July 21, 1959 C. E. DRAKE 2,895,508

HEAT EXCHANGE CONDUIT

Filed Nov. 23, 1955

FIG. 1

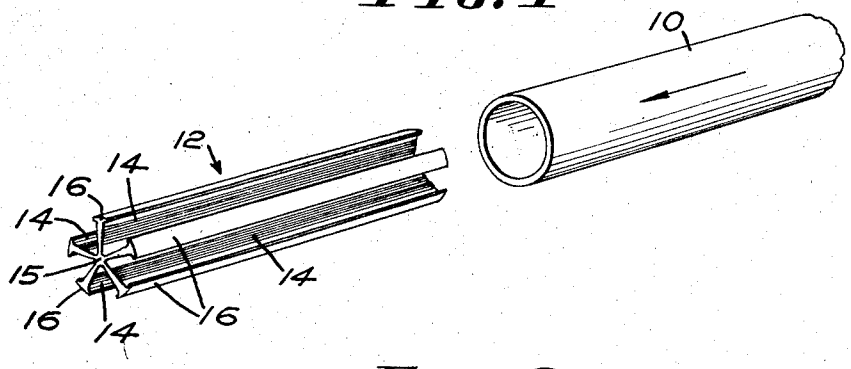


FIG. 2

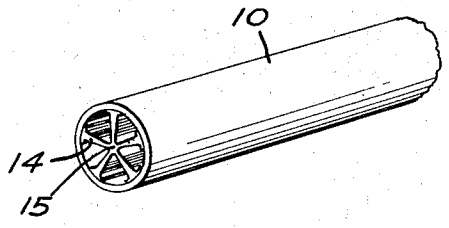
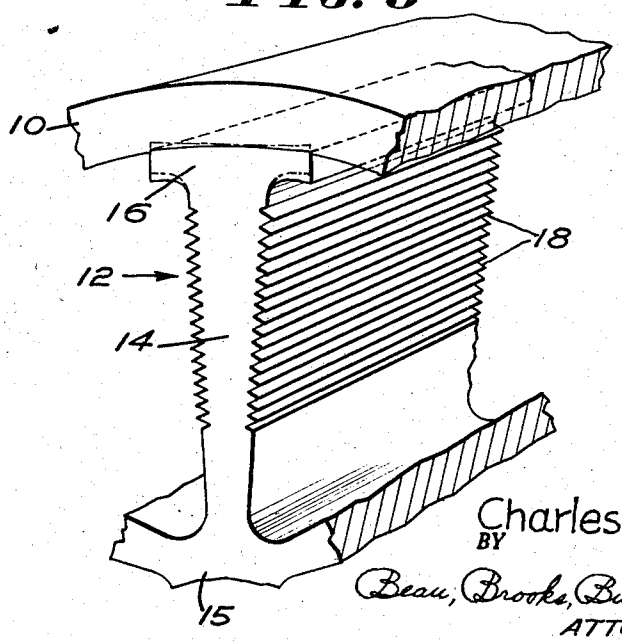


FIG. 3



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2,895,508

HEAT EXCHANGE CONDUIT

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1 Claim. (Cl. 138—38)

This invention relates to heat exchange devices, and more particularly to improvements in internally finned conduits such as are useful in various industrial heat exchange applications, such as radiators, condensers, expansion coolers, etc.

It is an object of the present invention to provide an improved form of inner fin component for internally finned conduits, whereby the fin component may be force-fitted into the tube component as by drawing the tube over the fin component, to provide an improved mechanical bond between the fin and tube components.

Another object of the invention is to provide in an internally finned conduit construction, an inner fin component comprising integrally cast radially extending legs of novel sectional form, whereby to give the fin component an improved mechanical strength-to-weight ratio.

Another object of the invention is to provide an inner fin component as aforesaid which is of novel sectional form so as to provide fluid passageways of improved form between adjacent legs of the fin component.

Still another object of the invention is to provide in a fin component as aforesaid an improved leg surface form, whereby to obtain an improved form of fluid flow through the tube and improved heat exchange results from the contact of the fluid with the fin leg surfaces.

Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 illustrates, in disassembled relation, an inner fin and a tube component, prior to force-fitting assembly of the parts to provide an internally finned conduit of the present invention;

Fig. 2 is a fragmentary perspective view of an assembled internally finned conduit of the invention; and

Fig. 3 is a fragmentary end view, on a greatly enlarged scale, of a detail of the finned tube construction of Fig. 2.

As illustrated in the drawing, an internally finned tube of the present invention may be fabricated to comprise an outer cylinder or tube as indicated at **10**, comprising a conduit of any standard form; the same being constructed of any desired metallic or non-metallic substance according to the requirements of the intended use of the device. The inner fin component of the device is indicated generally at **12** and may conveniently comprise a metallic extrusion or casting or other fabrication in integral form of any desired metallic or non-metallic material, such as the intended use of the device may require. In any case, the fin component **12** comprises a plurality of legs designated **14** extending integrally and radially from a central hub or core portion **15**. As shown in the drawings, the legs **14** are five in number, but it will be understood that in lieu thereof any other suitable number of leg elements may be provided, according to the dictates of the intended use of the device.

More specifically, as illustrated in the drawing in Fig. 3, the legs **14** are preferably formed of tapering sectional form, increasing in width toward their outer ends and terminating in foot portions **16**. The conduit and fin

components **10**, **12**, are separately fabricated as indicated hereinabove, by any suitable or preferred drawing, extruding, casting or spinning methods; and the foot portions **16** of the leg elements of the fin member are preferably of flattened shapes at outer end portions as originally fabricated. Then, when the tube **10** is drawn or force-fitted upon the fin component, the opposite sides of the foot portions **16** are spring-fitted against the inner surface of the conduit **10** and somewhat elastically deformed during the assembly process so as to provide a snug, resilient, force-fit and intimate mechanical bond between the feet of the fin legs and the inner surface of the conduit.

Depending upon the relative hardness of the materials forming the fin foot portions and the conduit **10**, either one or both members will elastically deform and/or cut into the other, incidental to the process of force-fitting the fin and tube components together. Thus, when the fabrication is completed an improved mechanical bond and heat exchange transfer connection between the inner fin component and the conduit component will be effected. If desired, the assembly may subsequently be drawn or run through a drawing die to squeeze the tube **10** inwardly upon and into further intimate bearing connection with the core component **12**. Fig. 3 of the drawing illustrates by means of broken and solid lines the elastic deformations set up in the foot portions **16** of the inner fin member incidental to assembly thereof within the tube **10**. Thus, optimum metal-to-metal contact between the outer ends **16** of the fin legs and the conduit **10** are assured, even though there might be imperfections in the tube and fin fabrications and/or in the relative assembling operation.

As illustrated in better detail in Fig. 3, the inner fin leg portions **14** are of tapering or increasing width dimensions from their inner to their outer ends, thereby providing a more mechanically sturdy fin construction of reduced thickness and weight, compared to conventionally shaped inner fin devices. Furthermore, as shown in the drawings, the side walls of the leg members **14** of the inner fin components are preferably serrated as illustrated at **18**, whereby gases or liquids flowing through the tube and against the leg portions of the inner fin construction come in contact with increased surface areas for improved heat exchange results. Also, the serrated surfaces **18** operate automatically to break up any streamline gas or fluid flow patterns interiorly of the tube, such as would otherwise be detrimental to efficient heat exchange operation.

Whereas only one form of the invention has been illustrated and described in detail hereinabove, it will be understood that various changes may be made therein without departing from the spirit of the invention or the scope of the following claim:

I claim:

A heat exchange conduit comprising an outer metallic shell, an internal metallic fin device comprising a longitudinal hub portion having a plurality of integral legs extending radially therefrom, each leg being of tapering sectional form of increasing width toward the outer end thereof, each leg terminating in an enlarged foot portion having an initially flattened shape at its outer surface, each foot portion being of a width greater than the width of the leg portion to which it is immediately joined whereby the opposite sides of each foot portion extend laterally beyond their corresponding leg, the longitudinally extending centers of said outer surfaces of the foot portions lying at points on a circle whose diameter is substantially the same as the inside diameter of said shell while the outer edges of said opposite sides of the foot portions lie at points on a circle whose diameter is greater than the inside diameter of said shell,

said fin device being of harder metal than said outer shell and being disposed within said shell with the opposite sides of said foot portions and the portions of said shell which they contact being mutually deformed so that the outer surfaces of the opposite sides of said foot portions define arcs having radii greater than the radius of the inner surface of said shell.

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