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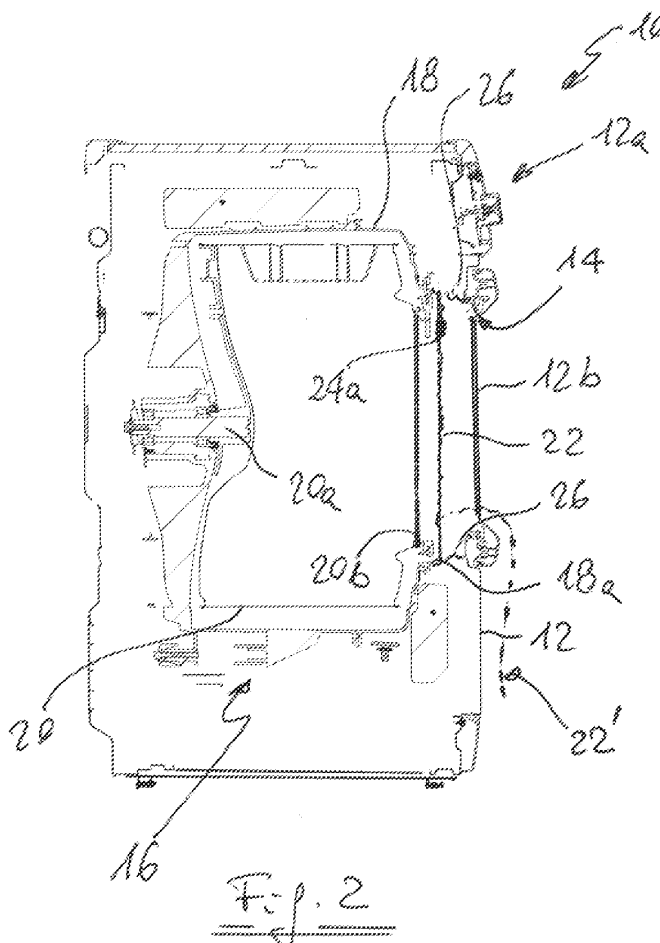
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(54) **Washing machine**

(57) A washing machine, particularly a front loading washing machine, comprises a cabinet (12) containing a wash unit (16) having a front opening (18a) aligned with

a front opening of the cabinet (12) which is closed by a watertight foldable component made of fabric or the like, access means (24,24a) being provided for opening/closing such component in order to load/unload laundry.



Description

[0001] The present invention relates to a washing machine, particularly a front loading machine, comprising a cabinet containing a wash unit having a front opening aligned with a front opening of the cabinet. The wash unit comprises a cylindrical tub mounted within the cabinet and a cylindrical drum rotatably mounted within the tub and having a front opening substantially aligned with the front opening of the tub.

[0002] It is well known in the art of washing machines that unbalanced load causes the wash unit to move inside the cabinet, transmitting forces and vibrations through dampers, suspension springs and the rubber bellow to the cabinet and other components as well as to the floor.

[0003] A solution for decreasing the amount of forces transmitted from the wash unit to the cabinet, particularly of a top loading washing machine, is disclosed in EP application 09152750. Nevertheless to apply the solution disclosed in such application to front loaders is quite complicated, mainly because the fabric connection element shown in EP 09152750 will have to withstand a constant static pressure of water. Moreover the simple replacement of a traditional rubber bellow of a front loading washing machine with a tubular component of water-tight fabric material would not solve the ancillary problem of increasing the volume of the tub, the dimension of the cabinet remaining the same.

[0004] An object of the present invention is to provide a washing machine which can solve the above technical problems in a simple and economical way.

[0005] The above object is reached thanks to the features listed in the appended claims.

[0006] The solution according to the invention consists mainly of a flat foldable component, with the overall shape of the tub opening, preferably made of a technical waterproof fabric with very low stiffness that is attached and sealed at the tub opening circular edge. With the term "foldable component" we mean any kind of component which is sufficiently flexible to be folded once a zip-fastener or similar device creates a cut in its surface; instead of a fabric or the like, such component can be made of any flexible and/or foldable polymeric films.

[0007] The flat foldable component can be glued, welded or over molded at the front surface of the tub. Additional clamps or retainer may be also used for this purpose.

[0008] The solution according to the invention allows avoiding any contact of water or laundry with the tubular connection item between the washing unit and the cabinet, still maintaining the advantages of the fabric technology disclosed by the above patent application.

[0009] Moreover with the solution according to the present invention it is not necessary to use either the traditional glass door which is subtracting volume from the drum capability or the current rubber bellow which is subtracting volume from the cabinet capability.

[0010] The technical solution according to the present

invention allows increasing the drum volume, without any increase of the overall volume of cabinet.

[0011] According to another feature of the present invention, it is possible to open and close a clearance through the fabric component closing the washing unit by means of a waterproof zip-fastener or a device similar to a vacuum bag closure that allows the customer to have access to the inside of the wash unit.

[0012] Thanks to this solution, it would also be possible to connect more easily wash unit and cabinet using an auxiliary fabric connection element, since this connection would not have to withstand the static water pressure anymore.

[0013] Benefits will be both in terms of force and vibration transmission between wash unit and cabinet and in terms of optimal use of cabinet volume or in terms of drum volume increase.

[0014] The fabric component must fulfill the technical requirements of the operating environment which are resistance (shrinkage, swelling, fatigue, etc.) to water and detergent solution with temperatures ranging from 10°C to 95°C as well as vapor and chemical solutions (including ozone) as can be found in a washing machine as well as steam, occasional contact to adjacent components at lower frequencies, contact with laundry items at high speeds, contact without tearing with sharp objects of laundry (i.e. zippers) during loading, unloading and washing, and de-colorization due to the above.

[0015] Further advantages and features according to the present invention will be clear from the following detailed description, provided as non limiting example, with reference to the attached drawings in which:

- figure 1 is a front view of a washing machine according to the present invention; and
- figure 2 is a cross section of the machine of figure 1.

[0016] With reference to the drawings, a front loading washing machine 10 comprises a cabinet 12 having a user interface 12a and a flat transparent door 12b made of polymeric material and closing a circular front opening 14 of the cabinet. Inside the cabinet a washing unit 16 is placed, such unit comprising a tub 18 supported by the cabinet 12 through springs and dampening means (not shown) and a drum 20 rotatably mounted within the tub and driven through a central shaft 20a by an electric motor (not shown).

[0017] The tub 18 has a front opening 18a aligned, on one side, with the front opening 14 of the cabinet 12 and, on the other side, with the front opening 20b of the drum 20.

[0018] The circular opening 18a of the tub 18 is closed by a fabric 22 with is welded, glued or tightly fixed in other ways to the tub, so as to provide a waterproof closure of the tub.

[0019] The fabric 22 can be made of polyethylene (PP) fibers, polyacrylate (PA) fibers or polyester (PET) fibers. These fabrics may be used as they are (due to their wa-

terproof properties, or coated by a plastic material such as polyacrylate or polyurethane. Furthermore the textile structure 22 can be either woven or knitted.

[0020] In order to allow the user to place the laundry inside the wash unit 16 the fabric 22 presents an opening-closing system 24 in the fabric surface.

[0021] This opening-closing system 24 is preferably realized by means of a waterproof zip-fastener 24a of circular shape or a system (not shown) similar to a vacuum bag closure. The circular shape of the zip-fastener 24a allows the user to easily fold the central portion of the fabric 22 so that a sufficiently wide opening is created for loading/unloading laundry in the drum 20. The zip-fastener 24a is interrupted in a lower portion of the fabric 22 so that this latter, in its open configuration, can be folded down as shown in dotted line in figure 2 with the reference 22' (of course in this configuration the flat door 12b should be also in its open configuration). According to a further embodiment (not shown), the fabric 22 can have a central rigid portion defining an annular zone in which the zip-fastener 24a is placed. The thick plastic door 12b, whose internal surface can be in contact with the fabric surface, gives more stiffness to this surface, determining the plane on which it is laying. According to a further feature of the present invention, the connection between the cabinet 12 and the wash unit 16 can be realized by means of a simple tubular fabric item 26 that will have only the function of preventing the user from being in touch with internal components, without a sealing function. Of course such tubular item 26 can be omitted.

[0022] All the interfacing areas may be treated or modified to achieve better fit (i.e. over molded or coated with rubber, plastic, metal or rubber parts sewn into the fabric). The advantage compared to existing solutions i.e. rubber bellows and sealing is the high flexibility and independence of geometric "decoupling" features of the fabric compared to the material- and geometric stiffness of current rubber seals. Fabric will not buckle under tangential load, hence not creating high reaction forces. This may allow for a design utilizing less space.

[0023] The advantages compared to the current front loading traditional systems are mainly the possibility of sealing the wash unit with respect to water and fabric directly at the tub interface, and a connection between tub and cabinet that will not have to resist a static water pressure anymore, and consequently it will be easier to use a fabric connection between tub and cabinet.

[0024] Since less force will be transmitted through the fabric connection, this connection will be shorter: this will lead to a bigger drum volume at the same external cabinet volume.

[0025] The door glass will not be anymore a sealing element as it is now, but it will be substituted by a simpler and cheaper plastic door.

Claims

1. Washing machine, particularly front loading machine, comprising a cabinet (12) containing a wash unit (16) having a front opening (18a) aligned with a front opening (14) of the cabinet (12), **characterized in that** the front opening (18a) of the wash unit (16, 18, 20) is closed by a foldable watertight component (22), access means (24, 24a) being provided for opening/closing such component (22) in order to load/unload laundry.
2. Washing machine according to claim 1, wherein the foldable watertight component comprises at least a portion made of fabric or the like.
3. Washing machine according to claim 2, wherein such component (22) is made totally of fabric.
4. Washing machine according to any of the preceding claims, wherein the foldable watertight component is fixed to the wash unit (16, 18) by gluing, welding or over-molding.
5. Washing machine according to any of the preceding claims, wherein such access means (24) comprises a watertight zip-fastener (24a).
6. Washing machine according to claim 5, wherein said zip-fastener (24a) has a circular shape and is adjacent the front edge of the opening (18a) of the wash unit (16) to which the component (22) is fixed.
7. Washing machine according to claim 6, wherein the zip-fastener (24a) is interrupted in a lower portion of the foldable component (22) so that, when said component is in its open configuration, it can be folded down.
8. Washing machine according to claim 1, wherein the component (22) comprises a flat rigid portion fixed circumferentially to an annular subcomponent made of fabric.
9. Washing machine according to any of the preceding claims, wherein between the cabinet (12) and the wash unit (16) a tubular auxiliary component (26) is interposed, such auxiliary component being made of flexible material.
10. Washing machine according to claim 9, wherein the auxiliary component (26) is made of fabric or the like.
11. Washing machine according to any of the preceding claims, wherein the front opening (14) of the cabinet (14) is closed by a flat door (12b).
12. Washing machine according to claim 11, wherein

the flat door (12b) is made of polymeric material.

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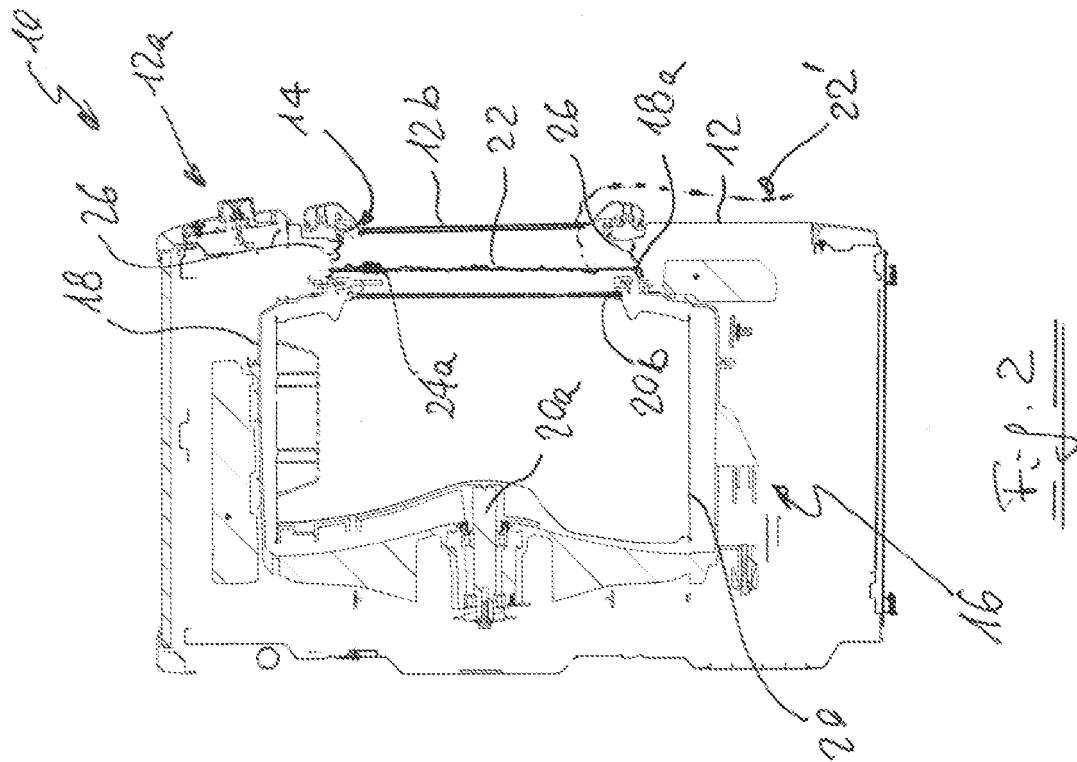
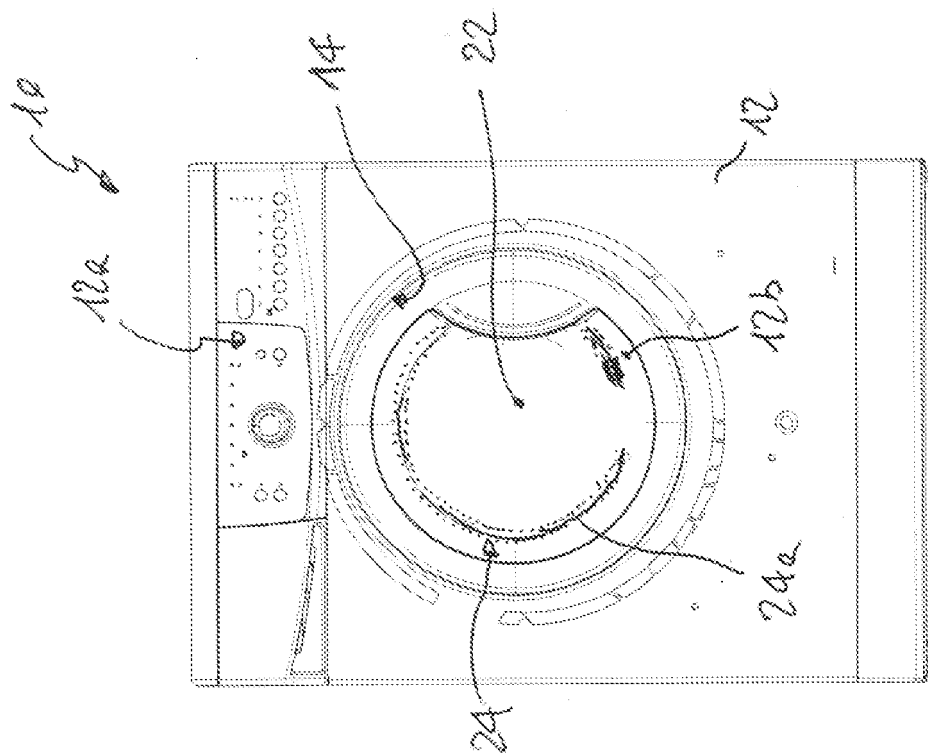
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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 4649

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			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 6 May 2010	Examiner Kising, Axel
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 17 4649

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
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06-05-2010

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