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(54) **Inner tub for clothes washing machine**

(57) An inner tub (1) for a clothes washing machine, washer-dryer or tumble dryer, comprises an access door (2) with at least one flap (3, 3') connected rotatably, by a hinge (4), to the inner tub (1) and loaded by elastic means (14) that move the flap (3, 3') to an open position; and a damper (15) for slowing the movement of the flap (3, 3'), comprising two portions (16, 17), the relative

movement of which is damped, in which the said two portions (16, 17) are connected, one to the inner tub (1), and the other to the flap (3, 3'), with the interposition of at least one ratio drive mechanism (18, 19), in such a way that the relative velocity ω_A between the two portions (16, 17) is greater than the relative velocity ω_C between the flap (3, 3') and the inner tub (1).

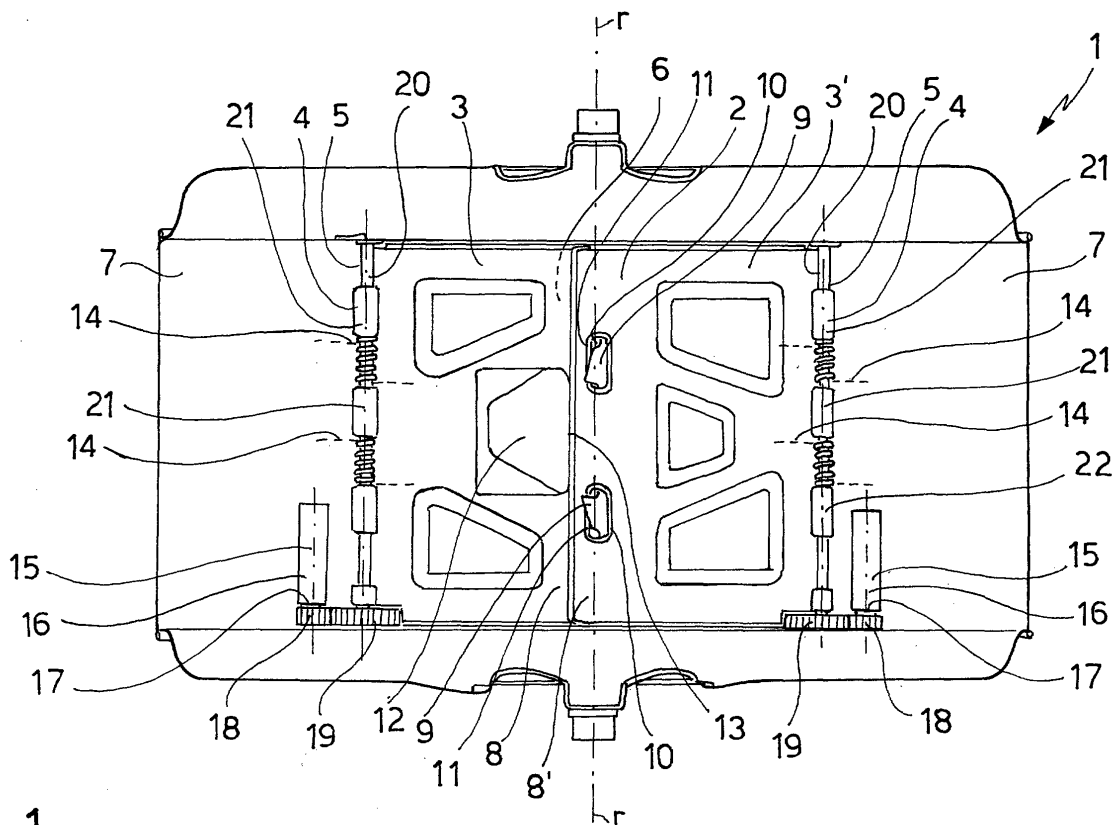


FIG. 1

Description

[0001] The present invention relates to an inner containment tub or drum for a top-loading clothes washing machine.

[0002] In top-loading clothes washing machines the inner containment tub is supported rotatably about an essentially horizontal axis and is loaded from the top through an access door in the side wall of the inner containment tub.

[0003] The access door usually consists of two flaps hinged to two opposite edges of a loading aperture in the side wall of the inner tub.

[0004] The flaps of the door comprise, at their free edges, which are the edges not hinged to the inner tub and which can be engaged together, catch means capable of keeping the door closed while the electrical appliance is in operation.

[0005] The catching together of the flaps of the closed door is achieved by torsion springs which exert a powerful pressure on the flaps tending to open them. This pressure means that, when the catch connection is released by hand pressure, the door springs open, sometimes violently. This springing open of the flaps of the door not only represents a risk of injury to the fingers of the user but is also very noisy and objectionable.

[0006] In order to slow down the rotary movement of the flaps of the access door, it has been proposed, for example in FR 2 723 382 and in FR 2 793 265, that friction means or dampers be fitted to the hinges of the flaps.

[0007] The use of the dampers fitted to the hinges of the flaps necessitates modifying the existing structure both of the inner tub and of the flaps of the door and of the hinge itself and, because of the high temperatures of the washing and the large force of the torsion springs needed to keep the door closed while the electrical appliance is running, prior-art dampers of acceptable dimensions do not sufficiently damp the movement of the flaps.

[0008] Dampers large enough to achieve satisfactory effect, however, require a lot of space and, because of their large dimensions, raise sealing problems with the risk of malfunctions.

[0009] The object of the present invention is therefore to provide an inner tub for a clothes washing machine, tumble dryer or washer-dryer having characteristics such as to obviate the problems of the prior art.

[0010] This and other objects are achieved by means of an inner tub for a clothes washing machine, washer-dryer or tumble dryer, comprising

- an access door with at least one flap connected rotatably, by a hinge, to the inner tub and loaded by elastic means that move the flap to an open position; and
- a damper for slowing the movement of the flap, comprising two portions, the relative movement of

which is damped, in which the said two portions are connected, one to the inner tub, and the other to the flap, with the interposition of at least one ratio drive mechanism, in such a way that the relative velocity ω_A between the two portions is greater than the relative velocity ω_C between the flap and the inner tub.

[0011] To explain the invention more clearly, an illustrative, non-limiting embodiment will now be described with reference to the appended drawings, in which

[0012] Figure 1 is a plan view of an inner tub according to the invention;

[0013] Figure 2 is a plan view of a detail of an inner tub according to the invention;

[0014] Figure 3 is a side view of the detail shown in Figure 2;

[0015] Figure 4 is a plan view of a detail of an embodiment of the invention;

[0016] Figure 5 is a side view of the detail shown in Figure 4;

[0017] Figure 6 is a cross section taken on the line marked VI-VI in Figure 5;

[0018] Figures 7, 8 and 9 are cross sections through details of the inner tub in other embodiments of the invention.

[0019] Referring to the figures, an inner tub for a clothes washing machine of the type mentioned above is indicated as a whole by the reference 1.

The inner tub 1 comprises a door 2 with at least one, and preferably two flaps 3, 3' connected rotatably, by one or more hinges 4, to edges 5, 5' of a loading aperture 6 in the side wall 7 of the inner tub 1. The edges 5, 5' of the loading aperture 6 are preferably opposite each other and essentially parallel to the axis of rotation r of the inner tub 1.

[0020] The flaps 3, 3' of the door 2 are provided, on their free edges 8, 8' remote from the hinges 4, with releasable catch means 9, 10, 11, 12 capable of keeping the door 2 closed while the clothes washing machine is in operation.

[0021] In the embodiment depicted in Figure 1, a first flap 3 comprises one or more hooks 9 in the vicinity of its free edge 8, and a second flap 3' defines one or more apertures 10 capable of receiving the hooks 9 when the door 2 is closed and having hook-receiving edges 11 for engaging the said hooks 9 and thus preventing the flaps 3, 3' from opening. It is preferable for the apertures 10, that is the hook-receiving edges 11, similarly to be in the vicinity of the free edge 8 of the second flap 3'.

[0022] The releasable catch means also comprise a release button 12 connected to one of the flaps 3, 3' and preferably provided with a stop edge 13 that abuts against the free edge 8, 8' of the other flap 3, 3' to prevent the flaps 3, 3' moving towards each other and so rotating inwards into the inner tub 1.

[0023] The inner tub 1 also comprises elastic means, particularly torsion springs 14, which exert an opening pressure on the flaps 3, 3' in such a way that the flaps

3, 3' spring open, exposing the loading aperture 6, when the releasable catch means 9, 10, 11, 12 of the flaps 3, 3' are released by actuating the button 12.

[0024] When the flaps 3, 3' are stationary in the closed position, the torsion springs 14 influence the flaps 3, 3' in a known manner, such as to elastically resist any movement of the flaps 3, 3' inwards into the inner tub 1.

[0025] The inner tub 1 also comprises at least one, and preferably two dampers 15 capable of slowing the movement of the flaps 3, 3' during their opening. The said dampers 15 comprise two portions 16, 17 whose relative movement is damped and which are connected, one to the inner tub 1, and the other to the respective flap 3, 3', with the interposition of at least one mechanism 18, 19 producing a drive ratio $(\omega_A/\omega_C) > 1$, in such a way that the relative velocity ω_A between the two portions 16, 17 is greater than the relative velocity ω_C between the respective flap 3, 3' and the inner tub 1.

In accordance with one embodiment, the damper 15 is a rotary damper, the relative movement between the two portions 16, 17 is a rotary movement, and the two portions 16, 17 are connected in rotation, one to the inner tub 1, and the other to the flap 3, 3', with the said ratio drive mechanism 18, 19 interposed between them, in such a way that the relative angular velocity ω_A between the two portions 16, 17 is greater than the relative angular velocity ω_C between the flap 3, 3' and the inner tub 1.

[0026] The damper 15 comprises a fixed portion 16 connected so as to be integral in rotation with the inner tub 1, and a rotatable portion 17 connected in rotation, by the ratio drive mechanism 18, 19, to the flap 3, 3'.

[0027] The ratio drive mechanism 18, 19 preferably comprises a gear pair 18, 19 with a drive wheel 19 integral in rotation with the flap 3, 3' and a driven wheel 18 integral in rotation with the rotatable portion 17 of the damper 15, in which the driven wheel 18 has a smaller radius than the radius of the drive wheel 19 so as to make the said drive ratio $\omega_A/\omega_C > 1$, preferably $1.1 < \omega_A/\omega_C < 3.0$, more preferably $1.5 < \omega_A/\omega_C < 2.5$, and still more preferably $\omega_A/\omega_C = 2.0$.

[0028] In accordance with one embodiment, the drive wheel 19 is essentially in the form of a sector of a circle corresponding to the maximum angle of rotation of the flap 3, 3' relative to the inner tub 1.

[0029] The drive wheel 19 is advantageously connected coaxially to a pin 20 integral with the flap 3, 3', which forms, together with the appropriate seats 21 connected to the side wall 7 of the inner tub 1, the above-mentioned hinges 4.

[0030] In accordance with one embodiment, the pin 20 is formed by complete or partial circular bending of the edge of the flap 3, 3' itself, defining an internal cavity 22 which extends effectively along the full length of the pin 20.

[0031] In accordance with a particularly advantageous embodiment, the torsion springs 14 comprise a torsion bar 23, housed inside the cavity 22 of the pin 20

and provided with two transverse ends 24, one resting against the inner tub 1, preferably against its side wall 7, and the other against the flap 3, 3' (Fig. 2).

[0032] The damper 15 is fixed to the inner tub 1, preferably to its side wall 7, at a distance from the axis of rotation 20 of the flap 3, 3'.

[0033] The damper 15 comprises a housing 16 that forms the abovementioned fixed portion 16 and defines internally an essentially cylindrical cavity which receives, in such a way that it can rotate, a spindle 17 that forms the abovementioned rotatable portion 17. The driven wheel 18 which meshes with the drive wheel 19 is connected coaxially to the spindle 17.

[0034] Between the spindle 17 and the housing 16 are means for slowing the rotation of the spindle 17 in the cavity of the housing 16.

[0035] In accordance with one embodiment, the said slowing means comprise a film of silicone.

[0036] The operation of the inner tub 1 according to the invention is described below.

[0037] During the opening of the door 2 by pressure on the release button 12, the stop edge 13 of the button 12 disengages the free edge 8 of the flap 3', allowing the free edges 8, 8' of the flaps 3, 3' to move towards each other to the point at which the hooks 9 of the first flap 3 come free of the hook-receiving edges 11 of the second flap 3', and the latter is then pushed, by the torsion springs 14, into the open position.

[0038] The gear pair 18, 19 transmits the rotational movement of the flap 3, 3' to the rotatable portion, that is the spindle 17, of the damper 15, multiplying it in such a way that the relative angular velocity ω_A between the spindle 17 and the housing 16 of the damper is greater than the relative angular velocity ω_C between the respective flap 3, 3' and the inner tub 1. Consequently the spindle 17 rotates through a greater angle than the angle of rotation of the flap 3, 3', dissipating a greater amount of kinetic energy for the same size of damper and torsion springs 14. Consequently the movement of the flap 3, 3' is slowed down considerably.

[0039] The inner tub according to the invention has numerous advantages.

[0040] It allows the use of small dampers for the same requisite slowing power and adaptation of the slowing power, by simple and careful selection of the drive ratio, to the opening force exerted by the torsion springs 14.

[0041] This reduces the size of the damper and associated costs, at the same time obviating the problems of space requirements and poor leaktightness of the damper itself.

[0042] In addition, the arrangement of the damper 15 at a distance from the axis of rotation 20 of the flaps 3, 3', and hence at a distance from the hinges 4, allows the dampers 15 to be fitted to existing inner tubs without necessitating major modifications of their structure.

[0043] The arrangement of the torsion bars in the internal cavities 22 of the pins 20 allows them to be positioned in the region of the ratio drive mechanism and

near the damper without interference between them.

[0044] It will be clear that variations and/or additions with respect to what is described above and illustrated may be adopted without departing from the scope of the invention.

[0045] In accordance with one embodiment, the fixed portion 16 out of the two portions 16, 17 of the damper 15 is connected so as to be integral in rotation with the flap 3, 3' and the rotatable portion 17 out of the said two portions is connected in rotation, by the said ratio drive mechanism 18, 19, to the inner tub 1, which is the reverse of the kinematic flow path of the embodiment described earlier.

[0046] In accordance with another embodiment, illustrated for example in Figure 2, the damper 15 is fixed to the side wall 7 of the inner tub 1 at the end of the pin 20 of the flap 3, 3', in such a way that the drive wheel 19 can be connected directly to the end of the pin 20 without major modifications to the inner tub 1 and to the flaps 3, 3'. The torsion bar 23 is inserted into the pin 20 at the same end thereof, in which one transverse end 24 thereof bears against the side wall 7 of the inner tub and the other against the flap 3, 3' approximately halfway along the pin 20. The drive wheel 19 is preferably in the form of a sector of a circle so as to not to project, when the flap 3, 3' is closed, into the inner tub 1 (Figure 3).

[0047] In accordance with another embodiment, there are two dampers 15 and 15' whose rotatable portions 17 are connected to a single driven wheel 18. The dampers 15, 15' and the ratio drive mechanism, i.e. the drive wheel 19 and driven wheel 18, are preferably arranged approximately halfway along the pin 20 and therefore centrally with respect to the width of the side wall 7 and with respect to the width of the flaps 3, 3'.

[0048] Figures 6 to 9 show further advantageous examples of dampers that can be used in the present invention.

[0049] Figure 6 shows for example an embodiment in which a ring or strip of foam rubber 25, for example of "Vulkolan" type, is wound around an elastic expansion band 32 connected to the spindle 17. This packet, consisting of spindle 17, elastic band 32 and foam rubber 25, is inserted into the housing 16 in such a way that the foam rubber ring 25 is pushed elastically, by a predetermined force, against the inside surface of the housing 16. The damper is advantageously sealed by plates 33 with suitable seals 34.

[0050] In an embodiment shown for example in Figure 8, the slowing means of the damper 15 takes the form of a compressed layer of foam rubber 25.

[0051] In another embodiment the compressed layer of foam rubber 25 is further coated or impregnated with lubricating grease.

[0052] In another embodiment, shown in Figure 7, the slowing means of the damper 15 consist of a predetermined number of hollow rubber cylinders 26, in which each of the cylinders 26 is arranged between two plates 27, preferably circular and integral in rotation with the

spindle 17. The damper can be calibrated by varying the number of rubber cylinders 26 and by their diameter and total length which determine the degree of radial and axial compression of the cylinders 26, once inserted into the housing 16 of the damper 15.

[0053] In accordance with another embodiment, shown for example in Figure 9, the slowing means comprise a cam 31 integral with the spindle 17 and a hollow cylinder 28 of flexible material, for example rubber, connected integrally to the housing 16, for example by means of projections 29 that engage in corresponding grooves 30, in which the cam 31 is fitted with interference inside the hollow cylinder 28.

[0054] Between the cam 31 and the hollow cylinder 28 there is advantageously a film of silicone or lubricating grease.

[0055] In accordance with an alternative embodiment, the damper is a translational damper, in which the relative movement between the two portions (16, 17) is a translational movement.

[0056] In accordance with other embodiments of the invention, the ratio drive mechanism takes the form of friction, belt, chain and suchlike drives.

[0057] Clearly, to fulfil any specific requirements which may arise, other modifications and alterations may be made by those skilled in the art to the inner tub according to the present invention, all such modifications and alterations however being contained within the scope of protection of the invention as defined in the following claims.

Claims

1. Inner tub (1) for a clothes washing machine, washer-dryer or tumble dryer, comprising
 - an access door (2) with at least one flap (3, 3') connected rotatably, by a hinge (4), to the inner tub (1) and loaded by elastic means (14) that move the flap (3, 3') to an open position; and
 - a damper (15) for slowing the movement of the flap (3, 3'), comprising two portions (16, 17), the relative movement of which is damped, in which the said two portions (16, 17) are connected, one to the inner tub (1), and the other to the flap (3, 3'), with the interposition of at least one ratio drive mechanism (18, 19), in such a way that the relative velocity ω_A between the two portions (16, 17) is greater than the relative velocity ω_C between the flap (3, 3') and the inner tub (1).
2. Inner tub (1) according to Claim 1, in which the damper (15) is a rotary damper, the relative movement between the two portions (16, 17) being a rotary movement, and the two portions (16, 17) are coupled in rotation, one to the inner tub (1), and the

other to the flap (3, 3'), with the said ratio drive mechanism (18, 19) interposed between them, in such a way that the relative angular velocity ω_A between the two portions (16, 17) is greater than the relative angular velocity ω_C between the flap (3, 3') and the inner tub (1).

3. Inner tub (1) according to Claim 1 or 2, in which one fixed portion (16) out of the two portions 116, 17) is connected so as to be integral in rotation with the inner tub (1) and one rotatable portion (17) out of the two portions (16, 17) is coupled in rotation, by the said ratio drive mechanism (18, 19), to the flap (3, 3').
4. Inner tub (1) according to Claim 1 or 2, in which one fixed portion (16) of the two portions (16, 17) is connected so as to be integral in rotation with the flap (3, 3') and one rotatable portion (17) out of the two portions (16, 17) is coupled in rotation, by the said ratio drive mechanism (18, 19), to the inner tub (3, 3').
5. Inner tub (1) according to any one of the preceding claims, in which the said ratio drive mechanism (18, 19) gives a drive ratio ω_A / ω_C of between 1.1 and 3.0.
6. Inner tub (1) according to Claim 5, in which the said ratio drive mechanism (18, 19) gives a drive ratio ω_A / ω_C of between 1.5 and 2.5.
7. Inner tub (1) according to Claim 6, in which the said ratio drive mechanism (18, 19) gives a drive ratio $\omega_A / \omega_C = 2.0$.
8. Inner tub (1) according to any one of the preceding claims, in which the said ratio drive mechanism (18, 19) comprises a gear pair (18, 19).
9. Inner tub (1) according to Claim 8, in so far as it depends on Claim 2, in which the said gear pair (18, 19) comprises a drive wheel (19) integral in rotation with the flap (3, 3') and a driven wheel (18) integral in rotation with the rotatable portion (17) of the damper (15), the said driven wheel (18) having a smaller radius than the radius of the drive wheel (19).
10. Inner tub (1) according to Claim 9, in which the drive wheel (19) is essentially in the form of a circular sector corresponding to the maximum angle of rotation of the flap (3, 3') relative to the inner tub (1).
11. Inner tub (1) according to Claim 9 or 10, in which the hinge (4) comprises a hinge pin (20) integral with the flap (3, 3') and one or more hinge seats (21) integral with the inner tub (1), and the drive wheel

(19) is connected to the said pin (20).

12. Inner tub (1) according to any one of the preceding claims, in which the damper (15) is positioned at a distance from the axis of rotation (20) of the flap (3, 3').
13. Inner tub (1) according to any one of the preceding claims, in which the damper (15) comprises a housing (16) that forms the said fixed portion (16) and defines an essentially cylindrical cavity which receives, in such a way that it can rotate, a spindle (17) forming the said rotatable portion (17), in which between the said spindle (17) and the housing (16) are means (25, 26, 27, 28, 29, 30, 31) for slowing the rotation of the spindle (17) in the cavity of the housing (16).
14. Inner tub (1) according to Claim 13, in which the said slowing means (25, 26, 27, 28, 29, 30, 31) comprise a film of silicone.
15. Inner tub (1) according to Claim 13, in which the said slowing means (25, 26, 27, 28, 29, 30, 31) comprise a compressed layer of a foam rubber (25).
16. Inner tub (1) according to Claim 14, in which the said compressed layer of foam rubber (25) is coated with lubricating grease.
17. Inner tub (1) according to Claim 13, in which the said slowing means (25, 26, 27, 28, 29, 30, 31) comprise a cam (31) integral with the spindle (17) and a hollow cylinder (28) of flexible material integral with the housing (16), in which the cam (31) is an interference fit inside the hollow cylinder (28).
18. Inner tub (1) according to Claim 17, in which a film of silicone or lubricating grease is provided between the said cam (31) and the said hollow cylinder (28).
19. Inner tub (1) according to Claim 1, in which the damper (15) is a translational damper, the relative movement between the two portions (16, 17) being a translational movement.
20. Top-loading clothes washing machine comprising an inner tub according to any one of the preceding claims.

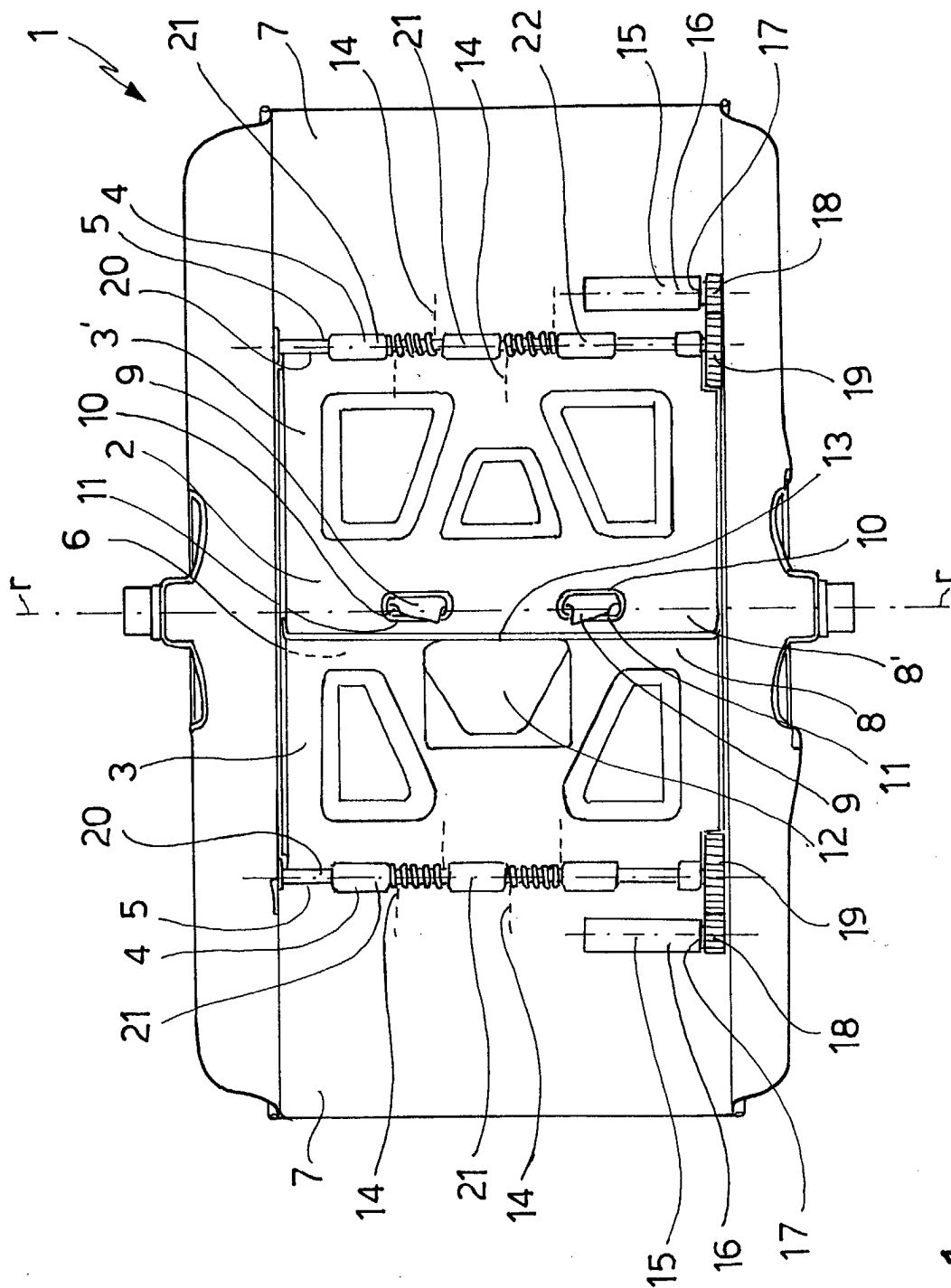
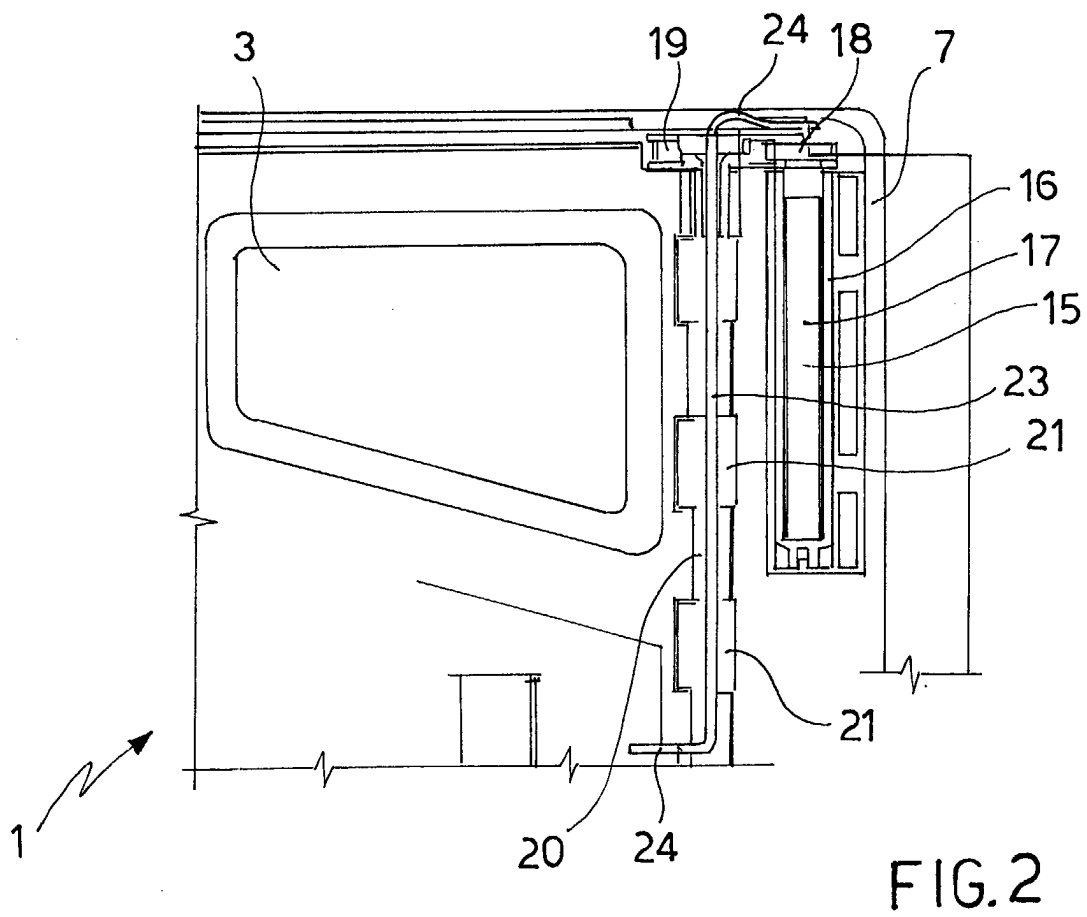
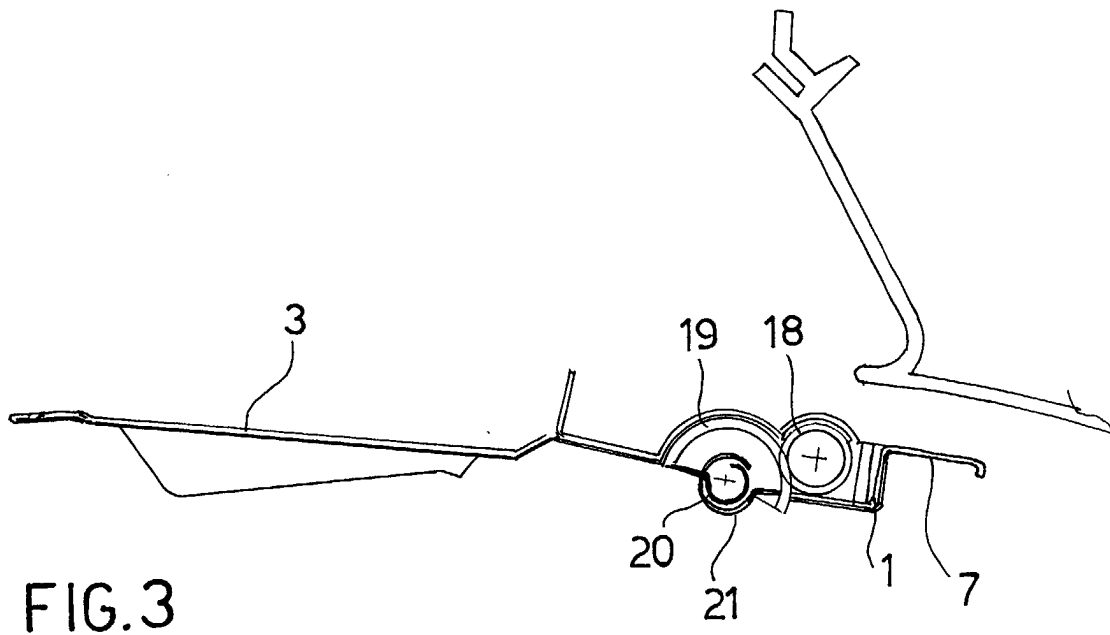
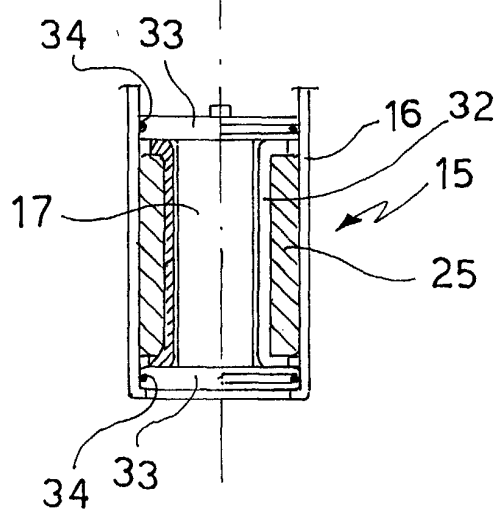
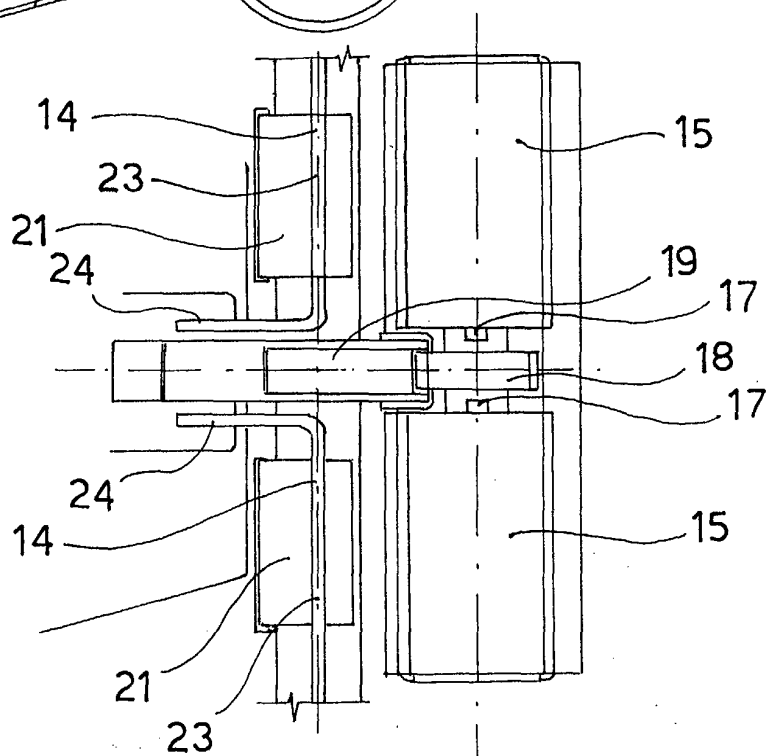
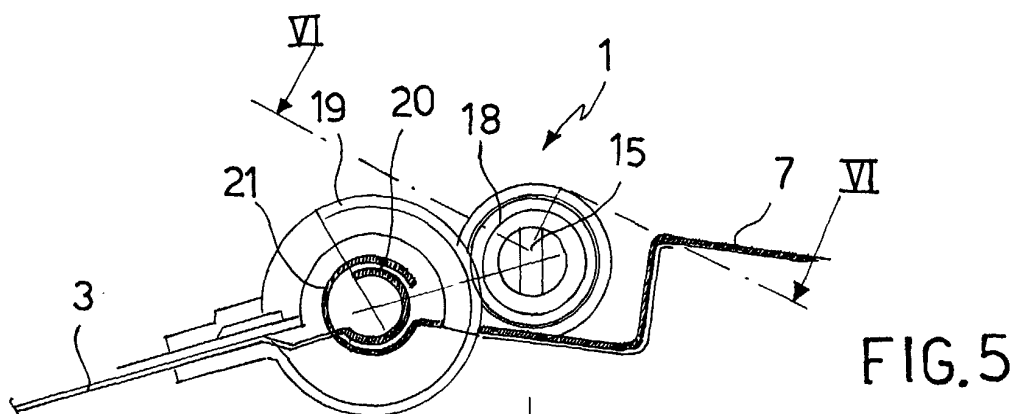


FIG.1





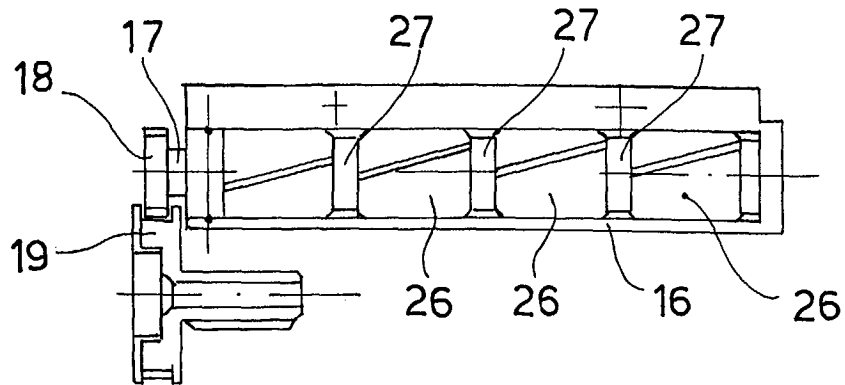


FIG. 7

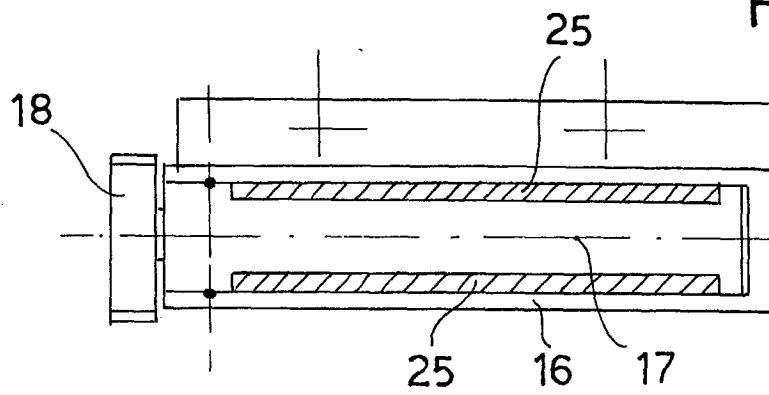


FIG. 8

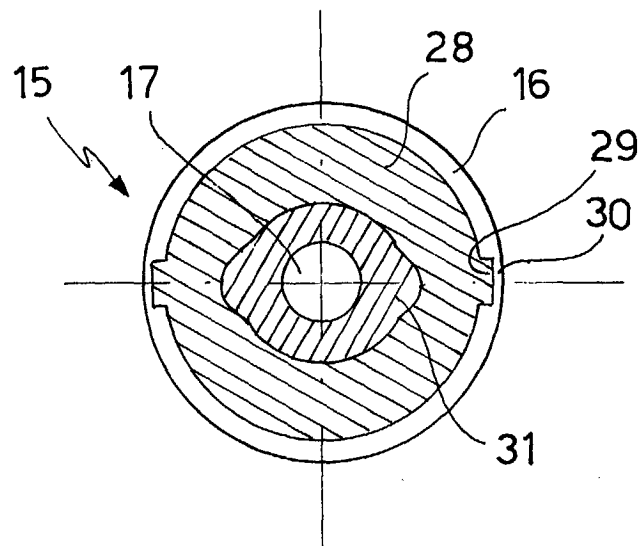


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5227

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A,D	FR 2 793 265 A (ELECTROLUX ZANUSSI ELETTRODOME) 10 November 2000 (2000-11-10) * the whole document *	1-20	D06F37/10
A	FR 2 811 009 A (CIAPEM) 4 January 2002 (2002-01-04) * claim 1; figures 3,4 *	1-18,20	
A	DE 195 15 878 C (MIELE & CIE) 28 November 1996 (1996-11-28) * claim 1; figures 1-3 *	1,19	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D06F E05F
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 9 September 2003	Examiner Weinberg, E
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EPO FORM 1503 03.82 (P04001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 42 5227

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09-09-2003

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
FR 2793265	A	10-11-2000	IT	PN990040 A1	06-11-2000
			DE	20007903 U1	20-07-2000
			ES	1046477 U1	01-01-2001
			FR	2793265 A1	10-11-2000

FR 2811009	A	04-01-2002	FR	2811009 A1	04-01-2002

DE 19515878	C	28-11-1996	DE	19515878 C1	28-11-1996
			DE	19644756 A1	30-04-1998
