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(54) **DRUM ASSEMBLY FOR A WASHING MACHINE**

(57) The invention relates to a drum assembly for a washing machine with a drum and a support assembly for the same that is an alternative to an aluminium alloy support and is able to withstand the mechanical forces and chemical attacks to which washing machine drums are subjected. The drum assembly comprises a drum and a support assembly that in turn comprises a star-shaped support having at least three arms and a shaft secured to the centre of the support, the star-shaped support further comprising a metallic core encapsulated by an overmoulded plastic covering. For each arm, the metallic core comprises two plates disposed transversely with respect to the main plane of the support assembly, the shaft being secured by the plastic covering.

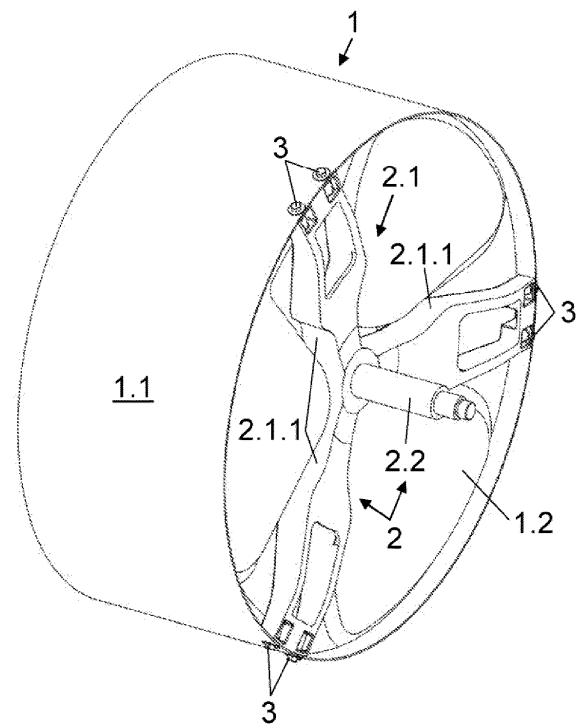


Fig.1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention falls within the field of washing machines, in particular the field of washing machine components, such as the drum.

[0002] Said invention is a drum assembly for a washing machine that comprises a drum, a support assembly for the same and fastening means between both the drum and the support assembly.

BACKGROUND OF THE INVENTION

[0003] Currently, in the manufacturing of washing machines, a star-shaped support in an aluminium alloy with a machined shaft secured to the same is used for transmitting the rotational movement of the motor to the stainless steel drum, said securing achieved with the same aluminium alloy of the support which is overmoulded on the shaft. This support assembly is subjected to alternating mechanical forces due to the movement of the drum, in addition to high temperature (up to 100°C) and to chemical attacks caused by detergents and other products used in washing clothes. The combination of mechanical forces and chemical attacks provokes the degradation of the support assembly during the lifespan of the washing machine, thus leading to mechanical failure and to the subsequent repair or replacement thereof.

[0004] There are other known components of washing machines other than the previously mentioned support assembly, such as tubs with a metal core and overmoulded plastic, such as in patent EP2392718. The tub does not receive mechanical forces combined with chemical attacks like the support assembly of the drum, and therefore its configuration is simple.

[0005] The present invention solves the drawbacks in the state of the art and covers the need for washing machine components that resist mechanical forces and chemical attacks.

DESCRIPTION OF THE INVENTION

[0006] The present invention is established and characterized in the independent claims, while the dependent claims describe other features of the same.

[0007] The object of the invention is a drum assembly for a washing machine with a drum and a support assembly for the same that is an alternative to an aluminium alloy support and is able to withstand the mechanical forces and chemical attacks to which washing machine drums are subjected. The technical problem to be solved is to configure the previously mentioned components to achieve the object of the invention.

[0008] In referring to star-shaped support including arms, it is necessary to specify that the arms are at an equal distance from one another, meaning they are equally distributed along the circumference, just as a star

with a regular distribution of the arms thereof. The symmetry of a configuration of this type is implicit in the definition of the same.

[0009] In mentioning overmoulding, an implicit characteristic of encapsulating with plastic is referred to, since it is a suitable and known technique for carrying out a configuration of completely enveloping of an element, without aiming to refer to a feature of a product through a process of obtaining the same.

[0010] One advantage of the invention in relation to claim 1 is that it thoroughly complies with the object of the invention since the arrangement and configuration of the metallic core together with the plastic covering has a greater resistant module than the same assembly in aluminium alloy, and therefore it better withstands the alternating forces and experiences a lesser degree of deformation.

[0011] Likewise, the encapsulation prevents any contact between the metallic core and the detergents in chlorinated water at high temperatures, and therefore prevents corrosion, unlike the aluminium alloy in the state of the art.

[0012] Another advantage in relation to claim 2 is that it properly resists torsional stress.

[0013] Another advantage in relation to claim 3 is that the metallic core is used only in the necessary parts, as can be seen in the prototypes tested, and therefore the location and amount of the metallic core is optimized, which is the most expensive and heaviest component.

[0014] Another advantage in relation to claim 4 is that the material is removed from areas where it is unnecessary, which reduces the cost of the assembly by using less plastic and also makes the assembly lighter.

[0015] Another advantage in relation to claim 5 is that it allows a metallic core of a single piece to be prepared for two contiguous arms, and therefore the manufacturing is more simple, normally by stamping a metal sheet.

[0016] Another advantage in relation to claim 6 is that the joint of the shaft is reinforced, and therefore it better resists the transmission of the torque that it receives and transmits to the support assembly.

[0017] Another advantage in accordance with claim 7 is that it resists the torsional stresses on the shaft for any condition of the drum or any load in the drum.

[0018] Another advantage in relation to claim 8 is that it facilitates the connection of the shaft to the metallic core.

[0019] Another advantage in relation to claim 9 is that, in addition to the fact that the thickness is suitable for resisting the previously mentioned mechanical forces, it provides enough weight to the assembly in order to minimise the use of counterweights, in comparison with aluminium alloy in the state of the art which has a greater need of using counterweights.

[0020] Another advantage in relation to claim 10 is that plastics that are already used in other components of washing machines, and which can include grades that are resistant to attacks by detergents and chlorinated

water at high temperatures, are used in the covering.

[0021] Another advantage in relation to claim 11 is that the fibres are already used in other components of the washing machines and provide great rigidity to the assembly.

[0022] Another advantage in relation to claim 12 is that the fastening is not affected by the phenomenon of loosening and the screws do not need a self-locking additive, as is the case in aluminium alloys in the state of the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The present specification is complemented by a set of figures that illustrate the preferred example of the invention in a non-limiting manner.

Figure 1 is a rear perspective view of the drum assembly.

Figure 2 is a cross section showing the fastening means of an arm of the support to the drum of the drum assembly in figure 1 in detail.

Figures 3A-3C show a perspective view of the support assembly, and of the drum assembly in figure 1, made up of a star-shaped support with 3, 6 and 8 arms, respectively.

Figure 4 is an exploded perspective view of the drum assembly in figure 1.

Figure 5 is an elevation view of the metallic core of the star-shaped support.

Figure 6 is an elevation view of the star-shaped support.

Figure 7 is a cross section of an arm of the star-shaped support, related to the cutting line VII of figure 6.

Figure 8 is a longitudinal cross section of the support assembly, related to the cutting line VIII of figure 6.

Figure 9 is a perspective view of the shaft, joined by welding to the metallic core.

Figure 10 is a perspective view of the shaft with broached areas made on the end thereof where it is joined to the metallic core.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE

INVENTION

[0024] What follows is an embodiment of the invention with the help of the figures.

[0025] Figure 1 shows a drum assembly for a washing machine as it is known in the state of the art that comprises:

- a drum (1), which in turn comprises a cylindrical lateral wall (1.1) and a rear wall (1.2) that covers one of the faces of the cylindrical lateral wall (1.1);
- a support assembly (2), which in turn comprises a star-shaped support (2.1) with at least three arms

(2.1.1), the ends of which make up the main plane of the support assembly (2), and a shaft (2.2) secured to the centre of the support (2.1) and perpendicular to said main plane;

- fastening means (3) for each one of the arms (2.1.1) of the support (2.1) to the rear part of the drum (1), in other words, the part of said drum (1) that corresponds to the cylindrical lateral wall (1.1) covered by the rear wall (1.2).

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[0026] In the embodiment shown in figures 1, 2 and 4, the arms (2.1.1) of the support (2.1) are fastened to an edge of the cylindrical wall (1.1) that projects from the rear wall (1.2) of the drum (1), however, with simple and evident changes, it may be envisaged that the fastening of said arms (2.1.1) be done to the rear wall (1.2) itself.

[0027] Figures 1, 3A and 4 show a preferred embodiment of the star-shaped support (2.1) with 3 arms (2.1.1), however, supports (2.1) with 6 or 8 arms (2.1.1) could be used, such as the ones shown in figures 3B and 3C, respectively.

[0028] Figures 4 to 8 show that the star-shaped support (2.1) further comprises a metallic core (2.1.2) encapsulated by an overmoulded plastic covering (2.1.3), said metallic core (2.1.2) comprising two plates (2.1.4) for each arm (2.1.1) disposed transversely with respect to the main plane of the support assembly (2), in other words, the plates (2.1.4) extend radially in the star-shaped support (2.1), with the larger sides of the transverse cross section thereof disposed parallel to the shaft (2.2). Each plate (2.1.4) in each arm (2.1.1) has a central part (2.1.5) that clasps to a portion of the shaft (2.2), followed by a first section (2.1.6) that extends in each arm (2.1.1) to a second section (2.1.7) as a continuation of the first, the shaft (2.2) remaining secured by the plastic covering (2.1.3).

[0029] Normally the star-shaped support (2.1) forms a diameter between a minimum of 300 mm to a maximum of 600 mm. This makes it so that, along with the fastening means (3) used, they are compatible with those used in an already existing drum assembly, for example, making threaded holes coincide, and further makes it possible to replace an existing support assembly (2) with a star-shaped support (2.1) in aluminium alloy by one in accordance with the invention.

[0030] Optionally, as shown in figures 4 to 7, in each arm (2.1.1) the second sections (2.1.7) of the plates (2.1.4) are more separated from each other than the first sections (2.1.6). Specifically, it is verified that the separation (s1) between the first sections (2.1.6) of the plates (2.1.4) can be between 10 mm and 40 mm, and the separation (s2) between the second sections (2.1.7) of the plates (2.1.4) can be between 40 mm and 200 mm. As shown in figure 5, the transition between the first section (2.1.6) and the second section (2.1.7) can be made by means of a smooth transition, in other words, in a curved shape, preventing vertices from forming, in order to transition from one separation to another, although any other

configuration is also possible.

[0031] Another option, as shown in figure 7, is that the transverse cross section of each arm (2.1.1) corresponding to the first section (2.1.6) of the plates (2.1.4) is in a U-shape, the plates (2.1.4) being the wings, with a plastic covering (2.1.3) and the central span (2.1.8) of plastic covering (2.1.3). Figure 8 shows a longitudinal cross section of an arm (2.1.1), the profile of which is inclined, able to have a height from the highest part to the lowest part between 20 mm and 100 mm, although the profile could also be straight. The small heights are favourable for support assemblies (2) that are more compact but with less moment of inertia, which are more favourable for drums with smaller loads of clothes, while the greater heights are favourable for larger loads of clothes.

[0032] Another option, as shown in figures 3, 4, 6 to 8, is that each arm (2.1.1), has a hollow (2.1.9) in at least one portion of the plastic covering (2.1.3) in correspondence with the second section (2.1.7) of the plates (2.1.4).

[0033] Another option, as shown in figures 4 and 5 is that the plates (2.1.4) with two contiguous arms (2.1.1) are connected in a continuous manner, in other words, the plates (2.1.4) with two contiguous arms (2.1.1) make up a single piece.

[0034] Another option, as shown in figure 9, is that the shaft (2.2) is further secured to the central part (2.1.5) of each plate (2.1.4) of each arm (2.1.1) by welding (4), able to be a cord, as shown, a point or even a button by filling a hole made on the central part (2.1.5), not shown in the figures.

[0035] Another option, as shown in figure 8, is that on the portion with plastic covering, the shaft (2.2) is knurled (2.2.1) with teeth of heights between 2 mm and 4 mm.

[0036] Another option is that the shaft (2.2) is broached (2.2.2) on the portion of the central part (2.1.5), meaning, in the areas where said central parts (2.1.5) of the plates (2.1.4) are secured to the shaft (2.2). Figure 10 illustrates the shaft (2.2) with two broached areas (2.2.2), however, said shaft (2.2) could comprise up to 8 broached areas (2.2.2), for example, depending on the number of arms (2.1.1) that the star-shaped support (2.1) has.

[0037] Another option is that the plates (2.1.4) have a thickness between 1 mm and 5 mm. In the case one desires to lighten the weight of the plates (2.1.4), holes could be made in the same, not shown in the figures.

[0038] Another option is that the plastic covering (2.1.3) is reinforced with fibres, the plastic being a plastic chosen from PP (polypropylene), PPS (polyphenylene sulfide), PSU (polysulfone) and PET (polyethylene terephthalate). Regardless of the plastic material used, being either the aforementioned plastic material or any other, it is advantageous to use the grades available that are most resistant to chemical attacks by detergents, chlorine and high temperatures.

[0039] Another option is that the fibres are a material chosen from glass, calcium and carbon. The fibres can be short, medium or long, the length preferably being between 0.1 mm and 3 mm for glass and between 1 μ m

and 20 μ m for calcium.

[0040] Another option, as shown in figure 2, is that the fastening means (3) comprise at least a threaded hole (3.1) in the plastic covering (2.1.3) of each arm (2.1.1) and a screw (3.2) with a self-locking thread.

[0041] The options shown do not imply compliance of the previous option, rather that they can be combined in any order and in any manner.

Claims

1. A drum assembly for a washing machine comprising:

- a drum (1), which in turn comprises a cylindrical lateral wall (1.1) and a rear wall (1.2) that covers one of the faces of the cylindrical lateral wall (1.1); a support assembly (2), which in turn comprises a star-shaped support (2.1) with at least three arms (2.1.1), the ends of which make up the main plane of the support assembly (2), and a shaft (2.2) secured to the centre of the support (2.1) and perpendicular to said main plane;
- fastening means (3) of each one of the support arms (2.1) to the rear part of the drum (1),
characterized in that the star-shaped support (2.1) further comprise a metallic core (2.1.2) encapsulated by an overmoulded plastic covering (2.1.3), said metallic core (2.1.2) comprising two plates (2.1.4) for each arm (2.1.1) disposed transversely with respect to the main plane of the support assembly (2), each plate (2.1.4) in each arm (2.1.1) having a central part (2.1.5) that clasps to a portion of the shaft (2.2), followed by a first section (2.1.6) that extends in each arm (2.1.1) up to a second section (2.1.7) as a continuation of the first, the shaft (2.2) being secured by the plastic covering (2.1.3).

2. The assembly according to claim 1, wherein in each arm (2.1.1) the second sections (2.1.7) of the plates (2.1.4) are more separated from each other than the first sections (2.1.6).

3. The assembly according to claims 1 or 2, wherein the transverse cross section of each arm (2.1.1) corresponding to the first section (2.1.6) of the plates (2.1.4) is in a U-shape, the plates (2.1.4) being the wings, with a plastic covering (2.1.3) and the central span (2.1.8) having a plastic covering (2.1.3).

4. The assembly according to any of the preceding claims, wherein each arm (2.1.1), has a hollow (2.1.9) in at least one portion of the plastic covering (2.1.3) in correspondence with the second section (2.1.7) of the plates (2.1.4).

5. The assembly according to any of the preceding

claims, wherein the plates (2.1.4) of two contiguous arms (2.1.1) are connected in a continuous way.

6. The assembly according to any of the preceding claims, wherein the shaft (2.2) is further secured to the central part (2.1.5) of each plate (2.1.4) of each arm (2.1.1) by welding (4). 5
7. The assembly according to any of the preceding claims, wherein the portion with plastic covering of the shaft (2.2) is knurled (2.2.1) with teeth of heights between 2 and 4 mm. 10
8. The assembly according to any of the preceding claims, wherein the shaft (2.2) is broached (2.2.2) on the portion of the central part (2.1.5) of the plate (2.1.4). 15
9. The assembly, according to any of the preceding claims, wherein the plates (2.1.4) have a width between 1 mm and 5 mm. 20
10. The assembly according to any of the preceding claims, wherein the plastic covering (2.1.3) is reinforced with fibres, the plastic being chosen from PP, PPS, PSU and PET. 25
11. The assembly according to claim 10, wherein the fibres are made of a material chosen from glass, calcium and carbon. 30
12. The assembly according to any of the preceding claims, wherein the fastening means (3) comprise at least a threaded hole (3.1) in the plastic covering (2.1.3) of each arm (2.1.1) and a screw (3.2) with a self-locking thread. 35

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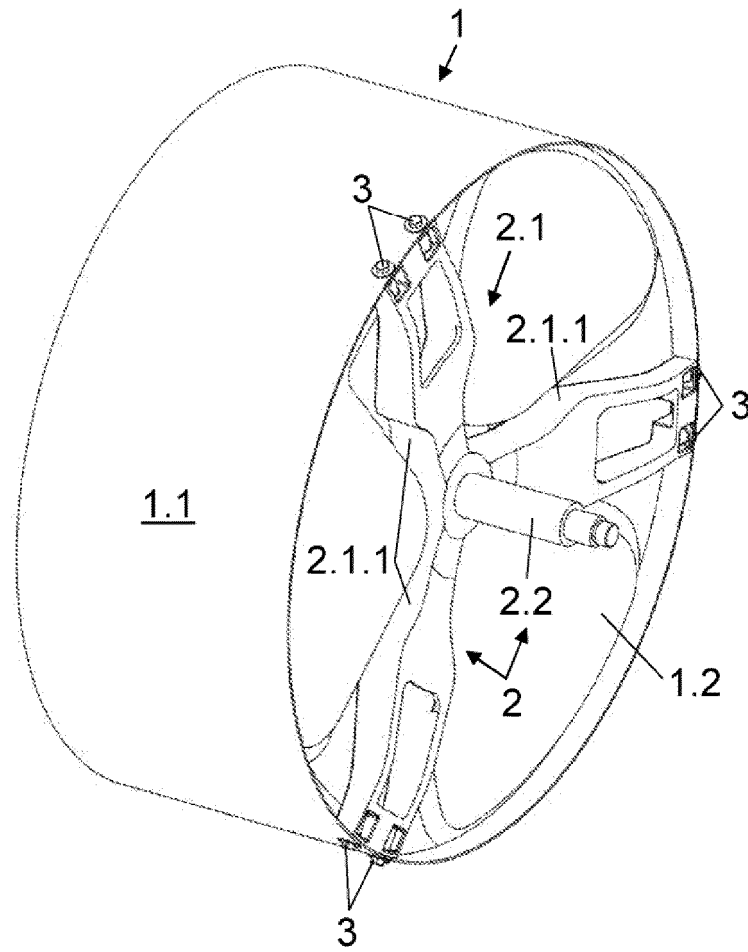


Fig.1

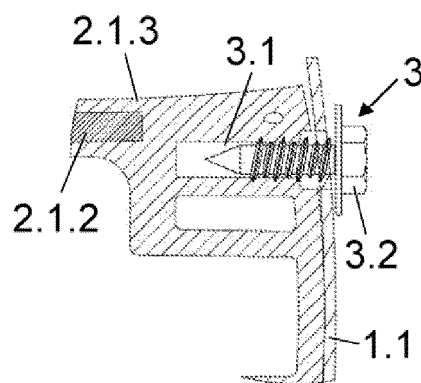


Fig.2

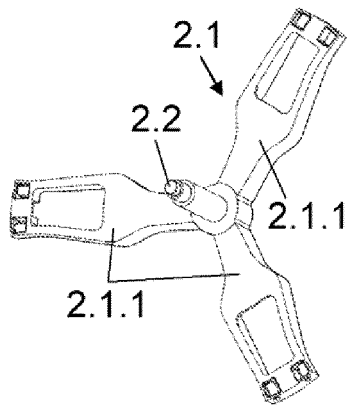


Fig.3A

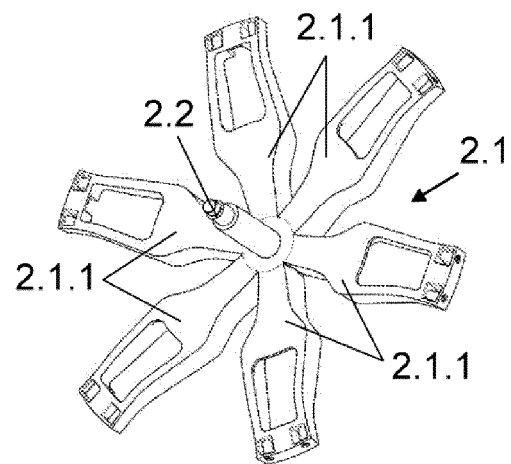


Fig.3B

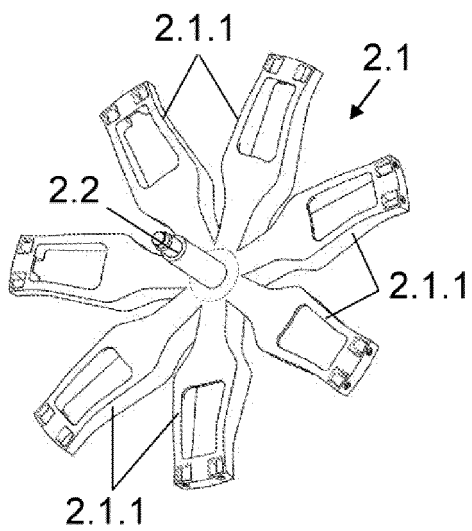


Fig.3C

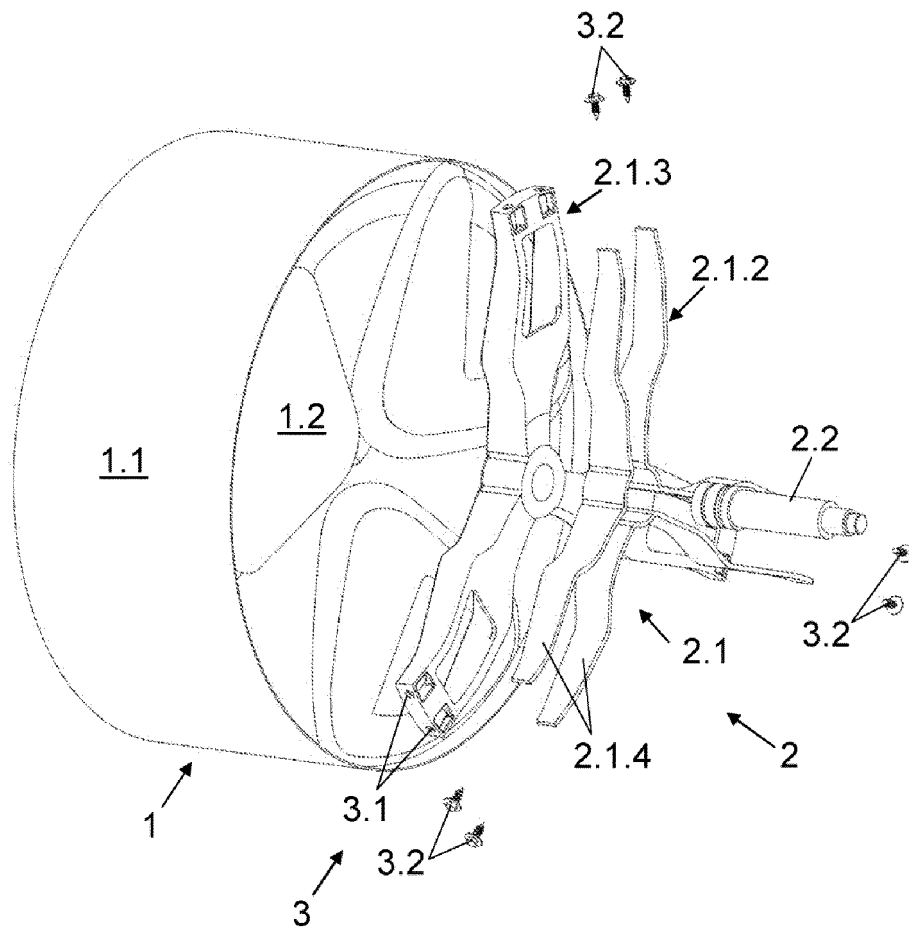


Fig.4

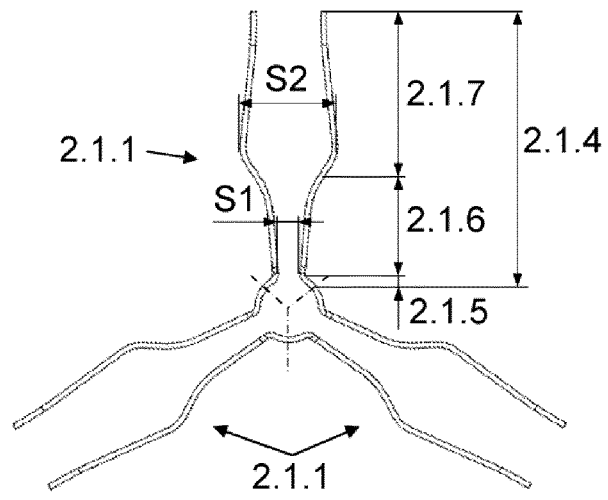


Fig.5

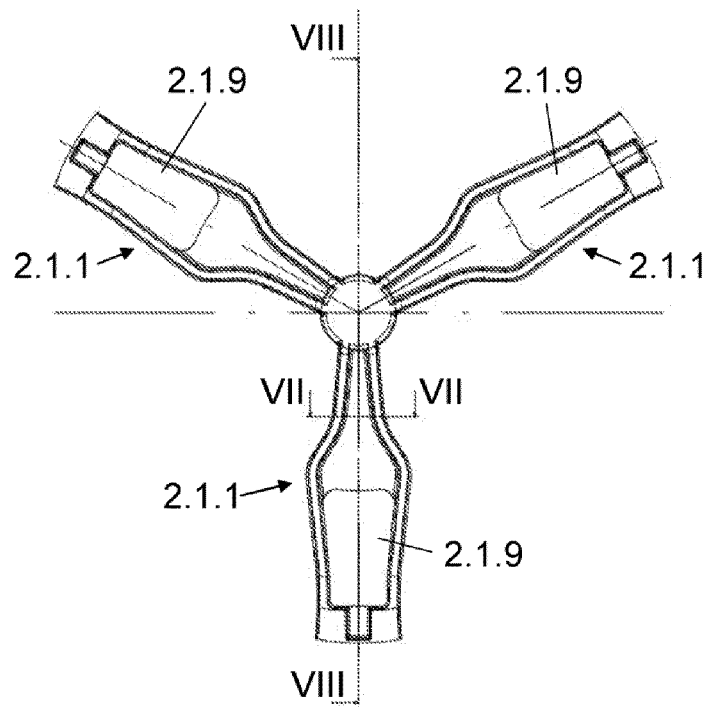


Fig.6

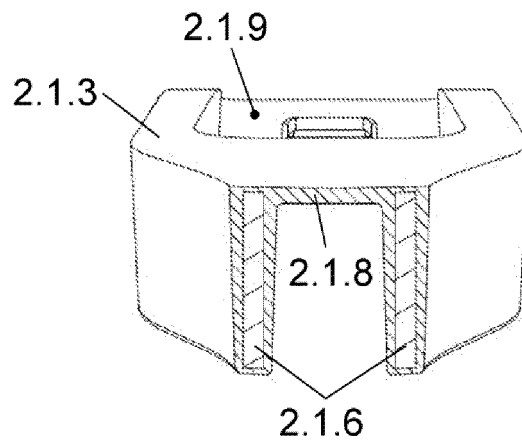


Fig.7

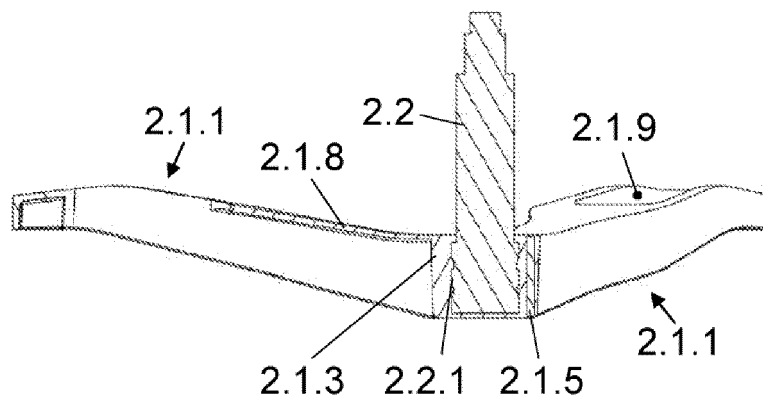


Fig.8

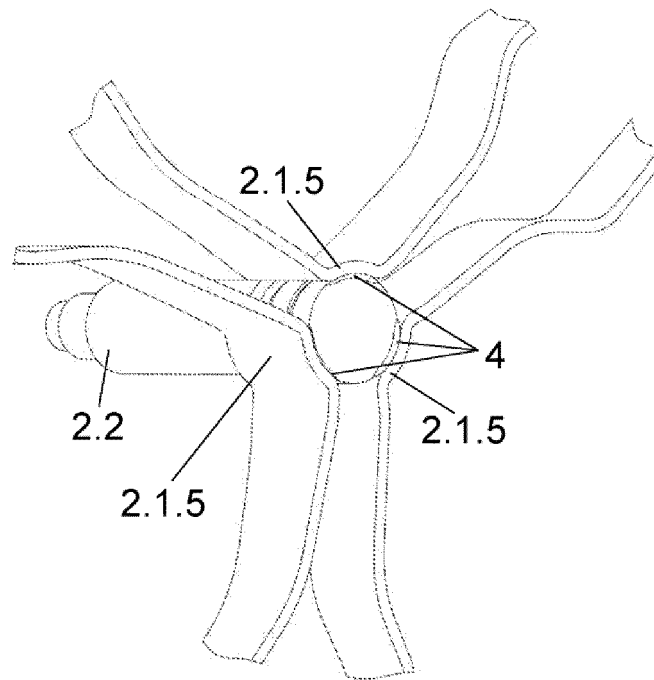


Fig.9

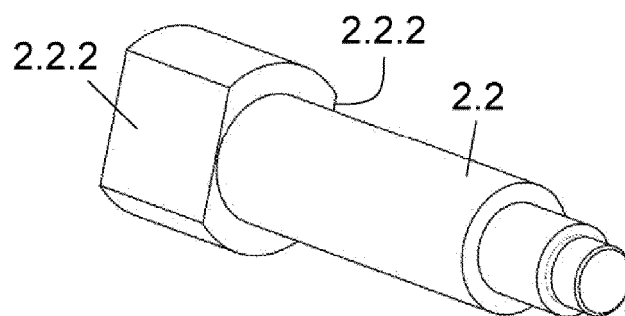


Fig.10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2015/070627

A. CLASSIFICATION OF SUBJECT MATTER

D06F37/02 (2006.01)*D06F25/00* (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)

D06F

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.
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Date of the actual completion of the international search

19/11/2015

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EP 3 339 491 A1

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INTERNATIONAL SEARCH REPORT

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2392718 A [0004]