Aug. 30, 1949. H. F. BRINEN 2,480,706

INTERNAL FIN FOR HEAT EXCHANGER TUBES

Filed Dec. 4, 1946

Fig. 1

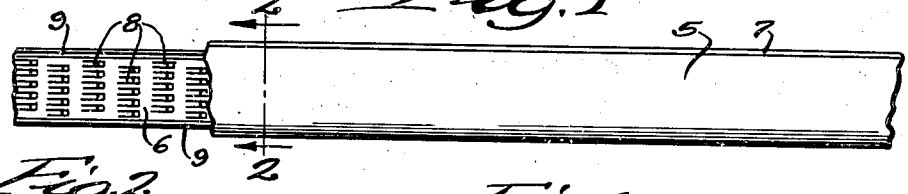


Fig. 2

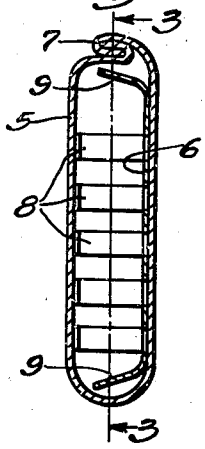


Fig. 3

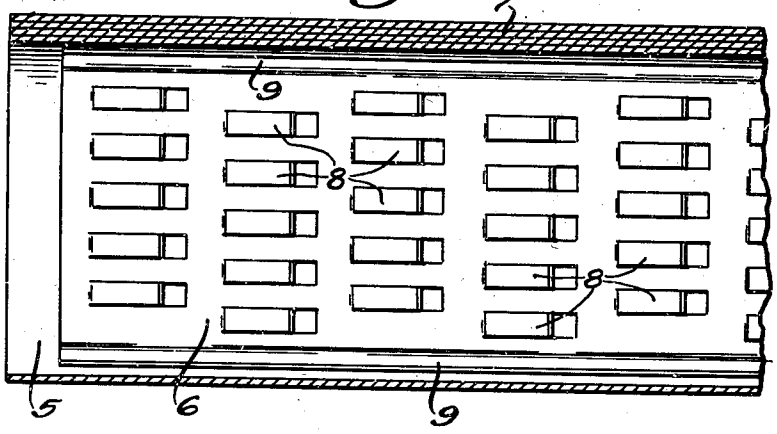
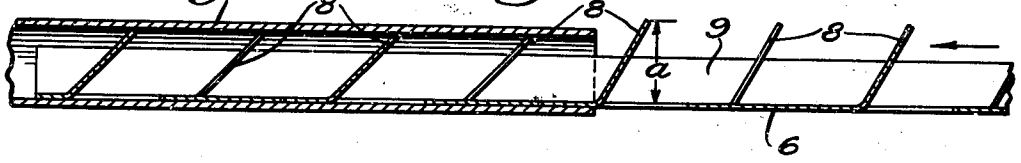


Fig. 4



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INTERNAL FIN FOR HEAT EXCHANGER TUBES

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2 Claims. (Cl. 138—38)

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In the construction of equipment for the dispersion of heat from a fluid flowing through a tube, two results are sought. First, the highest possible transference of heat from the fluid to the tube. Secondly, the creation of the least amount of turbulence in and consequent resistance to the fluid flowing through the tube.

It is well known that the use of fins inside the tube materially increases the heat transference. However, the resulting turbulence increases resistance to the fluid flow. Generally, therefore, the use of internal fins to gain in heat transference has been at the sacrifice of a freer fluid flow, whereas the omission of internal fins for the sake of the greatest possible fluid flow has been at the expense of an increased heat dispersion.

Flat or elliptical tubes are known to provide a higher degree of heat transference than circular tubes of the same volumetric capacity. Moreover, flat tubes lend themselves better to the use of internal fins. Heretofore the problem has been to provide an internal fin for flat tubes which would produce so great a gain in heat transference, over the results obtainable without an internal fin, as to make the increased resistance to fluid flow through such a finned tube as unobjectionable a factor as possible.

An internal, flat-tube fin designed to attain these ends is disclosed in Patent No. 2,359,288. The construction therein shown materially increases the heat dispersion over a tube of the same size but having no fin. However, this gain in heat dispersion has been accompanied by a material increase in the resistance to fluid flow over that encountered in a tube without a fin.

The main objects of this invention, therefore, are, to provide an improved form of internal fin, particularly for use with flat tubes employed in heat-exchange equipment; to provide a form of flat-tube, internal fin which accomplishes a high degree of heat transference accompanied by a low degree of resistance to fluid flow; and to provide an improved fin of this kind the heat-transference capacity of which exceeds that of the form of fin shown in the aforesaid patent and the resistance-to-fluid-flow capacity of which is materially less than the construction employed in said patent.

A preferred form of internal fin embodying this invention is shown in the accompanying drawings, wherein:

Fig. 1 is a plan view of a section of flat tube showing an internal fin, embodying this invention, protruding beyond one end thereof;

Fig. 2 is an enlarged transverse sectional view

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of the fin and tube taken on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view of the same taken on the line 3—3 of Fig. 2; and

Fig. 4 is a cross-sectional view of the same showing the fin in process of being inserted into the tube, the view serving to illustrate the angularity of the tongues before and after the insertion of the fin into the tube.

A tube 5, for use with which this improved form of internal fin 6 has been designed, is of the type most generally used in the construction of heat-exchange cores for the tempering of water or oil required to disperse the heat generated by various types of power units. The tube 5 is preferably thin metal. The lateral edges are folded over so that when the sheet is bent to form a tube of desired shape and dimension these bent-over lateral portions are interlocked, as shown at 7, and suitably bonded to form a fluid-tight seam.

The fin 6 is likewise in the form of a thin sheet-metal strip. Parallel, transverse rows of tongues 8 are struck up from the face of the strip. The number of tongues in a row of course depends upon the width of the strip and the width of the tongues. Preferably the tongues in adjacent rows are staggered so that the tongues for one row are disposed in longitudinal alinement with the metal between two tongues in the next adjacent row. This, obviously, disposes the tongues in alternate rows in the same plane longitudinally of the strip.

The tongues 8, when originally struck out of the fin 6, are disposed at such an angle that the distance a (see Fig. 4) between the bottom of the strip and the end of the tongue is greater than the internal transverse dimension of the tube 5. Thus, when the strip is inserted into the tube, the tongues are sprung back to a greater angle to the face of the strip than they occupy before the strip is inserted into the tube as is most clearly evident from Fig. 4.

The fin 6 is preferably less in width than the greater cross-sectional dimension of the tube 5. The form of the lateral edges of the strip is optional. As herein shown the lateral portions are bent to form flanges 9 disposed at less than a right angle to the strip, with the distance between the ends of the flanges slightly less than the longitudinal cross-sectional dimension of the tube 5.

A tongued, internal fin 6 of this construction, when inserted into a tube 5, brings the end of each tongue 8 into contact with one wall of the tube.

By reason of their resiliency, these tongues tend to firmly press the strip 6 against the opposite face of the tube 5.

The column of fluid flowing through the tube equipped with such a fin tends to have the heat from the core or central part thereof readily dispersed to the side walls of the tube. Obviously the degree of heat dispersion would be greater than would be possible with a tube of the same volumetric capacity having no internal fin arranged therein.

Of necessity, the use of a fin within a tube, by reason of the turbulence it causes in fluid flowing through the tube, creates a resistance to such fluid flow. However, by reason of having the fin pressed firmly against one face of the tube there is a material lessening of the turbulence over what results with a fin, such as shown in the aforesaid patent, where the body thereof is disposed in a plane intermediate the walls of the tube 5.

Identical tests with this construction and that shown in the aforesaid patent reveal material advantages in favor of the former. Such tests show a 5 per cent greater heat transference and a more than 50 per cent reduction in resistance to the oil flow through the tube for a construction embodying this invention, as compared with that shown in said patent.

Variations and modifications in the details of structure and arrangement of the parts may be resorted to within the spirit and coverage of the appended claims.

I claim:

1. An internal fin for flat heat-exchange tubes comprising, a flat strip having parallel transverse rows of tongues struck out therefrom and all bent upwardly on one side of said strip whereby when said fin is inserted within a tube said tongue ends all contact one side wall of said tube and hold the strip in contact with the opposite side wall of said tube.

2. An internal fin for flat heat-exchange tubes comprising, a flat strip having parallel transverse rows of tongues struck out therefrom and all bent upwardly on one side of said strip at an angle normally spacing the outer extremities of each tongue away from said strip face a distance greater than the transverse cross-sectional dimension of the tube wherein said fin is to be used, whereby said tongue ends all contact one side wall of said tube and hold the strip in firm contact with the opposite side wall of said tube.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
837,582	Ordway	Dec. 4, 1906
1,612,931	Lochen	Jan. 4, 1927
2,359,288	Brinen	Oct. 3, 1944