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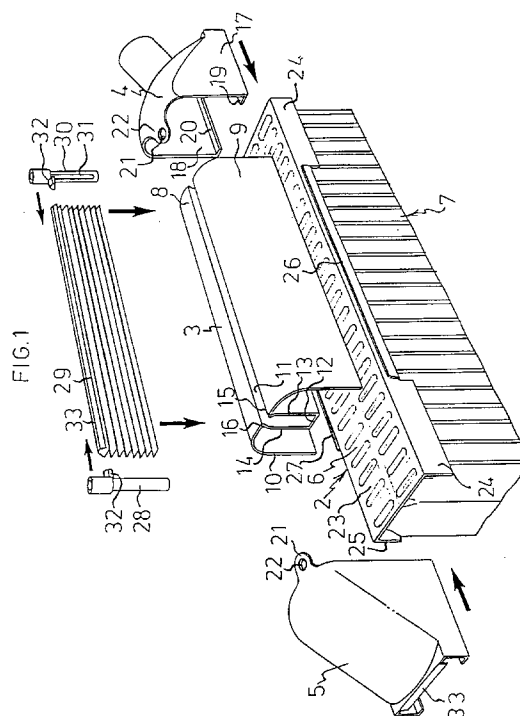
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(54) **Heat exchanger.**

(57) A heat exchanger integrated in another heat exchanger and having a closed chamber, through which the fluid to be treated is flowed, an inlet and an outlet (30) for the fluid, and a surface extender (29) disposed in the chamber, said chamber comprising an external groove (11) formed in a tank of the other heat exchanger and a means for sealing the groove, the sealing means comprising a portion (33) of the surface extender (29) which seals the longitudinally extending opening of the groove (11).



The present invention relates to a heat exchanger.

In motor vehicles such as cars, trucks, boats, etc., various types of heat exchanger are used. The engine of a vehicle is cooled with liquid by a vehicle cooler, while an oil cooler is used to cool gearbox oil, hydraulic oil, etc., which is used to drive hydraulically powered devices in the vehicle.

5 Developments in engine design call for vehicle coolers and oil coolers offering ever greater and greater cooling capacity, while, at the same time, the available space for the location of these devices is becoming increasingly limited as a result of higher design requirements upon the vehicle.

Heightened environmental requirements with increased requirements for the recovery of components forming part of the car mean that the parts belonging to these devices should be made of the same material.

10 A conventional solution is for the oil cooler for cooling to make use of the liquid in a tank belonging to the vehicle cooler. One solution, which is satisfactory per se, is shown in SE-A-9303659-8. In the SE-document it is shown how the tank of a previously known vehicle cooler is utilized as part of an oil cooler, i.e. the oil cooler has a common limit wall with the vehicle cooler tank. This is realized by virtue of the fact that the roof 19 of the tank has a drawn-in portion, which, together with a rectangular plate 14, forms a pipe in which there is placed
15 a surface extender. The pipe then has an inlet and an outlet to form a complete oil cooler. The parts of the oil cooler, like other parts in the associated vehicle cooler, are interconnected by hard-soldering in a vacuum furnace.

The risk of water leaking into the oil is thereby reduced and the configuration of a vehicle cooler and oil cooler entirely in metal, preferably an aluminum alloy, is thereby simplified.

20 The above solution does however have an important drawback. In the hard-soldering of the rectangular plate onto the drawn-in portion, external fixtures are required to hold the plate in the desired position during the soldering procedure. These fixtures increase the manufacturing costs, either directly through the cost of the fixtures or indirectly by these having to be secured prior to soldering. Manual attachment of the external fixtures also entails risks that the plate will end up slightly awry, this leading directly to undesirable soldering
25 results.

There is therefore a need for a better solution relative to the known methods.

One feature of an embodiment of the invention is a heat exchanger which has common boundary walls with another heat exchanger and which, in the assembly, is entirely self-securing.

Another feature is the elimination of the need for a separate plate.

30 According to the present invention there is provided a heat exchanger having a chamber, through which flows the fluid to be treated, an inlet and an outlet for the fluid, and a surface extender disposed in the chamber, said chamber comprising an external groove formed in a wall portion of a further heat exchanger, and sealing means for sealing the groove, characterised in that the sealing means comprises a portion of the surface extender which seals the longitudinally extending opening of the groove.

35 Preferred embodiments of the invention are defined in the subordinate patent claims.

The invention shall now be described, by way of illustration, with reference to appended drawings, in which:
Fig. 1 is an exploded view showing a heat exchanger according to the invention.

Fig. 2 is a sectional view showing a cross section of the heat exchanger.

In the figures, like reference numerals indicate like parts.

40 Fig. 1 shows an oil cooler, and a vehicle cooler tank which is generally denoted by 2 and which forms part of the oil cooler. The vehicle cooler tank 2 has an elongate middle piece 3, two end pieces 4, 5 and an elongate end plate 6. The end plate 6 is connected to a heat-exchanger assembly 7, which, together with the cooler tank, forms part of a vehicle cooler.

45 The middle piece 3 consists of a bent or rolled, principally U-shaped sheet having a web 8 and two flanges 9, 10. Said web 8 is provided, in its middle portion, with an elongate groove 11 having a base wall 12 and two side walls 13, 14. The side walls 13, 14, in their uppermost portions at the transition to said web, are slightly angled or conical in the inward direction towards the middle of the groove, thereby forming the undercut surfaces 15, 16.

50 The end pieces 4, 5 are cup-shaped and are formed along their sides with guide flanges 17, 18 for fitting together with the end plate 6. The guide flanges 17, 18 also have fixing lips 19, 20 extending essentially perpendicularly inwards from the guide flanges 17, 18. The mouth of the cup is provided with a connecting tongue 21 in which there is incorporated a hole 22. The end face of the end piece has, furthermore, a fixing tongue 33.

55 The end plate 6 consists of a U-shaped sheet, which has a web 23, forming the base of the vehicle cooler tank, and two flanges 24, 25. The flanges 24, 25, along a portion which corresponds in length to the length of the middle piece and extends from the middle of the end plate and outwards, are bent outwards and upwards to form principally V-shaped grooves 26, 27. The V-shaped grooves are arranged for the reception of the edge portions of the flanges 9, 10 of the middle piece, while the outer portions of the flanges 24, 25 of the end plate,

i.e. those which are not bent, are arranged to receive the guide flanges 17, 18 of the end pieces 4, 5, as can be seen from the arrows in the figure.

The oil cooler has inner limit walls in the form of the base wall 12 and side walls 13, 14 of the groove 11. The oil cooler further comprises an elongate, essentially zig-zag shaped surface extender 29 and two connecting pipes 28, 30. The surface extender 29 has a wedge-shaped upper portion 33 with an essentially flat top surface and two obliquely angled side surfaces, while the connecting pipes 28, 30 have an open and a closed end and are designed having an axial slot 31 in their one circumferential portion. The connecting pipe 28, 30 has moreover, at its upper open end, a guide pin 32.

It can be seen from Fig. 2 that the surface extender 29 is placed in the groove 11 so that its base bears against the base wall 12 of the groove and its wedge-shaped portion 33 bears with its side surfaces tightly against the undercut, conical surfaces 15, 16 of the side walls 13, 14 in the groove, the conical portion 33 of the surface extender 29, together with the undercut, conical surfaces 15, 16, forming the top wall of the oil cooler.

This is realized by virtue of the fact that the middle piece 3 is pressed apart at the groove 11 to enable the surface extender 29 to be placed in the groove 11. Furthermore, the surface extender is slightly biased in the groove upwards against the undercut surfaces 15, 16, thereby enabling the tight contact between the side surfaces of the wedge-shaped portion 33 of the surface extender and the undercut surfaces 15, 16. The bias is realized by virtue of the fact that the surface extender 29, before being placed in the groove, is longer than the depth of the groove, i.e. the surface extender 29 is slightly compressed in the groove 11.

In the assembled position of the vehicle cooler tank, the middle piece is disposed on top of the end plate, the lower portions of the respective flanges 9, 10 being disposed in the grooves 26, 27 such that the edges of the flanges rest against the base of the V-shaped grooves. The outer, free flanges of the grooves 26, 27, i.e. the bent-up part of the flanges, are clamped for contact against the flanges of the middle piece. The end pieces 4, 5 are then slid onto the end plate 6 so that their guide flanges 17, 18 are disposed outside and bear against the flanges 24, 25 of the end plate 6. The fixing lips 19, 20 are folded inwards round the edges of the flanges 24, 25, while the fixing tongue 33 is folded round the end-face edge of the end plate. All for the purpose of fixing the end piece to the end plate.

The connecting pipes 28, 30 are connected to the end pieces 4, 5 by their upper open end being disposed in the hole 22 incorporated in the connecting tongue 21 of the end piece 4, 5.

In the assembled position of the vehicle cooler tank, the connecting pipes 28, 30 are herein disposed at the respective end of the surface extender 29 with their axial slot 31 directed towards said surface extender. The pipes 28, 30 are fixed in the correct position by means of the guide pin 32, which engages in the wedge-shaped portion 33 of the surface extender 29. The sealing of the ends of the groove 11 is realized by the connecting pipes also being connected to the groove 11 of the middle piece 3 and by the outermost portions of the side walls 13, 14 and the base wall 12 of the groove 11 wholly or partially enclosing the circumferential surface of the pipe.

The oil cooler is therefore formed by the two connecting pipes 28, 30, of which the one comprises an inlet pipe and the other an outlet pipe, by the surface extender 29 and by the groove 11 of the middle section 3. The limit walls of the oil cooler are therefore constituted by the side walls and base wall of the groove, as well as the top wall formed by the wedge-shaped portion of the surface extender together with the undercut, conical surfaces 15, 16, and it is sealed at the ends of the groove 11 by the fact that the end portions of the groove 11 wholly or partially enclose the circumferential surface of the connecting pipes.

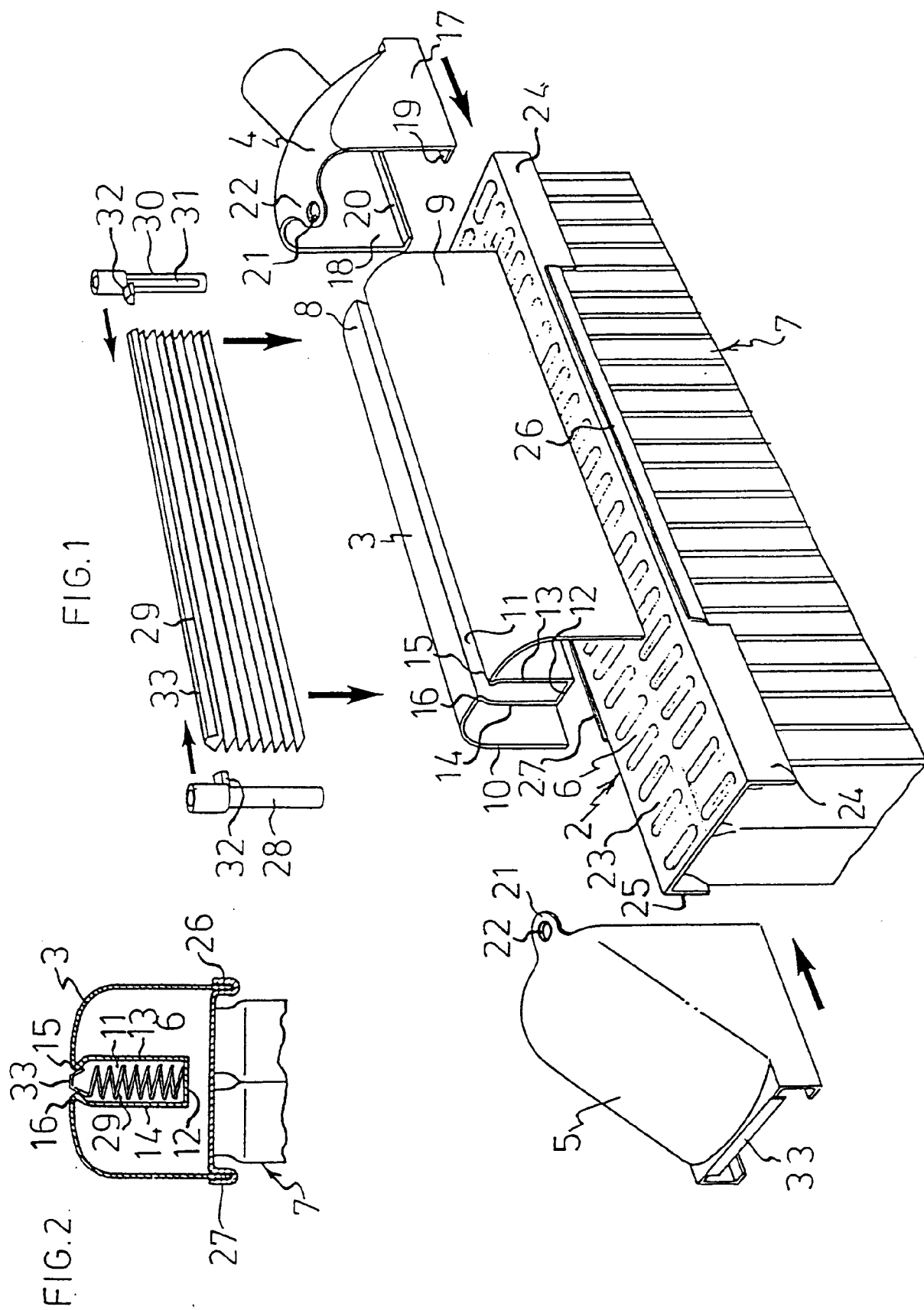
The oil cooler therefore operates in such a way that oil is conducted into the groove 11 through one of the connecting pipes 28, 30, flows through the groove 11 and is simultaneously cooled by heat exchange between the warm oil and the cooler liquid located in the vehicle cooler tank, whereafter the oil flows out of the oil cooler through the other connecting pipe.

All parts belonging to the oil cooler and vehicle cooler tank are made from an aluminum alloy to enable the parts to be joined together by hard-soldering in a vacuum furnace. The hard-soldering is made possible by the fact that all of the oil cooler, as, incidentally, of the vehicle cooler also, is fixed together by virtue of the specific design of the oil cooler and vehicle cooler, the parts lying tightly against one another.

The invention therefore yields the major advantage that the surface extender is utilized as a limit wall to the oil cooler, thereby eliminating the top plate which would otherwise be required to seal the oil cooler against the longitudinally extending opening of the groove. At the same time, the surface extender, like other parts belonging to the oil cooler, is self-fixing, whereupon the need for external fixtures in the subsequent soldering procedure is eliminated.

Claims

1. A heat exchanger having a chamber, through which flows the fluid to be treated, an inlet and an outlet (30) for the fluid, and a surface extender (29) disposed in the chamber, said chamber comprising an external groove (11) formed in a wall portion of a further heat exchanger, and sealing means for sealing the groove, characterised in that the sealing means comprises a portion (33) of the surface extender (29) which seals the longitudinally extending opening of the groove (11).
2. A heat exchanger as claimed in claim 1, wherein the sealing portion (33) of the surface extender is wedge-shaped for contact-bearing against undercut surfaces (15, 16) of the groove at said opening.
3. A heat exchanger as claimed in claim 2, wherein the surface extender (29) is resilient in the vertical direction and, in the free state, is slightly higher than the depth of the groove (11), the surface extender (29), following insertion in the groove, being biased such that the sealing portion (33) is pressed against the undercut surfaces.
4. A heat exchanger as claimed in any of claims 1-3, in which the groove (11) is open at its ends, wherein the inlet and the outlet consist of a pipe (30), whose one end is open and whose other end is closed and which has an axial slot (31) in its circumferential portion facing the groove (11); and wherein the pipes (30) close the respective end of the groove (11) by bearing against the walls (13, 14) of the groove.
5. A heat exchanger as claimed in claim 4, wherein the pipe (30) has a pin (32) which slides into the groove (11) to engage with the surface extender (29) and thereby position the pipe (30) in relation to the groove (11).
6. A heat exchanger as claimed in claim 5, wherein the pin (32) is wedge-shaped for engagement with the sealing portion (33) of the surface extender (29).





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 30 2337.1

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.6)
A	US, A, 4834171 (LARRABEE ET AL), 30 May 1989 (30.05.89) --	1-6	F28F 9/02
A	US, A, 4903760 (JOSHI ET AL), 27 February 1990 (27.02.90) --	1-6	
A	DE, B, 1277282 (BORG-WARNER CORPORATION), 12 September 1968 (12.09.68) -----	1-6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.6)
			F28F F28D F01P
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
STOCKHOLM		4 July 1995	ANNETTE RIEDEL
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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