Sept. 16, 1947. J. ASKIN 2,427,336

HEAT TRANSFER UNIT

Filed April 25, 1945

Fig. 1

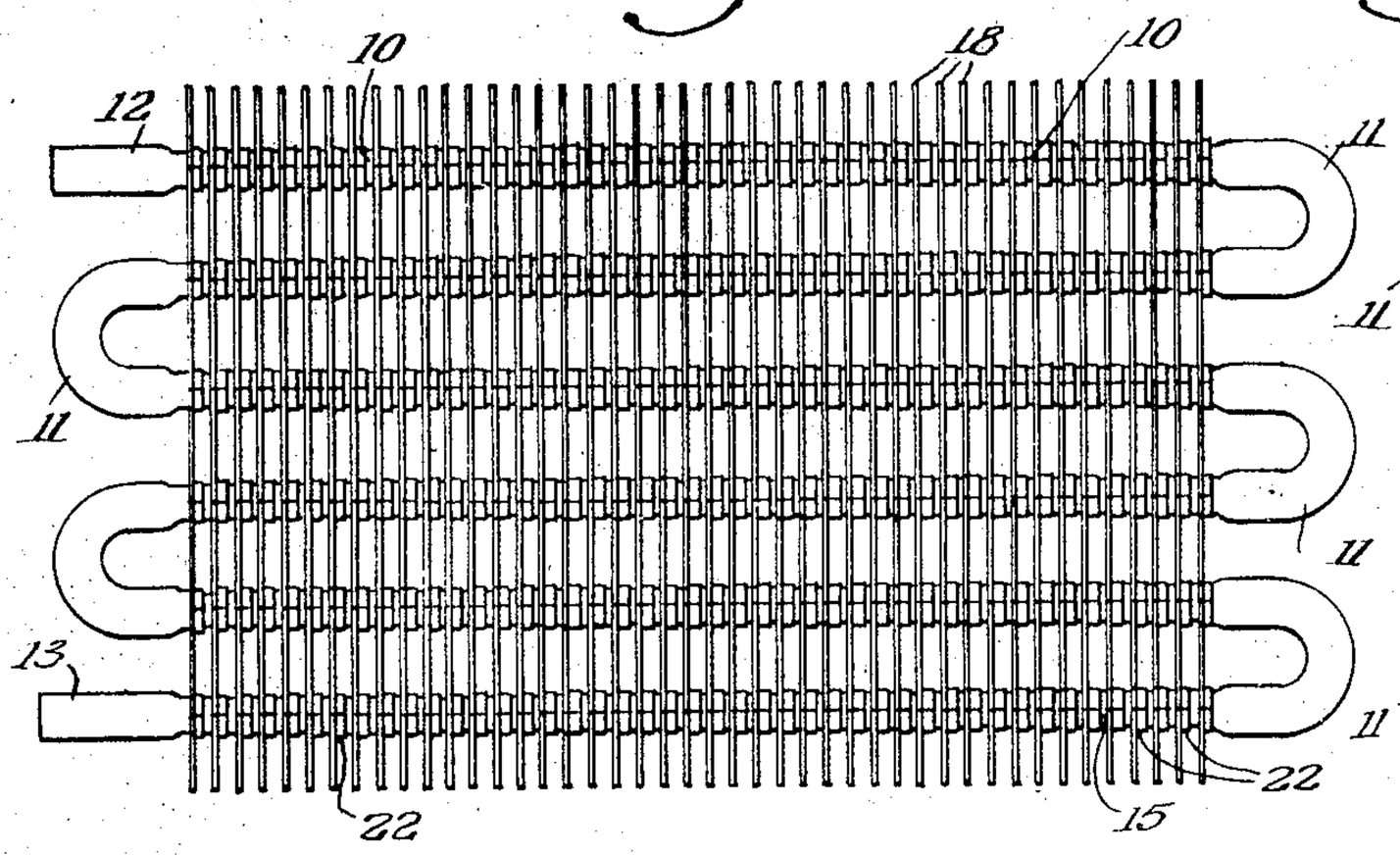


Fig. 2

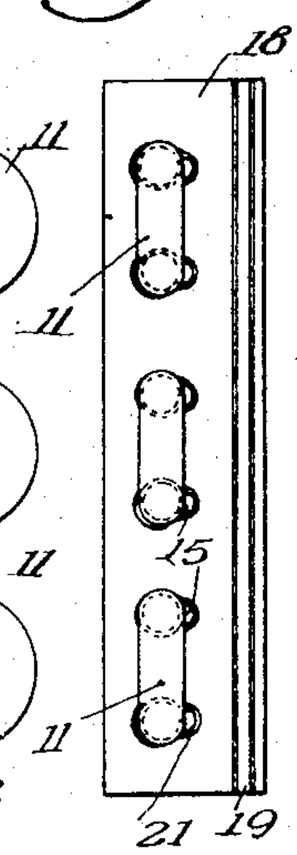


Fig. 4

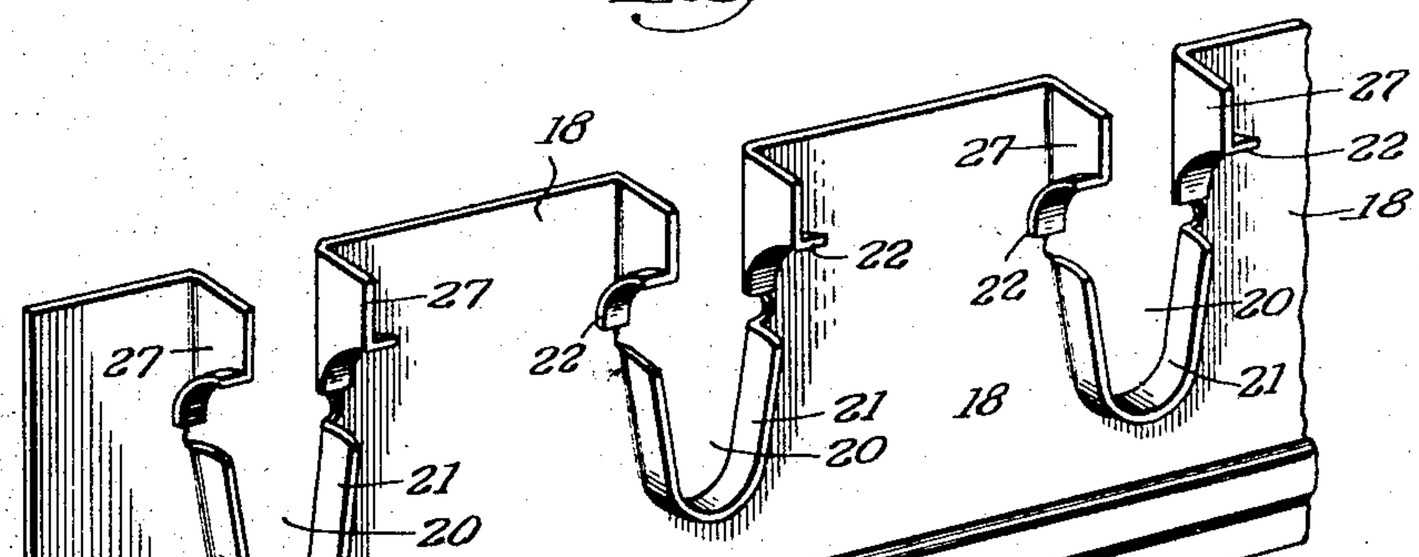
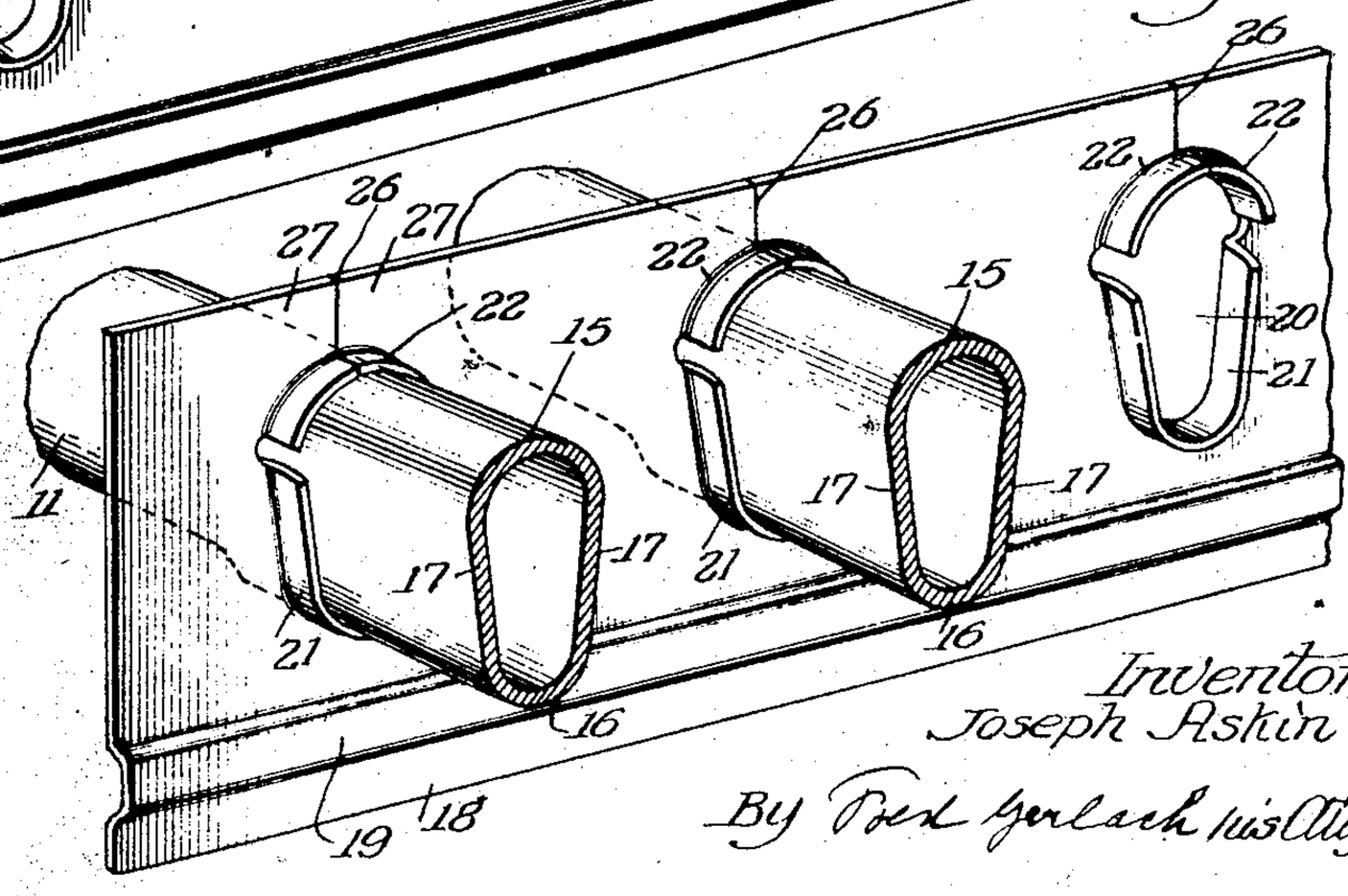


Fig. 3



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By Fox Gerlach his Attys.

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2,427,336

UNITED STATES PATENT OFFICE

2,427,336

HEAT TRANSFER UNIT

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Application April 25, 1945, Serial No. 590,237

1 Claim. (Cl. 257—262)

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The invention relates to heat transfer units.

In heat transfer units, such as condensers for a refrigerant, it has been found advantageous to form a coil through which fluid passes for heat transfer from a single length of tubing with integral bends at the ends and parallel members between the bends and to use sheet metal fin-forming strips through which the tubing extends for heat transfer from the tubing.

One object of the invention is to provide a coil of this type with fin-forming strips through which a series of parallel tubing-members extend, and in which said members are secured with contacting areas between the fin-strips and the tubing for efficient heat transfer.

Another object of the invention is to provide a heat transfer unit which comprises a coil of tubing with integral bends at its ends and intermediate connecting-members between the bends which, in cross-sectional contour, are deformed for efficient heat transfer from the fluid passing through the tubing to fin-strips having surfaces contacting with and conforming to the deformed tubing.

A still further object of the invention is to provide a heat transfer unit which comprises tubing having substantially parallel members serially connected by integral bends and fin-forming sheet metal strips which is simple in construction, can be produced at low cost, and is efficient in heat transfer.

Other objects of the invention will appear from the detailed description.

The invention consists in the several features hereinafter set forth and more particularly defined by the claim at the conclusion hereof.

In the drawings:

Fig. 1 is a side elevation of the heat transfer unit embodying the invention.

Fig. 2 is an end view.

Fig. 3 is a perspective on an enlarged scale of one of the fin-strips and a portion of the coil.

Fig. 4 is a perspective of a portion of the fin-strip which is provided with openings into which the tubing may be placed before the strips are bent to secure the tubing in the strips.

The invention is exemplified in a heat transfer unit, for example, a condenser which comprises a coil of tubing which is formed of a continuous length of stock bent to form a series of parallel tube-members 10 connected by 180° integral bends 11. The ends of the tubing, as at 12 and 13 provide connections for inlet and outlet pipes for the fluid, such as a refrigerant gas. The parallel tube-members 10 between bends 11, and inlet 12

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and outlet 13 are, in cross-section, deformed to increase the rate of flow of the fluid between said bends. Each tube-member 10, in cross-section, has a portion 15 curved on a relatively large radius, an oppositely disposed portion 16 which is curved on a smaller radius, and substantially straight convergent side-portions 17 opposite the differently curved portions. The bends 11 are cylindrical in cross-section.

The tubing-members 10 extend through a series of strips 18 which are formed of sheet metal having a high coefficient heat conduction. Each strip has a series of openings 20 which conform to the cross-sectional contour of tube-members 10 and extends transversely across the entire series of said tubing-members. Each strip 18 is formed around a portion of each hole 20 with an integral flange 21 extending transversely to the plane of the strip and longitudinally of the tubing-members 10. These flanges 21 conform to and fit around the convergent side portions 17 and the curved portion 16 which is formed on a curve of lesser diameter than the longitudinally curved portion 15 on the opposite side of the tubing. Each fin-strip 18 is also formed with integral arcuate flanges 22 which project transversely from the plane of the strip and extend longitudinally of and conform to opposite sides of curved portion 15 of the tubing which is curved on the greater diameter. The strips 18 may be formed with an offset rib 19 for stiffening them. This cross-sectional contour of coil-members 10 produces low frictional resistance to and increases the velocity of the gas in transit through said members, for improved heat conduction. After assembly of the strips and tubing in this manner, they are bonded together by soldering or brazing. This may be done by dipping the unit in solder which causes the solder to be held by capillary attraction in the corners of the joints between the strips, draining the other solder from the unit and the plates including the meeting edges of the portions 27. The tubing and strips may also be copper-plated and bonded together by hydrogen brazing.

In order to permit the coil of tubing to be assembled and extend through strips 18, each strip is split as at 26 between the openings 20 therein and one edge of the strip to render the portions 27 bendable at right angles to the plane of the strip, as illustrated in Fig. 4. After the coil has been placed in the openings 20 in the strips, the portions 27 are bent so they will be coplanar with the strip and the integral arcuate flanges 22 thereon will engage opposite side-por-

tions of the curved portion 15 of the deformed tubing. The portions 27 will then cause arcuate flanges 22 to impinge against the opposite side portions 15 of the tubing and force the curved portions 16 and convergent sides 17 of the tubing into contact with the conforming flanges 21. When the portions 27 have been thus bent, the openings 20 around the tubing will be closed and the edges of portions 27 will be joined together.

The convergent and curved flanges 21 provide increased contact area and wedging engagement with the convergent side portions 17 and the curved portion 16 of the tubing. Flanges 22, after the split portions of the strips are bonded together, provide increased contact area and firm contact between the strips 18 and the curved portion 15 of the tubing. In the assembled unit, the metal in portions 27 will close the openings in the strips 18. The heat transfer is improved by virtue of having a greater amount of indirect surface as well as by virtue of an increase in contact between the direct and indirect surfaces.

The unit may be fabricated according to the method set forth in an application filed by me on April 25, 1945, serially numbered 590,238.

The invention exemplifies a heat transfer unit which comprises a coil formed of a single length of tubing and fin-strips adapted for efficient heat transfer from the tubing which is efficient in operation, is composed of few parts, and may be produced at low cost.

The invention is not to be understood as limited to the details described, since these may be modified within the scope of the appended claim without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

A heat transfer unit comprising a coil of tubing having a series of integral parallel portions connected by integral bends, the bends being cylindrical in cross-section, the parallel portions of the tubing having in cross-section oppositely disposed portions, one of which is curved on a greater radius than the other and substantially flat convergent portions between the curved portions, and one-piece fin strips, of sheet material having a series of openings through which the parallel portions of the tubing extend and conforming to said cross-sectional contour of the parallel portions, splits extending from the portions of the openings fitting the portions of the greater radius to one edge of the strips through which the parallel portions of the tubing can be inserted transversely into the openings, arcuate flanges on the portions of the strips extending around the portions of the tube having the greater radius and flanges each conforming to the flat convergent portions and the curved portions having lesser radius of the tubing.

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