

June 22, 1943.

M. F. BOOTH

2,322,341

HEAT EXCHANGE UNIT

Filed Jan. 27, 1940

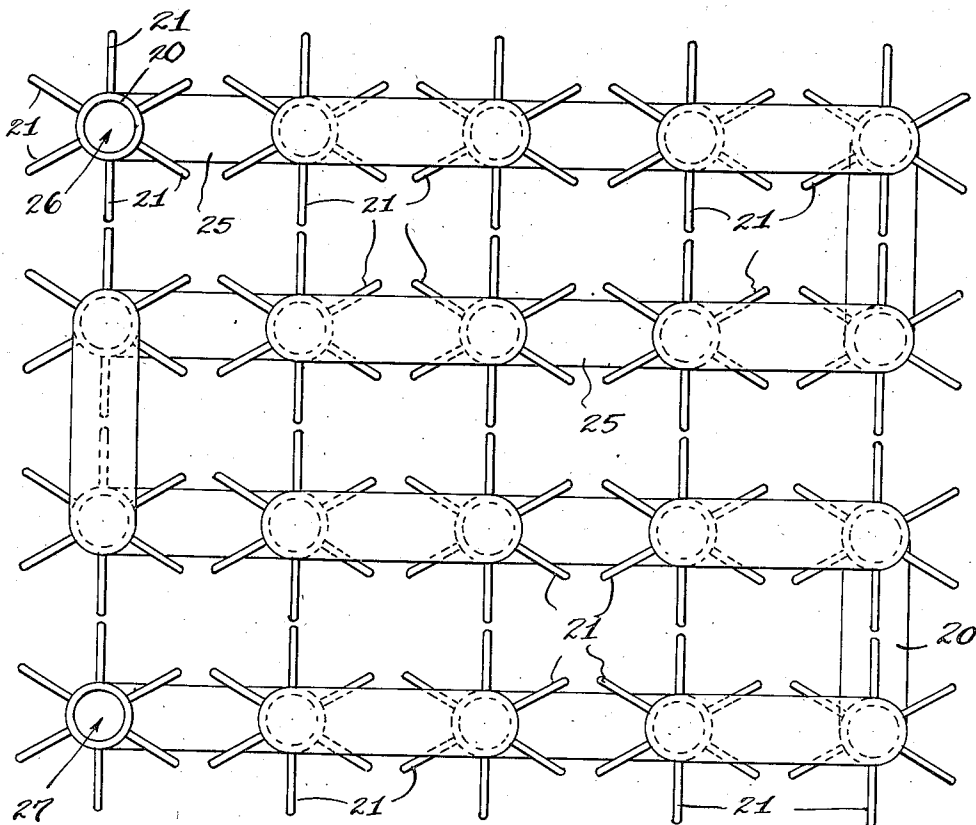


Fig. 1.

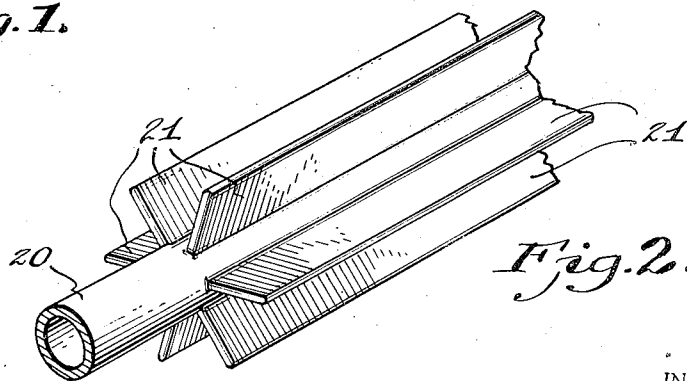


Fig. 2.

INVENTOR.
Morris F. Booth
BY *Barnes, Kuselle, Laughlin & Rauch*
ATTORNEYS

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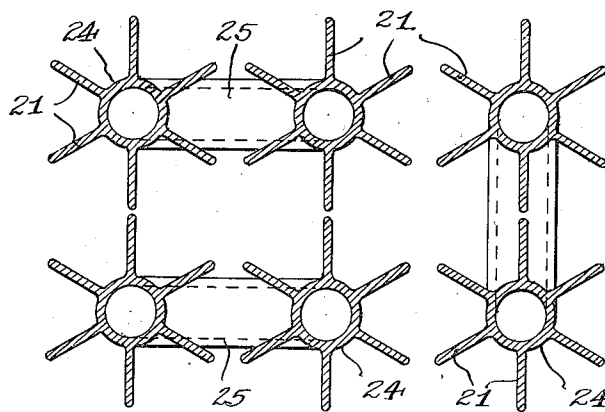
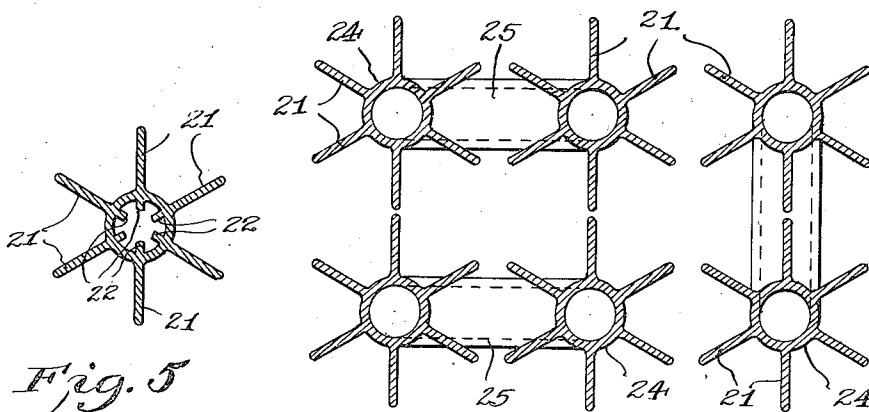
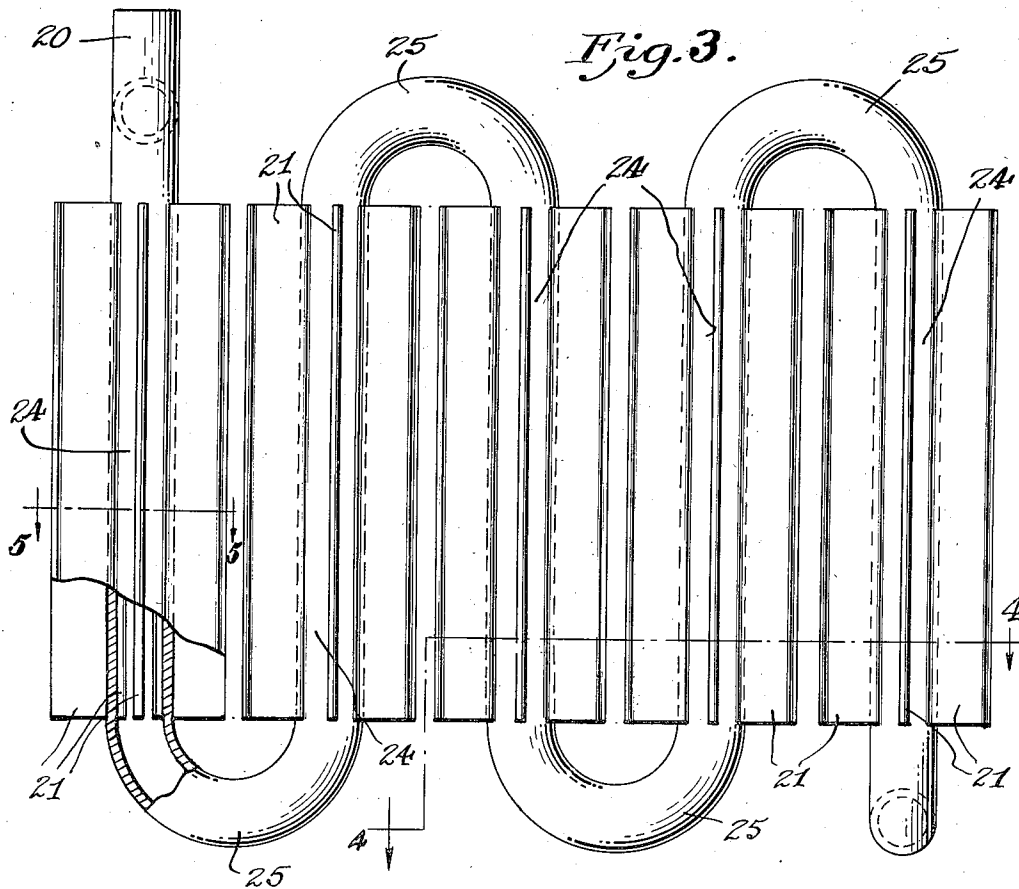


Fig. 4

INVENTOR.
Morris F. Booth

BY
Barnes, Kesselle, Laughlin & Leuch
ATTORNEYS

UNITED STATES PATENT OFFICE

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HEAT EXCHANGE UNIT

Morris F. Booth, Alden, Mich.

Application January 27, 1940, Serial No. 315,933

4 Claims. (Cl. 257—148)

This invention relates to a heat exchange unit and has particularly to do with that type of unit which is formed from extruded metal, as described in my Patent No. 2,212,912, issued August 27, 1940, of which this application is a continuation in part.

It is an object of the present invention to provide a heat exchange unit which is formed of integral extruded metal, the refrigerant passageways and the heat conducting fins, all being formed in the same integral piece of metal. Further features of the invention have to do with a heat exchange unit formed of extruded metal which is preferably a non-ferrous metal, such, for instance, as aluminum, copper or brass; the extruded metal being refined by the extrusion step whereby such metals as aluminum, which could not be used in a cast form because of porosity, can now be safely used because of refining and compacting of the grains of the metal.

Another object of the invention is to provide a complete evaporator in a simplified manner by bending an extruded tube which is provided at intervals with longitudinally extending fins.

Still other features have to do with details of structure and various modifications to which the invention adapts itself, as more clearly set forth in the specification and claims.

In the drawings:

Fig. 1 is an elevation of a heat exchange unit formed in accordance with the present invention.

Fig. 2 is a perspective view of a portion of extruded tube and fins used to form the heat exchange unit.

Fig. 3 is a plan view of the unit shown in Fig. 1 illustrating the manner in which the tube is bent.

Fig. 4 is a section taken on the lines 4—4 of Fig. 3.

Fig. 5 illustrates a cross section taken on lines 5—5 of Fig. 3, in which radial fins are formed within the tube as well as on the outside.

In the present invention the entire heat exchange unit is extruded.

Due to limitations of dies, I have found that aluminum is very well suited for use in extruded evaporator or heat exchange sections, although it will be understood that any other metals may be used, limited only by available dies for accomplishing the extrusion step. Aluminum becomes important because when heated to extrusion temperature and placed under high extrusion pressure, the texture of the metal is clearly refined with the result that the extruded section of the aluminum is substantially equivalent to standard sheet aluminum. Because of the re-

fined nature of aluminum after the extrusion step, all question of leakage of the volatile refrigerant or other heat absorbing or carrying liquid, is eliminated. Heretofore, leakage has been a very serious drawback because of the porosity of cast aluminum.

The form of heat exchange unit with which the present invention is particularly concerned is illustrated in Figs. 1 to 5. This form consists of a continuous tube 20 which is extruded in straight lengths from a die and which is provided at spaced intervals along its length with radially extending fins 21 which are also extruded from the same die and form integrally with the tube. In some cases, the die may be used to form inwardly extending fins 22 as shown in Fig. 5 to increase greatly the contact surface with the tube. As a general rule the fins are made continuous along the tube and portions of them are milled off at spaced intervals along the tube to leave the tube clear.

When the tube has been formed, it may be bent sinuously, as shown best in Fig. 3, so that parallel sections 24 are formed. The bended part of the tube may consist of portions 25 lying between the parallel sections 24 which are provided with the fins 21. The bending of the tube need not be limited to a single plane but may be continued to form a heat exchange unit as illustrated in Fig. 1 wherein there are four planes of sinuous bending, each connected by finless portions of the tube and the entire unit having inlet-outlet openings 26 and 27. It will thus be seen that the fins on the parallel portion of the tube are adjacently positioned so that they cooperate with each other to form air passageways which convey heat to or from the unit. A decided advantage of the unit is that all of the parts are integral and therefore, there is no heat loss between joints.

I claim:

1. An evaporator unit comprising an extruded tube bent sinuously in spaced parallel, horizontal and vertical planes with spaced parallel sections, and extruded, lengthwise extending, radial fins integral with and projecting from the walls of said tube in opposed pairs, said fins being spaced longitudinally on said tube whereby they are located on parallel portions thereof, and said tube being so bent that the fins of the adjacent vertical parallel portions form substantially closed walls between said portions and permit passage of air between said walls upwardly.

2. An evaporator unit comprising a plurality of parallel sections spaced in horizontal and vertical planes, and each section comprising an ex-

truded tube having lengthwise extending radial fins integral with and projecting from the walls of said tube, means connecting said sections, and said sections being arranged that the fins of adjacent vertical parallel sections form substantially closed walls between said sections and permit passage of air between said walls upwardly.

3. An evaporator unit comprising an extruded tube bent sinuously in spaced parallel, horizontal and vertical planes with spaced parallel sections, and extruded, lengthwise extending, radial fins integral with and projecting inwardly and outwardly from the walls of said tube in opposed pairs, said fins being spaced longitudinally on said tube whereby they are located on parallel portions thereof, and said tube being so bent that

the fins of the adjacent vertical parallel portions form substantially closed walls between said portions and permit passage of air between said walls upwardly.

5 4. An evaporator unit comprising a plurality of parallel sections spaced in horizontal and vertical planes, and each section comprising an extruded tube having lengthwise extending radial fins integral with and projecting inwardly and outwardly from the walls of said tube, means connecting
10 said sections, and said sections being arranged that the outwardly extending fins of adjacent vertical parallel sections form substantially closed walls between said sections and permit passage
15 of air between said walls upwardly.

MORRIS F. BOOTH.