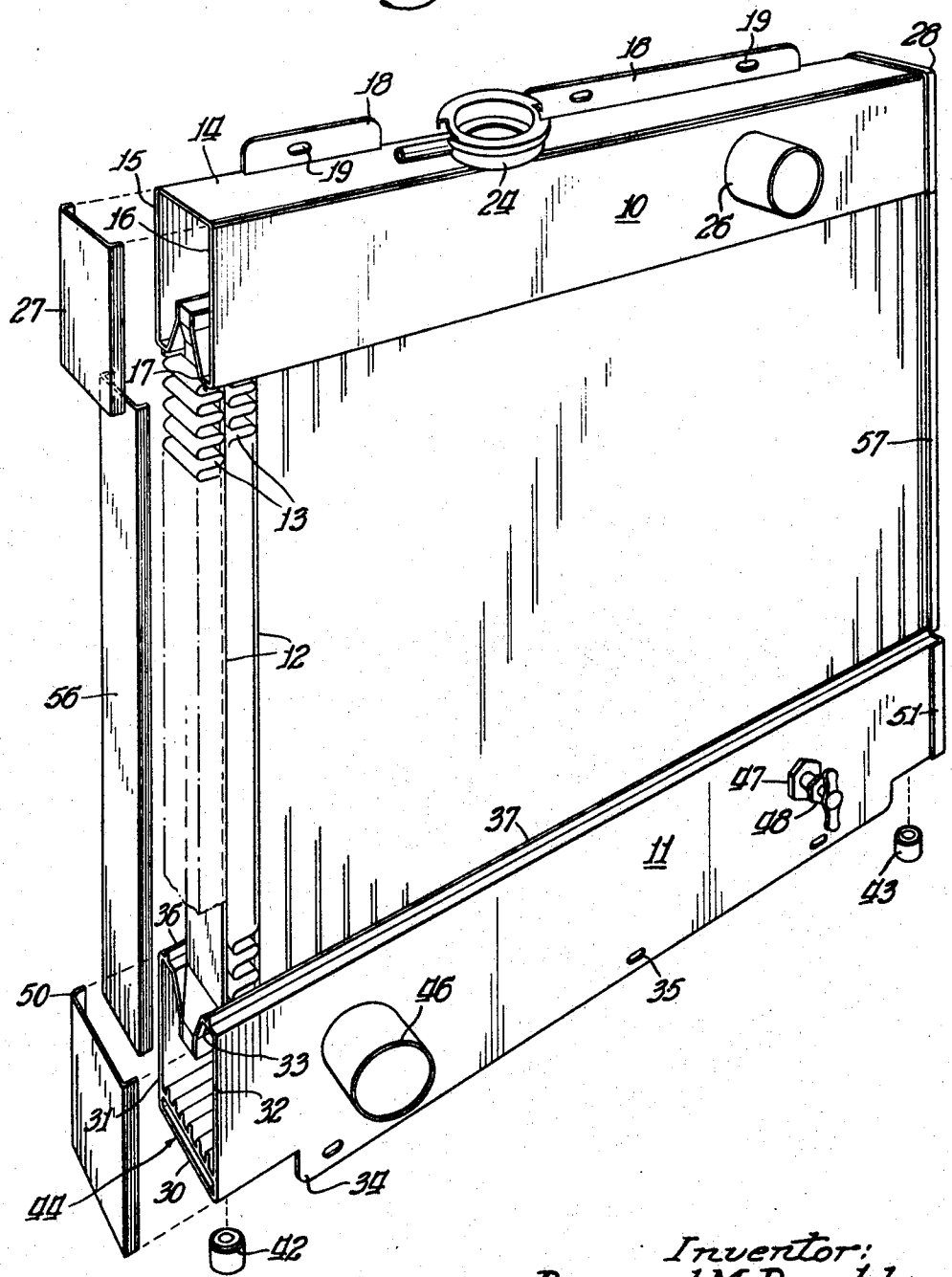
March 3, 1970 D. M. DONALDSON 3,497,936

METHOD OF MAKING A HEAT EXCHANGER

Original Filed Nov. 14, 1963 2 Sheets-Sheet 1

Fig. 1



Inventor:
Desmond M. Donaldson
By: John H. Butcher

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Original Filed Nov. 14, 1963 2 Sheets-Sheet 2

Fig. 3

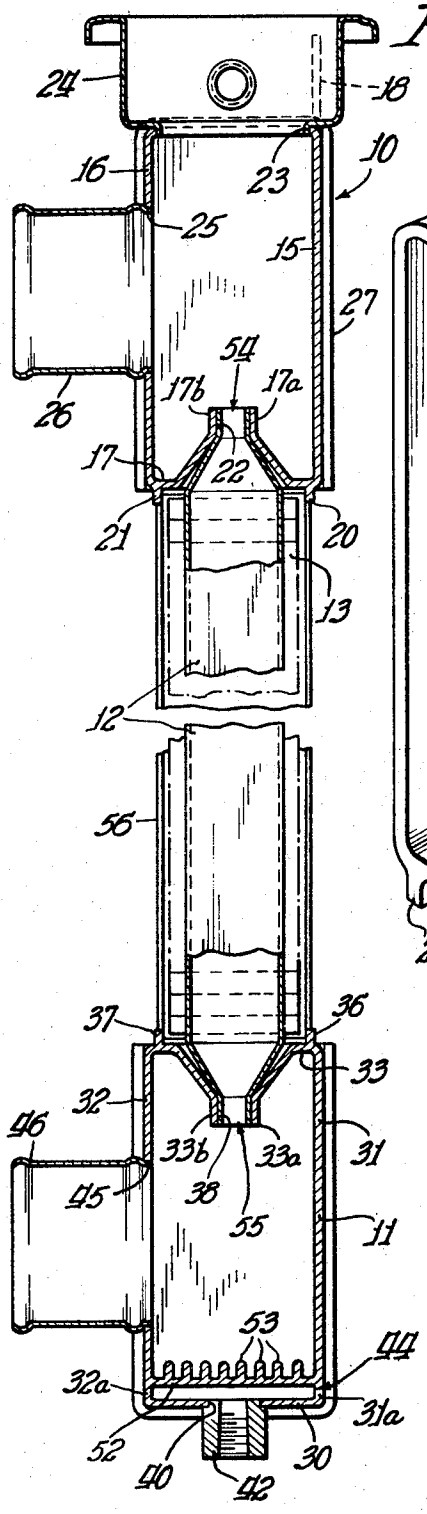
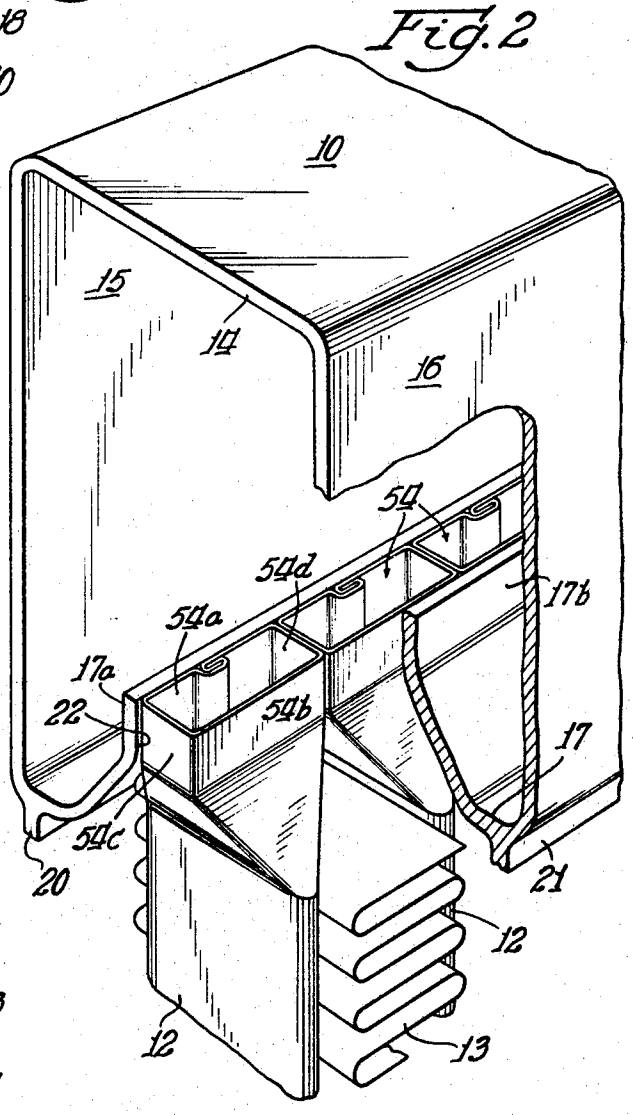


Fig. 2



Inventor:
Desmond M. Donaldson
By: John H. Butcher
Atty.

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METHOD OF MAKING A HEAT EXCHANGER

Desmond M. Donaldson, Oakville, Ontario, Canada, assignor to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois

Original application Nov. 14, 1963, Ser. No. 323,654, now Patent No. 3,265,126, dated Aug. 9, 1966. Divided and this application Feb. 25, 1966, Ser. No. 555,654

Int. Cl. B23p *15/26*

U.S. Cl. 29—157.3 2 Claims

ABSTRACT OF THE DISCLOSURE

A method of making a heat exchanger which includes forming an oil cooler and a mounting flange for mounting the heat exchanger to a structure as an integral part of one of the header tanks of the heat exchanger.

This application is a division of application Ser. No. 323,654, Desmond M. Donaldson, entitled "Heat Exchanger," filed Nov. 14, 1963, now issued U.S. Patent No. 3,265,126, issued Aug. 9, 1966.

The present invention relates to heat exchangers and more particularly to a heat exchanger for cooling the liquid coolant of an internal combustion engine.

The present automobile radiator uses a two part tank or header on each end of a radiator core. The two parts of the header are usually joined by some type of soldered seam. The tubes of the radiator core are connected and soldered individually to the headers. The fabrication of this multitude of soldered joints is expensive and provides many opportunities for coolant leaks, both in manufacture and service.

The primary object of the present invention, therefore, is to provide a radiator which is easily and inexpensively fabricated and wherein the possibility of leakage is reduced considerably.

The present invention contemplates the use of extruded or roll-formed sections in making the headers, and the utilization of a particular tube end and header construction to provide a substantially continuous opening between the headers and the tubes. It is further contemplated that mounting flanges for the radiator, the oil cooler, and support means for the radiator fins be formed as an integral extrusion or roll-formed section.

While the primary object of the present invention relates to the reduction of expense of fabrication and the reduction of leakage in service of a heat exchanger, other objects and advantages will be apparent from the following detailed description taken in conjunction with the appended drawings wherein:

FIGURE 1 is an exploded, perspective view of a heat exchanger made in accordance with the present invention;

FIGURE 2 is an enlarged fragmentary perspective view, partially in section, of the header and tube construction of the heat exchanger of FIGURE 1; and

FIGURE 3 is a cross-sectional view of the heat exchanger.

Referring to the drawings, there is disclosed in FIGURE 1 a heat exchanger in accordance with the present invention which comprises, in general, a pair of parallel, elongated tanks or headers **10**, **11** and a plurality of spaced tubes **12** extending between and in fluid communication with the tanks **10**, **11**. A plurality of convoluted fins **13** are provided in the spaces between the tubes **12**.

An important aspect of the present invention is the use of extrusions, preferably formed of aluminum, for the tanks **10** and **11**. The tank **10** is a modified rectangular extrusion comprising a top wall **14**, side walls **15** and **16**, and a bottom wall **17**. The top wall **14** has a projecting flange **18** thereon which, as extruded, is a continuous

flange, but a portion thereof is removed as seen in FIGURE 1 and apertured at **19** to provide a mounting flange for the heat exchanger. The bottom wall **17** of the extruded tank **10** has a pair of downwardly extending projections **20**, **21** thereon, as seen in FIGURE 2, which direct the air flow away from space **17***c* between the top of fins **13** and the bottom wall **17**, and into the fin and tube area of the heat exchanger. The projections **20**, **21** thus prevent the short circuiting of air through the space **17***c*. The bottom wall **17** has a pair of spaced, upwardly extending members **17***a* and **17***b* thereon which form a longitudinally extending channel **22** for receiving the ends of the tubes **12**. An aperture **23** is provided in the top wall **14** for a coolant supply and overflow fitting **24**, and an aperture **25** is provided for the coolant inlet tube fitting **26**. A pair of caps **27**, **28** are welded or otherwise suitably secured to the ends of the tank **10**.

The bottom tank **11** is an extrusion of substantially the same configuration as tank **10**. As seen in FIGURE 3, the tank **11** has a bottom wall **30**, side walls **31** and **32**, and a top wall **33**. The bottom wall **30** has a projecting flange **34** thereon which, like the flange **18** of tank **10**, has a portion thereof removed and apertures **35** formed therein to provide a mounting flange. The top wall **33** has a pair of upwardly extending projections **36**, **37** thereon which serve to retain the bottom ends of the fins **13**. The top wall **33** also has a pair of spaced, downwardly extending members **33***a* and **33***b* which form a longitudinally extending channel **38** for receiving the bottom end of the tubes **12**. The bottom wall **30** of the tank **11** has an aperture **40** therein which receives a fitting **42** for an oil cooler **44**. An oil cooler fitting **43** is also provided in the wall **30**. An aperture **45** is provided in the wall **32** for receiving a coolant outlet fitting **46**. A drain boss **47** and valve **48** are provided in the wall **32**. A pair of caps **50**, **51** are welded or otherwise suitably secured to the ends of the tank **11**.

Another important aspect of the present invention is the formation of the oil cooler **44** as an integral part of the bottom tank **11**. The oil cooler **44** is formed by an extruded partition **52**; bottom ends **31***a*, **32***a* of the side walls **31**, **32**; and the bottom wall **30**. Heat exchange fins **53** are formed on the partition **52**. By forming the partition **52** with its fins **53** by extrusion to provide the oil cooler **44**, the costs and problems of assembling a separate oil cooler in the bottom tank are substantially eliminated, as well as the possibility of leakage and contamination of the coolant and/or the oil.

Another important aspect of the present invention relates to the construction of the ends of the tubes **12** and their relationship to the channels **22** and **38** of the tanks **10** and **11**, respectively. The tubes **12**, which are relatively flat to provide space therebetween for the heat exchange fins **13**, are expanded at both ends thereof to provide rectangular-shaped openings **54**, **55**. The opening **54** is defined by side walls **54***a*, **54***b* and end walls **54***c*, **54***d*. When the heat exchanger is assembled, the end walls **54***c* are placed in contact with the end walls **54***d* of the adjacent tube **12** and the side walls **54***a*, **54***b* are placed in contact with the upwardly extending members **17***a*, **17***b*, respectively. The areas of contact of the tubes with each other and with members **17***a*, **17***b* are provided with a weld or other suitable sealant. The bottom ends of the tube **12** are assembled in the channel **38** in the same manner. The aforedescribed flared tube and channel construction eliminates the need of a separate multiple apertured wall in the headers of a heat exchanger.

A pair of plates **56**, **57** are welded or otherwise suitably secured to the projections **20**, **21**–**36**, **37**, respectively, to support the outermost fin **13** of the heat exchanger.

While the description of the present heat exchanger has been more or less limited to a radiator for an internal

combustion engine, it will be understood by those skilled in the art that this is only one of many embodiments of the invention, which invention obviously has many other applications in the heat exchange art.

I claim:

1. The method of making a heat exchanger including extruding a header tank such that an oil cooler is positioned within said header tank and formed as an integral part of said tank; forming another header tank; and connecting a plurality of spaced tubes to said tanks at opposite ends thereof.

2. The method of making a heat exchanger as in claim 1, including forming mounting means as an integral part of one of said header tanks for mounting the heat exchanger to structure.

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JOHN F. CAMPBELL, Primary Examiner

D. C. REILEY, Assistant Examiner

U.S. Cl. X.R.

29—33; 113—118