May 2, 1939
2,212,481	Sendzimar	Aug. 20, 1940
2,451,744	Johnson	Oct. 19, 1948
2,662,273	Long	Dec. 15, 1953
2,690,002	Grenell	Sept. 28, 1954