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(54) Title: WASHING MACHINE TUB AND INERTIA COUNTERWEIGHT ASSEMBLY

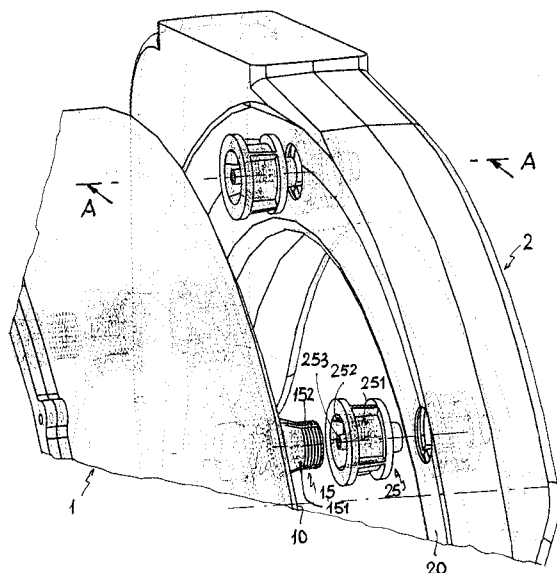


Fig. 2

(57) Abstract: In order to essentially simplify assembling of a washing machine tub (1) and inertia counterweight (2), both the tub (1) and the inertia counterweight (2) are each per se furnished with a plurality of male and female interconnecting members (15, 25). Each interconnecting member (15, 25) on the tub (1) is coaxially aligned with each corresponding interconnecting member (15, 25) on the inertia counterweight (2), or vice versa, and each male interconnecting member (15) on the tub (1) or on the inertia counterweight (2) is axially insertable into each corresponding female interconnecting member (25) on the tub (1) or on the inertia counterweight (2), or vice versa, by which a positive interconnection between each pair of mutually arrested male and female interconnection members (15, 25) is established, upon which the tub (1) and the counterweight (2) remain permanently interconnected.

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Washing machine tub and inertia counterweight assembly

The present invention refers to a washing machine tub and inertia counterweight assembly, which is usually available within a modern washing machine for household purposes.

Washing machine tub and inertia counterweight assembly is disclosed in SI 20945 A. A tub is among others furnished with outwardly protruding pair of arms extending towards the counterweight. A counterweight as such consists of concrete, in which metallic inserts are embedded. Each of said inserts is optionally attached to a reinforcing ring, which is also embedded within the concrete, and is moreover furnished with a ring-shaped end portion protruding out of the concrete. Said counterweight is interconnected with the tub by means of screws, which are inserted through said ring-shaped portions on the counterweight and screwed into recess between each pair of said arms on the tub. Manufacturing of such assembly is pretty difficult and time consuming, due to pre-forming and positioning of said inserts, forming said arms on the tub and also assembling said tub and said counterweight by means of screws.

By taking into consideration drawbacks of known assemblies of washing machine tubs and counterweights, the invention is based on a problem, how to essentially simplify and accelerate attachment of a counterweight onto each corresponding tub.

The invention refers to a washing machine tub and inertia counterweight assembly, such assembly comprising

- a hollow essentially cylindrical tub with longitudinal central axis, wherein such tub is elastically suspended within a washing machine body and adapted to receive a basket which is rotatably embedded therein and driven by appropriate motor; and
- at least approximately annular inertia counterweight, which is mounted onto said tub and is adapted for compensating dynamic forces and dampening vibrations on said tub, wherein said tub is furnished with a face, which is adapted to receive said inertia counterweight, and is oriented by means of its longitudinal central axis and optionally consists of appropriately preformed metallic material or of molded or otherwise preformed thermoplastic material on the basis of polymers, and wherein said counterweight preferably consists of reinforced concrete and is furnished with a face, which is adapted to be rest on the face of the tub, and is moreover adapted to surround at least partially said central axis of the tub.

In accordance with the present invention, both the tub and the inertia counterweight are each per se furnished with a plurality of male and female interconnecting members, which are arranged on the face of the tub as well as on the face of the inertia counterweight, wherein the interconnecting members on the tub are either firmly embedded within said tub or are firmly interconnected therewith, and corresponding interconnecting members on the inertia counterweight are either firmly embedded within said inertia counterweight or are firmly interconnected therewith, so that, when observed along the central axis of the tub, each interconnecting member on the tub is coaxially aligned with each corresponding interconnecting member on the inertia counterweight, or vice versa, and that each male interconnecting member on the tub or on the inertia counterweight is axially insertable into each corresponding female interconnecting member on the tub or on the inertia counterweight, or vice versa, and that by inserting each male interconnecting members into each corresponding female interconnecting members a positive interconnection between each pair of mutually arrested male and female interconnection members is established, by which the tub and the counterweight remain permanently interconnected.

In one embodiment of the invention, the tub is furnished exclusively with male interconnecting members, and the inertia counterweight is furnished exclusively with female interconnecting members. In a further embodiment of the invention, the tub is furnished exclusively with female interconnecting members, and the inertia counterweight is furnished exclusively with male interconnecting members. A still further embodiment of the invention provides that the tub is furnished with at least two male interconnecting members and at least two female interconnecting members, and that the inertia counterweight is furnished with at least two male interconnecting members and at least two female interconnecting members, providing that said male and female interconnecting members on the tub and the inertia counterweight are arranged in such manner that each male interconnecting member on the tub is insertable into a corresponding female interconnecting member on the inertia counterweight, or vice versa, that each male interconnecting member on the inertia counterweight is insertable into a corresponding female interconnecting member on the tub.

In accordance with the most preferred embodiment of the invention, each female interconnecting member is formed as appropriately rigid and at least partially hollow essentially cylindrical part and comprises

- an outer circumferential surface, which is adapted for anchoring said female interconnecting member within the material of the tub or the inertia counterweight, which appropriate, and is optionally furnished with circumferential ribs ; and
- an inner circumferential surface, which is toothed or corrugated or otherwise adapted for establishing a positive interconnection with each corresponding male interconnecting means. Moreover, said female interconnecting member can further comprise a centrally arranged protrusion, which is surrounded by said internal circumferential surface and is essentially available in the form of a truncated cone, which converges outwards i.e. opposite to a direction of inserting each corresponding male interconnecting means.

In addition to that, each male interconnecting member preferably comprises a radially resilient and essentially cylindrical projection, which is insertable into each corresponding male interconnecting means and is moreover furnished with an external circumferential surface, which is toothed or corrugated or otherwise formed for the purposes of cooperation with the internal circumferential surface of each corresponding female interconnecting member due to establishing a positive interconnection between said internal circumferential surface of the female interconnecting member and said external circumferential surface of the male interconnecting member. Moreover, said male interconnecting member further comprises

- a central longitudinal passage, which is adapted to cooperate with the protrusion of the female interconnecting member, wherein the diameter of said passage is larger than the minimal diameter of the truncated-cone-shaped external surface of said protrusion and smaller than the maximal diameter of the truncated-cone-shaped external surface of said protrusion; as well as
- at least two longitudinal weakening recesses for enabling radial resiliency of said projection of the male interconnecting member and expansion of its external circumferential surface for the purposes of engagement with the internal circumferential surface of the female interconnecting member when the protrusion of the of the female interconnecting member is inserted into said central passage in the projection of the male interconnecting member.

The invention will be described on the basis of embodiments, which are shown in the enclosed drawings, wherein

Fig. 1 is a perspective view of a washing machine tub, which is ready for receiving each corresponding counterweight.

Fig. 2 is a partial explosion presentation of the tub according to Fig. 1 together with corresponding counterweight, just prior to assembling thereof;

Fig. 3 is a detailed view B according to Fig. 1;

Fig. 4 is a counterweight, namely the cross-section thereof along the plane A - A according to Fig. 2; and

Fig. 5 is a cross-section of already assembled tub and counterweight along the same plane A - A according to Fig. 2.

Washing machine tub 1 and inertia counterweight 2 assembly generally comprising a hollow essentially cylindrical tub 1 (Fig. 1) with a longitudinal central axis 100, and a counterweight 2, which can be attached to said tub 1.

In general, said tub 1 is elastically suspended within a washing machine body and is adapted to receive a basket which is rotatably embedded therein and driven by appropriate motor. An embodiment of the tub 1 is shown in Fig. 1, in which said basket and motor are not shown.

At least approximately annular inertia counterweight 2 is mounted onto said tub 1 (Figs. 2 and 5) for the purposes of compensating dynamic forces and dampening vibrations on said tub 1.

Said tub 1 is furnished with a face 10, which is adapted to receive a counterweight 2. Moreover, the tub 1 is oriented by means of its longitudinal central axis 100 and optionally consists of appropriately preformed metallic material or of molded or otherwise preformed thermoplastic material on the basis of polymers.

Said inertia counterweight 2 preferably consists of reinforced concrete and is also furnished with a face 20, which is adapted to be rest on the face 10 of the tub 1. Since the inertia counterweight 2 is essentially annular, it is adapted to surround at least partially said central axis 100 of the tub 1.

In accordance with the present invention, assembling of the tub 1 and the inertia counterweight 2 is essentially simplified due to the fact that both the tub 1 and the inertia counterweight 2 are each per se furnished with a plurality of male and female

interconnecting members 15, 25, which are arranged on the face 10 of the tub 1 as well as on the face 20 of the inertia counterweight 2. Said interconnecting members 15, 25 on the hub 1 are either firmly embedded within said tub 1, or are firmly interconnected therewith, and each corresponding interconnecting members 15, 25 on the inertia counterweight 2 are either firmly embedded within said inertia counterweight 2, or are firmly interconnected therewith. Consequently, when observed along the central axis 100 of the tub 1, each interconnecting member 15, 25 on the tub 1 is coaxially aligned with each corresponding interconnecting member 15, 25 on the inertia counterweight 2, or vice versa, and each male interconnecting member 15 on the tub 1 or on the inertia counterweight 2 is axially insertable into each corresponding female interconnecting member 25 on the tub 1 or on the counterweight 2, or vice versa, so that by inserting of each disposable male interconnecting members 15 into each corresponding female interconnecting members 25 a positive interconnection between each pair of mutually arrested interconnection members 15, 25 is established, by which the tub 1 and the counterweight 2 remain firmly and permanently interconnected.

In the first embodiment of the invention, the tub 1 is furnished exclusively with male interconnecting members 15 and the inertia counterweight 2 is furnished exclusively with female interconnecting members 25.

In the first embodiment of the invention, the tub 1 is furnished exclusively with female interconnecting members 25 and the inertia counterweight 2 is furnished exclusively with male interconnecting members 15.

A further embodiment provides that the tub 1 is furnished with at least two male interconnecting members 15 and at least two female interconnecting members 25, and that the inertia counterweight 2 is furnished with at least two male interconnecting members 15 and at least two female interconnecting members 25, providing that said male and female interconnecting members 15, 25 on the tub 1 and the inertia counterweight 2 are arranged in such manner that each male interconnecting member 15 on the tub 1 is insertable into a corresponding female interconnecting member 25

on the inertia counterweight 2, or vice versa, and that each male interconnecting member 15 on the inertia counterweight 2 is also insertable into a corresponding female interconnecting member 25 on the tub 1.

In a preferred embodiment, each female interconnecting member 25 (Fig. 4) is formed as appropriately rigid and at least partially hollow essentially cylindrical part, and comprises

- an external circumferential surface 251, which is adapted for anchoring of said female interconnecting member 25 within the material of the tub 1 or the inertia counterweight 2, which appropriate, and is optionally furnished with circumferential ribs 251', 251''; and
- an internal circumferential surface 252, which is toothed or corrugated or otherwise adapted for establishing a positive interconnection with each corresponding male interconnecting means 15.

Still in the context of this embodiment, said female interconnecting member 25 can further comprise a centrally arranged protrusion 253, which is surrounded by said internal circumferential surface 252e and is essentially available in the form of a truncated cone, which converges outwards i.e. opposite to a direction of inserting each corresponding male interconnecting means 15.

Besides, each male interconnecting member 15 (Fig. 3) comprises a radially resilient and essentially cylindrical projection 151, which is insertable into each corresponding male interconnecting means 252 and is moreover furnished with external circumferential surface 152, which is toothed or corrugated or otherwise formed for the purposes of cooperation with the inner circumferential surface 252 of each corresponding female interconnecting member 25 due to establishing a positive interconnection between said internal circumferential surface 252 of the female interconnecting member 25 and the external circumferential surface 152 of the male interconnecting member 15.

Moreover, said male interconnecting member 15 preferably comprises

- a central longitudinal passage 153, which is adapted to cooperate with the protrusion 253 of the female interconnecting member 25, wherein the diameter of said passage 152 is larger than the minimal diameter of the truncated-cone-shaped external surface of said protrusion 253 and smaller than the maximal diameter of the truncated-cone-shaped external surface of said protrusion 253; as well as
- at least two longitudinal weakening recesses 153 for enabling radial resiliency of said projection 151 of the male interconnecting member 15 and expansion of its external circumferential surface 152 for the purposes of engagement with the internal circumferential surface 252 of the female interconnecting member 25, when the projection 253 of the of the female interconnecting member 25 is inserted into said central passage 153 in the projection 151 of the male interconnecting member 15.

In the embodiment, which is shown in Figs. 1 to 5, the male interconnecting members 15 are available on the tub 1, and the female interconnecting members 25 are embedded within the material of the inertia counterweight 2. The tub 1 and the counterweight 2 are separately manufactured and furnished with said male and female interconnected members 15, 25, which are however appropriately arranged on each of them. By assembling of inertia counterweight 2 and the tub 1, the inertia counterweight 2 is positioned with its face 20 towards the face 10 of the tub 1, and the interconnecting members 15, 25 on the tub 1 and the inertia counterweight 2 are coaxially aligned with respect to each other. Upon that, the inertia counterweight is simply pressed towards the tub 1 in the direction of said axis 100, so that each male interconnecting means 15 is inserted into each corresponding female interconnecting means 25. In the preferred embodiment, each protrusion 253 of the female interconnecting member 25 is inserted into each corresponding passage 152 of the projection 151 of each corresponding male interconnecting member 15. Since the external circumferential surface of said protrusion 253 is formed as a truncated cone, and the projection 151 of the male interconnecting member 15 is weakened and radially resilient, the pre-formed external surface 152 of the male interconnecting member 15 is expanded and pressed radially towards the internal circumferential

surface of the female interconnecting member 25, by which the male interconnecting member 15 is firmly and securely arrested within the female interconnecting member 25, and the tub 1 and the inertia counterweight 2 remain firmly and permanently interconnected.

PATENT CLAIMS

1. Washing machine tub and inertia counterweight assembly, comprising
- a hollow essentially cylindrical tub (1) with longitudinal central axis (100), which is elastically suspended within a washing machine body and adapted to receive a basket which is rotatably embedded therein and driven by appropriate motor; and
- at least approximately annular inertia counterweight (2), which is mounted onto said tub (1) and is adapted for compensating dynamic forces and dampening vibrations on said tub (1),

wherein said tub (1) is furnished with a face (10), which is adapted to receive said inertia counterweight (2), and is oriented by means of its longitudinal central axis (100) and optionally consists of appropriately preformed metallic material or of molded or otherwise preformed thermoplastic material on the basis of polymers, and wherein said counterweight (2) preferably consists of reinforced concrete and is furnished with a face (20), which is adapted to be rest on the face (10) of the tub (1), and is moreover adapted to surround at least partially said central axis (100) of the tub (1), **characterized in that**

both the tub (1) and the inertia counterweight (2) are each per se furnished with a plurality of male and female interconnecting members (15, 25), which are arranged on the face (10) of the tub (1) as well as on the face (20) of the inertia counterweight (2), wherein the interconnecting members (15, 25) on the tub (1) are either firmly embedded within said tub (1) or are firmly interconnected therewith, and corresponding interconnecting members (15, 25) on the inertia counterweight (2) are either firmly embedded within said inertia counterweight (2) or are firmly interconnected therewith,

so that, when observed along the central axis (100) of the tub (1), each interconnecting member (15, 25) on the tub (1) is coaxially aligned with each corresponding interconnecting member (15, 25) on the inertia counterweight (2), or vice versa,

and that each male interconnecting member (15) on the tub (1) or on the inertia counterweight (2) is axially insertable into each corresponding female interconnecting member (25) on the tub (1) or on the inertia counterweight (2), or vice versa, and that by inserting each male interconnecting members (15) into each corresponding female interconnecting members (25) a positive interconnection between each pair of mutually arrested male and female interconnection members (15, 25) is established, by which the tub (1) and the counterweight (2) remain permanently interconnected.

2. Assembly according to Claim 1, **characterized in that** the tub (1) is furnished exclusively with male interconnecting members (15) and the inertia counterweight (2) is furnished exclusively with female interconnecting members (25).

3. Assembly according to Claim 1, **characterized in that** the tub (1) is furnished exclusively with female interconnecting members (25) and the inertia counterweight (2) is furnished exclusively with male interconnecting members (15).

4. Assembly according to Claim 1, **characterized in that** the tub (1) is furnished with at least two male interconnecting members (15) and at least two female interconnecting members (25), and that the inertia counterweight (2) is furnished with at least two male interconnecting members (15) and at least two female interconnecting members (25), providing that said male and female interconnecting members (15, 25) on the tub (1) and the inertia counterweight (2) are arranged in such manner that each male interconnecting member (15) on the tub (1) is insertable into a corresponding female interconnecting member (25) on the inertia counterweight (2), or vice versa, that each male interconnecting member (15) on the inertia counterweight (2) is insertable into a corresponding female interconnecting member (25) on the tub (1).

5. Assembly according to anyone of Claims 1 to 4, **characterized in that** each female interconnecting member (25) is formed as appropriately rigid and at least partially hollow essentially cylindrical part and comprises

- an outer circumferential surface (251), which is adapted for anchoring said female interconnecting member (25) within the material of the tub (1) or the inertia counterweight (2), which is appropriate, and is optionally furnished with circumferential ribs (251', 251''); and
- an inner circumferential surface (252), which is toothed or corrugated or otherwise adapted for establishing a positive interconnection with each corresponding male interconnecting means (15).

6. Assembly according to Claim 5, **characterized in that** said female interconnecting member (25) further comprises a centrally arranged protrusion (253), which is surrounded by said internal circumferential surface (252) and is essentially available in the form of a truncated cone, which converges outwards i.e. opposite to a direction of inserting each corresponding male interconnecting means (15).

7. Assembly according to anyone of Claims 1 to 6, **characterized in that** each male interconnecting member (15) comprises a radially resilient and essentially cylindrical projection (151), which is insertable into each corresponding male interconnecting means (252) and is moreover furnished with an external circumferential surface (152), which is toothed or corrugated or otherwise formed for the purposes of cooperation with the internal circumferential surface (252) of each corresponding female interconnecting member (25) due to establishing a positive interconnection between said internal circumferential surface (252) of the female interconnecting member (25) and said external circumferential surface (152) of the male interconnecting member (15).

8. Assembly according to Claims 5 and 7, **characterized in that** said male interconnecting member (15) further comprises

- a central longitudinal passage (153), which is adapted to cooperate with the protrusion (253) of the female interconnecting member (25), wherein the diameter of said passage (152) is larger than the minimal diameter of the truncated-cone-shaped

external surface of said protrusion (253) and smaller than the maximal diameter of the truncated-cone-shaped external surface of said protrusion (253); as well as

- at least two longitudinal weakening recesses (153) for enabling radial resiliency of said projection (151) of the male interconnecting member (15) and expansion of its external circumferential surface (152) for the purposes of engagement with the internal circumferential surface (252) of the female interconnecting member (25) when the protrusion (253) of the female interconnecting member (25) is inserted into said central passage (153) in the projection (151) of the male interconnecting member (15).

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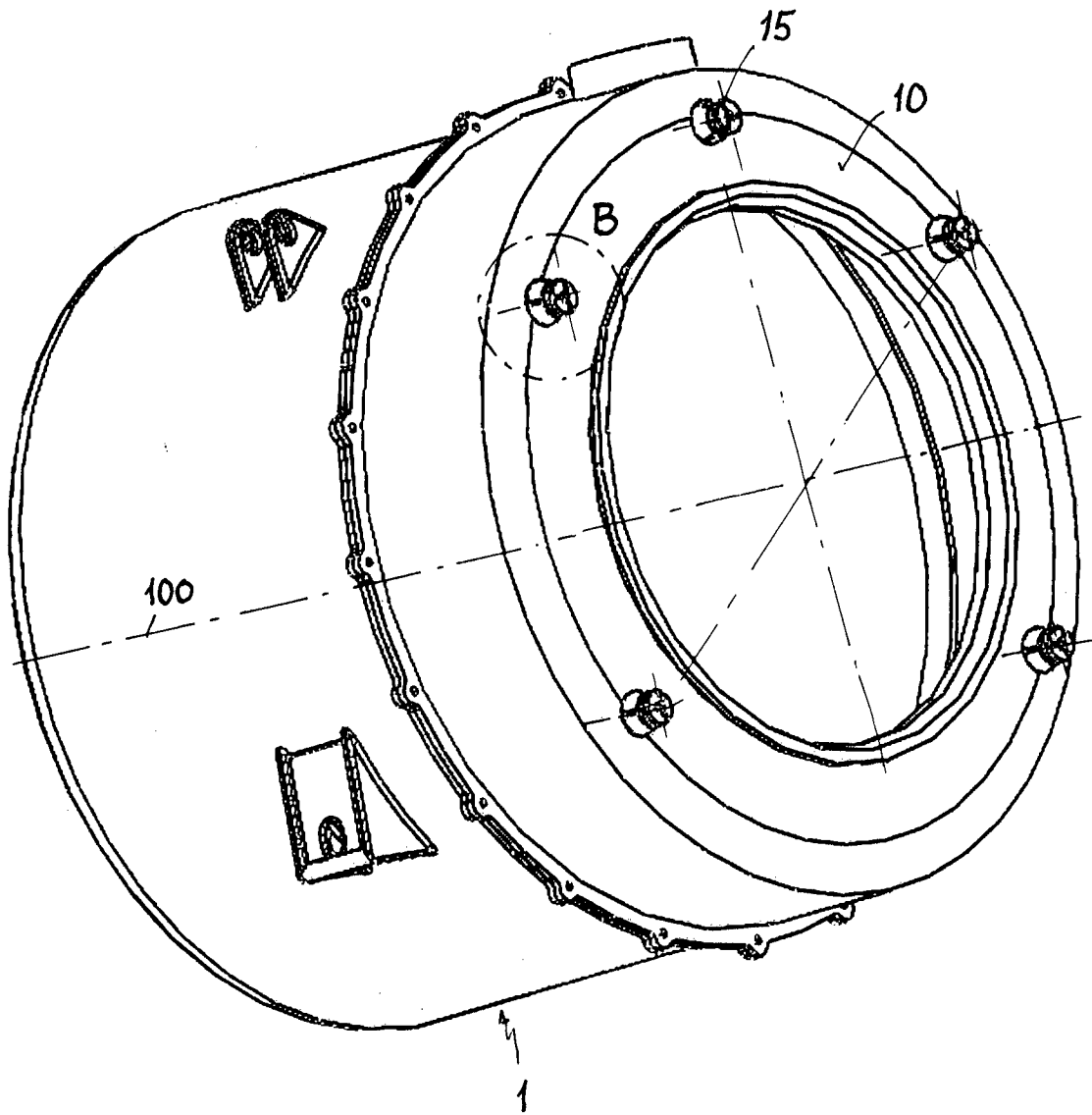


Fig. 1

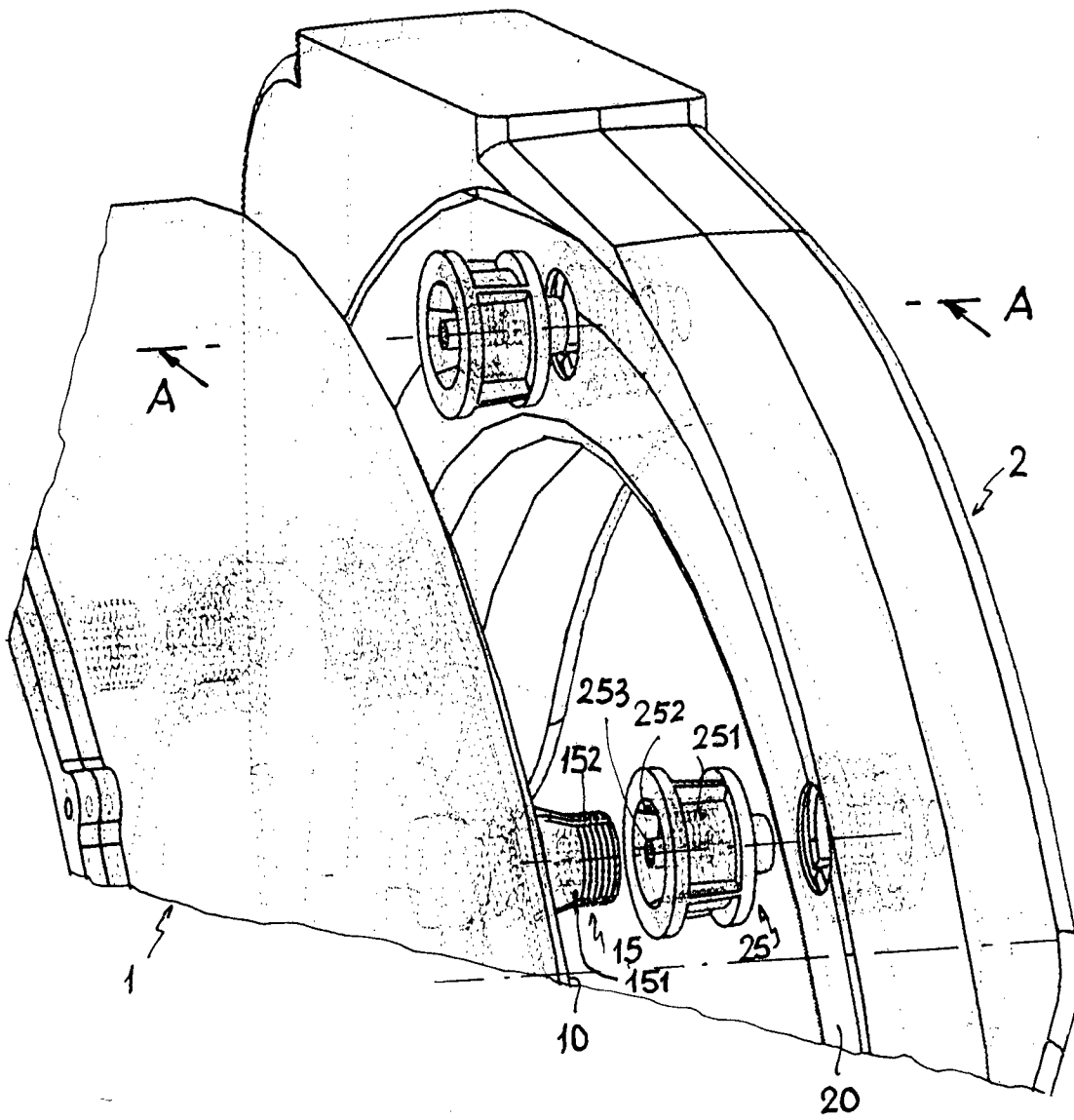


Fig. 2

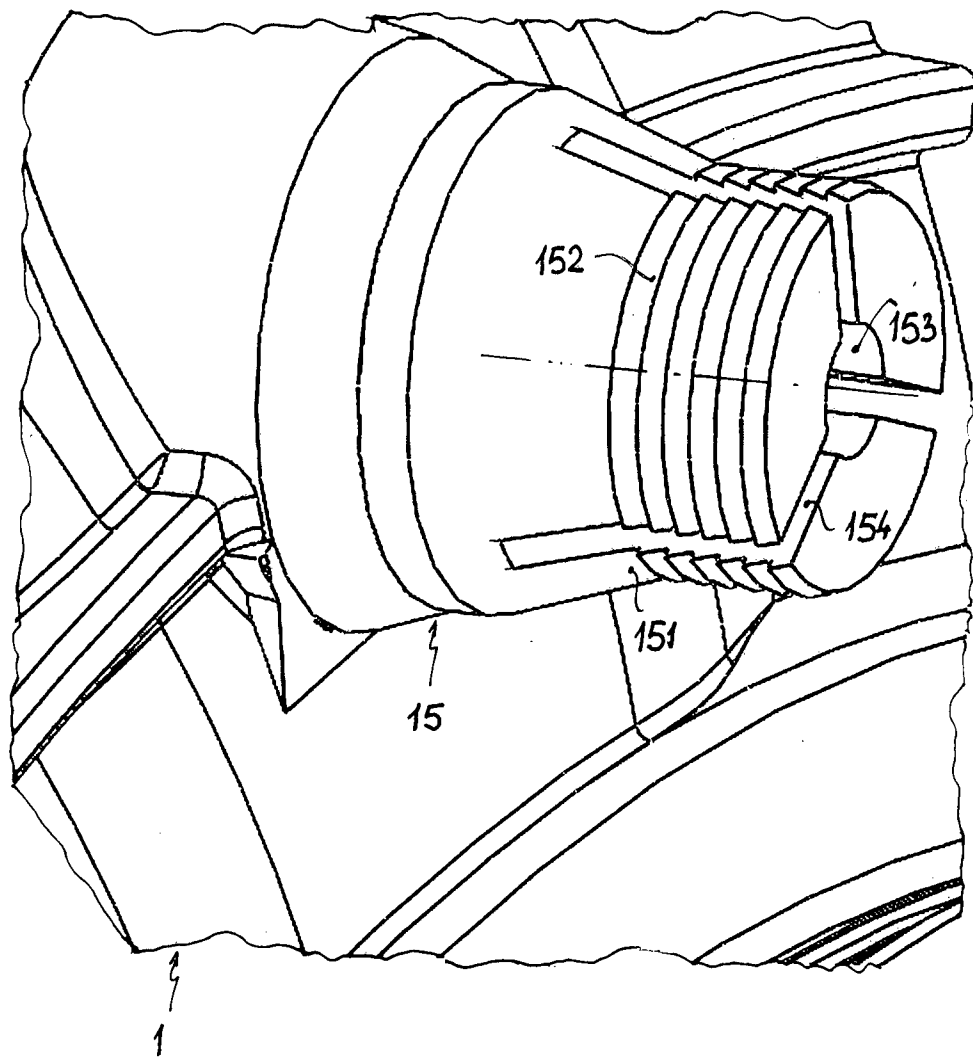


Fig. 3

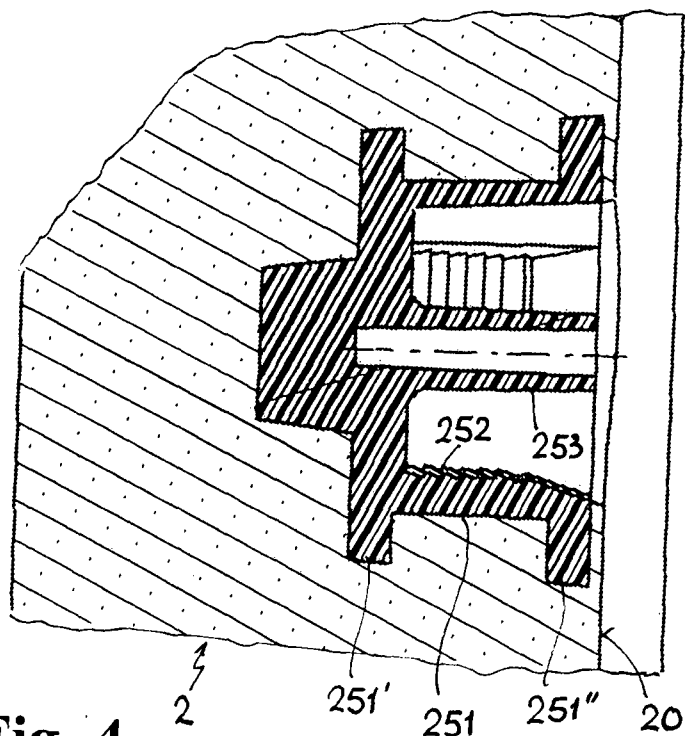


Fig. 4

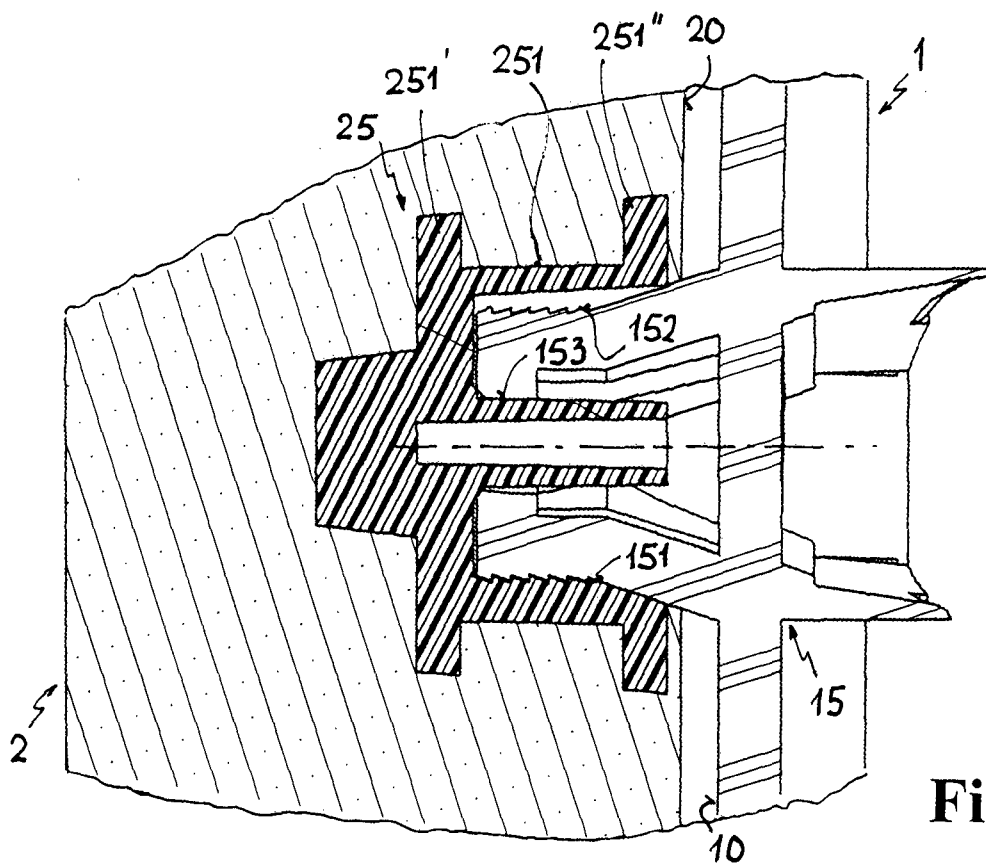


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No PCT/SI2012/000045

A. CLASSIFICATION OF SUBJECT MATTER
 INV. D06F37/26
 ADD.

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 426 477 A2 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 9 June 2004 (2004-06-09) paragraphs [0001] - [0016] claims 1-3; figures 1-2 -----	1-8
Y	WO 2007/104628 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 20 September 2007 (2007-09-20) page 2, lines 31-36 page 7, lines 13-34 page 10, lines 8-19 page 11, lines 7-28 page 13, lines 5-7 figures 1-13 ----- -/--	1-8

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No PCT/SI2012/000045

C(Continuation). 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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INTERNATIONAL SEARCH REPORT

Information on patent family members

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