G. E. WHEELER.

MANUFACTURE OF RADIATOR TUBING.

APPLICATION FILED JUNE 5, 1918.

1,320,430. Patented Nov. 4, 1919.

Fig. 1

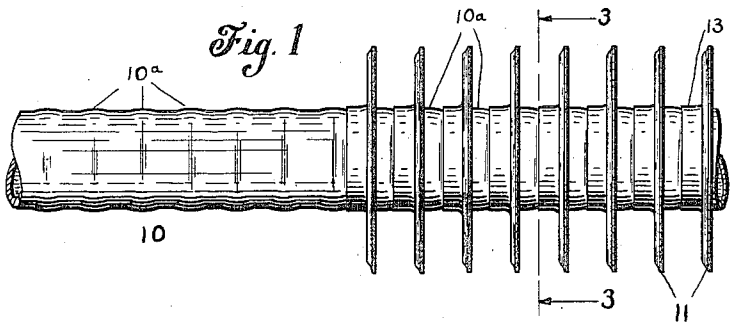


Fig. 2.

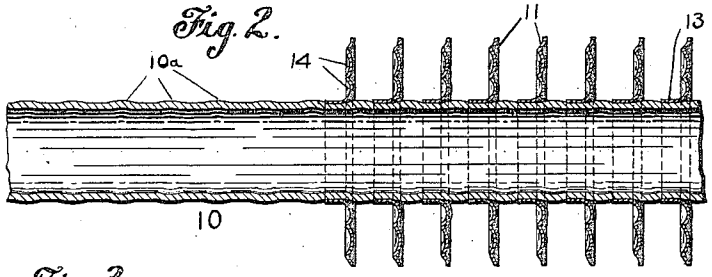


Fig. 3.

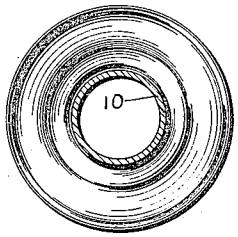


Fig. 4.

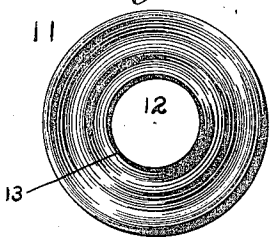


Fig. 5.

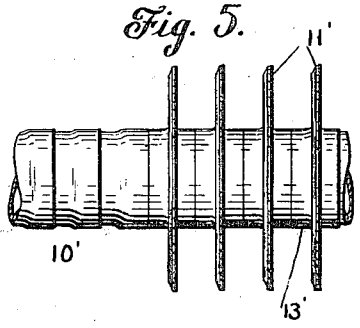
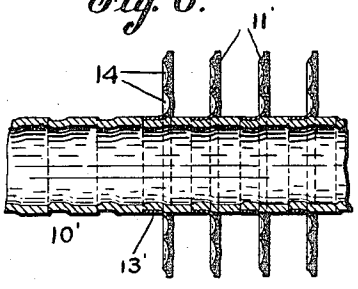


Fig. 6.



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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF RADIATOR-TUBING.

1,320,430. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed June 5, 1918. Serial No. 238,406.

To all whom it may concern:

Be it known that I, GARDNER E. WHEELER, a citizen of the United States, residing in New Haven, county of New Haven, and State of Connecticut, have invented certain new and useful Improvements in the Manufacture of Radiator-Tubing and the like, of which the following is a full, clear, and exact description.

This invention relates to a method of rigidly securing fins and the like to tubes, and it has particular reference to a method of rigidly securing fins or disks to automobile radiator tubes without the use of solder, metallic cement or the like.

Many of the automobile radiators now in general use and particularly the radiators used upon heavy automobile trucks are provided with radiator cooling tubes which are surrounded by fins or the like to increase the surface area of the cooling tubes and thereby increase the cooling effect of the radiator. These radiators, which may be used to cool practically any type of internal combustion engines, are commonly provided with a number of vertical tubes through which the cooling liquid flows. One well known method of increasing the surface area of these tubes is to stamp a large number of thin disks out of a sheet of brass or the like, then place these disks upon the tube, and solder the same in place upon the tube. It is essential that some means other than frictional engagement between the tubes and the disk be provided to retain the disks in place, since the expansion and contraction of the tubes produced by the changes in temperature to which the radiator is submitted in actual use is such that a snug engagement between the disks and tubes will not retain the disks in place. The only practical means now in use for retaining these disks in place (so far as I am aware) is solder, but solder is expensive and at present is very difficult to obtain at any price.

The primary object of the present invention therefore is to provide a simple and efficient method of permanently securing cooling disks or fins in place upon radiator cooling tubes without the use of solder or other form of metallic cement.

To these and other ends, the invention consists in the novel features and steps to be hereinafter described and claimed.

In the accompanying drawing,

Figure 1 is a side view of a short portion of a radiator tube having the disks or fins secured thereto by my new method, the tube being shown with a number of disks or fins removed therefrom;

Fig. 2 is a longitudinal sectional view of Fig. 1;

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a plan view of one of the disks or fins removed from its tube;

Fig. 5 is a side view of a tube showing a modification of my method of securing the disks to a radiator tube; and

Fig. 6 is a longitudinal sectional view of Fig. 5.

In the accompanying drawing, the numeral 10 designates a short section of a metallic tube having a number of disks or fins 11 mounted thereupon. The disks 11 have a central opening 12 formed therethrough, which opening is surrounded by an integral flange 13. These disks are also preferably provided with a plurality of annular grooves or corrugations 14. The latter tend to reinforce or stiffen the disks, and the laterally bent annular flange 13 forms a collar or sleeve to receive the tube 10. The type of disk or fin just described is well-known and is in common use upon radiator tubes, the fins usually being made of brass, and the radiator tube upon which they are usually mounted is of soft copper. These disks are usually rigidly secured to the radiator tube upon which they are mounted by giving the tube a coating of solder, then placing the disks upon the same in the desired spaced relation, and then heating these tubes sufficiently to cause the solder to rigidly bind the disks to the tube. This method of securing the disks to the tube up to the present time has proved fairly satisfactory except that it consumes a considerable amount of solder, which is expensive and at present difficult to obtain, as above stated. Therefore it is very desirable to provide means for securing the disks 11 rigidly in place upon their tube without the use of solder.

With this object in view I have devised the following method of securing disks to a tube, which consists of placing a number of disks upon a tube in the desired spaced relation, as shown in the drawing, the central open-

ing through the disks 11 being of substantially the same size as the external diameter of the tube 10 upon which they are mounted, and then connecting the ends of the tube to a hydraulic pump or the like by which liquid may be forced into the tube 10 under sufficient pressure to cause the walls of the tube to bulge outwardly between the adjacent flanges 13 of the disks 11. The pressure to which the interior of the tube is submitted should be sufficient to force the metal outwardly between the adjacent annular flanges 13, but should not be sufficient to distort or burst these flanges. The tube after being submitted to the desired pressure should preferably assume the appearance shown in cross-section in Fig. 2, which shows this tube as having small undulations 10^a formed between the disks 11. Figs. 1 and 2 illustrate a tube which has been subjected to the desired amount of internal pressure, with the disks applied upon the outer surface thereof, certain of the disks having been cut off afterward to better illustrate the undulations formed in the tube.

Heretofore it has been customary to use soft copper seamless tubes for the type of radiator tube herein described, and to form the fins or disks with which these tubes are provided out of brass or similar material somewhat harder than the tube upon which they are mounted. This difference in the two metals just referred to lends itself admirably to the method above described for securing the disks to the tubes, since the soft copper tube is sufficiently ductile to permit its walls to be forced outwardly between the adjacent disks 11 without requiring an internal pressure sufficient to burst the flanges 13 of the disks 11. However, it will be apparent that the method herein described may be used in connection with any tube which is sufficiently ductile to permit its walls to be bulged outwardly without rupturing the same.

In Figs. 5 and 6 of the drawing, I have illustrated a modification of the method of securing the disks or fins to the radiator tube without the use of solder, it being obvious that the method described herein is not limited to the idea of distorting the tube outwardly to prevent lateral displacement of the disks thereupon, since the same result may be accomplished by forcing the flanges 13 into rigid binding engagement with the tube upon which they are mounted.

In this modification of my invention, I place a number of disks or fins on a radiator tube, as above described, and then secure these disks 11′ to their tube 10′ by exerting external pressure upon the flanges 13′ of the disks so as to embed these flanges in the external walls of the tube 10′, as shown more particularly in Fig. 6. One practical way which I propose for exerting a pressure on the flanges 13′ to embed the same in the tube 10′ is to provide a number of semi-circular jaws or the like having substantially the same diameter as the exterior of the tube 10′, between which the tube and the flanges 13′ may be gripped with sufficient force to embed the flanges in the relatively soft tube upon which they are mounted.

It will be obvious that my invention is not limited to the securing of disks on radiator cooling tubes, since the method herein described may be employed to secure disks or the like upon tubes for various purposes. Moreover, I do not limit myself to the precise procedure herein described as various minor changes may be made therein without departing from the scope of my invention as defined in the claims.

While my invention is of particular value by reason of the economies due to the elimination of solder, it will be apparent that the method herein described is very advantageous by reason of its simplicity and the fact that the known drawbacks and inconveniences incident to the use of solder in manufacturing operations are avoided. The invention provides, in a very simple way, a positive interlock between the fin and the ductile tube on which it is mounted, said tube lending itself easily to such distortion of its wall on opposite sides of each fin or elsewhere, as the case may be, as to provide the locking enlargements or bulges disposed between the various fins. While, in the form shown in Figs. 5 and 6, the operation as such is not one of outwardly bulging the tube, the finished article presents outward bulges between the fins or disks, generally similar to those shown in Figs. 1 and 2.

What I claim is:—

1. The method of securing fins to a radiator tube or the like, which comprises placing individual fins upon a tube in spaced relation, and then distorting the wall of the tube outwardly between the adjacent fins to prevent the fins from moving lengthwise of said tube.

2. The method of securing fins to a radiator tube or the like, which comprises placing individual disks upon a tube in spaced relation, and then forcing a liquid into said tube under sufficient pressure to produce a bulging of the walls of the tube between the adjacent disks.

3. The method of securing fins to a radiator tube or the like, which comprises placing upon a tube a plurality of disks having central openings therethrough and flanges surrounding said openings, and then producing a relative distortion between the walls of the tube and said flanges by the exertion of pressure to produce binding engagement between said flanges and tube.

4. The method of securing fins to a radiator tube or the like, which comprises placing upon a tube a plurality of disks having central openings therethrough and flanges surrounding said openings, and exerting pressure upon one of said elements to distort the same sufficiently to produce binding engagement between said flanges and tube.

5. The method of securing fins to a radiator tube or the like, which comprises placing a plurality of perforated fins on a tube in spaced relation, and then subjecting the tube to lateral pressure at a plurality of points to form locking bulges between the fins.

6. The method of securing cooling fins to a radiator tube or the like, which comprises placing individual fins upon a tube in spaced relation to each other, and then submitting the interior of the tube to sufficient bulging pressure to distort the portions of the tube not engaged by the fins outwardly between the adjacent fins.

In witness whereof, I have hereunto set my hand on the 3rd day of June, 1918.

GARDNER E. WHEELER.