Dec. 2, 1952 M. DUBIN ET AL 2,620,171

HEAT EXCHANGE FINS AND ASSEMBLY

Filed Oct. 27, 1949

Fig. 1

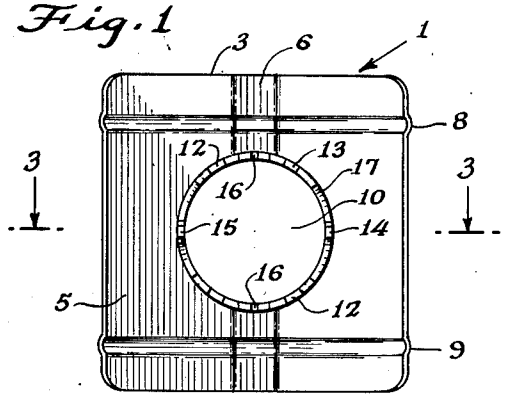


Fig. 2

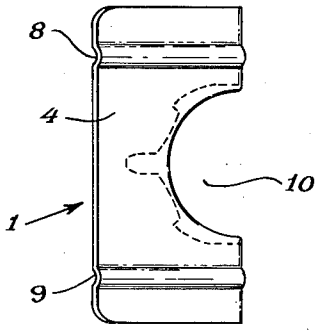


Fig. 3.

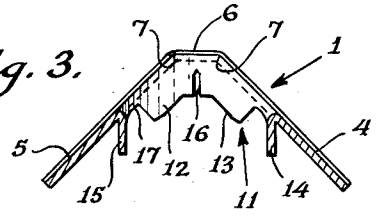


Fig. 4.

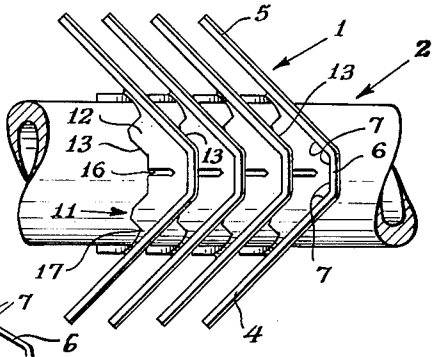
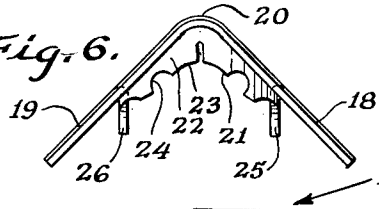


Fig. 6.



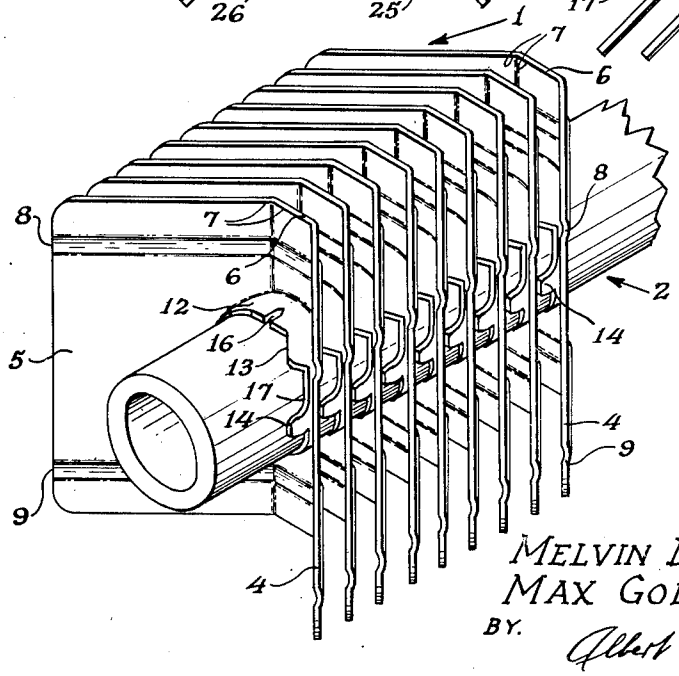


Fig. 5.

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HEAT EXCHANGE FIN AND ASSEMBLY

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12 Claims. (Cl. 257—262.16)

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This invention relates to heat exchange fins for pipes or conduits and to assemblies of such fins with such pipes, or conduits.

Heat exchange constructions involving a conduit, or pipe, to which fins are applied, though suggesting a construction which should be easy of installation have heretofore failed to live up to that suggestion. In the first place, the fins have been difficult to apply to pipes, so much so that in order to have good thermal contact and a firm engagement with the conduit, it has been the practice to have the fins applied by suitable equipment before they are brought to the job. Once so applied, the effective removal and replacement of them on the job when called for in order to thread, weld, or cut the pipe, have involved considerable difficulty. Furthermore, this type of heat exchange apparatus should provide maximum radiation surface in a minimum of space, but the prior constructions have required more fins than necessary to provide proper radiation surface foot of pipe. In addition, the prior art fins have been made of relatively heavy material in order to give them desired rigidity and have included no provision for accommodation to irregularities in surface of the conduit. These and other drawbacks of existing fin constructions have indicated a definite need for improvement in this field and such improvements are incorporated in the construction of the instant invention.

It is, accordingly, an object of the instant invention to provide fins which may readily be applied to and removed from pipes at any time without any special tools and without impairing their effectiveness when reapplied.

Another object is to provide fins which furnish greater surface area with a smaller number of fins than has heretofore been the practice.

A further object is to provide fully effective fins out of lighter weight material than has heretofore been employed.

Still further objects are to provide for the effective gripping of fins on a conduit despite their light weight and removability to provide greater thermal contact between the fin and the pipe and to prevent the turning of one fin with respect to another when mounted on the pipe, all while enabling such changes, or adjustments, in the number of fins employed as are found to be necessary or desirable when the conduits and fins are on hand on the job.

Further and more detailed objects of the invention will become apparent from the following description taken in conjunction with the accompanying drawing, in which drawing:

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Figure 1 is a front elevation of a fin in accordance with the preferred form of the invention.

Figure 2 is a side elevation thereof, looking at Figure 1 from the right side thereof.

Figure 3 is a horizontal section taken on line 3—3 of Figure 1 and looking in the direction of the arrows.

Figure 4 is a top plan view of an assembly of a plurality of the fins of Figure 1 applied to a pipe.

Figure 5 is a perspective view of an assembly of a number of fins on a pipe, and

Figure 6 is a top plan view of a modified form of fin.

In the accompanying drawing the preferred form of fin in accordance with the invention is generally indicated at 1, while the pipe to which such fins are applied is generally indicated at 2. The fin 1 consists of a plate, or sheet-like, body portion 3, formed with a pair of fin elements 4 and 5 which are angularly related with respect to each other and at their inner ends meet the joining section 6 at the angle 7. The joining section 6, as here shown, is a narrow vertical strip of the fin which, when the fin is mounted on a pipe as shown in Figures 4 and 5, is designed to lie directly transversely of said pipe. Preferably, the joining section 6 is substantially narrower than the width of the pipe, in order to include as much of the fin area as possible in the fin elements 4 and 5, and for other reasons which will appear hereinafter.

The angles 7 by which the fin elements 4 and 5 meet the joining section 6 are equal and are reasonably small, inasmuch as the smaller these angles, the greater the area of the elements 4 and 5, within a reasonable distance away from the pipe. By this angular arrangement of the fin elements, the fin of the invention provides considerably greater heating surface in the same overall height and width of assembly than is presented by flat transverse fins of the same overall height and making up the same width. Hence in a given length of pipe a smaller number of fins in accordance with the invention will provide the same or greater radiating area than would be provided by conventional flat fins.

Though equal angles 7 have been shown for the joining of the fin elements 4 and 5 to the joining section 6, it is of course to be understood that the angles may be different if desired. Ease of manufacture and application indicate preference for equal angles.

It is further to be noted that the fin elements 4 and 5, and the joining section 6, are traversed horizontally adjacent the upper and lower ends thereof by ribs, or corrugations, 8 and 9. These

corrugations in cooperation with the angularity of the fin elements and the joining section enable the complete fins to be made out of lighter weight material than has heretofore been the case, while, at the same time, assuring that they will have the necessary rigidity. In addition, this adoption of lighter weight material makes for a more resilient construction with attendant advantages in the assembly of the fins with the pipe as will appear hereinafter.

The fin 1 is perforated as shown at 10 in order to mount it upon the pipe 2. This perforation, as best seen in Figure 3, extends across the joining section 6 and well out along the elements 4 and 5. When viewed as in Figure 1 the perforation appears circular, and the flange formations bordering it do define a circular opening for reception of a pipe. Actually, however, if the whole of the fin 1 were flattened out into the plane of the joining section 6, the perforation 10 would no longer appear as a circle but would show its true oval shape and that it presents a substantially longer border than the apparent circle. The longer border of the perforation 10, as against that presented by a circular perforation in a flat sheet, introduces several improvements into the art.

In the first place, the flange 11 bordering the perforation, as clearly seen in Figures 3 and 4, bridges the angle between the fin elements 4 and 5 so has elongated upper and lower portions. Thus increased thermal and gripping contact is provided between the flange 11 and the pipe engaged thereby. The flange 11 has identical upper and lower portions 12 bridging the angle between the fin elements 4 and 5. The portions 12 have end edges 13 shaped to conform to, and mate with, the exterior surface of the next adjacent fin. By referring to Figure 4 it will be seen that the edges 13 have a flat center portion to overlie the outer portion of the joining section 6, and wing portions extending therefrom to lie down a short distance over the outer surfaces of the fin elements 4 and 5. Thus, the flange portions 12 not only provide a substantial gripping surface for holding on to the pipe, but they also provide for spacing the fin elements of adjacent fins apart and for preventing rotation of one fin with respect to the adjacent one.

Additional gripping of the fin on the pipe and additional assurance against rotation is provided by fingers 14 and 15 which extend respectively from the flange portions which border the extreme portions of the aperture 10 out along the fin elements 4 and 5. These fingers 14 and 15 not only extend along the pipe to grip it, but also extend into engagement with the outer surfaces of the fin elements of the next adjacent fin, so assist the edge 13 in preventing rotation of one fin with respect to the other. Thus, when a plurality of fins are assembled in interengaging relation, as shown in Figures 4 and 5, each assists the one next to it in resisting any tendency to rotate, and it is accordingly evident that an extremely rigid, non-rotating, construction is provided.

Effective mounting of the fins on the pipe would leave considerable to be desired, if it did not also incorporate good thermal conductive characteristics, for, the principal purpose of these fins is to receive the heat from the pipe and distribute it. Here, however, the thermal conductive aspect is well taken care of. The substantial engagement with the pipe provided by the flange elements 12 and the additional engagement provided by the fingers 14 and 15, all of which is fully effective, due to the resilience of the material, assures adequate conductivity of heat from the pipe to the elements 4 and 5, and 6 of the fin. The separation of the various gripping surfaces from each other, enabling them to operate independently, accommodates for irregularities in pipe diameter or surface irregularities, since each of the gripping surfaces will be resiliently urged against the pipe surface in a manner to overcome irregularities.

Another important feature of the invention is the manner in which the application of the fins to a pipe is facilitated. By reference to Figure 3, it will be seen that the flange 11 is slotted at 16 and recessed at 17. These slots and recesses enable a reasonable bending of the fin elements 4 and 5 to increase the angle between them and cause them to approach the flat plane of the portion 6. Here resiliency of the fin material comes into play, for it not only permits the desired bending, but it also restores the fin to its original position once the bending force is released.

The effect of bending the elements 4 and 5 apart to move them bodily towards the plane of the joining section 6 is to enlarge the circular aperture 10 horizontally into an oval, or elliptical shape, thus a good portion of the surrounding flange is moved out of contact with the pipe and the fin can be readily drawn off the pipe by hand. Conversely, if it is desired to replace the fin on the pipe, or place a new one thereon, the same elongation of the aperture is employed. No tools are needed and there is no permanent distortion of any of the elements of the fin as would result from it being removed by hammering, or chiseling. Furthermore, the same fin may be removed and replaced, and when replaced will grip the pipe as firmly and have the same thermal contact therewith as if its initial installation had not been disturbed.

A slightly modified form of the construction of the invention is shown in Figure 6. Here, angularly related fin elements 18 and 19, instead of meeting a flat joining section, extend into a curved joining section 20, which forms the arc of the angle between them. Thus a smooth continuous surface is provided from one fin element around the curve to the other. Here, though the perforation through the fin is of the same extent as the perforation 10, it is bordered by a flange construction 21 which is slightly different from that heretofore described. The inner edges of the upper and lower extending portions 22 are formed on the curve 23, complementary to the curve 20, so that each fin may be effectively nested with an adjacent fin of the same construction. The curve 23 terminates at its outer ends in inset recesses 24, which serve in a comparable manner to the recesses 17, to facilitate the springing of the elements 18 and 19 for enlargement of the mounting aperture. Fingers 25 and 26 of similar construction and function to the fingers 14 and 15 are provided at the horizontal extremities of the flange 21. In other respects, such as the gripping of the conduit, accommodation to surface irregularities thereof, and the facilitating of the application and removal of fins to, or from, a conduit, this construction is generally similar to that heretofore described.

While in the foregoing description and in the accompanying drawing we have shown and described the presently preferred embodiments of our invention, it is to be understood that such

is for illustrative and not for limiting purposes and that different embodiments of the invention could be made without departing from the spirit and scope thereof.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A heat exchange fin formed of relatively rigid material comprising a pair of fin elements extending away from each other at an included angle of substantially less than 180°, means for joining said fin elements together at their adjacent ends, said joining means and said fin elements adjacent thereto being formed with a perforation therethrough for reception of a pipe, and a flange formed from the material of said fin bordering said perforation and extending within said angle for engagement with said pipe, said flange being formed with interruptions therein about the apex of said included angle.

2. A heat exchange fin formed of relatively rigid resilient material comprising a pair of fin elements, means for joining said fin elements together at their adjacent ends, said fin elements meeting said joining means at obtuse angles said joining means and said fin elements adjacent thereto being formed with a perforation therethrough for reception of a pipe, a flange bordering said perforation and extending within said angle for engagement with said pipe, said flange being interrupted at positions about its periphery to facilitate horizontal elongation of said aperture by increasing the angle between said fin elements.

3. A heat exchange fin comprising a fin portion and a mounting portion, said fin portion being formed with elements at angles to each other providing angularly related exterior face portions, said fin portion being perforated for the reception of a conduit therethrough and said mounting portion including an element extending inwardly of said angles from the edge of said perforation, said element being formed with angularly related end faces to engage different angular exterior face portions of an adjacent fin.

4. A heat exchange fin comprising a fin portion and a mounting portion, said fin portion being formed with elements at angles to each other providing angularly related exterior face portions, said fin portion being perforated for the reception of a conduit therethrough, and said mounting portion including extending elements extending inwardly of said angles from the edge of said perforation, said extending elements being formed with end faces angularly related with respect to each other to engage different angular exterior face portions of an adjacent fin.

5. A heat exchange fin comprising a fin portion and a mounting portion, said fin portion being formed of angularly related fin elements with a perforation therethrough and said mounting portion including conduit engagement elements extending from the border of said perforation, said conduit engaging elements being formed with end surfaces at different longitudinal positions with respect to said conduit to engage an adjacent fin at different positions on the exterior surface of said adjacent fin.

6. A heat exchange fin comprising a fin portion and a mounting portion, said fin portion being formed of angularly related fin elements with a perforation therethrough, said mounting portion including a mounting flange extending from the edge of said perforation, said mounting flange being formed with elements at different distances from said fin portion to engage the exterior surface of an adjacent fin at spaced positions on said exterior surface.

7. In heat exchange fins, a fin element and a mounting element said elements being formed of a single piece of relatively rigid material, said fin element including a pair of fin portions extending outwardly at an angle with respect to each other, the included angle between said fin portions being substantially less than 180°, said fin element being formed with a perforation therein extending through both of said fin portions in the position where they approach each other, said mounting element including a mounting flange extending from the periphery of said perforation into the angle between said fin portions, said mounting flange being formed with a longitudinal slot extending from the edge thereof toward the apex of the angle between said fin elements whereby an increase of said angle toward 180° may be effected to enlarge said perforation and facilitate application to and removal of said fins from a conduit.

8. In heat exchange fin construction in combination, a plurality of interengaged fin members, each of said fin members being formed with angularly related portions and each of said fin members being formed with an extended engaging portion, each said extended engaging portion being provided with a mating surface, included angularly related portions, formed to mate with the angularly related portions of the exterior surface of an adjacent fin.

9. In heat exchange construction in combination, a conduit, a plurality of fins carried by said conduit, gripping elements formed on said fins for gripping engagement with said conduit, said fins and said clamping elements being formed of relatively rigid resilient material, said fins being formed with angularly related exterior surfaces thereon and said gripping elements being formed with mating surfaces for interengaging relation with the angularly related exterior surfaces of an adjacent fin, said mated surfaces and said angularly related surfaces being interengaged whereby rotation of one fin with respect to the other and with respect to the conduit is precluded.

10. A heat exchange fin comprising a pair of fin elements diverging from each other at an acute angle, an element for joining said fin elements, said fin elements and said joining element being formed of a single piece of relatively rigid material and means for mounting said joining element and said fin elements on a pipe, said mounting means including a portion extending from said fin elements within said acute angle, said extending portion being recessed at spaced positions, to enable increase in said acute angle for expediting the mounting of said elements on said pipe.

11. A heat exchange fin formed of relatively rigid resilient material comprising a pair of fin elements extending away from each other at an angle, the included angle between said fin elements being acute means for joining said fin elements together at their adjacent ends, said joining means and said fin elements adjacent thereto being formed with a perforation therethrough for reception of a pipe, and spaced mounting portions extending from the material of said fin, inwardly of said angle for mounting said fin elements and said joining means in gripping engagement with a pipe for enabling said fin elements to be spread apart to elongate said perforation and facilitate reception of the fin on a pipe.

12. A heat exchange fin formed of light weight resilient material and comprising a pair of blades set at a diverging angle, a center section joining said blades at their inner ends, said center section and said blades being formed with a perforation therethrough, said center section and portions of said blades bordering said perforation being formed with spaced finger-like elements extending away from the surfaces thereof and within said angle for reception of a conduit.

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