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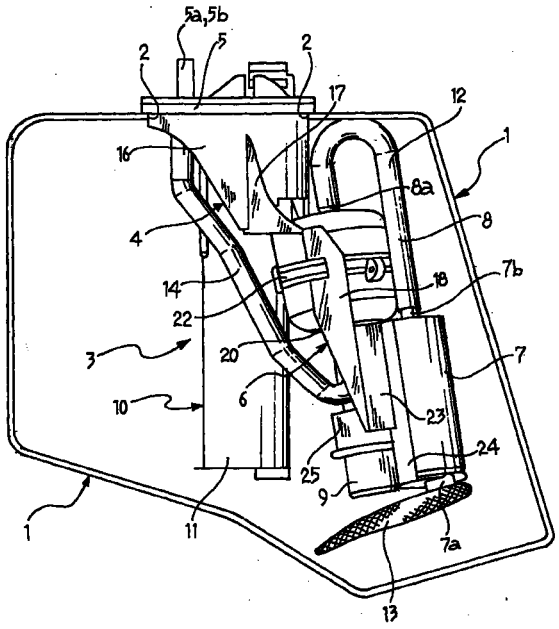
(54) A fuel pumping and level-detection assembly for a motor-vehicle tank

(57) The assembly comprises a support structure (4) including an attachment portion (5) for fixing to the tank (1) in the vicinity of an opening (2) thereof, and a support portion (6) which is connected to the attachment portion (5) and to which the pump (7), the fuel filter (8), and the respective connecting pipes (12, 14) can be fixed beforehand so as to form a sub-assembly (30) which can be inserted in the tank (1) through the opening (2) and can adopt an inclined operative arrangement in which it does not interfere with the space to be operatively occupied by the level sensor (10).

The attachment portion (5) defines a passageway (5c) which allows the level sensor (10) to be inserted and positioned in the tank (1) after the insertion and positioning of the sub-assembly (30).

FIG. 1



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Description

[0001] The present invention relates to a fuel pumping and level-detection assembly for fitting in a motor-vehicle tank having an access opening of small cross-section.

[0002] More specifically, the subject of the invention is a fuel pumping and level-detection assembly comprising:

a pump with an intake opening and a delivery opening,

a fuel filter with an inlet connected to the delivery opening of the pump by means of a first pipe and with an outlet connected to a second pipe for connection to the motor-vehicle engine, and

an electric level sensor comprising a generally elongate casing.

[0003] Tanks for motor-vehicles, particularly so-called motor-scooters, often have quite irregular shapes; for this reason, and also in view of the fact that the access openings of these tanks are generally quite small, it is often difficult to mount various devices such as the pump and the fuel filter, an electric level sensor, and possibly a pressure regulator, as well as the respective tubing, inside the tanks.

[0004] The object of the present invention is to provide a fuel pumping and level-detection assembly for a motor-vehicle tank which enables the various devices of the assembly to be inserted through an opening in the tank the cross-section which is smaller than the transverse dimension of the whole set of devices forming the assembly.

[0005] This and other objects are achieved, according to the invention, by a fuel pumping and level-detection assembly the main characteristics of which are defined in appended Claim 1.

[0006] Further characteristics and advantages of the invention will become clear from the following detailed description, given purely by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a sectioned view of a motor-vehicle tank comprising a fuel pumping and level-detection assembly according to the invention;

Figure 2 is a perspective view of a support structure for an assembly according to the invention;

Figure 3 shows the support structure of Figure 2 to which some devices of the assembly are connected to form a sub-assembly;

Figure 4 is a rear perspective view of the sub-assembly shown in Figure 3;

Figure 5 is a view of the sub-assembly of Figure 4 from above, taken on the arrow V;

Figure 6 shows the sub-assembly of Figures 3 to 5 in the condition in which it is fitted in the tank;

Figures 7 and 8 show two variants of the assembly according to the invention; and

Figure 9 is a partially-sectioned view showing two possible methods of fixing an assembly according to the invention to a tank.

[0007] In Figure 1, a motor-vehicle fuel tank is indicated 1. The tank has an irregular shape and, at the top, has an opening 2 which is circular in the embodiment shown.

[0008] A fuel pumping and level-detection assembly, generally indicated 3, extends inside the tank 1.

[0009] The assembly 3 comprises a support structure, generally indicated 4, including an end attachment portion 5 fixed to the tank in the vicinity of the opening 2 thereof, and a support part or portion 6 which extends inside the tank.

[0010] The assembly 3 also comprises an electric pump 7, a fuel filter 8, and a pressure regulator 9, which are connected to the support portion 6 of the support structure 4.

[0011] The assembly 3 further comprises an electric level sensor 10 including an elongate, substantially cylindrical casing 11. The level sensor is, for example, of the type with a float, and is fixed to the attachment portion 5 of the support structure 4 in the manner which will be described further below.

[0012] The pump 7 has an intake connector 7a with which a sock-type filter 13 is associated, and an output or delivery connector 7b connected to the inlet 8a of the filter 8 by means of a pipe 12 which is preferably flexible.

[0013] As can best be seen in Figure 4, the filter 8 has an outlet connector 8b to which an end of a pipe 14, which is also preferably flexible, is connected, the other end of the pipe being connected to an outlet or delivery connector 5a formed in the attachment portion 5 of the support structure 4 for connection in turn to the motor-vehicle engine in order to supply a flow of fuel thereto, in operation.

[0014] The pressure regulator 9 has an inlet connector 9a (Figure 4), to which a first end of a pipe 15, which is also preferably flexible, is connected, the other end of the pipe being connected to an inlet connector 5b of the attachment portion 5 of the support structure 4.

[0015] The connector 5b is intended to be connected to a return pipe (not shown) by means of which the excess fuel not used by the motor-vehicle engine is brought back to the tank.

[0016] In the embodiment shown in Figures 1 to 6,

the support structure 4 (see Figure 2 in particular) is substantially rigid and may advantageously be made of moulded plastics material.

[0017] In the embodiment shown, the attachment portion 5 of the structure has a circular shape (Figure 5) and has an opening 5c which is also, for example, circular, and in which the upper end of the casing 11 of the level sensor 10 can be fixed.

[0018] A substantially cylindrical wall 16 extends from the lower side of the attachment portion 5 and is cut at the bottom substantially in the shape of the mouthpiece of a recorder.

[0019] Two substantially parallel, substantially triangular walls 17 are connected to the outer surface of the wall 16. These walls in turn are connected, in the region of their lower angles, to two further shaped walls 18, also substantially parallel to one another. These walls 18 are interconnected in their upper portions by a substantially semicylindrical wall 19, the lower edge of which is connected to a substantially semicircular base wall 20, the whole forming a half-cup-shaped seat for housing the body of the filter 8.

[0020] The upper portions of the shaped walls 18 have respective slots 21 through which a clamping clip 22 (Figures 1, 3 and 4), by means of which the filter 8 can be fixed firmly to the support structure 4, can extend.

[0021] Respective transverse flanges 23 (Figure 2) extend substantially towards one another from the lower ends of the shaped walls 18 and are connected to a substantially cylindrical receptacle 24 which is open at the front and can house the body of the pump 7.

[0022] Behind the receptacle 24, the support structure 4 forms a further, substantially inverted-beaker-shaped receptacle 25 for housing the body of the pressure regulator 9 (Figures 2 to 4). The top wall of the receptacle 25 has an opening through which the inlet connector 9a of the pressure regulator 9 can extend.

[0023] As can be appreciated from Figure 1, in the installed condition of use, the assembly 3 as a whole has transverse dimensions larger than those of the opening 2 in the tank 1.

[0024] The assembly 3 is fitted in the tank 1 as follows.

[0025] The pump 7 with the associated sock-type filter 13, the filter 8, and the pressure regulator 9, as well as the respective connecting pipes 12, 14 and 15, are pre-assembled on the support structure 4 so as to form the sub-assembly generally indicated 30 in Figures 3 to 5. This sub-assembly has transverse dimensions which allow it to be inserted in the tank 1 through the opening 2 thereof. In the embodiment shown, this is also made possible by virtue of the flexibility of the pipes 12, 14 and 15. Generally speaking, however, it is also possible to form a sub-assembly 30 which can be inserted through the opening 2 in the tank with the use of suitably pre-shaped, rigid connecting pipes.

[0026] The sub-assembly 30 is then fixed in its operative arrangement shown in Figure 6 by anchoring the attachment portion 5 of the support structure 4 in the vicinity of the opening 2 in the tank. This anchoring can be achieved in various known ways, for example, by means of a threaded or bayonet coupling, or with the use of ring nuts, as will be described further below.

[0027] As can be seen in Figure 6, in the installed condition, the sub-assembly 30 extends along a longitudinal axis which is inclined relative to the axis of the opening 5c (Figure 5) of the attachment portion 5 of the support structure and does not interfere with the space which is to be operatively occupied by the level sensor 10. The level sensor can then be inserted in the tank 1 through the opening 5c in the attachment portion 5 of the support structure 4 and can then be clamped in position by known fixing means, for example, of the bayonet type. The fitting of the assembly 3 is thus completed, as shown Figure 1.

[0028] The arrangement described above thus enables the fuel pumping and level-detection assembly to be fitted easily in a tank having a relatively restricted access opening.

[0029] A further advantage of this arrangement is that, in the event of damage, the fuel-level sensor can easily be removed and replaced if necessary without this also involving the removal of the support structure 4 and the devices connected thereto.

[0030] A further advantage of the invention is that, in order to install the assembly in tanks having different configurations, it is possible to provide correspondingly diversified support structures to which devices (pump, filter, etc.) having standardized characteristics can be connected.

[0031] Figures 7 and 8 show two variants in which the support structure 4 is not strictly rigid.

[0032] In the variant of Figure 7, the support structure 4 comprises, in addition to the attachment portion 5, two shaped support bodies, that is, an upper support body and a lower support body 31 and 32, respectively, interconnected by means of articulated parallelograms (of which only one is visible in Figure 7), formed by pairs of substantially parallel bars 33 each having one end articulated to the support body 31 and one end articulated to the support body 32.

[0033] The upper support body 31 in turn is connected to the attachment portion 5 by means of further articulated parallelograms formed by pairs of bars 34.

[0034] The filter 8 is advantageously fixed to the upper support body 31 beforehand, and the pump 7 with the associated sock-type filter 13 and the pressure regulator 9 are fixed to the lower support body 32 beforehand.

[0035] In order to give the support structure 4 a fairly stable operative configuration, biasing springs 35 are advantageously arranged between opposed angles of the above-mentioned articulated parallelograms and tend to urge the structure and the devices carried thereby away from the region occupied by the level sen-

sor 10. The loads of the springs 35 are advantageously such as to prevent excessive oscillation of the support structure 4 and of the devices fixed thereto in operation, as a result of jolts to which the motor-vehicle is subjected in motion.

[0036] The fact that the support structure of the variant according to Figure 7 has a degree of flexibility may be useful for facilitating the insertion in the tank of the sub-assembly formed by the support structure 4 and by the devices connected thereto.

[0037] In the variant according to Figure 8, the support structure 4 comprises, in addition to the attachment portion 5, an upper support body 31 and a lower support body 32 for the fixing of the filter 8, and for the fixing of the pump 7 and the pressure regulator 9, respectively. These support bodies and the attachment portion 5 are interconnected by means of an articulated structure 36 formed by a plurality of bars 37 articulated to one another in pairs. The articulations between these bars, as well as between the bars and the attachment portion 5 and the support bodies 31 and 32, preferably have resistance, for example due to friction, so that the structure 36 is deformable only provided that its articulations are subjected to a stress above a predetermined threshold. By virtue of this characteristic, the support structure 4 of the embodiment of Figure 8 can be deformed, for example, to facilitate its insertion in the tank 1 but can nevertheless retain the final operative configuration imparted to it by virtue of the relative "stiffness" of its articulations.

[0038] Alternatively, the articulations of the structure 36 of Figure 8 may be yielding and the stability of the operative configuration of the structure in this variant may also be ensured with the use of springs or other resilient biasing means.

[0039] Figure 9 shows, by way of example, two different methods of fixing the assembly 3 in the opening 2 in the tank 1. In the method shown in the left-hand portion of this drawing, an externally threaded collar 40 is fixed around the edge of the opening 2 in the tank, for example, by welding. The attachment portion 5 of the support structure 4 bears on the upper end of this collar with the interposition of a seal 41. The attachment portion is fixed by means of a ring nut 42 screwed onto the thread of the collar 40.

[0040] In the embodiment which can be seen in the right-hand portion of Figure 9, the collar 40 is formed integrally with the tank 1. Otherwise, the anchorage of the assembly 3 to the tank is achieved in the manner described above with reference to the left-hand portion of this drawing.

[0041] The assembly 3 may, of course, be fixed to the tank in various other known ways, for example, by bayonet coupling means, etc.

[0042] Naturally, the principle of the invention remaining the same, the forms of embodiment and details of construction may be varied widely with respect to those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.

[0043] In particular, the invention is not limited to embodiments in which a pipe is provided for returning fuel to the tank but also includes assemblies for so-called "returnless" fuel-supply systems.

Claims

1. A fuel pumping and level-detection assembly (3) for a motor-vehicle tank (1) having an access opening (2) of small cross-section, comprising:

   a pump (7) with an intake opening (7a) and a delivery opening (7b),

   a fuel filter (8) with an inlet (8a) connected to the delivery opening (7b) of the pump (7) by means of a first pipe (12), and with an outlet (8b) connected to a second pipe (14) for connection to the motor-vehicle engine,

   an electric level sensor (10) comprising a generally elongate casing (11);

   the pump (7), the filter (8), and the level sensor (10) being intended to be disposed inside the tank (1) in a working configuration in which, as a whole, they have a transverse dimension greater than the dimension of the opening (2) in the tank (1); and

   a support structure (4) including

   an attachment portion (5) for fixing to the tank (1) in the vicinity of the opening (2), and

   a support portion (6) which is connected to the attachment portion (5) and to which the pump (7) and the filter (8) with the respective connecting pipes (12, 14) can be fixed beforehand so as to form a sub-assembly (30) which can be inserted in the tank (1) through the opening (2) and can adopt an inclined operative arrangement in which it does not interfere with the space to be operatively occupied by the level sensor (10);

   the attachment portion (5) defining a passageway (5c) which allows the level sensor (10) to be inserted and positioned in the tank (1) after the insertion and positioning of the sub-assembly (30).

2. An assembly according to Claim 1, in which the support structure (6) is substantially rigid.

3. An assembly according to Claim 2, in which a first receptacle and a second receptacle (21, 24; 31, 32) are defined in the support portion (6) of the support structure (4) for housing the pump (7) and the filter (8).

4. An assembly according to Claim 3, in which a further receptacle (25) is defined in the support portion (6) of the support structure (4) for housing a pressure regulator (9).

5. An assembly according to Claim 1, in which the support portion (6) of the support structure (4) comprises a plurality of support bodies (31, 32) connected to one another and to the attachment portion (5) in an articulated manner.

6. An assembly according to Claim 5, in which the support bodies (31, 32) and the attachment portion (5) of the support structure (4) are interconnected by means of articulated parallelograms (33, 34).

7. An assembly according to Claim 5 or Claim 6, in which resilient means (35) are provided and tend to cause the support structure (4) to adopt a predetermined configuration.

8. An assembly according to any one of the preceding claims, in which the connecting pipes (12, 14, 15) are flexible.

FIG. 1

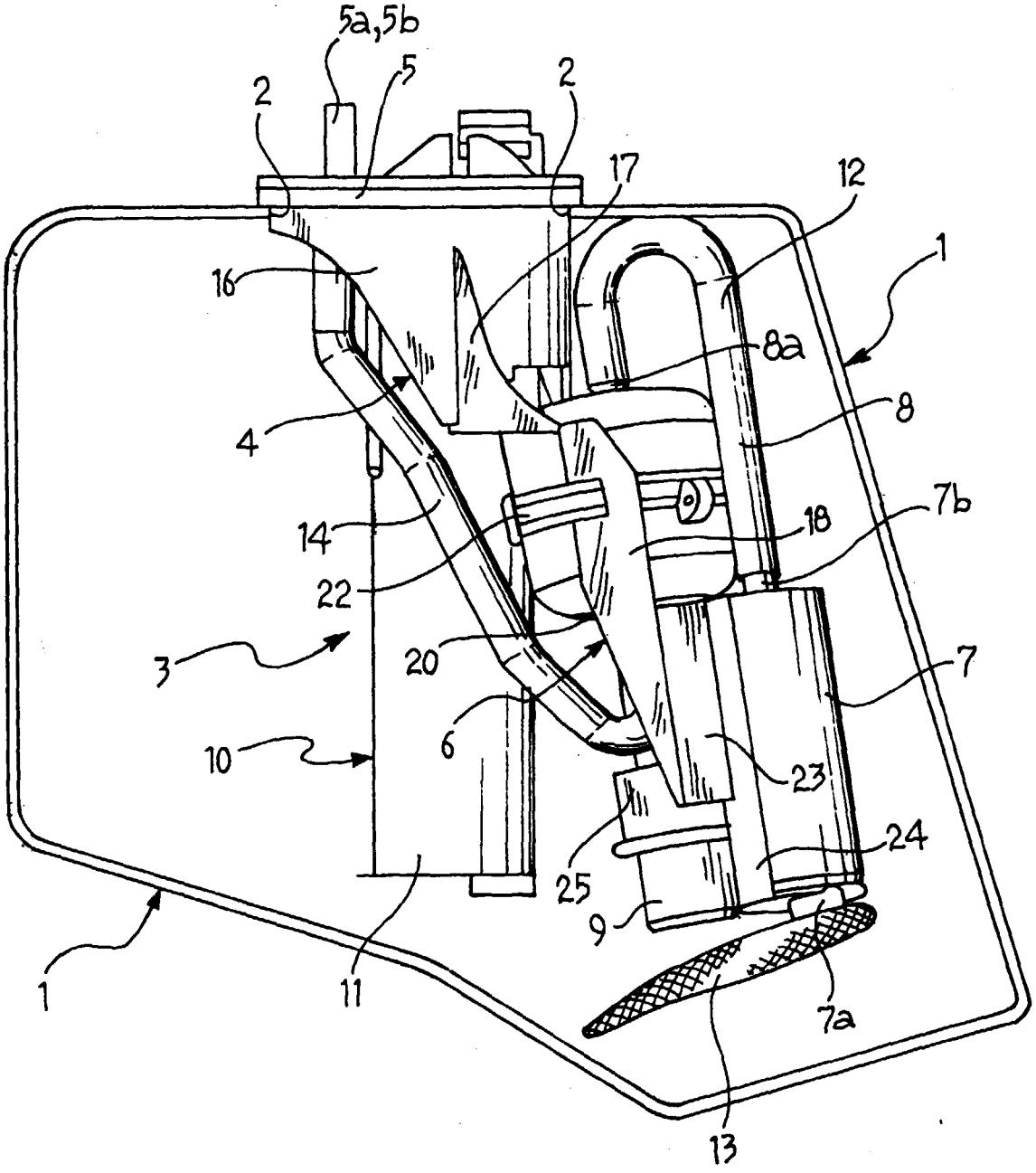
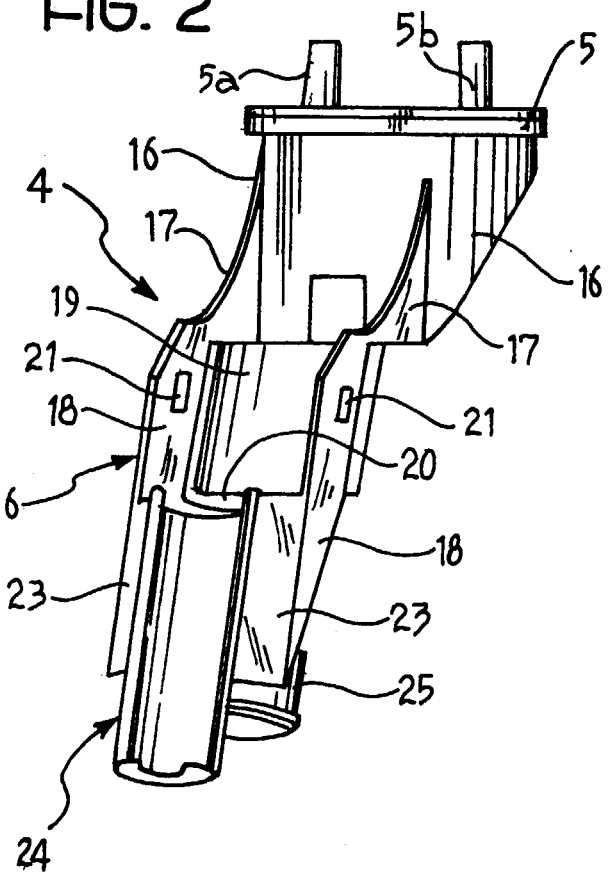


FIG. 2


5a
5b
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16
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FIG. 3

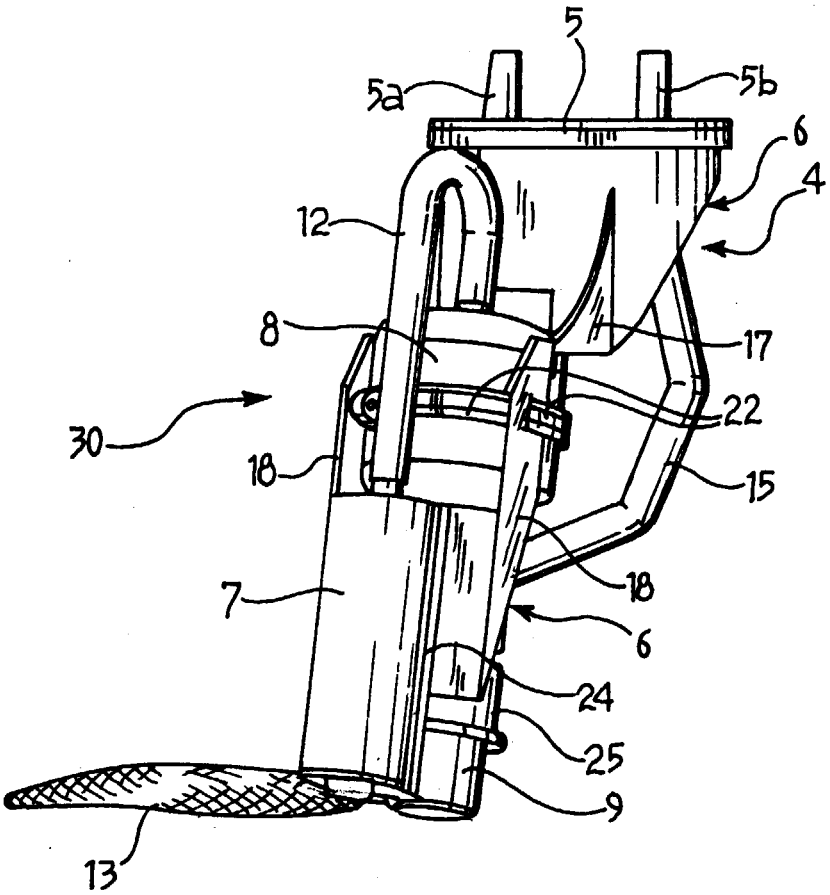
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FIG. 4

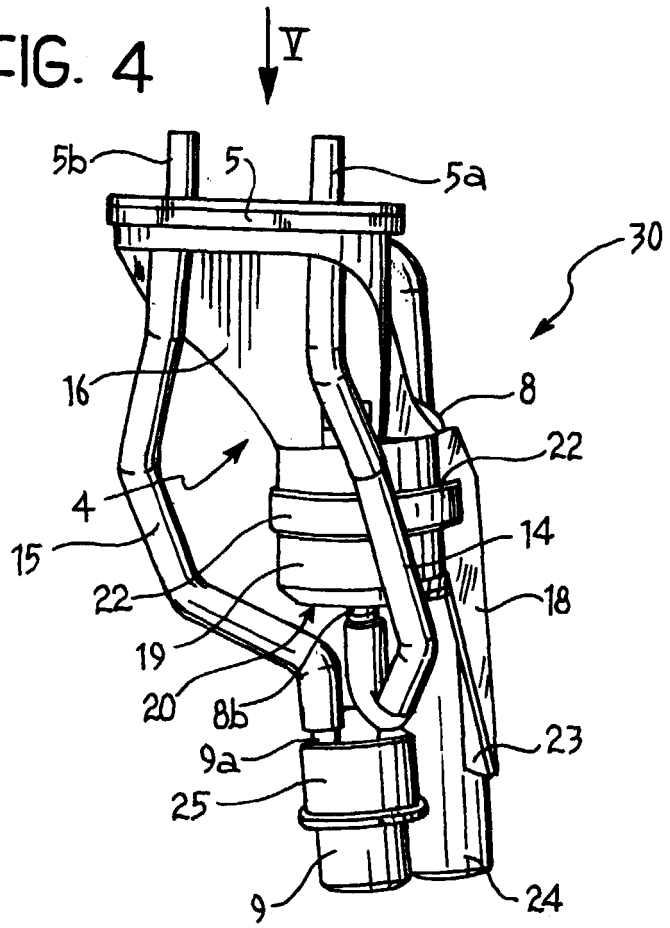
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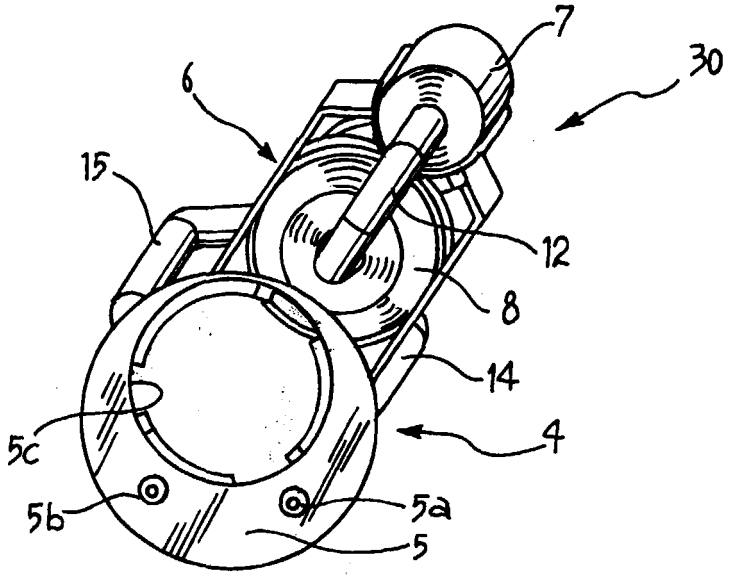
FIG. 5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5a
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FIG. 6

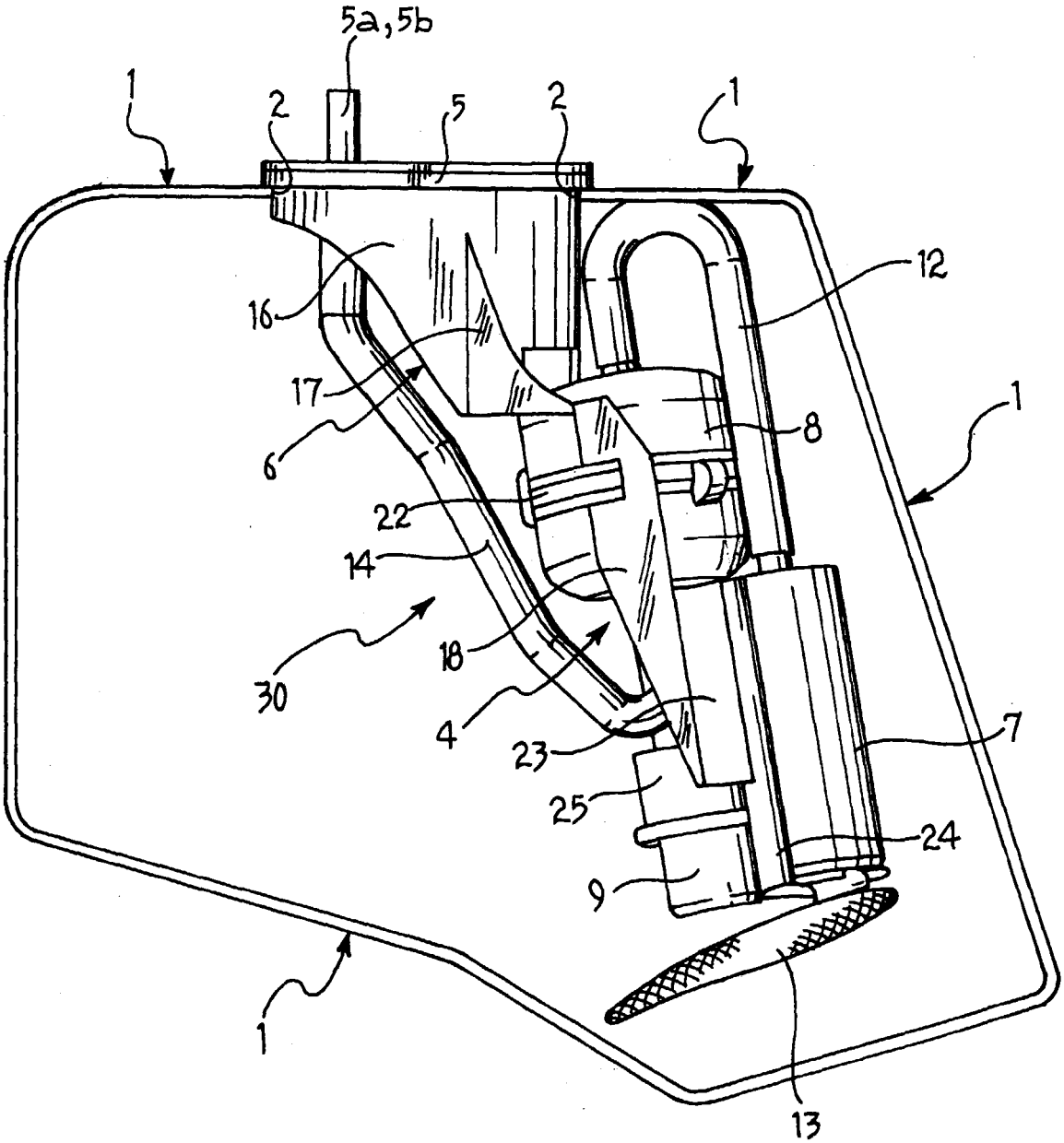

FIG. 7

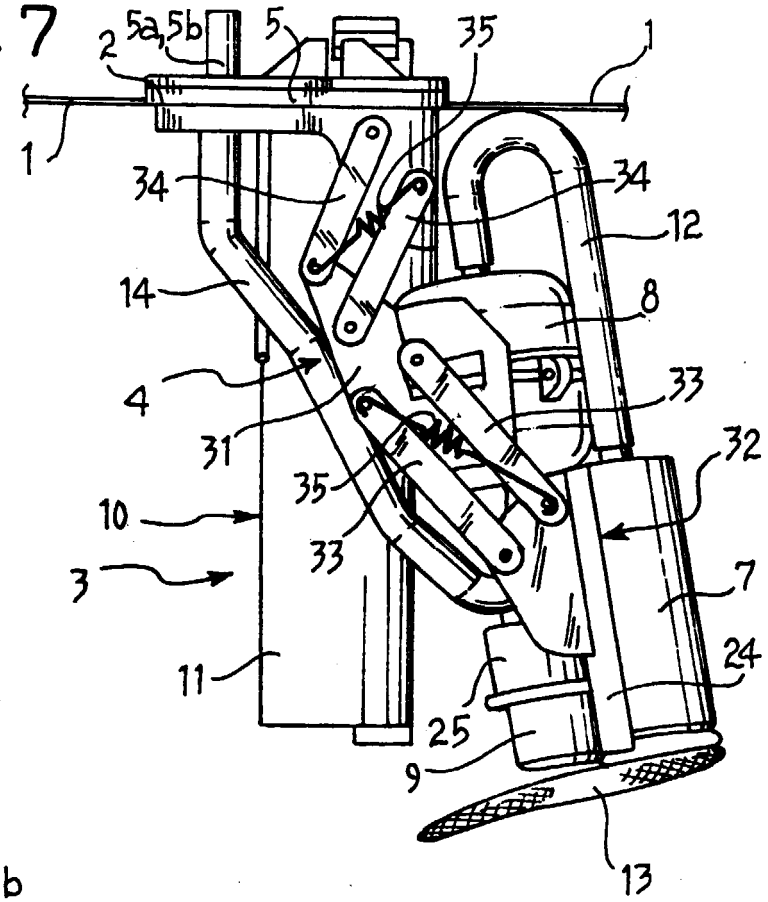
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FIG. 8

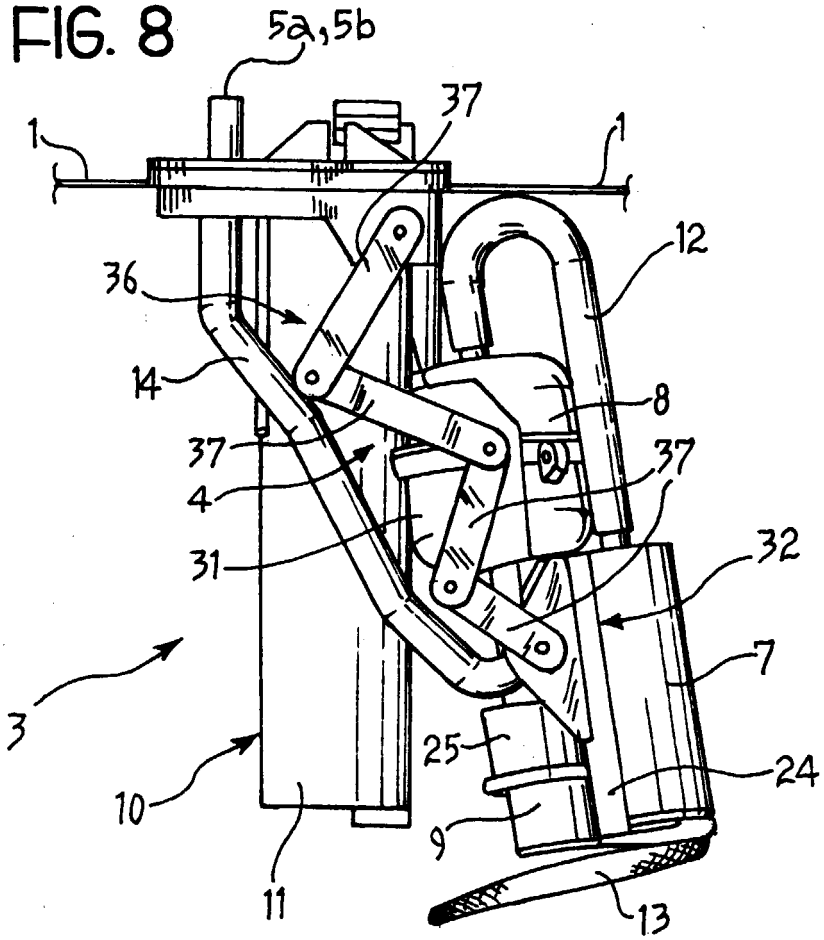
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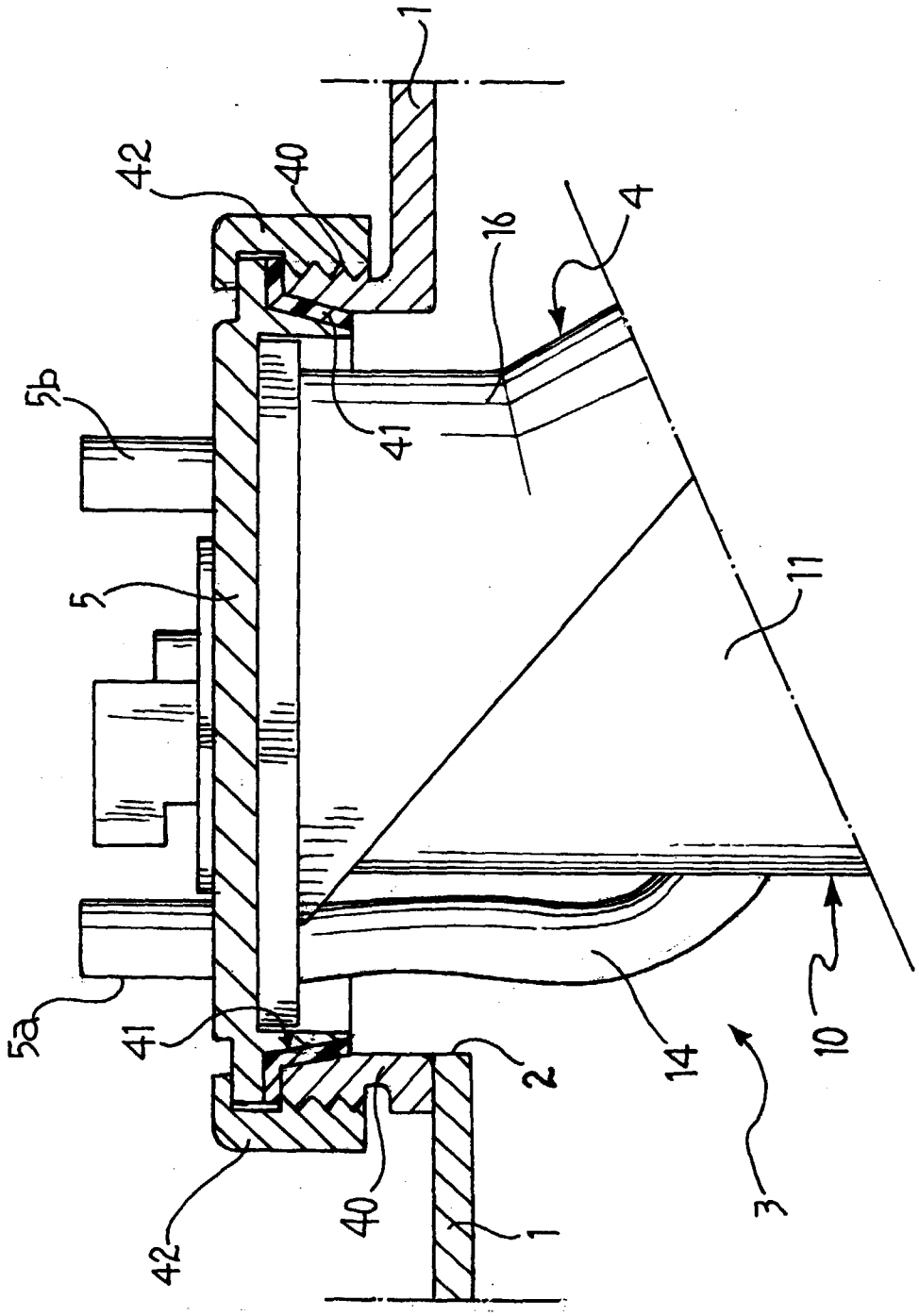
FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 00 12 1990

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	DE 195 08 978 A (MERCEDES-BENZ) 19 September 1996 (1996-09-19) * column 2, line 25 - line 44; figures 1,3 *	1	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 January 2001	Joris, J

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