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(71) Applicant: **Soler & Palau Research, S.L.**
08150 Parets del Vallés (Barcelona) (ES)

(72) Inventor: **GAMISSANS BOU, Màrius**
E-08150 Parets Del Valles (Barcelona) (ES)

(74) Representative: **Evens, Paul Jonathan et al**
Maguire Boss
24 East Street
St. Ives, Cambridgeshire PE27 5PD (GB)

(54) COUPLING BETWEEN A CENTRIFUGAL FAN AND THE SUCTION INLET THEREOF

(57) The invention relates to a coupling between a centrifugal fan and the suction inlet thereof, comprising a suction inlet (1) defining an opening (2) for the passage of a flow of fluid under suction and a rotatably mounted centrifugal suctioning fan (3). A closure coupling is formed around the opening (2), between said centrifugal fan (3) and the suction inlet (1), by means of fitting together flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1), which flanges define therebetween a labyrinthine passage that obstructs the ingress of an air disturbing flow through the coupling.

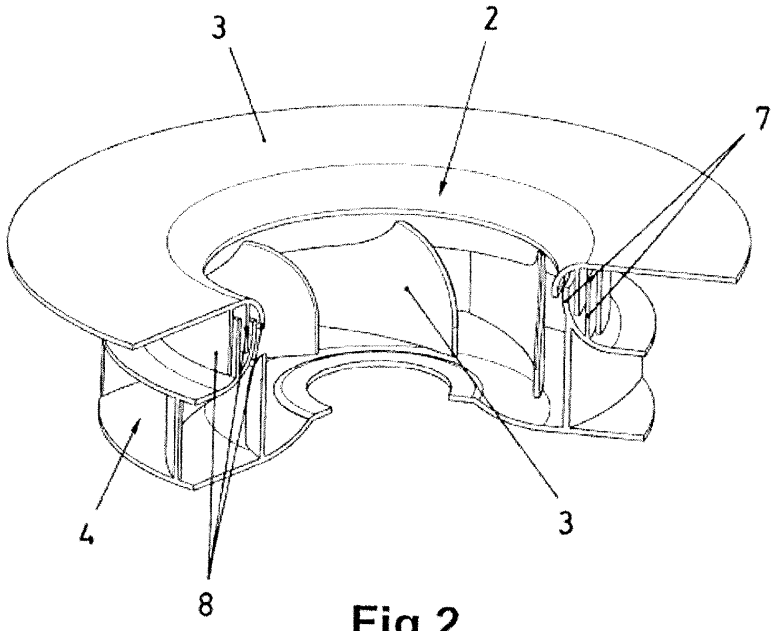

Fig.2

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Description

Field of the Art

[0001] The present invention relates to driving gaseous fluids for applications of any type, proposing a coupling between a centrifugal fan and a suction inlet with a closure "sealing" in said coupling conferring advantageous features with respect to the current state of the art.

State of the Art

[0002] A type of apparatus commonly used for driving gaseous fluids in domestic, industrial or commercial applications are those formed by a centrifugal fan with backward-curved blades connected to a suction inlet.

[0003] In said apparatus, the centrifugal fan defines a peripheral outlet, forming a coupling with an axial suction inlet, such that when the centrifugal fan rotates, the blades thereof suction the gaseous fluid to be driven through the suction inlet, expelling it through the peripheral outlet.

[0004] In the functional arrangement of said apparatus, the suction inlet is fixed and the centrifugal fan is rotary, such that between said suction inlet and the centrifugal fan a coupling which allows rotation of the centrifugal fan must be formed; said coupling must, however, have play to prevent friction.

[0005] That play of the coupling between the centrifugal fan and the fixed suction inlet causes the ingress of a flow of disturbing fluid through said coupling because the action of the centrifugal fan inside the assembly causes negative pressure, which results in disturbance of the main suction flow, causing a distortion thereof, while at the same time producing more noise in the apparatus due to turbulences of the fluid circulating therethrough.

[0006] The solution conventionally adopted for reducing those problems is to minimize the play of the coupling between the centrifugal fan and the suction inlet, but this has a limitation due to variations in diameters and roundness and concentricity defects between parts, so the play cannot be less than a specific value.

Object of the Invention

[0007] The purpose of the invention is to reduce the flow of disturbing fluid in the mentioned apparatus, defining to that end the coupling between the centrifugal fan and the suction inlet in the form of a labyrinth, such that it is harder for the flow of disturbing fluid to pass through the coupling, significantly reducing the flow thereof.

[0008] To that end, said coupling between the centrifugal fan and the suction inlet is defined by fitting together concentric flanges of both parts, play being generated between said concentric flanges forming the coupling, preventing friction therebetween, but the fitting arrangement forms a path between flanges that obstructs the passage of the flow of disturbing fluid.

[0009] Loss of the suction effect produced by the action of the centrifugal fan in relation to the suction inlet is therefore reduced, as the centrifugal fan is not affected by the braking effect in relation to the suction inlet, such that actuation of the rotational operation of said centrifugal fan is used more effectively for the suction effect that is sought through the suction inlet, the functional performance of said suction therefore being greater.

[0010] In that sense, the coupling between the centrifugal fan and the suction inlet can define two or more concentric flanges of each of the parts being fitted together, whereby a labyrinthine path that obstructs the passage of disturbing flow through the coupling to a greater extent is formed, said obstruction of passage of the disturbing flow increasing the greater the number of concentric flanges forming the fitting of the coupling.

[0011] As a result, said coupling object of the invention has very advantageous features for the suction performance of the apparatus of application, this coupling acquiring its own identity and preferred character with respect to conventional solutions in apparatus of the same type.

Description of the Drawings

[0012]

Figure 1 shows a perspective view of an assembly of a centrifugal fan and a suction inlet that are coupled according to the invention, the centrifugal fan and suction inlet being depicted separated, in a position facing one another.

Figure 2 shows a perspective view of the assembly of the preceding figure coupled to one another with a section that allows seeing the coupling between the centrifugal fan and suction inlet.

Figure 3 is an enlarged partial detail of an assembly of a centrifugal fan and suction inlet connected to one another by means of a conventional coupling, depicting the main flow of fluid entering through the suction inlet and the disturbing flow entering through the coupling between the centrifugal fan and the suction inlet.

Figures 4 to 9 show different embodiments of the coupling between a centrifugal fan and a suction inlet according to the invention, fitting together concentric flanges that are axially oriented in the direction of suction.

Figures 10 and 11 show other embodiments of the coupling between a centrifugal fan and a suction inlet according to the invention, fitting together flanges that are radially oriented with respect to the direction of suction.

Detailed Description of the Invention

[0013] The present invention relates to a coupling be-

tween a suction inlet (1) defining an opening (2) and a centrifugal fan (3) defining peripheral openings (4), such that in the functional arrangement, the suction inlet (1) is fixed, the centrifugal fan (3) being rotatably mounted with respect to said suction inlet (1), such that rotation of the centrifugal fan (3) causes suction of a flow of fluid (A) through the opening (2) of the suction inlet (1), to expel it through the peripheral openings (4).

[0014] To favor that suction of the flow of fluid (A) through the opening (2), a coupling is formed around the mentioned opening (2) between the centrifugal fan (3) and the suction inlet (1) by means of respective concentric flanges (5 and 6) of both parts, said coupling having the function of defining a closure to prevent the ingress of disturbing flow (B) therethrough, since said disturbing flow (B) causes turbulence (C) in the interior which produces loss of the effect of the sought action of suctioning the flow of fluid (A) through the opening (2) of the suction inlet (1).

[0015] Nevertheless, the centrifugal fan (3) must have freedom of rotation for its function, so there must be play preventing friction between the concentric flanges (5 and 6) forming the coupling around the central opening (2) between said centrifugal fan (3) and the suction inlet (1), which results in a passage between said flanges (5 and 6) of the coupling through which ingress of disturbing flow (B) causing turbulence (C) in the interior occurs, as seen in Figure 3.

[0016] To reduce that ingress of disturbing flow (B), the coupling around the opening (2) is formed by fitting together flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1), as depicted in Figure 2, whereby there is a labyrinthine passage between said flanges (7 and 8) that obstructs the ingress of disturbing flow (B) through the coupling, and therefore reduces turbulence (C) in the interior, as seen in Figure 4.

[0017] In a simple embodiment, the labyrinthine passage for obstructing the ingress of disturbing flow (B) can be defined by fitting together a flange (7) of the centrifugal fan (3) and two flanges (8) of the suction inlet (1), like in the embodiments of Figures 4 and 7, or conversely, like the embodiment of Figure 6; but the greater the number of flanges (7) and flanges (8) that are fit together, the more effective the obstruction of passage of the disturbing flow (B) through the coupling defined around the opening (2), and therefore the lower the loss of performance for suctioning the flow of fluid (A) through the suction inlet (1).

[0018] According to the foregoing, embodiments of different forms in which flanges (7) of the centrifugal fan (3) are fitted together with flanges (8) of the suction inlet (1), such as the embodiments of Figures 5, 8 and 9, which are only non-limiting, representative examples.

[0019] For that purpose, flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1) can furthermore be fitted together in the axial direction of suction, like the mentioned examples of Figures 5 to 9; but they can also be fitted together in the radial direction, like the examples of Figures 10 and 11, which are also non-limiting, the concept of the invention remaining unaltered as regards defining a labyrinthine passage that obstructs the ingress of disturbing flow (B) through the coupling defined around the opening (2) of the suction inlet (1).

[0020] To achieve a more effective closure in the sense of preventing the ingress of disturbing flow (B) through the coupling between the centrifugal fan (3) and the suction inlet (1), the inclusion of a filler in the labyrinthine passage of the coupling with a soft moldable material, such as gel, silicone, etc., is envisaged, whereby achieving a closure that prevents almost entirely the passage of air or any other gaseous fluid through the coupling. In this case, the filler material does not obstruct the rotational movement of the centrifugal fan (3), because since it is a soft moldable material, when said centrifugal fan (3) rotates, it will make a channel in said filler material that allows free rotation with virtually no friction.

Claims

1. A coupling between a centrifugal fan and the suction inlet thereof, comprising a suction inlet (1) defining an opening (2) for the passage of a flow of fluid (A) and a centrifugal fan (3) rotatably mounted with respect to said suction inlet (1) for driving the flow of fluid (A), a closure coupling being formed around the opening (2), between the centrifugal fan (3) and the suction inlet (1), by means of respective concentric flanges between which there is play for freedom of rotation of the centrifugal fan (3), **characterized in that** the closure coupling around the opening (2) fits together flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1), which flanges define therebetween a labyrinthine passage that obstructs the ingress of disturbing flow (B) through the coupling.

2. The coupling between a centrifugal fan and the suction inlet thereof according to claim 1, **characterized in that** the closure coupling around the opening (2) is defined by means of flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1), fitting them together in the axial direction of suction of the flow of fluid (A).

3. The coupling between a centrifugal fan and the suction inlet thereof according to claim 1, **characterized in that** the closure coupling around the opening (2) is defined by means of flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1), fitting them together in the radial direction of suction of the flow of fluid (A).

4. The coupling between a centrifugal fan and the suction inlet thereof according to claim 1, **characterized in that** a filler with a soft moldable material is included

in the labyrinthine passage defining the fitting together of flanges (7) of the centrifugal fan (3) and flanges (8) of the suction inlet (1).

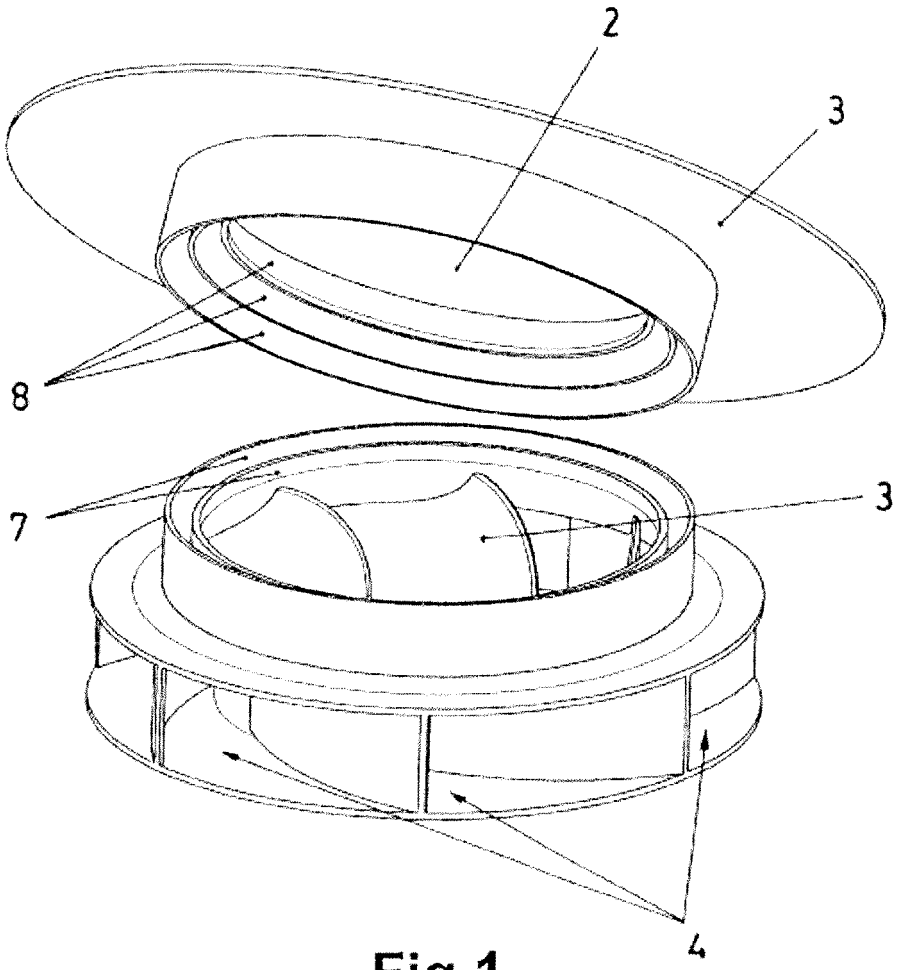

Fig.1

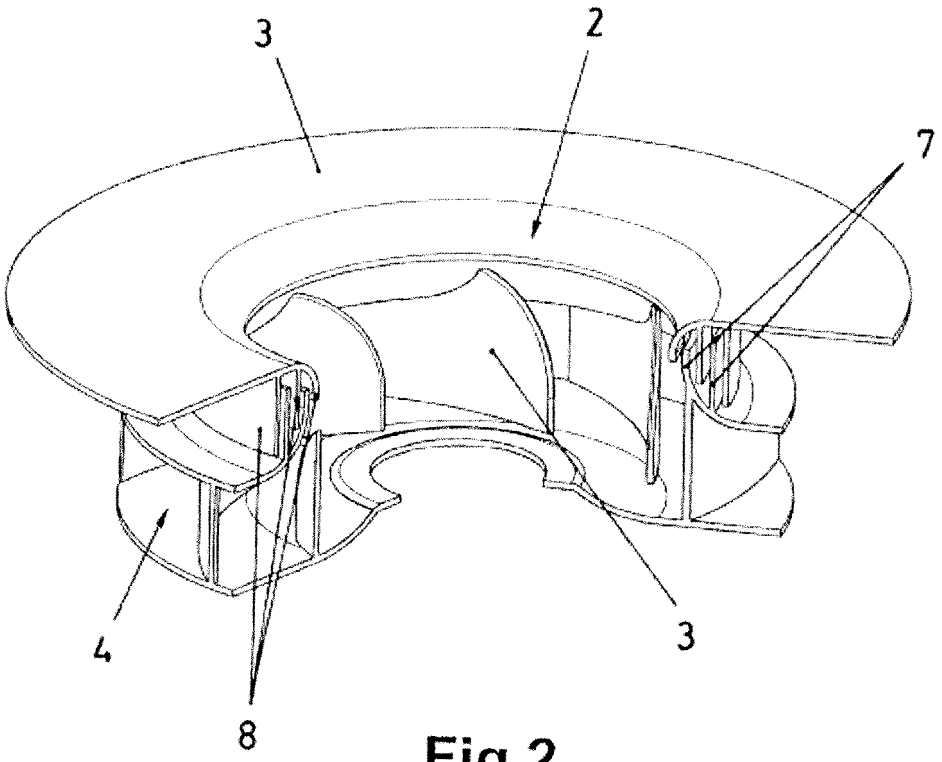

Fig.2

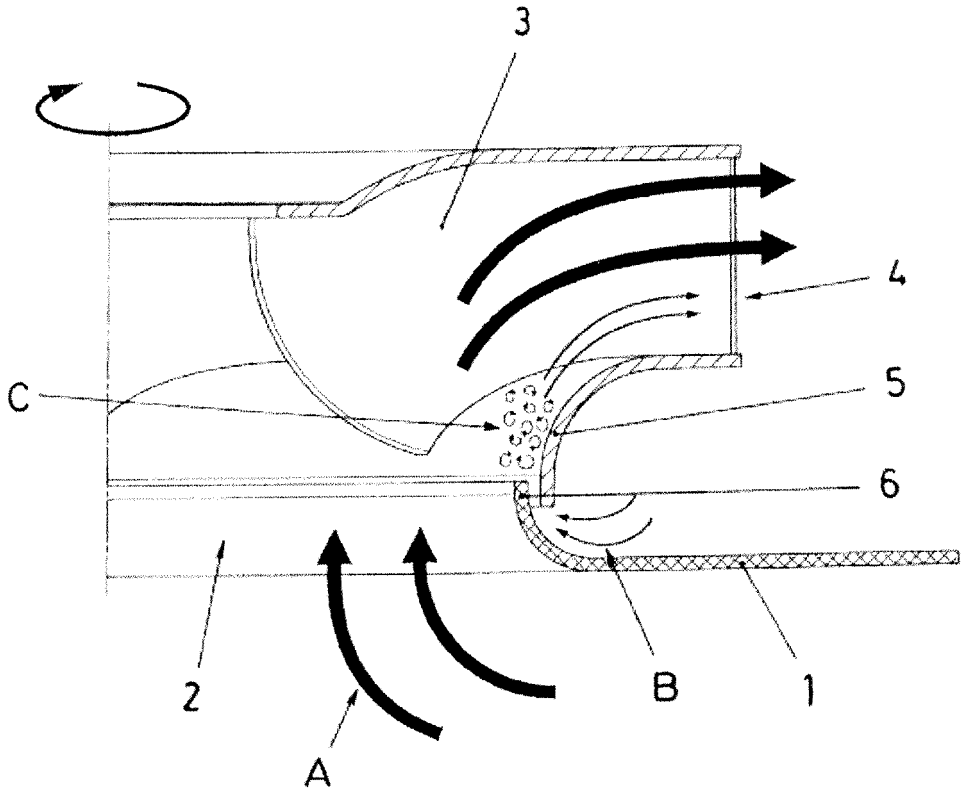

Fig.3

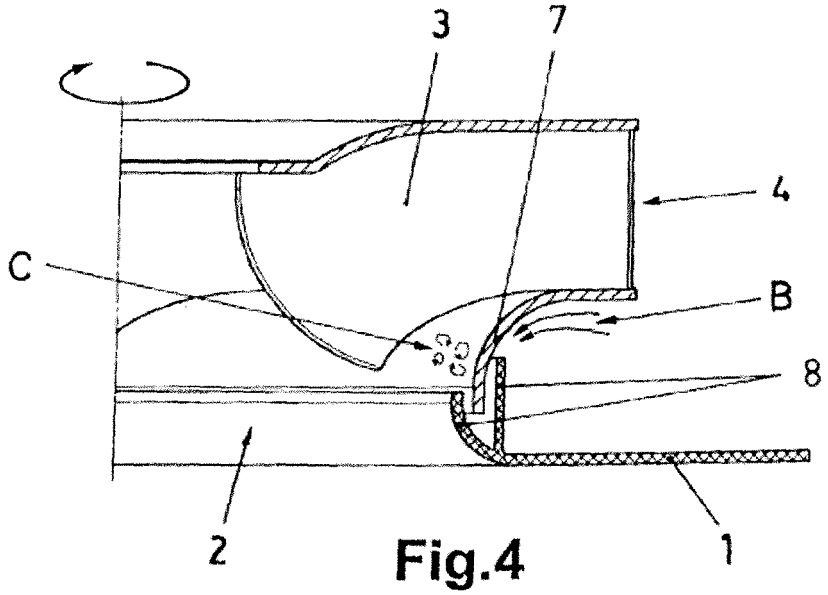

Fig.4

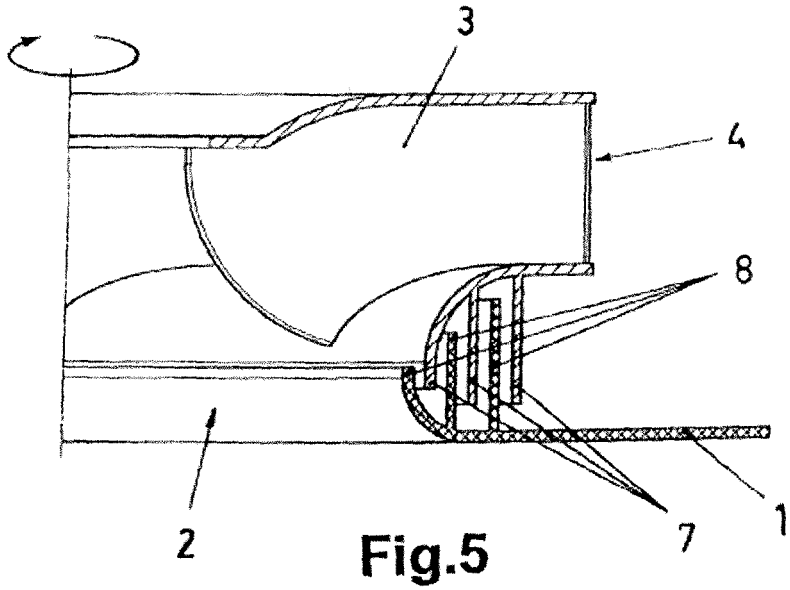

Fig.5

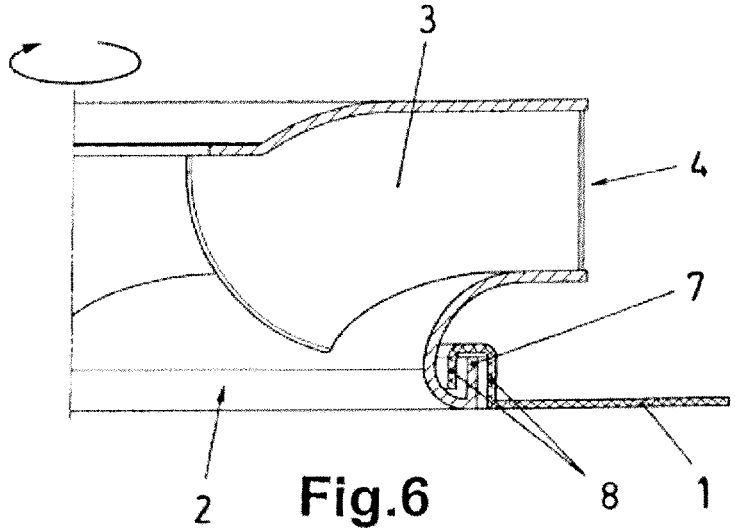

Fig.6

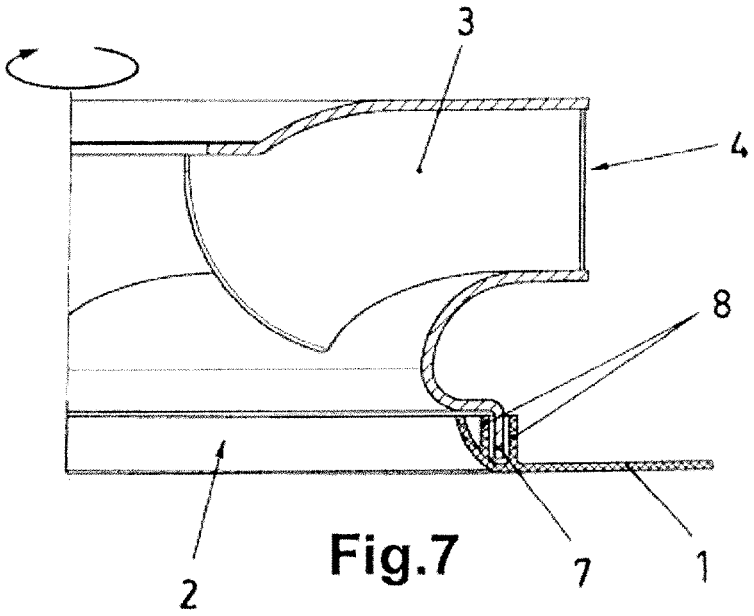

Fig.7

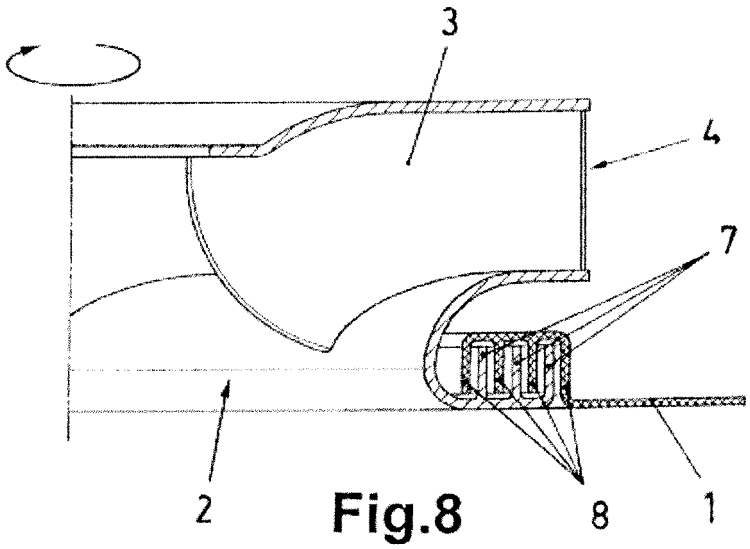

Fig.8

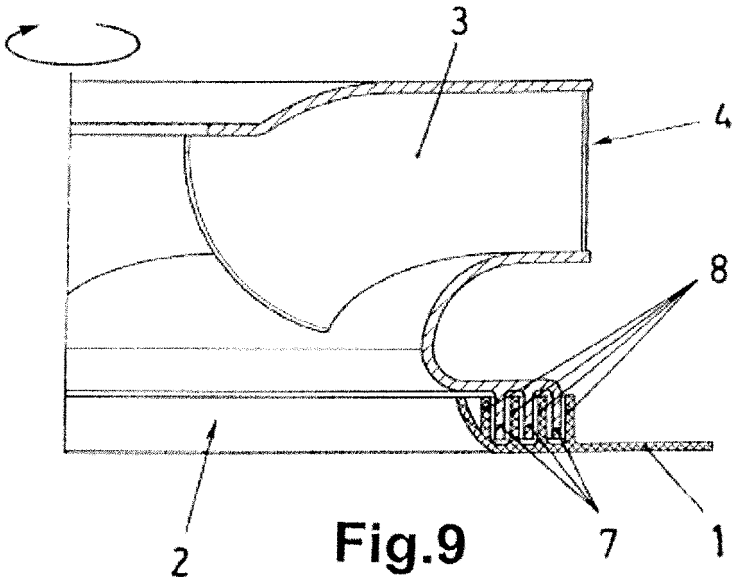

Fig.9

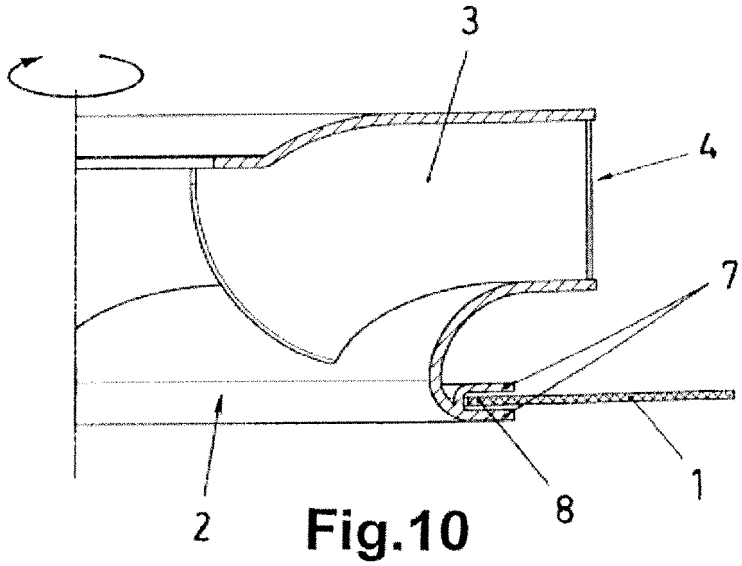

Fig.10

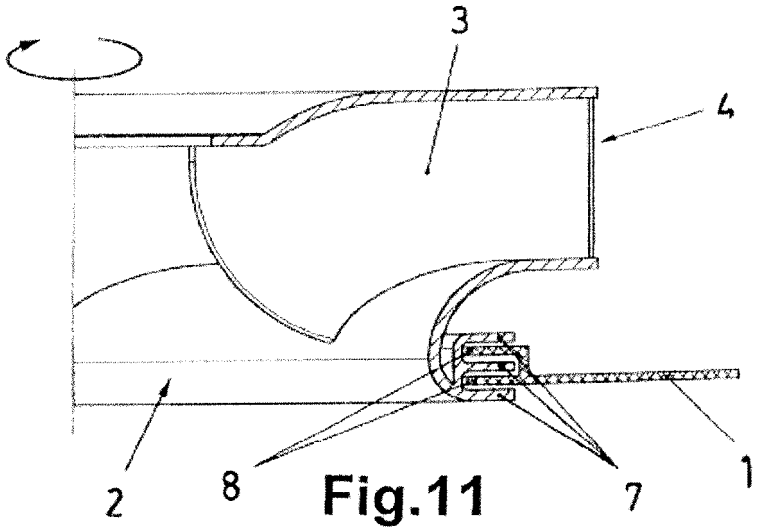

Fig.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2013/070525

A. CLASSIFICATION OF SUBJECT MATTER

F04D29/16 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002164247 A1 (NADEAU SYLVAIN ET AL.) 07/11/2002, paragraph [15]; figures.	1-4
X	US 5489186 A (YAPP MARTIN G ET AL.) 06/02/1996, figure 10.	1,2
X	EP 0569863 A1 (SIEMENS AUTOMOTIVE LTD SIEMENS CANADA LTD) 18/11/1993, figure 6.	1
X	US 2010068028 A1 (BUSHNELL PETER R) 18/03/2010, figures 11 - 13.	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
02/12/2013	**(09/12/2013)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer C. Piñero Aguirre Telephone No. 91 3493405

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2013/070525

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
US2002164247 A1	07.11.2002	US6508624 B2	21.01.2003
US5489186 A	06.02.1996	WO9506822 A1	09.03.1995
		JPH09505375 A	27.05.1997
		ES2173121T T3	16.10.2002
		EP0746689 A1	11.12.1996
		EP0746689 A4	15.07.1998
		DE69430488T T2	19.12.2002
		AT216757T T	15.05.2002
		US5297931 A	29.03.1994
		WO9305275 A1	18.03.1993
		JPH07501593 A	16.02.1995
		JP3390989B B2	31.03.2003
		ES2128357T T3	16.05.1999
		EP0601119 A1	15.06.1994
		EP0601119 A4	19.04.1995
		DE69228189T T2	17.06.1999
		US5209638 A	11.05.1993
EP0569863 A1	18.11.1993	US5326225 A	05.07.1994
		JPH06147194 A	27.05.1994
		JP3481970B B2	22.12.2003
		EP0913584 A1	06.05.1999
		EP0913584 B1	20.07.2005
		DE69333845T T2	27.04.2006
		DE69328212T T2	07.09.2000
US2010068028 A1	18.03.2010	WO2008082428 A1	10.07.2008
		US8568095 B2	29.10.2013
		WO2008082397 A1	10.07.2008

Form PCT/ISA/210 (patent family annex) (July 2009)