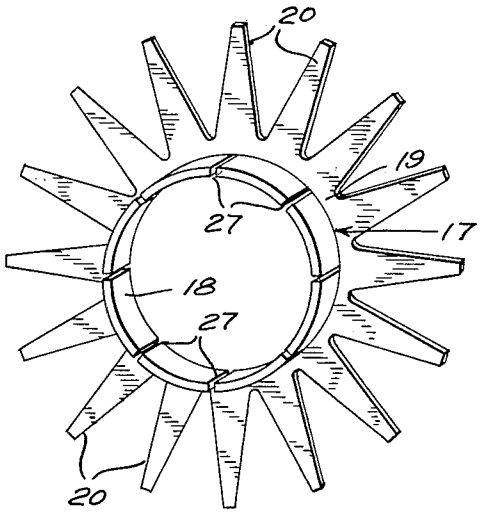
March 6, 1956 M. FRISCH ET AL 2,737,370

EXTENDED SURFACE ELEMENT FOR HEAT EXCHANGER

Filed July 9, 1949

Fig. 1.



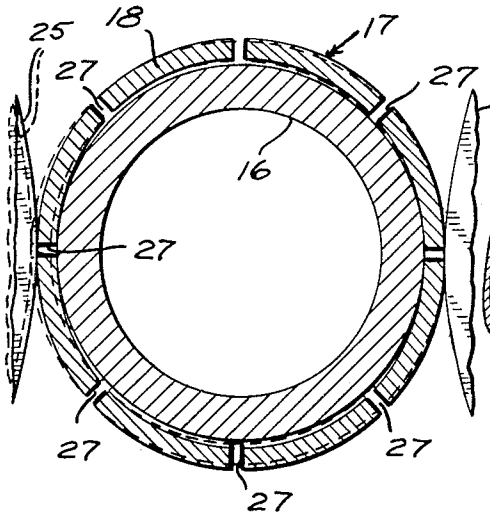


Fig. 3.

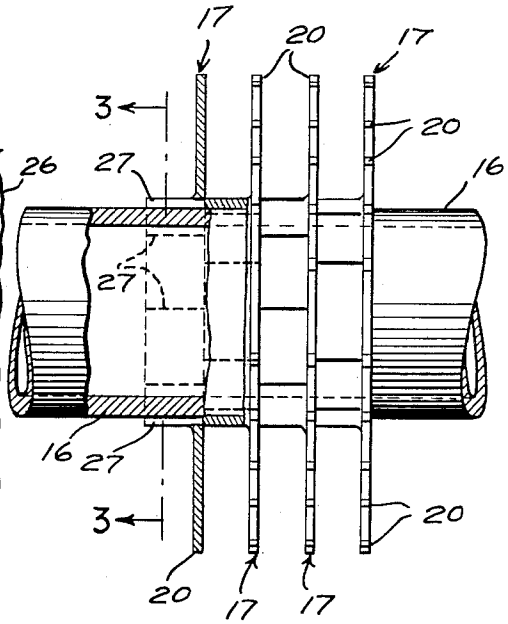


Fig. 2.

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EXTENDED SURFACE ELEMENT FOR HEAT EXCHANGER

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6 Claims. (Cl. 257—262.16)

This invention relates to heat exchange apparatus having tubular members, and more particularly pertains to extended surfaces for the tubular members thereof.

The invention provides novel extended surface elements for tubular members of heat exchange apparatus and novel means for securing said elements to the tubular members.

This application is a continuation in part of application Serial No. 508,668 filed November 2, 1943 and issued on July 12, 1949 as United States Patent No. 2,475,604.

The invention will be understood from the following description when considered in connection with the accompanying drawings forming a part thereof, and in which:

Fig. 1 is a cabinet projection of an extended surface element embodying the invention;

Fig. 2 is an elevational view, with parts in section, of a tubular member with the extended surface elements of the present invention welded thereto, and

Fig. 3 is a view illustrating in an exaggerated manner, the action of the hub of an extended surface element of the present invention while it is being welded to a tubular member.

Like characters of reference refer to the same or to similar parts throughout the several views.

Referring to the drawing, reference character **16** designates a metallic tubular member provided with metallic extended surface elements **17**. Each element **17** consists of a hub **18** and a flange **19** which is integral with the hub at one end thereof, and extends transversely to the axis of the tubular member on which the element is mounted and is constructed and arranged to provide a plurality, sixteen as shown, of radially extending projections **20**, of isosceles trapezoidal configuration in the plane of the projections, the bases of which are spaced a short distance from the hub **18**. The hub **18** has a plurality of spaced, longitudinally extending slots **27** which extend through the hubs **18** at a plurality of circumferentially spaced points.

The extended surface elements are secured to the tubular members by electric resistance seam welding the hubs **18** of the elements to the tubular members, with the hub of one element in contact with the flange of the next adjacent element as shown in Fig. 3, so that the hubs will provide a covering for each tubular member to shield it from contact with the fluid flowing over the tubular members and the extended surface elements thereon. The major portions of the hubs preferably will be seam welded to the tubular member.

The function of the slots **27** in the hub **18** will be understood from a consideration of Fig. 3, wherein the seam welding electrode wheels are designated **25** and **26**. Due to the pressure of the electrode wheels and to the necessity for clearance between the tubular member **16** and the hub **18** of the extended surface element, at the beginning of and in the early stages of the welding operation, the hub **18** will be forced into an elliptical shape as

indicated in Fig. 3, with air gaps between the tube and the hub in the areas between the welded areas. Moreover, substantially throughout the welding operation, the hub will be heated to a higher temperature than the tube, resulting in an expansion of the hub and an increase in its circumference as well as an increase in the air gaps. As the welding proceeds, the circumference of the hub will increase further, due to the plasticity assumed by the metal of the hub. The net result is to cause a shearing stress to be set up between the hub and the tube at the weld which may actually cause the weld to be partially broken as fast as it is made. The slots **27** provide spaces into which the expanding metal can be forced during welding and they also provide areas of local weakness in the hub so that the metal of the hub can be forced against the tube without deformation of adjacent parts of the hub. Thus the magnitude of the shearing stress is reduced with the result that the hub will tend to keep its original circular shape and the weld will be good. Hubs **18** of extended surface members **17** may be spot welded to tubular members **16** if so desired. When spot welding the hubs **18** to tubular members **16**, slots **27** provide spaces into which the expanding metal is forced during welding, the slots being of such width that they are closed by such expansion and thereby shield said peripheral surface of the tubular member from contact with fluid flowing over the tubular members and the extended surface elements thereon.

The form of the invention disclosed herein is to be considered as a preferred embodiment, and the invention is not to be limited excepting by the scope of the appended claims.

What is claimed is:

1. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on and welded to the tubular member, and heat conducting means integral with and in heat exchange relationship with the hub, said heat-conducting means projecting outwardly from the hub, the hub prior to said welding having a plurality of slots therethrough circumferentially spaced from one another around the periphery of the hub and extending substantially parallel to the axis of the hub, the number and length of said slots being such as to provide areas of local weakness in the hub and the width and shape of the slots being such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

2. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on and welded to the tubular member, and a plurality of projections of heat conducting material integral with and in heat exchange relationship with the hub, said heat-conducting means projecting outwardly from the hub, the hub prior to said welding having a plurality of slots therethrough circumferentially spaced from one another around the periphery of the hub and extending substantially parallel to the axis of the hub, the number and length of said slots being such as to provide areas of local weakness in the hub and the width and shape of the slots being such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

3. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on and welded to the tubular member, and a plurality of projections integral with and projecting outwardly from the hub, the hub prior to said welding having a plurality of slots therethrough circumferentially spaced from one another around the periphery of the hub and extending substantially parallel to the axis of the hub, the number and length of said slots being such as to provide areas of local weakness in the hub and the width and shape of the slots being

such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

4. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on the tubular member in heat transfer relationship and a plurality of projections of heat conducting material and of isosceles trapezoidal configuration in a direction normal to the axis of the hub and integral with the hub and extending outwardly therefrom at one end thereof and disposed approximately in a plane extending substantially transversely to the axis of the hub, the hub being adapted to be welded to the tubular member and prior to said welding having a plurality of elongated slots therethrough circumferentially spaced from one another around the periphery of the hub and extending substantially parallel to the axis of the hub, the opposite sides thereof being parallel, the number and length of said slots being such as to provide areas of local weakness in the hub and the width of the slots being such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

5. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on and welded to the tubular member, heat conducting means integral with the hub and extending outwardly from and in a direction normal to the axis of the hub, the hub prior to said welding having elongated slots therethrough circumferentially spaced from one another around the periphery of the hub and extending substantially parallel to the axis of the hub, the opposite sides thereof being parallel, the number and length of said slots being such as to provide areas of local weakness in the hub and the width of the slots being such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

6. In a heat exchange device comprising a tubular member, a metallic hub adapted to be mounted on and welded to the tubular member, and heat conducting means integral with and in heat exchange relationship with the hub, said heat-conducting means projecting outwardly from the hub, the hub prior to said welding having a plurality of elongated slots therethrough extending axially of the hub, said slots being circumferentially spaced from one another around the periphery of the hub, the opposite sides of the slots being parallel to one another and to the longitudinal axis of the tubular member, the number and length of said slots being such as to provide areas of local weakness in the hub and the width and shape of the slots being such that they are closed when the hub expands during welding and remain closed thereafter, thereby shielding the peripheral surface of the tubular member.

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