Jan. 7, 1964 H. A. NICKOL ETAL 3,116,541

METHOD OF MAKING A HEAT EXCHANGER

Filed May 20, 1957 2 Sheets-Sheet 1

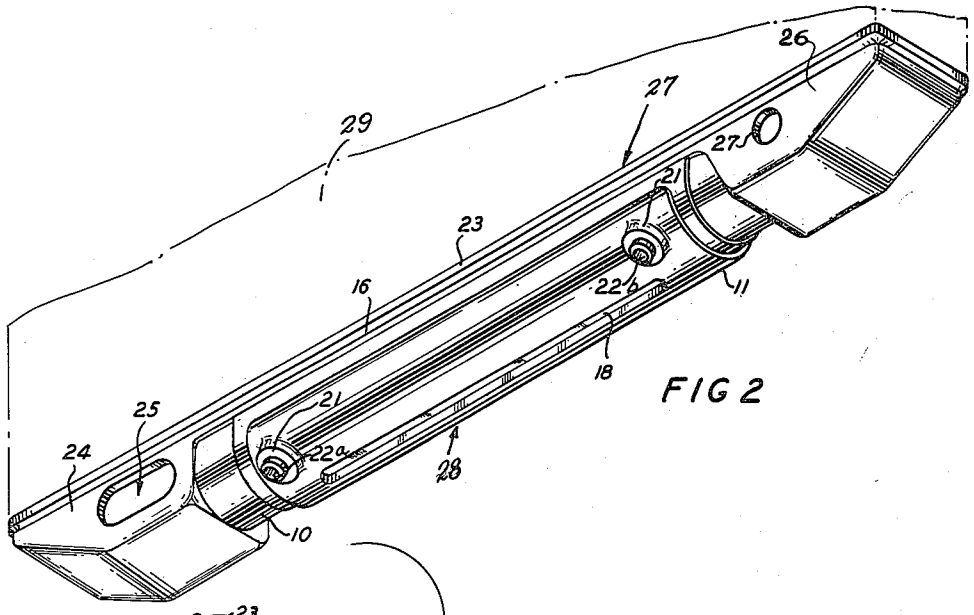


FIG 2

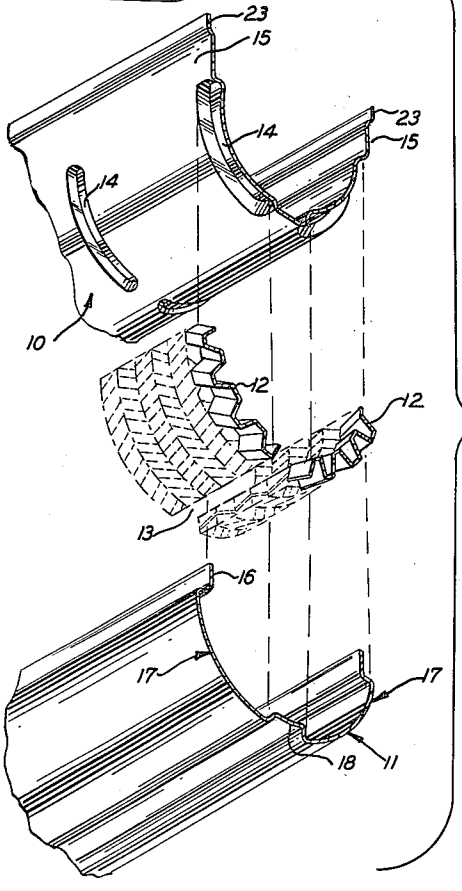


FIG. 1

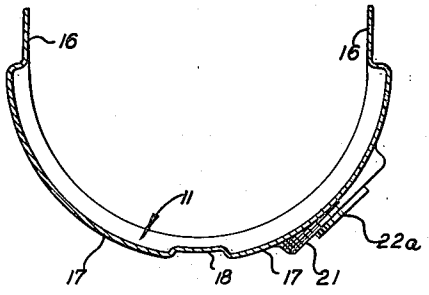


FIG. 3

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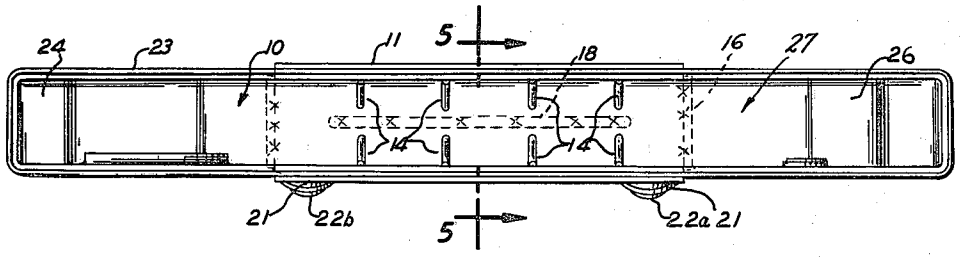


FIG. 4

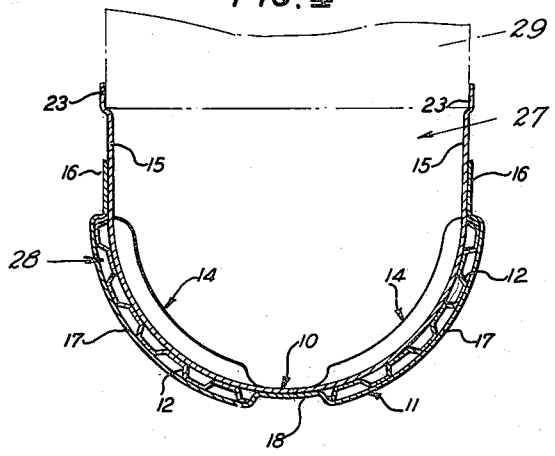


FIG. 5

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METHOD OF MAKING A HEAT EXCHANGER

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1 Claim. (Cl. 29—157.3)

This invention relates to a heat exchanger and more particularly to a heat exchanger adapted for use with a cooling system of an internal combustion engine. It was specifically designed as a part of an internal combustion engine to control the temperature of hydraulic fluid employed in a automatic transmission. However, the invention is not so limited and has application in any fluid to fluid heat exchange system.

The present invention is intended as an improvement over the heat exchanger disclosed and claimed in our co-pending application Ser. No. 637,011 filed January 29, 1957, and may employ as turbulence inducing members the structure disclosed and claimed in our co-pending application Ser. No. 636,933 filed January 29, 1957, now abandoned, or that disclosed in FIGURES 2 and 3 of the application Ser. No. 637,011, or any other suitable turbulence inducing structure.

Briefly, the invention contemplates the use of an inner sheet metal member, an outer sheet metal member and a pair of turbulence inducing members having a longitudinal space therebetween positioned intermediate the two sheet metal members. The outer sheet metal member is secured to the inner sheet metal member around the periphery of the outer member. The outer sheet metal member is then secured to the inner sheet metal member in the space between the turbulence inducing members. The outer sheet metal member is so dimensioned that a deformation will occur during the process of securing the members together so that the outer sheet metal member is forced into firm heat transferring relation with turbulence inducing members and this force is conveyed through the turbulence inducing members to secure a firm heat transferring contact between them and the inner sheet metal member.

The object of the present invention is the provision of a unique method of obtaining firm heat transferring contact between a turbulence inducing member and two sheet metal members.

This invention is best illustrated in terms of the FIGURES of the drawing in which:

FIGURE 1 is an exploded view of the heat exchanger prior to assembly; and

FIGURE 2 is a perspective view of the completed heat exchanger; and

FIGURE 3 is a cross sectional view of the outer sheet metal member prior to assembly; and

FIGURE 4 is a top plan view of the completed heat exchanger with the radiator core removed, and,

FIGURE 5 is a cross sectional view of the completed heat exchanger taken along the lines 5—5 of FIGURE 4.

Referring now to the drawings which illustrate a preferred embodiment of the invention and in which like reference numerals designate like parts throughout the several views thereof, there is shown in FIGURE 1, an inner sheet metal member **10**, which may take the form of a bottom radiater tank **27** of an internal combustion

engine, an outer sheet metal member or cover **11** and two turbulence inducing members **12** having a longitudinal space **13** positioned therebetween. The inner sheet metal member **10** has stiffening ribs **14** positioned at spaced intervals and for a portion of its length to give added strength to the heat exchanger. It also may have a peripheral portion **15** for receiving a complemental flange **16** on the outer sheet metal member or cover **11**. The outer sheet metal member has two raised portions **17** separated by a depression **18** which extends for a portion of the length of said outer sheet metal member.

In the assembly of the apparatus, the turbulence inducing members **12** are positioned in the raised portions **17** of the outer sheet metal member or cover and this assembly is then brought into contact with the inner sheet metal member **10**. As can best be seen in reference to FIGURE 1, the outer sheet metal member is secured to the peripheral portion **15** of the inner sheet metal member **10** to form a cooler **28** for a fluid entering at one connector **22***a* and leaving at a second connector **22***b*. The joining of the flange **16** to the peripheral portion **15** may be accomplished by resistance welding or any other suitable process. In comparing FIGURES 3 and 5, it will be noted that the depression **18** is considerably more shallow in FIGURE 3 which shows the outer sheet metal member prior to assembly than it is in FIGURE 5 which shows a cross section of the completed heat exchanger. This deepening of the depression **18** is brought about by a resistance welding apparatus which supplies sufficient pressure to deform the outer sheet metal member **11** sufficiently to allow the inner face of the depression **18** to come into contact and to be secured to the inner sheet metal member **10**. This deforming forces the outer sheet metal member **10** into firm heat transferring relation with the turbulence inducing members **12** and simultaneously forces the turbulence inducing members into firm heat transferring relation with the inner sheet metal member **10**.

Referring to FIGURES 2 and 4, it will be seen that the depression **18** where the two sheet metal members are secured extends for only a portion of the length of the member **11**, thus providing a flow path for the fluid between the two turbulence inducing members. The connectors **22***a* and **22***b* are welded to bosses **21** (see FIGURE 3) which are positioned in the outer sheet metal member between the ends of the depression **18** and the ends of the outer sheet metal member, thus providing a connection for the fluid to be cooled.

The inner and outer sheet metal members **10** and **11** are preferably constructed of stainless steel but may be made of any metals which are capable of being secured together by resistence welding. The inner sheet metal member **10** may also serve as a portion of the external shell of a radiator tank **27** which has end portions **26**. If the inner sheet metal member **10** takes the form of the radiator tank **27**, there may be provided as best shown in FIGURES 1, 4 and 5, a flange **23** which may be used to receive a radiator core **29** an end portion **24** having an aperture **25** for the reception of a cooling system connector, and the end portion **26** having an aperture **27** for the reception of a drain cock.

We claim as our invention:

The process of fabricating a heat exchanger comprising placing a pair of turbulence, inducing members between a radiator tank and a cover such that the turbulence

inducing members are in contact with said radiator tank and said cover and a space is provided between adjacent edges of the turbulence inducing members, securing said radiator tank and said cover together around the periphery of said cover, said cover being spaced from said radiator tank in the region between said turbulence inducing members, deforming said cover into contact with said radiator tank and securing it thereto between said turbulence inducing members along an appreciable portion of their length, thereby forcing said cover and said radiator tank into tight heat transferring relation with said turbulence inducing members.

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