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(54) **System for absorb spray overflow**

(57) System fit to absorb spray overflow at a location where a surface (2) is locally sprayed with a pressurized spray (3). The system comprises a plenum (4), fit for at least partially enclosing said spraying location and comprising suction apertures, to be connected to suction means (5,9) fit to absorb said spray overflow. One or more suction apertures (8) are substantially located at

the side of the plenum pointing to said surface (2) when in operation. Additional means (9) may position the plenum (4) thus that the mean distance between the apertures (8) and the surface (2) has the same magnitude order as the size of the cross section (10) of the apertures.

EP 1 666 161 A1

Description

FIELD OF THE INVENTION

[0001] The invention relates to a system fit to absorb spray overflow at a location where a surface is locally sprayed with a spray, e.g. a solid or liquid coating (paint, dye, powder) or sanding particles, propelled by gas or air under pressure.

BACKGROUND OF THE INVENTION

[0002] Spray overflow ("overspray") is an unavoidable parasitic component of spray that occurs because the flow of air or other gas in the spray must turn at the sprayed surface. Very small droplets or particles are carried away in this turning flow, and some land on adjacent surfaces not meant to be treated (coated, painted, sanded). Besides the overspray droplets or particles may threaten the health of the sprayer.

[0003] One principle for "spray catching" is to divert the overspray into a suction (absorption) system at the boundary of the area to be treated. Such a system is known from www.nasatech.com/Briefs/June03/LAR15613.html. The known system comprises a plenum, fit for at least partially enclosing said spraying location and comprising suction apertures, to be connected to suction means fit to absorb said spray overflow. In general, the term plenum indicates an enclosure in which air or other gas is at a pressure different from the outside atmosphere.

[0004] The prior art system includes a toroidal plenum connected through narrow suction apertures and a nozzle that faces toward the center of the area to be sprayed. The plenum is supported by four tubes also serving as suction exhaust ducts. The downstream ends of the tubes are connected to a suction pump.

[0005] It is noted that an important condition for the spray quality is that an overspray catcher does not make contact with the surface to be sprayed.

SUMMARY OF THE INVENTION

[0006] It is one aim of the system as proposed hereinafter to improve the system's "spray catching" capabilities. To that end one or more of the suction apertures are -contrary to the prior art system- (substantially) located at the "off spray" (lee) side of the plenum, i.e. the side of the plenum facing the surface that is or is to be sprayed.

[0007] It has been found that locating the suction apertures in the off spray side of the plenum, the suction capabilities are surprisingly better and more effective than when applied at the plenum's side facing toward the center of the area to be sprayed. This surprising effect may be caused to a better match of the course of the pressure and/or flow of the spray medium.

[0008] The system preferably comprises filter means

fit for filtering the spray overflow absorbed via said one or more suction apertures, e.g. preventing that the suction tubes, pump etc. will be affected by the exhausted spray material. Moreover, a more even flow distribution along the aperture's length will be achieved.

[0009] Preferably the system will comprise means for, when in operation, positioning the plenum thus that the mean distance between said one or more apertures and said surface has substantially the same magnitude order as the size of the cross section of said one or more apertures. The effect of this preferred additional measure is that a narrow, intensively acting suction slot, formed between the off spray side of the plenum and the surface to be treated, enabling a very effective suction flow from the plenum's interior, matching the flow of the spray medium

EXEMPLARY EMBODIMENT

[0010]

Figure 1 shows a prior art embodiment.

Figure 2 shows a diagram of a spraying profile.

Figure 3 shows a first embodiment of the system proposed above.

Figure 4 shows a second embodiment of the system.

Figure 5 shows a third embodiment of the system.

Figure 6 shows some examples of the system in operation.

Figure 7 shows a cross sectional view of one embodiment.

[0011] Figure 1 shows the embodiment of a prior art exhaust system. A spray head 1 is used to treat a surface 2 with e.g. a spray coating 3. A toroidal plenum 4 is connected through narrow suction apertures 6 and a nozzle 7 module, facing toward the center of the area to be sprayed. The plenum 4 is supported by tubes 5 that also serve as suction exhaust ducts. The downstream ends of the tubes are connected to a suction pump.

[0012] Figure 2 shows a diagram of a spraying profile, i.e. the result of a close investigation of the shape of the spray intensity and flow along the path between the spray head 1 and the surface 2. It appears that the majority of the spray overflow will scatter outside in a plane close to the surface 2.

[0013] Figure 3 shows a first embodiment of the system as proposed above, comprising equal parts as the prior art system shown in figure 1, but, contrary to that system, comprising suction apertures 8 which not -as in the prior art plenum 4- are fit in the plenum's inner side, viz. facing to the plenum's center, but which are fit in the plenum's "off-stream" or backside, i.e. at the side of the plenum 4, facing the surface 2 when the system is in operation. The result of this is a surprisingly improved operation of the suction plenum 4, matching much better the spray profile as shown in figure 2.

[0014] Figure 4 shows an artist's impression of second

embodiment, figure 5 of a third embodiment of the system, i.e. of its plenum 4. Figure 4 shows a "split version" of the plenum 4, comprising two sub-plenums 4a and 4b, each connected with its own suction tube 5a and 5b respectively. This split plenum may be used in some special cases, where a "normal" plenum, shown in figure 5, is less convenient to operate. Each sub-plenum 4a resp. 4b has two slot shaped apertures 8a resp. 8b at the sub-plenum's off-stream side, serving as suction mouth for the overspray during operation, which overspray is exhausted via the suction tubes 5a and 5b respectively. During operation the plenum 4 (or each sub-plenum 4a, 4b) preferably will be set thus that the distance between the apertures 8 and the surface 2 is about equal to the size of the (smallest) cross section 10 of the apertures.

[0015] Figure 5 shows a "non-split" version of the plenum 4, comprising one suction tube 5 (but also may be connected to two suction tubes) an four slot shaped apertures 8 in the plenum's backside, fit to suck up the spray overflow during operation. Also in here, during operation the plenum 4 preferably will be set thus that the distance between the apertures 8 and the surface 2 is about equal to the size of the (smallest) cross section 10 of the apertures.

[0016] Figure 6 shows some examples of the system in operation, showing a split version of the plenum 4a and 4b in operation, together with a hand-operated spray head 1. The surface, e.g. an aircraft to be sanded and/or coated/painted, is sprayed at succeeding locations which are surrounded by the suction plenums 4 (4a, 4b), sucked through the suction tubes 5 (5a, 5b) which are connected with a suction pump within a suction device 9, and thus serving the protection of the spraying personal.

[0017] It is noted that during operation the plenum preferably is set thus that the (mean) distance between the apertures 8 and the (to be) sprayed surface 2 is about equal to the size of the (smallest) cross section 10 of the apertures.

[0018] Figure 7 is an illustration of a preferred option that the system may comprise filter means 11 which are fit for filtering the spray overflow, absorbed via the suction apertures 8, preventing that the suction tubes 5, pump 9 etc. may be affected by the exhausted spray material. Moreover, the filters 11, which may be mounted inside the suction apertures 8, achieve a more even distribution of the suction flow along the extend of the whole aperture and thus of the whole plenum, improving the plenum's effectiveness. Finally, the filter means 11 will reduce dripping of the spray overflow material, e.g. paint, to the surface 2.

[0019] Preferably the suction device comprises means for guiding the plenum 4 (4a, 4b) along the surface 2 (e.g. of the aircraft shown) in such way that the distance between apertures 8 and the surface 2 has about the same magnitude order as the size of the cross section 10 of the apertures. In other words, the suction device 9 may be able to operate as a robot, using e.g. the suction tubes 5 a and 5b as actuator arms, comprising servo motors

etc. Additionally, the plenum 4 (4a, 4b) may comprise distance detectors to measure the distance between the plenum's backside (and thus the apertures 8) and the relevant surface, transmitting the detected distance to the robot/suction device 9 and thus keeping the plenum 4 in its best position to function optimally for the person's health security.

10 Claims

1. System fit to absorb spray overflow at a location where a surface (2) is locally sprayed with a spray (3), the system comprising a plenum (4), fit for at least partially enclosing the relevant spraying location and comprising one or more suction apertures, to be connected to suction means (5,9) fit to absorb said spray overflow, **characterized in that** one or more of those suction apertures (8) are substantially located at the side of the plenum pointing to said surface (2) when in operation.
2. System according to claim 1, comprising means (9) for, when in operation, positioning said plenum (4) thus that the mean distance between said one or more apertures (8) and said surface (2) has substantially the same magnitude order as the size of the cross section (10) of said one or more apertures.
3. System according to claim 1, comprising filter means (11) fit for filtering the spray overflow absorbed via said one or more suction apertures (8).

Prior art

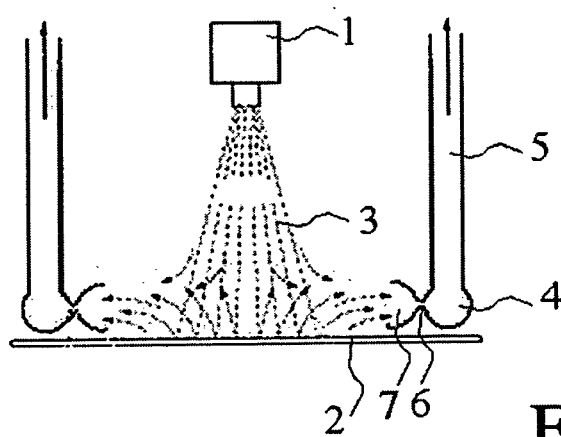
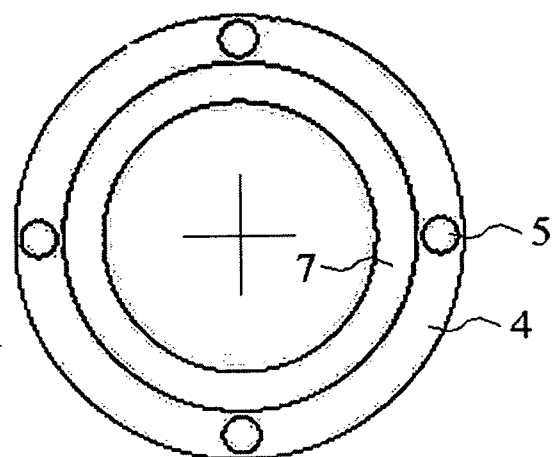


FIG. 1

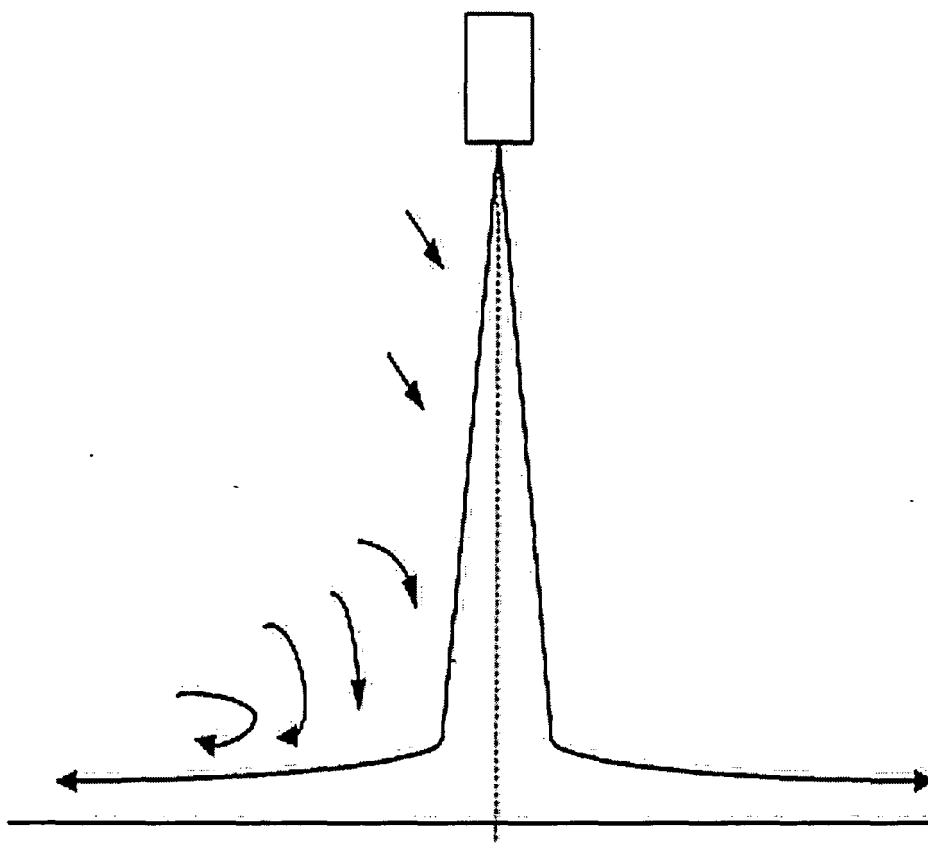
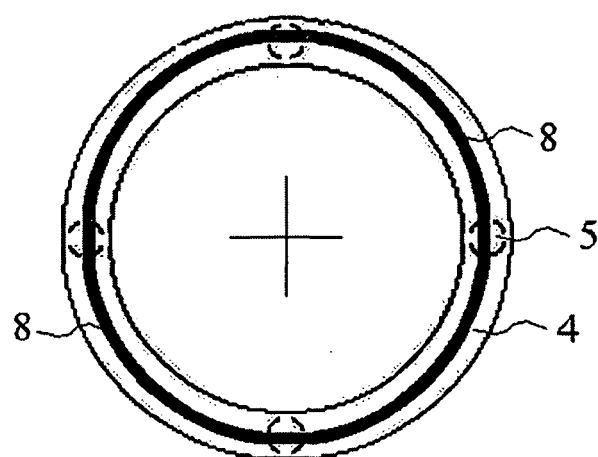
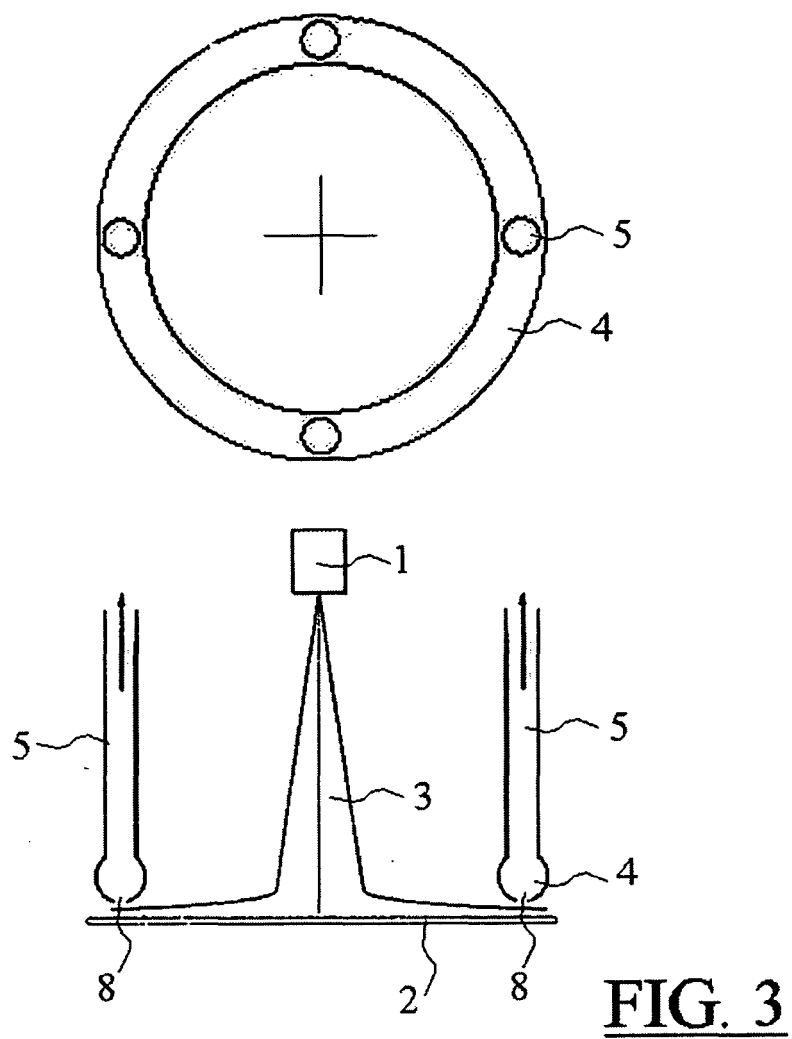


FIG. 2



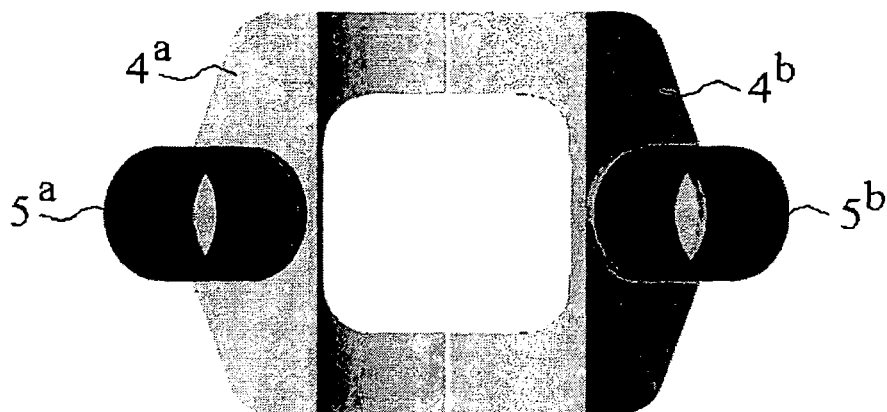
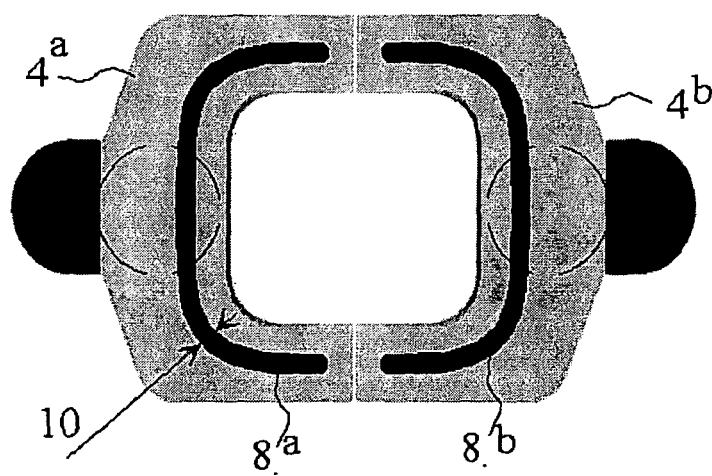


FIG. 4



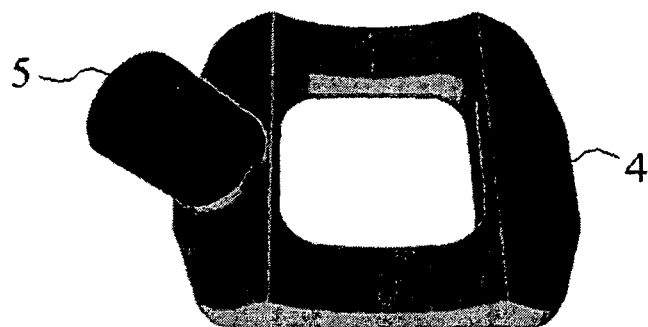
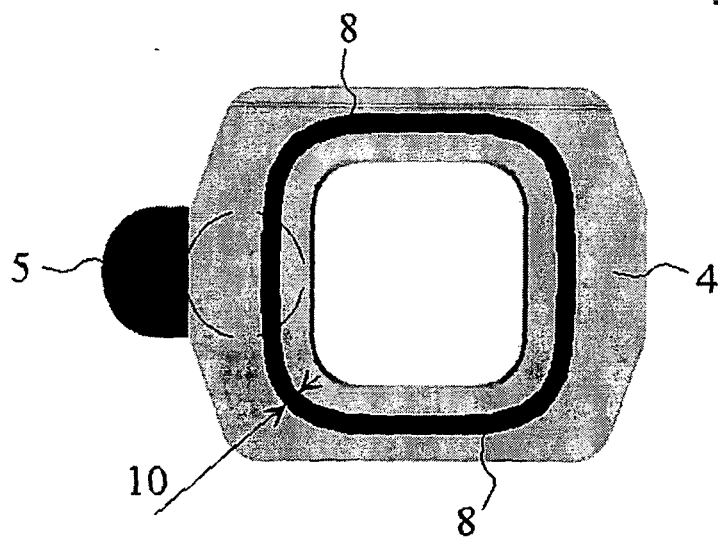


FIG. 5



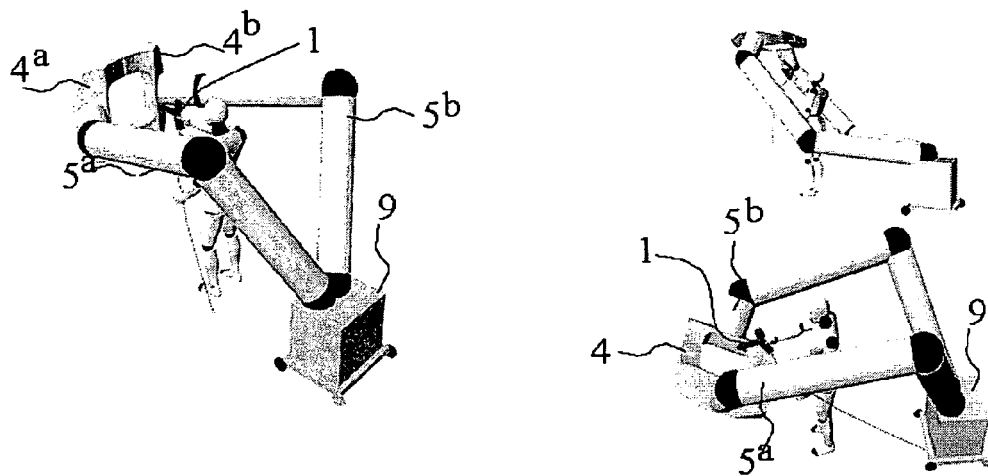
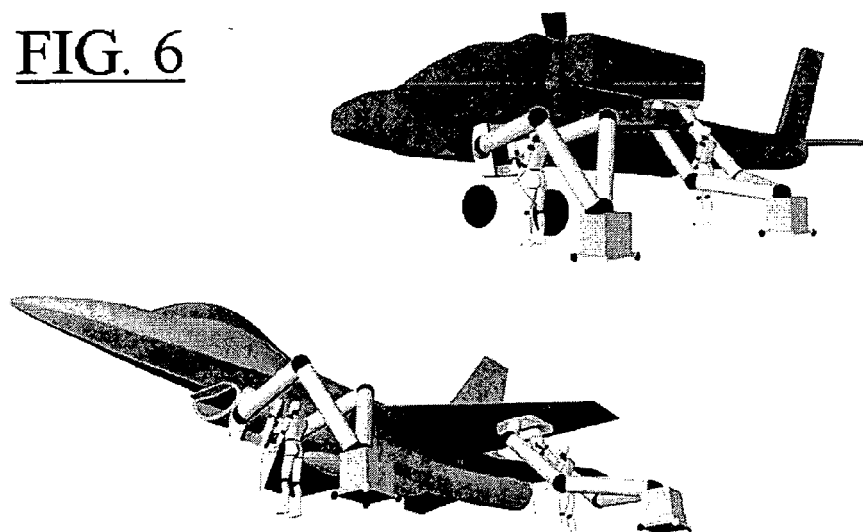


FIG. 6



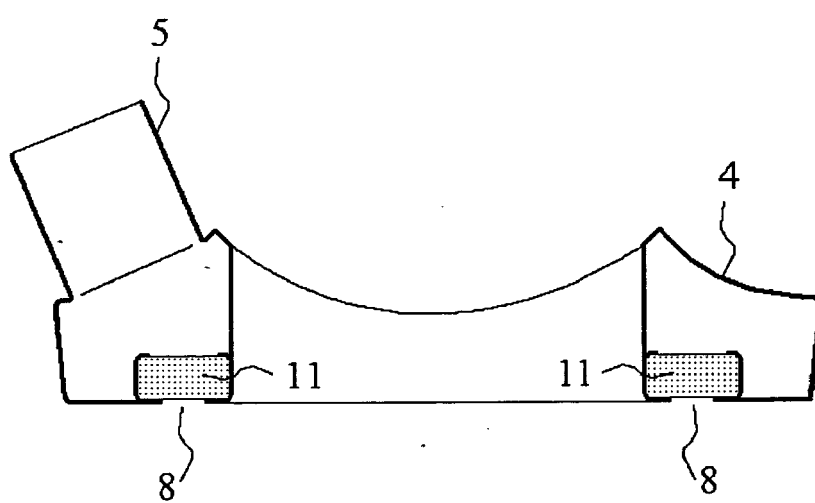


FIG. 7



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	WO 01/34309 A (VROLIJK, PETER, WILLIAM) 17 May 2001 (2001-05-17) * page 6, line 33 - line 35 * * page 9, line 20 - line 36 * * page 12, line 37 - page 13, line 14; figures 1,14,15 * -----	1-3	B05B15/04
X	GB 1 376 695 A (FORD MOTOR CO LTD) 11 December 1974 (1974-12-11) * page 2, line 74 - line 102 * * page 2, line 123 - page 3, line 35; figures * -----	1-3	
X	US 5 729 893 A (TANIFUJI ET AL) 24 March 1998 (1998-03-24) * column 4, line 44 - line 62 * * column 5, line 12 - line 26 * -----	1,3	
X	DE 197 38 962 A1 (BLOHM + VOSS INTERNATIONAL GMBH, 20457 HAMBURG, DE) 11 March 1999 (1999-03-11) * column 2, line 11 - line 26; figures * -----	1,3	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 March 2005	Examiner Brévier, F
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 07 8213

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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31-03-2005

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