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(71) Applicant: **Vestel Beyaz Eşya Sanayi Ve Ticaret
A.Ş.**

45030 Manisa (TR)

(72) Inventors:

- **Telci, Yetkin**
35035 Manavkuyu
Izmir (TR)
- **Dereli, Hasan**
35041 Bornova
Izmir (TR)

(74) Representative: **Cayli, Hülya**

Paragon Consultancy Inc.
Koza Sokak No: 60/6
GOP
06700 Ankara (TR)

(54) **Connection mechanism for balance weight**

(57) The present invention relates to fixed-type connection slots (21) and expanding-type connection slots (24) provided on the front side of the tub of a clothes washing machine (or at the section where balance weights are to be fastened) for connecting said tub (20) with the balance weight (30). Both types of connections slots have cylindrical bodies in the form of a projection extending outwardly. There is provided a hole coincident

with the central axis of this cylindrical form and screw-like fixation means are introduced into such hole. A set of connection holes (31) and another set of connection holes (34) are provided on the balance weight (30) so as to coincide with the fixed-type connection slots (21) and the expanding-type connection slots (24), respectively.

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Description

Technical Field

[0001] The present invention relates to strengthening the manner of connecting the balance weight to the tub in washing machines.

Prior Art

[0002] It is known that the washing drum in washing machines exerts different dynamic loads on machine components during the washing and spinning phases, and especially that the centrifugal forces generated at high-speed spinning phases cause machine components to vibrate and to failures based on such vibrations. In addition, high noise levels produced during the machine's operation do disturb the user.

[0003] It is further known in the relevant art that the front tub and the associated front balance weights are frequently affected from the dynamic loads created while the washing machine is in use. The patent application GB2346622 may constitute an example for the researches conducted in this field. In this document, various fixing means are formed on the tub and balance weights in a manner substantially parallel to the axis of rotation of drum and along a circular line defined as the neutral section. In the present invention, it has been claimed that such fixing means reduce the number of components employed in washing machines. It has also been claimed that assembly-related advantages are provided by having the connection of the front balance weight to the tub in a direction that is parallel to the axis of rotation. In the same invention, however, the connection of the front balance weight with the front tub does not ensure long-term resistance against dynamic loads.

Brief Description of Invention

[0004] The present invention relates to strengthening the assembly of the balance weight exposed to various dynamic loads to the tub, by making use of various numbers of expanding-type and fixed-type connection slots together in washing machines. In this invention, it has been envisaged to use expanding-type and fixed-type connection slots together on the same tub and balance weight in order to reduce the slacking problems of connections in high-spin washing machines. As known, the balance weights are exposed to various dynamic loads at working periods with different speeds in time. Thus the use of fixed-type and expanding-type connection slots within the same construction in the connection of balance weight and tub provides resistance against dynamic loads.

[0005] The balance weights are exposed to variable dynamic loads which are axial (coincide with or parallel to the drum's axis of rotation) and radial (perpendicular to the drum's axis of rotation) with respect to the drum.

Such forces increase as the machine's spin rate is raised. Special connection types are developed for this reason. Expanding-type slots have the feature of becoming radially-expanded to a certain degree, when screw-like fixation means are introduced into themselves. This expansion creates a throughout force on the lateral surfaces of the connection slot, the inner surfaces of holes in the balance weight, so that the slot's radial movement with respect to the hole is restricted. In this connection method, however, the resistance against axial forces is relatively lower. The connection manner formed against axial forces corresponds to the type of connection that is called the "fixed" type. In this connection type, a screw introduced into a slot fixes the balance weight and tub on the axial direction. As for the radial direction, there is left a certain space between the connection slot and the hole in which the slot exists. Therefore the fixed-type connection slot provides a relatively smaller resistance against radial loads. In the present invention, both expanding-type and fixed-type connection slots are employed in connection points of the tub and balance weights to increase the resistance against both radial and axial loads.

The Aims of Invention

[0006] Washing machines are exposed to several dynamic loads, with respect to both the operation principle and construction. Balance weights are assembled to the tub for maintaining the machine's balance during operation. In high-spin machines, balance weights become exposed to radial (or lateral) and axial loads on the connection points with tubs in long term, due to dynamic loads created during operation. Accordingly, the aim of the present invention is to provide a reliable and sound connection and to avoid any such loosening problems of such connections in long term for high-spin washing machines. For this reason, it is hereby aimed to make use of expanding-type and fixed-type connection slots together in connection points of the tub and balance weights, in order to increase the resistance against both radial and axial loads in washing machines.

Description of Figures

[0007] Exemplary embodiments of the subject balance weight connection system are illustrated in annexed figures as described below in brief.

Figure 1 is a general view of the internal structure of a washing machine.

Figure 2 is a front view of the tub.

Figure 3 is a front view of the balance weight.

Figure 4 is a cross-sectional view of the expanding-type connection slot prior to assembly.

Figure 5 is a cross-sectional view of the expanding-type connection slot after assembly.

Figure 6 is a cross-sectional view of the fixed-type connection slot prior to assembly.

Figure 7 is a cross-sectional view of the fixed-type connection slot after assembly.

Figure 8 is a perspective view of the tub and balance weight prior to assembly.

Figure 9 provides top and side cross-sectional views of the expanding-type connection slot.

Figure 10 provides top and side cross-sectional views of the fixed-type connection slot.

[0008] The parts in the said figures are individually enumerated as following:

Tub (20)

Fixed-type connection slot (21)

Spacer (22)

Connection means (23)

Expanding-type connection slot (24)

Spacer (25)

Connection means (26)

Cleavage (27)

Hole (28)

Hole (29)

Balance weight (30)

Connection hole (31)

Connection hole (34)

noise in the machine. Therefore, it becomes necessary to support the tub by means of various balance weights. In this case, however, the connection manner of the tub and balance weights becomes crucial. In the present invention, it is aimed to embody the connection system between the tub (20) and balance weight (30) so as to resist against both radial and axial loads.

[0010] Figure 2 is a front view of the tub. As shown in this illustrative figure, the fixed-type connection slots (21) and the expanding-type connection slots (24) are provided on the front side of the tub (or at the section where the balance weights are to be fastened). Both types of connections slots have cylindrical bodies in the form of a projection extending outwardly. There is provided a hole coincident with the central axis of this cylindrical form and screw-like fixation means are introduced into such hole. In Figure 3, a front view of an exemplary balance weight (30) is given. A set of connection holes (31) and another set of connection holes (34) are provided on the balance weight (30) so as to coincide with the fixed-type connection slots (21) and the expanding-type connection slots (24), respectively. With respect to the assembled form of the tub (20) and balance weight (30), each fixed-type connection slot (21) and each expanding-type connection slot (24) become introduced into respective connection holes (31 and 34).

[0011] Figures 4 and 5 are cross-sectional views of the expanding-type connection slot (24) prior to and after assembly, respectively. As indicated above, the expanding-type connection slot (24) has a cylindrical form extending out of the tub (20), whereas a screw-like fixation means (26) is introduced into a hole (28) that is coincident with the central axis of this cylindrical formation. On this connection slot (24) is provided at least one cleavage (27) (illustrated in Figure 9) which starts from the said connection hole (28) and extends up to the exterior of the slot. The diameter of connection means (26) employed in the expanding-type connection slot (24) is somewhat larger than the diameter of the said hole (28). Therefore, while the connection means (26) is assembled to this hole (28), the cleavage (27) on the slot (24) allows the latter (24) to expand laterally (i.e. to enlarge its outer diameter). Because of this expansion, the external surface of the slot (24) leans against the internal surface of the connection hole (34) of the balance weight, in which it (24) exists. Thus, the connection slot (24) on the tub becomes centered with the connection hole (34) on the balance weight. In this connection manner, the lateral (or radial) movement of the slot (24) within the hole (34) is avoided. Thanks to this feature, the loads arising from the drum's rotation are prevented from moving the tub on the lateral direction. This connection type, however, is not resistant against the loads exerted on the axial direction (on the direction of the slot's central axis). Although the spacer (25) shown in figures 4 and 5 avoids the tub's (20) axial movement to a certain degree with respect to the balance weight (30) by becoming tightened on the slot's (24) outer surface, on the surface it settles

Disclosure of Invention

[0009] Figure 1 is a general view of the interior of a washing machine. The tub (20) and balance weight (30) connection system according to the present invention is shown in an assembled form and in a disassembled form in figures 1 and 8, respectively. As is known, the washing drum rotating within the tub in high spin rates exerts dynamic loads on the tub in varying directions and magnitudes. So the tub must be properly fixed in order to prevent these loads from causing excessive vibration and

on the balance weight (30), it does not provide a tight connection in this direction. For this reason, another type of connection becomes necessary for providing axial resistance for the tub's (20) connection with the balance weight (30).

[0012] Figures 6 and 7 are cross-sectional views of the fixed-type connection slot (21) prior to and after assembly, respectively. As indicated above, the fixed-type connection slot (21) has a cylindrical form extending out of the tub (20), whereas a screw-like fixation means (23) is introduced into a hole (29) that is coincident with the central axis of this cylindrical formation. This connection slot (21) is embodied so that no expansion or enlargement can occur. For this reason, once the connection means (23) are attached to the hole (20) on the slot (21) (illustrated in Figure 7), they avoid the axial movement rather than the lateral movement- of the slot (21) with respect to the connection hole (31). In this connection manner, the connection means (23) exerts an axial force to the balance weight (30) by pulling the slot (21) towards itself. Thanks to this feature, the loads arising from the drum's rotation are prevented from moving the tub (20) on the axial direction with respect to the balance weight (30). A spacer (22) can also be used in this connection manner so as to become tightened between the connection element (23) and the balance weight (30). In the connection system disclosed according to the present invention, lateral and axial movements of the tub (20) with respect to the balance weight are avoided during the drum's rotation, by using at least one fixed-type connection slot (21), together with at least one expanding-type connection slot (24) on the tub (20).

Claims

1. A connection system of and between the tub (20) and the balance weight (30) in washing machines, said system being **characterized by** comprising at least one expanding-type connection slot (24) for avoiding the tub's (20) lateral displacement with respect to the balance weight (30) and at least one fixed-type connection slot (21) for avoiding the tub's (20) axial displacement with respect to the balance weight (30), so that both slots (24, 21) are provided on the tub (20) section where the balance weight (30) is to be fastened; said expanding-type connection slot (24) having a cylindrical form and a hole (28) on its central axis to introduce a connection or fixation means (26) therein, and comprising at least one cleavage (27) on itself starting from said hole (28) and extending outwardly in order to increase its (24) external diameter while said connection means (26) is assembled into said hole (28); and said fixed-type connection slot (21) having a cylindrical form and a hole (29) on its central axis to introduce a fixation or connection means (23) therein.

2. A connection system according to Claim 1, **characterized in that** each fixed-type connection slot (21) becomes introduced into a connection hole (31) on the balance weight (30), when the tub (20) and balance weight (30) are in their assembled form.
3. A connection system according to Claim 1, **characterized in that** each expanding-type connection slot (24) becomes introduced into a connection hole (34) on the balance weight (30), when the tub (20) and balance weight (30) are in their assembled form.
4. A connection system according to Claim 2, **characterized in that** said connection means (23) is structured so as to puii onto itself said slot (21), to exert an axial force on the balance weight (30) in the fixed-type connection slot (21).
5. A connection system according to Claim 3, **characterized in that** said connection means (26) is structured so as to expand said slot (24) outwardly, in order to have the slot (24) lean upon the connection hole (34) and exert a lateral force on the balance weight (30) in the expanded-type connection slot (24).

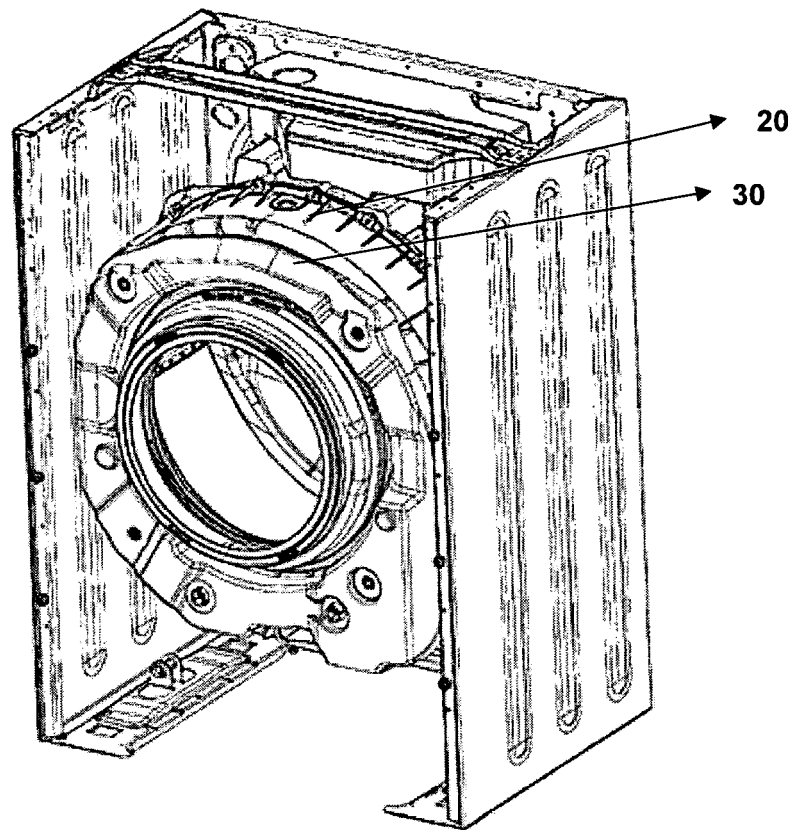


Figure – 1

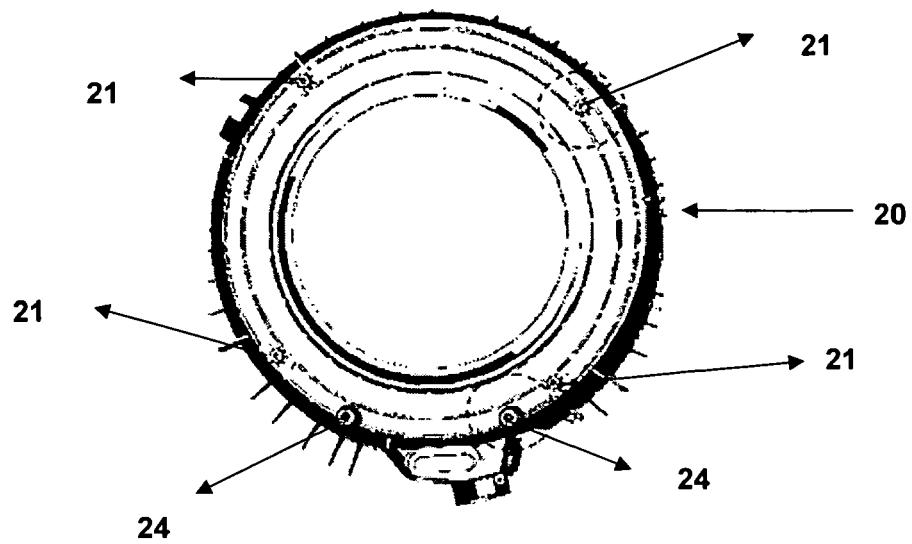


Figure - 2

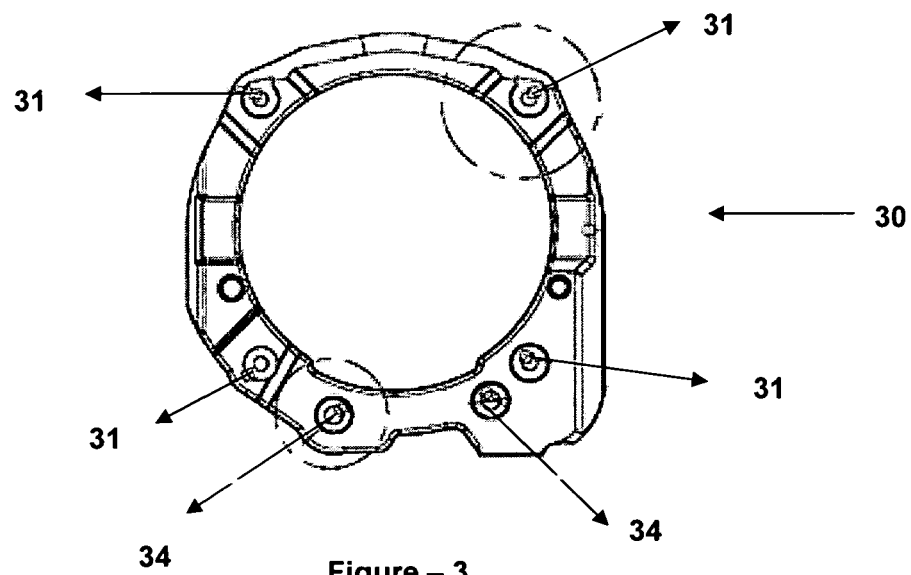


Figure - 3

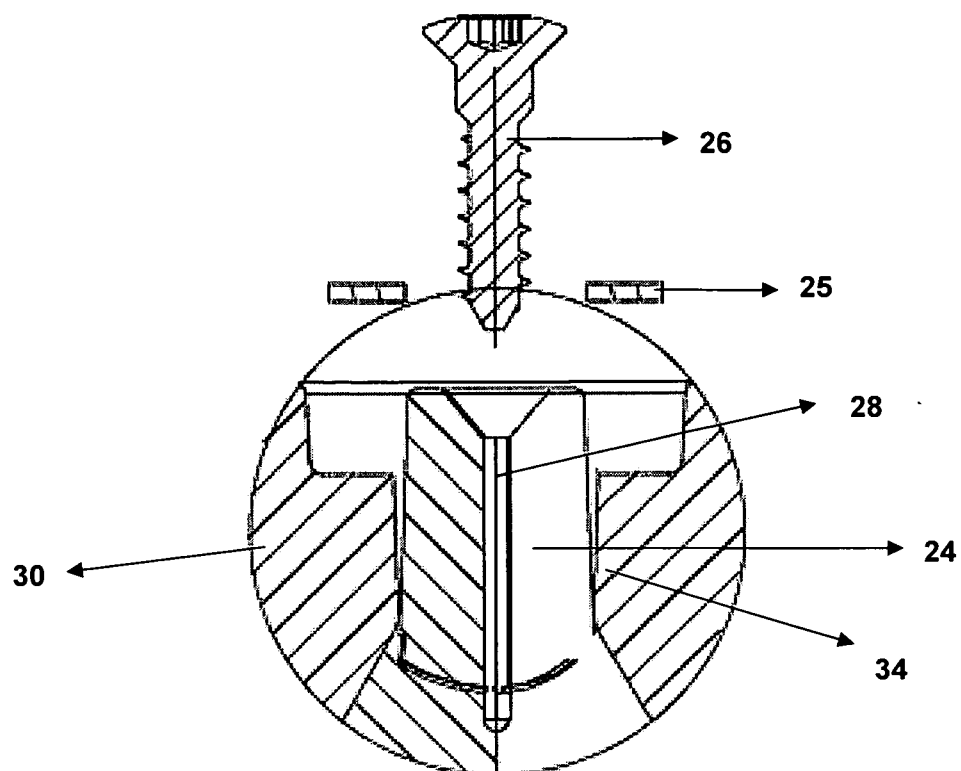


Figure - 4

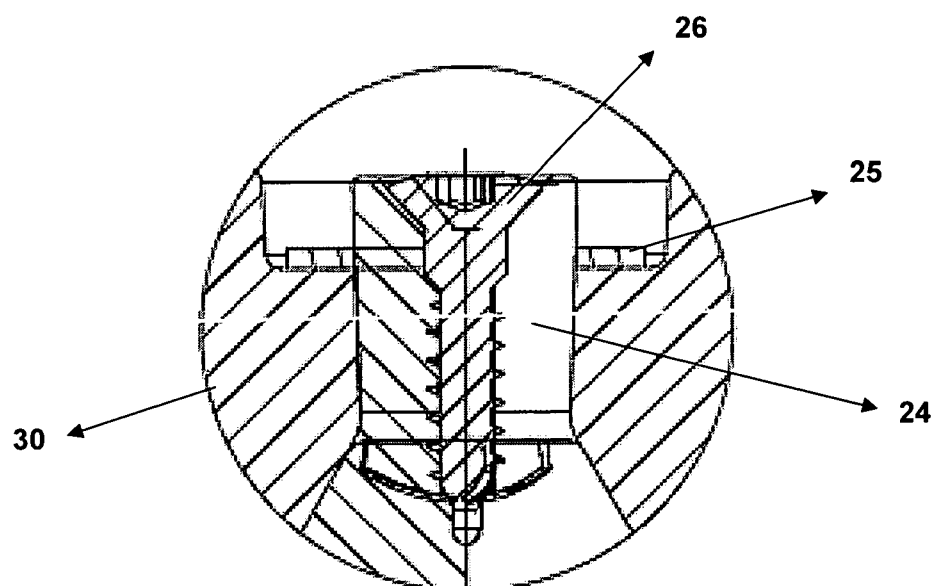


Figure - 5

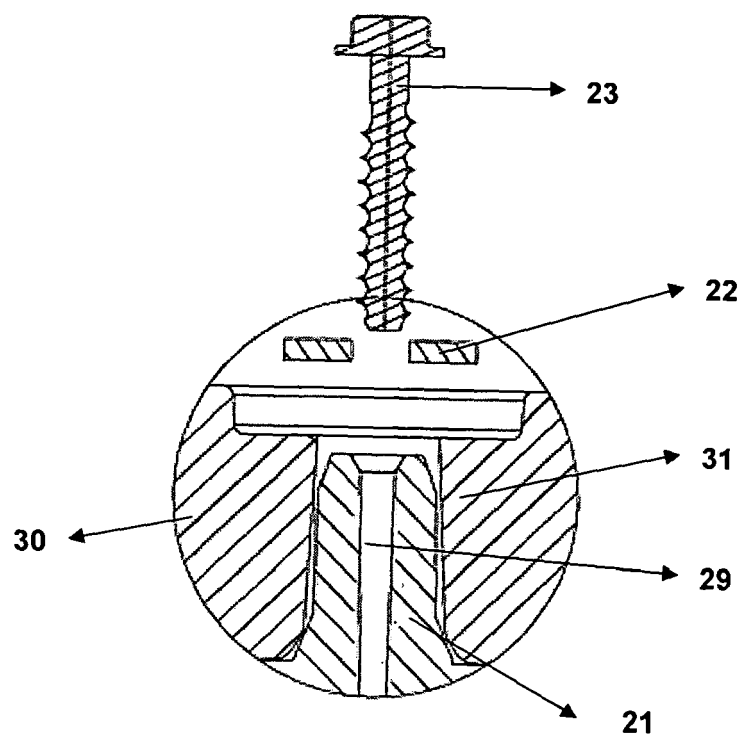


Figure - 6

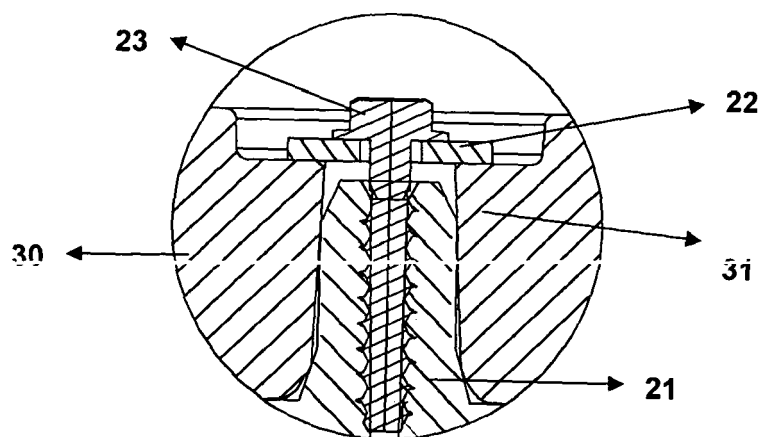


Figure - 7

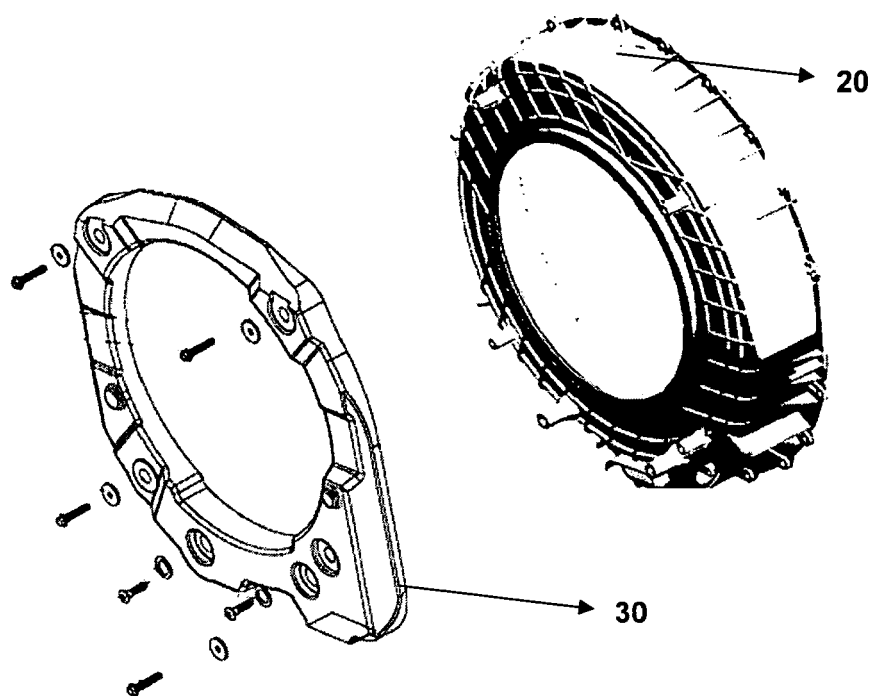


Figure – 8

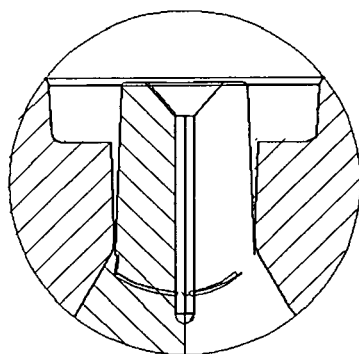
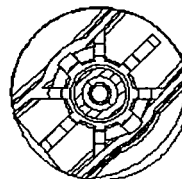
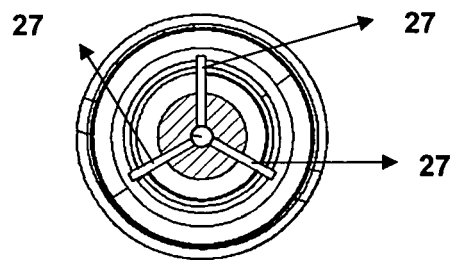


Figure – 9

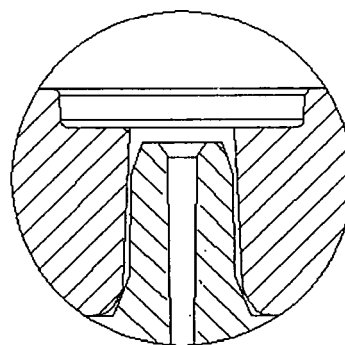


Figure – 10

REFERENCES CITED IN THE DESCRIPTION

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