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(71) Applicant: **VALEO AUTOSYSTEMY Sp. Z. o.o.**

32-050 Skawina (PL)

(72) Inventors:

- **Dolnicki, Wojciech**
32-050 Skawina (PL)

• **Kurowski, Boleslaw**

32-050 Skawina (PL)

• **Bedek, Adam**

32-050 Skawina (PL)

(74) Representative: **Gavin, Pablo et al**

Valeo Systèmes Thermiques

8, Rue Louis Lormand

La Verrière

78321 Le Mesnil Saint-Denis Cedex (FR)

(54) **Fastening device for a heat exchanger core, particularly for a motor vehicle**

(57) This invention relates to a fastening device (32) adapted for being attached to a heat exchanger core (12), said core having two opposite main faces (36, 30) and at least one end face (28, 30) connecting said main faces. The device is a one-part moulded component having a bottom wall and two opposite side walls depending on

said bottom wall for providing a substantially U-shaped profile adapted for engaging the main faces and the end face of the heat exchanger by a clipping effect, said component having at least one fastening feature (34) integrally moulded therewith. This invention is applicable to automotive heat exchangers.

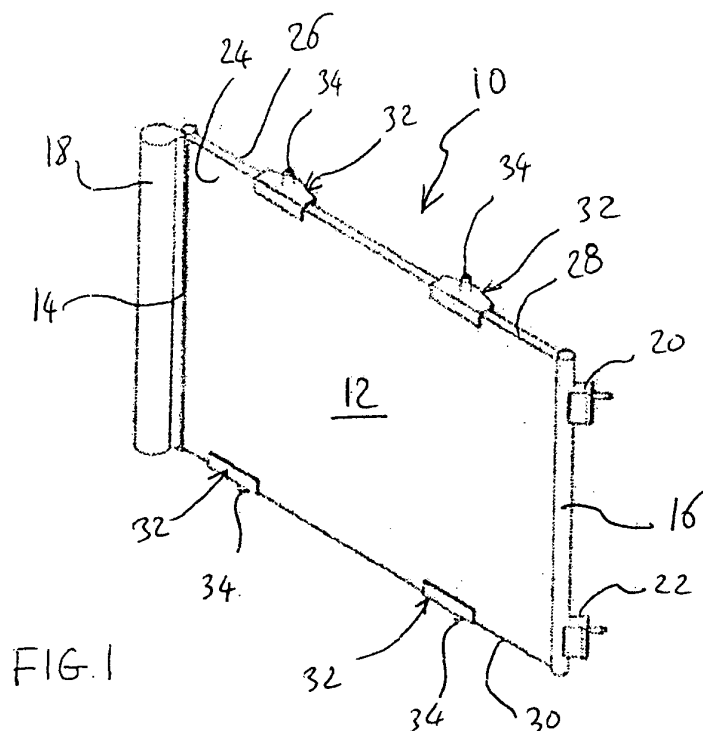


FIG. 1

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Description

[0001] This invention relates to heat exchangers, particularly for motor vehicles.

[0002] More particularly this invention concerns a fastening device for a heat exchanger core adapted for fastening said core on a structure and/or for fastening an additional part or equipment to said core.

[0003] In the particular application to motor vehicles, the fastening device may thus be used for fastening the heat exchanger core to an automotive structure and/or for fastening an equipment to said core. In this respect such a device should provide an easy mounting of the exchanger to the automotive structure and/or an easy mounting of an equipment to said heat exchanger.

[0004] A fastening device of this kind, also called holder, is known from EP 1 439 364 A1. It is embodied as a clip connection consisting of two lockable clip elements which receive a heat exchanger core thereinbetween.

[0005] This known device has several drawbacks : it requires the use of two elements which have to be mutually locked, and the clip elements are not able, at least under some circumstances, to properly clamp the core and assume a good maintaining of the device to the core.

[0006] The main object of this invention is to provide a fastening device of the kind as above mentioned which is capable of avoiding such drawbacks.

[0007] According to a main characteristic feature of this invention, the instant device is a one-part moulded component having a bottom wall and two opposite side walls depending on said bottom wall for providing a substantially U-shaped profile adapted for engaging the main faces and the end face of the heat exchanger by a clipping effect, said component having at least one fastening feature integrally moulded therewith.

[0008] Thus a very simple device is provided which nevertheless provides a proper attachment to the heat exchanger core by a clipping effect.

[0009] Under such circumstances one or several fastening device may be clipped on the core of a heat exchanger in respective selective locations, without needing a particular tool for installing the same.

[0010] For instance a pair of such fastening devices may be installed along the length of a first end face of the core and another pair of such fastening devices may be installed along the length of a second end face of the core for mounting the heat exchanger on an automotive structure or body.

[0011] Alternatively, the device may be installed in a proper location of the core for fastening or holding an additional part or equipment, such as for example a fluid tank or the like.

[0012] Preferably, each of the side walls of the fastening device has at least one fixed rib protruding from an internal face of the side wall to engage a respective main face of the core and prevent a sliding movement of the fastening device with respect to the core in a selected first direction.

[0013] It is also preferable that each of the side walls has at least one elastic rib protruding from an internal face of the side wall to engage a respective main face of the core and prevent a sliding movement of the fastening device with respect to the core in a selected second direction.

[0014] According to another feature of this invention, the bottom wall may extend beyond one of the two side walls.

[0015] In a preferred embodiment, the fastening feature is a pin extending from the bottom wall in a direction opposite to the side walls.

[0016] The instant fastening device is preferably made of a plastic or a light weight alloy.

[0017] Further characteristic features and advantages of this invention will become apparent to the man skilled in the art from the following detailed description and in conjunction with the drawings, in which :

- figure 1 is a perspective view of a heat exchanger having two pairs of fastening devices according to this invention maintained by clipping engagement on the core of said heat exchanger ;
- figure 2 is a perspective view of a fastening device according to this invention ;
- figure 3 is a side view of the fastening device according to figure 2 ; and
- figure 4 is an end view of the fastening device according to figures 2 and 3.

[0018] Reference is made first to figure 1 which represents a heat exchanger 10 comprising a core 12 composed of a bundle of tubes and fins (not shown) extending between two generally tubular header boxes 14 and 16 which extend in generally parallel directions. To the header box 14 is connected a fluid tank 18. The header box 16 has two fittings 20 and 22 for fluid connection. The core 12 of the heat exchanger has two opposite main faces 24 and 26 of a generally rectangular shape which are connected through an upper end face 28 and a lower end face 30. In this example, the end faces 28 and 30 are generally horizontal.

[0019] In this embodiment the heat exchanger is a condenser for an automotive air conditioning installation.

[0020] The core 12 has a first pair of fastening devices 32 which are clipped in selected locations along the end face 28 and another pair of fastening devices 32 which are clipped in selected locations along the lower end face 30. These fastening devices 32 are identical and embodied according to this invention. Each fastening device has a fastening feature 34 consisting of a pin. Each of the four pins 34 is designed for attaching the exchanger to the structure or body of a motor vehicle (not shown). Each of the fastening devices 32 is merely clipped on the core 12 without requiring a specific tool or any fastening

devices.

[0021] Reference is now made to figure 2 which represents a perspective view of a fastening device 32 according to this invention. The instant device 32 is a one-part moulded component advantageously made of a plastic or a light weight alloy.

[0022] The device has a bottom wall 36 and two opposite side walls 38 depending on said bottom wall and extending perpendicular thereto. The two side walls 38 are spaced apart and provide, together with the bottom wall 36, a substantially U-shaped profile which is also apparent on figure 4. The U-shaped profile is adapted for engaging the main faces 24 and 26 and the end face 28 or 30 of the core by a clipping effect. The fastening feature 34, which is embodied as a pin in this example, is also integrally moulded with the instant device.

[0023] As resulting from figures 2 to 4, each of the side walls 38 has several fixed ribs 40 protruding from an internal face of the side wall to engage a respective main face of the core and prevent a sliding movement of the fastening device with respect to the core in a selected direction, namely in a Y direction which is generally parallel to the length of the U-shaped profile (figure 2).

[0024] In this embodiment, each of the side wall 38 has a pair of fixed ribs 40 on respective end regions 42 and three other ribs 40 on a central region 44 of the side wall (figure 2).

[0025] Thus each side wall has seven ribs 40 which are regularly spaced, each of which has a rectilinear shape and extends in a Z direction perpendicular to the Y direction.

[0026] These fixed ribs are adapted for engaging a main face of the core providing a local deformation of the fins of the core which are not detrimental for its working.

[0027] Furthermore, each of the side walls 38 has two elastic ribs 46 protruding from an internal face of the side wall to engage a respective main face of the core and prevent a sliding movement of the fastening device with respect to the core in a selected second direction, namely in the Z direction perpendicular to the Y direction. Each elastic rib is shaped as a tooth and is depending from a flexible tong 48 cut in a generally U-shaped window 50 of the side wall. In this embodiment, each of the side walls 38 has two elastic ribs 46 on the central region 44 of the side wall. The elastic ribs 46 alternate with the three fixed ribs 40 of the central region.

[0028] In this embodiment, the bottom wall 36 extends beyond one of the two side walls 38 for providing a lateral extension 52 which is particularly shown on figure 4.

[0029] The fastening feature 34 is embodied as a pin extending from the bottom wall 36 in a direction opposite to the side walls 38. Said pin has a revolution axis 54 extending from one of the side walls. In this example, the side pin has a generally frusto conical shape facilitating engagement of the pin into a receiving housing (not shown).

[0030] The four fastening features 34 may thus be inserted in respective housings of an automotive structure

or body in a conventional way.

[0031] As mentioned above, the instant fastening device may be used for fastening a heat exchanger on an automotive structure or body.

5 [0032] Alternatively, such a device may be used for fastening an additional part or equipment, for instance a fluid tank.

10 [0033] In the example given on figure 1, the heat exchanger is a condenser of an air-conditioning installation. Obviously, such a heat exchanger may also be a cooling radiator, a heater for heating air to be admitted within an automotive cabin, etc...

15 Claims

1. A fastening device adapted for being attached to a heat exchanger core (12), said core having two opposite main faces (24, 26) and at least one end face (28 ; 30) connecting said main faces, **characterized in that** said device (32) is a one-part moulded component having a bottom wall (36) and two opposite side walls (38) depending on said bottom wall for providing a substantially U-shaped profile adapted for engaging the main faces and the end face of the heat exchanger by a clipping effect, said component having at least one fastening feature (34) integrally moulded therewith.
2. A fastening device according to claim 1, **characterized in that** each of the side walls (38) has at least one fixed rib (40) protruding from an internal face of the side wall to engage a respective main face (24, 26) of the core (12) and prevent a sliding movement of the fastening device with respect to the core in a selected first direction (Y).
3. A fastening device according to claim 2, **characterized in that** each of the side walls (38) has two fixed ribs (40) on respective end regions (42) of said side wall.
4. A fastening device according to any one of claims 2 and 3, **characterized in that** each of the side walls (38) has fixed ribs (40) on a central region (44) of said side wall.
5. A fastening device according to any one of claims 1 to 4, **characterized in that** each of the side walls (38) has at least one elastic rib (46) protruding from an internal face of the side wall to engage a respective main face (24, 26) of the core (12) and prevent a sliding movement of the fastening device with respect to the core in a selected second direction (Z).
6. A fastening device according to claim 5, **characterized in that** said elastic rib (46) is depending from a flexible tong (48) cut in a generally U-shaped win-

dow (50) of the side wall.

7. A fastening device according to any one of claims 5 and 6, **characterized in that** each of the side walls (38) has two elastic ribs (46) on a central region (44) of said side wall. 5
8. A fastening device according to any one of claims 1 to 7, **characterized in that** the bottom wall (36) extends beyond one of the two side walls. 10
9. A fastening device according to any one of claims 1 to 8, **characterized in that** the fastening feature (34) is a pin extending from the bottom wall (36) in a direction opposite to the side walls (38). 15
10. A fastening device according to claim 9, **characterized in that** said pin has a revolution axis (54) extending from one of the side walls. 20
11. A fastening device according to any one of claims 1 to 10, **characterized in that** it is made of a plastic or a light weight alloy. 25

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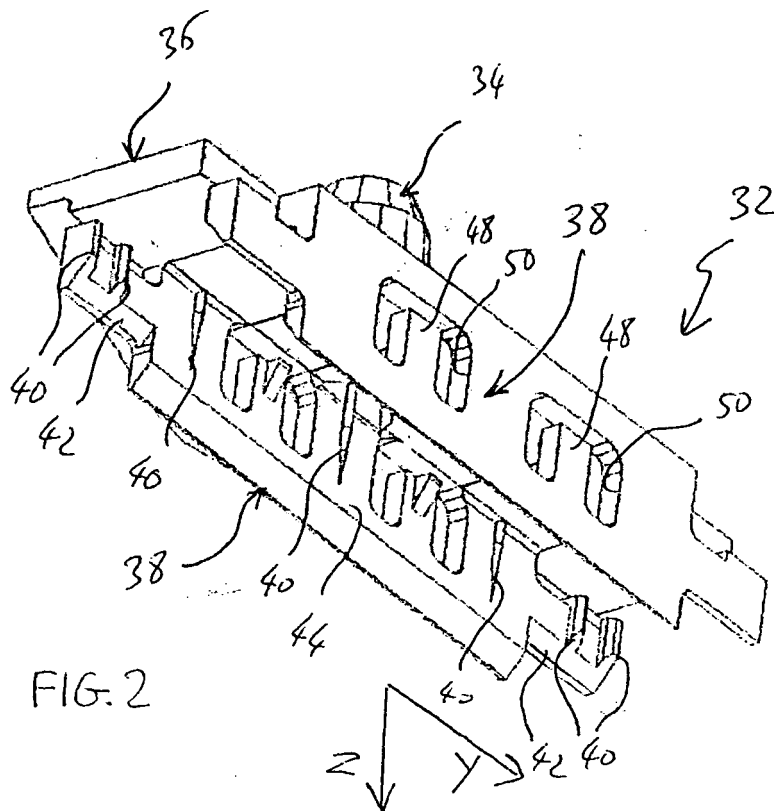
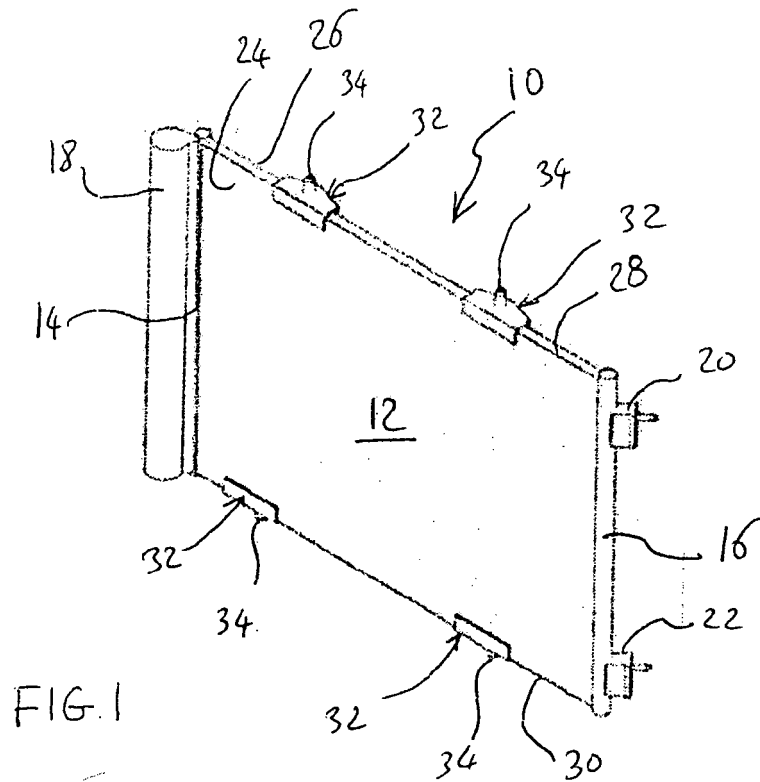
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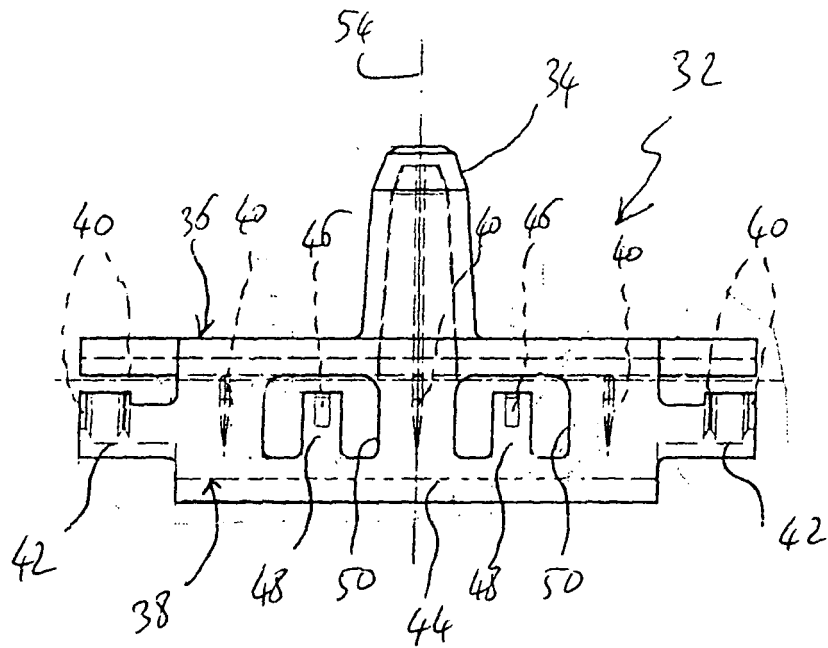


FIG. 3

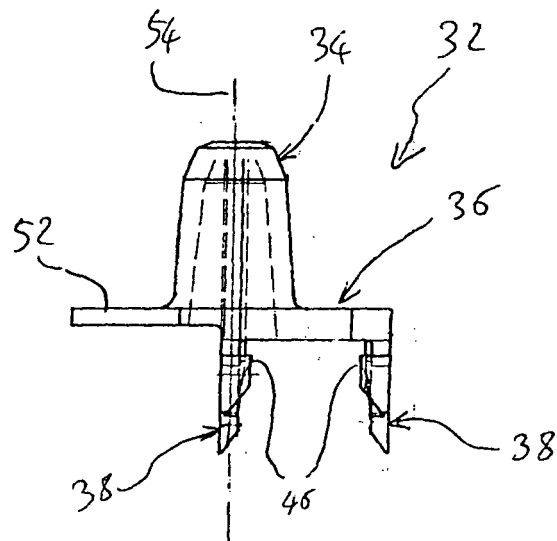


FIG. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 46 0025

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	----- US 7 040 380 B1 (O'BRIEN STEPHEN W [US]) 9 May 2006 (2006-05-09) column 2, line 16 - column 3, line 52* figures 1,3-5 *	10	
X	----- EP 0 677 716 A1 (SHOWA ALUMINUM CORP [JP]) 18 October 1995 (1995-10-18) column 9, line 6- column 9, line 13	1	
Y	----- EP 1 439 364 A (BEHR LORRAINE S A R L [FR]) 21 July 2004 (2004-07-21) abstract* figure 3 *	10	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
Munich		3 November 2006	Martínez Rico, Celia
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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EPO FORM 1503.03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 46 0025

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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