



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**02.02.2011 Bulletin 2011/05**

(51) Int Cl.:  
**D06F 39/10 (2006.01)**

(21) Application number: **09009687.6**

(22) Date of filing: **27.07.2009**

(84) Designated Contracting States:  
**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 SE SI SK SM TR**  
 Designated Extension States:  
**AL BA RS**

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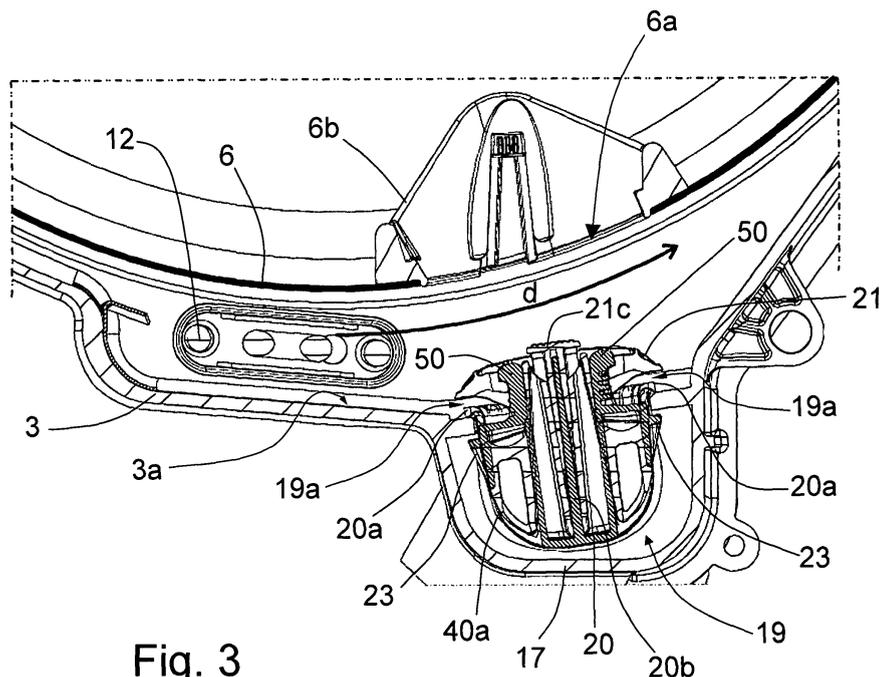
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(54) **Laundry washing machine and filtering assembly for the draining circuit of a laundry washing machine**

(57) A Laundry washing machine (1) comprising a washing tub (3) containing a drum (6), a draining circuit, for draining washing/rinsing liquid out of the washing tub (3), comprising a draining sump (17) provided at the bottom of said washing tub (3) for collecting the washing/rinsing liquid, a filtering assembly (19) positioned into the draining sump (17); the filtering assembly (19) comprises a closed hollow container (19), structured to be openable by a user, provided with a plurality of apertures or holes (30) adapted to allow the free passage of the washing/

rinsing liquid and to impede the passage of coins, rings, buttons and similar small objects, the closed hollow container (19) being provided with one or more transversal slots (19a) dimensioned for permitting the entrance of coins, buttons, rings, and similar small objects into the closed hollow container (19), and being associated into the draining sump (17) so that the one or more transversal slots (19a) are substantially perpendicular to the traveling direction (d) of the overhanging portion of the peripheral wall of the drum (6).



**Fig. 3**

## Description

**[0001]** The present invention relates to a laundry washing machine and to a filtering assembly for the draining circuit of a laundry washing machine.

**[0002]** It is underlined that in the present application the expression "washing machine" may as well indicate both a "simple" washing machine (i.e. a washing machine which can only wash and rinse the laundry) and a washing-drying machine (i.e. a washing machine which can also dry the laundry).

**[0003]** Moreover, even if in the following the present invention will be described, purely by way of example, in relation to a front-loading laundry washing machine, it is clear that the present invention may be applied, substantially without any crucial modification, to a top-loading washing machine.

**[0004]** As is known, front-loading laundry washing machines generally comprise a substantially parallelepiped-shaped outer box casing structured for resting on the floor; a substantially bell-shaped washing tub which is suspended in floating manner inside the casing by means of a number of coil springs and shock-absorbers, directly facing a laundry loading and unloading opening realized in the front face of the casing; a door hinged to the front face of the casing to rotate to and from a closing position in which the door closes the opening in the front face of the casing to seal the washing tub; a substantially bell-shaped cylindrical rotatable drum for housing the laundry to be washed, and which is housed substantially horizontally inside the washing tub to rotate about its longitudinal axis; and an electric motor assembly for rotating the drum about its longitudinal axis inside the washing tub.

**[0005]** Laundry washing machines of the above type are also provided with a draining circuit adapted to drain the washing/rinsing liquid (i.e. water or water mixed with washing and/or rinsing products) from the bottom of the tub, particularly after the washing and rinsing phases, and to release it into a waste-water exhaust duct located outside of the washing machine casing.

**[0006]** In some known washing machines the draining circuit comprises a draining sump obtained in the lower region of the lateral surface of the tub and fluidly communicating with the internal of the latter, so as to collect the washing/rinsing liquid present in the bottom of the tub; the draining sump fluidly communicates also with a draining pump, fluidly connected with one or more draining pipes adapted to drain to the waste-water exhaust duct the washing/rinsing liquid collected into the draining sump and sucked by the draining pump.

**[0007]** Sometimes the draining circuit is also provided with a recirculation circuit, adapted to drain the washing/rinsing liquid from the bottom of the tub and to re-admit such liquid into an upper region of the tub, for improving the wetting of the laundry.

**[0008]** In addition to the above, the draining circuit of these known washing machines also comprises a filtering assembly which is generally located into the draining

sump, between the bottom of the tub and the drain pump.

**[0009]** This filtering assembly comprises a cup-shaped basket, having perforated walls, which is snap-fitted in a stable, but easy removable manner into the draining sump; the cup-shaped basket collects and retains lint, fluff, and all undesirable bodies (for example, buttons came off from the laundry, coins or rings erroneously introduced into the washing machine, etc.) passed through the holes located on the periphery of the washing drum, or fell to the bottom of the tub by passing between the drum and the tub, which could damage or obstruct the draining pump.

**[0010]** In these known washing machines a user may reach the filtering assembly, for example for its removal and/or cleaning, directly from the internal of the drum, typically via a suitable opening, obtained in the lateral surface of the drum, which is closable by a removable lifter (i.e. an element fixed to the inner lateral surface of the drum adapted to improve the stirring of the laundry during the rotation of the latter) or by another suitable lid associated to the inner lateral surface of the drum.

**[0011]** For example EP 1 849 904 discloses a top-loading washing machine comprising a draining filter access apparatus integrated in a lifter diametrically opposite to the drum access door (i.e. to the internal lid allowing the access to the drum). The draining filter access apparatus comprises a body, including an opening aligned with an opening of the same shape and dimensions made in the body of the drum, and a lid, hinged to the body and locking on the body by a simple ratchet mechanism.

**[0012]** The major drawback of this type of known filtering assembly is that, particularly during the spinning phase, coins, rings, buttons and similar small objects start hopping around inside the cup-shaped basket due to the hard mechanical vibrations of the washing tub, and may jump out of the cup-shaped body. If magnitude of vibrations is enough strong, the objects jumping out of the cup-shaped body may also reach the peripheral wall of the drum and, if drum is rotating at high speed, these objects may be shot by the drum against the washing tub at very high speed. Particularly in case of coins, rings and other metal objects, the consequent heavy impact against the washing tub is extremely noisy and it may also damage the washing tub and create leaks. This drawback is particular important in the case of a top-loading washing machine, in which the upper region of the lateral and substantially cylindrical surface of the washing tub is provided with an opening for the loading/unloading of the laundry, which is closed by a suitable porthole, in proximity of which there is sometimes positioned a detergent dispensing device; in this case coins, rings and other metal objects which are "shot" by the rotation of the drum may impact against the porthole and/or the dispensing device, with the risk of damage the latter.

**[0013]** These filtering assembly have moreover another drawback; in fact the achieving of the correct fixation of the filtering assembly into the draining sump is quite difficult, in particular because it requires to push the fil-

tering assembly towards the bottom of the draining sump with a power sufficient to cause the snap-fitting of the filtering assembly in the draining sump, and this is not very easy, in particular because of the particular shape of the cup-shaped basket which doesn't provide the user with a stable support for pushing.

**[0014]** It is the aim of the present invention to provide a washing machine provided with a filtering assembly adapted to collect and retain coins, rings, buttons and similar small objects present in the washing tub, avoiding that such objects would jump out of filtering assembling, particularly during the rotation of the drum.

**[0015]** Within this aim, another object of the invention is to allow a user to easily remove coins, rings, buttons and similar small objects from the internal of the filtering assembly.

**[0016]** Another object of the present invention is to facilitate the correct insertion and fixation of the filtering assembly into the draining sump of a washing machine.

**[0017]** According to the present invention, there is provided a laundry washing machine as claimed in Claim 1 and preferably, though not necessarily, in any one of the dependent claims.

**[0018]** Moreover, according to the present invention, there is provided a filtering assembly as claimed in Claim 11 and preferably, though not necessarily, in any one of the dependent claims.

**[0019]** A non-limiting embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figure 1 shows a schematic lateral view, with parts in section and parts removed for clarity, of a front-loading laundry washing machine realized in accordance with the teachings of the present invention;
- Figure 2 shows a front view of the washing group of the Figure 1 laundry washing machine, with parts in section and parts removed for clarity;
- Figure 3 is an enlarged view of the bottom portion of the Figure 2 washing group;
- Figure 4 shows an isometric view, with parts in section and parts removed for clarity, of the washing group of a washing machine according to the invention;
- Figure 5 shows a first isometric view of the filtering assembly disclosed in Figures 1-4, in a closing configuration;
- Figure 6 shows a second isometric view of the filtering assembly of Figure 5, in an opened configuration;
- Figures 7 and 8 show two isometric views of a further embodiment of a filtering assembly according to the invention.

**[0020]** It is underlined that in the following the present invention is described with reference to a front-loading washing machine, but that the present invention may be as well applied to a top-loading washing machine, substantially without any crucial modification.

**[0021]** With reference to Figure 1, number 1 indicates as a whole a laundry washing machine which comprises: a preferably, though not necessarily, parallelepiped-shaped outer box casing 2 structured for resting on the floor; a substantially bell-shaped washing tub 3 suspended in floating manner inside casing 2, advantageously via a suspension system comprising a number of coil springs 4 (only one shown in Figure 1) preferably, though not necessarily, combined with one or more vibration dampers 5 (only one shown in Figure 1); a substantially bell-shaped cylindrical rotatable drum 6 for housing the laundry to be washed, and which is fixed in axially rotating manner inside washing tub 3 for rotating about its longitudinal axis L; and an electric motor 7 for rotating, on command, drum 6 about its longitudinal axis "L" inside washing tub 3. The electric motor 7 may be connected to the drum 6 via a suitable belt pulley, as illustrated in Figure 1, or it may be also directly mounted on the drum 6 (or on a rotating shaft associated to the drum 6).

**[0022]** More specifically, drum 6 is housed into washing tub 3 so that its longitudinal axis "L" is oriented substantially horizontally, and approximately coincides with the longitudinal axis of washing tub 3. Together with washing tub 3, drum 6 forms the washing group of the washing machine. In a further embodiment, not illustrated, the longitudinal axis "L" of the drum 6, and also the approximately coinciding longitudinal axis of the washing tub 3, may be also inclined.

**[0023]** With reference to Figure 1, in the example shown the laundry washing machine 1 is a front-loading washing machine, and therefore washing tub 3 is suspended substantially horizontally inside casing 2, with the front opening of washing tub 3 directly faced to a laundry loading and unloading opening formed in the front face 2a of casing 2. The laundry washing machine 1 is provided with a cylindrical elastic-deformable bellows 8 which connects the front opening of washing tub 3 to the laundry loading and unloading opening formed in the front face 2a of casing 2.

**[0024]** Laundry washing machine 1 also comprises a porthole door 9 which is hinged to front face 2a of casing 2 to rotate to and from a closing position in which porthole door 9 closes the laundry loading and unloading opening in front face 2a to watertight seal the washing tub 3.

**[0025]** With reference to Figures 1, laundry washing machine 1 is also provided with a washing/rinsing liquid (i.e. water or water mixed with washing and/or rinsing products) supply circuit 10 for supplying, on command, a given amount of washing/rinsing liquid into washing tub 3.

**[0026]** The washing/rinsing liquid supply circuit 10 advantageously comprises a detergent drawer 13, fluidly connected to the washing tub 3, which is removably housed inside a seat provided on the front face 2a of casing 2, and which has at least one compartment for a given amount of a washing and/or rinsing product (for example a detergent and/or a softener) for use in the washing cycle. The washing/rinsing liquid supply circuit

10 also comprises one or more pipes or ducts 10a adapted for feeding, on command, a given amount of tap water into the compartments of drawer 13, so as to flush the washing and/or rinsing products out of the compartments and down into the washing tub 3.

**[0027]** Laundry washing machine 1 also comprises a draining circuit 11 adapted to drain, after the washing and the rinsing phases, the washing/rinsing liquid accumulated on the bottom of washing tub 3 into a waste-water exhaust duct (non shown) located outside of the casing 2.

**[0028]** Advantageously the draining circuit comprises a draining sump 17 associated to the bottom of the washing tub 3, and fluidly communicating with the internal of the latter, so as to collect the washing/rinsing liquid present at the bottom of the washing tub 3.

**[0029]** Preferably the draining sump 17 is obtained in single-body construction with the washing tub 3.

**[0030]** Opportunely the draining circuit comprises a draining pump 18, fluidly connected to the draining sump 17, which impeller chamber 18a is preferably, but not necessarily, obtained in a single-piece construction with the draining sump 17 and with the washing tub 3, preferably in correspondence to an extension of the draining sump 17. In a further embodiment, not illustrated, the draining pump 18 is housed preferably into a suitable housing, not illustrated, obtained preferably, but not necessarily, in an extension of the draining sump 17, preferably in a single-piece construction with the latter.

**[0031]** The draining pump 18 is also fluidly connected to a draining pipe 16 which fluidly connects the outlet of the draining pump 18 to the waste-water exhaust duct (not shown) located outside of casing 2.

**[0032]** Therefore the washing/rinsing liquid, sucked by the draining pump 18, exits the washing tub 3 via the draining sump 17, goes through the draining pump 18, and exits to the waste-water exhaust duct via the draining pipe 16.

**[0033]** Opportunely, but not necessarily, the draining circuit may be also provided with a recirculation circuit, adapted to drain the washing/rinsing liquid from the bottom of the washing tub 3 and to re-admit such liquid into an upper or central region of the washing tub 3 or directly into the drum 6, for improving the wetting of the laundry.

**[0034]** In the embodiment illustrated in Figure 1, the recirculation circuit comprises a recirculating pipe 15 which connects, preferably via a tree-way valve 14, the draining pump 18 to the drum 6 (but clearly the recirculating pipe may connect the draining pump 18 to an upper portion of washing tub 3), so that the draining pump 18 (depending on the status of the three-way valve 14) may re-admit into a central region of the drum 6 (or in an upper or central region of the washing tub 3) the washing/rinsing liquid exiting the washing tub 3 via the draining sump 17.

**[0035]** In a further embodiment, not illustrated, the recirculation circuit comprises a dedicated recirculation pump, also not illustrated, fluidly connected downstream of the draining sump 17 and housed preferably into a

suitable further housing obtained preferably in a further extension of the draining sump 17; the recirculation pump is in this case fluidly connected to a recirculating pipe 15 which connects the recirculation pump to the upper portion of washing tub 3 (or directly to drum 6). Preferably the further housing is obtained in a single-piece construction with the draining sump 17 and with the washing tub 3. In a further embodiment the impeller chamber of the recirculation pump may be obtained in a single-piece construction with the draining sump 17 and with the washing tub 3.

**[0036]** The recirculation pump sucks the washing/rinsing liquid from the bottom of the washing tub 3 via the draining sump 17, and re-admits such liquid into an upper or central region of the washing tub 3 or drum 6 via the recirculating pipe 15.

**[0037]** Clearly the recirculation circuit may be also not provided.

**[0038]** It is however underlined that in all the embodiments described above, washing/rinsing liquid may exit the washing tub only via the draining sump 17.

**[0039]** Laundry washing machine 1 also comprises an electrically operated heater 12, namely a resistor, which is located on the bottom of washing tub 3, preferably, thought not necessarily, into an outwards-projecting recessed seat 3a realized on the bottom of washing tub 3, and is structured for rapidly heating the washing/ rinsing liquid accumulated on the bottom of washing tub 3.

**[0040]** Casing 2, washing tub 3, the suspension system, drum 6, electric motor assembly 7, bellows 8, port-hole door 9, the washing/rinsing liquid supply circuit 10 and the heater 12 are commonly know parts in the washing machine technical field, and therefore not described in detail.

**[0041]** With reference to Figures 1, 2, 3 and 4, the draining circuit 11 is provided with a washing/ rinsing liquid filtering assembly 19 which is housed, preferably, but not necessarily in a removable way, into the draining sump 17, upstream of draining pump 18 (and therefore also upstream of the further recirculation pump if the latter is provided), and is structured for allowing the free passage of the washing/rinsing liquid, and for holding fluff, lint and all the other undesirable bodies (for example, buttons came off from the laundry, coins or rings erroneously introduced into the washing machine, etc.) present in the washing/ rinsing liquid.

**[0042]** This filtering assembly 19 is arranged in such a way that it completely obstructs the draining sump 17, and therefore the washing/rinsing liquid has to pass necessarily through this filtering assembly 19 before exiting the washing tub 3 via the draining sump 17 and going to the draining circuit and/or to the recirculation circuit (clearly if the latter is provided); fluff, lint, conins, buttons, rings, and all the other undesirable bodies contained in the washing/rinsing liquid are therefore trapped by the filtering assembly 19 before exiting the draining sump 17.

**[0043]** The removal of the filtering assembly 19 from the working position in which the filtering assembly 19 is

housed into the draining sump 17 can be performed manually by the user, directly from the internal of the drum 6, through an opening 6a provided on the peripheral wall of drum 6; this opening 6a may be closed, for example, by a lifter or elevator 6b, removably associated to the peripheral wall of drum 6 and adapted to improve the stirring of the laundry during the rotation of the drum 6. In a further embodiment, not illustrated, the opening 6a may be removably closed by a dedicated lid, not illustrated.

**[0044]** With reference to Figures 3, 4, 5 and 6, differently from known laundry washing machines, however, the filtering assembly 19 comprises a closed hollow container 19, at least part of which external surface comprises a plurality of apertures or holes 30 adapted to allow the free passage of the washing/rinsing liquid, and to impede the passage of fluff, lint and other undesirable bodies (i.e. buttons, coins, rings, etc.) present in the washing/rinsing liquid.

**[0045]** As will be better explained in the following, the closed hollow container 19 is structured for being openable by a user, in order to allow a user to accede to its internal, for example for removing lint, fluff, coins, buttons, rings, or other undesirable bodies therein accumulated.

**[0046]** The closed hollow container 19 is provided with one or more transversal long and narrow slots 19a dimensioned for permitting the entrance of coins, rings, buttons and similar small objects into the container (clearly also washing/rinsing liquid and fluff or lint may enter the closed hollow container 19 via the one or more slots 19a); advantageously the closed hollow container 19 is arranged in such a way that when it is correctly positioned into the draining sump 17, in an operative position, illustrated in Figure 4, the one or more slots 19a are located inside the washing tub 3, and extends locally substantially tangent to the bottom surface of washing tub 3. In other words, when the closed hollow container 19 is inserted into the draining sump 17, the one or more slots 19a are substantially flush with the bottom surface of the washing tub 3; this, how will be better explained in the following, allows the entrance into the closed hollow container 19, through the one or more slots 19a, of coins, rings, buttons and similar objects laying on the bottom surface of the washing tub 3.

**[0047]** In addition to the above, closed hollow container 19 is fitted into draining sump 17 so that at least part of the one or more transversal slots 19a is oriented locally substantially perpendicular to the travelling direction, illustrated with an arrow indicated with letter "d" in Figure 3, of the overhanging portion of peripheral wall of drum 6, so that coins, rings, buttons and similar small objects that reach the bottom of the washing tub 3 are swept away into slots 19a of the closed hollow container 19 by the washing/rinsing liquid which moves more or less tangentially to the bottom of washing tub 3 when drum 6 rotates about its longitudinal axis L. The travelling direction "d" of the overhanging portion of peripheral wall of

drum 6 is, obviously, perpendicular to longitudinal axis "L" of drum 6. In other words, closed hollow container 19 is fitted into draining sump 17 so that at least part of the one or more transversal slots 19a crosses transversally the substantially cylindrical lateral surface of the washing drum 6.

**[0048]** More specifically, with reference to Figures 2 and 3, in the example shown the draining sump 17 is preferably, though not necessarily, placed on the bottom of the recessed seat 3a which houses the heater 12, beside the heater 12. Moreover, in the example shown, the bottom surface of the recessed seat 3a (which in this case coincide with the bottom surface of the washing tub 3) is tilted towards the draining sump 17 and towards two slots 19a provided on one of the lateral walls (in particular the one indicated with number 40a in Figure 3) of the closed hollow container 19 fitted into the draining sump 17, so as to facilitate the sliding, by gravity, of coins, rings, buttons and similar small objects, laying on the bottom of the recessed seat 3a, into these slots 19a.

**[0049]** Clearly the draining sump 17 may be positioned in another region of the bottom of the washing tub 3, and therefore also not in correspondence of the recessed seat 3a; in this case, not illustrated, the bottom surface of the washing tub 3 contiguous to one or both the lateral walls 40a, 40b of the draining sump 17 provided with the one or more slots 19a, may be tilted towards the latter, in order to facilitate the sliding, by gravity, into slots 19a, of coins, rings, buttons and similar small objects laying on this bottom surface.

**[0050]** Therefore coins, rings, buttons and similar small objects laying on the bottom of the washing tub 3 are conveyed into the one or more slots 19a by gravity (thanks to the inclination of the bottom surface of the washing tub 3) and also, during the washing, by the rotation of the drum 6 which moves the washing/rinsing liquid more or less tangentially to the bottom of washing tub 3 (and therefore substantially along the travelling direction "d" of the overhanging portion of peripheral wall of drum 6), dragging in the same direction (and therefore towards one or more slots 19a) coins, rings, buttons and similar small objects laying on the bottom of the washing tub 3.

**[0051]** With reference to Figures 3, 4, 5 and 6, in the example shown, the closed hollow container 19 comprises preferably, though not necessarily, a cup-shaped body 20, on which external surface, preferably both on its lateral surface and on its bottom, apertures or holes 30 are provided, adapted for allowing the free passage of the washing/rinsing liquid, and to impede the passage of fluff, lint and other undesirable bodies (i.e. buttons, coins, rings, etc.) present in the washing/rinsing liquid.

**[0052]** The cup-shaped body 20 comprises an outwards-projecting peripheral flange 20a, projecting from its upper border and adapted to be put in abutment against the border of washing tub 3 surrounding the draining sump 17, while the rest of the cup-shaped body 20 is positioned inside the draining sump 17, for avoiding

that such cup-shaped body 20 would fall into the draining sump 17.

**[0053]** The closed hollow container 19 illustrated in Figures 5 and 6 advantageously comprises an upper cover or lid 21 associated to the cup-shaped body 20 in a totally or partially removable way, so as to allow, by its full or partial removal, the access to the internal of the cup-shaped body 20.

**[0054]** Preferably, but not necessarily, the upper cover or lid 21 is hinged to the cup-shaped body 20, preferably, but not necessarily to the outer peripheral flange 20a of the latter; in this case the upper cover or 21 may be manually rotated about the hinge articulation axis A, to from a closing position (Figure 5) in which the upper cover or lid 21 lies above the opening of the cup-shaped body 20, with its peripheral edge 21a substantially parallel and spaced to the peripheral edge 20c of the cup-shaped body 20, so as to define a peripheral gap which is wide enough to permit the entrance into the cup-shaped body 20 of coins, rings, buttons and similar small objects. In this case the peripheral gap defines the one or more transversal slots 19a of the closed hollow container 19.

**[0055]** In the example shown, in particular, the slots 19a delimited by the cover or 21 and the cup-shaped body 20 are preferably, though not necessarily, 1-15 millimeters wide.

**[0056]** Preferably, though not necessarily, the closed hollow container 19 also comprises manually-releasable locking means 22 structured for clamping in a rigid and stable, but easy releasable manner, the upper cover or lid 21 in the closing position to the cup-shaped body 20.

**[0057]** In the example shown, locking means 22 consist preferably, though not necessarily, in one or more elastic-deformable snap-lock locking pins or tongues 22 projecting from both the outer peripheral flange 20a of cup-shaped body 20 and from the peripheral edge of lid 21, so as to selectively engage to one another.

**[0058]** In another embodiment, not illustrated, the cover or lid 21 may be associated to the cup-shaped body 20 in other suitable ways; for example the cover or lid 21 may be associated to the cup-shaped body 20 in a totally removable way, for instance by manually-releasable locking means, not illustrated.

**[0059]** Anyway, independently from the way in which the cover or lid 21 is associated to the cup-shaped body 20, in the closing position the cover or lid 21 lies above the opening of the cup-shaped body 20 in such a way to define a peripheral gap which is wide enough to permit the entrance into the cup-shaped body 20 of coins, rings, buttons and similar small objects; the peripheral gap defines the one or more transversal slots 19a of the closed hollow container 19.

**[0060]** The cover or lid 21 may be advantageously provided with a plurality of aperture or holes 31, dimensioned for permitting the free passage of the washing/rinsing liquid and of the fluff or lint, and to impede the passage of coins, rings, buttons and similar small objects; the aperture or holes 31 of the cover or lid 21 are therefore

wider than the aperture or holes 30 of the cup-shaped body 20.

**[0061]** When the closed hollow container 19 is associated to the draining sump 17, in the operative position of Figure 4, the washing/rinsing liquid, and also the fluff or lint potentially present in the latter, may therefore freely enter the cup-shaped body 20 both via the aperture or holes 31 of the cover or lid 21, and via the one or more transversal slots 19a.

**[0062]** In another embodiment, not illustrated, the cover or lid 21 isn't provided with holes or apertures; in this case washing/rinsing liquid may enter the cup-shaped body 20 via the one or more slots 19a; other openings, not illustrated, may be provided on the closed hollow container 19 for allowing washing/rinsing liquid, fluff, and lint, but not coins, rings, buttons and similar small objects, to enter the closed hollow container 19.

**[0063]** Rings, buttons and similar small objects present in the bottom of the washing tub 3, enter the cup-shaped body 20 via the one or more slots 19a, by the effect of gravity and of the sloping of the bottom surface of the washing tub 3, and also, during the washing, by the rotation of the drum 6 which moves the washing/ rinsing liquid more or less tangentially to the bottom of washing tub 3, dragging in the same direction coins, rings, buttons and similar small objects laying on the bottom of the washing tub 3.

**[0064]** Once rings, buttons or other similar small objects have entered the cup-shaped body 20, and have settled in the bottom of the latter, they can't jump out of the cup-shaped body 20, because it is closed by the cover or lid 21. The removal of these rings, buttons or other similar small objects from the internal of the cup-shaped body 20 may be done by a user by lifting the cover or lid 21.

**[0065]** More generally, once rings, buttons or other similar small objects have entered the closed hollow container 19 via the one or more slots 19a, they can't jump out of the closed hollow container 19, and they may be removed by a user, by opening the closed hollow container 19.

**[0066]** Advantageously, the closed hollow container 19 preferably, though not necessarily, also comprises manually-releasable locking means 23 structured for clamping in a rigid and stable, but easy releasable manner, the cup-shaped body 20 to the body of the washing tub 3 when the closed hollow container 19 is fitted into the draining sump 17. In the example shown, locking means 23 comprise preferably, though not necessarily, a number of elastic-deformable snap-lock locking pins or tongues 23 projecting from the cup-shaped body 20, so as to selectively engage on the edge of the bottom wall of washing tub 3.

**[0067]** In the embodiment illustrated in the enclosed figures, the snap-lock locking pins or tongues 23 protrude laterally from two elastically deformable arms 50 provided respectively on the lateral walls 40a, 40b of the cup-shaped body 20 and arranged in such a way that they

may be elastically pressed one towards the other, so as to cause the disengagement of the snap-lock locking pins or tongues 23 from the edge of the bottom wall of washing tub 3.

**[0068]** Advantageously the arms 50 are arranged in such a way that their free ends are accessible from the internal of the washing tub 3 when the filtering assembly 19 is inserted into the draining sump 17, so as to allow a user to press the arms 50 one towards the other for removing the filtering assembly 19 from the draining sump 17.

**[0069]** Advantageously the snap-lock locking pins or tongues 23 comprises a tilted surface 23a arranged so that it engages the edge of the bottom wall of washing tub 3 during the insertion of the cup-shaped body 20 into the latter, causing an elastic rotation of the respective arm 50 towards the inside of the cup-shaped body 20 while the latter is pushed towards the bottom of the draining sump 17, until the snap-lock locking pins or tongues 23 go beyond the edge of the bottom wall of washing tub 3, clasping the edge of the bottom wall of washing tub 3 between the snap-lock locking pins or tongues 23 and the peripheral flange 20a, and fixing in this way the closed hollow container 19 to the washing tub 3.

**[0070]** In order to insert and snap-fix the filtering assembly 19 into the draining sump 17, a user has therefore simply to push the filtering assembly 19 towards the bottom of the draining sump 17 until the snap-lock locking pins or tongues 23 go beyond the edge of the bottom wall of washing tub 3.

**[0071]** In order to extract the filtering assembly 19 from the draining sump 17, a user has to press the arms 50 one towards the other until disengaging the snap-lock locking pins or tongues 23 from the edge of the bottom wall of washing tub 3, so as to be free to extract the filtering assembly 19 from the draining sump 17.

**[0072]** In the example shown, cup-shaped body 20 and upper cover or lid 21 are preferably, thought not necessarily, made of plastic material, and locking means 22 and 23 are made in one piece respectively with the cup-shaped body 20 and with the upper lid 21.

**[0073]** In addition to the above, with reference to Figures 5 and 6, the cup-shaped body 20 is preferably, thought not necessarily, provided with a central septum 20b which lies substantially on the middle plane of the cup-shaped body 20 and of the closed hollow container 19 so as to divide the cup-shaped body 20 in two compartments, and which, preferably, but not necessarily, juts out from the opening of the cup-shaped body 20 substantially perpendicular to said opening.

**[0074]** The central septum 20b is preferably partially perforated, in particular in proximity to the bottom of the cup-shaped body 20, and the closed hollow container 19 is fitted into the draining sump 17 so that the central septum 20b is locally substantially perpendicular to the bottom surface of washing tub 3 (or also, in the embodiment illustrated in Figure 3, to the bottom surface of the recessed seat 3a on washing tub 3), and is oriented locally

substantially perpendicular to the travelling direction "d" of the overhanging portion of peripheral wall of drum 6, so as to partly divert upwards the washing/rinsing liquid lapping against said bottom surface.

5 **[0075]** After the washing/rinsing liquid has entered the cup shaped body 20, the central septum 20b conveys the washing/rinsing liquid towards the bottom of the cup-shaped body 20, where the central septum 20b is partially perforated; the washing/rinsing liquid traverses therefore  
10 the central septum 20b in proximity of the bottom of the cup-shaped body 20, pushing in this way towards the internal of the washing tub 3 possible air bubbles which tend to accumulate on the bottom of the cup-shaped body 20, and which should compromise the correct functioning  
15 of the draining pump 18, or also damage the latter, if they would enter into the draining pump 18.

**[0076]** Similarly, the upper cover or lid 21 of the closed hollow container 19 is preferably, thought not necessarily, provided with a central septum 21 b which lies substantially on the middle plane of the upper cover or lid 21  
20 and of the closed hollow container 19.

**[0077]** The central septum 21b of upper cover or lid 21 is coplanar with the central septum 20b of the cup-shaped body 20, and is structured to fit and rest onto the upper  
25 edge of the central septum 20b of the cup-shaped body 20 when upper cover or lid 21 is placed in the closing position, so as to form, together with the central septum 20b, an inner partitioning wall of closed hollow container 19 which cuts in half the internal volume of closed hollow  
30 container 19.

**[0078]** More specifically, in the example shown the hinge connecting upper cover or lid 21 to cup-shaped body 20 lies substantially on the middle plane of the closed hollow container 19, and the hinge articulation  
35 axis A is locally substantially perpendicular to said middle plane.

**[0079]** Clearly the filtering assembly 19 may also be not provided with the central septum 21 b of upper cover or lid 21 and with the central septum 20b of the cup-shaped body 20.  
40

**[0080]** Preferably, thought not necessarily, the filtering assembly 19 comprises at least one pushing support adapted for providing a stable support to the user, for facilitating the pushing of the filtering assembly 19 towards the bottom of the draining sump 17.  
45

**[0081]** Advantageously the pushing support may comprise one or more regions (for example the regions numbered 90a and 90b in Figure 5) of the external surface of the closed hollow container 19 (particularly of the cover or lid 21 in the embodiment illustrated in Figure 6) opposite to the bottom of the draining sump 17 when the filtering assembly 19 is introduced into the latter, having an area wide enough to allow a user to place on one or more of his fingers, so as to easily push the closed hollow  
50 container 19 towards the bottom of the draining sump 17.

**[0082]** In the embodiment illustrated in the enclosed figures, the pushing support advantageously comprises a rigid base 21c protruding from the external surface of

the cover or lid 21 opposite to the cup-shaped body 20; preferably but not necessarily, the rigid base 21c is located, approximately in the center of the outer face of the cover or lid 21, so as to be aligned to the central septum 21b which juts out from the inner face of the lid.

**[0083]** Preferably the rigid base 21c is arranged in such a way that it is positioned between the two arms 50 when the upper cover or lid 21 is fixed to the cup-shaped body 20.

**[0084]** When the upper cover or lid 21 is placed in the closing position, after partially positioning the filtering assembly 19 into the draining sump 17, the user can push directly on the rigid base 21c to drive, as a whole, the closed hollow container 19 into the draining sump 17, so as to cause the snap-lock locking pins or tongues 23 going beyond the edge of the bottom wall of washing tub 3, fixing the filtering assembly 19 into the draining sump 17. Clearly, more than one rigid base 21c may be provided on the cover or lid 21.

**[0085]** The at least one pushing support solves the technical problem of facilitating the correct insertion of the filtering assembly into the draining sump.

**[0086]** This technical problem, as it will be better explained in the following, may be solved also by another suitable embodiment of the filtering assembly 19.

**[0087]** Operation of laundry washing machine 1 and of filtering assembly 19 are clearly inferable from the above description, with no further explanation required. As regards the cleaning of the filtering assembly 19, the user, from the internal of the drum 6, can manually extract and insert the closed hollow container 19 into the draining sump 17 provided at the bottom of the washing tub 3, via the opening 6a obtained on the peripheral wall of drum 6, after having manually aligned the opening 6a to the draining sump 17, and having opened the lifter or elevator 6b (or other dedicated lid) which closes the opening 6a.

**[0088]** The particular structure of the filtering assembly 19 has lots of advantages.

**[0089]** Firstly the presence of the upper cover or lid 21 prevents coins, rings, buttons and similar small objects from jumping out of the cup-shaped body 20, particularly when drum 6 rotates at high speed and the whole washing group is subjected to hard mechanical vibrations.

**[0090]** Thus the risk of coins or other small metal objects to be shot against the wall of the washing tub 3 is reduced substantially to zero.

**[0091]** Moreover the access to the internal of the filter for cleaning it and removing coins, rings, buttons and similar small objects collected therein is very fast and easy.

**[0092]** Clearly, changes may be made to the laundry washing machine 1 and to the filtering assembly 19 as described herein without, however, departing from the scope of the present invention.

**[0093]** For example, the closed hollow container 19 may consist of two valve-like half shells which are laterally hinged to one another, so as to be manually openable in a book-like manner when the closed hollow container 19

is completely extracted/removed from the draining sump 17 on the bottom wall of washing tub 3.

**[0094]** In another embodiment, not illustrated, the closed hollow container 19 is a closed box-shaped body, for example a cube, or a parallelepiped, or a prism, or a cylinder, on which lateral surface the one or more transversal long and narrow slots 19a are provided; in this case the internal of the closed hollow container 19 may be reached (for removing coins, buttons, rings or the like entered via the one or more slots 19a) via a suitable door or porthole provided on the external surface of such a box-shaped body. This door or porthole may be, for example, hinged to the external surface of the box-shaped body, or it may be slidably associated to the latter, for example by suitable guide, or it may be a sort of plug, partially or fully removable from the box-shaped body.

**[0095]** Moreover, as indicated above, laundry washing machine 1 may be as well a top-loading washing machine.

**[0096]** Clearly, the technical problem of avoiding that coins, rings, buttons and similar small objects collected into the filtering assembly would jump out of filtering assembling, particularly during the rotation of the drum, is solved also if the closed hollow container, openable by a user and provided with one or more slots 19a dimensioned for permitting the entrance of coins, rings, buttons and similar small objects into the container, is fixed to the draining sump 17 in a permanent (i.e. not-removable) way. In this case a user may remove coins, buttons, rings, and other objects or material collected into the closed hollow container 19 by opening the latter, directly from the internal of the drum 6. In this case the closed hollow container 19 may be advantageously obtained in a single-piece construction with the draining sump 17.

**[0097]** For example, with reference to an embodiment in which the closed hollow container 19 comprises a cup-shaped body 20 and a cover or lid 21, for example analogous to the ones described above with reference to Figures 5 and 6, the cup-shaped body 20 may be obtained in a single piece construction with the draining sump 17.

**[0098]** As indicated above, the technical problem of facilitating the correct insertion of the filtering assembly into the draining sump may be solved also by another suitable embodiment of the filtering assembly; in particular, with reference to figures 7, and 8, this technical problem is solved by a washing machine comprising a filtering assembly 119 comprising in turn a cup-shaped body 120, preferably substantially analogous to the cup-shaped body 20 illustrated with reference to the embodiment of Figures 1 to 6, on which lateral wall and on which bottom apertures or holes 130 are provided, adapted to allow the free passage of washing/rinsing liquid, and to impede the passage of fluff, lint and other undesirable bodies (i.e. buttons, coins, rings, etc.) present in the washing/rinsing liquid.

**[0099]** It is underlined that the washing machine comprising the filtering assembly 119 may be both a top-loading washing machine and a front-loading washing ma-

chine (for example analogous to the one illustrated in Figures 1, 2, 3 and 4), provided that it comprises a washing tub, containing a drum, on which bottom surface a draining sump is provided, connected to a draining and/or recirculation circuit, into which the filtering assembly 119 may be removably fixed, so as to retain coins, rings, buttons and similar small objects present in the washing tub, for avoiding that these objects could reach the draining and/or the recirculation pump.

**[0100]** Advantageously the cup-shaped body 120 comprises manually-releasable locking means 123 structured for clamping in a rigid and stable, but easy releasable manner, the cup-shaped body 120 to the body of the washing tub when the cup-shaped body 120 is fitted into the draining sump.

**[0101]** In the example shown in Figures 7 and 8, locking means 123 comprise, preferably though not necessarily, a number of elastic-deformable snap-lock locking pins or tongues 123 projecting from the cup-shaped body 120, so as to selectively engage on the edge of the bottom wall of the washing tub.

**[0102]** In the embodiment illustrated in the enclosed figures, the snap-lock locking pins or tongues 123 protrude laterally from two elastically deformable arms 150 provided respectively on the lateral walls 140a, 140b of the cup-shaped body 120 and arranged in such a way that they may be elastically pressed one towards the other, so as to cause the disengagement of the snap-lock locking pins or tongues 123 from the edge of the bottom wall of washing tub.

**[0103]** Advantageously the arms 150 are arranged in such a way that their free ends are accessible from the internal of the washing tub when the filtering assembly 119 is inserted into the draining sump, so as to allow a user to press the arms 150 one towards the other for removing the filtering assembly 119 from the draining sump.

**[0104]** Advantageously the snap-lock locking pins or tongues 123 comprises a tilted surface 123a arranged so that it engages the edge of the draining sump during the insertion of the cup-shaped body 120 into the latter, causing an elastic rotation of the respective arm 150 towards the inside of the cup-shaped body 120 while the latter is pushed towards the bottom of the draining sump, until the snap-lock locking pins or tongues 123 go beyond the edge of the bottom wall of washing tub 3, fixing the filtering assembly 119 to the washing tub in the same way described above with reference to the embodiment of figures 1 to 6.

**[0105]** In order to insert and snap-fix the filtering assembly 119 into the draining sump, a user has therefore simply to push the filtering assembly 119 towards the bottom of the draining sump until the snap-lock locking pins or tongues 123 go beyond the edge of the bottom wall of washing tub.

**[0106]** In order to extract the filtering assembly 119 from the draining sump a user has to press the arms 150 one towards the other, until disengaging the snap-lock

locking pins or tongues 123 from the edge of the bottom wall of washing tub.

**[0107]** The cup-shaped body 120 is advantageously provided with a central septum 120b which lies substantially on the middle plane of the cup-shaped body 120 so as to divide the cup-shaped body 120 in two compartments, and which, preferably, but not necessarily, juts out from the opening of the cup-shaped body 120 substantially perpendicular to said opening.

**[0108]** The central septum 120b is arranged in such a way that, when the filtering assembly 119 is introduced into the sump, the central septum 120b is oriented locally substantially perpendicular to the travelling direction of the overhanging portion of peripheral wall of drum, so as to partly divert upwards the washing/rinsing liquid lapping against said bottom surface; the central septum 120b is preferably partially perforated, in particular in proximity to the bottom of the cup-shaped body 120, so as to allow the washing/rinsing liquid to remove possible air bubbles from the bottom of the cup shaped body 120, in the same way illustrated above with reference to the central septum 20b illustrated in Figures 3 and 5.

**[0109]** Advantageously the filtering assembly 119 comprises at least one pushing support adapted for providing a stable support to the user for facilitating the pushing of the filtering assembly 119 towards the bottom of the draining sump.

**[0110]** Advantageously, the pushing support comprises an upper member 160 associated, preferably in a totally or partially removable way, to the upper region of the cup-shaped body 120 facing the drum when the filtering assembly 119 is inserted into the sump.

**[0111]** With particular reference to the embodiment illustrated in Figures 7 and 8, the upper member 160 comprises two substantially parallel plates 161a, 161b, connected one another in correspondence of one of their transversal end by a connecting element 161c, which may straddle the septum 120d of the cup-shaped body 120.

**[0112]** Advantageously the upper member 160 may be hinged to the cup-shaped body 120, preferably, but not necessarily to the outer peripheral flange 120a of the latter; in this case the upper member 160 may be manually rotated about the hinge articulation axis A1, to and from a closing position (Figure 7) in which the upper member 160 straddle the septum 120d of the cup-shaped body 120.

**[0113]** Preferably, though not necessarily, the filtering assembly 119 also comprises manually-releasable locking means 122 structured for clamping in a rigid and stable, but easy releasable manner, the upper member 160 in the closing position to the cup-shaped body 120. In the example shown in figures 7 and 8, locking means 122 consist preferably, though not necessarily, in one or more elastic-deformable snap-lock locking pins or tongues 122 projecting from both an outer peripheral flange 120a of cup-shaped body 120 and from the peripheral edge of upper member 160, so as to selectively

engage to one another.

[0114] In a further embodiment, not illustrated, the upper member 160 may straddle the septum 120d of the cup-shaped body 120 in a fully removable way.

[0115] Advantageously the pushing support comprises also one or more rigid bases 121c, that is a rigid region having an area wide enough to allow a user to place thereon one or more of his fingers, so as to easily push the filtering assembly 119 towards the bottom of the draining sump.

[0116] Preferably, but not necessarily, the pushing support comprises only one rigid base 121c, positioned in a central region of the connecting element 161c, so as to be placed between two arms 150 when the upper member 160 is in the closing position.

[0117] In a further embodiment, not illustrated, the pushing support may comprise one or more regions of the upper member 160 which face the drum when the filtering assembly 119 is inserted into the sump and which have an area wide enough to allow a user to place on one or more of his fingers, so as to easily push the filtering assembly 119 towards the bottom of the draining sump.

[0118] In a further embodiment thereof, also not illustrated, the upper member 160 is not provided, and one or more rigid bases 121c are provided directly on the central septum 120b; for example the one or more rigid bases 121c may be obtained in a single-body construction with the central septum 120b.

[0119] After partially positioning the filtering assembly 119 into the draining sump, a user may push directly on the one or more rigid bases 121c to drive the filtering assembly 119 into the draining sump 17, so as to cause the snap-lock locking pins or tongues 123 going beyond the edge of the bottom wall of washing tub and clasping the edge of the bottom wall of washing tub, so as to fix the filtering assembly 119 into the draining sump.

[0120] Clearly the technical problem of facilitating the correct insertion of the filtering assembly into the draining sump is also solved by a filtering assembly comprising a cup-shaped body 20 and a cover or lid 21 similar to the one illustrated above with reference to Figures 1 to 6 (in which the cover or lid 21 is provided with at least one pushing support adapted for providing a stable support to the user, for facilitating the pushing of the filtering assembly 19 towards the bottom of the draining sump 17 independently from the presence of a peripheral gap between the cup-shaped body 20 and the cover or lid 21, and therefore even without the one or more slots 19a; in other words such cup-shaped body 20 and cover or lid 21 solves this technical problem even if when the cover or lid 21 is in the closing position there isn't any gap or slot 19a between the cup-shaped body 20 and the cover or lid 21.

## Claims

1. Laundry washing machine (1) comprising:

a washing tub (3) containing a drum (6);  
a draining circuit for draining washing/rinsing liquid out of the washing tub (3), comprising a draining sump (17) provided at the bottom of said washing tub (3) for collecting the washing/rinsing liquid;

a filtering assembly (19) positioned into said draining sump (17),

**characterized in that**

said filtering assembly (19) comprises a closed hollow container (19), structured to be openable by a user, provided with a plurality of apertures or holes (30) adapted to allow the free passage of the washing/rinsing liquid and to impede the passage of coins, rings, buttons and similar small objects, said closed hollow container (19) being provided with one or more transversal slots (19a) dimensioned for permitting the entrance of coins, buttons, rings, and similar small objects into said closed hollow container (19), and being associated into said draining sump (17) so that said one or more transversal slots (19a) are substantially perpendicular to the travelling direction (d) of the overhanging portion of the peripheral wall of said drum (6).

2. A laundry washing machine as claimed in Claim 1, wherein the closed hollow container (19) is fitted into the draining sump (17) so that said one or more transversal slots (19a) are substantially flush with the bottom surface of the washing tub (3), so as to allow the entrance into said hollow container (19), through said one or more slots (19a), of coins, rings, buttons and similar objects laying on the bottom surface of said washing tub (3).

3. A laundry washing machine as claimed in Claim 1 or 2, wherein the bottom surface of said washing tub (3) is locally tilted towards said draining sump (17), and towards one or more transversal slots (19a) of the closed hollow container (19) placed into said sump (17).

4. A laundry washing machine as claimed in one or more of the previous Claims, wherein the closed hollow container (19) comprises:

a cup-shaped body (20), associated or associable into said draining sump (17), on which external surface said plurality of apertures or holes (30) is provided;

an upper cover or lid (21) which is fixable to the cup-shaped body (20) in a closing position in which said upper cover or lid (21) lies above the opening of the cup-shaped body (20), with its peripheral edge (21a) substantially parallel and spaced to the peripheral edge (20c) of the cup-shaped body (20), so as to define a peripheral

- gap which is wide enough to permit the entrance of coins, buttons and similar small objects into the cup-shaped body (20), said peripheral gap defining said one or more transversal slots (19a) of said closed hollow container (19). 5
5. A laundry washing machine as claimed in Claim 4, wherein the upper cover or lid (21) is hinged to the cup-shaped body (20) so as to be rotatable about a hinge articulation axis (A) to and from said closing position in which said upper cover or lid (21) lies above the opening of the cup-shaped body (20). 10
6. A laundry washing machine as claimed in Claim 4 or 5, wherein the closed hollow container (19) comprises first locking means (22) structured for clamping in a releasable manner the upper cover or lid (21) in said closing position to the cup-shaped body (20). 15
7. A laundry washing machine as claimed in one or more of the previous Claims, wherein said closed hollow container (19) comprising second locking means (23) structured for clamping in a releasable manner said closed hollow container (19) to the washing tub (3) when the closed hollow container (19) is fitted into said draining sump (17). 20 25
8. A laundry washing machine as claimed in any one of Claims 4 to 7, wherein said cover or lid (21) is provided with a plurality of aperture or holes (31) dimensioned for permitting the free passage of the washing/ rinsing liquid, and to impede the passage of coins, rings, buttons and similar small objects. 30
9. A laundry washing machine as claimed in any one of Claims 4 to 8, wherein said cup-shaped body (20) is provided with a central septum (20b) which lies substantially on the middle plane of the closed hollow container (19) so as to divide the cup-shaped body (20) in two compartments; and wherein said upper cover or lid (21) is provided with a central septum (21b) which lies substantially on the middle plane of the closed hollow container (19), and is structured to fit and rest onto the upper edge of the central septum (20b) of the cup-shaped body (20) when upper cover or lid (21) is placed in the closing position, so as to form an inner partitioning wall of hollow container (19). 40 45 50
10. A laundry washing machine as claimed in any one of the previous Claims, wherein said filtering assembly (19) is accessible from the internal of said drum (6). 55
11. Filtering assembly (19) for the draining circuit of a laundry washing machine **characterized by** comprising a closed hollow container (19), structured to be openable by a user and provided with a plurality of apertures or holes (30) adapted for allowing the free passage of a liquid and to impede the passage of coins, rings, buttons and similar small objects, said closed hollow container being provided with one or more transversal slots (19a) adapted for allowing the entrance of coins, buttons and similar small objects into said closed hollow container (19).
12. A filtering assembly as claimed in Claim 11, wherein the closed hollow container (19) comprises a cup-shaped body (20) on which external surface said plurality of apertures or holes (30) is provided, and an upper cover or lid (21) which is fixable to the cup-shaped body (20) in a closing position in which said upper cover or lid (21) lies above the opening of the cup-shaped body (20), with its peripheral edge (21a) substantially parallel and spaced to the peripheral edge (20c) of the cup-shaped body (20), so as to define a peripheral gap which is wide enough to permit the entrance of coins, buttons and similar small objects into the cup-shaped body (20), said peripheral gap defining said one or more transversal slots (19a) of the closed hollow container (19).
13. A filtering assembly as claimed in Claim 12, wherein the upper cover or lid (21) is hinged to the cup-shaped body (20) so as to be rotatable about a hinge articulation axis (A) to and from said closing position in which said upper cover or lid (21) lies above the opening of the cup-shaped body (20).
14. A filtering assembly as claimed in any one of Claims 11-13, wherein said cover or lid (21) is provided with a plurality of aperture or holes (31) dimensioned for permitting the free passage of the washing/rinsing liquid, and to impede the passage of coins, rings, buttons and similar small objects.
15. A filtering assembly as claimed in any one of Claims 11-14, wherein the cup-shaped body (20) is provided with a central septum (20b) which lies substantially on the middle plane of the closed hollow container (19) so as to divide the cup-shaped body (20) in two compartments; and wherein the upper lid (21) is provided with a central septum (21b) which lies substantially on the middle plane of the closed hollow container (19), and is structured to fit and rest onto the upper edge of the central septum (20b) of the cup-shaped body (20) when the upper lid (21) is placed in the closing position, so to form an inner partitioning wall of hollow container (19).

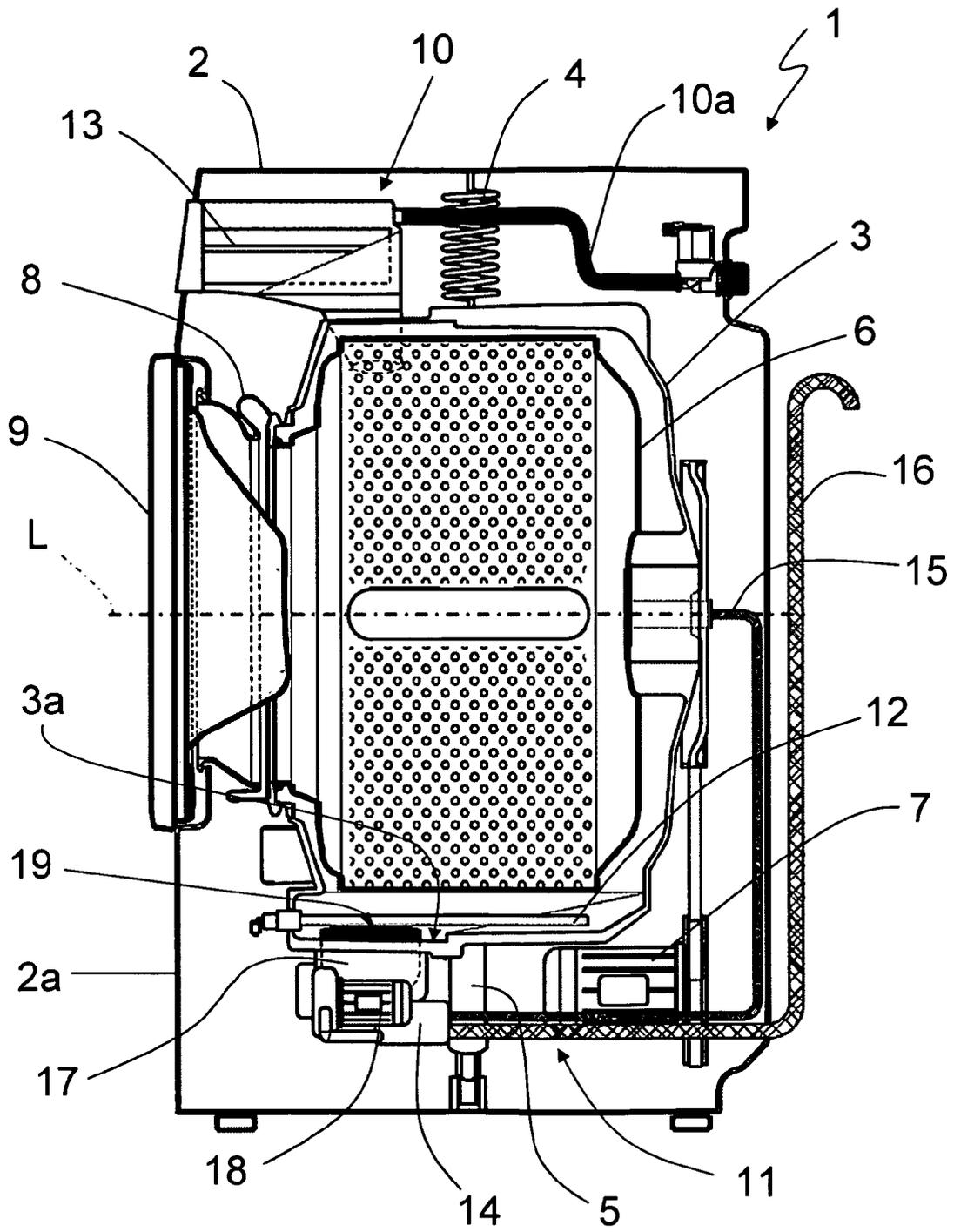


Fig. 1

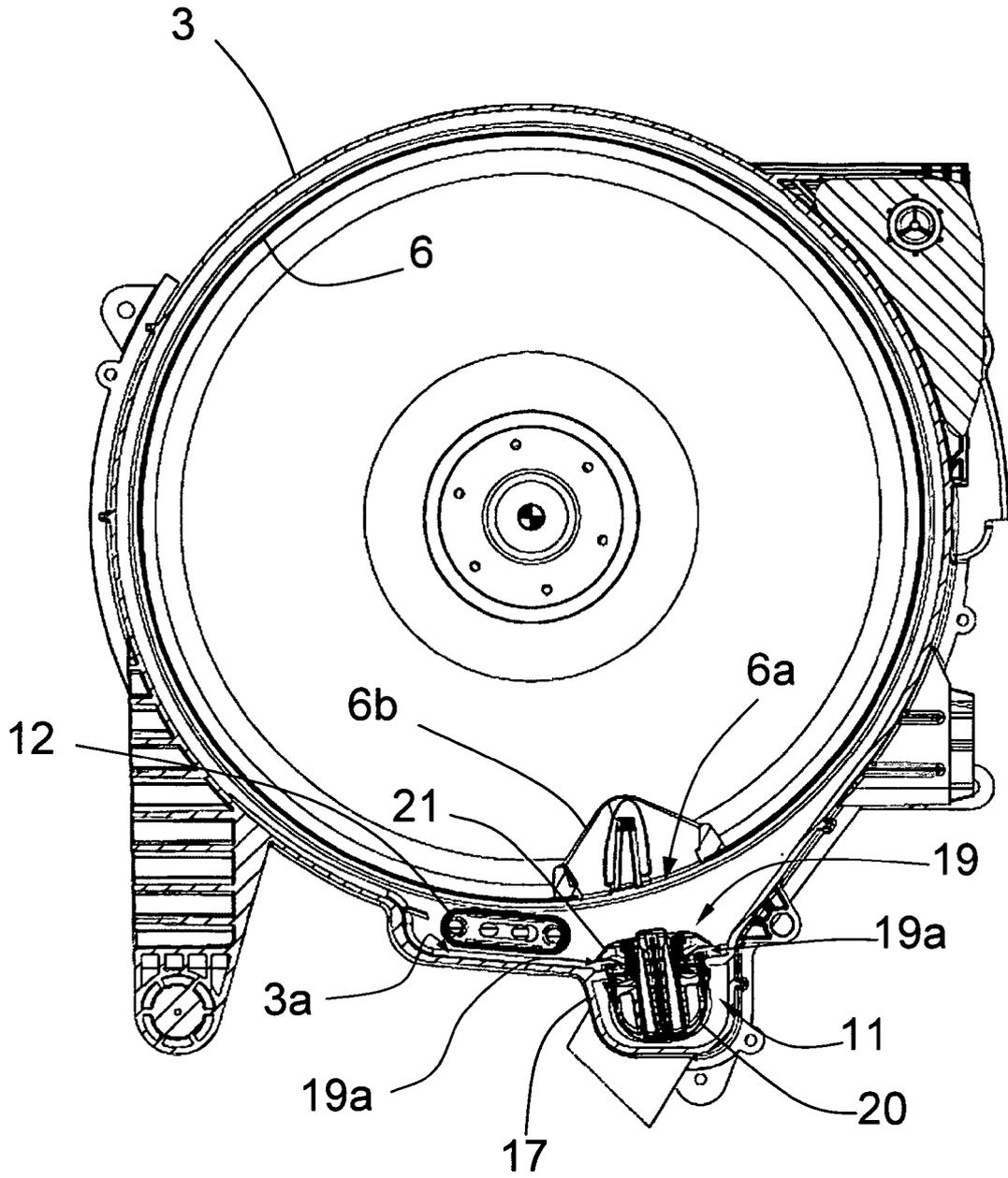


Fig. 2

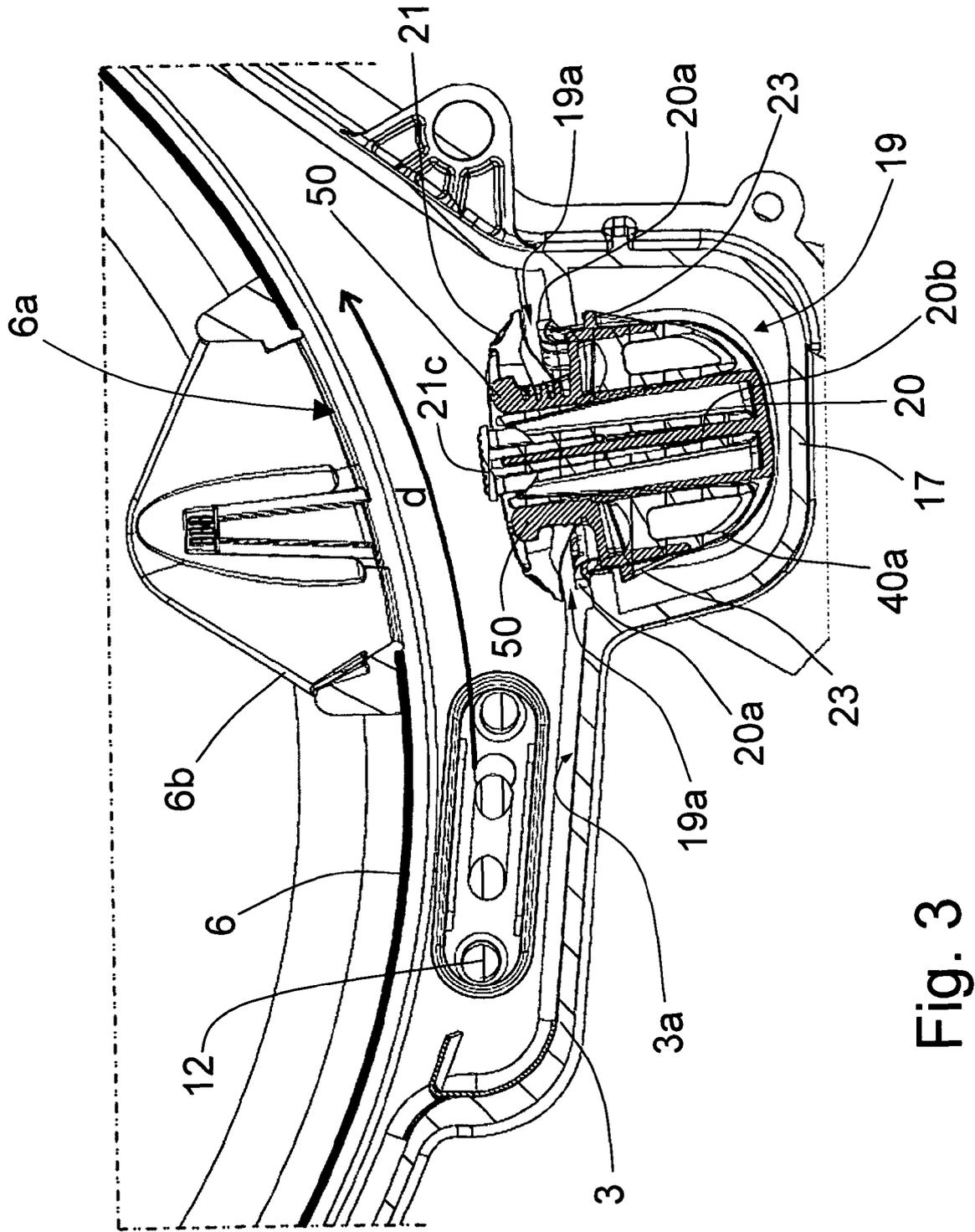


Fig. 3

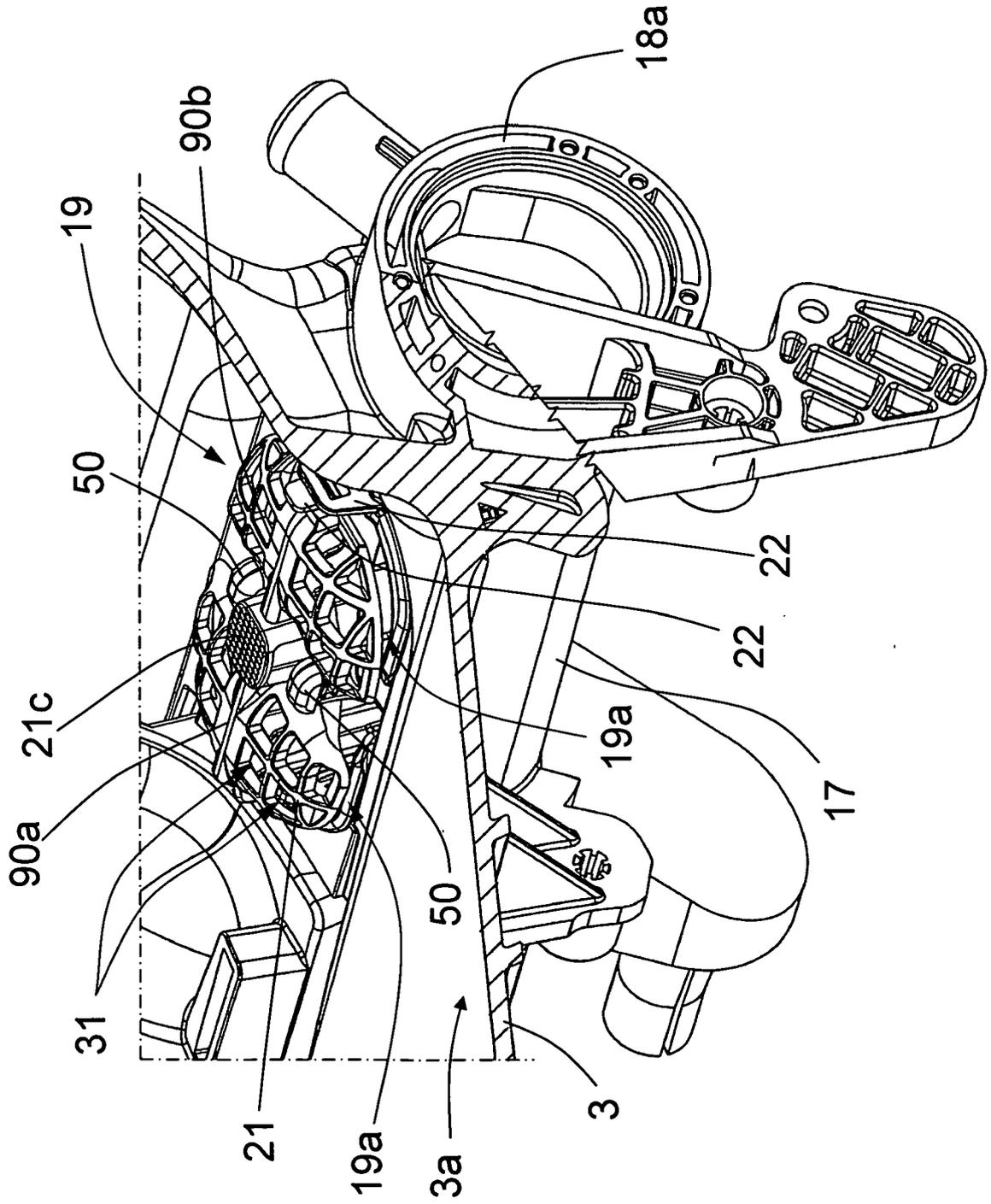


Fig. 4

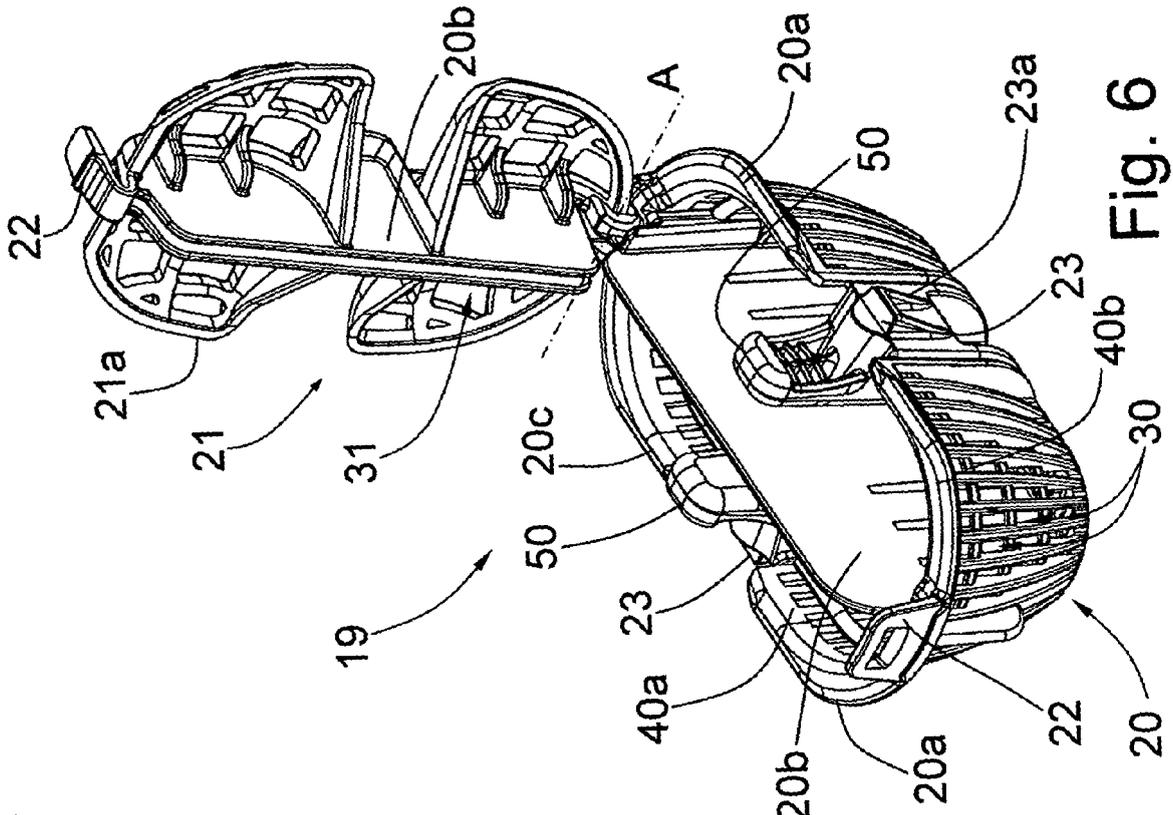


Fig. 6

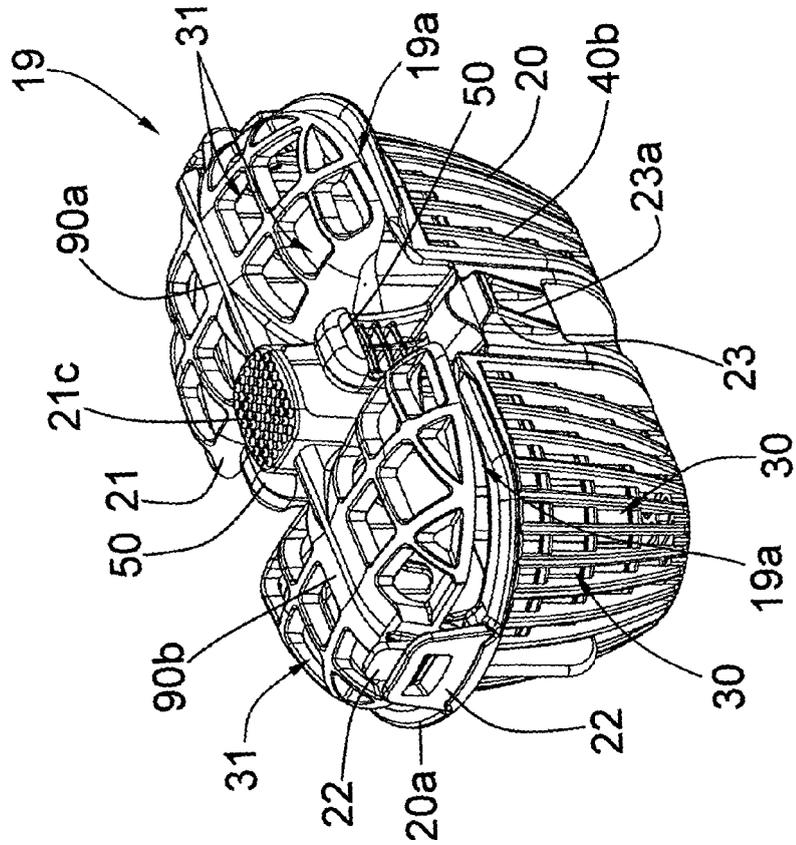


Fig. 5

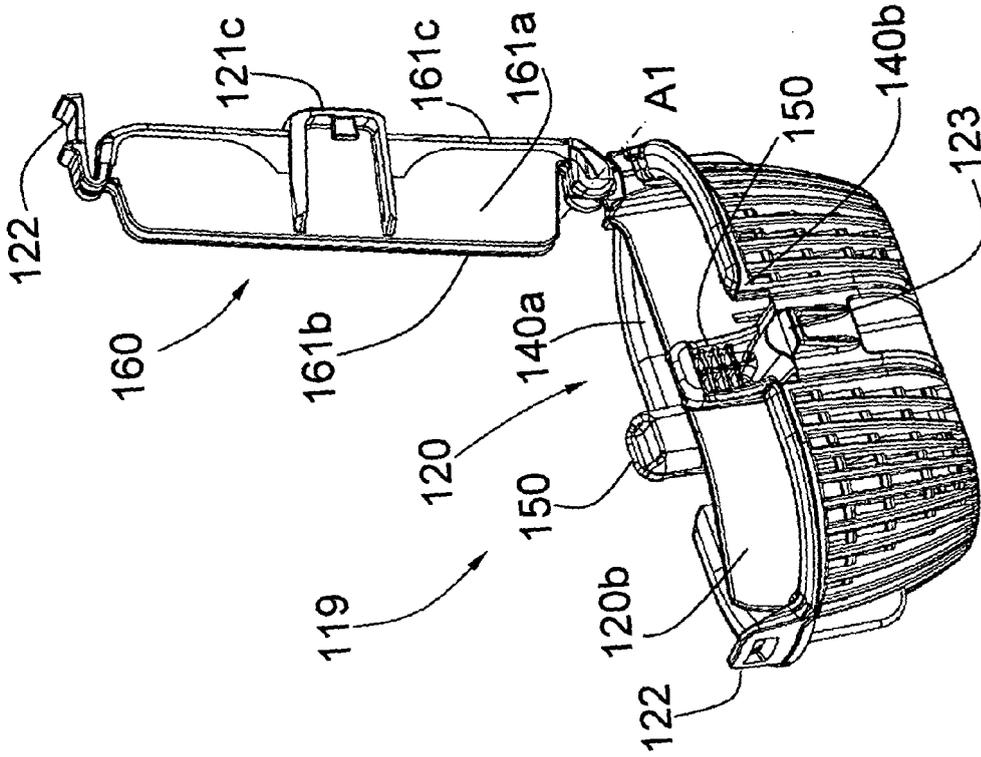


Fig. 8

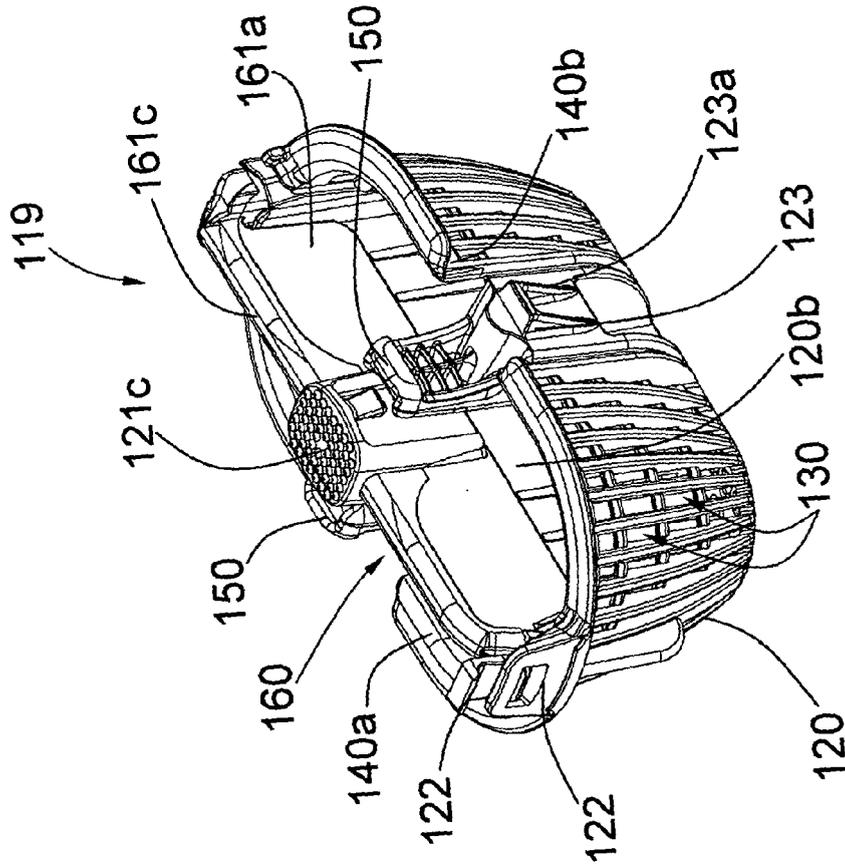


Fig. 7



EUROPEAN SEARCH REPORT

Application Number  
EP 09 00 9687

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Place of search Munich		Date of completion of the search 16 December 2009	Examiner Fachin, Fabiano
CATEGORY OF CITED DOCUMENTS		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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