

Oct. 8, 1935.

S. PRZYBOROWSKI

2,016,822

RADIATOR

Filed Feb. 19, 1932

2 Sheets-Sheet 1

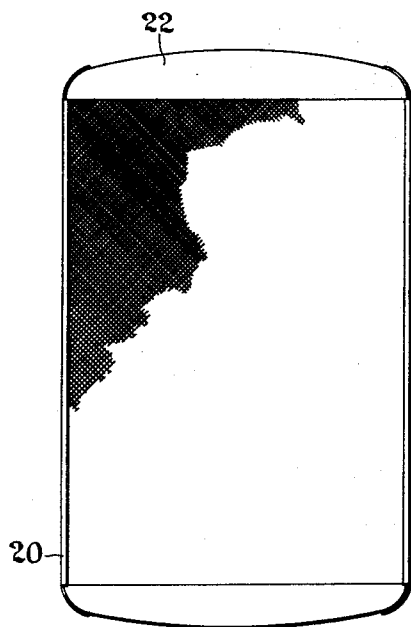


Fig. 1.

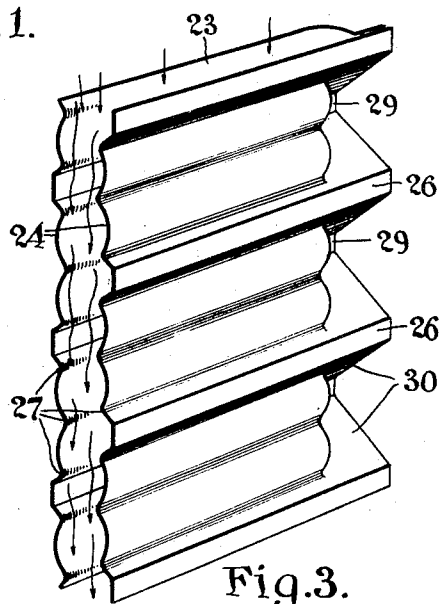


Fig. 3.

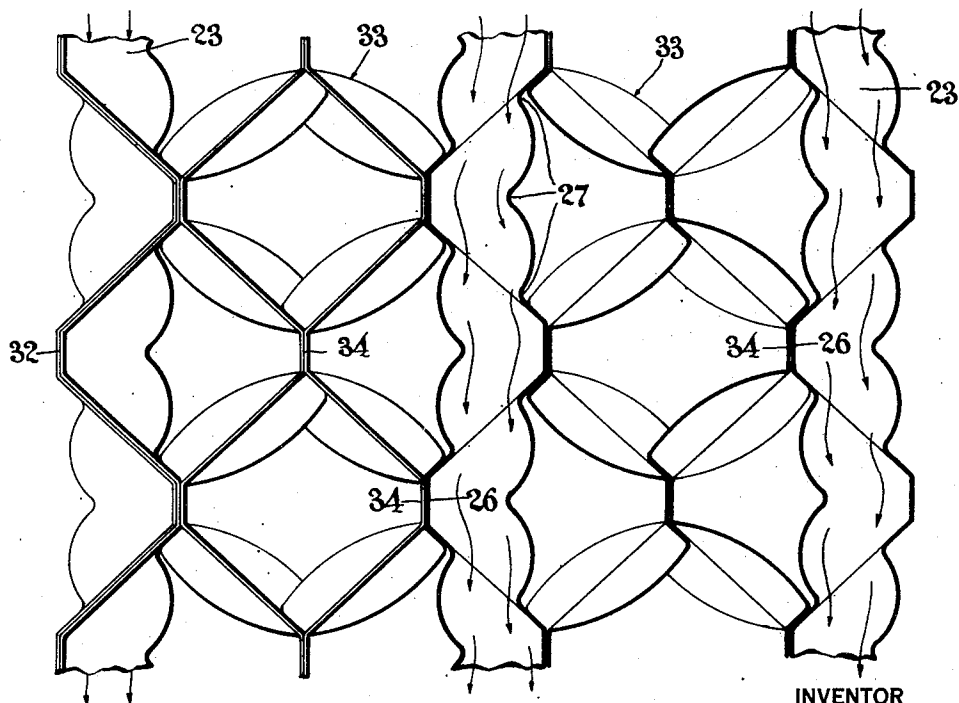


Fig. 2.

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Fig. 4.

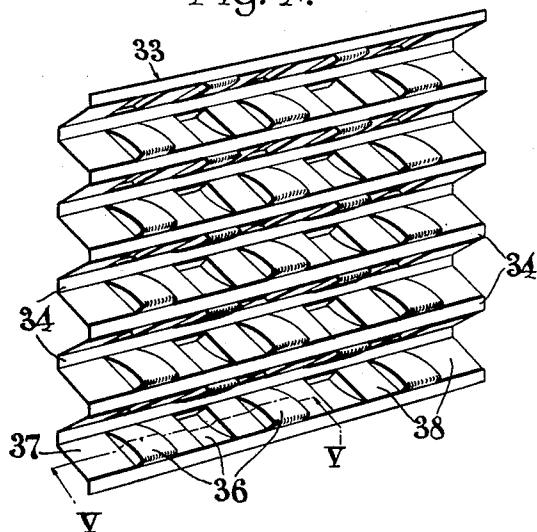


Fig. 5.

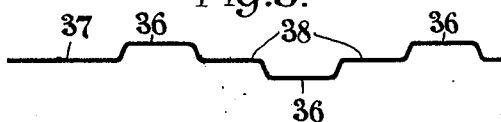


Fig. 6.

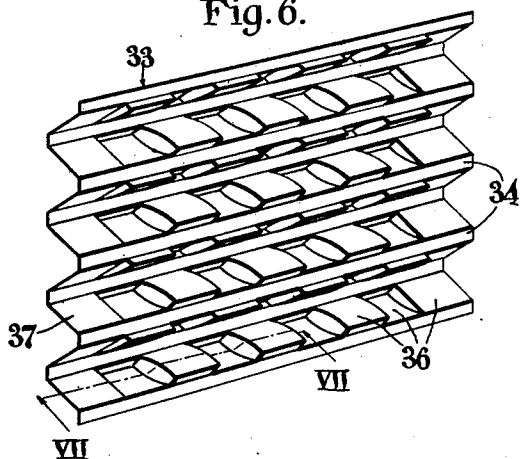


Fig. 7.

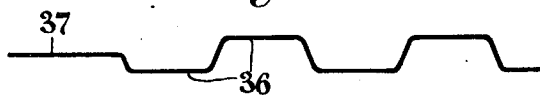


Fig. 8.

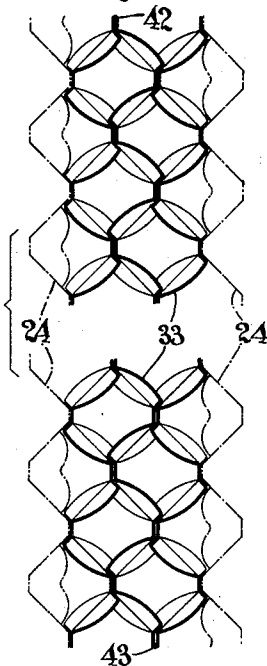
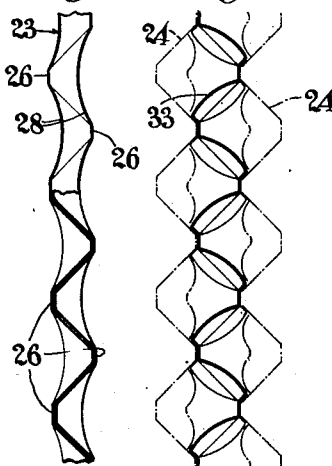


Fig. 9.



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RADIATOR

Stanislaus Przyborowski, Buffalo, N. Y.

Application February 19, 1932, Serial No. 594,014

3 Claims. (Cl. 257—130)

This invention relates to heat exchange units and it has particular relation to the construction and arrangement of water courses and heat radiating fins or spacers in radiators for automotive vehicles.

In the manufacture of radiators for automobiles, a series of water courses are provided for the purpose of circulating water or other cooling liquids to cool the vehicle motor, and are separated by means of spacing ribbons or fins, which with the water courses, form a construction in the form of a honeycomb configuration. Since it is desired to obtain the greatest cooling effect possible from the circulated water, the fins are bent in zig-zag form or are offset along their surfaces to create proper turbulence of the air passing therethrough. These elements are first assembled in suitable units and dipped into solder which provides a bond between them. Since the motor vehicle is subjected to a great deal of vibration and shock it is essential that no loose portion remains in the finished radiator unit if the assembly is to be free from noise and possible premature deterioration.

It is often desirable to manufacture several types of radiators having one partition or spacer thickness between adjacent water courses, or in other cases, two or more thicknesses. In such instances it has heretofore been possible to provide this kind of construction by employing different configurations of ribbon for each partition.

According to this invention a radiator unit has been provided in which a single configuration of strip for spacing the water courses is suitable for use as a fin or ribbon construction having one, two, three or more partition or wall thicknesses. It is only necessary to bend the strip upon itself and its configuration is such that it conforms to its own adjacent folded portion as well as to the shape of the contacting surfaces of the water courses. Moreover, in this type of radiator the several elements are so fitted together that it is only necessary to dip them slightly, even as slightly as one eighth of an inch, into the solder along each edge portion in order to provide for a complete and continuous bond between all of the contacting parts or parts which are designed to be bonded in spacing relation.

For a better understanding of the invention reference may now be had to the accompanying drawings forming a part of this specification of which

Fig. 1 is a diagrammatic elevation of a radiator embodying the invention;

Fig. 2 is a fragmentary diagrammatic view, on a larger scale, partially in elevation and partially in cross section of a radiator unit constructed according to the invention;

Fig. 3 is a perspective of a pair of plates or ribbons forming water courses for the radiator;

Fig. 4 is a perspective of a spacing ribbon for a radiator unit;

Fig. 5 is a cross section taken substantially along the line V—V of Fig. 4;

Fig. 6 is a perspective of another form of spacing ribbon;

Fig. 7 is a cross section taken substantially along the line VII—VII of Fig. 6;

Fig. 8 is a diagrammatic view of a radiator section illustrating the manner in which the ribbons are bent to form a triple partition construction;

Fig. 9 is a diagrammatic view of a radiator section illustrating a single wall construction for the ribbon spacer; and

Fig. 10 is a diagrammatic view of another configuration of water course plates.

Referring particularly to the drawings, the invention is incorporated in one of its forms in a radiator 20 of a motor vehicle. The radiator is composed of an outer supporting shell 22 provided with conventional inlet and outlet openings (not shown) for supplying and draining cooling fluid, and a plurality of water courses 23 which comprise pairs of metallic ribbons or strips 24 having a general zig-zag configuration particularly pronounced at their outer marginal portions. Flat straight contact surfaces 26 constituting crests of zig-zag configuration at one side of each strip 24 extend from one edge of each strip to the other, and the material between the surfaces is bent away from the flat contact surfaces. In Fig. 2 the water course strips are shown as having obtuse reverse bends 27 in the nature of corrugations which add strength to the assembly. In an alternate form of construction, as shown by Fig. 10, the metal may be formed into a series of continuously curved portions 28 from one flat contact surface 26 to the other. This arrangement, although not as strong as the corrugated intermediate construction, is sufficiently strong for practical purposes and provides for a smoother flow of fluid through the water courses.

The marginal edges of the strips are provided with relatively short contact surfaces 29 defining marginal crests diagonally opposite the crests 26, and extending only a short distance from the edges of the strip before they merge into the inwardly bent portions 27. Sloping portions 30, 55

which define substantially the zig-zag configuration, join the short crests 29 to the bent portions 27 and to the outer crests 26. As best shown by Figs. 2 and 3 a pair of water course strips of this construction are assembled in such manner that their contact surfaces 26 face in opposite directions outwardly and the edge portions fit in flush relation along a line 32. However, the intermediate portions of these strips are sufficiently spaced to provide for the free flow of water or other liquid therethrough.

A series of these water courses arranged in parallel vertical relation are provided in each radiator and between them are arranged a series of ribbon or strip spacers 33 corrugated into zig-zag configuration. The marginal portions of each spacer 33 are not offset and when assembled with the strips of the water courses the straight contact surfaces 26 contact throughout from one edge of each strip to the other with the continuous straight crest or surfaces 34 of the zig-zag spacer. A plurality of projections 36 extending outwardly alternately from opposite sides of each of the straight contact surfaces 34 assist in assembling in interfitting relation therewith the surfaces 26 of the water courses. Each of these projections is identical but where one of them is stamped in one direction from a wall portion 37, the next laterally disposed adjacent projection is stamped from the same wall in the opposite direction. Thus each side of the metal ribbon spacer is the same with the exception that a bulge on one side constitutes a depression on the other side. The relative positions of one pattern of projections is clearly shown by Figs. 4 and 5. According to these figures straight portions 38 constituting parts of the wall portion 37 remain between the spaced projections 36. The alternate arrangement of these projections on adjacent converging walls is such that the air passing through the radiator will be directed along a substantially sinuous path thus creating turbulence therein.

If it is desired to have two ribbon spacer partitions, as shown by Fig. 2, it is only necessary to bend the ribbon 33 in either direction along one of the contact surfaces 34 and the material folds against itself in perfect fitting relation with contiguous contact surfaces or crests 34 engaging each other throughout their length. The outwardly facing surfaces 34 of this folded strip fit in the same manner against the contact surfaces 26 of the water course ribbon 24. If a construction is desired wherein there are three partition walls constructed of the spacer 33 the latter is bent first in one direction, as indicated at 42 Fig. 8, and then bent, as indicated at 43, in the opposite direction along suitable contact surfaces 34 according to the length of the ribbon necessary. In fact the ribbon may be bent as many times as desired and the crests constituting the contact surfaces 34 always fit perfectly upon corresponding contiguous surfaces 34 and the outer surfaces 34 will contact along the surfaces 26 of the water course ribbon.

The projections 36 can be placed in closer relation, as shown by Figs. 6 and 7 wherein they merge directly alternately from one side of the strip to the other without the intervening flat surfaces 38. It is of course to be understood that the greater number of projections create greater turbulence in the air passing through the radiator.

After the elements have been assembled and clamped together they are dipped into solder along their marginal portions to a depth not ex-

ceeding the extent of the marginal crest 29 of the water courses. In fact it is only necessary to dip them a depth approximately equal to the width of the contact surfaces 26 or 34. However owing to the unbroken smoothness of the surfaces of the contacting faces 34 of the ribbon and the contact surfaces 26 of the water courses which directly engage them, as well as the contact surfaces along the line 32, the solder will spread throughout between the continuous contacting surfaces and form a firm bond entirely along these surfaces from one edge of the strip to the other. There are no grooves or off-set portions transversely of the contact surfaces to impede the flow of solder along all of the contact surfaces which are provided for securing the elements together.

From the foregoing description it will be apparent that the invention provides for universal spacer ribbons suitable for use without alteration as to ribbon manufacture for any number of ribbon partitions between the water courses of radiators. Such universal construction requires only one set of dies to form or produce ribbon for a number of different constructions of radiators described. Moreover this type of ribbon is suitable for use in various other applications. For example, in heat exchange devices, ventilators, grates, heaters, etc., in which heat dissipating fins, or the like are desired.

Although only illustrative forms of the invention have been shown and described in detail it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What I claim is:

1. A radiator core comprising a plurality of conduits for the passage of fluid and a plurality of spacers for separating said conduits, said conduits being formed of a pair of metal ribbons having contacting portions at the margins thereof and being spaced between the margins to permit the passage of fluid, said ribbons being further formed with regularly spaced transverse plane contact surfaces disposed in staggered relation on opposite sides of said conduit, said spacer being formed of a sheet of metal ribbon into a zig-zag configuration defined by oppositely sloping intermediate portions connected by plane contact surfaces extending from margin to margin transversely of the ribbon, said last named surfaces constituting the crests and troughs of said zig-zag configuration, all of said crests and troughs being of substantially the same area and of substantially the same width as the contact surfaces of said conduit ribbons, and a plurality of protuberances extending from said intermediate portions to overlie the plane transverse contact portions of said spacer ribbon, whereby said spacer ribbon is adapted to fit between and space adjacent water conduits both as a single ribbon and in multiple fold with the juxtaposed plane contact surfaces in engagement.

2. A radiator core comprising a plurality of water conduits formed of sheet metal ribbon spaced by other sheet metal ribbons, said spacing ribbons being formed from sheet metal bent into a zig-zag configuration defined by crests and troughs and intermediate connecting portions, the crests and troughs lying in common planes and extending in straight lines from margin to margin of said ribbon to provide straight transverse contact surfaces, the intermediate

portions being deformed to provide alternate projections and depressions overlying said contact surfaces, the projections and depressions on adjacent intermediate portions being disposed in staggered relation with respect to each other, whereby said ribbon is adapted to be bent in either direction on itself and any number of times to bring said transverse contact surfaces into mutual engagement and said projections and depressions into telescoping relation locking adjacent lengths of said ribbon along said contacting portions and defining tortuous air passages through said ribbon, said water conduits being formed with transverse contact surfaces adapted to abut the adjacent contact surfaces of said spacer ribbon between said projections, the marginal portions of said water conduits being sealed together and the intermediate portions of said water conduit being spaced.

3. A radiator core including a plurality of water conduits spaced by spacing ribbons, said water conduits being formed of sheet metal ribbon having the marginal portions thereof bent into zig-zag configuration, straight flat contact surfaces disposed transversely of the ribbon at the crests and troughs of the ribbon between the marginal portions thereof, intermediate portions of said ribbon being bent away from said

marginal portions whereby a pair of said ribbons may be juxtaposed with the marginal portions in contact and the intermediate portions spaced to provide a conduit for water, the spacing ribbons being formed from sheet metal bent into zig-zag configuration to define crests and troughs and intermediate oppositely sloping portions, the crests and troughs extending from edge to edge of said ribbon and lying in common planes, the intermediate portions of said spacing ribbon being deformed with alternate projections and depressions projecting beyond the planes of the crests and troughs, the projections and depressions on adjacent intermediate portions being staggered with respect to each other, the crests and troughs all being of substantially the same width, the elevational distance between adjacent crests or troughs being the same as the distance between the straight flat contact surfaces of said water conduit, whereby said spacer ribbon will space said conduits with said transverse portions in contact and secured by said projections and depressions, and is adapted to effect such spacing both when said spacer ribbon is employed in single section and is bent on itself to form a space of multiple section.

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