July 26, 1932. A. F. IHDE 1,869,338

RADIATOR CORNER CONSTRUCTION

Filed March 13, 1930 2 Sheets-Sheet 1

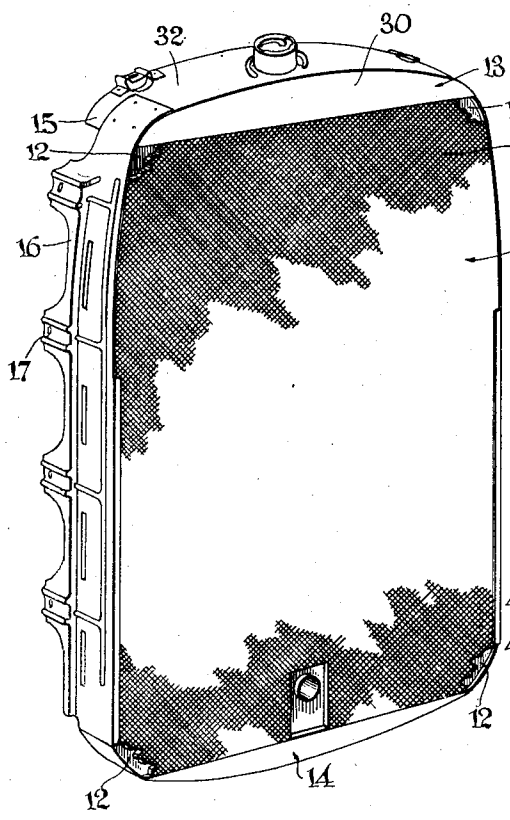


FIG. 1.

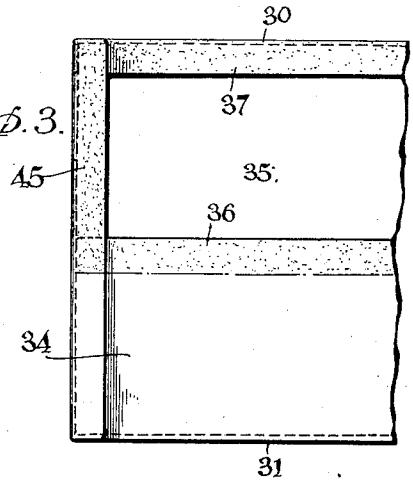


FIG. 3.

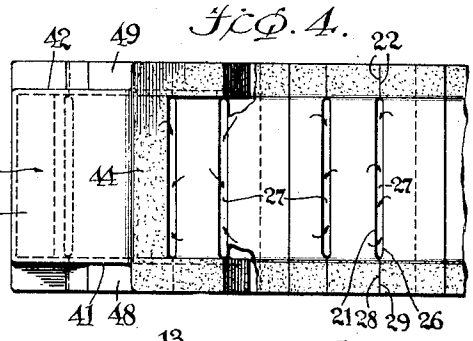


FIG. 4.

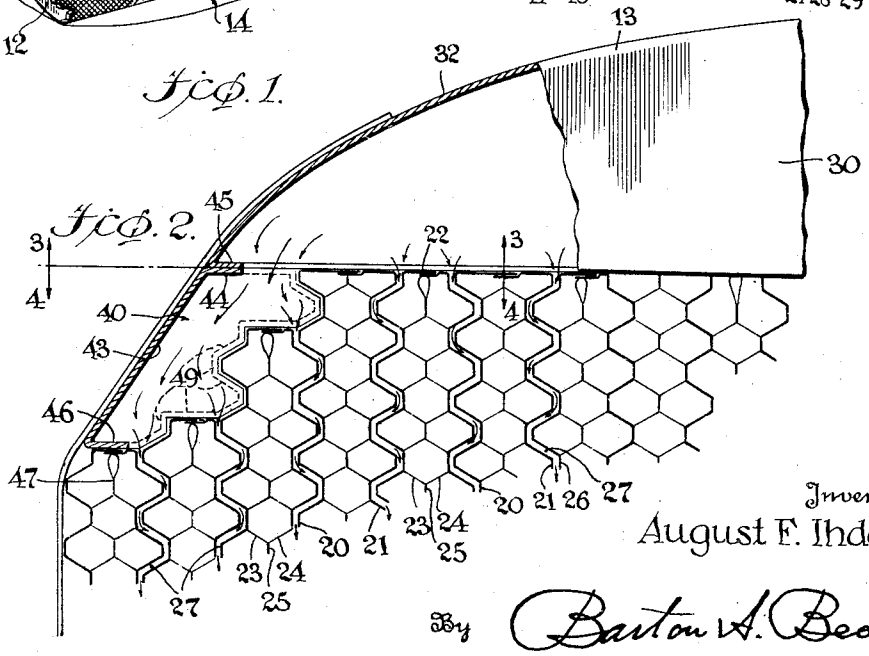


FIG. 2.

Inventor
August F. Ihde,

By Barton A. Beach

Attorney

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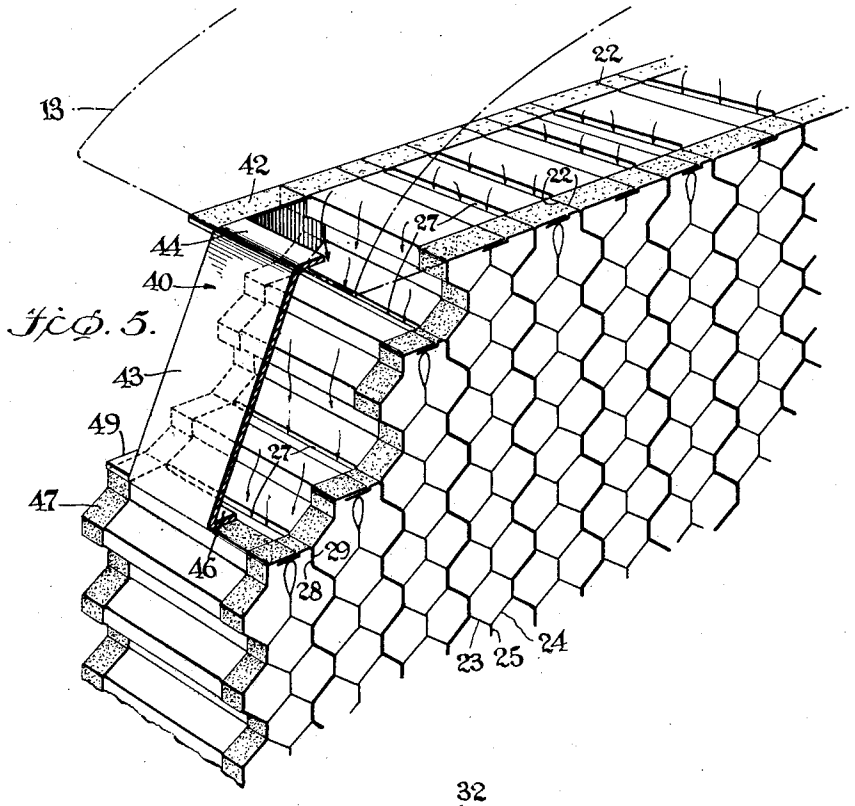


Fig. 5.

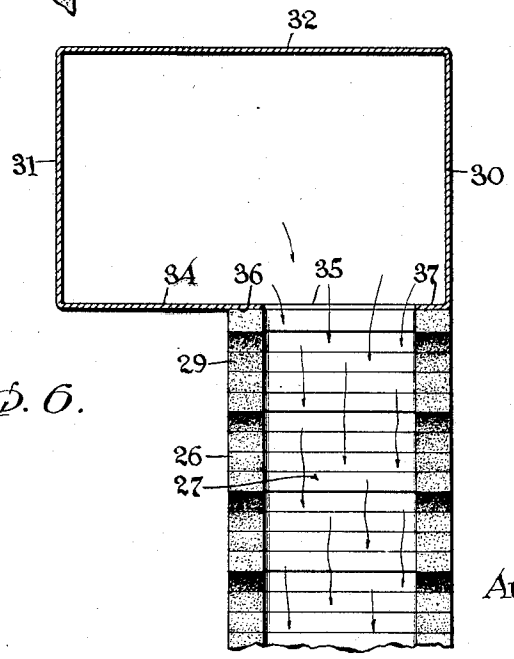


Fig. 6.

Inventor
August F. Ihde,

By Barton A. Beauf
Attorney

Patented July 26, 1932 1,869,338

UNITED STATES PATENT OFFICE

AUGUST F. IHDE, OF BUFFALO, NEW YORK, ASSIGNOR TO FEDDERS MANUFACTURING COMPANY, INC., OF BUFFALO, NEW YORK

RADIATOR CORNER CONSTRUCTION

Application filed March 13, 1930. Serial No. 435,558.

This invention relates to radiators and method of making the same, and it has particular reference to the manufacture of an automobile radiator in which distributing reservoirs or shells are built in with the honeycomb portions of the core for providing an efficient and reliable means for intercommunication between the upper and lower water tanks through certain of the water passages formed in the body of the radiator core.

In the usual type of automobile construction, motive power is provided by a water cooled internal combustion engine, to which cooling water is supplied through a radiator mounted in front of the motor. These radiators include upper and lower tanks which communicate with each other through a plurality of water passages around which air may circulate to cool the water contained in the passages. While other types of radiators are known, and while radiators of this general description may be utilized elsewhere than in automobiles, the principles of the present invention may be described with reference to such typical construction.

In making up radiators of this type, it has heretofore been proposed to assemble a square or rectangle of a plurality of rows of metal ribbon, engage them in a frame, and subsequently seal the outer or marginal portions with solder, in order to form a honeycomb or core portion. The upper and lower water tanks have subsequently been soldered to the top and bottom sides of such core. Such method of assembly has been found useful so long as the upper and lower edges or surfaces of the honeycomb core are substantially plane, or the honeycomb itself is substantially rectilinear in shape.

For reasons not here necessary to enumerate, however, the plane top and bottom type of radiator has been found unsuitable in certain automobile constructions, in which it is desired to form the core with beveled corners. Such cutting away of the corners reveals several of the water passages on either side of the honeycomb, to which the upper and lower tanks can not be shaped in such manner as to fit the irregular shape of the core. With these given conditions, it has been necessary to seal off the openings of the exposed water passages of the cut-away portions, with solder, in order to make a water-tight core assembly, and hence these passages, due to solder running across them, are rendered "dead" or inoperative for water conducting and cooling purposes. At other times during the soldering operations, solder may run across passage openings intended to be left "live" and in communication with the water tanks, with a concomitant loss of efficiency in the radiator. These defects have naturally resulted in waste in manufacture, and unreliability in the radiation capacity of a unit of any given size.

The present invention contemplates the provision of means whereby a radiator with beveled corners or with an irregular outline may be made without loss of the use of the water passages opening into the beveled or cut-away portions of the honeycomb structure. As hereinafter more fully explained, the principles of the invention may be successfully put into practice by forming separate shells or small communicating tanks, communicating with both the adjacent water passages and the main tank, either top, or bottom, or both. In such construction, it is unnecessary to seal off any of the passages, and hence their radiation capacity is retained, the overall efficiency of the radiator maintained, and the total capacity readily predetermined.

In making the radiator, the honeycomb portion is laid up with the communicating pockets, so that the upper and lower tanks may subsequently be attached in a simple manner, and the work inspected for defects prior to final assembly. The various features of the invention may be further understood by reference to the following description, read in connection with the accompanying drawings, wherein:

Fig. 1 is a view in perspective of an automobile radiator in which the principles of the invention are embodied;

Fig. 2 is a fragmentary view on an enlarged scale of a corner portion of the radia-

tor, partially in front elevation and partially in cross section;

Fig. 3 is a fragmentary detail view taken along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary detail view taken along the line 4—4 of Fig. 2;

Fig. 5 is a view in perspective of the corner portion of the radiator core illustrated in Fig. 2 with parts broken away; and,

Fig. 6 is a fragmentary longitudinal cross-sectional view taken adjacent the corner portion of the radiator.

As shown in Fig. 1, the radiator comprises a core portion 10 including an open textured or honeycomb structure of metal 11 and corner portions 12 into which shell members may be inserted and assembled. Mounted above the core is a top water tank 13, while below the core is positioned a bottom water tank 14, the construction being such that water from the tank 13 may flow downwardly to the tank 14 through ducts or water passages formed in the core. The water tanks are formed with open walls along the surfaces contacting with the core.

Positioned at either side of the assembled core and tanks are frame members 16 which are secured to the core unit and which are also formed with apertured lugs 17 permitting the assembly of the radiator with the radiator shell. In use, pipe connections (not shown) connect on the upper and lower tanks 13 and 14 to the water casings of the internal combustion engine, and a cyclic flow is effected through the engine and the tanks by means of the water passages extending through the core 10. As the water, heated from the engine, passes from one tank to the other, it is subjected to the cooling influence of air which is sucked through the honeycomb passages of the radiator.

The construction of the honeycomb may be best understood by reference to Fig. 2, wherein it will be noted that the heavy lines, 20 and 21, designate strips or ribbons of thin sheet metal, which are turned first to the right and then to the left, forming zig-zag or tortuous passageways through which water may flow. These ribbons are turned horizontally at their ends to overlap, and may be interlocked and mutually secured by soldering, to form a substantially plane or continuous and regular top surface. Intermediate the ribbons 20 and 21 are another pair of ribbons 23 and 24, similarly corrugated and also made of thin sheet metal, and joined together along their mating portions, as indicated by the numeral 25. In practice, the ribbons 23 and 24 are deformed and cut through to provide a large radiating or cooling surface, but the specific deformation of the ribbons need not here be described, as it is not in itself the subject matter of the present invention.

It may be considered that a plurality of ribbons 20 and 21 are formed by passing the strips of metal through a bending or corrugating machine, are joined at their ends 22, and have inserted therebetween a mesh formed of a pair of ribbons 23 and 24. This much of the core may be regarded as a unit or layer, which is assembled with other like units to form the complete assembly. When a pair of units or layers are disposed along side of each other, (as, for example, a layer including the ribbon 21 and a layer including a like ribbon 26), passageways 27 are formed, through which the cooling water may flow. The space between the adjacent ribbons is provided by deforming the ribbons, as shown in Fig. 4, from which it will be observed that the central portion of each ribbon 21 and 26 is depressed below the marginal portions 28 and 29 of the ribbons. With this construction, the deformed ribbons 21 and 26 contact only along their marginal portions, and are spaced between the margins to provide for the water passage. The inner ribbons 23 and 24 are not, however, so formed but are joined along intermediate contacting portions 25, so that, when a plurality of layers are assembled, water may flow between certain pairs of ribbons, while air may flow around the ribbons therebetween. With this construction, there is provided a number of water passages and cooling areas in association therewith, in order to effect the cooling of water flowing through the radiator.

It will be observed that, in the radiator illustrated, the majority of the layers of ribbon terminate in the same plane, or a continuous surface approaching a plane surface. Upon this surface is mounted and secured the water tank, as, for example, the top water tank 13. This tank is formed, (see Figs. 2 and 6) as an open vessel, having imperforate front and back walls 30 and 31, a curved top wall 32 (to accord with desired modes or styles in radiator appearance), and a bottom wall 34 provided with a cut-away portion 35 for direct communication with the water passages terminating in the continuous top surface of the ribbon layers. The bottom wall 34 is formed with flanged portions 36 and 37 to contact with the continuous margin defined by the portions 28 and 29 of the ribbons, so that, when the tank 13 is soldered to the ribbons, the various passages 27 communicate with the tank, and all of the water is confined. It will be understood, from this description, that the bottom tank 14 is secured and constructed in a similar manner, and hence express description of this tank need not be made.

In the practice of making a perfectly rectangular tank, or one having straight side walls and plane top and bottom walls, the assembling procedure is comparatively simple. The layers of ribbon, each of equal length, are placed within an open frame and compressed

or clamped together by screws or other suitable means secured to the frame, so that the marginal portions 28 and 29 of the water passage ribbons are in continuous contact. This assembly is then dipped, face down, into an acid bath and then into a bath of molten solder, which adheres to the marginal portions of the ribbons, securing them together and sealing the margins against leakage. The core so formed is then secured to the top and bottom tanks by applying solder between the marginal portions of the ribbons on the end surfaces of the core, and pressing the flanged portions 36 and 37 of the tank thereagainst. When the core is of an irregular outline, however, different conditions prevail. Thus, as indicated in Figs. 1 and 2, if the marginal layers of ribbon be of unequal length, clamping in a frame is not easily effected, as the pressure tends to force the layers of ribbon in a lateral direction, so that proper spacing can not be maintained. As the formation of cores of irregular outline is a given condition in the automobile industry which the radiator manufacture can not alter, it follows that means must be provided to "finish off" the core along the marginal portions, or those portions where an irregular contour is presented.

Heretofore, to effect the necessary result of stopping off the water passages which terminated in the irregular marginal portions, the practice has been resorted to of building up the irregular corner portion with a triangular block or wedge, so that the rectangular outline could be approximated. This practice resulted, to a certain tolerable extent, in the maintaining of the layers of ribbon in proper alignment, but it also resulted in the crushing or distortion of the ribbon ends adjacent the wedge. Due to the irregular outline, the ribbons were not crushed in a single plane, but rather were left with an irregular surface of random configuration, to which no connecting member of definite outline or size could be secured. Hence it was necessary to fill in the surface with solder, which, due to its fluid nature, tended to run down into the water passages, and over into others intended to be left open, and, occasionally, not into those which were to be sealed off. This method of finishing off the core resulted in considerable uncertainty in the quality and efficiency of the product, and also reduced the capacity to an undesirable extent. Thus, it could not be determined for every case how many passages would be so crushed, or whether they would be properly sealed, and, because of these deleterious results and the practical lack of methods for inspection, the radiating characteristics of a core of given dimensions were unknown. Similarly, the sealing off of the marginal water lines reduced the number of available water lines, and the capacity of the core, for given dimensions, was proportionately decreased.

In order to reclaim the lost capacity, and to provide a core of known or predetermined and definite characteristics, the present invention contemplates the provision of shells or pockets which embrace or fit over the marginal water lines and which are in free communication therewith and with the water tanks.

As shown in Figs. 2 and 5, the outer or marginal layers of ribbon terminate at varying distances from the top of the core 10, and are disposed in stepped relation, so as to present an irregular outline whose contour depends upon the contours of the ribbons and their relative spacing. The dimensions of this outline, when not crushed by the application of wedges, are known. To this portion of the layers of assembled ribbons is juxtaposed a hollow shell having open sides, designated in Fig. 2 generally by the numeral 40. This member is formed with imperforate front and back walls 41 and 42 (Fig. 4) and a curved or sloping imperforate side wall 43 which is designed to continue the slope or curvature of the top wall 32 of the tank 13. The side wall 43 terminates at its upper portion in a flat flange 44 which is adapted to be aligned with the plane of the ends of the layers of ribbon abutting the bottom of the tank 13, and to which a flange 45, formed on the bottom of the tank, may be soldered. The lower extremity of the side wall 43 terminates in a similar flange 46 which may be brought into contact with a layer of ribbon, such as the outer layer of ribbon 47.

The side walls 41 and 42 extend, along their upper and lower edges, outwardly to form flanges 48 and 49, which are substantially of the same width as the contacting portions 28 and 29 of the ribbons 20 and 21. With this construction, the shell 40 may be positioned into mating relation with the ends of the outer layers of ribbon, to engage snugly therewith and to embrace within the open bottom of the shell all of the passages which terminate in the marginal portion. It will be observed that due to the irregular configuration, the shell interlocks with the corrugations in the ribbons, so that the layers are restrained from endwise movement when compressed together in a frame preparatory to soldering.

In making the core with the inclusion of the shells 40, the layers of ribbon are laid up in the frame, with the outer layers terminating short of the top of the frame or the ends of the inner layers. This operation leaves the open space into which the shell 40 is inserted, to interlock with the marginal layers and with the flanges 48 and 49 contacting with the corresponding flanged portions of the adjacent ribbons. The parts are then clamped or compressed within the frame, a

small wooden wedge being inserted, if necessary, above the tapered face 43 of the shell to fill out the mold. It will be observed that this procedure eliminates the possibility of crushing or distorting the ends of the marginal ribbons, and that the water passages included thereby are not sealed, but are left open to view through the top portion of the shell. The assembled frame, shells, and ribbons are then dipped, face downwardly, into a bath of acid to a depth equivalent to the width of the flanged portions, then into a bath of solder a corresponding depth, so that the entire assembly of ribbons and shells are cemented together into a unitary structure. The core is then removed from the holding frame, and the top and bottom tanks are subsequently secured.

Referring again to Fig. 2, it will be observed that with the complete assembly of tanks, shells, and ribbons, water may communicate through the marginal passages as indicated by the lines of arrows. The shell communicates both with the tank and the passages, which, according to the present invention, are not merely stopped off, but are reclaimed for use. With this construction and method of assembly, there is no difficulty in inspection, or uncertainty as to capacity, as the passageways are open to observation after the soldering step. It will be noted that the shells are built into and with the honeycomb structure of the core, and that the maximum capacity of the core may be availed of, while still satisfying the technical requirements for cores of designated shape and irregular outline.

It will be understood that throughout the foregoing description, reference has been made to a single shell built into one corner of the core, but that the same methods may be employed for building in more than one shell, as indicated in Fig. 1, wherein four irregular portions are delineated. Similarly, it will be understood that the shell may be employed in other portions of the radiator than in the corners thereof. It is desired, therefore, that the foregoing description shall be taken as illustrative of the principles of the invention as specifically applied in a single instance, and that the scope of the invention shall be determined in accordance with the following claims.

What is claimed is:

1. A radiator comprising a honeycomb structure including a plurality of water passages, a tank in direct communication with certain of said passages, and spaced from others of said passages, said spaced passages presenting an irregular contour, and a hollow shell interposed between said tank and said spaced passages to provide communication between said tank and said spaced passages and formed with marginal portions continuously engaging said tank on one side and said irregular contour on the other.

2. A radiator comprising a core including a plurality of water passages and having an irregular outline, portions of the perimeter of said core defining a substantially uniform edge, a tank having a mating uniform edge secured to said portion of the core for direct communication with the water passages terminating therein, a shell formed with an irregular outline corresponding to the outline of the irregular portion of the core and secured to said core portion and embracing the water passages opening therein, said shell also being in communication along another surface with said tank.

3. A radiator comprising a core composed of a plurality of layers of deformed metal contacting along their marginal portions and spaced therebetween to form water passages and formed along a portion of the perimeter of the core with an irregular outline, and a shell secured to said irregular portions of said layers for communication with the water passages embraced thereby, said shell being formed with outwardly flanged marginal portions adapted to engage the marginal portions of the contacting layers of deformed metal, said marginal portions of the metal and the flanged portion of the shell being continuously secured to each other.

4. A radiator comprising a core comprising a plurality of layers of deformed metal contacting along their marginal portions and spaced therebetween to form water passages, the layers along the opposite sides of the core being of less length than the layers intermediate the side portions, said outer layers terminating at different distances from the top of the core to provide an irregular outline, said inner layers terminating substantially in the same upper plane, a top tank disposed above said layers and communicating along its lower edges with said inner layers and secured thereto, and corner shells disposed in open communication with the passages formed between the outer layers and the top tank, said corner shells being formed with an irregular edge for contacting continuously with said outer layers, and with an upper edge secured to the bottom of the top tank to provide free communication from said tank to said outer water passages.

5. A radiator comprising a core including a plurality of water passages formed between sheets of deformed metal contacting along their outer edges, the layers adjacent corners of the core being of less length than the layers therebetween and terminating at varying heights, the intermediate layers terminating in a continuous surface, a tank secured to the layers terminating in the continuous surface and formed with an open side for communication with the passages embraced thereby, corner shells provided with an irregular surface

adapted to mate and interlock with the marginal layers of the core, said irregular shell surface being flanged outwardly and secured along the flanged portion to said marginal portions of the adjacent layers, said shells further being formed with an opposed surface mating with and secured to the tank, whereby the marginal water passages are in free communication with the tank.

6. A radiator comprising a core including a plurality of water passages, certain of said passages terminating in substantially the same plane to define a substantially uniform edge of the core, certain other of said passages terminating short of said plane, a shell secured adjacent the ends of said other of said passages and extending into the plane of termination of said first mentioned passages, said shell being in communication with said other of said passages and being open in said plane, and a water tank having a substantially uniform edge, extending across said shell and said first mentioned passages and opening into said shell and first mentioned passages whereby water may pass between said water tank and all of said passages.

AUGUST F. IHDE.