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(54) Door for front-loading washing machine

(57) A door is described for front-loading washing machine comprising a unit (1) with front panel (9) having an opening (2) for loading laundry to be washed with the door (3) suitable for closing the opening. The door has a frame (31) and an inner part (32); the inner part comprises

a circular peripheral part (35) and is shaped so that the horizontal section passing through the centre (C) of the door comprises a central convex part (33) and two concave parts (34) which are adjacent and connect up to the convex part and with the circular peripheral part (35) of the door.

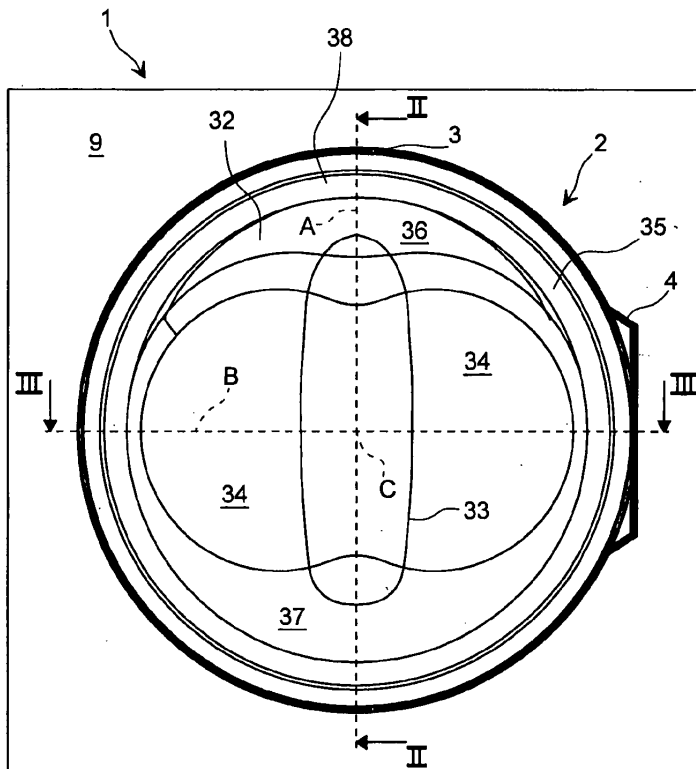


Fig.1

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Description

[0001] The present invention refers to a door for front-loading washing machine.

[0002] Front-loading washing machines comprise a unit having a tub comprising a drum, normally with horizontal axis; the drum has an opening for loading the laundry to be washed which is aligned with the opening of the unit. Said opening is closed by an openable door hinged to the unit.

[0003] The door is generally shaped like a porthole and comprises a transparent glass part with a plastic frame. The door has a ring-shaped seal which, once the door has been closed, presses up against the edge of the opening to prevent water and detergent coming out during washing.

[0004] Normally the glass part of washing machine doors is a recess shaped so as to keep the laundry inside the washing drum and prevent the laundry being damaged during washing or spin-drying operations.

[0005] In view of the described state of the art, the object of the present invention is to provide a door for front-loading washing machines that upgrades the washing action of the washing machine itself.

[0006] In agreement with the present invention, such object is achieved by means of a door for front-loading washing machines comprising a unit with a front panel having an opening for loading the laundry to be washed with said door suitable for closing said opening, said door comprising a frame and an inner part, said inner part comprising a circular peripheral part, characterised in that the inner part of said door is shaped so that the horizontal section passing through the centre of the door comprises a convex central part and two concave parts adjacent to one another and which connect up with the convex part and the circular peripheral part of the door.

[0007] Thanks to the present invention, it is even possible to make a front-loading washing machine as defined in claim 6.

[0008] The characteristics and the advantages of the present invention will appear evident from the following detailed description of one of its practical embodiments, given by way of non-limiting example in the attached drawings in which:

the figure 1 is a front view of the door for front-loading washing machine in agreement with the present invention;

the figure 2 is a schematic view in vertical section according to the line II-II of the door of figure 1;

the figure 3 is a schematic view in horizontal section according to the line III-III of the door of figure 1;

the figure 4 is an enlarged view of a detail of the door of figure 3;

the figure 5 is a perspective view of the door of figure 1.

[0009] With reference to the figures 1-5 a door is shown

for front-loading washing machine in agreement with the present invention. The washing machine, preferably a laundry washing machine, has in a known way a unit 1 comprising a front panel 9 having an opening 2 for loading the laundry to be washed, a washing tub fitted inside the unit and containing a drum fitted inside the tub in a revolving way and the drum and the tub (not visible in the illustrations) have respective openings aligned the one with the other and with the opening of the unit. The opening 2 of the unit 1 is closed by a door 3 hinged in 4 to the unit 1.

[0010] The door 3 is of the porthole type and comprises a circular frame 31 and an inner part 32, preferably in glass. The inner part 32 comprises a central part 33 with a convex part 33 adjacent to two concave parts 34. More precisely, the inner part 32 of the door 3 is shaped so that the horizontal section passing through the centre C of the door (figure 3) comprises the convex part 33 arranged at the centre of the inner part 32 and the concave parts 34 adjacent to the part 33; the concave parts 34 connect up on one side with the convex part 33 and on the other side with a circular peripheral part 35 of the door 3. Said shaping of the inner part 32 stretches vertically for at least half the height H of the door 3.

[0011] The convex part 33 has a lower horizontal extension than each concave part 34; the concave parts 34 preferably have the same horizontal extension.

[0012] The circular peripheral part 35 is adjacent to and integral with the frame 31. The circular peripheral part 35 has a shape identical to that of the known doors; this way it is not necessary to change the joint of the opening of the washing machine that presses up against the door 3 and more precisely with the circular peripheral part 35 of the door 3. This way, the door 3 can be used for any type of front-loading washing machine.

[0013] The inner part 32 of the door is shaped symmetrically with respect to the vertical axis A passing through the centre C of the door 3. The convex part 33 protrudes further from the inner profile P of the door than do the concave parts 34, i.e., it has a greater depth of the concave parts 34 with respect to the profile P on the side of the door which, with the door closed, is fitted inside the opening 2. The profile P is a vertical axis passing through the inner part of the frame 31 of the door P, i.e., the part of the frame 31 that presses up against the front panel of the unit 1 when the door 3 is closed.

[0014] As is better shown in the figure 5, the convex part 33 stretches along the vertical axis A passing through the centre C of the door 3 while the concave parts 34 connect up with said convex part 33 and with the circular peripheral part 35 of the door.

[0015] The door therefore has a double involute symmetric with respect to the central axis A.

[0016] Once arranged so as to close the opening 2 of the unit and therefore of the washing machine drum, the door 3 allows a greater revolution action of the laundry load acting on the involute surface of the porthole door. In fact, the result is a greater twisting of the laundry which

wraps up in partial rotation and slips on the parts 34 of the door by means of a movement with direction shown by the arrows F in figure 5; the rotary movement of the laundry is substantially crossways to the typical rotary movement of the washing-machine drum. Said rotary movement of the laundry according to the arrows F combined with the typical rotary movement of the drum helps ensure more effective laundry washing.

[0017] The inner part 32 of the door is furthermore shaped asymmetrically with respect to the horizontal axis B passing through the centre C of the door 3 (figure 2). In fact, by dividing the door into a lower part 37 and an upper part 36, the upper part 36 has a different shape with respect to the lower part 37. The convex part 33, arranged centrally and adjacent to the two concave parts 34, connects up with the upper extremity 38 of the circular peripheral part 35 by means of a concave part 39. The particular shape of the upper part 36 helps increase the effectiveness of the rotary movement according to the arrows F of the laundry load in the drum.

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6. Front-loading washing machine comprising a unit (1) with a front panel (9) having an opening (2) for loading laundry to be washed and a door (3) suitable for closing said opening, a washing tub fitted inside the unit and containing a drum fitted inside the tub in a revolving way, the drum and the tub having respective openings aligned the one with the other and with the opening of the unit, **characterised in that** said door is defined as in any one of the preceding claims.

Claims

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1. Door for front-loading washing machine comprising a unit (1) with a front panel (9) having an opening (2) for loading the laundry to be washed with said door (3) suitable for closing said opening, said door comprising a frame (31) and an inner part (32), said inner part comprising a circular peripheral part (35), **characterised in that** the inner part (32) of said door is shaped so that the horizontal section passing through the centre (C) of the door comprises a central convex part (33) and two concave parts (34) which are adjacent and connect up with the convex part and with the circular peripheral part (35) of the door.
 2. Door according to claim 1, **characterised in that** said shaping of the inner part (32) of the door stretches vertically for at least half the height (H) of the door.
 3. Door according to claim 1 or 2, **characterised in that** said convex part (33) stretches along the vertical axis (A) passing through the centre of the door and said inner part is symmetrical with respect to said vertical axis passing through the centre of the door.
 4. Door according to claim 1, **characterised in that** said convex part (33) protrudes more than the concave parts (34) with respect to the inner profile (P) of the door.
 5. Door according to claim 1, **characterised in that** said inner part (32) of said door is shaped so that the upper extremity (36) of said convex part (33) connects up with the circular peripheral part (35) by means of a concave part (39).

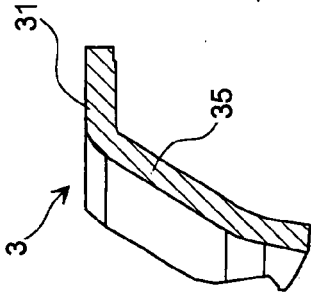


Fig. 4

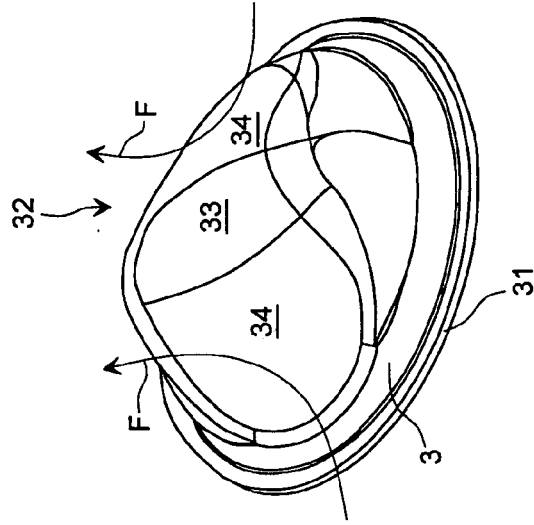


Fig. 5

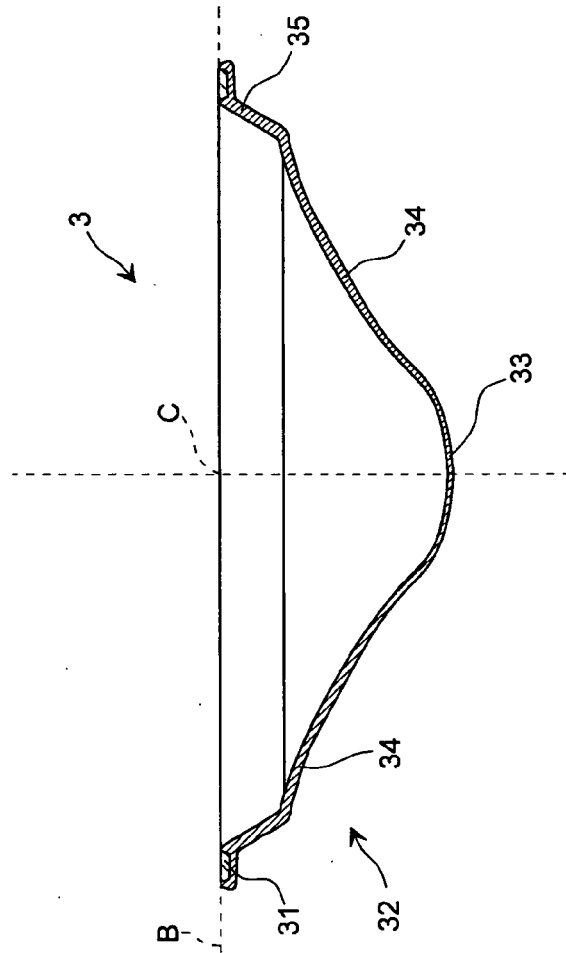


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5404

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2006 012320 U1 (V ZUG AG [CH]) 5 October 2006 (2006-10-05) * paragraphs [0014], [0 15], [0 18]; figure 1 *	1-6	INV. D06F37/28 D06F39/14
A	----- WO 2006/072904 A1 (ARCELIK ANONIM SIRKETI [TR]; OZDEMIR YASEMIN [TR]; GULAY ERSAN [TR]; A) 13 July 2006 (2006-07-13) * claim 1; figure 6 * -----	1-6	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 April 2010	Examiner Dupuis, Jean-Luc
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	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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

EP 09 42 5404

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-04-2010

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WO 2006072904 A1	13-07-2006	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82