Feb. 6, 1951 R. W. KRITZER 2,540,339

HEAT EXCHANGE UNIT

Filed June 14, 1948

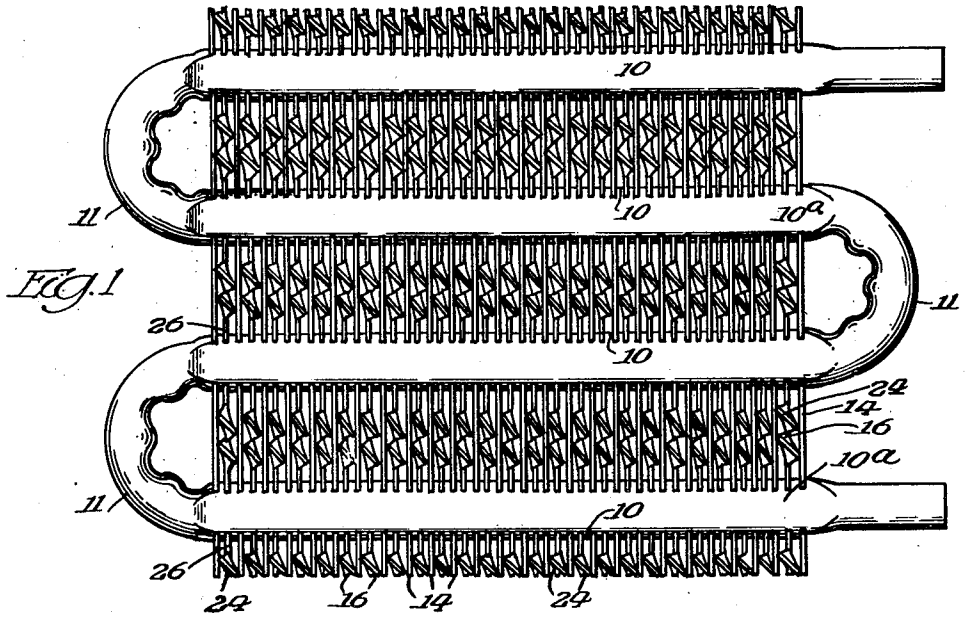

Fig. 1

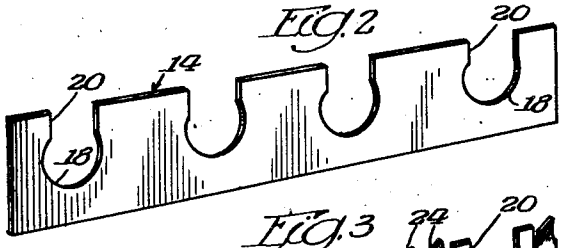

Fig. 2

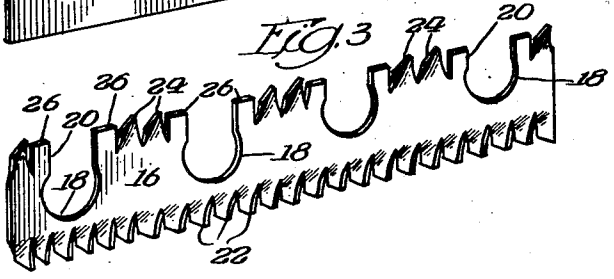

Fig. 3

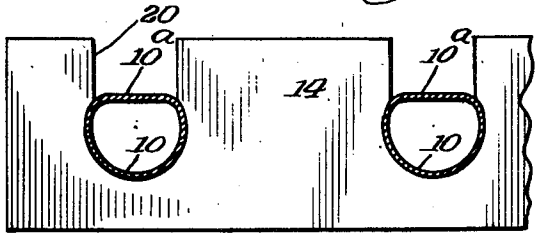

Fig. 4

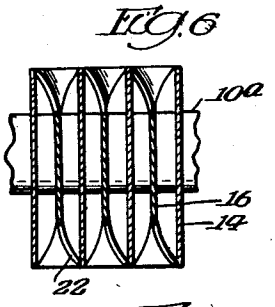

Fig. 6

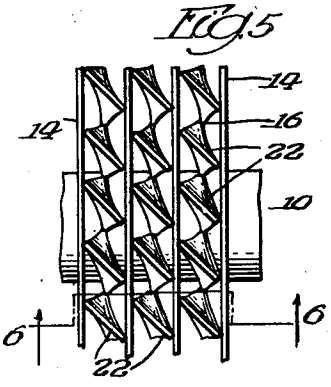

Fig. 5

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UNITED STATES PATENT OFFICE

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HEAT EXCHANGE UNIT

Richard W. Kritzer, Chicago, Ill.

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3 Claims. (Cl. 257—262.11)

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The invention relates to cross-fin heat exchange units.

One object of the invention is to provide a heat exchange unit which includes serpentine tubing, cross-fins provided with slots for the side entry of the tubing and interlocked with expanded tubing, the cross-fins being provided with integral teeth for spacing the fins apart longitudinally of the tubing, so that, in fabricating the unit, the fins are self-spacing and the necessity of positioning the fins in spaced relation by apparatus during the insertion into and the expansion of the tubing in the holes in the fins or the labor in so positioning them, will be eliminated.

Another object of the invention is to provide a heat exchange unit in which the tubing is expanded into interlocking relation with the cross-fins, and in which the cross-fins are provided along their outer margins with twisted tongues or teeth between alternate flat portions of fins for deflection of the air passing between the fins, to produce more efficient heat transfer.

Another object of the invention is to provide an improved method for fabricating cross-fin heat exchange units which includes cross-fins interlocked with expanded portions of a coil of tubing, which comprises providing integral tongues or teeth along the margins of alternate fins for spacing the fins, so that the entire group of fins can be pressed together during the insertion into and the flattening of the tubing for interlocking engagement with the fins.

Other objects will appear from the detailed description.

The invention consists in the several novel features which are hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings—

Fig. 1 is an elevation of a heat exchange unit embodying the invention, viewed from the side at which the fins are provided with slots for the entry of the tubing in the holes in which the tubing is expanded;

Fig. 2 is a perspective of one of the flat fins;

Fig. 3 is a perspective of one of the fins provided with twisted teeth along its margins;

Fig. 4 is a section through a portion of the tubing and illustrating the flattened tubing interlocked with a flat fin;

Fig. 5 is a side elevation of a portion of the unit viewed from the opposite side of Fig. 1; and

Fig. 6 is a section taken on line 6—6 of Fig. 5.

The heat exchange unit comprises a continuously formed serpentine coil of tubing, which includes parallel reaches 10 serially connected by integral return bends 11 and cross-fins fixedly held on and spaced along the straight reaches of the tubing. All of the fins are formed with apertures 18 and slots 20 intersecting one edge of the fins and the rims of the apertures for the side entry of the parallel reaches of the tubing into said apertures while the tubing has its normal or initial diameter. The apertures 18 are of greater width or diameter than the slots 20, and the slots correspond in width substantially to the diameter of the tubing before it is secured in the fins. After the sidewise insertion of the tubing into the apertures 18, the tubing is flattened as at 10a and thereby expanded transversely into tight interlocking relation with the edges of the apertures 20, as illustrated in Fig. 4, to secure the fins and tubing in heat-conducting relation.

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The fins include a series of flat fins 14 and a series of fins 16 provided with integral offset spacer tongues, the fins of one series being alternately disposed between the fins of the other series. Fins 16 are provided along their continuous edge with a series of twisted tongues 22, the outer ends of which extend diagonally between the flat fins 14. Along the opposite edges of fins 16, which are interrupted by slots 20, these fins are provided with oppositely twisted tongues 24 which extend between flat portions 26 at the sides of slots 20. These twisted tongues along the opposite side-edges of the fins function to symmetrically space the flat fins transversely apart along the tubing and to space the fins 16 symmetrically between the fins 14. The outer corners of the twisted tongues engage the contiguous flat fins and space the flat central portions of fins 16 between the flat fins 14.

Besides functioning as spacers, the twisted or helical tongues cause the air entering and leaving the portion of the spaces between the central portions of flat fins 14 and the flat central portions of fins 16 to be deflected for more efficient heat transfer by the contact of the air with the fins, and because the tongues extend angularly across the spaces between the fins.

In fabricating the unit, the tubing is bent to form the coil with integral straight reaches 10 and return bends 11 with the tubing normally of a diameter, which permits it to pass through the slots 20 and into the apertures 18 in the fins. The fins 14 are cut from a strip of metal and punched to form the apertures 18 and slots 20, according to the spacing of the parallel reaches of the coil. The fins 16 are cut from a strip of

metal punched to form the apertures 18 and slots 20. The side-margins are simultaneously slitted and the portions between the slits are twisted to form tongues 22, 24. Fins 14 and 16 are assembled on a suitable table or support in alternate arrangement, with the slots 20 for each straight reach of the coil in alignment. All of the fins 14 and 16 are then pressed together transversely by any suitable pressure means, the twisted tongues functioning to maintain the equal spacing between the flat portions of the contiguous faces of the fins. The resiliency of the tongues cause their outer corner to insure contact between the flat fins 14 and the tongues when the fins are pressed together. The reaches 10 of the coil are then passed sidewise through the slots 20 into the apertures 18. The portions of the straight reaches of the coil, which extend through the series of fins, are then simultaneously flattened as at 10^a by a suitable die to expand the tubing in the apertures 18 and transversely interlock the fins and coils. The tongues result in self-spacing of the fins during the fabrication of the unit, so that it is not necessary to provide a jig or frame for relatively positioning the fins during the fabrication of the unit. This effects a great saving in the cost of fabrication.

In the completed coil thus fabricated, the corners of the tongues, as the result of the end pressure applied to the entire group of fins during fabrication, resiliently contact the contiguous fins and deflect the air between the fins, which results in high thermal transfer efficiency.

The invention exemplifies a heat transfer unit of the type which includes cross-fins with side-entry slots for a continuously formed coil which can be fabricated at a low cost and possesses high efficiency.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

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

1. A heat transfer unit comprising: a coil of tubing including straight reaches and integral return bends, and cross-fins provided with slots for the side-entry of the coil into apertures in which the tubing is expanded for transversely interlocking the fins and coils, and with series of slits extending inwardly from their edges and resilient helically twisted tongues extending between the slits for spacing the fins along the tubing.

2. A heat transfer unit comprising: a coil of tubing including longitudinally extending reaches and a return bend, and series of alternately arranged cross-fins provided with slots for the side-entry of the coil and apertures in which the tubing is expanded for transversely interlocking the fins and coils, one series of fins having substantially flat edge portions and the other series having integral offset tongues along their edges and extending between said flat edge portions, for spacing the fins apart along the tubing.

3. A heat transfer unit, comprising: a coil of tubing including longitudinally extending reaches and a return bend, and series of alternately arranged cross-fins provided with slots for the side-entry of the coil and apertures into which the tubing is expanded for transversely interlocking the fins and coils, one series of fins being substantially flat and the other series having integral resilient twisted tongues along their edges projecting transversely from both faces of the fins of such other series and extending between said flat fins, for spacing the fins apart along the tubing.

RICHARD W. KRITZER.

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