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(54) Thermal protection piece and inlet manifold comprising such a piece

(57) A piece that is substantially in the form of a sleeve or a tubular fitting, designed to be set into an inlet manifold or splitter made of thermoplastic material, notably with a double plenum or chamber, at the level of an inlet opening of this manifold, the said piece having an inlet opening and an outlet opening; the piece (1) is made of a material that withstands temperatures of at least 250°C, has a tubular structure and channels the gas flux that passes through it into the said manifold or splitter by directing it substantially towards the centre of the internal volume of the chamber.

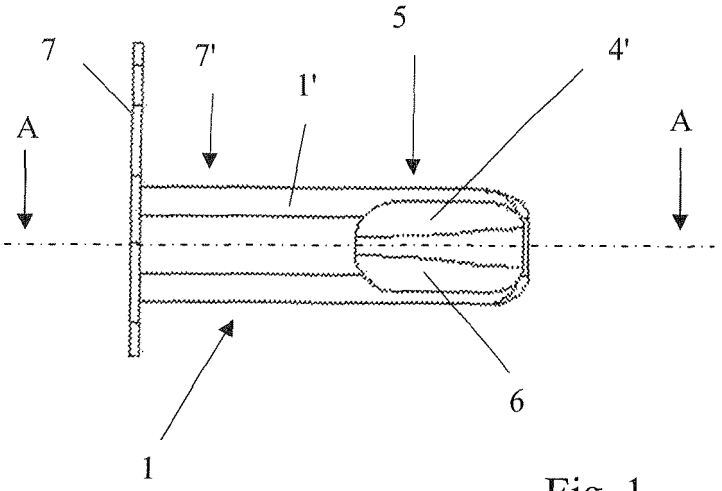

Fig. 1

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Description

[0001] This invention relates to the field of equipment for vehicles fitted with internal combustion engines, more particularly the inlet manifolds or splitters thereof, and its subject-matter concerns a piece, particularly an inlet and thermal protection piece, designed to be set into such a manifold and a manifold comprising such a piece.

[0002] The recirculation of exhaust gases or EGR gases has now become commonplace, due to the growing importance of economic and ecological considerations connected with using a vehicle that operates by means of a fossil fuel.

[0003] On the other hand, the use of thermoplastic materials in the manufacture of inlet manifolds or splitters is also widespread, this is chiefly for reasons of production costs, weight and versatility of configuration possibilities.

[0004] However, the thermoplastic materials currently used have much lower melting point temperatures than the temperatures of the exhaust gases to be recycled by reinjection into the manifolds or splitters.

[0005] In order to overcome this obvious incompatibility, various devices for cooling, thermo-decoupling or suchlike have already been proposed.

[0006] Nevertheless, these known devices have one or several of the following drawbacks: complex structure, high production cost, large dimensions, heavy weight and too high a pressure drop.

[0007] The aim of this invention is to suggest a solution that has none of these drawbacks.

[0008] For this purpose, its object is a piece substantially in the form of a sleeve or tubular fitting, designed to be set into an inlet manifold or splitter made of a thermoplastic material, at an inlet opening of this manifold, the said piece having an inlet opening and an outlet opening, a piece characterised in that it is made of a thermosettable material, having a substantially linear structure and, at its end that is to be located in the manifold and that has an outlet opening, having a configuration such that the gaseous flux passing through the said hollow piece is deviated sideways, in relation to the longitudinal direction of extension of the piece and/or to the direction of flow of the gases therein, before exiting.

[0009] Further features and advantages of the invention will emerge from the following description of a preferred embodiment, given by way of a non-limiting example and shown in the accompanying drawings, in which:

Figures 1, 2 and 3 are front-elevation, side-elevation and bird's eye views respectively of a piece according to an embodiment of the invention;

Figure 4 is a cross-sectional view along A-A of the piece shown in Figure 1;

Figure 5 is a cross-sectional view of an embodiment of an inlet manifold having a reception site for the piece shown in Figures 1 to 4;

Figure 6 is a side elevation along direction B of the manifold shown in Figure 5;

Figure 7 is a cross-sectional view of a piece according to another embodiment of the invention, and

Figure 8 is a cross-sectional view, similar to Figure 5, of another embodiment of a manifold fitted with a piece as shown in Figure 7.

[0010] Figures 1 to 4 and 7 show a piece 1 that is substantially in the form of a sleeve or a tubular fitting, designed to be set into an inlet manifold or splitter 2 made of thermoplastic material, notably with a double plenum or chamber 3, at the level of an inlet opening of this manifold, the said piece 1 having an inlet opening 4 and an outlet opening 4'.

[0011] According to the invention, the piece 1 is characterised in that it is made of a material that withstands temperatures of at least 250°C, has a tubular structure and channels the gaseous flux that passes through it into the said manifold or splitter 2 by directing it substantially towards the centre of the internal volume 3' of the chamber 3.

[0012] According to a first embodiment, shown in Figures 7 and 8, the piece 1 is made of a thermosettable material and has a straight or linear tubular structure along its entire length, the inlet and outlet directions of the gases passing through the said piece 1 being combined.

[0013] According to a second embodiment, shown in Figures 1 to 4, the piece 1 is made of a thermosettable material and has a substantially linear tubular structure with, at its end 5 that is to be located in the manifold 2 and that has the outlet opening 4', a configuration such that the gaseous flux passing through the said hollow piece 1 is deviated sideways, in relation to the longitudinal direction of extension of the piece 1 and/or to the direction X of flow of the gases therein, before exiting.

[0014] In the two embodiments, the piece 1 is of sufficient length to bring the gaseous flux to a place that gives directly into the internal volume 3' (flared part of the inlet opening or passage giving into the volume 3').

[0015] More precisely, in the second embodiment, the end 5 designed to be located in the manifold 2 is shaped so that, after positioning the said piece 1 in the manifold 2, the incoming gaseous flux is deviated towards the internal volume 3' of the said chamber 3 and the main direction X of flow of the gaseous flux, inside the hollow piece 1 which is substantially linear and/or near the outlet opening 4' or end giving into the corresponding chamber 3, only intersects the wall 2' of the manifold 2 after it has intersected the wall 1' of the piece 1.

[0016] Thus, the piece 1 protects the wall 2' of the manifold 2 from a direct impact of the incoming flux of hot EGR gases and directs said flux into the space of the internal volume 3' of the chamber 3 where the gases spread out by diffusing, without leading to a marked pres-

sure drop and allowing the said gases to be sufficiently cooled before they make contact with the wall 2.

[0017] According to a preferred embodiment of the invention, shown in Figures 1 to 4, the end 5 to be located in the manifold 2 comprises a portion of wall 6, curved in a circular or elliptical arc, forming an outlet deflector for the gaseous flux passing through the piece 1 and in that the outlet opening 4', corresponding to the end opening giving into the corresponding chamber 3 of the manifold 2 after inserting the piece 1 therein, is positioned sideways in relation to the longitudinal direction DL of extension of the said substantially linear piece 1.

[0018] Advantageously, the curved portion of wall 6, which may have an increased and/or variable thickness, has an angular extension of about 90°, the gaseous flow being substantially deviated by an angle of the same amplitude between its entry into and exit from the piece 1.

[0019] The thickness of the wall 1' of the piece 1 may be optimised in order to adapt it to the thermal and mechanical stresses resulting from the hot gaseous flux, for example by simulation or experimentation.

[0020] In particular, the thickness of the portion of inflected or curved wall, subjected to the impact of the flux, may be greater than that of the tubular part 7'.

[0021] Furthermore, the shape of this portion of wall 6, its edge and its area of connection with part 7' may be defined so as to obtain a flow of a set nature, direction and pressure drop.

[0022] According to an advantageous practical variation, the edges defining the inlet 4 and outlet 4' openings of the said piece 1 deviating the gaseous flux passing through it, lie in planes that are substantially perpendicular to each other.

[0023] In order to fit it, for example by screwing (preferred mode), gluing, welding or suchlike, the piece 1 has, in the two above-mentioned embodiments, at the level of and around its inlet opening 4, a connection interface 7, in the form of a plate or fixing flange for example, preferably made in a one piece with the tubular part 7' of the piece 1.

[0024] Preferably, as shown in Figures 1 to 4 and 7, the connection interface 7 has a structure in the form of a cut-out plate designed to form a thermal decoupling element, and may connect, in addition to the first opening corresponding to the inlet opening 4 of the tubular part 7' of the piece 1, also a second opening 8 for the passage of a gaseous flux towards a second chamber, the said tubular part 7' possibly comprising external projecting formations providing supporting and keying surfaces, lines or points cooperating with the reception site of the said piece 1 in the manifold 2.

[0025] According to a variant not shown, the second opening 8 of the plate-shaped connection interface 7 may also extend as a tubular body extending into a second inlet opening of the chamber 3 or into the inlet opening of a second chamber of the said manifold 2.

[0026] The resulting simple construction of the piece 1 means that it is easy to manufacture by injection moulding in a single piece.

[0027] The piece 1 may, for example, be made of Thermodur (a material produced by the Vyncolit Company, Reference X70/10) or PPS (produced by the Ryton Company, Reference R4 220 40% GF), which also have heat insulation properties.

[0028] This invention also relates, as shown in Figures 5, 6 and 8, in conjunction with Figures 1 to 4 and 7, an inlet manifold or splitter for a vehicle with an internal combustion engine, having at least one chamber or plenum, at least one external air inlet opening and at least one inlet opening for exhaust gas to be re-injected or EGR gas, the outside air and EGR gases ending up in the same chamber or in two chambers or parts of separate chambers.

[0029] Specifically, this manifold 2 has at the level of its EGR gas inlet opening 9 a set-in piece 1 as described above and shown in Figures 1 to 4 and 7.

[0030] Preferably, the EGR gas inlet opening 9 consists of or extends as a tubular portion 9' giving into the internal volume 3' of the chamber 3 or corresponding chamber and providing a reception site with a key for the set-in piece 1, such that the gaseous flux exiting therefrom is substantially pointing towards the middle of the said internal volume 3' of the said chamber 3.

[0031] Thus, in addition to the deviation of the gaseous flux towards the internal volume 3' of the chamber 3, the piece 1 also forms a protective lining for the wall 2' at the EGR gas inlet passage in the manifold 2.

[0032] In order to achieve a rigid, precise and strong connection between the piece 1 and the manifold 2, the latter, on the external side of the reception site for the set-in piece, has fixing sites 10 and a support surface 10' for the plate or connecting flange 7 forming part of the said piece 1.

[0033] According to an advantageous embodiment, the manifold 2 may have two chambers or plenums and in that the set-in piece 1 is a set-in piece 1 according to the variation not shown or shown in the above-described Figure 2 .

[0034] Clearly, the invention is not limited to the embodiment described and shown in the accompanying drawings. Modifications can be made, particularly as regards the construction of the various elements or by substituting equivalent techniques, without departing from the scope of protection of the invention.

Claims

1. Piece that is substantially in the form of a sleeve or a tubular fitting, designed to be set into an inlet manifold or splitter made of thermoplastic material, at the level of an inlet opening of this manifold, the said piece having an inlet opening and an outlet opening, piece (1) **characterised in that** it is made of a material that withstands temperatures of at least 250°C, has a tubular structure and channels the gaseous

flux that passes through it into the said manifold or splitter (2) by directing it substantially towards the centre of the internal volume (3') of the chamber (3).

2. Piece according to claim 1, **characterised in that** it is made of a thermosettable material and has a substantially linear tubular structure with, at its end (5) that is to be located in the manifold (2) and that has the outlet opening (4'), a configuration such that the gaseous flux passing through the said hollow piece (1) is deviated sideways, in relation to the longitudinal direction of extension of the piece (1) and/or to the direction (X) of flow of the gases therein, before exiting.

3. Piece according to claim 2, **characterised in that** the end (5) designed to be located in the manifold (2) is shaped so that, after positioning the said piece (1), the incoming gaseous flux is deviated towards the internal volume (3') of the said chamber (3) and the main direction (X) of flow of the gaseous flux, inside the hollow piece (1) which is substantially linear and/or near the outlet opening (4') or end giving into the corresponding chamber (3), only intersects the wall (2') of the manifold (2) after it has intersected the wall (1') of the piece (1).

4. Piece according to any one of claims 2 and 3, **characterised in that** the end (5) to be located in the manifold (2) has a portion of wall (6), curved in a circular or elliptical arc, forming an outlet deflector for the gaseous flux passing through the piece (1) and **in that** the outlet opening (4'), corresponding to the end-opening giving into the corresponding chamber (3) of the manifold (2) after inserting the piece (1) therein, is positioned sideways in relation to the longitudinal direction (DL) of extension of the said substantially linear piece (1).

5. Piece according to claim 4, **characterised in that** the curved portion of wall (6), which may have an increased and/or variable thickness, has an angular extension of about 90°, the gaseous flow being substantially deviated by an angle of the same amplitude between its entry into and exit from the piece (1).

6. Piece according to any one of claims 2 to 5, **characterised in that** the edges defining the inlet (4) and outlet (4') openings of the said piece (1) deviating the gaseous flux passing through it, lie in planes that are substantially perpendicular to each other.

7. Piece according to claim 1, **characterised in that** it is made of a thermosettable material and has a straight or linear tubular structure along its entire length, the inlet and outlet directions of the gases passing through the said piece (1) being combined.

8. Piece according to any one of claims 1 to 7, **characterised in that** it has, at the level of and around its inlet opening (4), a connection interface (7), in the form of a plate or fixing flange for example, preferably made in a one piece with the tubular part (7') of the piece (1).

9. Piece according to claim 8, **characterised in that** the connection interface (7) has a structure in the form of a cut-out plate designed to form a thermal decoupling element, and may connect, in addition to the first opening corresponding to the inlet opening (4) of the tubular part (7') of the piece (1), also a second opening (8) for the passage of a gaseous flux towards a second chamber, the said tubular part (7') possibly comprising external projecting formations providing supporting and keying surfaces, lines or points cooperating with the reception site of the said piece (1) in the manifold (2).

10. Piece according to claim 9, **characterised in that** the second opening (8) of the plate-shaped connection interface (7) may also extend as a tubular body extending into a second inlet opening of the chamber (3) or into the inlet opening of a second chamber of the said manifold (2).

11. Inlet manifold or splitter for a vehicle with an internal combustion engine, having at least one chamber or plenum, at least one external air inlet opening and at least one inlet opening for exhaust gas to be reinjected or EGR gas, the outside air and EGR gases ending up in the same chamber or in two chambers or parts of separate chambers, manifold (2) **characterised in that** it has at the level of its EGR gas inlet opening (9) a set-in piece (1) according to any of claims 1 to 9.

12. Manifold according to claim 11, **characterised in that** the EGR gas inlet opening (9) consists of or extends as a tubular portion (9') giving into the internal volume (3') of the chamber (3) or corresponding chamber and providing a reception site with a key for the set-in piece (1), such that the gaseous flux exiting therefrom is substantially pointing towards the middle of the said internal volume (3') of the said chamber (3).

13. Manifold according to claim 12, **characterised in that** on the external side of the reception site for the set-in piece, it has fixing sites (10) and a support surface (10') for the plate or connecting flange (7) forming part of the said piece (1).

14. Manifold according to any one of claims 11 to 13, **characterised in that** it has two chambers or plenums and **in that** the set-in piece (1) is a piece according to any one of claims 9 and 10.

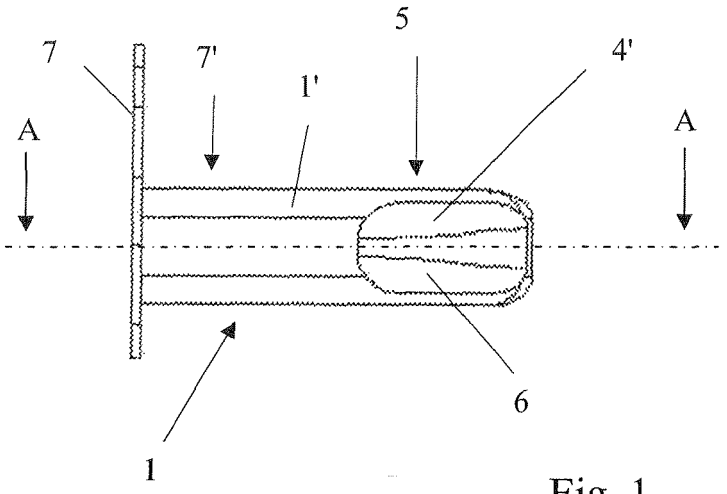

Fig. 1

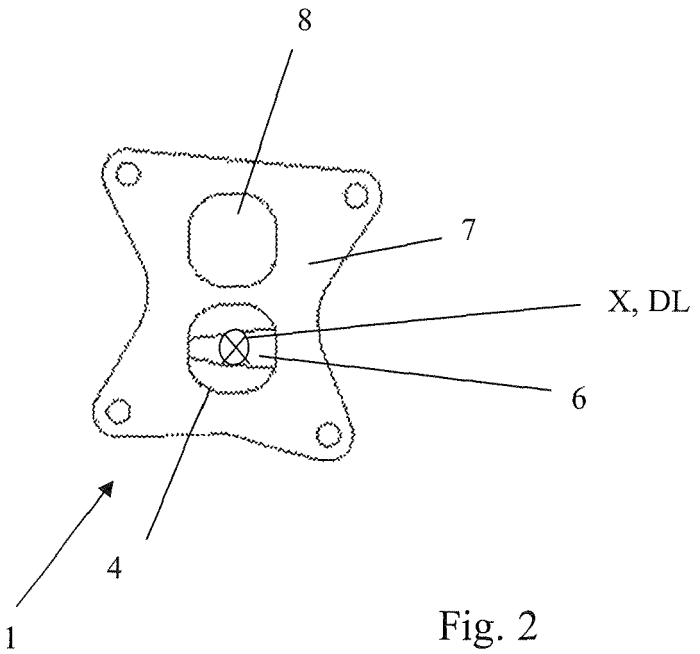

Fig. 2

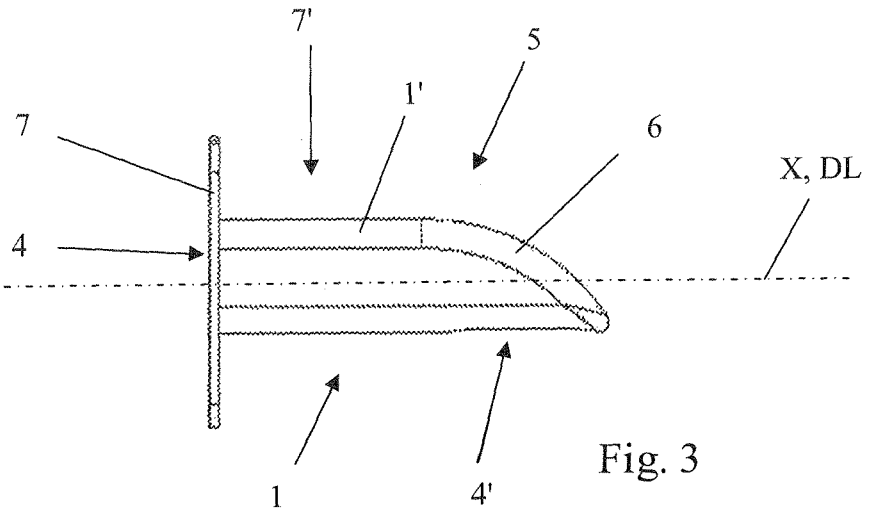

Fig. 3

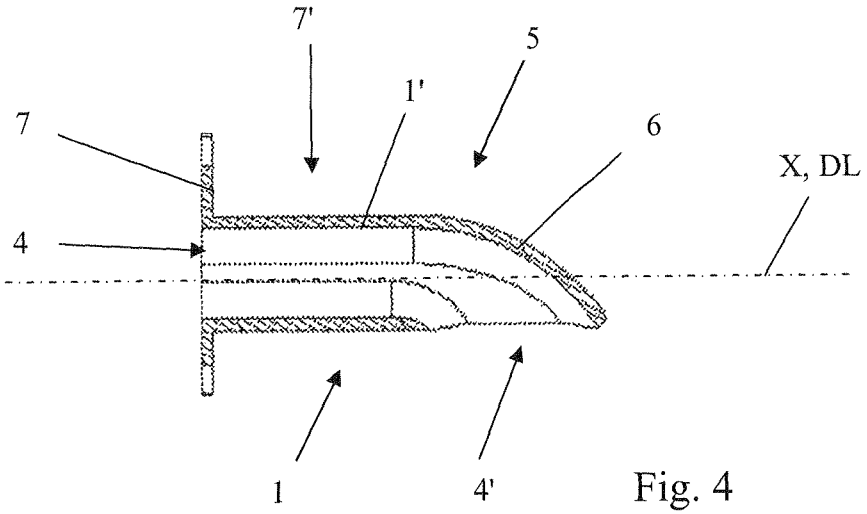

Fig. 4

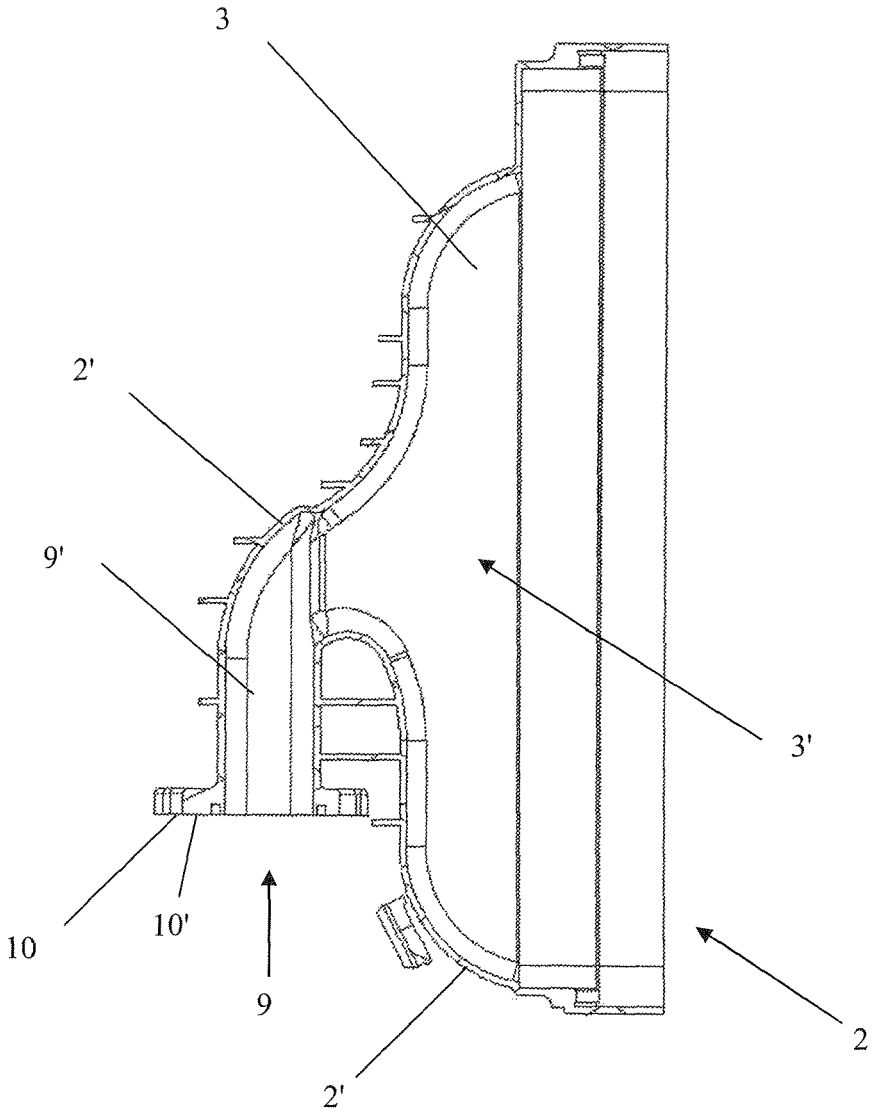

Fig. 5

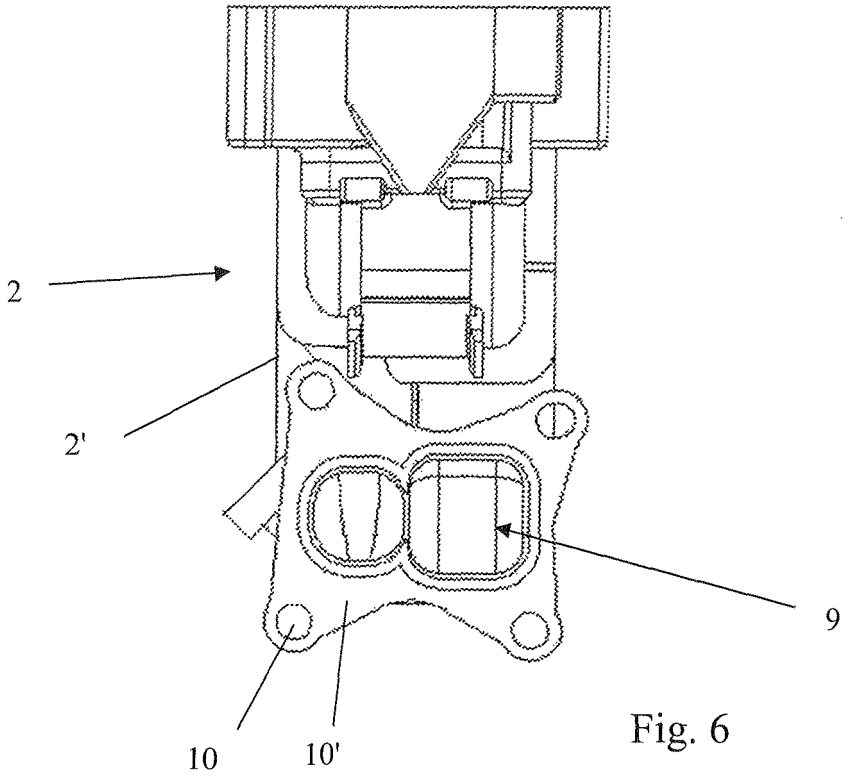

Fig. 6

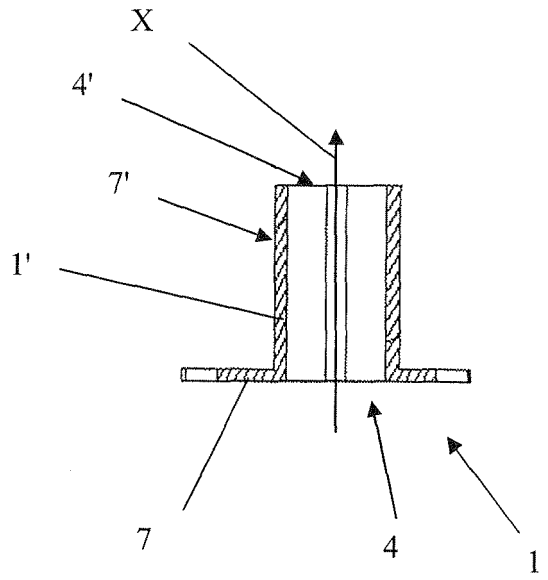

Fig. 7

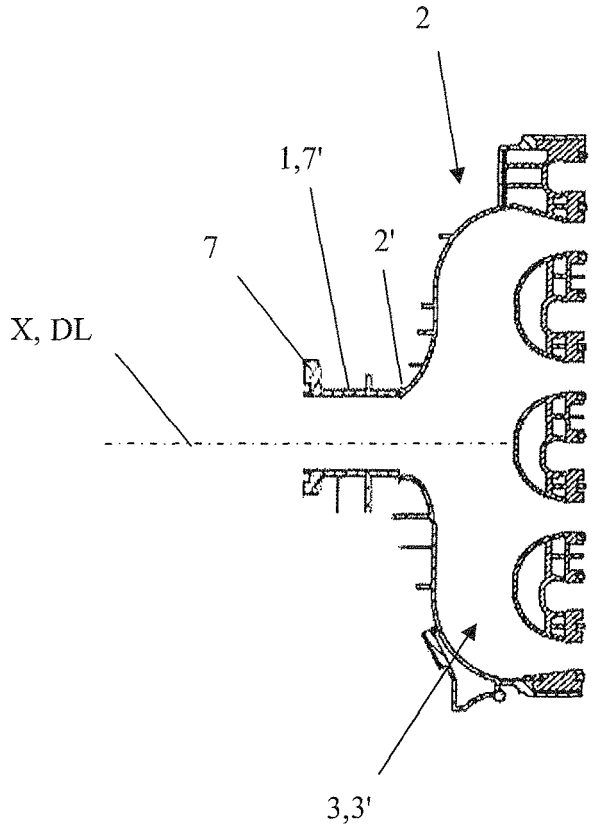

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 7589

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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
Munich	15 September 2008	Dorfstätter, Markus

CATEGORY OF CITED DOCUMENTS

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15-09-2008

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