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• **Hebda, Dariusz**
32050, Skawina (PL)

(74) Representative: **Metz, Gaëlle**
Valeo Systemes Thermiques
BG THS - Service Propriété Industrielle
8, rue Louis Lormand
B.P. 517 - La Verrière
78321 Le Mesnil Saint-Denis (FR)

(71) Applicant: **VALEO AUTOSYSTEMY Sp. Z. o.o.**
32-050 Skawina (PL)

(72) Inventors:
• **Stramecki, Tomasz**
32050, Skawina (PL)

(54) **Injection channel bypass for probe measurement**

(57) An admission gas supply device (18) comprising an air inlet mounting side and a body (23a) having an internal cavity (23b), the body (23a) being arranged for being mounted, on the air inlet mounting side, on the air outlet of a heat exchanger (16) of an automotive vehicle engine, said body (23a) comprising an injection channel (24) for injecting recirculated exhaust gas into said inter-

nal cavity (23b) and an opening arranged for receiving a measurement probe (30) for measuring at least one parameter in the internal cavity (23b), said admission gas supply device (18) being characterized in that the opening is made in the body (23a) between the injection channel (24) and the air inlet mounting side of the admission gas supply device (18).

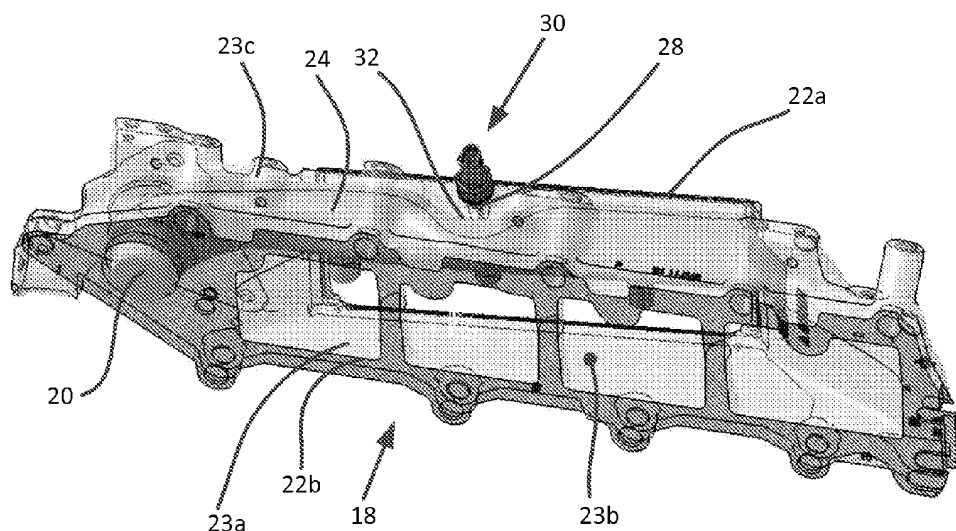


Figure 4

Description

[0001] The invention relates to an admission gas supply device of an automotive vehicle and to an admission gas supply module comprising such an admission gas supply device.

[0002] An automotive vehicle comprises an engine, which comprises cylinders, and may further comprise an admission gas supply module that allows providing a gas mix, called admission gas, comprising air, for operating the engine. Such an admission gas supply module comprises a heat exchanger allowing cooling the air and an admission gas supply device. The admission gas supply device comprises a body, an air inlet mounting side and an admission gas outlet mounting side. The body defines an internal cavity, and is arranged for being mounted on the outlet of the heat exchanger on the air inlet mounting side and for being mounted on a cylinder head of the engine on the admission gas outlet mounting side.

[0003] Some known admission gas supply modules further comprise a valve allowing the injection of part of the exhaust gas of the vehicle, called recirculated exhaust gas or EGR, into the admission gas supply device. In that case, the admission gas supply device allows mixing, in the internal cavity, the air provided by the heat exchanger with the recirculated exhaust gas provided by the valve, into a gas mix. The admission gas supply device is further adapted for guiding the gas mix toward the cylinders of the engine, via a cylinder head.

[0004] In order to inject the recirculated exhaust gas, most known admission gas supply devices comprise a straight, substantially cylinder-shaped, injection channel. The injection channel comprises a proximal end, for receiving recirculated exhaust gas from the valve, and an distal end, which is closed. In order to inject the recirculated exhaust gas into the internal cavity of the admission gas supply device, the injection channel further comprises a plurality of holes or openings, also called injectors, opening into the cavity. Thus, as the valve provides the recirculated exhaust gas to the proximal end of the injection channel, the recirculated exhaust gas are further diffused within the internal cavity of the admission gas supply device through the injectors of the injection channel.

[0005] In addition, in order to control the operation of the engine, it may be of advantage to measure some parameters, such as e.g. temperature or pressure of the gas in the internal cavity of the admission gas supply device. In order to do so, a probe allowing such measurements may be mounted on the admission gas supply device. Such a known probe comprises a body with a proximal end and a distal end. The distal end comprises a sensor and is arranged for being placed into the internal cavity of the admission gas supply device to perform measurements of the gas in the internal cavity. The proximal end remains outside of the admission gas supply device while the body of the probe traverses a side of the admission gas supply device body. The probe, the sensor of which being placed, during normal use, in the

cavity of the admission gas supply device, may thus be subject to an accumulation of dirt due to the recirculated exhaust gas in the cavity, which may lead to failure or malfunction of the probe.

[0006] In order to eliminate at least partially this drawback, the invention concerns an admission gas supply device comprising an air inlet mounting side, arranged for being mounted on an air outlet of a heat exchanger of an automotive vehicle engine, said admission gas supply device further comprising a body having an internal cavity, an injection channel for injecting recirculated exhaust gas into said internal cavity, said body further comprising an opening arranged for receiving a measurement probe for measuring at least one parameter in the internal cavity, said admission gas supply device being characterized in that the opening is made in the body between the injection channel and the air inlet mounting side. This allows the sensor of the probe to be placed near the outlet of the exchanger, reducing therefore the amount of dirt of the recirculated exhaust gas that may foul up the sensor of the probe.

[0007] In a preferred embodiment, the opening is provided on an upper wall of the body of the admission gas supply device in order to receive the measurement probe on said upper wall. This allows the probe to be easily accessible by an operator for mounting, operation and/or maintenance purposes.

[0008] According to another aspect of the invention, the injection channel bypasses the opening. In that respect, the injection channel may extend along a dimension of the body and the opening is provided along the injection channel at a location where the injection channel width is decreased. Hence, the size or the volume of the injection channel does not need to be dramatically reduced or even not reduced at all, preserving therefore the efficiency of the injection channel and, at the same time, a space is thus created to mount the probe in the wall of the admission gas supply device. Moreover, such a bypass allows the mounting of the probe to be performed without traversing the injection channel and therefore creating a leak in the injection channel.

[0009] In an alternative embodiment, the edges of the injection channel are straight and the width of the injection channel is smaller than the width of the upper wall of the body. This allows the injection channel to have a simple straight shape while the opening is located between the injection channel and the air inlet mounting side of the admission gas supply device.

[0010] In an embodiment, the opening is a closed hole.

[0011] The opening may further comprise means for providing airtightness between the measurement probe and the upper wall of the body of the admission gas supply device.

[0012] In an alternative embodiment, the opening is open and arranged for being closed by a part of the heat exchanger.

[0013] The opening may further comprise means for providing airtightness between the measurement probe,

the upper wall of the body of the admission gas supply device and the heat exchanger.

[0014] The invention also concerns an admission gas supply device according to any of the preceding claims, said admission gas supply device comprising a measurement probe, said measurement probe being mounted in the opening of the admission gas supply device.

[0015] The invention also concerns an admission gas supply module comprising an admission gas supply device as defined here above.

[0016] Embodiments of the present invention will now be described solely by way of example and with reference to the accompanying drawings, where like parts are provided with corresponding reference numerals, and in which:

- figure 1 is a disassembled view of an admission gas supply module,
- figure 2 is an assembled view of the admission gas supply module of figure 1,
- figure 3 is a view, from the air inlet mounting view side, of an admission gas supply device comprising an injection channel,
- figure 4 is a view, from the admission gas outlet mounting view side, of an admission gas supply device comprising an injection channel,
- figure 5 is a view, from the admission gas outlet mounting view side of the admission gas supply device, of an admission gas supply module,
- figure 6 is a sectional view of an admission gas supply device with a measurement probe mounted on said admission gas supply device,
- figure 7 is a partial view of an admission gas supply device with a measurement probe mounted on said admission gas supply device.

[0017] Figures 1 is a disassembled view illustrating different parts of an admission gas supply module of a vehicle engine. The admission gas supply module comprises an air inlet tank 14 for supplying a heat exchanger 16 with air. The admission gas supply module 10 may also comprise a valve 12 for controlling the flow of said fluid into the admission gas supply module 10.

[0018] The heat exchanger 16 comprises, for instance, side walls 16a, a bottom wall 16b and a top wall 16c defining a cavity wherein some plates 16d and inner fins 16e are stacked one on top of the others for creating the heat exchanger. The top wall 16c comprises inlet and outlet pipes, respectively 17a and 17b, of a coolant. Plates 16d are mounted by pair in order to form, between two plates of the same pair, a first channel for the circulation of the coolant, and between two plates of two different pairs, positioned face to face, a second channel, comprising the inner fins 16e, for the circulation of the fluid to be cooled. The fluid to be cooled goes thus through the valve 12, then the fluid inlet tank 14, and through the second channels of the heat exchanger comprising the inner fins, whilst being cooled by the coolant fluid circu-

lating in the first channels of the heat exchanger.

[0019] The admission gas supply module 10 comprises an admission gas supply device 18 allowing guiding the air provided by the heat exchanger 16 toward the engine cylinders.

[0020] The admission gas supply module 10 illustrated on figure 1 further comprises a valve 20, called EGR valve, allowing the injection of a part of the recirculated exhaust gas provided by the engine into the admission gas supply device 18.

[0021] Figure 2 illustrates the admission gas supply module 10 of figure 1, assembled. Valve 12, for controlling the flow of the air into the admission gas supply module 10, is mounted on the air inlet tank 14. The air inlet tank 14 is mounted on one open side of the heat exchanger 16 in order to allow the fluid flowing into the heat exchanger 16. The admission gas supply device 18 comprises an air inlet mounting side 22a (Figure 3) and is mounted, on said air inlet mounting side 22a, on the other open side of the heat exchanger 16. The admission gas supply device 18 also comprises an admission gas outlet mounting side 22b (Figure 4) and is arranged for being mounted, on said admission gas outlet mounting side 22b, on a cylinder head 19 of the vehicle engine.

[0022] The admission gas supply device 18 comprises a body 23a defining an internal cavity 23b, as described hereunder in reference to figure 3, for collecting the air cooled by the heat exchanger 16, allowing mixing said cooled fluid with recirculated exhaust gas collected from the engine by the EGR valve 20 and providing said mix to the cylinders of the engine via the cylinder head 19 through the admission gas outlet mounting side 22b. The EGR valve 20 is here mounted on the admission gas supply device 18. The air provided by the heat exchanger 16 flows from the heat exchanger 16 to the internal cavity 23b of the admission gas supply device 18 in the flowing direction F as described in figure 3.

[0023] As described thereon, the EGR valve 20, which is only partially illustrated for clarity purposes, allows the input, via an input hole 21, of the recirculated exhaust gas into a injection channel 24 of the admission gas supply device 18. The injection channel 24 comprises a plurality of injection holes or injectors for injecting the recirculated exhaust gas into the internal cavity 23 of the admission gas supply device 18. The injection channel 24 has an elongated shape and comprises a proximal end 25a, for receiving the recirculated exhaust gas from the EGR valve 20, and an distal end 25b, which is closed. The injection channel 24 is here made of material of the body 23a of the admission gas supply device 18.

[0024] According to the invention and as described on figure 4, the admission gas supply device 18 further comprises an opening 28, on the upper wall 23c of the body 23a, arranged for receiving a measurement probe 30 for measuring at least one parameter in the internal cavity 23b of the admission gas supply device 18. The opening 28 is made in the body 23a between the injection channel 24 and the air inlet mounting side 22a of the admission

gas supply device 18 and a measurement probe 30 is mounted in said opening 28.

[0025] A curved shape 32 is given to the injection channel 24 in order for the injection channel 24 to bypass the opening 28. Any shape may be given to the injection channel to bypass the opening 28, such as for example a squared or triangle shape. The section of the injection channel 24 may be either smaller or substantially constant in the curved-shape area so that for the injection channel 24 to curve around the opening 28.

[0026] Furthermore, one may note that the EGR valve 20 is only partially illustrated on figure 4 for clarity purposes.

[0027] Once mounted on the heat exchanger 16 as described on figure 5, the measurement probe 30, when mounted in the opening 28 of the admission gas supply device 18, is located on the upper wall 23c of the body 23a of the admission gas supply device 18, beside the curved area 32 of the injection channel 24 and between the injection channel 24 and the air inlet mounting side 22a of the admission gas supply device 18. The measurement probe 30 is therefore easily accessible by an operator for operation and maintenance purposes.

[0028] Figure 6 is a sectional view of the admission gas supply device 18 of figures 4 and 5. The admission gas supply device 18 comprises a measurement probe 30 which is mounted in the opening 28 made in the upper wall 23c of the body 23a of the admission gas supply device 18 and bypassed by the injection channel 24 of the admission gas supply device 18.

[0029] The measurement probe 30 comprises a body 34 with a proximal end 35 and a distal end 36. The distal end comprises a sensor 37 and is arranged for being located into the internal cavity 23b of the admission gas supply device 18 while the measurement probe 30 is mounted in the opening 28 in order to perform measurements on the gas, such as e.g. temperature or pressure, in the internal cavity 23b. The proximal end 35 remains outside of the admission gas supply device while the body 34 of the measurement probe 30 at least partially traverses the upper wall 23c of the body 23a of the admission gas supply device 18. The body 34 of the measurement probe 30 has a circular section which is slightly smaller than the one of the opening 28 so that the body 34 of the measurement probe 30 fits into the opening. A gasket may be used between the body 34 of the measurement probe 30 and the body 23a of the device in order to provide air tightness between the internal cavity 23b and the outside.

[0030] As described on figure 7, which is a partial view of an admission gas supply device with a measurement probe mounted on said admission gas supply device, the section of the injection channel is substantially constant in the curved area 32 of the injection channel 24. The opening 28 may be either closed and performed in the material of the body 23a or be open in the material of the body 23a. In the latter case, the heat exchanger may close the opening when mounted on the air inlet mounting

side 22a of the admission gas supply device 18.

[0031] The probe 30 may be located, along the injection channel 24, substantially in the middle thereof. At least one EGR injection hole is located in the curved area 32. The distal end of the probe 30, having the sensor 37, is for instance located beneath the level of the injection channel 24.

10 Claims

1. An admission gas supply device (18) comprising an air inlet mounting side (22a), arranged for being mounted on an air outlet of a heat exchanger (16) of an automotive vehicle engine, said device further comprising a body (23a) having an internal cavity (23b) comprising an injection channel (24) for injecting recirculated exhaust gas into said internal cavity (23b) and an opening (28) arranged for receiving a measurement probe (30) for measuring at least one parameter in the internal cavity (23b), said admission gas supply device (18) being **characterized in that** the opening (28) is made in the body (23a) between the injection channel (24) and the air inlet mounting side (22a).
2. An admission gas supply device (18) according to claim 1, wherein the opening (28) is provided on an upper wall (23c) of the body (23a) of the admission gas supply device (18) in order to receive the measurement probe (30) on said upper wall (23c).
3. An admission gas supply device (18) according to any of the preceding claims, wherein the injection channel (24) bypasses the opening (28).
4. An admission gas supply device (18) according to any of the preceding claims, wherein the injection channel (24) extends along a dimension of the body (23a) and the opening (28) is provided along the injection channel (24) at a location where the injection channel width is decreased.
5. An admission gas supply device (18) according to any of the preceding claims, wherein the opening (28) is a closed hole.
6. An admission gas supply device according to claim 5, wherein the opening (28) further comprises means for providing airtightness between the measurement probe (30) and the upper wall (23c) of the admission gas supply device (18).
7. An admission gas supply device (18) according to any of the preceding claims 1 to 4, wherein the opening (28) is open and arranged for being closed by a part of the heat exchanger (16).

8. An admission gas supply device (18) according to claim 7, wherein the opening (28) further comprises means for providing airtightness between the measurement probe (30), the upper wall (23c) of the body (23a) of the admission gas supply device (18) and the heat exchanger (16). 5
9. An admission gas supply device (18) according to any of the preceding claims, said admission gas supply device (18) comprising a measurement probe (30), said measurement probe (30) being mounted in the opening (28) of the admission gas supply device (18). 10
10. An admission gas supply module (10) comprising an admission gas supply device (18) according to any of the preceding claims 1 to 9. 15

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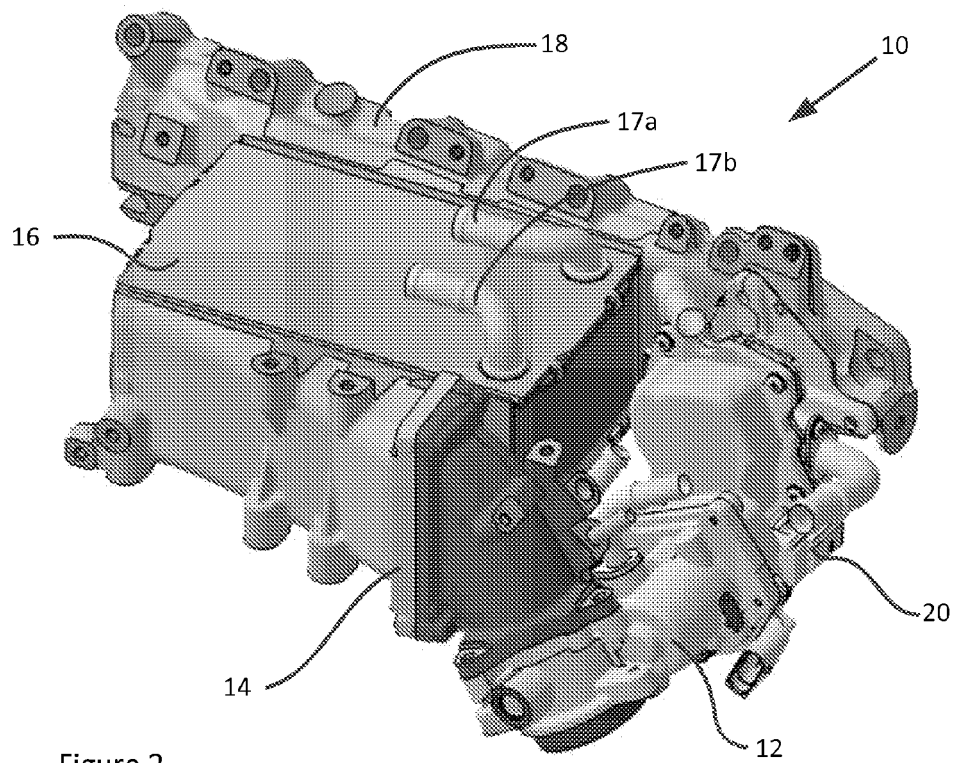
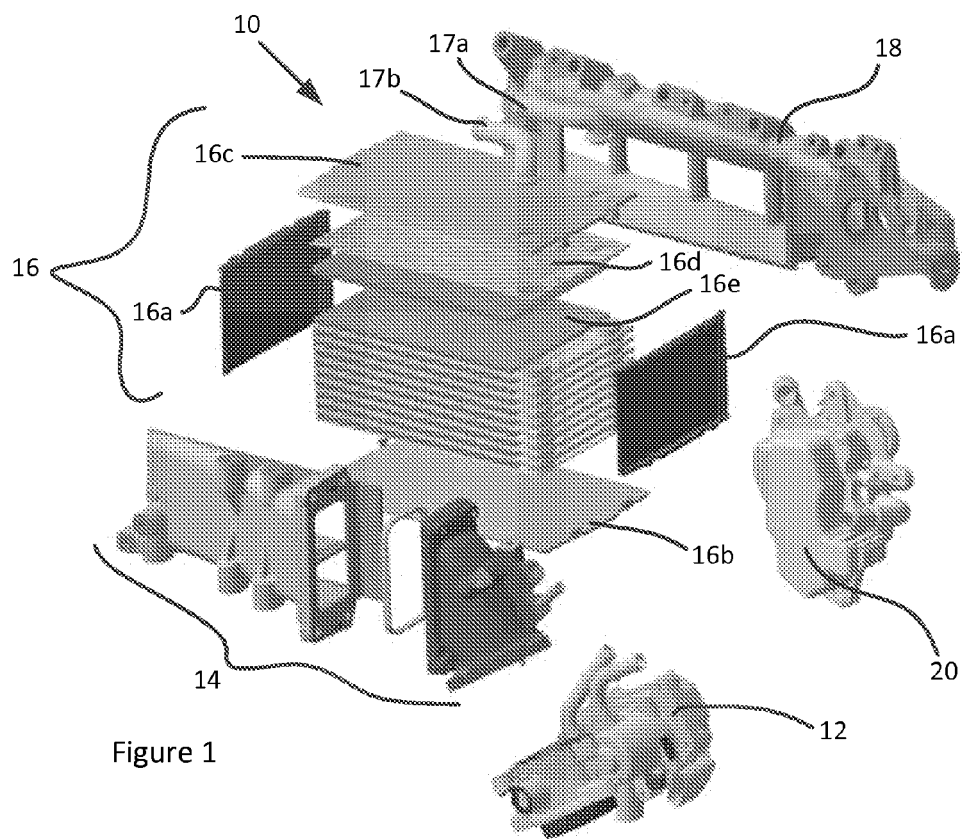
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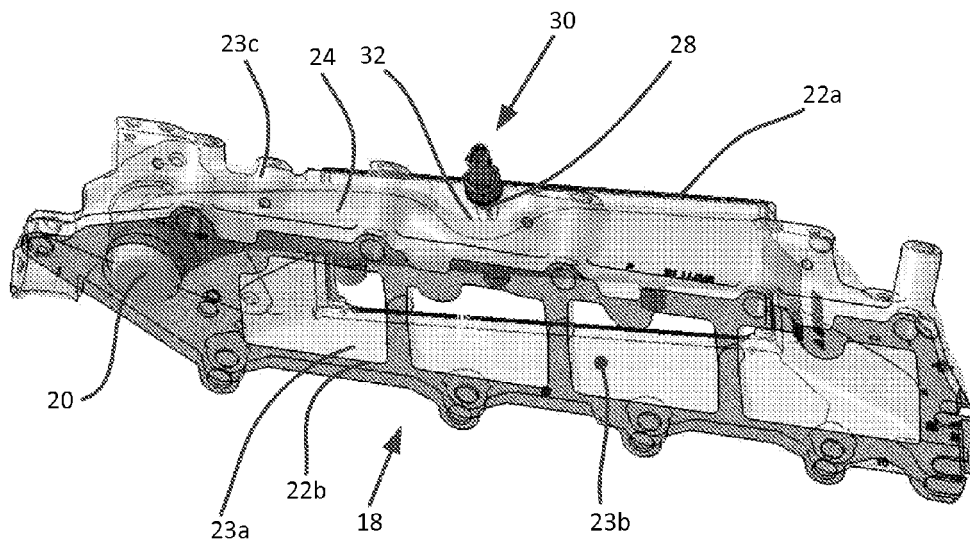
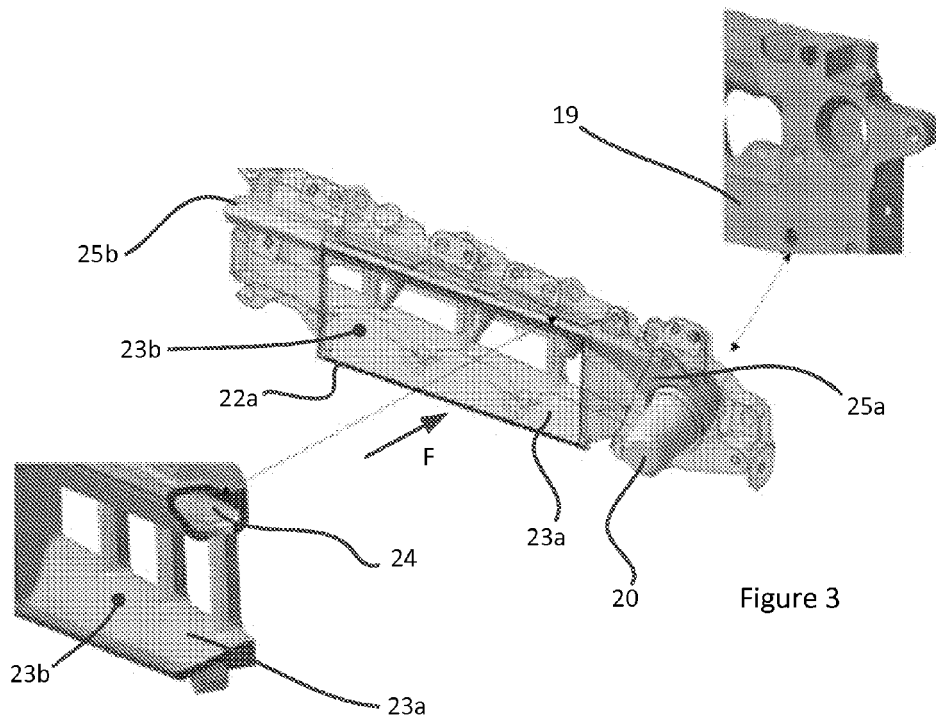
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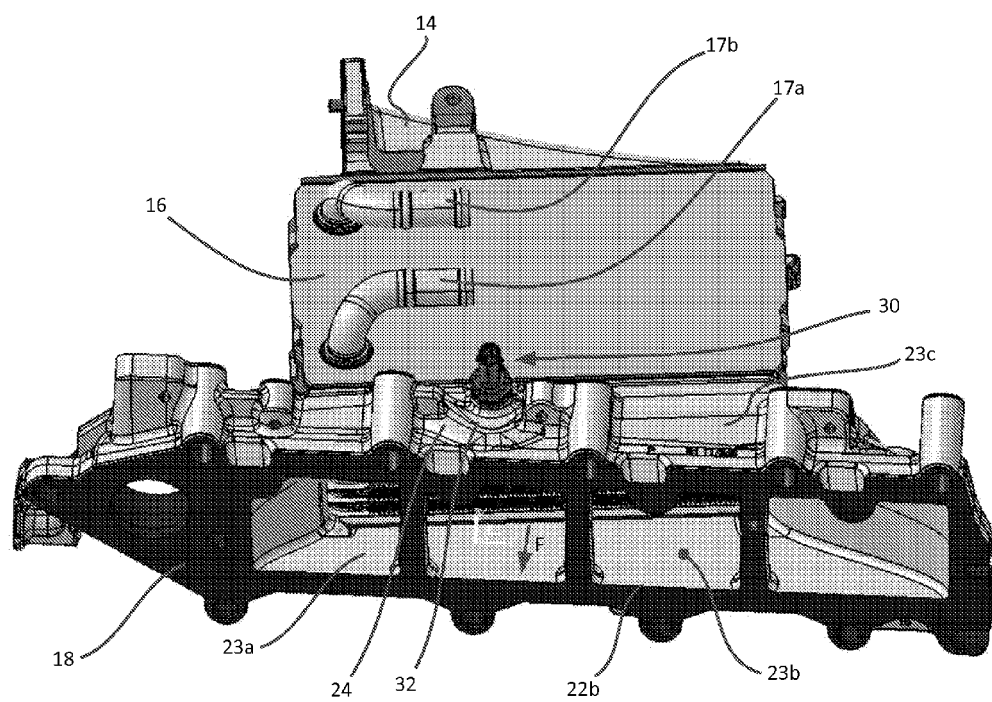


Figure 5

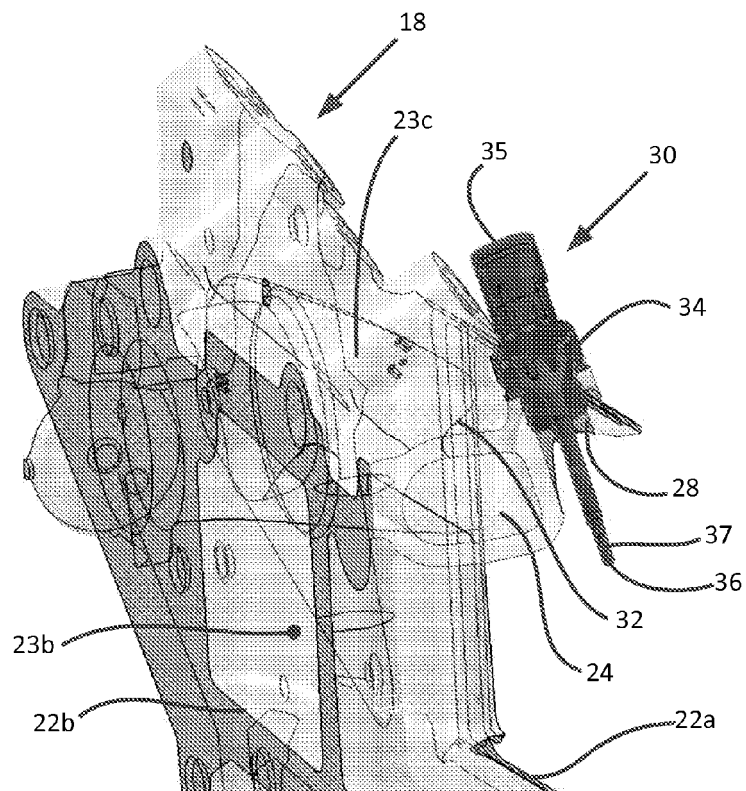


Figure 6

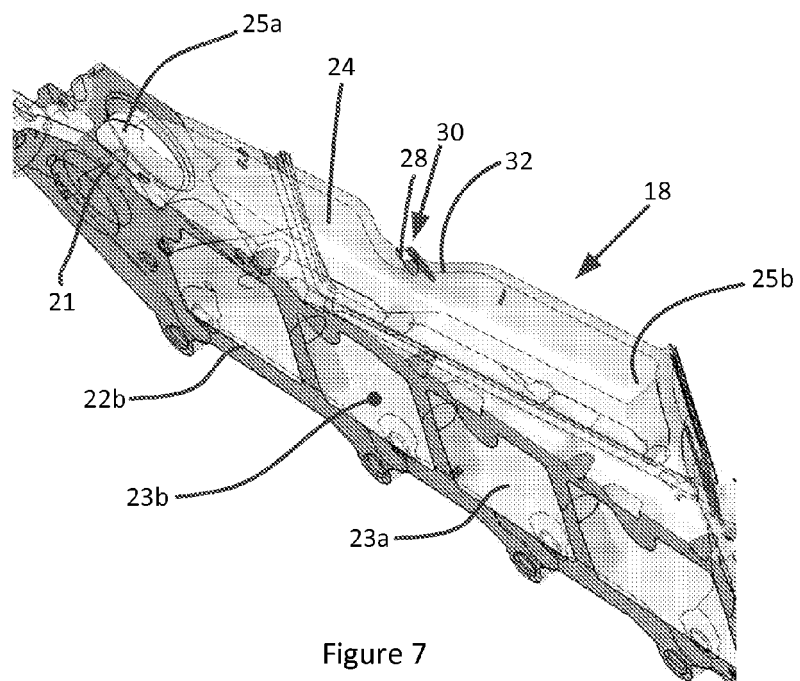


Figure 7



EUROPEAN SEARCH REPORT

Application Number
EP 11 46 1513

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	EP 2 133 548 A1 (PERKINS ENGINES CO LTD [GB]) 16 December 2009 (2009-12-16) * figure 7 *	1-10	INV. F02M35/10 F02M35/112 F02M25/07
X	EP 2 270 327 A2 (MITSUBISHI MOTORS CORP [JP]) 5 January 2011 (2011-01-05) * paragraph [0090] - paragraph [0110]; figures 1,2 *	1-10	
X	EP 1 577 536 A2 (DEERE & CO [US]) 21 September 2005 (2005-09-21) * paragraph [0008] - paragraph [0013] *	1-10	
X	FR 2 915 239 A1 (RENAULT SAS [FR]) 24 October 2008 (2008-10-24) * figure 6 *	1-10	
X	JP 2003 003879 A (TOYOTA MOTOR CORP) 8 January 2003 (2003-01-08) * figures 2-5 *	1-10	
X	EP 1 870 591 A2 (MAHLE FILTERSYSTEME GMBH [DE]) 26 December 2007 (2007-12-26) * figure 3 *	1-10	TECHNICAL FIELDS SEARCHED (IPC)
A	DE 199 09 433 C1 (DAIMLER CHRYSLER AG [DE]) 13 April 2000 (2000-04-13) * column 1, line 55 - column 2, line 23 *	1	F02M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 September 2011	Examiner de Mateo Garcia, I
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 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 11 46 1513

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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