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(72) Inventors:
• **del Grosso, Alessandro**
10135 Torino (IT)
• **Visconti, Fabio**
10135 Torino (IT)

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(74) Representative: **Lovino, Paolo et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

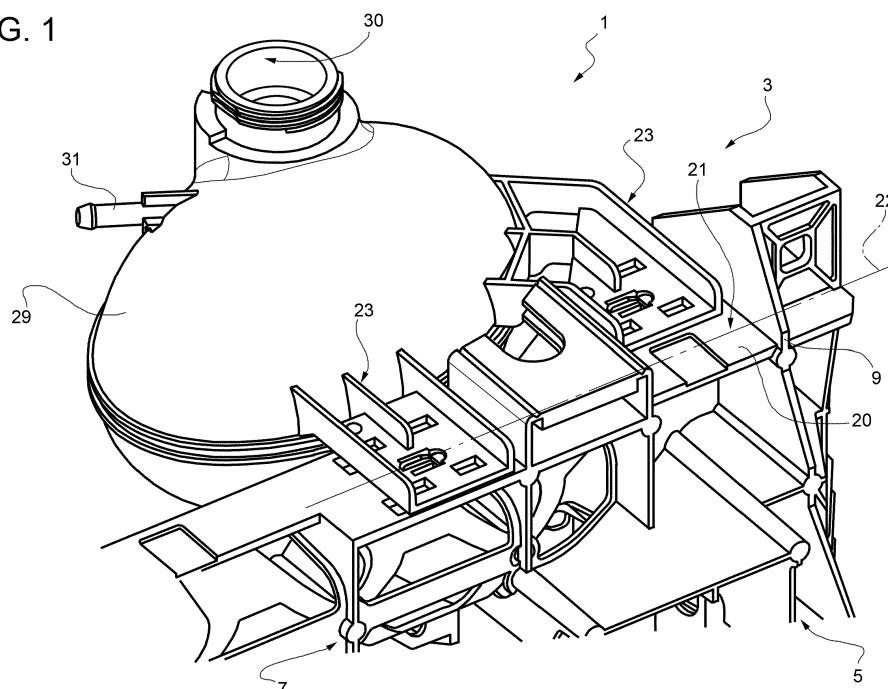
(71) Applicant: **Fiat Group Automobiles S.p.A.**
10135 Torino (TO) (IT)

(54) **Motor vehicle engine compartment provided with an expansion tank for a cooling system**

(57) An expansion tank (1) for a cooling system in a motor vehicle engine compartment has a container, which is adapted to receive a cooling fluid, and is fixed to a support structure (7) of the engine compartment by at least one bracket (23); the bracket (23) is fixed and laterally protrudes with respect to the container and is bayonet- coupled to the support structure (7) by a first vertical downwardly directed mounting movement, to rest

a wall (44) of the bracket (23) on the support structure (7), and a second mounting movement directed along a horizontal direction (37), to vertically lock the bracket (23); the bracket (23) has, in addition, at least one locking tooth (60), which is elastically deformable and is adapted to engage snap-wise a corresponding retaining seat (61) made in the support structure (7) for locking the bracket (23) along said horizontal direction (37).

FIG. 1



Description

[0001] The present invention relates to a motor vehicle engine compartment provided with an expansion tank for a cooling system.

[0002] As known, a motor vehicle engine is cooled by a cooling system using a mixture of water/ethylene glycol as a heat transfer fluid, and envisages an expansion tank fixed to a support structure arranged in the motor vehicle engine compartment.

[0003] Normally, the expansion tank is fixed to said support structure by screws, bolts, metal coupling elements, etc....

[0004] In order to reduce the time required to fix the expansion tank and reduce the cost for manufacturing the connecting elements, it is felt the need for coupling the expansion tank to the support structure without the use of additional metal elements, but still ensuring stable fixing during time and ease of mounting/dismounting.

[0005] EP2375028 corresponds to the preamble of claim 1 and describes a bayonet-coupling between a support and the expansion tank, allowing for simple and quick expansion tank mounting without special tools. This solution provides a more rigid point to be by-passed during coupling so as to indicate to the installer when the expansion tank has reached a locked position.

[0006] Purpose of the present invention is to provide a motor vehicle engine compartment provided with an expansion tank for a cooling system, which allows to fulfill the necessity described above in a simple and economic way.

[0007] According to the present invention, a motor vehicle engine compartment provided with an expansion tank for a cooling system, as defined in claim 1, is provided.

[0008] For a better understanding of the present invention a preferred embodiment is now described, purely by way of nonlimiting example, with reference to the accompanying drawings, wherein:

- Figure 1 is a perspective view, showing a preferred embodiment of the motor vehicle engine compartment provided with an expansion tank for a cooling system, according to the present invention;
- Figure 2 is similar to Figure 1 and shows the expansion tank when the latter is decoupled from a respective support structure;
- Figure 3 shows, from a different point of view, the support structure shown in Figures 1 and 2; and
- Figure 4 is a bottom perspective view of a detail of the expansion tank of figures 1 and 2.

[0009] In Figures 1 and 2, the reference number 1 denotes an expansion tank, constituting part of a cooling system which is arranged in a motor compartment 3 (partially illustrated) of a motor vehicle and which, in use, circulates a cooling fluid for removing heat from an internal combustion engine (not shown).

[0010] The engine compartment 3 has a structure 5, which supports the expansion tank 1 and, preferably, a heat exchanger, not shown, which also forms part of the cooling system. Preferably, the expansion tank 1 is fixed to a cross member 7, defining the upper end of the structure 5 and extending along a substantially horizontal direction, orthogonal to the motor vehicle travel direction. In particular, the expansion tank 1 is fixed to a side portion, on the left according to the vehicle travel direction, at one end 9 of the cross member 7.

[0011] With reference to Figure 3, the portion 9 comprises an appendix 10, which horizontally protrudes with respect to the remaining part of the portion 9 and has a vertical through hole 11. The cross section of the hole 11 is not circular, but is elongated along a horizontal axis 13, so as to define a slot. In the particular example illustrated, the axis 13 is parallel to the cross member 7.

[0012] In particular, the cross section of the hole 11 is constant in the vertical direction, and the ends of the hole 11, along the axis 13, are defined by respective semi-cylindrical surfaces 15. Laterally, the hole 11 is delimited by two guide surfaces 16, which are vertical and parallel to the axis 13, face each other and are connected to one another by the surfaces 15.

[0013] Furthermore, the portion 9 comprises a supporting wall 20 being substantially horizontal, is arranged at a different height with respect to the hole 11, preferably at a greater height, and is also horizontally spaced apart from the hole 11.

[0014] On the top the wall 20 is delimited by a face 21, extending along a direction 22 parallel to the axis 13 and defining a resting surface for two brackets 23 forming part of the expansion tank 1.

[0015] The wall 20 has at least one opening 24, which will be described in detail hereinafter, and is configured so as to bayonet-couple the brackets 23 to the cross member 7 along the direction 22.

[0016] With reference to Figures 2 and 3, the expansion tank 1 is made of plastic material, made from a single piece or from multiple pieces fixed to one another, and comprises a container 29, of a known type, adapted to receive the cooling liquid. In particular, the container 29 has, at the upper end thereof, an opening 30 closed by a removable cap, not shown, and defines an internal cavity communicating with the remaining part of the cooling system by a fitting 31 which laterally protrudes from the container 29.

[0017] For the coupling to the cross member 7, the expansion tank 1 comprises a positioning pin 33, which vertically protrudes downwards along an axis 34 starting from a support portion 35 defined, in particular, by the lower end of the container 29.

[0018] The pin 33 comprises a portion 36 which, along a horizontal direction 37 perpendicular to axis 13, has a width substantially equal to the distance between the guide surfaces 16, so as to be guided by the hole 11 along the axis 13 during the mounting of the expansion tank 1.

[0019] Preferably, as mentioned above, the direction 22 and the axis 13 are rectilinear. Alternatively, the direction 22 may be curved.

[0020] Advantageously, the pin 33 comprises a terminal portion 38, which has a radial dimension greater than the hole 11 and is elastically deformable, radially inwards, so as to be axially inserted into the hole 11. When the portion 36 completely engages the hole 11, the portion 38 elastically returns to its original shape, snapping radially outwards over a lower edge 39 of the hole 11, so as to prevent the upward slippage of the pin 33 during installation and operation of the expansion tank 1.

[0021] In particular, the portion 36 comprises a fork defining the axial extension of the portion 36 and which consists of two arms 41 spaced apart from one another along the direction 37, so as to be able to radially flex inwards. The portion 36 further comprises, two retaining teeth 43, protruding from the respective arms 41 towards the outside along the direction 37, so as to engage the edge 39 when the pin 33 has been inserted into the hole 11.

[0022] The coupling between the pin 33 and the hole 11 is not of a stable type, but has the main function of facilitating mounting and achieving a more stable coupling of the brackets 23.

[0023] With reference to Figure 2, the brackets 23 are fixed with respect to the container 29, and arranged higher than the pin 33, being horizontally spaced apart from each other and advantageously laterally protrude from the container 29, thus are radially spaced from the axis 34. According to an alternative not shown, only one bracket 23 is provided.

[0024] As shown in Figure 4, each bracket 23 comprises a wall 44 parallel to the face 21 and at least one connecting appendix 46, which comprises, in turn, a vertical arm 47, which downwardly protrudes from the wall 44, and a cross fin 48, horizontally protruding from a lower end of the arm 47 and is vertically distanced from wall 44 by a length substantially equal to the thickness of the wall 20, so as to have, between the wall 44 and the fin 48, an empty space adapted to be engaged by an edge of the wall 20 for vertically locking the bracket 23.

[0025] Advantageously, each bracket 23 has a plurality of connecting appendixes 46, each of which engages a corresponding opening 24.

[0026] Again referring to Figure 2, each opening 24 comprises an area 55 having such a size and a shape that the corresponding connecting appendix 46 can be vertically fitted with clearance; and an area 56, which is narrower than the area 55 so as to let the arm 47 slide along the direction 22, but axially retaining the fin 48. In particular, the area 56 is defined by two edges parallel to the direction 22 and distanced by a length substantially equal to the thickness of the arm 47, for guiding the sliding of the arm 47 itself and to prevent translation of the coupling appendix 46 and, therefore, of the bracket 23 parallel to the direction 37.

[0027] Returning to Figure 4, each bracket 23 comprises

a locking tooth 60, which is carried by the wall 44 and has sufficient elasticity for flexing upwards when the wall 44 is placed in contact with the face 21 during insertion and sliding of the connecting appendixes 46 into the openings 24.

[0028] At the end of the sliding of the connecting appendixes 46 along direction 22, the locking teeth 60 are engaged snap-wise by respective retaining seats 61 (fig. 2 and 3) made in the wall 20, so as to prevent the reversal of the connecting appendixes 46 from respective areas 56 of the openings 24 and therefore permanently lock the brackets 23 and the entire expansion tank 1 along direction 22.

[0029] Preferably, the connecting appendixes 46 and the locking teeth 60 are made in a single piece with the walls 44.

[0030] As mentioned above, for assembling the expansion tank 1 on the cross member 7 it is necessary to first insert the pin 33 in the hole 11, until the snapping of the retaining teeth 43 over the edge 39 and the resting of the walls 44 on the wall 20. While the walls 44 are rested on the wall 20, the connecting appendixes 46 must be inserted in the areas 55 of the respective openings 24. The axial holding action exerted by the retaining teeth 43 against the edge 39 allows keeping the walls 44 resting against the wall 20. At this point, while a light downward pressure on the brackets 23 is exerted to maintain deformation of the locking teeth 60, a simple push on the expansion tank 1 along the direction 22 is necessary to insert the connecting appendixes 46 into the bottom of the areas 56, until the locking teeth 60 snap into the respective retaining seats 61. During the sliding of the brackets 23 along the direction 22, the pin 33 can slide into the hole 11 along the axis 13, thanks to the particular shape of the hole 11 itself.

[0031] It is evident that the bayonet-coupling between the brackets 23 and the cross member 7 may be defined by appendixes and/or by openings configured in a different way from that just described, but always so as to perform the same function. For example, it is possible to provide a pair of connecting appendixes arranged on the sides of the bracket 23 and bayonet-coupled to the end edges of the wall 20, without making the openings 24 as intermediate holes, but by making notches along said end edges for inserting the fins 48 below said wall 20. Again by way of example, the connecting appendixes 46 may be carried by the wall 20 and be engaged by respective edges of the wall 44.

[0032] In any case, it is evident how the bayonet-coupling, in combination with the snap-wise coupling of the locking tooth 60, allows locking in all directions, the brackets 23 and therefore the expansion tank 1, without using any additional metal connection element.

[0033] The pin 33 in addition to the brackets 23 facilitates the bayonet-coupling during the mounting of the expansion tank 1 and helps to hold the expansion tank 1 in a fixed position with respect to the cross member 7. In particular, the axial holding action exerted by the edge

39 on the retaining teeth 43 and the holding action exerted by the guide surfaces 16 on the pin 33 along the direction 37 are in addition to those exerted by the edges of the openings 24 upon the connecting appendices 46.

[0034] Therefore, the connection to the cross member 7 is extremely stable and rigid, thus limiting possible breakage and vibration.

[0035] Moreover, the mounting is extremely simple, thanks to the fact that two mounting movements are simply provided, namely a first movement vertically directed downwards, to rest said wall on the cross member 7, and a subsequent second movement directed along the direction 37 to lock the bracket 23 in a vertical direction and, thanks to the locking tooth 60, also along the direction 37 itself.

[0036] Finally, from the above, it is evident that the described and illustrated engine compartment 3 may be subject to modifications and variations which do not depart from the scope of the present invention, as defined in the attached claims.

[0037] In particular, as mentioned above, the various parts of the expansion tank 1 may have a different shape and size from those illustrated by way of example. For example, the connecting appendices 46 could be replaced by appendices or slides having an inverted T cross-section, rather than being L-shaped.

[0038] Also, the position of the pin 33 and/or of the brackets 23 may be different from that described above; for example, the pin 33 may be supported by a further bracket fixed with respect to the container 29.

Claims

1. A motor vehicle engine compartment comprising:

- a support structure (7) comprising a wall (20) having:

- a) first connecting means defined by at least one opening (24) and/or at least one appendix, and
- b) at least one retaining seat (61);

- an expansion tank (1) for a cooling system, the expansion tank comprising:

- a) a container (29) adapted to receive a cooling fluid;
- b) second connecting means for fixing said container (29) to said support structure (7); said second connecting means comprising at least one bracket (23), which is fixed with respect to said container (29), laterally protrudes with respect to said container and comprises:

(1) bayonet coupling means (46) en-

gaging said first connecting means and configured so as to couple said bracket (23) to said support structure (7) by way of a first mounting movement directed vertically downwards, which allows said bracket (23) to be rested on said wall (20), and a subsequent second mounting movement directed along a horizontal direction (37), which allows said bracket (23) to be vertically locked; (2) at least one locking tooth (60) elastically deformable and adapted to engage snap-wise said retaining seat (61) for locking said bracket (23) along the said horizontal direction (37) **characterized in that:**

- the second connecting means comprise a positioning pin (33) which protrudes vertically downwards; and
- said support structure (7) comprises a horizontal protrusion (10) having a vertical hole (11), which is engaged by said positioning pin (33) and defines an elongated slot along a horizontal axis (13) parallel to the horizontal direction (22) of the second mounting movement.

2. The engine compartment according to claim 1, **characterized in that** said bracket (23) is made of plastic material.
3. The engine compartment according to claim 2, **characterized in that** said bracket (23) is made in a single piece.
4. The engine compartment according to any one of the preceding claims, **characterized in that** said bayonet coupling means comprise at least one downwardly protruding connecting appendix (46).
5. The engine compartment according to any one of the preceding claims, **characterized in that** said second connecting means comprise two of said brackets, arranged in positions horizontally spaced apart from each other.
6. The engine compartment according to any one of the preceding claims, **characterized in that** said positioning pin (33) is vertically and horizontally spaced apart from said bracket (23).
7. The engine compartment according to claim 6, **characterized in that** said positioning pin comprises an end portion (38), which comprises at least one axial retaining tooth (43), radially protruding outwards, and is elastically deformable, radially inwards.
8. The engine compartment according to claim 6 or 7,

characterized in that said positioning pin extends downwards starting from the bottom end (35) of said container (29).

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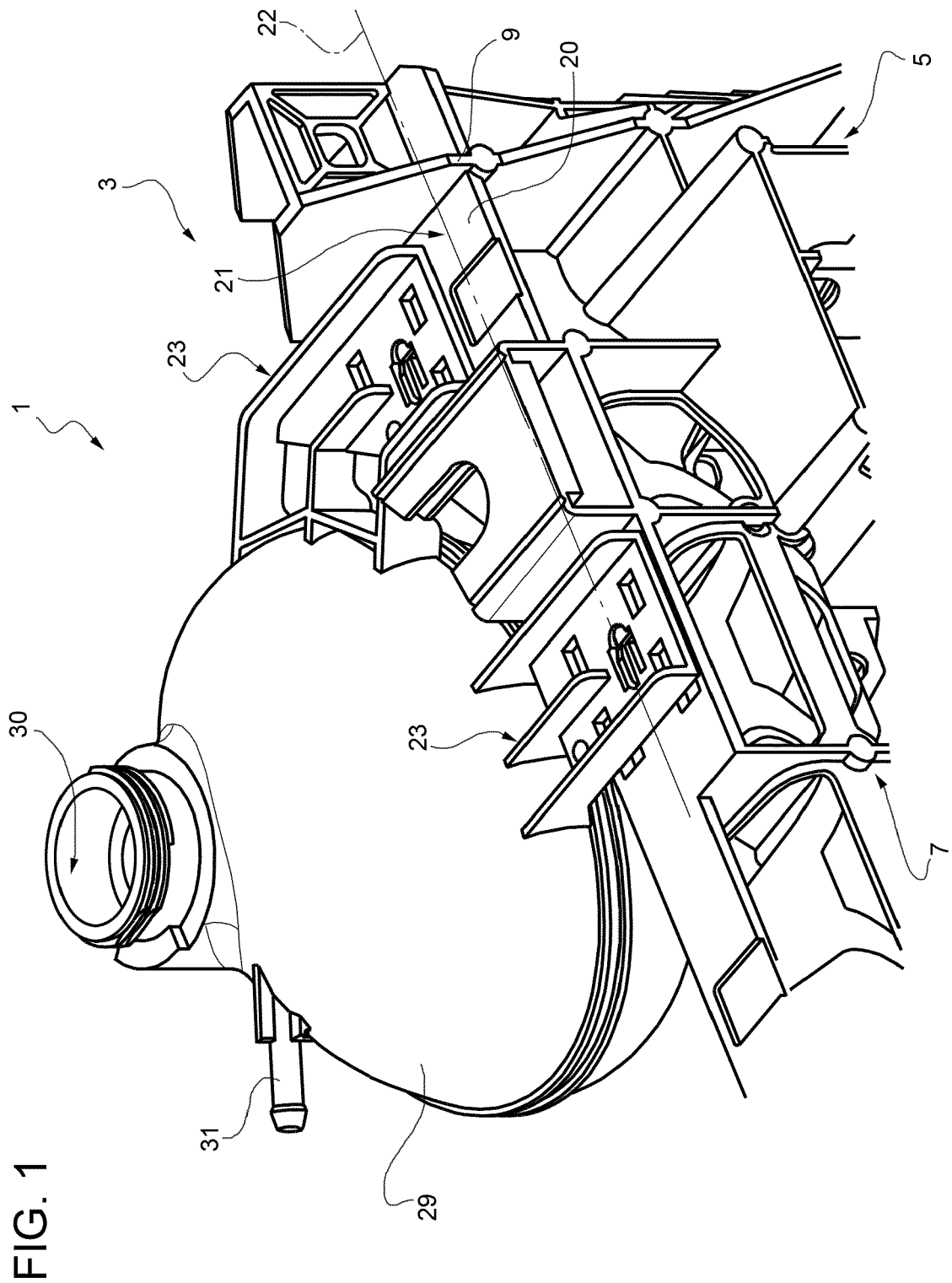


FIG. 2

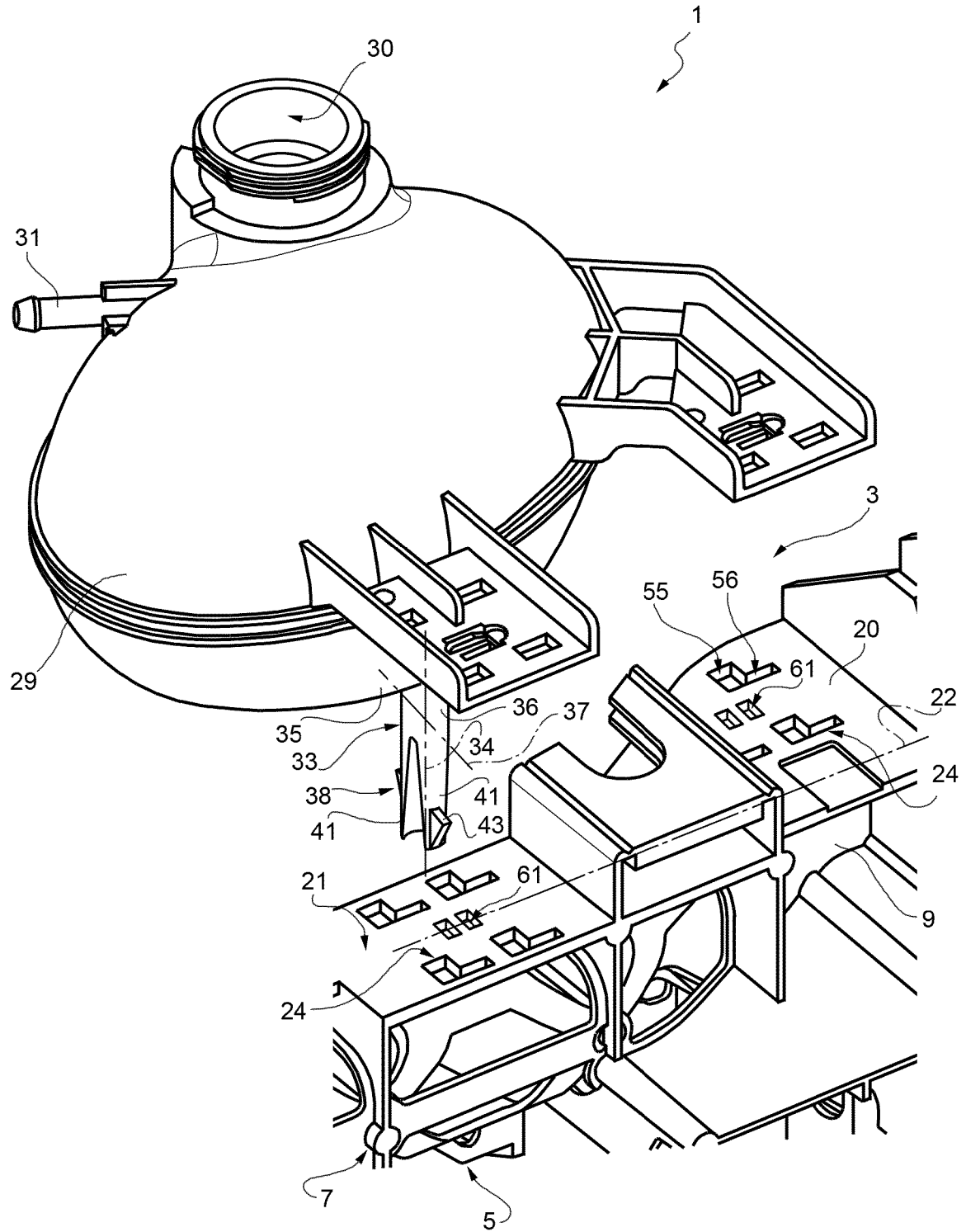


FIG. 3

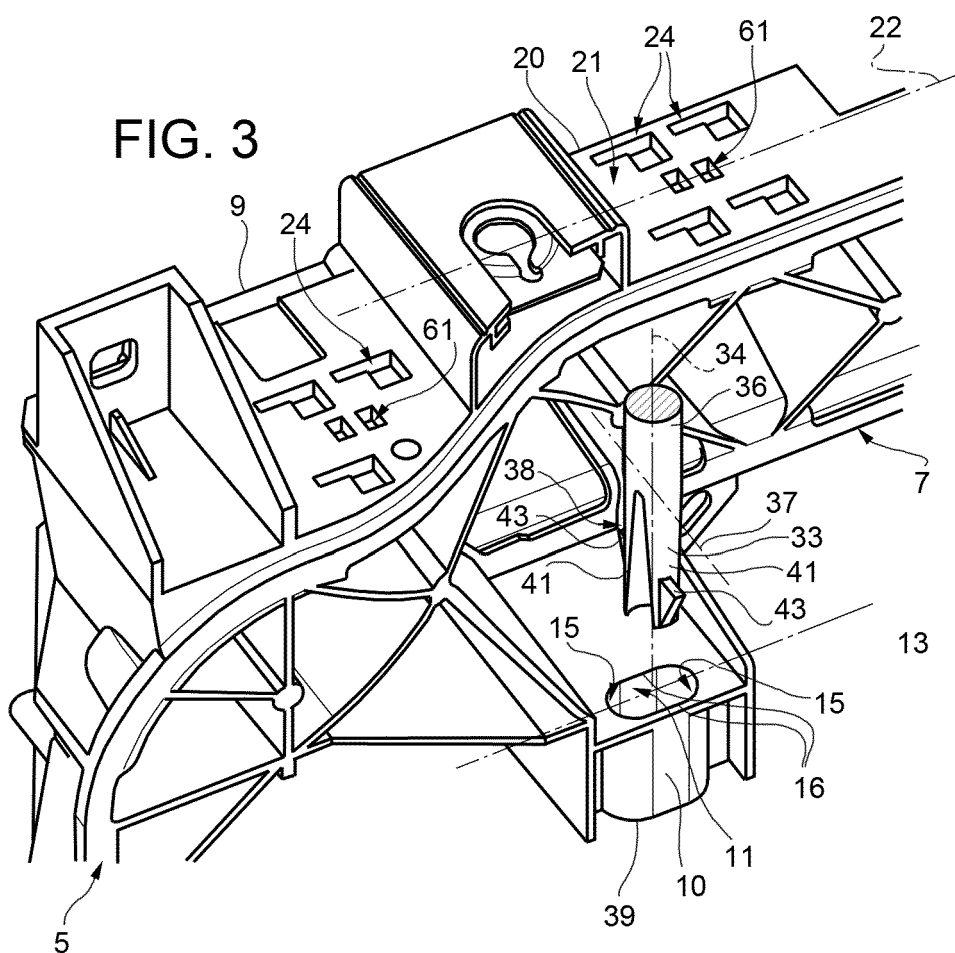
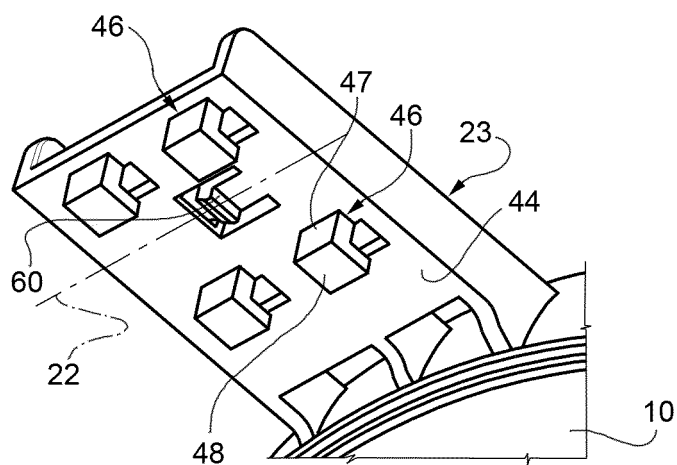


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 14 17 8438

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 375 028 A1 (TRISTONE FLOWTECH SOLUTIONS TFS [FR]) 12 October 2011 (2011-10-12) * paragraphs [0014], [0027] - [0030], [0040] * * figures 1-4 *	1-8	INV. F01P11/02
A	FR 2 918 621 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 16 January 2009 (2009-01-16) * pages 10-11 * * figures 1-2 *	1-8	
A	FR 2 921 019 A1 (RENAULT SAS [FR]) 20 March 2009 (2009-03-20) * pages 3-5 * * figures 1-3 *	1-8	
A	EP 1 562 017 A2 (CALSONIC KANSEI CORP [JP]) 10 August 2005 (2005-08-10) * figures 1-6, 8-9 * * paragraph [0007] *	1-8	TECHNICAL FIELDS SEARCHED (IPC)
A	JP H07 243326 A (NIPPON DENSO CO) 19 September 1995 (1995-09-19) * abstract; figures 1,3 *	1-8	F01P B60S
A	EP 1 255 029 A1 (RENAULT SA [FR]) 6 November 2002 (2002-11-06) * paragraphs [0021], [0026] - [0027]; figure 2 *	1-8	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 October 2014	Examiner Schwaller, Vincent
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 17 8438

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The members are as contained in the European Patent Office EDP file on
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10-10-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2375028 A1	12-10-2011	EP 2375028 A1	12-10-2011
		FR 2958682 A1	14-10-2011

FR 2918621 A1	16-01-2009	NONE	

FR 2921019 A1	20-03-2009	EP 2188507 A1	26-05-2010
		FR 2921019 A1	20-03-2009
		WO 2009044079 A1	09-04-2009

EP 1562017 A2	10-08-2005	EP 1562017 A2	10-08-2005
		JP 2005220795 A	18-08-2005
		US 2005180850 A1	18-08-2005

JP H07243326 A	19-09-1995	JP 3351086 B2	25-11-2002
		JP H07243326 A	19-09-1995

EP 1255029 A1	06-11-2002	DE 60222047 T2	29-05-2008
		EP 1255029 A1	06-11-2002
		ES 2290258 T3	16-02-2008
		FR 2824309 A1	08-11-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2375028 A [0005]