

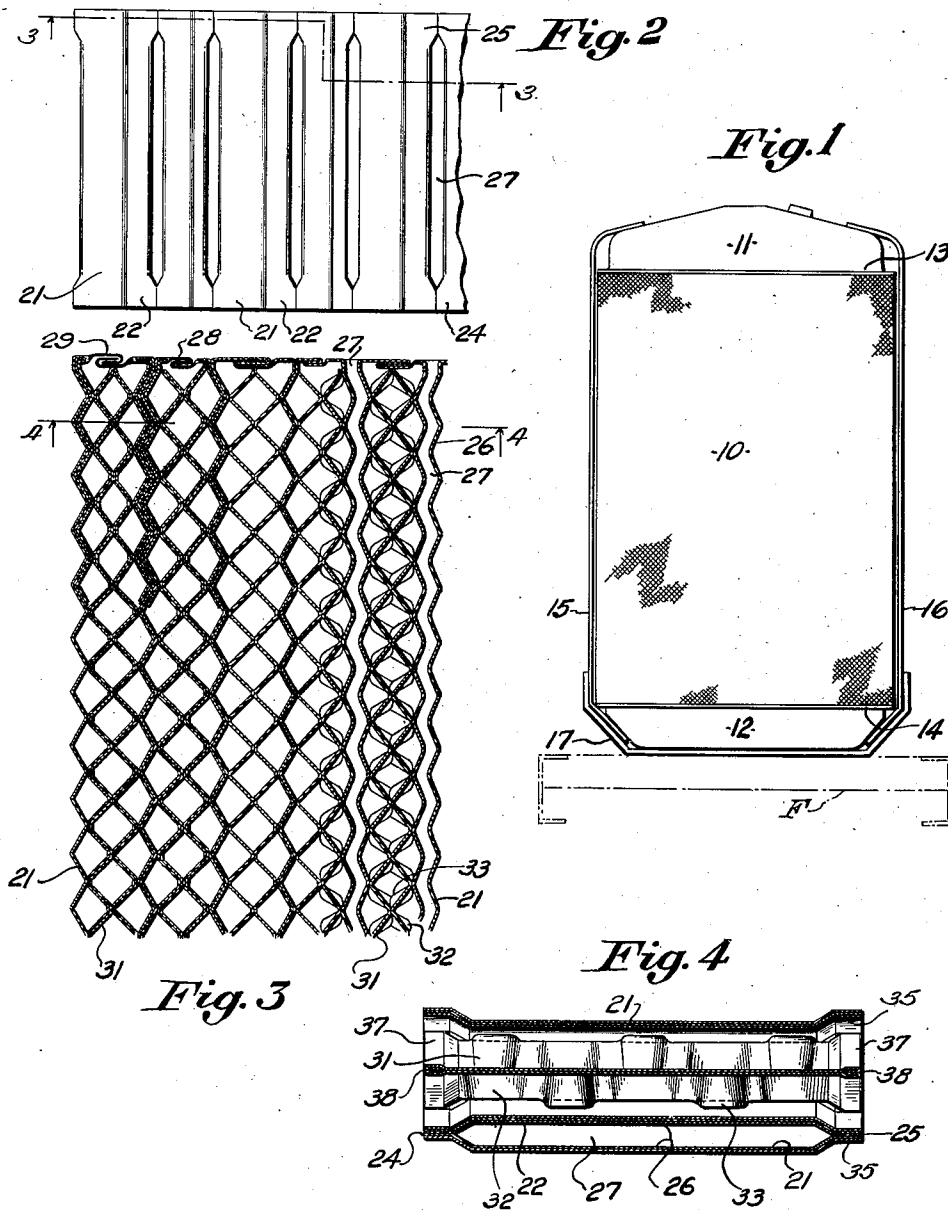
March 9, 1937.

S. PRZYBOROWSKI
AUTOMOBILE RADIATOR CORE

2,073,588

Filed Jan. 18, 1935

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5

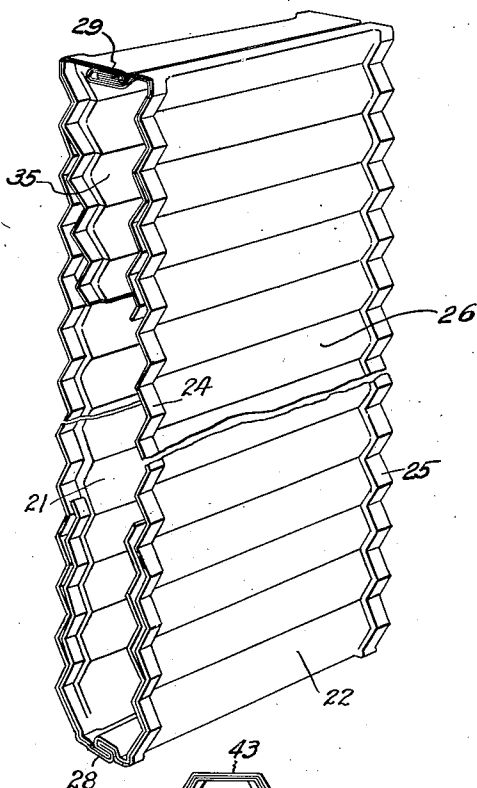


Fig. 6

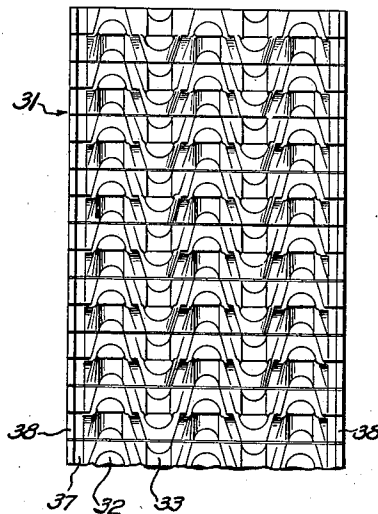


Fig. 8

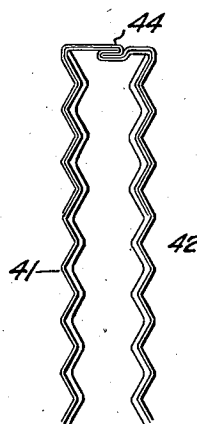
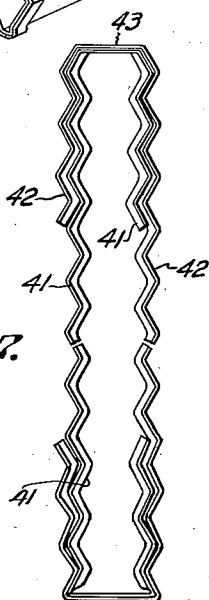


Fig. 7



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UNITED STATES PATENT OFFICE

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AUTOMOBILE RADIATOR CORE

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8 Claims. (Cl. 257—130)

This invention relates to automobile radiator cores of the cellular type, and it has particular reference to a radiator core for automobiles which, while having a high weight efficiency, is durable and resistant to destructive vibratory stresses.

The invention contemplates the provision of a radiator core of the cellular type which is so constructed as to enhance the general strength and resistance of the core to destructive forces, and wherein such increase in strength may be effected with a diminution in the total weight of the core, thereby increasing the overall weight efficiency of the radiator. In general, the desired results are obtained by making the water legs of the core, and particularly adjacent the corners, of one or more strips or layers of sheet metal having substantially the same configuration as the ribbons of the water legs, and which are integrated therewith. Other objects and advantages of the invention will appear from the following portions of the descriptions and appended claims.

The ways in which the invention may be applied in practice will be more fully apparent from a perusal of the following description of typical embodiments thereof, illustrated in the accompanying drawings, wherein:

Fig. 1 is a general front elevation of a cellular radiator and the mounting means therefor;

Fig. 2 is a fragmentary plan view of a radiator core, showing particularly a corner thereof;

Fig. 3 is a section, taken substantially on the line 3—3 of Fig. 2;

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

Fig. 5 is a perspective of a portion of the ribbons used in making the water legs;

Fig. 6 is a side elevation of a spacer strip;

Fig. 7 is an end view of a slightly modified form of water legs; and,

Fig. 8 is a view of the ribbon of Fig. 7, showing an interlocking joint incorporated therein.

Referring first to Fig. 1, there is shown an automobile radiator having a cellular core portion 10 with upper and lower water tanks 11 and 12 secured thereto by means of peripheral flanges 13 and 14 respectively. It will be understood that the face of the core reveals a large number of transverse apertures, through which air may flow, and that a plurality of longitudinal passages extend from one tank to the other, thus permitting the cooling of the circulated engine water by air rushing through the core.

Such cores are mounted on the engine frame, and the mounting means herein shown is typical

of the mode of positioning the core in front of the engine. Side wall members 15 and 16, formed with laterally extending portions, extend from the tank 11 to the tank 12, being secured directly to such tanks or to each other above and below the tanks. To prevent too much strain on the radiator, however, it is common practice to provide a clearance between the side walls and the material of the core 10. The side walls 15 and 16 may be connected to a stud bar 17, which in turn is secured to the frame F of the automobile.

As stated, the mounting just described is typical of those which have been used heretofore to provide more or less free movement of the radiator with respect to the automobile,—a semi-floating mounting, as it might be termed. However, while such mountings permit some restrained freedom of movement of the radiator, thereby meeting to some extent the torsional strains leading to the type of failure discussed above, it will nevertheless be understood that such strains are not entirely met by these expedients, but have heretofore been met by sheer weight and inherent strength of metal used in fabricating the core 10.

Referring next to Figs. 2, 3, and 4, the core 10 is generally composed of a plurality of juxtaposed imperforate ribbons 21 and 22, which are substantially identical in form and size, and which have (see Fig. 5) offset zig-zag marginal portions 24 and 25 and generally corrugated mid-portions 26. Upon bringing a pair of these ribbons into matched contact, the margins may be secured by soldering, while the mid-portions are slightly spaced, thus providing a passage 27 for the water, as shown in Figs. 2, 3, and 4.

A convenient and effective way to make these ribbons for assembly purposes is to take a long strip of corrugated ribbon, of something more than twice the length of the core, and bend it on itself, while crimping the bent section to form a joint such as the joint indicated in Fig. 8, and shown in continuous heavy black line by the numeral 28 in Fig. 3. The free ends of the ribbon are then measured off the desired length, and are bent toward each other, folded and overlapped and crimped, to provide a joint such as the joint 29, indicated in discontinuous heavy black line in Fig. 3, and illustrated more specifically in Fig. 5. It will be understood that these ribbons are intended to be of paper thickness, or nearly so, and hence the black line delineation represents these joints within the scale to which the figures are made. By so folding the

ribbons, there is formed a rectangle with open faces, into which the spacing ribbon may be inserted. Since, in assembly, a number of these units are racked together, it is convenient for reference purposes to refer to this envelope as an "outer" ribbon, while the inserted spacing ribbon may be called an "inner."

The spacing ribbons 31 are formed of thin sheet metal into a generally zig-zag fashion, the sloping faces of which are further formed with air-diverting means, such, for example, as the bumps or protuberances 32 and 33, as best shown at the right of Fig. 3 and in Figs. 4 and 6. These ribbons are folded on themselves, cut into suitable lengths, and are inserted in the envelopes formed by the outers, thus spacing the walls 21 and 22 in the manner shown in Fig. 3. Each outer and inner forms a unit for assembly, and it will be understood that a number of such units may be juxtaposed, clamped in a frame, and the front, rear, upper, and end faces dipped in a bath of solder, thereby integrating the units to form the cellular core.

In such cores, however, made simply as thus far described, it will be apparent from what was initially stated that the strength of the core is inherently dependent upon the thickness of the metal of which it is formed, and such thicknesses as have heretofore been deemed necessary lead to undue weight. Accordingly, the present invention modifies such structure by means which do not, however, modify the mode of assembly or type or design, except insofar as they effect the useful results of enhancing the strength and the weight efficiency.

Referring first to Fig. 5, it will be noted that the "outer" has combined therewith, and within its confines, two short lengths 35 of water leg ribbon, which may be made on the same die, and may be of the same weight or thickness. These short lengths contact the water leg ribbons throughout their extent, and particularly on the marginal portions 24 and 25, thus providing, in effect, a double thickness of metal at this point. It will be observed that such random lengths can be assembled with the water lines during manufacture, whether the herein described unit assembly method is used, or some other procedure. When the described method is employed, however, the lengths 35 may be readily assembled and secured in place prior to the soldering operation by the joints 28 and 29.

If desired, each pair of lengths 35, instead of being separate pieces, may be formed from one continuous piece. In either event, it has been found that the inserted lengths improve the water tight qualities of the "open" joint 29, to such an extent that solder dipping of the upper and lower faces of the core, as heretofore practiced in the art, is unnecessary.

The ribbon so made is intended to be located at the side face of the core, as illustrated in Fig. 3. As herein shown, the outermost water line includes two added lengths, while the next unit includes one, and the next is made without any. It will, of course, be understood that the number of inserts may be varied, depending to a large extent upon the duty to which the core is subjected. Thus, the outer line may have only one, or more than two, and all the lengths may be concentrated in the outer line, and the length vertically of the core may be varied. There is no purpose, however, as I have discovered, in extending the ribbons 35 the entire length of the core, since such expediency simply adds weight

without performing a corresponding beneficial result.

The lower portion of the core is reinforced in the same manner as just described, so that, at each corner of the core, there are provided localized reinforcing zones, which operate to overcome the stresses met in service. By actual test, I have found that cores so manufactured have a life of from three to five times those of cores not including the invention, as measured by a standard vibrating machine. And these comparative results hold true, when the tests are made against heavier gauge cores as standards. Just why these results obtain is something I cannot explain exactly, except to state that the results are as noted, and I believe they follow from the breaking up of the shearing stresses before the metal of the ribbon can be crystallized or a tear developed.

The reinforcing of the core by including the random lengths 35 presents a simple way to meet the described problem, although it will be apparent, in accord with my understanding of the actions, that these lengths 35 may be made in various forms. Thus, some of the central portion of the metal could be eliminated, but I do not regard this as desirable, since the manufacturing cost is at a practical minimum when the full width sheets are used.

It will be understood, of course, that the inner ribbons 31 may be laminated in the same fashion, but due to the differences in configuration between inner and outer ribbons, and the characteristics of the metal, I prefer to employ a different expedient when additional shear resistance is desired at this point. As shown in Figs. 3, 4, and 6, the marginal edges 37 of the ribbon 31 are lapped over slightly to form a seam 38, so offset that the ribbons may nevertheless be folded into full contacting relation. This plan provides a zone at the edges of the inner or spacing ribbons, to meet the destructive stresses, thus protecting the ribbons from failure without disproportionate increase in weight. It will be noted, from Fig. 3, that the random lengths 35 of the water lines lie between, rather than in, the water passages 27, and hence, by confining the reinforcing of the ribbons 31 to the marginal portions, there is less blocking out of the transverse air passages, than would be the case if the full width strips were repeated. Similarly, it will be understood that the margins 24 and 25 of the water line ribbons could be turned over to provide additional reinforcement therefor.

It will be understood that the extent to which these expediciencies are used should depend upon the desired increase of weight efficiency, when correlated with cost. Thus, under some conditions, it may be found preferable to add the lengths 35, and forego the seams 38, or vice versa, or to employ both. But it is deemed advantageous in all cases to provide reinforcing at the corners of the core, where the load must be met, in order to obtain the greatest strength increase.

A slightly modified form of outer ribbon is shown in Figs. 7 and 8, and may advantageously be used where the water passages 27 are relatively large. Two lengths of ribbon 41 and 42 are measured off and are overlapped at their ends, so that the ribbon 42 lies outside of and follows for a short distance the ribbon 41, while the end of the ribbon 41 lies inside of the ribbon 42. The end portion 43 may then be folded on itself and crimped, to provide the joint 44, similar to the joint 28, securing the ribbons in place and form-

ing a unit similar to the outer heretofore described. It will be noted from the drawings that the end joints are flattened down, thus providing smooth ends for the core, permitting the attachment of the water tanks 11 and 12 without the use of shims or offsets in the flanges 13 and 14.

From the foregoing description of certain typical modes of utilizing the principles of the invention, it will be understood by those skilled in the art that I have provided an effective way of increasing the strength and weight efficiency of an automobile radiator core, without, however, interfering with the design or volumetric efficiency, or satisfactory methods of manufacture. It will also be understood that it is not intended to limit the invention to the precise forms herein illustrated, but that it is intended to include all such variants and modifications as fall within the scope of the following claims.

I claim:

1. In a radiator core having opposed water tanks and a cellular core interposed between and connected to said tanks, said core being formed of a plurality of rows of ribbons contacting at their margins to define water passages and other ribbons interposed therebetween to space the water passages and define transverse air passages, the provision of multiple thicknesses of ribbons at the corners and adjacent said tanks, and contacting said first named ribbons at the marginal portions thereof, said multiple thicknesses of ribbons contacting at least both ribbons of the outermost water passages.

2. An automobile radiator comprising upper and lower water tanks and a cellular core interposed between and connected to said tanks, said core comprising a plurality of pairs of imperforate ribbons contacting along their margins and other ribbons interposed between said pairs, thereby defining water passages between said tanks and air passages between said water passages, the outermost ribbons of said core and adjacent said corners being of multiple thickness.

3. An automobile radiator comprising upper and lower water tanks and a cellular core interposed between and connecting said tanks, said core comprising a plurality of pairs of ribbons contacting along their marginal portions and spaced at their mid-portions to define water passages, other ribbons interposed between said water passages to space the same and to define transverse air passages, the ribbons of said water passages adjacent the corners of said core being of multiple thickness along the marginal portions thereof, the ribbons of the water passages remote from the corners being of single thickness.

4. An automobile radiator comprising upper and lower water tanks and a cellular core interposed between and connected to said tanks, said core comprising a plurality of pairs of imperforate ribbons extending between said tanks to define water passages and other ribbons interposed between said water passages to space the

same, and short lengths of ribbon contacting with the ribbons of the water passages at the corners only of said core.

5. A radiator comprising a core of the cellular type and tanks secured to the upper and lower faces of the core, said core being formed of a plurality of juxtaposed ribbon units, each unit comprising a corrugated water passage ribbon bent to form an elongated enclosure and a corrugated fin ribbon inserted in the enclosure and spacing the walls of the water passage ribbon, the outermost of said units being additionally provided with a plurality of inserts of similar ribbon inserted in the water passage ribbon enclosure at each end thereof and being superimposed on each other and on the adjacent walls of the water passage ribbon, and means integrating the water passage ribbon, fin ribbon and said inserts to provide a rigid structure.

6. A radiator comprising a core of the cellular type and tanks secured to the upper and lower faces of the core, said core being formed of a plurality of juxtaposed ribbon units, each unit comprising a corrugated water passage ribbon bent upon itself to form an elongated enclosure, the ribbon at opposite ends of said enclosure being provided with interlocking joints, and a corrugated fin ribbon inserted in the enclosure and spacing the walls of the water passage ribbon, certain of said units being additionally provided with inserts of similar ribbon inserted in the water passage ribbon enclosure at each end thereof and being superimposed on the adjacent walls of the water passage ribbon, said inserts being also formed into the interlocking joint of the water passage ribbon, and means integrating the water passage ribbon, fin ribbon and said inserts to provide a rigid structure.

7. A radiator comprising a core of the cellular type and tanks secured to the upper and lower faces of the core, said core being formed of a plurality of juxtaposed ribbon units, each unit comprising a corrugated water passage ribbon bent upon itself to form an elongated enclosure, and a corrugated fin ribbon inserted in the enclosure and spacing the walls of the water passage ribbon, certain of said units having the water passage ribbon adjacent said tanks formed with reinforcing laminations, and means integrating the ribbons to provide a rigid structure.

8. A radiator comprising a core of the cellular type and tanks secured to the upper and lower faces of the core, said core being formed of a plurality of juxtaposed ribbon units, each unit comprising a corrugated water passage ribbon bent upon itself to form an elongated enclosure, and a corrugated fin ribbon inserted in the enclosure and spacing the walls of the water passage ribbon, certain of the units having a water passage ribbon formed of two pieces having mutually overlapping extremities providing a double thickness at each end, said ends being formed with folded joints, and means integrating the ribbons.

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