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(54) Device for exhaust gas treatment

(57) The invention relates to a device for exhaust gas treatment intended to be arranged in an exhaust system of a combustion engine, which device (1) comprises a casing (2) with an inlet aperture (3) for receiving exhaust gases and an outlet aperture for the exhaust gases. The device (1) comprises a pipe connection (8) with an outlet aperture (10) and an inlet aperture which is connected or connectable to the casing's outlet aperture, which pipe connection (8) is fastened or fastenable to the casing (2) and settable in various rotational positions relative to the casing (2) in order to regulate the direction of the pipe connection's outlet aperture (10) relative to the casing (2).

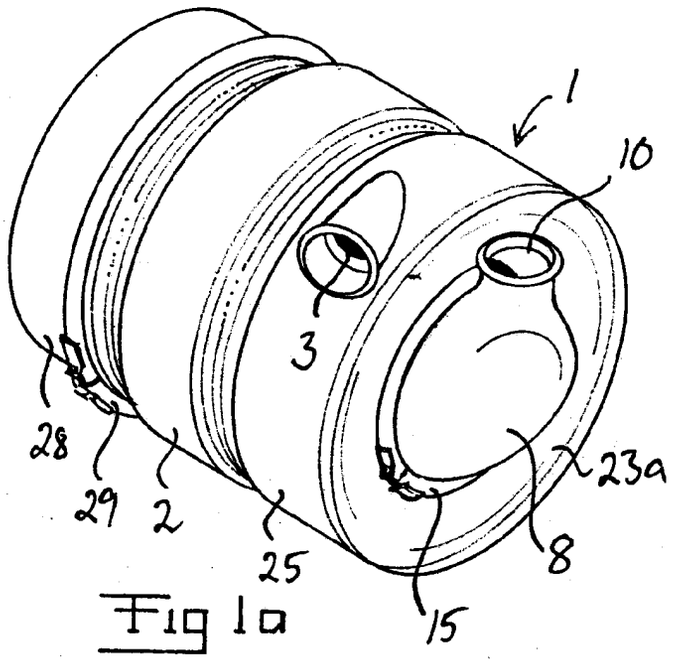

Fig 1a

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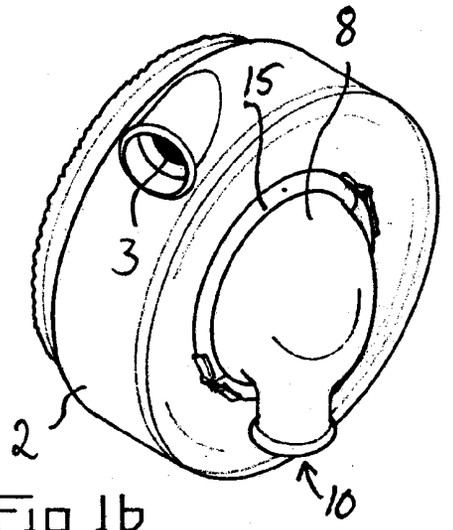

Fig 1b

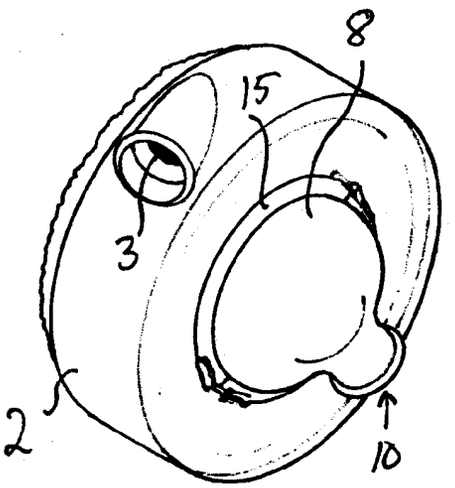

Fig 1c

Description

FIELD OF THE INVENTION AND STATE OF THE ART

[0001] The present invention relates to a device for exhaust gas treatment according to the preamble of claim 1.

[0002] Exhaust gas treatment devices intended to be arranged in an exhaust system of a combustion engine are previously known in a multiplicity of different forms. Such an exhaust gas treatment device usually comprises a casing with an inlet aperture for receiving exhaust gases and an outlet aperture for exhaust gases, and a passage extending inside the casing to guide the exhaust gases between the inlet aperture and the outlet aperture. As they pass between the inlet aperture and outlet aperture of the casing, the exhaust gases are brought into contact with means arranged inside the casing for damping of the low-frequency noise caused by the exhaust gases, and/or means for cleaning of the exhaust gases, e.g. one or more catalysts for effecting catalytic conversion of environmentally dangerous components of the exhaust gases to environmentally less dangerous substances, and/or one or more particle filters for removing particulate components from the exhaust gases.

[0003] An exhaust gas treatment device according to the preamble of claim 1 is previously known, e.g. from SE 520 350 C2. That exhaust gas treatment device comprises a substantially cylindrical casing with an inlet aperture arranged in the shell surface of the casing and an outlet aperture arranged in an endwall of the casing. The inside of the casing is provided with means for noise damping and means for cleaning the exhaust gases. That exhaust gas treatment device is thus designed to effect both noise damping and exhaust gas cleaning.

[0004] An exhaust gas treatment device according to the preamble of claim 1 is also previously known from GB 2 212 771 A. That exhaust gas treatment device comprises a cylindrical casing with an inlet aperture and an outlet aperture arranged in the shell surface of the casing. The inside of the casing is provided with means for noise damping. That exhaust gas treatment device thus constitutes a silencer. To enable the exhaust gas treatment device to be fitted quickly to a combustion engine with avoidance of problems caused by incorrect alignment between components of the combustion engine and the associated exhaust system, the casing is fastened in a retainer which allows rotation of the casing relative to the combustion engine at the time of fitting the casing to the combustion engine.

[0005] Fitting an exhaust gas treatment device of the type concerned to a heavy motor vehicle, e.g. in the form of a truck or trailer, normally involves the exhaust gas treatment device being placed with the longitudinal axis of the casing extending substantially parallel with or substantially perpendicular to the longitudinal axis of the motor vehicle. Depending on whether the motor vehicle is adapted to left-hand or right-hand driving and various legal requirements and market requirements, the exhaust gases from the motor vehicle's combustion engine are released into the open air downwards under the motor vehicle, to the right of the motor vehicle, to the left of the motor vehicle or vertically upwards. The exhaust line between the exhaust gas treatment device and the exhaust system outlet has therefore to be routed differently depending on the desired location and direction of the exhaust system outlet.

OBJECT OF THE INVENTION

[0006] The object of the present invention is to provide an exhaust gas treatment device of the type indicated in the introduction which affords greater flexibility in the design and fitting of an associated exhaust system and simplifies the adaptation of the exhaust system to the desired location and direction of the exhaust system outlet.

SUMMARY OF THE INVENTION

[0007] According to the present invention, said object is achieved by means of a device exhibiting the features indicated in claim 1. According to the invention, the device comprises a pipe connection which has an outlet aperture and an inlet aperture which is connected or connectable to the outlet aperture of the casing, which pipe connection is fastened or fastenable to the casing and settable at different rotational positions relative to the casing in order to regulate the direction of the outlet aperture of the pipe connection relative to the casing. The direction of the outlet of the exhaust gas treatment device can thus be varied without altering the location or orientation of the casing, thereby making it particularly easy to give the outlet of the exhaust gas treatment device a direction which is favourable with regard to the desired location and direction of the exhaust system outlet. The possibility of varying the direction of the outlet of the exhaust gas treatment device according to the invention makes it possible in many cases to make the exhaust line between the exhaust gas treatment device and exhaust system outlet straighter and occupy less space than would be possible when using a conventional design of exhaust gas treatment device with a fixed outlet direction. A straighter and shorter exhaust line is less expensive to manufacture and fit and at the same time reduces the risk of damage to the exhaust line.

[0008] According to a preferred embodiment of the invention, the pipe connection comprises a contact surface intended to engage with a corresponding contact surface of the casing or of a component arranged in the casing, said contact surfaces being so designed that the pipe connection is rotatable relative to the casing when the contact surfaces are in mutual engagement. This makes it easy to arrange the pipe connection in a desired rotational position relative to the casing by rotating

the pipe connection relative to the casing without having to remove the pipe connection from the casing.

[0009] Further preferred embodiments of the device according to the invention are indicated by the dependent claims and the description set out below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention is described below in more detail with reference to examples of embodiments and the attached drawings, which are as follows:

Fig. 1 a a perspective view of a device according to a first embodiment of the present invention, with a pipe connection arranged in a first rotational position,

Fig. 1 b a perspective view of part of the device according to Fig. 1 a, with the pipe connection arranged in a second rotational position,

Fig. 1 c a perspective view of part of the device according to Fig. 1 a, with the pipe connection arranged in a third rotational position,

Fig. 2 an exploded view of the device according to Fig. 1 a, with an associated outlet pipe,

Fig. 3 a longitudinal section of the device according to Fig. 1 a,

Fig. 4 an enlarged detail illustrating a first alternative for fitting a pipe connection to a casing of a device according to the invention,

Fig. 5 a section through A-A in Fig. 3,

Fig. 6 an enlarged detail illustrating a second alternative for fitting a pipe connection to a casing of a device according to the invention,

Fig. 7 a perspective view of part of a device according to a second embodiment of the invention,

Fig. 8 a perspective view illustrating a first alternative for fitting a device according to the invention to the frame of a motor vehicle, and

Fig. 9 a perspective view illustrating a second alternative for fitting a device according to the invention to the frame of a motor vehicle.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0011] The device 1 according to the invention is intended to be arranged in an exhaust system of a combustion engine in order to effect damping of the low-frequency noise caused by the exhaust gases and/or to effect cleaning of the exhaust gases. The device comprises a casing 2 with an inlet aperture 3 for receiving exhaust gases arising from the combustion engine, and an outlet aperture 4 for departure of exhaust gases after they have passed through the casing. Inside the casing 2, a passage 5 is arranged for guiding the exhaust gases between the inlet aperture 3 and the outlet aperture 4. The passage 5 extending between the inlet aperture 3 and the outlet aperture 4 is provided inside with means 6 for damping of noise caused by the exhaust gases, and/or means 7 for cleaning the exhaust gases. These latter means 7 may comprise one or more catalysts for effecting catalyst conversion of environmentally dangerous components of the exhaust gases to environmentally less dangerous substances, and/or one or more particle filters for removing particulate components from the exhaust gases. The casing 2 constitutes a closed external surface except at the points where the inlet aperture 3 and the outlet aperture 4 are arranged.

[0012] According to the invention, the device 1 comprises a pipe connection 8 which has an outlet aperture 10 and an inlet aperture 9 which is connected or connectable to the outlet aperture 4 of the casing. The pipe connection 8 is fastened or fastenable to the casing 2 and settable at various rotational positions relative to the casing 2 in order to regulate the direction of the outlet aperture 10 of the pipe connection relative to the casing 2.

[0013] In the embodiments illustrated in Figs. 1-6, the pipe connection 8 has a contact surface 11 intended to engage with a corresponding contact surface 12 of the casing 2 (see Fig. 6) or of a component 13 arranged in the casing (see Fig. 4), said contact surfaces 11, 12 being designed to enable the pipe connection 12 to be rotated relative to the casing 2 when the contact surfaces 11, 12 are in mutual engagement. Said contact surfaces 11, 12 are preferably rotationally symmetrical. The pipe connection 8 may be steplessly rotatable relative to the casing 2 or alternatively be rotatable between various predetermined setting positions relative to the casing. According to an alternative embodiment, the pipe connection 8 and the casing 2 have mutually engaging portions 14 of polygonal cross-sectional shape, e.g. square cross-sectional shape as illustrated in Fig. 7. It may be seen that, for example, a square cross-sectional shape of the engaging portions 14 concerned provides four different rotational positions of the pipe connection 8 relative to the casing 2. In this alternative embodiment, changing the rotational position of the pipe connection relative to the casing involves the pipe connection 8 being removed from the casing 2 and being returned to engagement with the casing after being rotated relative to the casing 2.

[0014] The pipe connection 8 is with advantage clamped firmly to the casing 2 by a clamping means 15. The clamping means 15 preferably takes the form of a clamp ring, advantageously of V-shaped or U-shaped

cross-section, arranged to engage with the pipe connection 8 externally about a flange 16 extending round the pipe connection's inlet aperture 9. The pipe connection's flange 16 is arranged to engage via its outside with the clamp ring 15 and via its inside with a corresponding flange 17', 17 of the casing 2 (see Fig. 6) or of a component 13 arranged in the casing 2 (see Fig. 4). In this case the aforesaid contact surface 11 of the pipe connection is thus arranged on the inside of the pipe connection's flange, while the corresponding contact surface 12 of the casing/component is arranged on the outside of the flange 17', 17 of the casing/component.

[0015] In the embodiment illustrated in Figs. 1-5, the device 1 comprises a component 13 in the form of an exhaust gas cleaning unit fitted detachably inside the casing 2 and insertable in the casing 2 via the casing's outlet aperture 4. In this case the clamping means 15 is with advantage arranged to clamp the pipe connection 8 firmly to the casing 2 by firmly clamping a flange 16 of the pipe connection and a flange 20 of the casing to a corresponding flange 17 of the exhaust gas cleaning unit 13. In the embodiment illustrated in Fig. 4, the clamping means 15 has two mutually opposite flanges 21, 22, whereby the one flange 21 engages externally about the pipe connection's flange 16 and the other flange 22 engages externally about the casing's flange 20 and clamps these flanges 16, 20 firmly to the exhaust gas cleaning unit's flange 17 situated under them. It thus becomes possible to use a single clamping means 15 to clamp both the pipe connection 8 and the exhaust gas cleaning unit 13 firmly to the casing 2. The exhaust gas cleaning unit 13 comprises preferably a catalyst but might also comprise a particle filter or a catalyst in combination with a particle filter.

[0016] In the embodiments illustrated, the casing 2 is substantially cylindrical and the casing's outlet aperture 4 is arranged in an endwall 23a of the casing, whereby the pipe connection 8 when fastened to the casing is arranged to protrude from this endwall. In this case the pipe connection's inlet aperture 9 has a centreline which substantially coincides with or is substantially parallel with the casing's centreline 24a. The pipe connection's outlet aperture 10 is arranged to be directed away from the casing's centreline 24a when the pipe connection is fastened to the casing. The pipe connection's outlet aperture 10 thus has a centreline 24b which extends at an angle relative to the casing's centreline 24a when the pipe connection is fastened to the casing. The centreline 24b of the pipe connection's outlet aperture 10 consequently extends likewise at an angle relative to the centreline of the pipe connection's inlet aperture 9. The casing's inlet aperture 3 is with advantage arranged in the casing's shell surface 25. If advantageous, elements 26 made of thermally insulating material may be arranged on the outside of the casing, as illustrated in Fig. 3.

[0017] In the embodiment illustrated in Fig. 3, a cylindrical pipe 27 is arranged inside the casing 2 in such a way that the pipe's centreline substantially coincides with the casing's centreline 24a. This pipe 27 extends from the endwall 23a provided with the outlet aperture 4 to a module 28 which comprises a second endwall 23b of the casing 2. The module 28 is advantageously fastened detachably to the remainder of casing 2 by a clamping means 29 in the form of a clamp ring. The aforesaid exhaust gas cleaning unit 13 is fitted inside the pipe 27. The passage 5 between the casing's inlet aperture and outlet aperture comprises a first part-section 5a situated between the casing 2 and the pipe 27, i.e. externally about the pipe 27. The first part-section 5a is connected by a second part-section 5b situated in the module 28 to a third part-section 5c situated internally in the pipe 27. The casing's inlet aperture 3 is connected to the first part-section 5a and the casing's outlet aperture 4 is connected to the third part-section 5c so that the exhaust gases received by the device are caused to flow successively through the first part-section 5a, the second part-section 5b and the third part-section 5c.

[0018] The greater part of the noise caused by the exhaust gases from a combustion engine comprises low-frequency noise. A basic principle for damping low-frequency noise arising from exhaust gases is to lead the exhaust gases through a long line between two spaces. The device 1 illustrated comprises noise-damping means 6 constructed according to this principle. Between a first space constituted by the passage's first part-section 5a and a second space constituted by the passage's third part-section 5c, the exhaust gases are led in a spiral flowpath 30 into the passage's second part-section 5b, as illustrated in Figs. 3 and 5. This spiral flowpath leads the exhaust gases radially inwards towards the casing's centreline 24a from the first part-section 5a to the third part-section 5c. Leading the exhaust gases along said spiral flowpath 30 enables the exhaust gases to be led for a long distance within a limited space, which means that the device can be made compact and occupy little space while at the same time very good noise characteristics can be achieved. If considered advantageous, a particle filter (not depicted) may be arranged in the first part-section 5a of the passage 5, i.e. in the space between the pipe 27 and the casing 2.

[0019] The device 1 according to the invention is particularly intended to be fitted to a heavy motor vehicle, e.g. in the form of a truck or trailer, in order to treat exhaust gases from the motor vehicle's combustion engine. The device 1 is normally positioned with the longitudinal axis of the casing extending substantially parallel with or substantially perpendicular to the motor vehicle's longitudinal axis. Figs. 8 and 9 illustrate a device 1 according to the present invention, fitted to a member 40 forming part of the frame of a motor vehicle. The member 40 illustrated is conceived as extending in the longitudinal direction of the motor vehicle. Fig. 8 illustrates how the device 1 is suspended by means of a bracket relative to the member 40 concerned, with the longitudinal axis of the casing 2 extending substantially per-

pendicular to the longitudinal direction of the member, i. e. substantially perpendicular to the longitudinal axis of the motor vehicle. Fig. 9 illustrates how the device 1 is suspended by means of a bracket 42 relative to the member 40 concerned, with the longitudinal axis of the casing 2 extending substantially parallel with the longitudinal direction of the member, i.e. substantially parallel with the longitudinal axis of the motor vehicle. Figs. 8 and 9 depict the device with the casing's inlet aperture connected to a pipe 43 which forms part of an exhaust line leading exhaust gases from the motor vehicle's combustion engine to the device, and with the outlet aperture of the pipe connection 8 connected to a pipe 44 which forms part of an exhaust line leading exhaust gases from the device 1 to the exhaust system outlet. An alternative version of this latter pipe 44 is also depicted in Fig. 2. By rotation of the pipe connection 8 relative to the casing 2, the pipe connection's outlet aperture 10 can be given a desired direction and location relative to the vehicle frame while maintaining the same fitting position of the casing 2 relative to the vehicle frame.

[0020] The invention is of course no way limited to the embodiments described above, as a multiplicity of possibilities for modifications thereof are likely to be obvious to a specialist in the field without having thereby to deviate from the basic concept of the invention as defined in the attached claims. For example, the passage 5 and the noise-damping means 6 may be designed differently from what is here illustrated. Inter alia the design of the casing 2 may also be different both internally and externally from what is here illustrated.

Claims

1. A device for exhaust gas treatment intended to be arranged in an exhaust system of a combustion engine, which device (1) comprises:

- a casing (2) with an inlet aperture (3) for receiving exhaust gases and an outlet aperture (4) for the exhaust gases,
- a passage (5) extending through the casing (2) for guiding the exhaust gases between the inlet aperture (3) and the outlet aperture (4), and
- means (6) arranged in the passage (5) for damping of noise caused by the exhaust gases, and/or means (7) arranged in the passage (5) for cleaning the exhaust gases,

characterised in that the device (1) comprises a pipe connection (8) which has an outlet aperture (10) and an inlet aperture (9) which is connected or connectable to the casing's outlet aperture (4), which pipe connection (8) is fastened or fastenable to the casing (2) and settable in various rotational positions relative to the casing (2) in order to regulate the direction of the pipe connection's outlet aperture (10) relative to the casing (2).

2. A device according to claim 1, **characterised in that** the pipe connection (8) has a contact surface (11) intended to engage with a corresponding contact surface (12) of the casing (2) or of a component (13) arranged in the casing, said contact surfaces (11, 12) being so designed that the pipe connection (8) is rotatable relative to the casing (2) when the contact surfaces (11, 12) are in mutual engagement.

3. A device according to claim 2, **characterised in that** said contact surfaces (11, 12) are rotationally symmetrical.

4. A device according to any one of the foregoing claims, **characterised in that** the device (1) comprises a clamping means (15) for clamping the pipe connection (8) firmly to the casing (2).

5. A device according to claim 4, **characterised in that** the clamping means (15) takes the form of a clamp ring arranged to engage with the pipe connection (8) externally about a flange (16) extending round the pipe connection's inlet aperture (9).

6. A device according to claim 5, **characterised in that** the pipe connection's flange (16) is arranged to engage via its outside with the clamp ring (15) and via its inside to engage with a corresponding flange (17'; 17) of the casing (2) or of a component (13) arranged in the casing.

7. A device according to any one of claims 4-6, **characterised in that** the device (1) comprises an exhaust gas cleaning unit (13) fitted detachably inside the casing (2) and insertable in the casing via the casing's outlet aperture (4), and that the clamping means (15) is arranged to clamp the pipe connection (8) firmly to the casing (2) by clamping a flange (16) of the pipe connection and a flange (20) of the casing firmly to a corresponding flange (17) of the exhaust gas cleaning unit.

8. A device according to claim 7, **characterised in that** the exhaust gas cleaning unit (13) comprises a catalyst.

9. A device according to any one of the foregoing claims, **characterised in that** the casing (2) is substantially cylindrical and that the casing's outlet aperture (4) is arranged in an endwall (23a) of the casing, whereby the pipe connection (8) when fastened to the casing (2) is arranged to protrude from this endwall (23a).

10. A device according to claim 9, **characterised in**

that the pipe connection's inlet aperture (9) has a centreline which substantially coincides with or is substantially parallel with the casing's centreline (24a).

11. A device according to claim 9 or 10, **characterised in that** the casing's inlet aperture (3) is arranged in the casing's shell surface (25).

12. A device according to any one of the foregoing claims,
characterised in that the pipe connection's outlet aperture (10) is arranged to be directed away from the casing's centreline (24) when the pipe connection (8) is fastened to the casing (2).

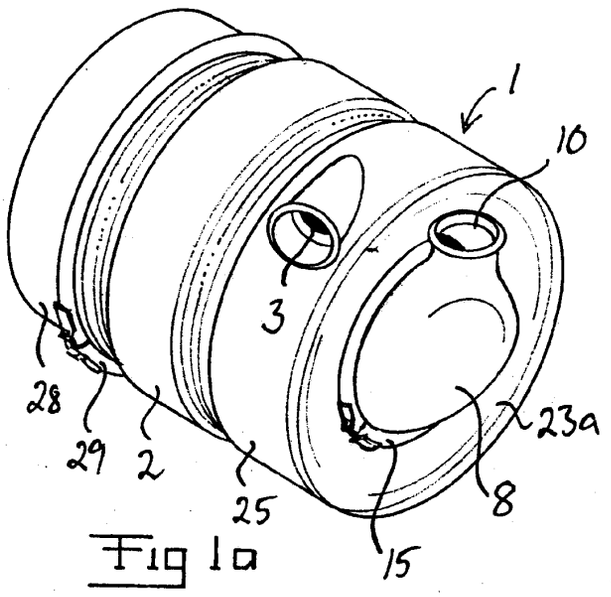

Fig 1a

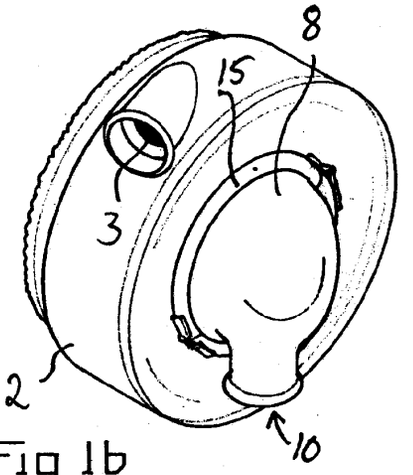

Fig 1b

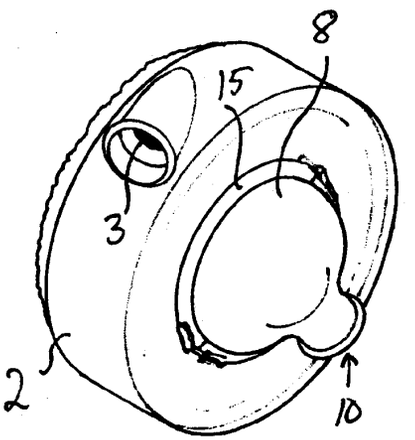

Fig 1c

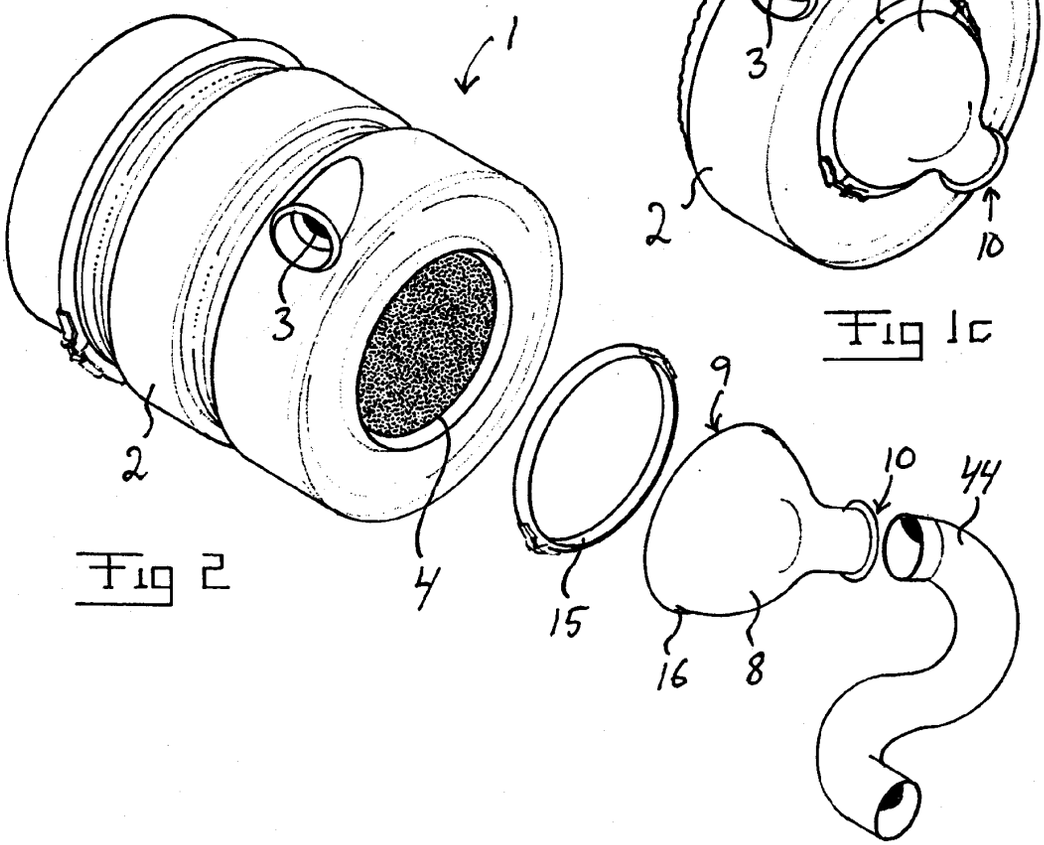

Fig 2

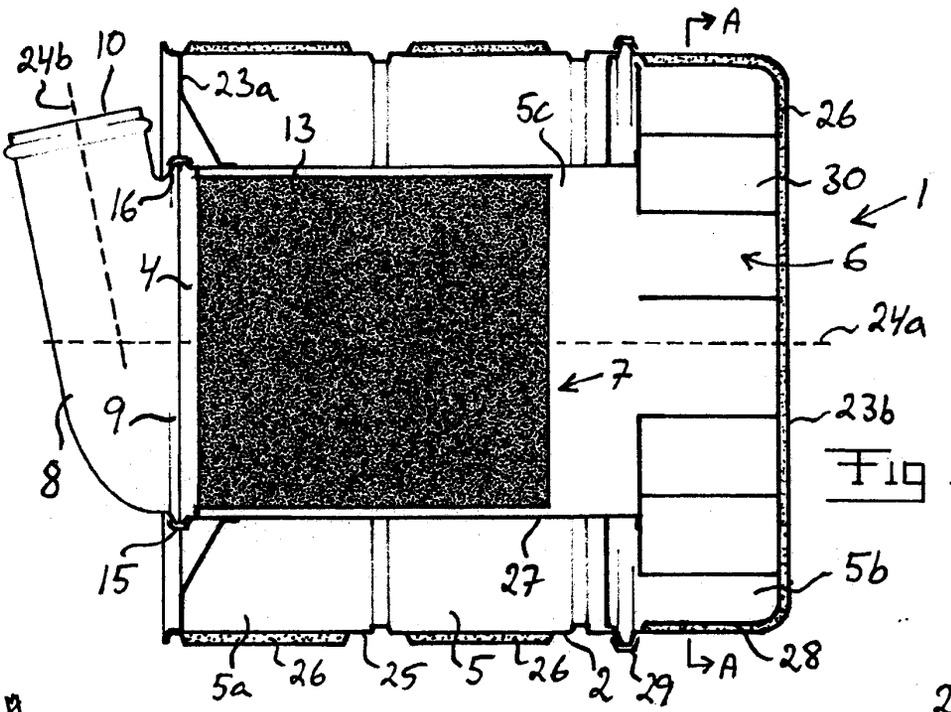

Fig 3

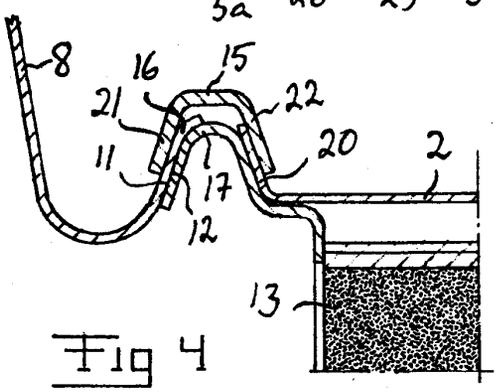

Fig 4

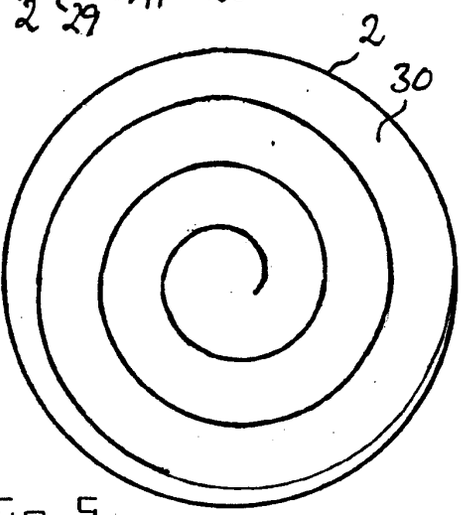

Fig 5

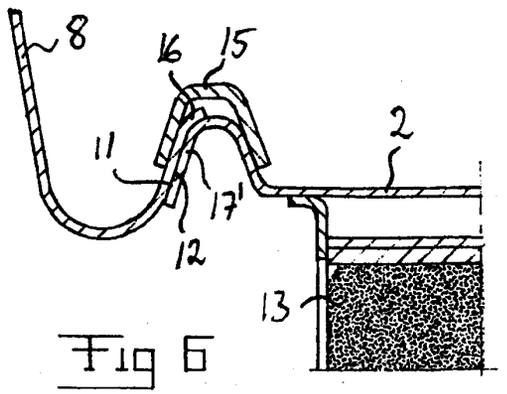

Fig 6

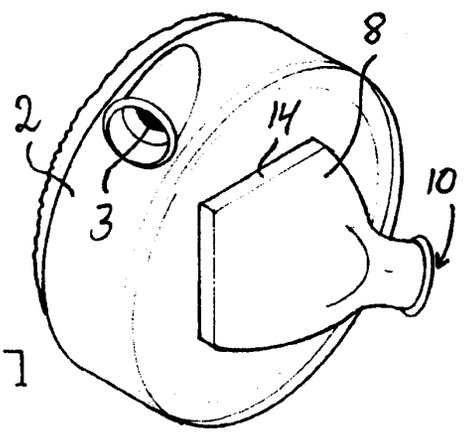

Fig 7

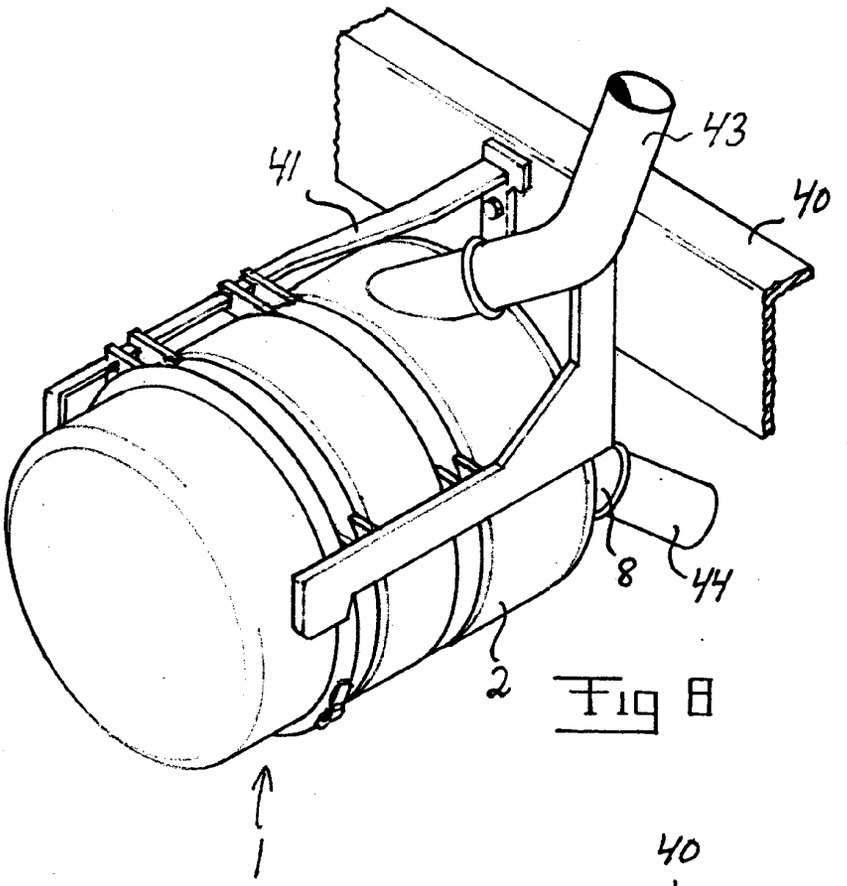

Fig 8

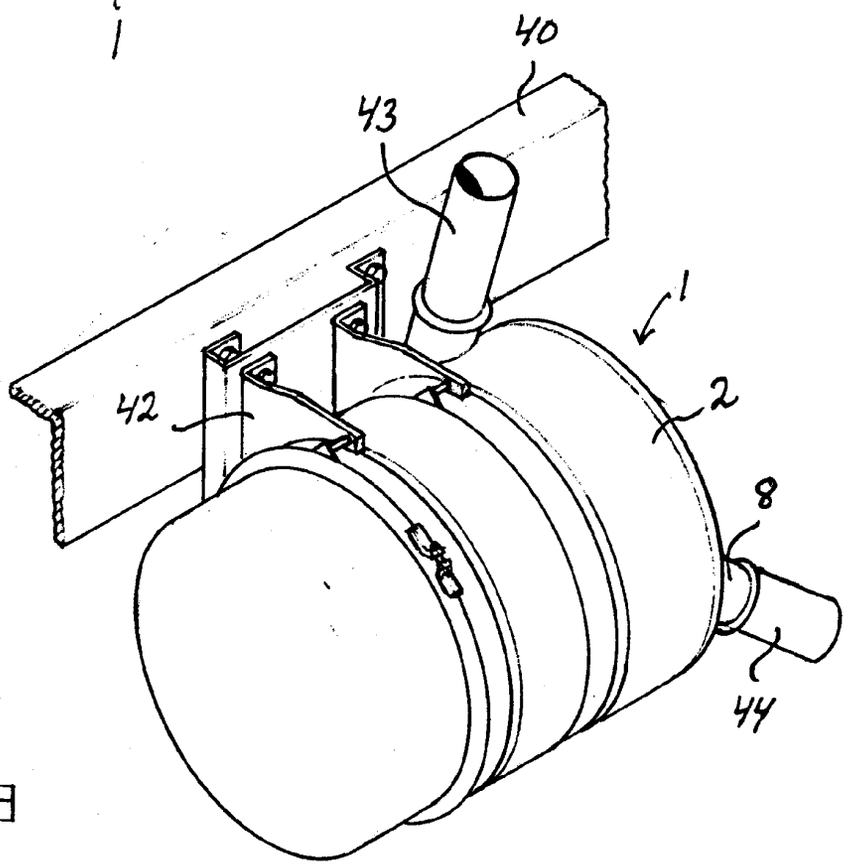

Fig 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 3766

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 2003/108457 A1 (GAULT ANTHONY JOHN ET AL) 12 June 2003 (2003-06-12) * paragraphs [0068], [0069]; figure a * -----	1-10,12	F01N1/08
A	US 2002/050260 A1 (HARVEY RODERICK E) 2 May 2002 (2002-05-02) * paragraphs [0028], [0029]; figure 7 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F01N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 June 2005	Tatus, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 10 3766

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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29-06-2005

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