Feb. 26, 1935. F. M. YOUNG 1,992,795

HEAT TRANSFER UNIT

Filed July 7, 1933 3 Sheets-Sheet 1

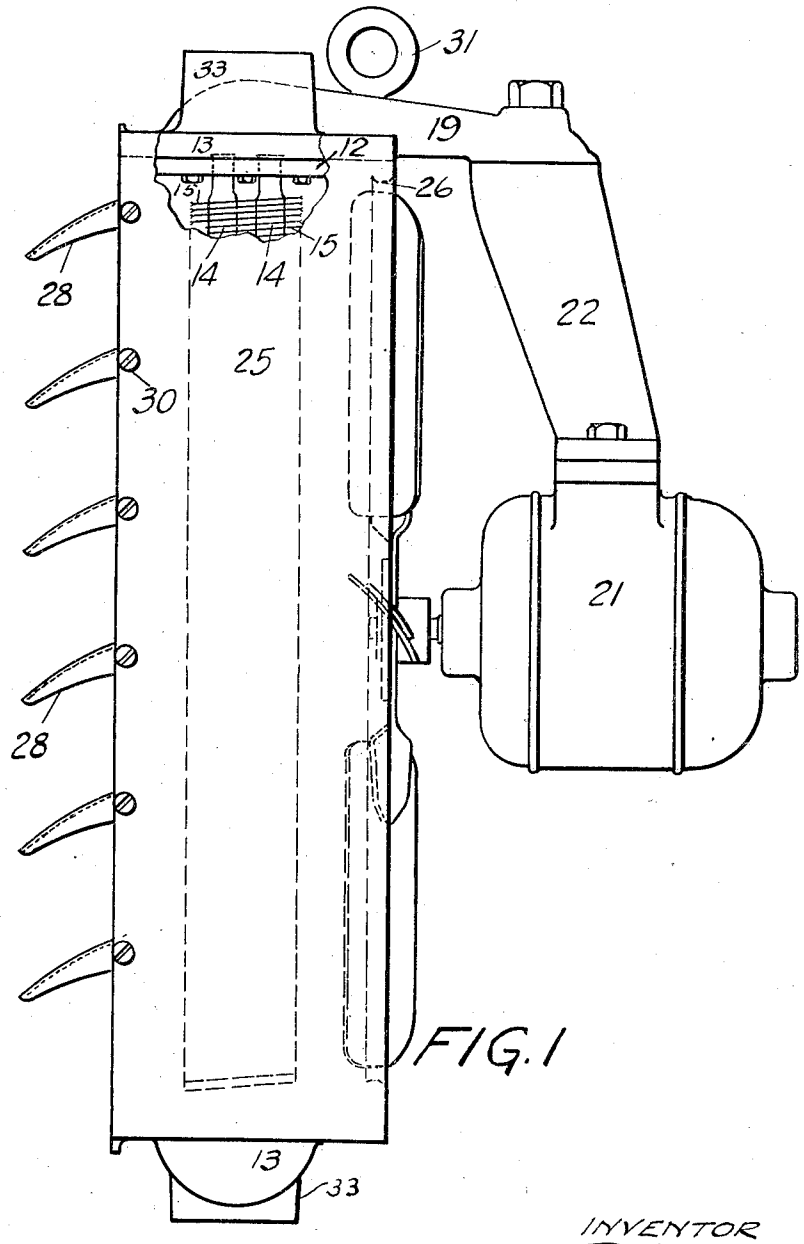


FIG. 1

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HEAT TRANSFER UNIT

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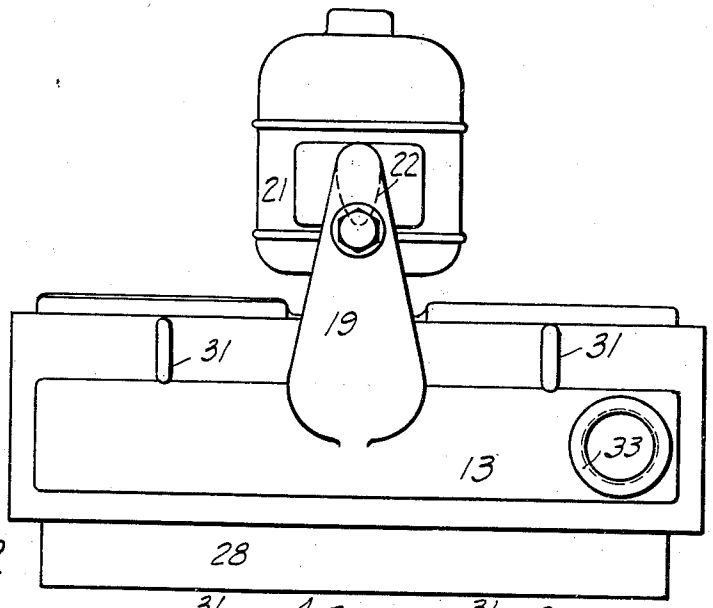


FIG. 2

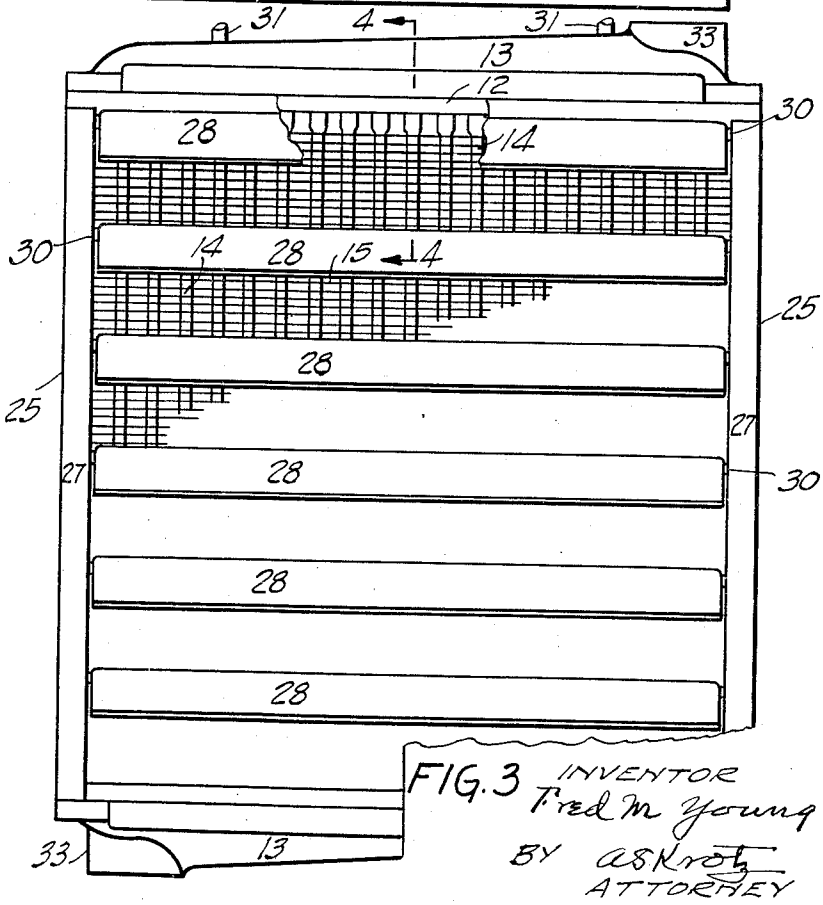


FIG. 3

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HEAT TRANSFER UNIT

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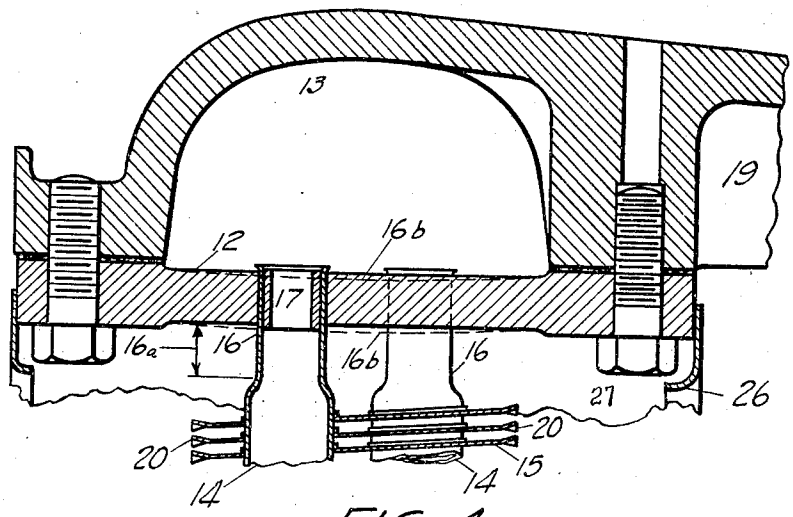


FIG. 4

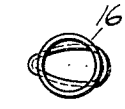


FIG. 5

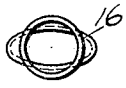


FIG. 6

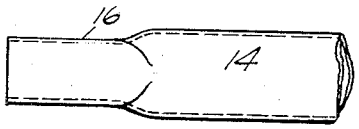


FIG. 7

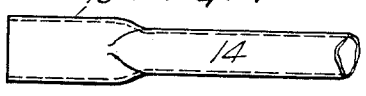


FIG. 8

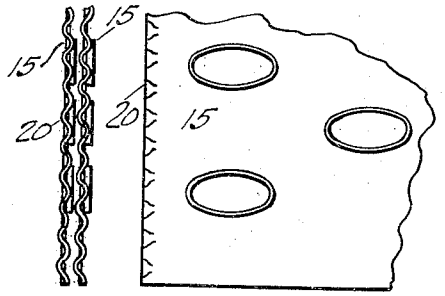


FIG. 9 FIG. 10

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Patented Feb. 26, 1935 1,992,795

UNITED STATES PATENT OFFICE

1,992,795

HEAT TRANSFER UNIT

Fred M. Young, Racine, Wis.

Application July 7, 1933, Serial No. 679,286

3 Claims. (Cl. 257—137)

My invention relates to heat transfer units which are adapted to circulate and heat air by deflection and for other purposes for which an appliance of this general class might be used.

The object of my invention, generally stated, is to increase the efficiency of the air circulating means and heat transferring surfaces, reduce cost and increase the general strength, reliability and appearance of the unit.

I accomplish these results in a manner which will hereinafter appear.

In devices of this type efficiency and proof against injury and leakage are all important factors which have not been sufficiently appreciated by builders in the past.

I serrate the exposed edges of the fins whereby these edges are strengthened, improved in appearance and the efficiency and area increased. These fins are further positioned at an angle to the normal direction of air-flow, whereby the air will be caused to periodically impinge the fins as it passes therebetween to still further increase the efficiency of the unit.

Round tubes are inefficient in that they restrict air flow, set up eddy currents and the swiftly passing air will not closely wipe the surface of the tube. I provide tubes preferably of elliptical or air foil shape and by positioning the narrow sides transverse to the direction of air-flow, there is less resistance offered and the air will more closely wipe the surfaces of the tubes, thus reducing the power required to move the air through the system and increase the heat transferring efficiency.

Irregular shaped tube ends cannot easily be suitably attached to the header plates. I round the flattened tube ends and expand these ends into smooth round openings in the header plate and thereby provide strong, leak-proof joints. I further strengthen this joint by expanding a suitable ferrule in the tube ends.

Header plates are flat and frequently subjected to extremely high pressure and, therefore, they are frequently distorted. With flattened tubes positioned with their wide section transverse to the plate this distortion will bend the tubes edgewise and result in frequent ruptures or loosened joints. I provide a sufficiently long projecting rounded section of a length preferably equal to its diameter, whereby this part of the tube will bend slightly without injury.

Applicant further increases the efficiency of his unit by providing a single novel motor support having an air foil shape which offers the least resistance to the air-flow.

To these and other useful ends my invention consists in matter hereinafter set forth and claimed and shown in the accompanying drawings in which:

Figure 1 is a side elevation of my improved unit having a fraction of the housing removed in order to illustrate the transverse position of the tubes.

Figure 2 is a top plan view of the unit as shown in Figure 1.

Figure 3 is a fractional front elevation of my invention.

Figure 4 is a fractinonal section taken on line 4 of Figure 3.

Figure 5 is an end view of one of the tubes having an air foil shape in cross section after the end has been rounded.

Figure 6 is an end view of an elliptical tube after the end has been rounded.

Figure 7 is a fractional side view of an elliptical tube after the end has been rounded.

Figure 8 is a fractional edgewise view of an elliptical tube after the end has been rounded.

Figure 9 is a fractional view of the front of two fins showing the corrugations and their relative position after the fins have been assembled on the tubes.

Figure 10 is a fractional top view of a fin as shown in Figure 9.

As thus illustrated, 12 designates the header plates and 13 the header caps, 14 designates the circulating tubes which are preferably elliptical in cross section and positioned in parallel relation, in the usual manner, and having their narrow sides positioned transverse to the direction of air-flow, fins 15 are properly flanged, closely spaced on the tubes and suitably bonded thereto, thus forming the core of the unit.

After the fins have been assembled and made fast by bonding to the tubes, the ends of the tubes are rounded as at 16 and are inserted into registering holes in the plates 12 and expanded therein in the usual manner, a ferrule 17 preferably slightly longer than the thickness of the plates 12 is positioned and expanded into the tube ends, as clearly indicated in Figure 4. The rounded ends 16 of the tubes are made long enough to provide a projecting portion as at 16^a which is preferably longer than the diameter of tubes 16 whereby, when the plate 12 is distorted, as indicated by dotted lines 16^b, this extended portion will be free to bend without injury.

It will be noted by referring to Figure 4 that the fins are positioned at an angle to the normal direction of air-flow having preferably their low

side on the front of the unit. However, under some circumstances the core is reversed in the assembly whereby to direct the air current upward. In operation the air will first impinge the fins at a slight angle then rebound and impinge the adjacent fin, thus creating a slight turbulence as the air passes between the fins.

I provide an assembly having tubes with elliptical shape in cross section and properly positioned, having rounded ends, reinforcing ferrules and novel fins, insuring efficiency and durability.

The header caps 13 are suitably made fast to the header plate; one of these caps is provided with a rearwardly projecting arm 19, which is an integral part thereof, for a purpose which will hereinafter appear.

The fins 15 are at the exposed or front and rear edges serrated, as at 20. These serrations are preferably narrow and short and in the shape shown in Figures 9 and 10; thus it will be seen they merge quickly into the body of the fin, and, in addition to providing increased area, they strengthen the edges of the fin and improve the general appearance of the assembly.

Thus far I have described my preferred form of the essential parts of a heat transfer unit comprising a core and end headers.

A fan motor 21 is suitably positioned and attached to the end of projecting arm 19 by means of a bracket 22 which has preferably an air foil shape in horizontal section, as indicated by dotted lines as at 22 in Figure 2 or otherwise suitably flattened into an air foil shape, whereby the air in its movement to the core will not be greatly restricted and an inexpensive single supporting means for the motor provided.

In order to form a restricting passageway for the air through the core, I provide side housing plates 25 having the usual circular opening in the rear for the fan blades, as at 26.

While I show elliptical tubes as the preferred form, under some conditions I may elect to use an air foil shaped tube, as illustrated in Figure 5, or a flattened tube of any conventional form may be used, thus to provide the most efficiently shaped tubes upon which to mount the fins.

On the front of side plates 25 I provide decorative inwardly and rearwardly extending members 27; air blades 28 are positioned transversely in spaced apart relation and pivoted to these members as at 30. These blades may have any desired shape and are provided with friction means whereby they may be moved manually but are held from accidentally moving out of position in a manner too well known to require further description or illustration.

I provide I-bolts 31 which are spaced apart and positioned whereby the unit may be supported from the ceiling or rafters by means of wires or chains and cause the unit to hang in a vertical position. Suitable pipe inlet and outlet flanges 33 are provided in the usual manner.

Obviously, many minor changes in the shape and position of parts and details may be made without departing from the spirit and scope of my invention.

Having thus shown and described my invention I claim:

1. A heat transfer unit, comprising a fan motor and a fan motor support, suitable header plates, header caps, a number of elliptical tubes having rounded ends expanded in openings in said plates, a plurality of closely spaced fins through which said tubes extend, one of said header caps having a rearwardly extending arm and forming an integral part thereof, said motor support having a connection to said rearwardly extending arm from the under side thereof and having an air foil shape in cross section in direction of air-flow.

2. A heat transfer unit, comprising suitable headers, a fan motor and a fan motor support, a number of tubes having an elliptical cross section shape, positioned in direction of air-flow, a plurality of closely spaced fins through which said tubes extend, said fins corrugated at their front and rear edges, said tubes having rounded ends adapted to be expanded in registering openings in said headers, said motor support extending from one of said headers to said motor and having an air foil shape in direction of air-flow.

3. A heat exchange unit, comprising, upper and lower headers having header plates, a fan motor and a fan motor support having a flattened shape in cross section, positioned in direction of air flow and attached to one of said headers, a number of tubes arranged in a number of transverse rows, said tubes having an elliptical cross section shape positioned in direction of air flow, a multiplicity of spaced apart strip fins through which the flattened portion of said tubes extend, the front and rear edges having short narrow corrugations which taper into the body of the fin to thereby stiffen the edge without interfering with the direct free passage of air therebetween, said tubes having rounded ends expanded into openings in said plates and extending from said plates a distance equal to or greater than their diameter.

FRED M. YOUNG.