May 29, 1934. J. C. MURN 1,960,345

RADIATOR

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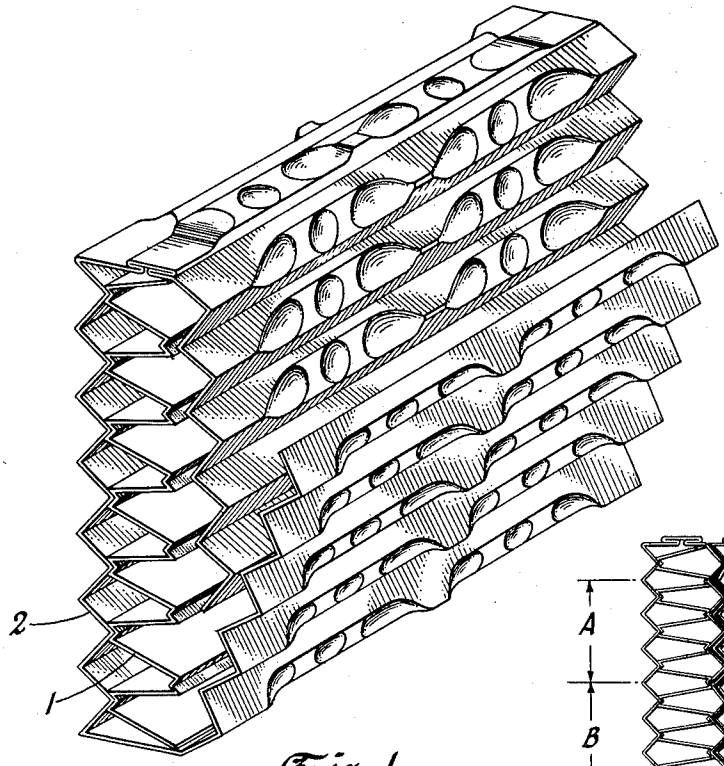


Fig. 1

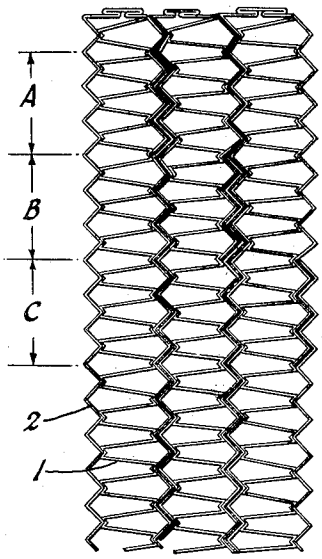


Fig. 2

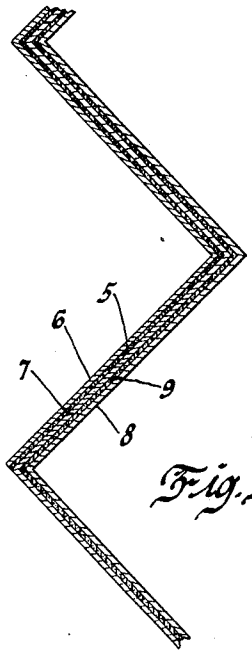


Fig. 3

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RADIATOR

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7 Claims. (Cl. 257—130)

This invention relates to heat exchange devices. It has to do particularly with radiators of the cellular type which are widely used as a part of the temperature regulating system of an internal combustion engine.

Such radiators involve a heat transfer unit or core, generally comprising a series of sub-assembly units, each made up of a metal strip pressed, rolled or otherwise formed, to a given contour and reversely bent into elongated loop formation to provide a pair of spaced walls, between which is interposed a fin or separator plate to divide the intervening space into a plurality of cells. The several sub-assembly units are arranged in side by side relation so that adjacent walls of adjoining units provide therebetween a passageway extending from end to end of the assembly, which is sealed along the mating edges of the plates by successively dipping both the front and the rear faces of the assembly first in a flux solution and then in molten solder. As regards the opposite ends of the individual loops, it is the usual practice to bring these ends together at one end of the loop and seal them with solder applied by hand as a part of the sub-assembly operation. It is now proposed to eliminate this hand soldering operation by bringing the opposite ends of the strip into close overlapping contact and relying upon capillary flow of solder between such overlapping parts at the time the front and rear faces of the assembly are dipped. For convenience in manufacture, and to insure a better seal, it is further proposed to arrange the overlapping ends in one of the longitudinal side walls of each sub-assembly and to space the overlapping parts in different units at different distances from the opposite ends of the loops so that the double wall thicknesses at the joints will be distributed in the length of the core and afford a more nearly uniform width to the whole assembly.

For a better understanding of the structure referred to, use may be made of the accompanying drawing, wherein Figure 1 illustrates in perspective, one type of sub-assembly unit with the overlapping ends of the looped plate spread apart; Figure 2 shows in front elevation a small fragment of an assembled core with the overlapping ends of succeeding loops in step relation so that the double wall thicknesses of the several plates are scattered in different transverse planes; and Figure 3 shows in section on a larger scale, the soldered edge portions of two nested walls, one of the walls containing a part of the double wall thickness produced by the overlapping ends of a looped strip.

To explain the structure of an individual sub-assembly of a preferred type, reference is made to Figure 1, from which it will be seen that each unit may consist of two pieces or strips of thin sheet copper, brass, or other metal, whose heat conductivity is suitable for the purpose. Each of these strips, as illustrated, is generally of corrugated or zigzag contour, so shaped from flat ribbons in suitable dies and cut to given lengths. The overall length of the inner or fin strip 1 is approximately that of the completed unit, while the outer plate 2 is made a little more than twice the length of the strip 1, so that it may be fashioned to elongated loop formation to encircle the inner strip. As will be readily understood by those skilled in the art, the corrugated center strip maintains the outer walls in spaced relation and divides the intermediate space into a series of cells.

As distinguished from the usual practice of arranging the outer wall strip so that its opposite ends come together for soldering at one end of the sub-assembly it is here proposed to join these ends in one of the side walls of the loop. For this purpose, the outer strip 2 is made of sufficient length that the end portions overlap, with their respective formations in nested relation and the adjacent surfaces in tight contact from edge to edge to insure inward capillary flow of solder to bond the parts when the edges are dipped at final assembly. The extent of overlap should be sufficient to result in a good seal and it has been found that an overlap of three corrugations, as illustrated, satisfies this requirement.

Where the end portions overlap, the thickness of the wall is doubled and if all the units of a complete core had the double wall thicknesses in the same relation to the ends of the core, it is obvious that in the transverse plane containing the double wall thicknesses, the assembly would be wider than on any other point in its length. To overcome this objection, the several loops are so formed that the opposite ends of different wall strips overlap at different distances from the loop ends, whereby the double wall thicknesses will be distributed or scattered in various transverse planes and balance one another to maintain substantial uniformity of width in the whole assembly. This expedient is clearly illustrated in Figure 2 where the double wall thicknesses in the three sub-assemblies shown occur in the areas denoted by the letters A, B, and C, respectively. It is mentioned, incidentally, that there is no necessity for the workman to make a careful selection of sub-assemblies for the purpose of pre-

cisely arranging the double wall portions in the regular step relation illustrated, since the desired effect is had so long as the overlapping portions of the several units are not concentrated in one locality.

While the above description has dealt particularly with increase in thickness as regards the material in the end portions of the outer strip, it will be evident that the layer of solder which joins these ends also has a share in the increase. As seen in Figure 3, which is a sectional view taken through joined edge portions of mating walls of two sub-assembly units, a layer of solder 5 occurs between the overlapping portions 6 and 7 of one wall to which is secured the adjacent wall 8 by a layer of solder 9. Thus each outer wall has a single thickness of metal throughout its major extent and three distinct metal layers in that portion containing the overlapping ends.

I claim:

1. In a radiator core constructed from a series of sub-assembly units placed side by side and each comprising a corrugated fin strip and a wall strip fashioned to elongated loop formation to receive the fin strip with portions at opposite ends overlapping intermediate the loop ends throughout a distance to be engaged by several fins of the fin strip, said overlapping ends of the several units being out of transverse alinement.

2. In a heat exchanger having a series of juxtaposed longitudinally extending plates, at least some of which have double wall thicknesses at points intermediate the ends of the assembly in abutting contact on both sides with the plates on opposite sides thereof, such plates being so arranged that the double wall portions are positioned at relatively different distances from the ends of the assembly.

3. In a radiator core having a series of wall strips extending from end to end of the core, certain of said strips having overlapping portions intermediate the core ends, with the overlapping portions of succeeding plates arranged in staggered relation and in abutting contact on both sides thereof within the next adjacent plates.

4. In a heat exchanger of the cellular type wherein certain of the wall plates are formed in sections with adjacent ends of the sections overlapped and solder bonded and interposed between in contact with portions of the plates on both sides thereof, said sectional plates being so arranged that the several bonds are in various transverse planes.

5. In a radiator core, a number of walls arranged in side by side relation, certain of the walls having portions clamped between surfaces of walls on both sides thereof, with one of such clamped portions intermediate opposite ends of the core of different thickness than the main body of the wall, and certain of said last mentioned portions being out of alinement transversely of the core.

6. In a radiator core, a series of plates arranged in side by side relation, portions of at least some of said plates being in surface contact on both sides thereof with next adjacent plates and certain of said portions being of enlarged thickness intermediate the ends of the core with the enlarged portions of the several plates scattered in planes located at relataively different distances from the ends of the core.

7. In a radiator core, a series of sub-assembly units arranged side by side and each unit comprising a zigzag fin strip and a wall strip looped around the fin strip and corrugated throughout both end portions, with said end portions in nested overlapping contact with several corrugations in one of the side walls of the loop and engaged by one or more of the fins, the several units having said overlapping end portions arranged in scattered relation to each other.

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