

(19)



(11)

EP 2 679 134 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

01.01.2014 Bulletin 2014/01

(51) Int Cl.:

A47L 15/23 (2006.01)

A47L 15/42 (2006.01)

(21) Application number: **12425115.8**

(22) Date of filing: **25.06.2012**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

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(54) An auxiliary spray device for dishwashers

(57) An auxiliary spray device comprises a fitting member (2) for fastening the device rotatably about an axis (X) to the washing chamber of a dishwasher, the fitting member (2) comprising a washing liquid inlet portion (4); a plurality of washing nozzles (5) is in fluid communication with the inlet portion (4), the washing nozzles (5) being designed to deliver fluid in a direction (L) having a component (L1) which is parallel to the axis (X) and

which is greater than the other components; and a plurality of propulsion nozzles (6) is in fluid communication with the inlet portion (4), the propulsion nozzles (6) being designed to deliver fluid in a direction (P) having a component (P1) perpendicular to the axis (X) and being more distant than the washing nozzles (5) from this axis, and the propulsion nozzles (6) being positioned on corresponding bevelled and rounded end portions (7).

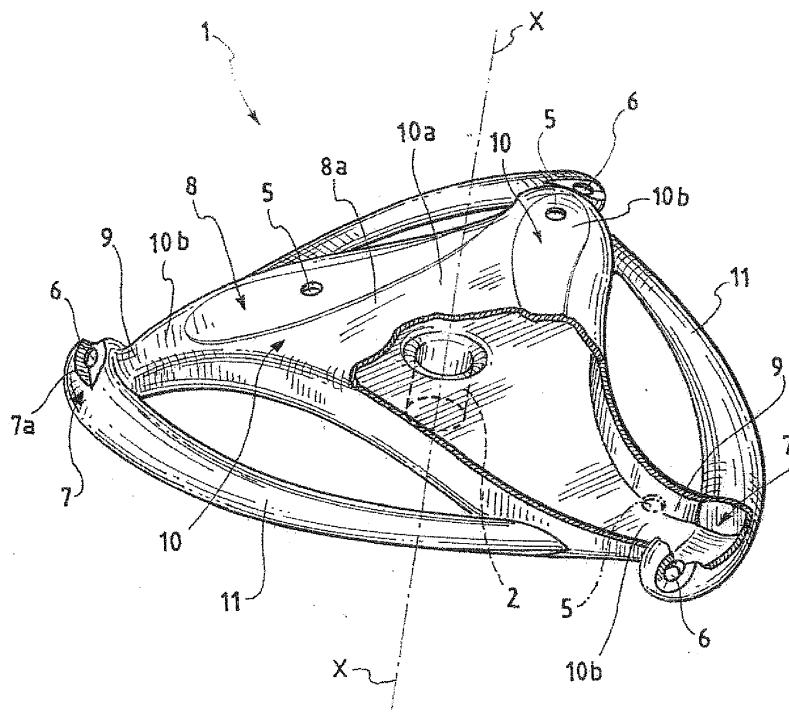


Fig. 1

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Description

[0001] The present invention relates to an auxiliary spray device for dishwashers, particularly for dishwashers for domestic use.

[0002] A dishwasher comprises a washing chamber which usually contains two tableware baskets, one placed above the other. One or two spray devices, usually provided with two arms which are rotatable about a single axis of rotation, and on which a plurality of delivery nozzles is arranged, spray the tableware baskets, and consequently the tableware, with washing liquid. The spray devices are made to rotate by the washing liquid itself, which, by passing out of the nozzles, transmits angular momentum to the two arms, thus causing them to rotate about the axis of rotation.

[0003] Some dishwashers make use of an auxiliary spray device, in other words a device supplementary to the aforementioned main spray devices. This auxiliary spray device is usually positioned in the washing chamber under the basket intended to hold cooking vessels, in such a way that the vessels, or tableware of larger size, can be exposed to the washing liquid in a more concentrated way.

[0004] Auxiliary spray devices, which also have delivery nozzles, are usually smaller than main spray devices, simply because their action has to be concentrated on one portion of the tableware basket. The flow rate of auxiliary spray devices, in other words the quantity of washing liquid delivered by them per unit of time, is less than that of main spray devices.

[0005] Auxiliary spray devices also rotate (usually about an axis of rotation other than that of the main spray devices), and they are made to rotate, as in the case of the main sprays, by the washing liquid itself, which by passing out of the nozzles transmits angular momentum which causes the rotation of the auxiliary sprayer. This angular momentum is markedly less than that generated by the main sprayers, and can be considered to be proportional, to a first approximation, to the flow rate of washing liquid supplied by the sprayer.

[0006] In particular, the angular momentum generated by the jets of washing liquid passing out of the nozzles of the auxiliary spray device must necessarily be greater than the mechanical friction between the device and the axis of rotation, and greater than the aerodynamic resistance encountered by the sprayer during its rotation.

[0007] It should be noted that the intensity of this aerodynamic resistance is not negligible, since the auxiliary spray device rotates in an environment which contains not only air but also falling washing liquid, in other words washing liquid which is supplied by the nozzles (of the auxiliary sprayer and the main sprayers) and which falls back by gravity towards the bottom of the washing chamber.

[0008] It is clear from the above that particular care must be taken in the design of auxiliary spray devices for dishwashers, in order to ensure their correct operation.

[0009] In this context, the problem which the present invention is intended to resolve is that of providing an auxiliary spray device for dishwashers which can provide full functionality even if the washing liquid delivery rates are low.

[0010] The problem is resolved in accordance with one or more of the attached claims.

[0011] The auxiliary spray device for dishwashers proposed by the present invention will now be described more fully with reference to the appended drawings, which are provided for guidance only and are non-limiting, in which:

- Figure 1 is a perspective view of an auxiliary spray device according to the present invention;
- Figure 2 is a plan view of the device of Figure 1;
- Figure 3 is a cross section taken through the plane III-III of the device of Figure 2;
- Figure 4 is a cross section taken through the plane IV-IV of the device of Figure 2;
- Figure 5 is a cross section taken through the plane V-V of the device of Figure 2.

[0012] With reference to the appended drawings, the number 1 indicates the whole of an auxiliary spray device made according to the present invention.

[0013] The device 1 comprises a fitting member 2 for fastening the device directly or indirectly to the washing chamber of a dishwasher. The terms "directly" and "indirectly" signify, respectively, that the fitting member can be fitted into a hole or flange in the washing chamber, or that it can be fitted on to a connector which in turn is fitted into a hole or flange present in the washing chamber. The fitting member 2 serves to fasten the device mechanically to the inside of the washing chamber while allowing the device 1 to rotate about an axis of rotation X within the washing chamber. In the preferred embodiment of the invention, the fitting member 2 comprises at least a pair of fitting teeth 3 (Figure 4) intended to engage with an annular connecting portion of the dishwasher, so as to fix the device 1 in a direction parallel to the axis of rotation X while allowing the device 1 to rotate (about the same axis X).

[0014] The fitting member 2 further comprises an inlet portion 4 for washing liquid which is provided by the dishwasher. In the preferred embodiment of the invention, the inlet portion 4 is a sleeve (Figure 3) having an axis of symmetry coincident with the axis of rotation X.

[0015] The device 1 comprises a plurality of washing nozzles 5 in fluid communication with the inlet portion 4, such that the washing liquid provided by the dishwasher can reach these nozzles and can be delivered by them to the inside of the washing chamber. The washing nozzles 5 are orientated so as to deliver washing liquid predominantly in the upward direction when the device 1 is in operation. In other words, the washing nozzles 5 are designed to deliver washing fluid in a direction L having a component L1 parallel to the axis of rotation. This com-

ponent L1 is larger than the other components (Figure 4). Thus the washing nozzles 5, when in use, can spray the inside of a cooking vessel, covering both the base and part of the inner side surface of the vessel.

[0016] The device 1 further comprises a plurality of propulsion nozzles 6 in fluid communication with the inlet portion 4. These propulsion nozzles 6 are similar or identical to the washing nozzles 5, the difference between the two types of nozzles being mainly or exclusively functional in nature. The propulsion nozzles 6 have the primary function of generating forces capable of causing the device 1 to rotate about the axis of rotation X. In order to perform this function, the propulsion nozzles 6 use the same washing liquid as that used by the washing nozzles 5. In particular, the propulsion nozzles 6 deliver washing liquid in such a way that a component of the direction of delivery is perpendicular to the axis of rotation X and lies on a plane which is also perpendicular to the axis of rotation X. In other words, the propulsion nozzles 6 are designed to deliver washing fluid in a direction P having a component P1 perpendicular to the axis of rotation X. This component P1 is preferably greater than, or at least of the same order of magnitude as, the other components (Figures 3 and 5). Thus, when pressurized liquid is delivered by the propulsion nozzles 6, a force is generated which acts on the device 1, creating an angular momentum about the axis of rotation X, and which causes the device to rotate. In order to maximize this angular momentum, the propulsion nozzles 6 are more distant than the washing nozzles 5 from the axis of rotation X. It should be noted that the rotation velocity of the device 1 is in the range from 30 to 100 revolutions per minute, and preferably from about 50 to about 60 revolutions per minute. The typical dimensions of the device 1 are such that it can be inscribed in a circle having a diameter in the range from 10 cm to 25 cm, preferably about 15 cm.

[0017] The propulsion nozzles 6 are located on corresponding bevelled and rounded end portions 7. The term "bevelled and rounded" signifies a shape which is not block-like, in other words a shape which does not have flat walls exposed perpendicularly to the flow which impinges on the walls and/or does not have a surface with sudden marked discontinuities (such as obvious sharp edges) in its development. In particular, the end portions 7 have a profile, as seen in a cross section taken along a plane substantially parallel to the axis of rotation X and containing the direction of delivery of the nozzle 6, which is substantially oval (Figure 5). Thus the form drag of the end portions 7 is such that it does not significantly impede the rotation of the device 1. This is because the form drag is created by the viscosity of the fluid in which the device rotates, this fluid being composed of both air and falling washing liquid, in other words washing liquid previously delivered to the washing chamber of the dishwasher which falls back and impinges on the device 1. If the fluid were not viscous, the flow lines would be symmetrical with respect to the body on which the flow impinges and would generate identical velocity and pressure fields up-

stream and downstream of the body (in other words between the front and the rear area, if the region on which the flow impinges is considered to be the front region). Because of the viscosity, the fluid loses energy by rotating the body and this causes the separation of the flow lines, thus forming an area of recirculation which creates resistance to the advance of the body, known as "form drag". The rounded and bevelled, particularly oval, shape of the end portions 7 reduces the separation of the flow lines which impinge on the end portions 7, thus limiting the form drag. Consequently, a smaller propulsive force is required for the same rotation velocity of the device 1, compared with the condition in which the end portions 7 are block-like bodies. Since the propulsive force of the propulsion nozzles is directly proportional to the flow rate of the nozzles, and since the flow rate of the device 1 is usually limited, the aforesaid arrangement makes it possible to provide a device 1 having optimal performance. It should be noted that the aerodynamic resistance (particularly the form drag) has its most negative effects at the end portions 7 which carry the propulsion nozzles 6. This is because these regions are those which are most distant from the axis of rotation X, and are therefore those whose friction generates a greater retarding moment. Preferably, each propulsion nozzle 6 is located in a channel 7a of a corresponding bevelled and rounded end portion 7. This channel 7a is such that the nozzle 6 faces the external environment at a height below that reached by the thickest point of the end portion 7. In other words, the nozzle 6 is contained in the profile defined by the end portion 7, without projecting beyond this profile.

[0018] The device 1 further comprises a central body 8 in which the washing nozzles 5 are formed. The end portions 7 are connected to terminal appendages 9 of the central body 8. The central body 8 is an internally hollow box-like body which is in fluid communication with the washing liquid inlet portion 5. In particular, the box-like body has an upper wall 8a and a lower part 8b from which the sleeve 4 of the washing liquid inlet portion protrudes (Figures 3 and 4). The terminal appendages 9 are put into fluid communication with the inside of the box-like body so that the propulsion nozzles 6 can be supplied with washing liquid. The washing nozzles 5 are substantially formed by holes made in the upper wall 8a of the central body 8. In the preferred embodiment of the invention, the central body 8 has a substantially multi-lobed shape, for example a trilobed shape, as in the example shown in the appended drawings. Each lobe 10 comprises a first portion 10a at the position of the fitting member 2 and a second portion 10b forming a corresponding terminal appendage 9 of the central body 8. The first portions 10a are interconnected to form a single element from which the second ends 10b protrude.

[0019] A plurality of connecting profiles 11 extend between the bevelled and rounded end portions 7 and the central body 8. In particular, each connecting profile 11 extends between a corresponding bevelled and rounded end portion 7, connected to the second portion 10b of

one lobe, and another lobe 10 (Figures 1 and 2). More particularly, each connecting profile extends from the corresponding bevelled and rounded end portion 7 and terminates at the second end 10b of an adjacent lobe 10, in the proximity of the bevelled and rounded end portion 7 of this adjacent lobe. Accordingly, the connecting profiles 11 extend with continuity of shape from the bevelled and rounded end portions 7 and have a substantially curved extension in plan view. In other words, each connecting profile 11 is an extension of the end portion 7 and there is no discontinuity of shape in the transition between the connecting profile 11 and the end portion 7 (see Figures 1 and 2). The connecting profiles 11 are substantially curved and have a concavity facing the central body 8. In other words, there is an empty space between each of the connecting profiles 11 and the central body. In a similar way to what has been described in relation to the end portions 7, the connecting profiles 11 have profiles, seen in cross sections taken along planes substantially parallel to the axis of rotation X, which are substantially oval, as shown in Figure 4. It should be noted that each connecting profile 11 extends from the corresponding bevelled and rounded end portion 7 on the side opposite the direction of delivery of the corresponding propulsion nozzle 6. According to what has been described, the connecting profiles 11 extend the aforementioned functionality of the end portions 7 to the whole perimeter of the central body 8, in other words the whole outer perimeter of the device 1. In other words, the connecting profiles 11 reduce the form drag of the outer perimeter of the central body 8 during its rotation according to the same principle as that stated previously.

[0020] Preferably, the propulsion nozzles 6 are identical to each other and are equidistant from the axis of rotation X, thereby providing the device 1 with a balanced thrust with respect to the axis of rotation X. The washing nozzles 5 are positioned at different distances from the axis of rotation X, so as to provide a washing jet which is as uniform as possible along the whole extension of the device 1. In the preferred embodiment of the invention, the number of propulsion nozzles 6 is equal to the number of lobes 10; in the preferred embodiment, this number is three. The washing nozzles 5 are preferably three in number, with each placed on a lobe 10, at different distances from the axis of rotation X.

[0021] The device 1 described above is suitable for use, as mentioned above, in a dishwasher having a washing chamber containing two tableware baskets, one above the other, each basket being served by a main spray device.

[0022] It is clear from the above description that the auxiliary spray device 1 enables full functionality to be provided even when the washing liquid delivery rates are low.

Claims

1. An auxiliary spray device for dishwashers, comprising:
 - a fitting member (2) for fastening the device directly or indirectly to the washing chamber of a dishwasher, the fitting member (2) comprising a washing liquid inlet portion (4), and the spray device being designed to rotate about an axis of rotation (X) passing through the fitting member (2);
 - a plurality of washing nozzles (5) in fluid communication with the inlet portion (4), the washing nozzles (5) being designed to deliver washing fluid in a direction (L) having a component (L1) which is parallel to the axis of rotation (X) and which is greater than the other components;
 - a plurality of propulsion nozzles (6) in fluid communication with the inlet portion (4), the propulsion nozzles (6) being designed to deliver washing fluid in a direction (P) having a component (P1) perpendicular to the axis of rotation (X), the propulsion nozzles (6) being more distant than the washing nozzles (5) from the axis of rotation (X);
 - the propulsion nozzles (6) being located on corresponding bevelled and rounded end portions (7).
2. A device according to Claim 1, wherein the end portions (7) have a profile, in a cross section taken along a plane substantially parallel to the axis of rotation (X), which is substantially oval.
3. A device according to any of the preceding claims, comprising a central body (8) on which the washing nozzles (5) are positioned, the end portions (7) being connected to terminal appendages (9) of the central body (8).
4. A device according to Claim 3, wherein the central body (8) has a substantially multi-lobed shape, each lobe (10) of this multi-lobed shape comprising a first portion (10a) at the position of the fitting member (2) and a second portion (10b) forming a corresponding end appendage (9) of the central body (8).
5. A device according to Claim 4, wherein the first portions (10a) of each lobe (10) are interconnected.
6. A device according to Claim 4 or 5, comprising a plurality of connecting profiles (11), each connecting profile (11) extending between a corresponding bevelled and rounded end portion (7), connected to the second portion (10b) of one lobe, and an adjacent lobe.

7. A device according to Claim 6, wherein the connecting profiles (11) extend with continuity of shape from the bevelled and rounded end portions (7) and have a substantially curved extension in plan view. 5
8. A device according to Claim 7, wherein the substantially curved connecting profiles (11) have a concavity facing the central body (8). 10
9. A device according to Claim 7 or 8, wherein the connecting profiles (11) have profiles, as seen in a cross section taken along planes substantially parallel to the axis of rotation (X), which are substantially oval. 15
10. A device according to any of Claims 6 to 9, wherein each connecting profile (11) extends from the corresponding bevelled and rounded end portion (7) on the side opposite the direction of expulsion of the corresponding propulsion nozzle (6). 20
11. A device according to any of the preceding claims, wherein each propulsion nozzle (6) is positioned in a channel (7a) of a corresponding end portion (7). 25
12. A device according to any of the preceding claims, wherein the propulsion nozzles (6) are equidistant from the axis of rotation (X). 30
13. A device according to any of the preceding claims, wherein the propulsion nozzles (5) are positioned at different distances from the axis of rotation (X). 35
14. A dishwasher comprising a washing chamber, and at least one auxiliary spray device according to any one or more of Claims 1 to 13, positioned in the washing chamber. 40

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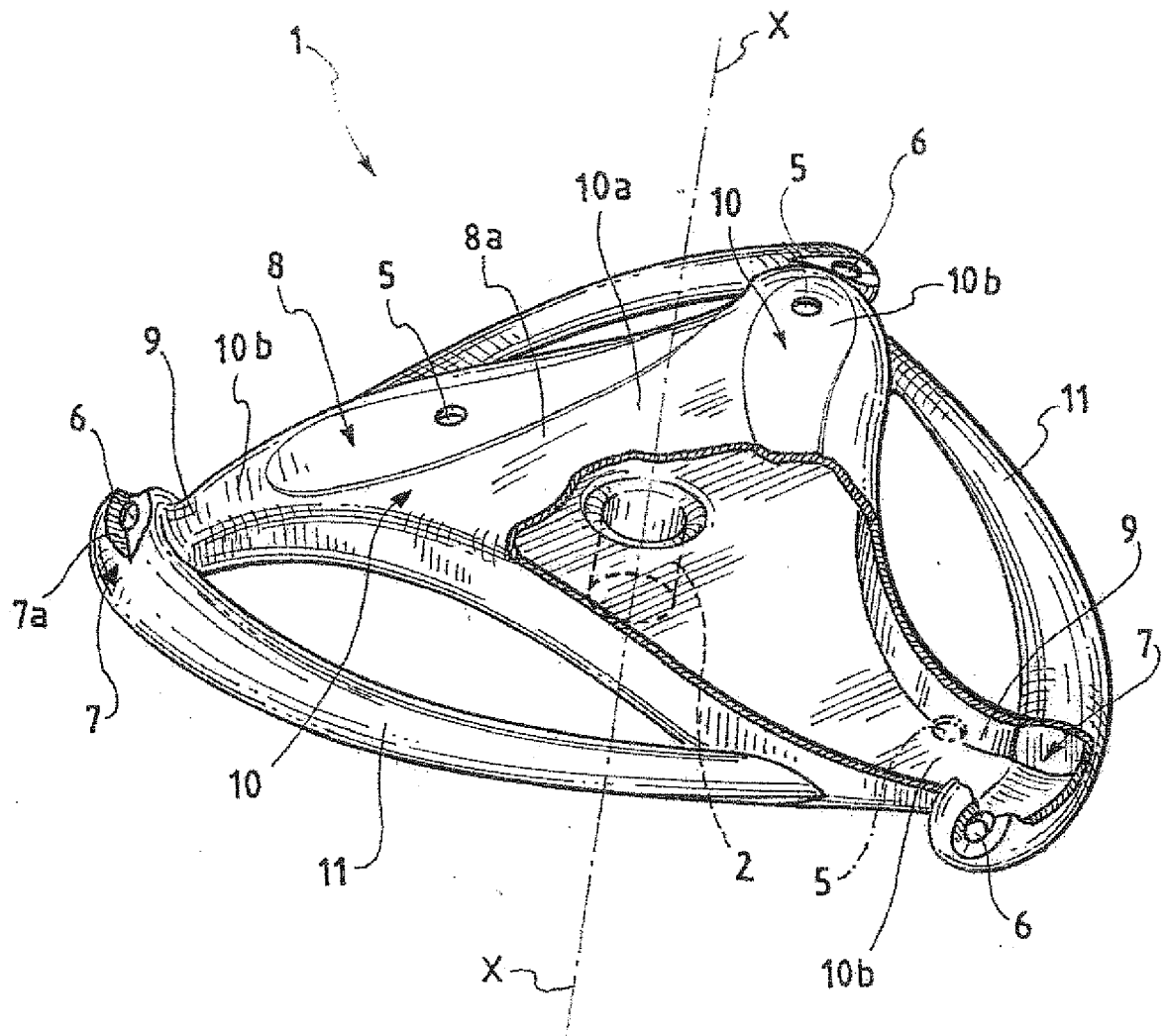


Fig. 1

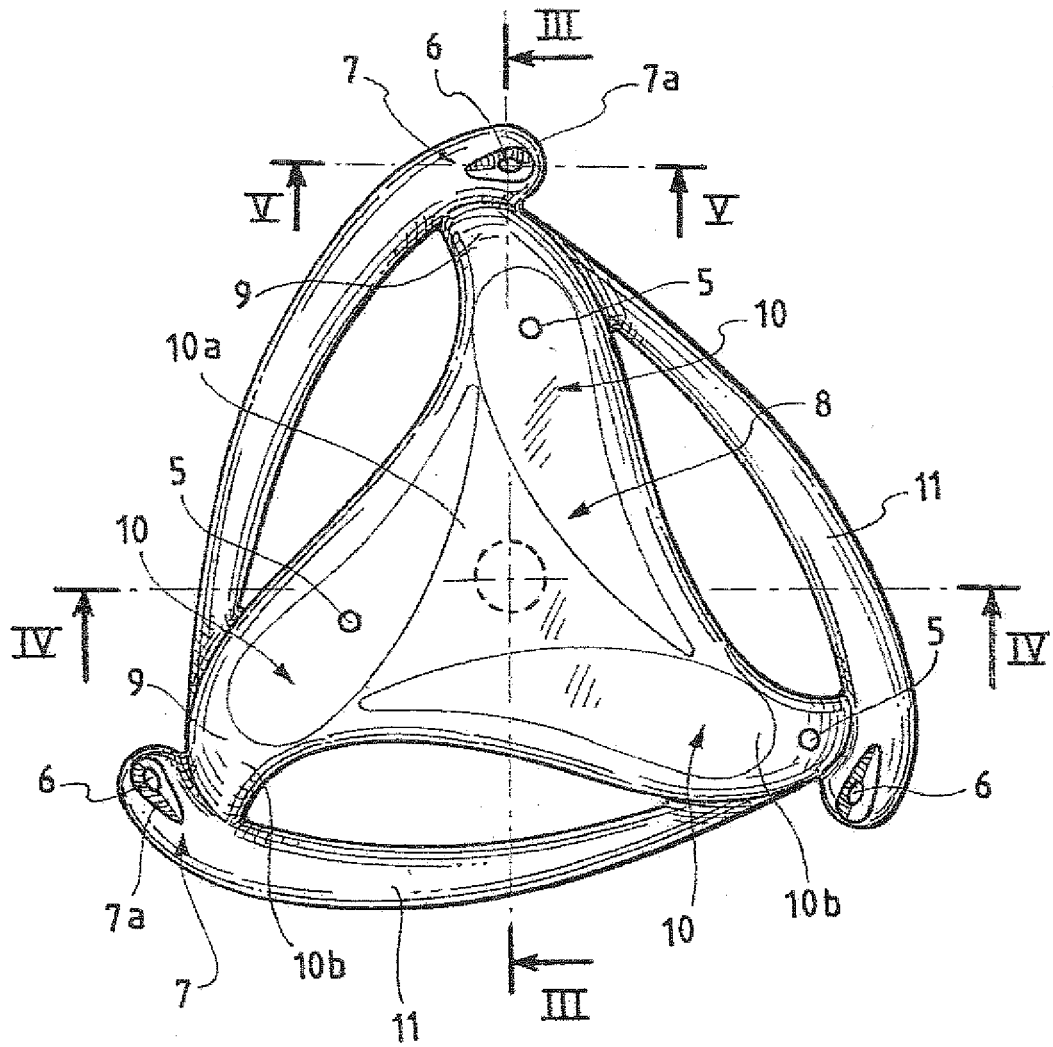


Fig. 2

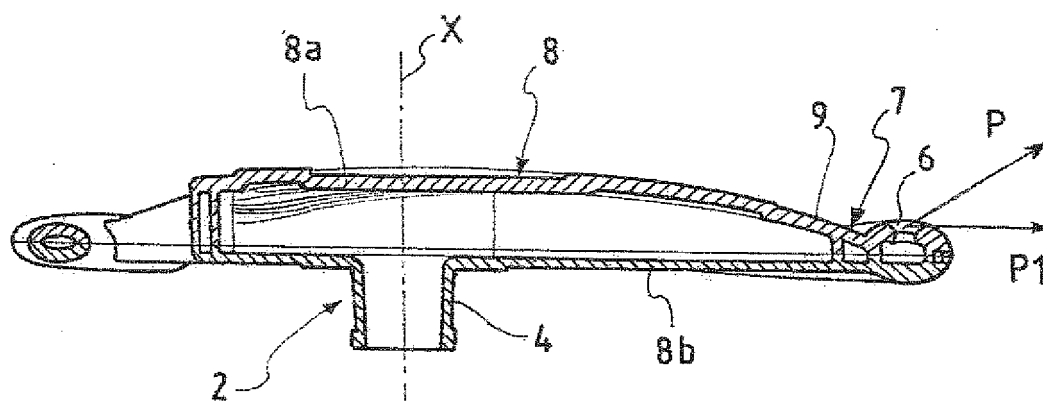


Fig.3

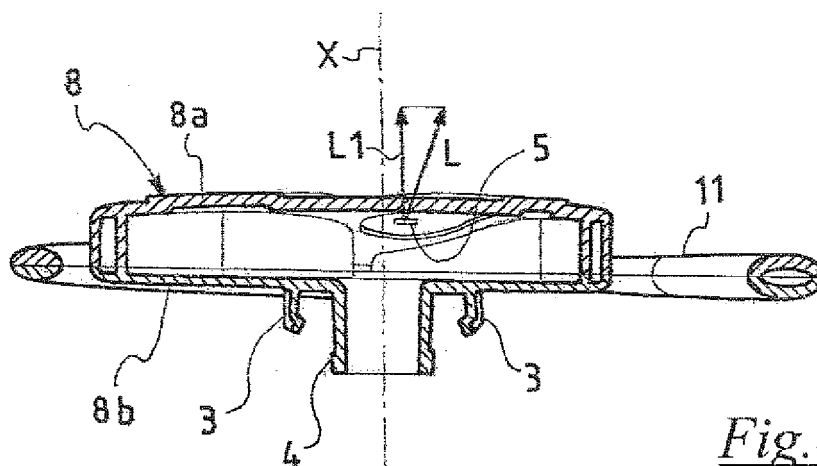


Fig.4

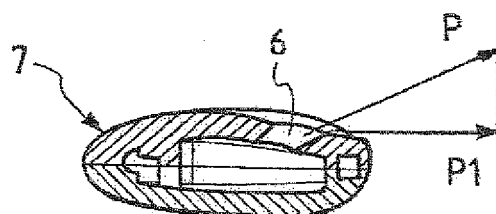


Fig.5



EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5115

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Place of search Munich		Date of completion of the search 7 November 2012	Examiner Weinberg, Ekkehard
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
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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