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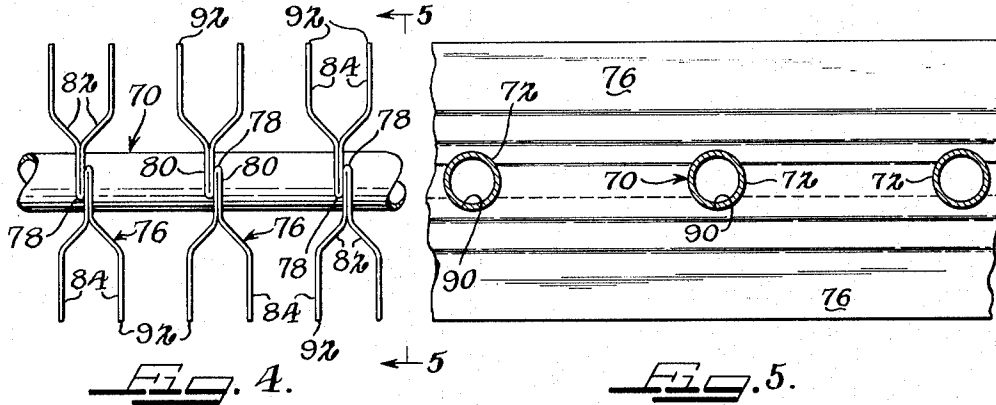
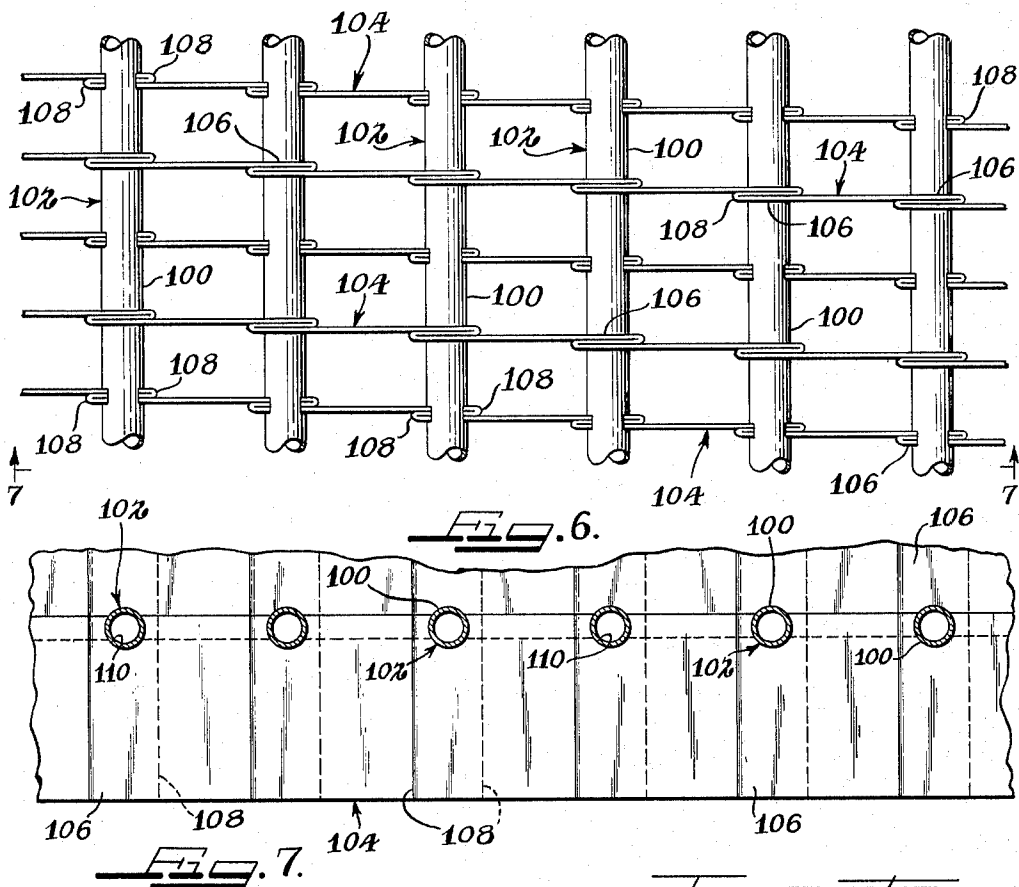
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FIN AND TUBE STOCK ASSEMBLIES FOR HEAT EXCHANGE UNITS

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FIN AND TUBE STOCK ASSEMBLIES FOR HEAT EXCHANGE UNITS

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The present invention relates to heat exchange units and has particular reference to units of the finned tubing type wherein serpentine lengths of tube stock having straight reach sections are pressed into substantially circular notches in the edge regions of a plurality of laterally spaced strips of flat fin stock. In United States Patent No. 2,540,339, granted to me on February 6, 1951, and entitled "Heat Exchange Unit," there is disclosed a heat exchange unit of the same general type as that with which the present invention is concerned. The heat exchange unit of the present invention is designed as an improvement over the heat exchange unit of said patent in that it presents functional advantages which are not present in the earlier unit.

As disclosed in my aforementioned patent, a heat exchange unit of the type to which the present invention relates consists of a length of serpentine tube stock having spaced apart, straight reach sections and curved or arcuate reverse bends at the ends of the straight reach sections. Closely spaced, elongated, parallel strips of flat fin stock are secured to, and extend transversely of, the straight reach sections for heat-radiating purposes. In fabricating a heat exchange unit of the type under consideration, the straight reach sections, which are originally of circular cross section, are laterally compressed or flattened so as to make them generally of over cross section. This flattening operation is performed before the serpentine tube stock and the fin stock strips are brought into assembled relation. After the compressing or flattening operation, the strips of fin stock are arranged in their final spaced relationship in an assembly jig and the serpentine tube stock is manipulated so as to effect insertion of the oval reach sections thereof into a series of substantially circular notches which are provided in the edge regions of the strips of fin stock and become aligned for reception of the reach section when the fin stock is arranged in the jig. Finally, the serpentine length of tube stock is subjected to internal pressure so as to expand the oval reach sections back to circular cross section to the end that they will frictionally engage the edges of the notches and thus become interlocked with the strips of fin stock.

An alternative method of finally expanding the oval reach sections to circular cross section within the notches has been disclosed in United States Patent No. 2,913,806, granted to me on November 24, 1959, and entitled "Fabrication of Heat Transfer Units." By such method, the minor axis of the ellipse involved in the straight reach sections of the serpentine tubing is of less extent than the entrance openings of the notches in the edges of the fin stock so that the reach sections may readily enter the notches. The major axis of the ellipse is greater than the depth of the notches so upon application of pressure to the oval reach sections in the direction of oval elongation thereof by means of a pressing platen, the oval reach sections will be deformed and thus brought back to their original circular cross sectional configuration so as to become expanded against the edge regions of the notches.

It is obvious that regardless of the particular method which may be employed for expanding the tube stock to circular cross-sectional shape within the notches of the fin stock, it is essential that good frictional line contact be made between the edges of the notches in the fin stock and the tubing so that there will be adequate heat conduc-

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tion between the fin stock and the tubing. To establish such line contact, it is obvious that the fin stock must be sufficiently rigid that it will not crumple, buckle, or bend at the line of contact when the tubing is expanded radially outwardly against the edges of the notches in which it is received. Heretofore, in order to attain the necessary rigidity, it has been deemed necessary to employ fin stock of a predetermined minimum gauge or thickness. It has been found that the use of fin stock of less thickness than such minimum gauge stock will not withstand the outward pressure of the tubing at the time it is expanded and there is a tendency for the fin stock to bend in the region of the edges of the notches and prevent the establishment of a tight bond or union between the tubing and the fin stock. Spaces between the tubing and fin stock along the line of contact will open up and prevent coextensive frictional engagement between the parts so that maximum heat conduction from the tubing to the fin stock, and vice versa, cannot be attained.

In heat exchange units of the general type under consideration, it is obvious that, the thinner the fin stock employed, the greater the number of fins that may be installed on a given length of tubing. The greater the number of fins on the tubing, the greater will be the heat dissipating efficiency of any given heat exchange unit. From a manufacturing standpoint, the thinner the fin stock, the more fins of a given size or area may be produced from a given quantity of the fin stock material by weight.

The present invention is designed to overcome the above-noted limitation of fin stock thickness that is attendant upon the construction and use of conventional heat exchange units employing tubing which is expanded into contact with the fin stock and, accordingly, it contemplates the provision of a novel means whereby fin stock of a gauge presenting a sheet thickness appreciably less than that heretofore established as a minimum thickness may be employed, while at the same time, adequate fin stock rigidity to withstand the outward pressure of the expanded tubing will be maintained.

The provision of an assembly of fin stock and tubing wherein the fin stock is of a thinner character than has heretofore been possible, as briefly outlined above, being among the principal objects of the invention, it is a further object to provide such an assembly wherein there is provided novel means for reinforcing the free or outer portions of the fins against lateral bending out of the general planes thereof so that, despite the fact that the fins are relatively thin, they will maintain the necessary even spacing therebetween under normal conditions of handling and use.

The invention is susceptible to considerable modification while at the same time preserving the essential features thereof, and in certain forms of tubing and fin stock assemblies, it is contemplated that all of the fins along a given length of tubing be formed from a continuous unsevered length of fin stock. In certain other forms of tubing and fin stock assemblies, it is contemplated that localized groups of two, three, or more adjacent fins be formed from short lengths of fin stock, the groups being closely spaced so that the fin stock of a given unit presents an over-all uniform appearance and renders uniform heat-dissipating characteristics at all regions of the assembly.

With these and other objects in view, which will become more readily apparent as the nature of the invention is better understood, the same consists of the novel construction, combination, and arrangement of parts shown in the accompanying two sheets of drawings forming a part of this specification and wherein several illustrative embodiments of the invention have been shown.

In these drawings:

FIG. 1 is a perspective view of a typical heat exchange unit of the type with which the present invention is concerned;

FIG. 2 is an enlarged side elevational view of a limited portion of the heat exchange unit of FIG. 1 in the vicinity of one of the straight reach sections of the tubing;

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 2 in the direction indicated by the arrows;

FIG. 4 is a sectional view similar to FIG. 2 but showing a modified form of tubing and fin assembly which may be employed in the construction of a heat exchange unit of the general type shown in FIG. 1;

FIG. 5 is a sectional view taken substantially along the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary sectional view similar to FIGS. 2 and 4 but showing a further modified form of tubing and fin assembly; and

FIG. 7 is a sectional view taken substantially along the line 7—7 of FIG. 6.

Referring now to the drawings in detail, and in particular to FIG. 1, a completely assembled heat exchange unit has been designated in its entirety at 10. This unit is exemplary of one form of unit which may embody the principles of the present invention insofar as tubing and fin stock assembly is concerned, including any of the contemplated forms of the invention.

Briefly, the unit 10 consists of two individual separate lengths 12 and 14, respectively, of tubing which have been bent to serpentine form and to which there has been applied a quantity of fin stock 16. The fin stock 16 establishes a series of cooling fins which extend across and bridge the straight reach sections of the serpentine tube stock. The lengths 12 and 14 of tube stock are substantially identical and are arranged in spaced parallelism in the unit. Each length of tube stock (which hereinafter will be referred to simply as tubing) includes, as hereinbefore indicated, a series of straight reach sections 20 and reverse bends 22 at the ends of the reach sections. The free ends of the tubing 12 and 14 terminate at the same end of the unit, these ends being communicatively connected to small, generally cubic, box-like manifolds 28 and 30, respectively, having threaded, connecting nipples 32 associated therewith, whereby the unit may be operatively connected for closed circuit fluid flow in any desired heating system or installation. Obviously, where the serpentine tubing possesses an even number of reach sections, the ends thereof will terminate at the same end region of the unit as shown herein, and where an odd number of such reach sections are provided, the ends will terminate at opposite end regions of the unit and the manifolds 28 and 30 will be positioned accordingly. To rigidify and complete the unit, channel-shaped enclosures 34 straddle the series of reverse bends 22 at both ends of the unit and are secured in position thereover by through-bolt assemblies 36 which pass through the bight portions of the reverse bends.

The arrangement of parts thus far described is purely conventional in its design and is typical of one form of heat exchange unit to which the principles of the present invention may be applied, the invention consisting rather in the character of the fin stock and its application to the tubing, as will be described in detail presently. Numerous other forms of heat exchange units are contemplated within the scope of the present invention whether the same employ a greater or lesser number of lengths of serpentine tubing. Furthermore, it is not essential to the present invention that the tubing be of serpentine configuration or that it be continuous tubing, since it is contemplated that fin stock constructed according to the principles of the present invention be applied to straight lengths of tubing, or, in fact, to tubing which is either curvilinear or straight. Irrespective, however, of the particular

design of the heat exchange unit, the essential features of the invention will at all times be preserved.

Considering now the form of the invention shown in FIGS. 2 and 3, each pair of adjacent straight reach sections 20 is bridged by an elongated single length of the fin stock 16 which is bent according to a predetermined pattern to provide a series of fins having effective body portions which are spaced apart along the adjacent reach sections. The single length of fin stock is bent generally in zig-zag fashion to provide an accordion-pleated structure extending from one end of the length to the other. The character of the accordion-pleated structure is such that adjacent fins are identical except for the fact that they are inverted with respect to each other. In FIG. 2, each fin afforded by the accordion-pleated structure has been designated in its entirety at 40 and extends between upper and lower reverse bends 42 and 44, respectively, at the opposite ends of the fin.

The reverse bends 42 and 44 are sharp, which is to say, they are in the form of flat linear creases which establish dual-thickness portions 46 having a folded edge and extend inwardly of the fin stock configuration a slight distance. One of the laminae of each dual-thickness portion 46 continues across the fin stock length in the same plane as the lamina to provide a body portion 48 which is spaced from the corresponding body portions of both adjacent fins, such spacing being maintained by means of an offset spacer rib having a short leg 50 and a long leg 52, the rib being of V-shape configuration. The spacer rib is disposed adjacent to the corresponding end of each individual fin, and since adjacent fins are inverted with respect to each other, as hereinbefore stated, the ribs of adjacent fins remain spaced from each other transversely of the fin stock length. Each spacer rib makes line contact as at 54 with the body portion 48 of an adjacent fin.

It will be observed that because each spacer rib has a short leg 50 and a long leg 52, the consecutive reverse creases 42 along the length of fin stock are staggered with respect to one another so that all of the dual-thickness portions 46 lie in different transverse planes. The body portions 48 also thus lie in different planes, any given body portion 48 remaining spaced from one adjacent body portion by a distance equal to the out-of-the-plane displacement or height of the short leg 50, and remaining spaced from the other adjacent body portion by a distance equal to the difference between the out-of-the-plane heights of the two legs 50 and 52. The out-of-the-plane height of the leg 50 is one-half of the out-of-the-plane height of the leg 52 and, thus, the various body portions 48 of the fins are equally spaced along the length of fin stock.

Referring now to FIG. 3, in order to attach the fin stock length to the adjacent reach sections 20 of the tubing lengths 12 and 14, the dual-thickness portions 46 are each formed with a pair of spaced apart arcuate notches 60 which constitute major circle sectors and are slightly greater in extent than 180°. The straight reach sections 20 of the tubing lengths 12 and 14 are assembled in the notches 60 according to the method disclosed in United States Patent No. 2,913,806, heretofore mentioned. According to such method, the straight reach sections 20, which are originally of circular cross section, are laterally compressed or flattened so as to make them of oval cross section. This operation is performed on the serpentine tube stock before the serpentine tube stock and the fin stock are brought into assembled relation. After the flattening operation, the straight reach sections, which are now oval in cross section, are inserted in the notches 60 of the fin stock, the minor axis of the oval being of lesser extent than the width of the entrance openings leading to the notches so that such insertion is facilitated. Thereafter, internal pressure is applied to the tubing to expand the oval reach sections to true circular form so that the outside surface of the tubing will frictionally grip or en-

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gage the surrounding marginal edges of the notches 60 and effect a union between the fin stock and the tubing. It will be understood, of course, that the spaces which exist between all of the adjacent pairs of straight reach sections 20 will have the folded and preshaped fin stock positioned therebetween immediately prior to the expanding operation.

It is to be noted, since the various notches 60 are disposed wholly within the confines of the dual-thickness folded portions 46 of the fin stock, dual-thickness edges are present to assimilate the outward thrust exerted by the tubing at the time of expansion thereof. For this reason, it is possible to fashion the fin stock lengths between adjacent straight reach sections 20 of considerably thinner fin stock material than has heretofore been possible in connection with the manufacture of conventional fin stock and tubing assemblies wherein the tubing is expanded into notches provided in the edges of the individual fins. For example, in a heat exchange unit which employs fin stock presenting single thickness notched edges for reception of the tubing and which must have a minimum thickness of not less than 0.012 inch, a heat exchange unit of similar design and embodying the principles of the present invention, as heretofore outlined, may employ fin stock of 0.006 inch in thickness.

In FIGS. 4 and 5, a modified form of fin stock and tubing assembly has been disclosed. In this illustrated form of the assembly, a single length 70 of serpentine tubing having straight reach sections 72 and reverse bends (not shown) is employed, and this length of tubing has applied thereto a series of individual, elongated, fin strips 76, the various strips being substantially identical in construction and design. The assembly may be designed to provide a heat exchange unit having the general characteristics of the heat exchange unit 10 of FIG. 1, which is to say that, it may have terminal manifolds similar to the manifolds 28 and 30 and channel-shaped enclosures similar to the enclosures 34. It has been deemed sufficient for purposes of disclosure herein to illustrate only a limited portion of the assembly at a region thereof where the union between the fin stock and tubing is effected.

Each fin strip 76 spans the distance between the outermost or remote reach sections and is comprised of a single elongated length of thin fin stock which is folded as at 78 midway between its longitudinal edges to provide a dual-thickness portion 80 similar to the portions 46 previously described in connection with the form of the invention shown in FIGS. 2 and 4. At the free edges of the fold, the laminae separate and diverge outwardly at an acute angle of approximately 30°, as indicated at 82, after which the side edge regions of the strip extend in parallelism as shown at 84. The appearance of the fin strip in transverse cross section resembles a modified form of the letter Y.

As shown in FIG. 5, the dual-thickness region 80 is formed with a series of notches 90 which are similar to the notches 60 and are in the form of major circle sectors. One notch is provided for each of the reach sections 72, and the reach sections are adapted to be assembled in the notches by the method previously described in connection with the form of the invention shown in FIGS. 2 and 3. In effecting the assembly, the preshaped fin strips 76 are arranged in pairs on opposite sides of the length 70 of serpentine tubing, the two strips of each pair being inverted, each with respect to the other. The position of each fin strip 76 of each pair relative to the other fin strip is such that the notched edge regions of the dual-thickness portions abut each other, or nearly so, in side-by-side relationship so that the two fin strips 76 assume the generally tandem relationship in which they are illustrated in FIG. 4. The fin strips 76 are spaced along the straight reach sections 20 on which they are mounted so that the free longitudinal edges 92 of adjacent strips extend in parallelism and are

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spaced from each other a slight distance, no portion of any one strip touching a portion of another strip on the same side of the length 70 of serpentine tubing.

As is the case in connection with the previously-described form of the invention, the notched dual-thickness portions 80 afford the necessary rigidity to assimilate the outward thrust exerted by the tubing 70 at the time that the straight reach sections 72 are expanded from their oval configuration to their cylindrical configuration within the notches.

In FIGS. 6 and 7, there has been disclosed still another modified form of tubing and fin stock assembly wherein the fin stock is provided with triple-thickness folded regions which are notched to receive the oval reach sections of the tubing prior to expansion of the latter. In this illustrated form of the invention, only the straight reach sections 100 of the tubing 102 have been illustrated, but it will be understood that these reach sections may be connected together at their ends by reverse bends (not shown).

The various reach sections 100 have applied thereto a series of spaced, generally parallel, elongated, fin strips 104, the strips being longitudinally spaced on the reach sections. The strips are generally planar except for the provision of a series of folded portions 106 in the vicinity of each reach section, each folded portion including two reentrant bends or creases 108 which afford triple-thickness laminae in these portions. The strips 104 bridge the distance between the various reach sections 100 and the latter are set into notches 110 provided in the triple thickness portions 106 along one longitudinal edge thereof. The notches 110 are generally of semi-circular configuration and constitute major circle sectors, and the method of installation of the tubing into the notches remains substantially the same as described in connection with the other illustrated forms of the invention so that a description thereof need not be repeated.

The various fin strips 104 are assembled upon the reach sections 100 in pairs on opposite sides of the serpentine length of tubing, the two strips of each pair being inverted, each with respect to the other, as is the case in connection with the assembly of the fin strips 76 of FIGS. 4 and 5.

It is to be noted, in connection with this latter described form of the invention, that the triple-thickness folded portions 106 will afford the necessary rigidity for assimilating the outward thrust exerted by the tubing 102 when the reach sections 100 thereof are expanded in the notches from their oval to their substantially circular configuration.

It will be understood that in any of the previously-described forms of the invention, the illustrated configuration of the tubing and fin stock assembly is applicable to a heat exchange unit having the physical characteristics of the unit 10 shown in FIG. 1, and also that it is applicable to various other types of heat exchange units, whether the same employ single lengths of serpentine tubing or multiple lengths thereof. In fact, such illustrated tubing and fin stock assemblies are applicable to heat exchange units which do not employ serpentine lengths of tubing, the essential feature of the invention being that the assembly of fin stock be made upon tubing having elongated sections or lengths which are capable of being flattened and then expanded into the notches provided in the multiple-thickness portions of the folded fin stock. In instances where a given length of tubing is curved on a relatively long radius, it is contemplated that the folded fin stock be applied thereto along the curved region of the tubing, in which case, the general planes of the body portions of the fins will assume generally radial positions with adjacent fins lying in planes which extend at a small angle to each other. It is also contemplated that, in certain instances, the folded fin stock may be assembled upon the tubing by providing holes in the multiple thickness folded

regions of the fin stock and threading the undersize tubing through the various holes, after which the tubing may be subjected to internal pressure to expand the same uniformly against the continuous circular edges of the holes. In such instances, the fin stock may assume any of the forms which have been illustrated herein. The invention, therefore, is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification, nor is it to be limited to the specific form of heat exchange unit shown in FIG. 1 since various changes in the details of construction may be resorted to without departing from the spirit of the invention. Only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desired to secure by Letters Patent is:

1. In a heat exchange unit of the finned tubing type, in combination, an elongated length of tube stock, and a series of closely spaced, generally parallel, heat-radiating fins secured to, and extending transversely of, said length, said fins being disposed in adjacent pairs, each pair of fins including a section of flat sheet metal fin stock creased linearly to provide a linearly straight folded edge and establishing a dual-thickness portion, said dual-thickness portion being formed with an opening therethrough of circular configuration, said dual thickness portion being comprised of laminae which are in face to face contact throughout at least the region of said opening, said length of tube stock passing through all of the openings of the various dual-thickness portions and bearing radially outwardly in coextensive frictional contact and expanded relationship with the edges of said openings.

2. In a heat exchange unit of the finned tubing type, the combination set forth in claim 1 and wherein said opening is in the form of a notch which extends inwardly of the dual-thickness portion from the folded edge thereof, the notch being in the form of a major circle sector having an entrance opening which is narrower than the over-all diameter of the expanded length of tubing.

3. In a heat exchange unit of the finned tubing type, in combination, an elongated length of tube stock, and a series of closely spaced, generally parallel, heat-radiating fins secured to, and extending transversely of, said length, said fins being disposed in adjacent pairs, each pair of fins including a section of flat sheet metal fin stock creased linearly to provide a linearly straight folded edge and establishing a dual-thickness portion having an opening therethrough in the form of a notch which extends inwardly of the dual-thickness portion and is in the form of a major circle sector having an entrance opening narrower than the over-all diameter of the expanded length of tubing, said dual-thickness portion being comprised of laminae which are in face-to-face contact throughout at least the region of the notch and have portions that diverge outwardly away from each other and provide fin body portions which are physically separated from each other for independent heat radiation.

4. In a heat exchange unit of the finned tubing type, the combination set forth in claim 3 and wherein said laminae have portions that diverge outwardly away from each other at an acute angle and then extend in parallelism and in planes which are normal to the axis of the length of tube stock.

5. In a heat exchange unit of the finned tubing type, in combination, an elongated length of tube stock, and a series of closely spaced, generally parallel, heat-radiating fins secured to, and extending transversely of, said length, said fins being disposed in adjacent pairs, each pair including a section of flat sheet metal fin stock creased linearly to provide a folded edge and establishing a dual-thickness portion, said dual-thickness portion being formed with a notch therein which is of circular configuration, and also being comprised of laminae which are in face-to-face contact throughout at least the region of the notch, said length of tube stock passing through all of

the notches of the various dual-thickness portions and bearing radially outwardly in coextensive frictional contact with the edges of the notches, each dual-thickness portion being comprised of laminae which are in face-to-face contact throughout at least the region of the notch, one lamina being provided with an offset extension which is displaced out of the plane of the other lamina and which extends parallel thereto, the other lamina being provided with an extension which extends to its own plane.

6. In a heat exchange unit of the finned tubing type, the combination set forth in claim 5 and wherein said notch is in the form of a major circle sector having an entrance opening which is narrower than the over-all diameter of the expanded length of tubing.

7. In a heat exchange unit of the finned tubing type, the combination set forth in claim 5 and wherein the extension of said other lamina is provided with an offset spacer rib designed for engagement with the extension of said one lamina to maintain the two extensions spaced apart.

8. In a heat exchange unit of the finned tubing type, the combination set forth in claim 5 and wherein the extension of said other lamina is provided with an offset spacer rib designed for engagement with the extension of said one lamina to maintain the two extensions spaced apart, and wherein the extension of said one lamina is provided with a similar offset rib designed for engagement with the other extension of an adjacent pair of fins.

9. In a heat exchange unit of the finned tubing type, in combination, an elongated length of tube stock, and a series of closely spaced, general parallel, heat-radiating fins secured to, and extending transversely of, said length, said fins being disposed in adjacent pairs, each pair including a section of flat sheet metal fin stock creased linearly to provide a linearly straight folded edge and establishing a dual-thickness portion, said dual-thickness portion being formed with a notch therein which is of circular configuration and which is in the form of a major circle sector, said length of tube stock passing through all of the notches of the various pairs and bearing radially outwardly in coextensive frictional contact and expanded relationship with the edges of the notches, said dual-thickness portion being comprised of laminae which are in face-to-face contact throughout at least the region of the notch, said laminae having portions which diverge outwardly away from each other at an acute angle and then extend in parallelism and in planes which are normal to the axis of the length of tube stock, each pair of adjacent sections of the linearly creased flat sheet metal fin stock extending in opposite directions radially outwardly of the length of tube stock.

10. In a heat exchange unit of the finned tubing type, in combination, a length of tube stock bent to serpentine form and presenting a pair of straight parallel reach sections connected together at adjacent ends by a reverse bend, and a series of closely spaced, generally parallel, heat-radiating fins secured to, and bridging the distance between, said reach sections, said heat-radiating fins being formed integrally from a single elongated strip of flat sheet metal fin stock folded upon itself to provide an accordion-pleated structure in which the adjacent pleats thereof are connected together at the opposite ends thereof by sharp linearly straight creases which provide dual-thickness portions at the ends of each adjacent pair of pleats, the medial regions of adjacent pleats being spaced from each other and establishing the body portions of the fins, each dual-thickness portion being formed with a notch therein of circular configuration, and also being comprised of laminae which are in face-to-face contact throughout at least the region of the notch, one of said straight reach sections of the length of tube stock passing through all of the notches in one series of corresponding ends of the adjacent pairs of pleats and bearing radially outwardly in coextensive

frictional contact and expanded relationship with the edges thereof, and the other straight reach section of the length of tube stock passing through all of the notches in the other series of corresponding ends of the adjacent pairs of pleats and being expanded radially outwardly into frictional contact with the edges thereof.

11. In a heat exchange unit of the finned tubing type, the combination set forth in claim 10 and wherein each pleat is formed with an offset spacer rib designed for engagement with an adjacent pleat.

12. In a heat exchange unit of the finned tubing type, the combination set forth in claim 10 and wherein the ribs on alternate pleats are in longitudinal alignment relative to the direction of extent of the straight reach sections with the ribs on one set of alternate pleats being displaced laterally from the axis of alignment of the ribs on the other set of alternate pleats.

13. In a heat exchange unit of the finned tubing type, in combination, a length of tube stock bent to serpentine form and presenting parallel straight reach sections connected together at their ends by reverse bends, and a series of closely spaced, generally parallel, heat-radiating fins secured to and spanning all of said reach sections and common thereto, each fin comprising an elongated length of flat sheet metal stock which is sharply creased along linearly straight lines and intermediate its ends at spaced regions therealong to provide multiple thickness portions comprised of laminae which are in face-to-

face contact, each of said multiple thickness portions being formed with an arcuate notch in one edge thereof and in the form of a major circle sector, the straight reach sections of said length of tube stock passing through respective notches and bearing radially outwardly in co-extensive frictional contact and expanded relationship with the edges thereof.

14. In a heat exchange unit of the finned tubing type, the combination set forth in claim 13 and wherein said fins are arranged in pairs of adjacent fins with the fins of each pair projecting radially outwardly from the various reach sections of the length of tube stock on opposite sides thereof.

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