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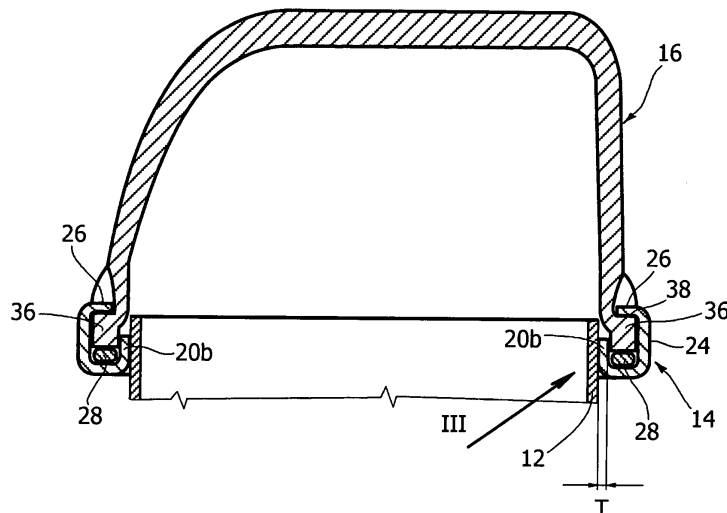
(54) **A heat exchanger, in particular an intercooler for motor vehicles**

(57) Described herein is a heat exchanger, in particular an intercooler for motor vehicles, comprising:
 - a plurality of pipes (12) parallel to one another;
 - a metal bottom plate (14) formed by a metal plate of constant thickness (T) sheared and bent and having a plurality of collars (20), inserted within which are the ends of the respective pipes (12);

- a manifold tank made of plastic material (16) fixed by clinching to the bottom plate (14); and
 - an annular gasket (28) compressed between an outer rim (36) of the manifold tank (16) and a base surface (22) of the bottom plate (14).

The distance between the outer surface of the pipes (12) and the gasket (28) is equal to the thickness of the walls (20b) of said collars (20).

FIG. 2



Description

[0001] The present invention relates to a heat exchanger, in particular an intercooler for motor vehicles.

[0002] More precisely, the invention relates to a heat exchanger comprising: a plurality of pipes parallel to one another, a metal bottom plate formed by a metal plate of constant thickness sheared and bent and having a plurality of collars inserted in which are the ends of respective pipes; a manifold tank made of plastic material and fixed by clinching to the bottom plate; and an annular gasket of a substantially rectangular shape, which surrounds the aforesaid collars and is compressed between a seat of the bottom plate and a rim of the manifold tank.

[0003] The purpose of the present invention is to provide a heat exchanger of this type that, given that all the other characteristics are the same, will be more compact than heat exchangers of a known type.

[0004] According to the present invention, the above purpose is achieved by a heat exchanger having the characteristics forming the subject of the claims.

[0005] The present invention will now be described in detail with reference to the attached drawings, provided purely by way of non-limiting example, in which:

- Figure 1 is a partial perspective view of a heat exchanger according to the present invention;
- Figure 2 is a cross-sectional view according to the line II-II of Figure 1;
- Figure 3 is an enlarged detail of the part indicated by the arrow III in Figure 2;
- Figure 4 is a perspective view of the bottom plate of a heat exchanger according to the present invention;
- Figure 5 is a perspective view of the gasket of a heat exchanger according to the present invention;
- Figure 6 is a perspective view illustrating the gasket mounted in the bottom plate;
- Figure 7 is a cross-sectional view corresponding to that of Figure 2 of a heat exchanger according to the prior art; and
- Figure 8 is an enlarged cross-sectional view of the part indicated by the arrow VIII in Figure 7.

[0006] With reference to Figure 1, designated by 10 is a heat exchanger for motor vehicles according to the present invention. The heat exchanger 10 illustrated in the figures is an intercooler designed to cool a flow of air upstream of the intake manifold of the vehicle.

[0007] The heat exchanger 10 comprises a plurality of pipes 12 with an oblong cross section arranged with their respective longitudinal axes parallel to one another.

[0008] The ends of the pipes 12 are fixed to two bottom plates 14, only one of which is visible in Figure 1. A manifold tank 16 made of injection-moulded plastic material is fixed by clinching to each bottom plate 14.

[0009] With reference to Figure 4, each bottom plate 14 of the heat exchanger 10 is obtained by shearing and bending starting from a metal plate of constant thickness

T. The bottom plate 14 has an array of holes 18, which are designed to receive the respective ends of the pipes 12. The holes 18 are provided with respective collars 20 formed by bent-up edges of the openings 18. The openings 18 have a flattened rectangular shape, and each collar 20 has two larger walls 20a and two smaller walls 20b set substantially according to the faces of a parallelepiped.

[0010] The bottom plate 14 has a plane base surface 22 that surrounds the collars 20. The base surface comprises first parts of surface 22a comprised between two adjacent larger walls 20a of the collars 20 and second parts of surface 22b comprised between the smaller walls 20b of the collars 20 and an outer edge 24 bent in a direction orthogonal to the base surface 22. The base surface 22 further comprises two parts of surface 22c comprised between the larger walls 20a of the two collars 20 arranged at the ends of the array and the outer edge 24.

[0011] The outer edge 24 has two larger walls 24a, which delimit the parts of surface 22b and face the smaller sides 20b of the collars 20. The outer edge 24 has two smaller sides 24b, which delimit the parts of surface 22c and face the outer larger sides 20a of the collars 20 located at the ends of the array. The outer edge 24 is provided with a plurality of teeth 26, which are to be bent to provide the connection by clinching between the bottom plate 14 and the manifold tank 16.

[0012] The walls 20a, 20b of the collars 20, the outer edge 24, and the base wall 22 of the bottom plate 14 all have the same thickness T, since the bottom plate 14 is obtained starting from a plane plate of constant thickness T by operations of shearing and bending.

[0013] With reference to Figures 5 and 6, mounted in the bottom plate 14 is a gasket made of elastomeric material 28. With reference to Figure 5, the gasket 28 has a substantially rectangular annular shape, with two larger sides 30 and two smaller sides 32. Preferably, the larger sides 30 of the gasket 28 are provided with a plurality of protuberances 34 on their inner side.

[0014] Figure 6 shows the gasket 28 housed in the bottom plate 14. The seat that receives the gasket 28 is formed by the parts 22b and 22c of the plane base surface 22. The larger sides 30 of the gasket 28 are housed in the parts of surface 22b, and the smaller sides 32 of the gasket 28 are housed in the parts of surface 22c. The protuberances 34 of the gasket 28 are arranged in the areas of connection between the stretches of surface 22a and 22b.

[0015] Figures 2 and 3 are cross-sectional views the manifold tank 16 mounted and fixed to the bottom plate 14. As may be noted, the manifold tank 16 has a rim 36, which rests on the gasket 28. The teeth 26 of the bottom plate 14 are bent against respective surfaces 38 provided on the outer side of the manifold tank 16. Bending of the teeth 26 against the seats 38 provides a clinched connection between the manifold tank 16 and the bottom plate 14.

[0016] Once again with reference to Figures 2 and 3, it may be noted that the distance between the outer wall of the pipes 12 and the gasket 28 is equal to the thickness T of the smaller wall 20b of the collars 20.

[0017] This arrangement enables overall dimensions to be obtained that are decidedly more contained than those of known solutions.

[0018] In order to render more evident the saving in overall dimensions that is obtained with the solution according to the present invention, represented in Figures 7 and 8 is the solution according to the known art used by the present applicant prior to the present invention. In these figures, the details corresponding to the ones previously described are designated by the same reference numbers.

[0019] In the solution according to the known art, the gasket 28 is housed in a seat with a U-shaped cross section displaced laterally outwards with respect to the walls 20b of the collars in which the pipes 12 are inserted. In the traditional arrangement, the collars and the seat for the gasket are two structurally distinct and separate elements. Instead, in the solution according to the present invention, the seat for containment of the gasket 18 is defined between the walls 20a, 20b of the collars 20 and the outer edge 24 of the bottom plate 14. The walls of the collars constitute also the walls for containment of the gasket.

[0020] The above characteristic enables a considerable saving on the overall dimensions of the heat exchanger to be obtained, maintaining the level of performance altogether unvaried.

Claims

1. A heat exchanger, in particular and intercooler for motor vehicles, comprising:

- a plurality of pipes (12) parallel to one another;
- a metal bottom plate (14) formed by a metal plate of constant thickness (T) sheared and bent and having a plurality of collars (20), inserted within which are the ends of the respective pipes (12);
- a manifold tank made of plastic material (16) fixed by clinching to the bottom plate (14); and
- an annular gasket (28) compressed between an outer rim (36) of the manifold tank (16) and a base surface (22) of the bottom plate (14),

said heat exchanger being **characterized in that** the distance between the outer surface of the pipes (12) and the gasket (28) is equal to the thickness of the walls (20b) of said collars (20).

2. The heat exchanger according to Claim 1, **characterized in that** the gasket (28) is housed in a space comprised between a part of base surface

(22b, 22c) of the bottom plate (14), between walls (20b, 20a) of the collars (20) and between an outer edge (24) of the bottom plate (14), the outer edge (24) and the walls of the collars (20b, 20a) being orthogonal to said end wall (22).

3. The heat exchanger according to Claim 1, **characterized in that** the base surface (22) on which said gasket (28) rests is coplanar to parts of surface (22a) arranged between adjacent parallel walls (20a) of said collars (20).

4. The heat exchanger according to Claim 3, **characterized in that** the gasket (28) comprises a plurality of protuberances (34) set in a position corresponding to the area of connection between parts (22a, 22b) orthogonal to one another of said base surface (22).

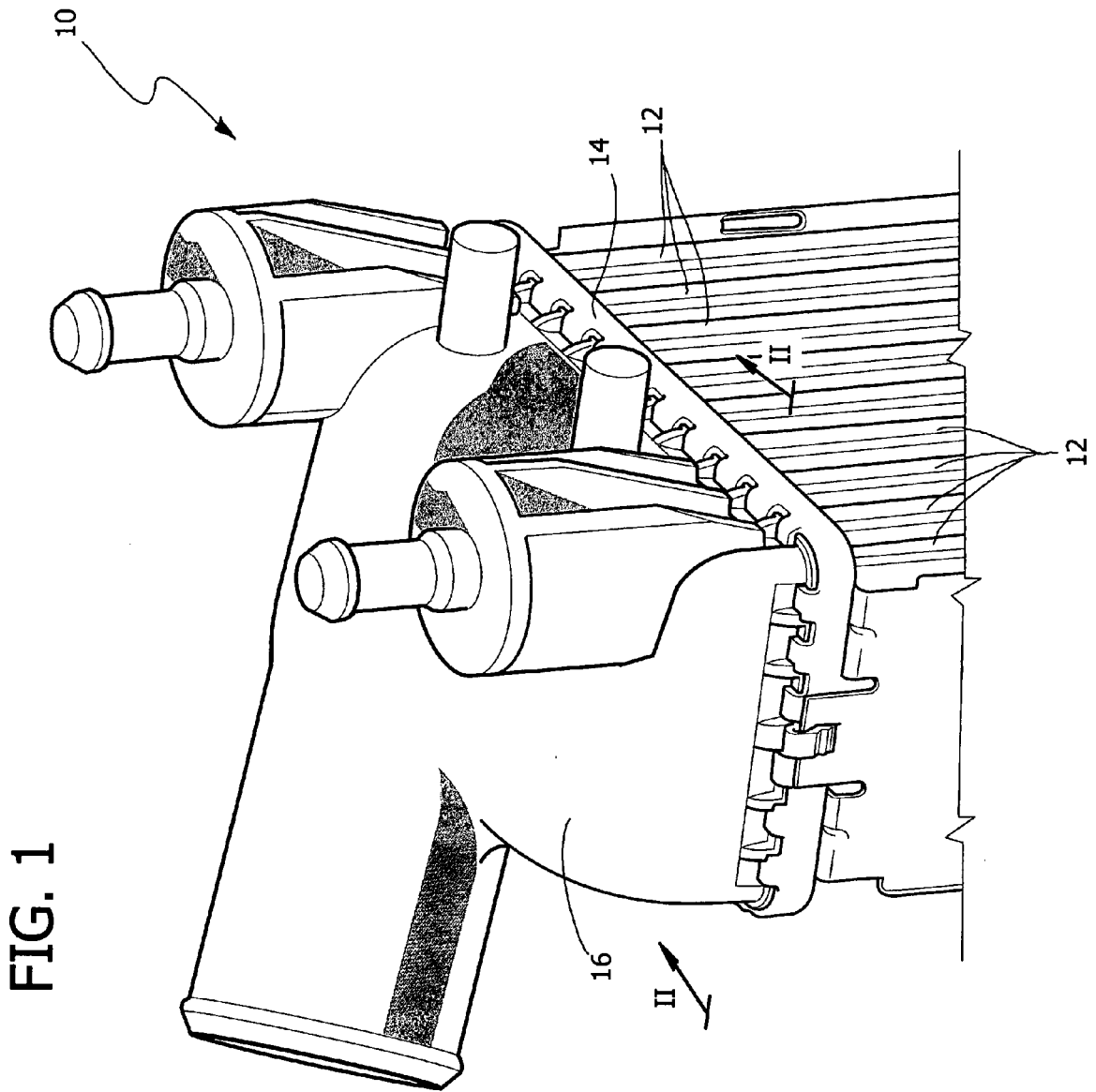


FIG. 3

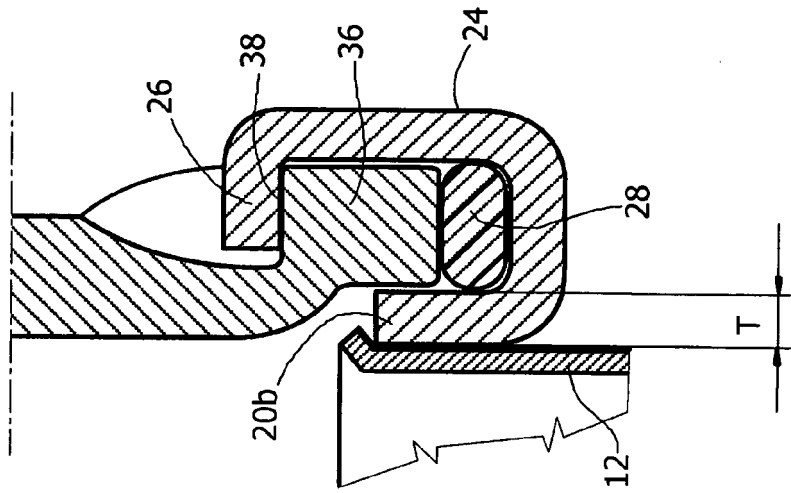


FIG. 2

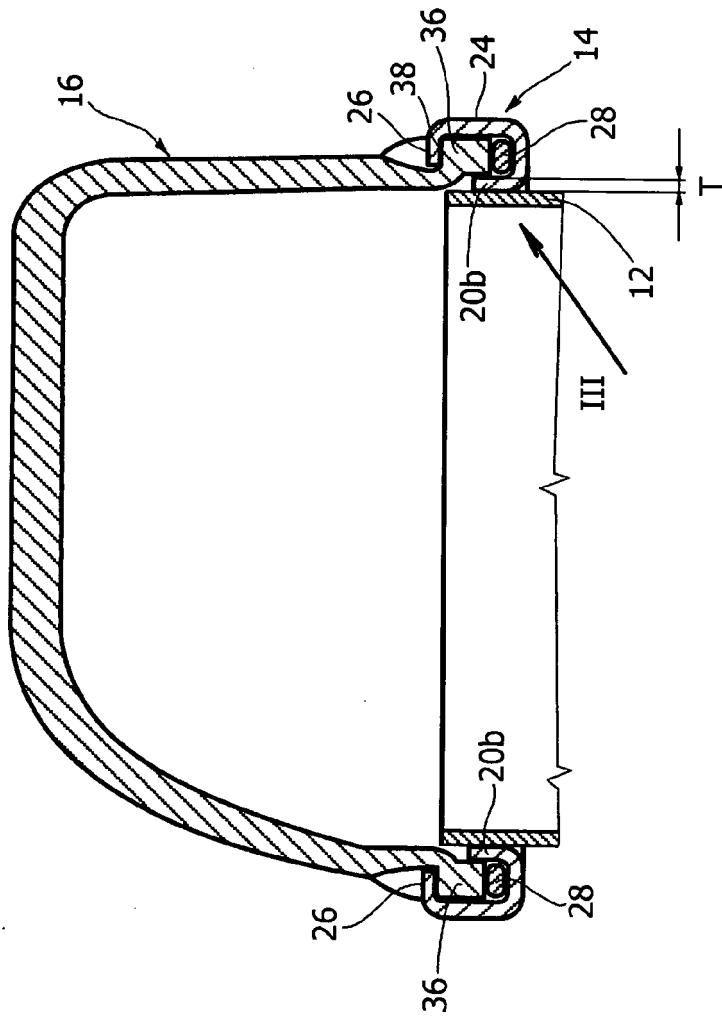


FIG. 4

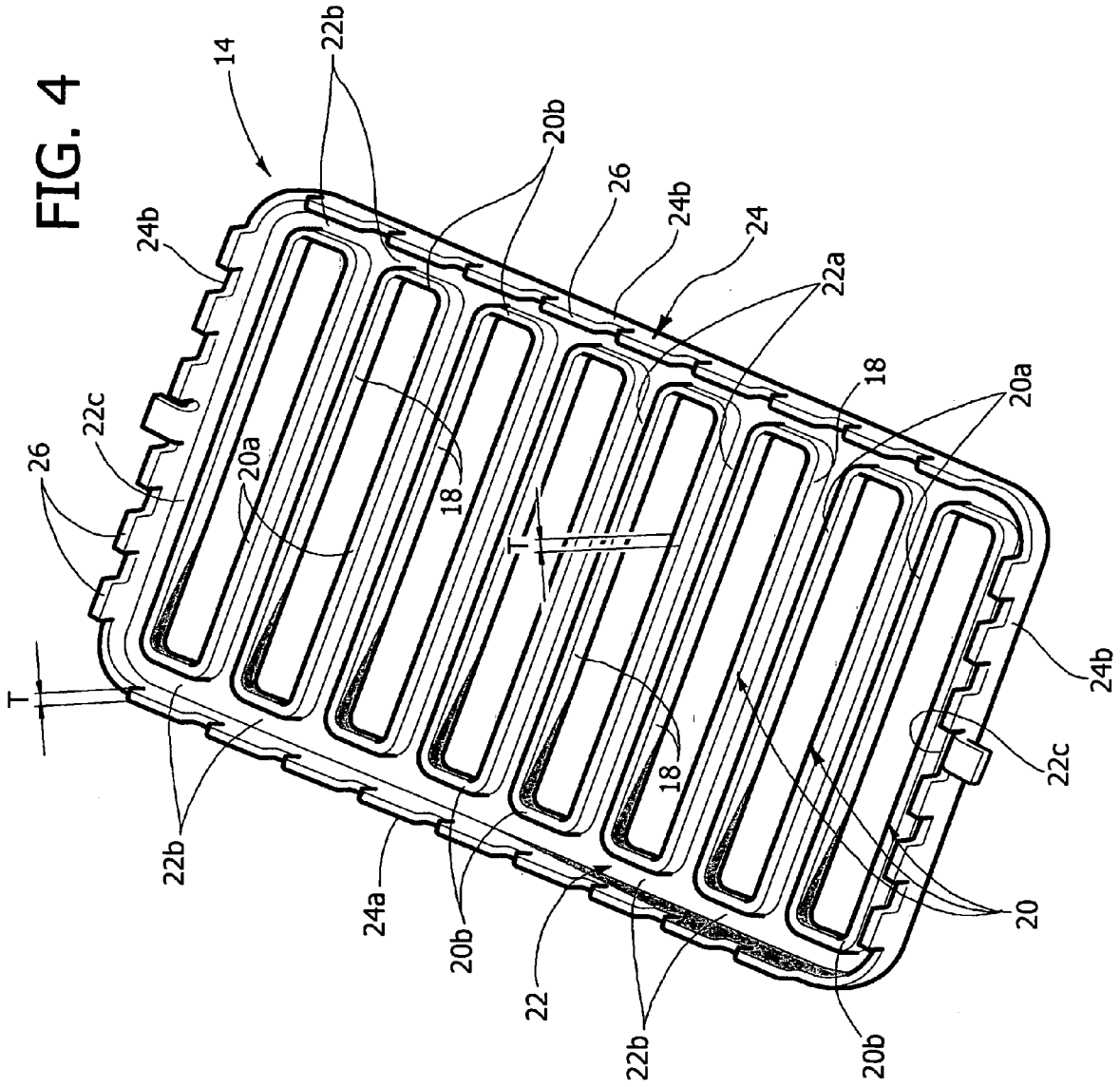


FIG. 5

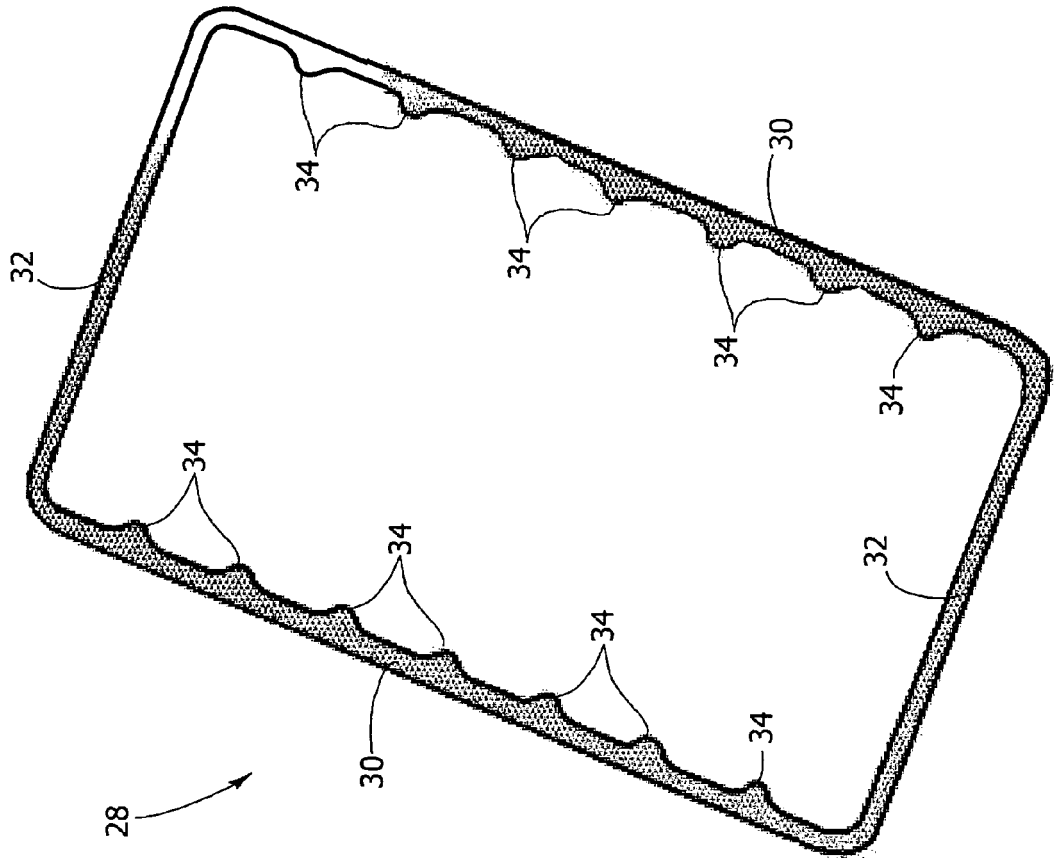


FIG. 6

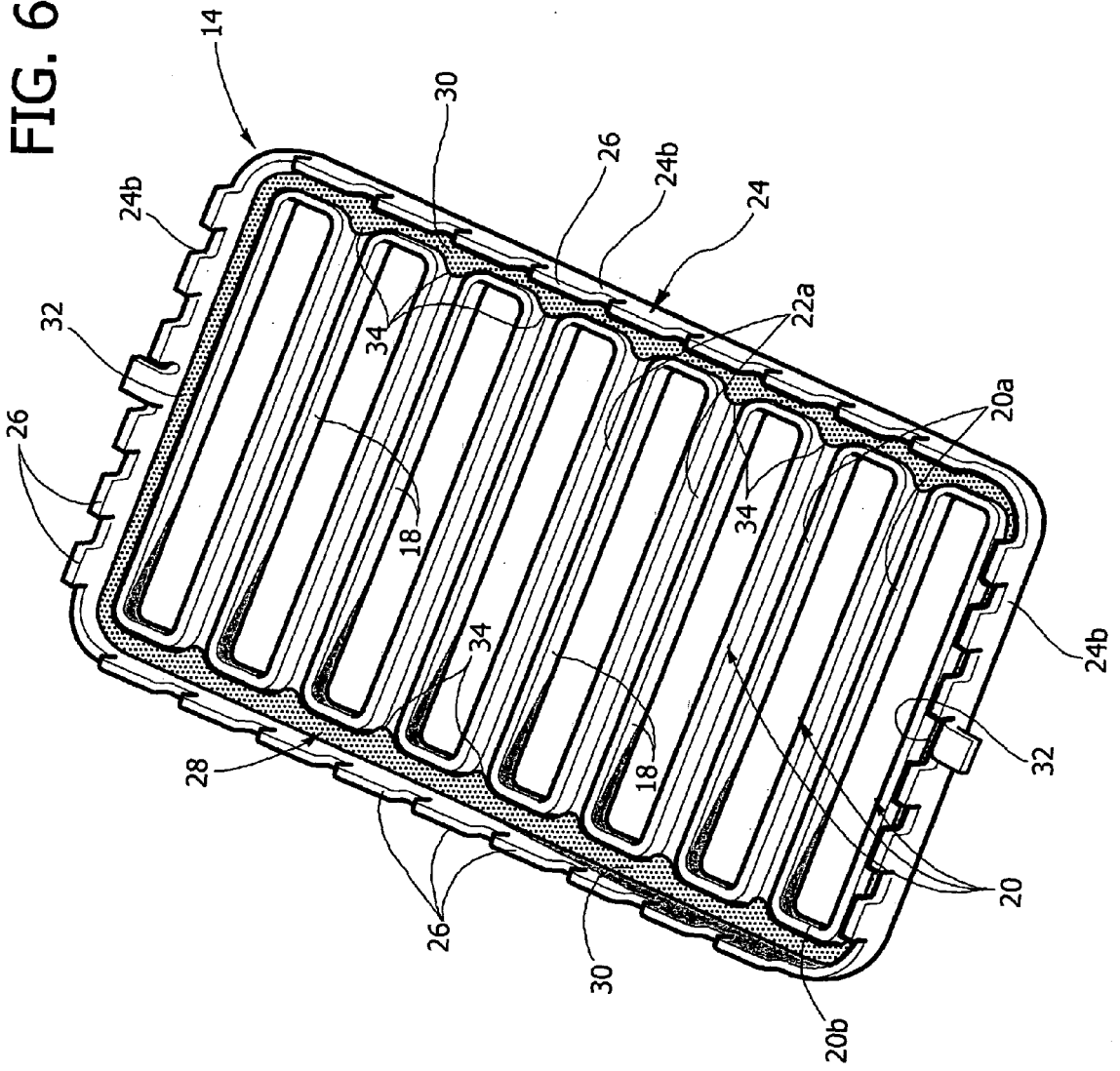


FIG. 8

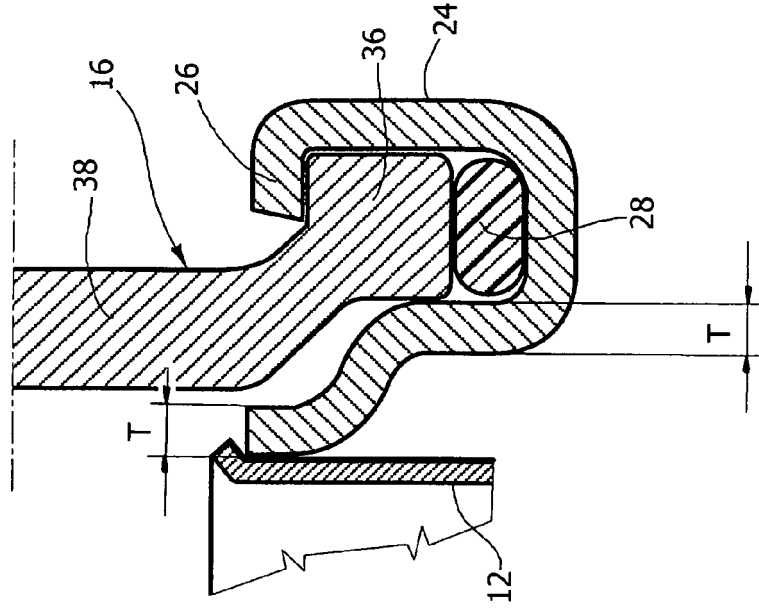
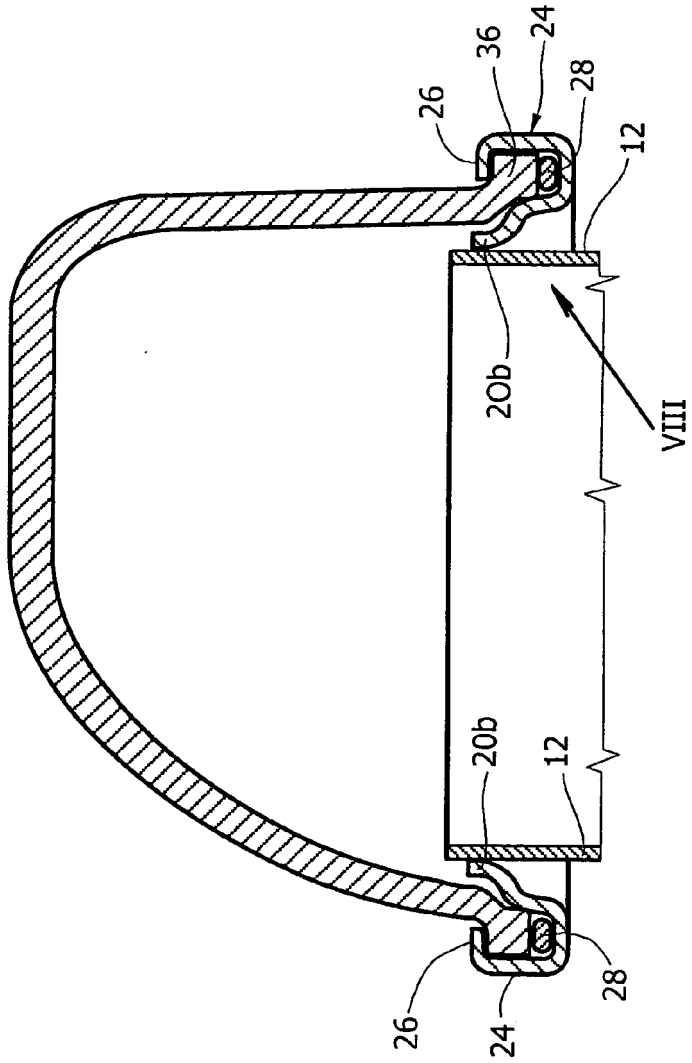


FIG. 7





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 882 428 A (VALEO SYSTEMES THERMIQUES BRAN [FR]) 25 August 2006 (2006-08-25)	1-3	INV. F28F9/02
Y	* the whole document *	4	
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X	US 2003/217838 A1 (DEY LAVOYCE [US] ET AL) 27 November 2003 (2003-11-27) * paragraphs [0056], [0057]; figure 6a *	1,2	
A	DE 10 2006 005421 A1 (BEHR GMBH & CO KG [DE]) 10 August 2006 (2006-08-10) * figure 2 *	1	
A	US 2005/051315 A1 (OZAKI TATSUO [JP] ET AL) 10 March 2005 (2005-03-10) * paragraphs [0045], [0046]; figures 1-5 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F28F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		18 April 2007	Van Dooren, Marc
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 39 8018

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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