Jan. 17, 1967 S. PRZYBOROWSKI 3,298,432

RADIATORS

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FIG.1

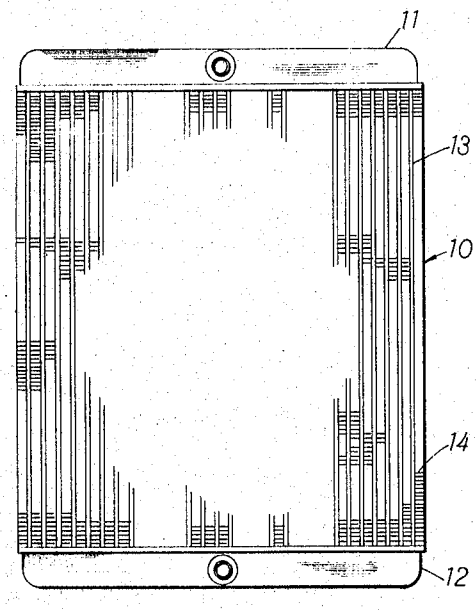


FIG.2

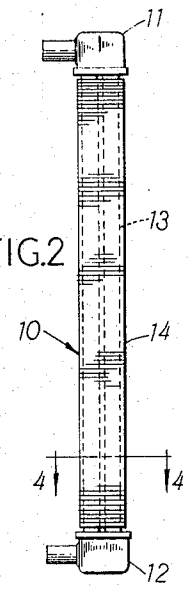


FIG.3

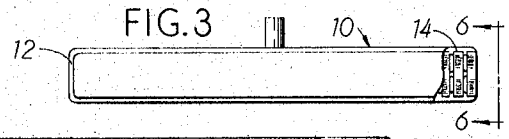


FIG.9

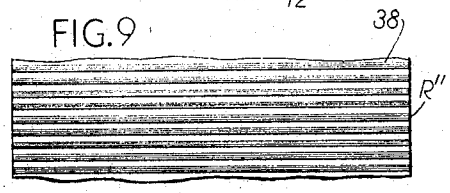


FIG.10

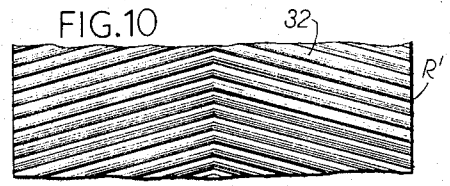
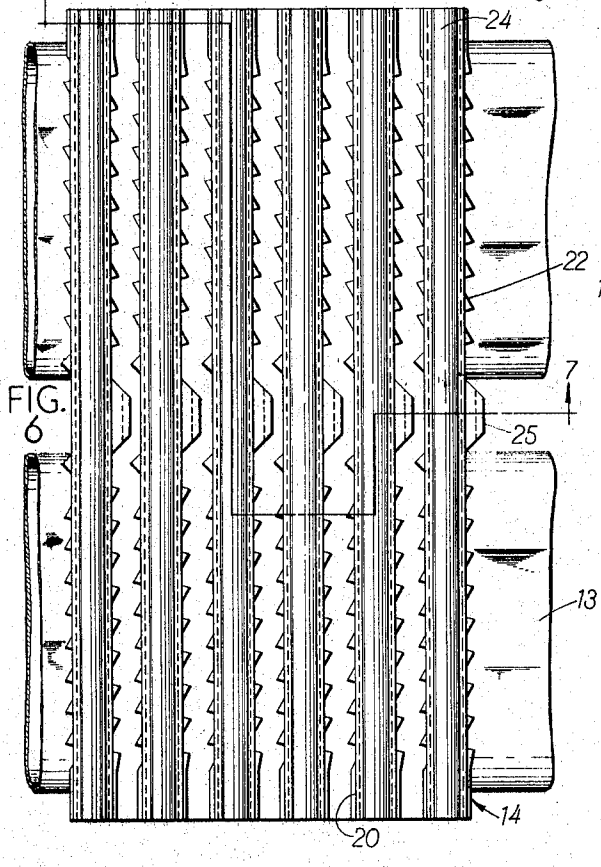


FIG. 6



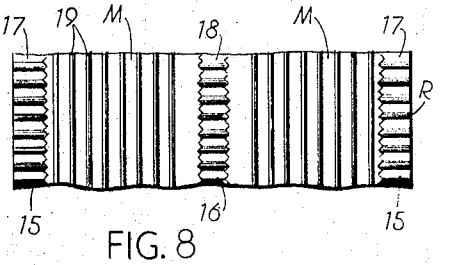


FIG. 8

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FIG. 4

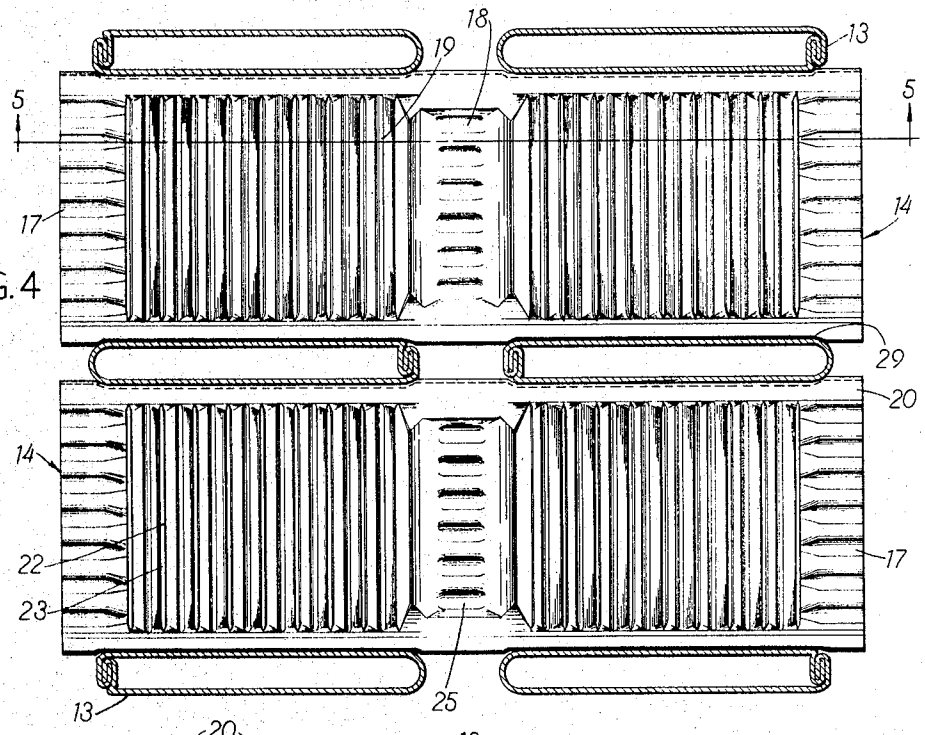
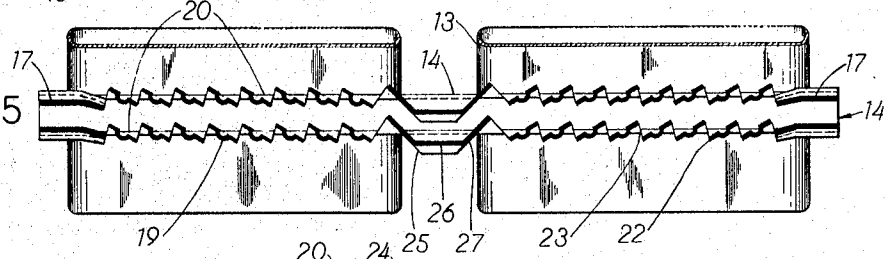


FIG. 5



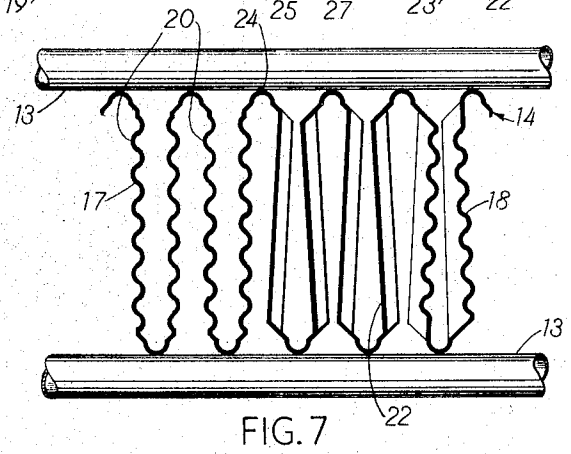


FIG. 7

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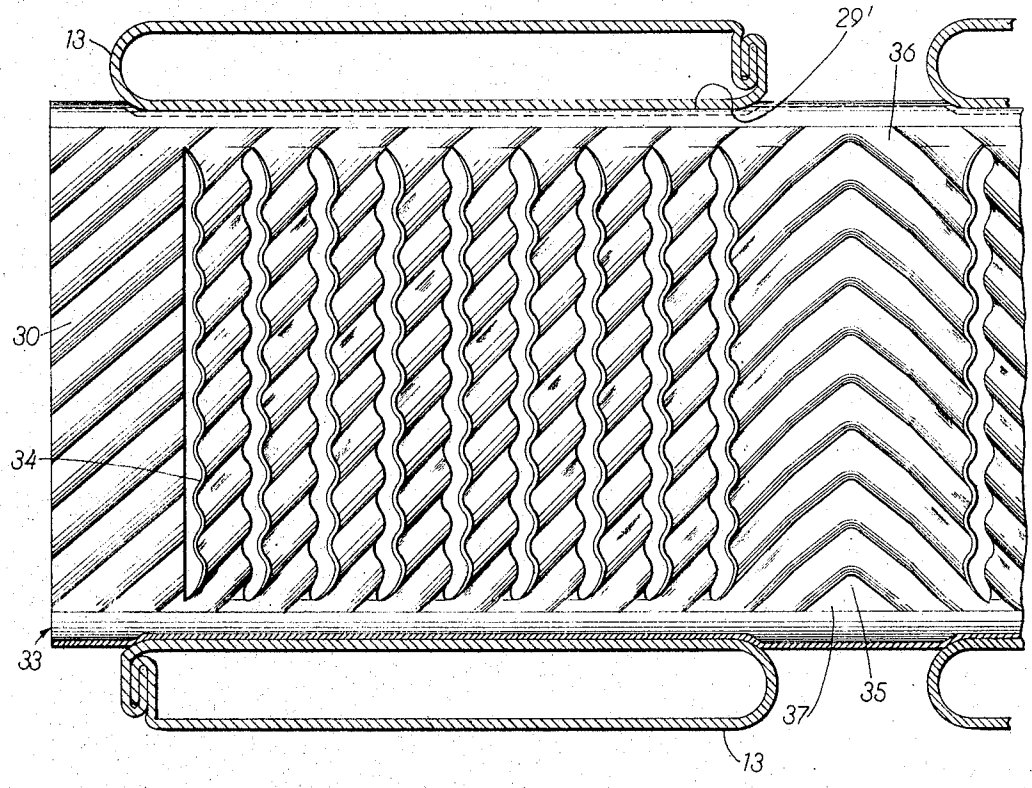
FIG.11



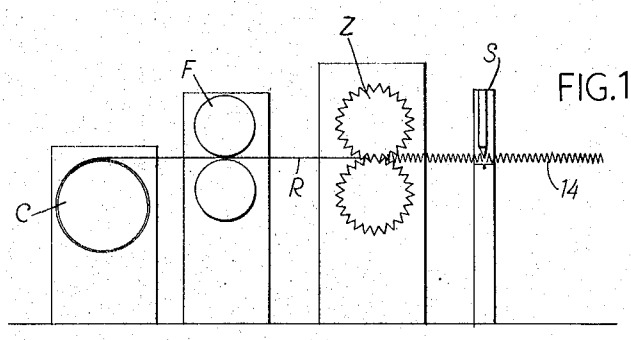


FIG.12

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3,298,432

RADIATORS

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Filed May 22, 1964, Ser. No. 369,478
2 Claims. (Cl. 165—153)

This invention relates to heat exchange apparatus, and it has particular reference to improved fin and tube cores of the cellular-tubular type adapted for use in automobile radiators or car heaters.

In modern production of fin and tube cores, the dual desiderata of high thermal efficiency and exceedingly light-weight in the fin elements of the core has provoked manufacturing problems, such as difficulty of production and loss of physical strength in the core. This has been aggravated in the slit fin type of ribbon which is physically weaker than former types. In the present invention, the handicaps of the slit fin and extremely light gage ribbon is overcome through the provision of a completely reinforced ribbon which permits clean shearing and constant reproduction with normal tooling methods. The reinforcement is so devised that it is attained with advantageous increase in thermal effectiveness as a result of its ability to promote proper air flow characteristics.

Other features of the invention including assembly advantages will be more fully set forth as this description proceeds, and the novelty will be pointed out in the appended claims. In the drawings:

FIG. 1 is a general view of the rear face of a radiator having the fin and tube structure of the invention.

FIGS. 2 and 3 are side and bottom views of the radiator of FIG. 1.

FIG. 4 is an enlarged section on the line 4—4 of FIG. 2.

FIG. 5 is an enlarged section on the line 5—5 of FIG. 4.

FIG. 6 is an enlarged fragmentary side elevation as viewed from the right of FIG. 3.

FIG. 7 is an enlarged fragmentary section on the line 7—7 of FIG. 6.

FIG. 8 is a view of the radiator ribbon after the first forming thereof, and before the final forming operation.

FIGS. 9 and 10 are views similiar to FIG. 8 where the ribbon is provided with differing preliminary forming.

FIG. 11 is an enlarged fragmentary cross section similar to FIG. 4 of another embodiment of the invention where the ribbon of FIG. 10 is used.

FIG. 12 is a view showing diagrammatically the forming steps involved in the production of the ribbon.

The radiator **10** of FIG. 1 consists of upper and lower tanks **11** and **12**, respectively, between which extend equally spaced parallel tubes **13** of the typical flat cross section. Fins **14** in the form of zig-zag ribbons occupy the spaces between adjacent tubes and contact the tubes to provide extended heat exchange surface as well understood in the art.

The fins **14**, wherein the invention resides, are of the slit type with the difference that in its preliminary form has a flat ribbon R (FIG. 8) with advantageously located reinforcements before finally being slit and formed into zig-zag formation. This will be better understood by referring to FIG. 12 where a coil C of flat ribbon material is introduced between preliminary forming rolls F to provide the pre-formed flat ribbon R of FIG. 8, whereupon it then passes through rolls Z, wherein the ribbon is finally formed into slit and zig-zag formation before being cut into proper lengths in a shearing unit S. In FIG. 8, there is shown a portion of a preliminary formed ribbon R which is used in the form illustrated in FIGS. 1 through 8, inclusive. It will be seen that the marginal and medial portions **15** and **16** of the ribbon are provided with transverse corrugations **17** and **18**, respectively. In the intermediate areas M between such corrugations, equally

spaced continuous vertical ribs **19** are provided. When the ribbon is folded into zig-zag formation to provide the finished fins **14**, the folds **20** thereof are nearly parallel as appears in FIG. 7, where the marginal corrugations **17** may be seen to the left of such view. Referring now to FIGS. 4, 5 and 6, it will be seen that the intermediate areas M are cut to provide slit portions **22** having the same spacing as the vertical ribs **19** which occupy the center of each slit portion. The slit portions **22** are bent in angular fashion to provide a plurality of air inlet nozzles **23**, thereby providing a structure capable of disseminating air flowing from the front to the rear of the radiator core **10**.

The medial portion **16** of each fold **20** is formed with an enlarged truncation **25** having a flat top **26** containing the previously described central corrugation **18** and sloping sides **27** terminating at the innermost of the slits **22**. The right hand folds as located in the conventional section FIG. 7 show the corrugated formation at the center of the truncations **25**, while the intermediate folds show sections through the vertical ribs **19** of the slit portions **22**.

It is preferred that the crests **24** of the zig-zag formation of the folds **20** be sligthly depressed at areas which are contacted by the tubes **13** to form saddles **29**. Such saddles are very slightly offset from the top of each press, and in providing a moderate seat for each tube, it effects a better soldering operation as will be presently described.

It will be observed in FIG. 5 that in the outermost slit portions adjacent the margin of the ribbon that the corrugations **17** have actually been cut through. This is advantageous particularly when the ribbon is of minimum thickness, since it has been found that clean shearing even with the fairly dull tools can be effected.

In the embodiment of the invention FIGS. 10 and 11, the ribbon R^1 is preliminarily formed throughout its area with a herringbone formation of ribs **32** of extremely fine spacing. When this ribbon is given its final processing, it appears as in FIG. 11, wherein the fins **33** are bent into folds **30** as in the first embodiment of the invention. The folds **30** are cut to provide a plurality of slit portions **34**, and a medial portion **35** containing an enlarged truncation **36**. The crests **37** are formed with depressed areas which form saddles 29^1 for receiving the tubes as in the first embodiment of the invention.

The ribs and/or corrugations as described are useful during the process of forming and slitting the ribbon and also provide after assembly of the radiator, a selectively strengthened structure, not interfering with but rather enhancing the heat exchange values of the radiator. It is therefore not intended that the invention be limited to the precise location and disposal of such ribs and corrugations since it is anticipated that they may be variously applied, depending on the type and usage of the radiator. For example, in FIG. 9, a uniformly transverse rib **38** in a ribbon R^{11} is shown. This may be useful in cores where compressive yielding of tthe ribbons is desired. It is therefore intended that numerous variations of the principle heretofore described may be used without departing from the spirit of the invention except as set forth in the accompanying claims wherein,

I claim:

1. A radiator comprising spaced tanks, each having header portions, a core including a plurality of independent tubes having an elongated cross-section, said tubes being positioned between said headers and being grouped in rows at the front and back of the core with their narrow dimensions disposed transversely, and continuous fins of zig-zag formation disposed between said rows, said zig-zag formation consisting of crest portions and relatively planar folds, a plurality of slits formed in each of said folds, said slits being disposed relatively perpendicular to

said crest portions and having portions offset relative to the planar folds, and corrugations of fine pitch formed in said fins and disposed angularly with respect to said slits, said corrugations being of a herringbone arrangement and being disposed throughout a major area of said folds, said tubes being solder coated to permit bonding of the tubes to the fins upon application of heat.

2. A radiator comprising spaced tanks, each having header portions, a core including a plurality of independent tubes having an elongated cross-section, said tubes being positioned between said headers and being grouped in rows at the front and back of the core with their narrow dimensions disposed transversely, and continuous fins of zig-zag formation consisting of crest portions and relatively planar folds, a plurality of slits formed in each of said folds, said slits being disposed relatively perpendicular to said crest portions and having portions offset relative to the planar folds, and corrugations of fine pitch formed in said fins in the marginal portions of the folds thereof disposed substantially parallel to each other and to said crest portions, and ribs formed in each slit portion of said folds, said ribs being disposed substantially parallel to said slit portions, said tubes being solder coated to permit bonding of the tubes to the fins upon application of heat.

References Cited by the Examiner

UNITED STATES PATENTS

1,950,500	3/1934	Loprich et al.	165—152
2,011,854	8/1935	Emmons et al.	113—118
2,063,757	12/1936	Saunders	165—153
2,252,210	8/1941	Seemiller	113—118
3,003,749	10/1961	Morse	165—152

FOREIGN PATENTS

635,188	4/1950	Great Britain.

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