(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 640 494 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.03.2006 Bulletin 2006/13

(51) Int Cl.:
D06F 39/14 *(2006.01)*

(21) Application number: **04022493.3**

(22) Date of filing: **22.09.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

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Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) Improvement in the lid of a top-loading clothes washing machine

(57) The present invention refers to a top-loading clothes washing machine that comprises an upper lid (2) shutting the washing tub (1) and enabling access to be gained into the interior of the clothes-holding drum rotatably supported therewithin, an outer casing (3) and a hopper (4) situated in correspondence to said lid and possibly provided with a joining member (14) that seals the upper edge of the hopper against the upper edge of the outer casing, a top lid (6) provided with a counter-lid (7) on the lower side thereof, elastic gasket means (10) arranged between the counter-lid and an upper portion of the hopper, a groove (9) extending along the inner surface of the counter-lid and adapted to receive the elastic gasket means, the latter being formed by a ring of a suitable thermoplastic material over-injected into said groove close to the outer edges thereof. The portion of this ring that protrudes from the groove comprises two distinct lips (11a,11b) that are oriented inwards and outwards, respectively, relative to the ring itself.

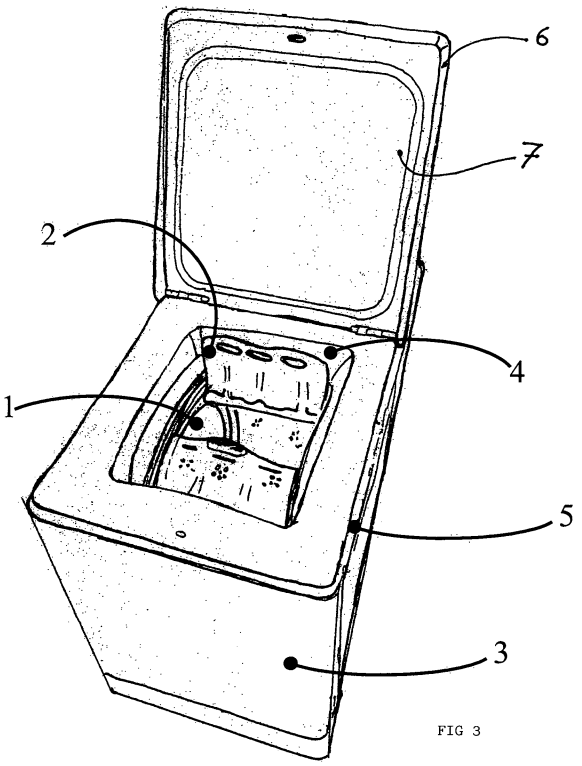

FIG 3

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Description

[0001] The present invention refers to a top-loading clothes washing machine of the kind provided with an improved top closing lid.

[0002] While reference is made in the following description to a top-loading clothes washing machine of a single-duty type, i.e. designed to only wash and spin-dry clothes, it will be readily appreciated that what is disclosed and explained in connection therewith may equally be applied to, and is therefore suitable for, a combined clothes washing and drying machine, i.e. a so-called washer-drier, as far as it is of the top-loading kind.

[0003] Top-loading clothes washing machines are generally known in the art to be provided with a top or upper lid of an essentially traditional kind, in which said lid is usually made in a sandwich-like manner with a top surface generally made of sheet-steel extending on a horizontal plane, and a corresponding lower surface, or counter-lid, made of plastics and facing towards the interior of the machine, i.e. towards the upper opening of the drum-holding tub.

[0004] Between this opening and said counter-lid there is provided a funnel-shaped member, forming practically a hopper, which is substantially intended to act as both a guiding member and a safety means.

[0005] As a guiding member, such a hopper-like member is designed to prevent the clothes being loaded in the drum from inadvertently slipping outside the upper loading aperture, while being guided to obligatorily fall through said loading aperture into the drum; in fact, along the upper portion thereof said hopper, along the upper portion thereof, is joined in a continuous manner with the upper edge of the outer casing of the washing machine, so that it is practically impossible for clothes to be placed on the machine, upon of course the lid thereof having been raised, without these clothes being spontaneously directed into the drum.

[0006] As a safety provision, such a hopper prevents a user from being able to gain access into the interior of the machine from above, thereby avoiding easily imaginable risks and dangerous situations.

[0007] However, the sole provision of such counter-lid usually gives rise to a drawback in that the steam generated inside the washing tub of the machine tends to seep through the passages it finds along the upper shutting lid of the tub and leaks into the surrounding ambient by passing through the interstice formed between the counter-lid and the upper portion of the hopper, or through the member joining the upper edge of the hopper with the upper edge of the outer casing of the machine.

[0008] In view of doing away with such drawback, a known prior-art solution lies in providing the lower surface of the counter-lid with an appropriate elastic sealing gasket, which is generally made as a closed-loop annular member and is arranged so that, when the lid is closed, it fully surrounds the upper aperture of the hopper and, as a result, closes and seals any passage that may exist between such aperture of the hopper and the peripheral or outermost zone of said counter-lid, as this is symbolically shown in Figure 1, which is a perspective view of the lower surface of an upwards facing counter-lid, and in Figure 2, which is a schematical, cross-sectional view of a portion of the counter-lid illustrated in Figure 1 as viewed along the A-A sectional plane.

[0009] Such solution is certainly effective and capable of being produced on an industrial scale. However, it proves rather demanding from a manufacturing point of view, since it requires a number of distinct manufacturing steps to be performed in order to:

- make such gasket member by extrusion,
- cut, prepare and properly shape said gasket member,
- apply an appropriate adhesive layer on the same gasket member,
- install the thus prepared gasket member on a proper groove provided in the lower surface of said counter-lid.

[0010] When added together, all these manufacturing steps generate an aggregate cost that, owing to both the number of the steps to be performed individually and the time required to complete all of them, turns out as being practically unacceptable in connection with such highly competitive and highly automated industrial manufacturing process as the one involved in the production of washing machines in general.

[0011] It would therefore be desirable, and it is actually a main object of the present invention, to provide a top-loading clothes washing machine, in which the manufacturing steps required to provide the lower gasket member of the counter-lid can be carried out and completed with simple, low-cost manufacturing operations allowing for a great extent of automation, without having to accept any drawback or disadvantage of a functional kind.

[0012] According to the present invention, these aims as set forth above, along with further ones that will become apparent from the following description, are reached in a top-loading clothes washing machine made so as to incorporate the features and characteristics as recited in the appended claims. Features and advantages of the present invention will anyway be more readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 3 is a symbolical perspective top view of the upper portion of a top-loading clothes washing machine with its lid in a partially open state;
- Figure 3A is a perspective view of the lower surface of the lid illustrated in Figure 3, as shown in the state in which it faces upwards;

- Figure 4 is a cross-sectional view along the sectional plane Z-Z of Figure 3A of a portion of a counter-lid according to the present invention;

- Figure 5 is a cross-sectional view similar to the one appearing in Figure 4 of a further improved embodiment of a counter-lid according to the present invention;

- Figures 6 and 7 are cross-sectional views of two further improved embodiments of a counter-lid according to the present invention, respectively;

- Figure 8 is a symbolical view similar of a further improved embodiment of a gasket member of a counter-lid according to the present invention;

- Figure 9 is a view corresponding to the one appearing in Figure 3 of a different embodiment of a top-loading clothes washing machine, as shown with its lid in a partially open state.

[0013] With reference to Figures 3 and 3A, in a top-loading clothes washing machine according to the present invention there are provided a washing tub 1 in which there is rotatably supported the inner drum holding the clothes to be washed, an upper lid 2 enabling access to the interior of the inner drum to be gained from above, an outer casing 3, a hopper 4 which is located above the upper aperture of the tub 1 and joins with its upper portion with the outer upper edge 5 of the outer casing 3, an upper lid 6 provided with a lower counter-lid 7.

[0014] With reference to Figure 4, in the lower surface 8 of said counter-lid 7 there is provided a groove 9 extending in a closed-loop pattern therearound to substantially surround the loading aperture of said hopper 4when the lid 6 is closed.

[0015] Using the by now largely known overinjection technique, in this groove 9 there is formed a gasket 10 of a suitable thermoplastic, elastic material, wherein said gasket does not only fill up said groove, but also protrudes outwardly therefrom all along the extension thereof; therefore, when the lid is lowered into closing, said gasket protrudes downwards, so that the resulting outward protrusion 11 comes to arrange itself in the form of a closed-loop ring elastically separating said counter-lid, and the related lid, from said hopper. In addition, the resulting separation is a continuous one extending evenly all along the closed loop formed by the groove 9 with a constant cross-section. This feature also enables a steam-tight sealing effect to be obtained between the inside of the hopper and the outer ambient, when the lid is closed, since the lid carrying said sealing gasket means is in this manner capable of actually working as a "stopper" plugging said hopper.

[0016] It can therefore be readily appreciated that the above-mentioned overinjection technique is fully effective in enabling the main purpose of the present invention, aimed substantially at cutting down the costs of providing said gasket as set forth earlier in this description, to be reached in an ideal manner. It can in fact be most readily appreciated that a single overinjection moulding operation is all that it takes to form a complete and definitively applied gasket on the counter-lid, without any additional operation being required or any interruption in the manufacturing cycle being introduced.

[0017] Furthermore, the above-mentioned overinjection moulding operation can be further optimised through a moulding sequence in which there is first moulded, eg. injection moulded, the counter-lid and said gasket is then overinjected onto the thus formed counter-lid immediately thereafter, i.e. before allowing the counter-lid to cool down excessively. This in fact enables a general improvement to be obtained as far as both the cost-effectiveness of the entire manufacturing step and the ultimate qualitative result are concerned, considering that if a base support to be overinjected is first heated up, the clinging, i.e. the adherence of the overinjected material to such base is much more effective.

[0018] The above-described invention allows for a number of advantageous improvements to be implemented. So, for instance, a first improvement lies in the possibility for the portion of said annular gasket 11 protruding from said groove to be subdivided into two distinct lips 11A and 11B, as this is shown schematically in Figure 6, where it can be noticed that these two lips are oriented inwards and outwards, respectively, relative to the gasket itself, so that, further to improving the elastic dampening effect, they prevent air or foreign bodies from passing therethrough in either direction.

[0019] A second improvement lies in the possibility for said gasket to be made by providing it with a thickness that increases gradually starting from the position thereof near the hinges, i.e. the rear position of said gasket, and moving towards the opposite, i.e. front position thereof. Figures 6 and 7 show respective cross-sectional views of the gasket with its respective lips 11A and 11B, in which Figure 6 illustrates the cross-section profile of the gasket in correspondence of the side "11A", whereas Figure 7 illustrates the cross-section profile of the gasket in correspondence of the side "11B". It should be noticed how, in the first case (Figure 6), said gasket has a height m that is lower than the height M of the same gasket on the side shown in Figure 7.

[0020] Such solution is generally preferred and used since loads, stresses and shocks imposed from above, and even the closing speed and, as a result, the speed at which the gasket on the counter-lid strikes against the hopper surface, are generally greater in the front zone of the lid.

[0021] It should be briefly noted here that such differentiated sizes of the gasket are certainly not so easy to obtain with the prior-art technique of extrusion, in which the gasket id first extruded and then cut to length and attached to the counter-lid.

[0022] A further improvement is obtained by providing

a material interruption or gap 12 in the profile of the portion of gasket protruding from the groove 9, as this is symbolically illustrated in Figure 8. This gap allows gas to pass therethrough from said hopper to the outside ambient when said lid is closed.

[0023] In a preferred manner, the above-mentioned gap is situated in the rear portion of the gasket, i.e. on the side of the gasket that is opposite to the one facing the user. Such improvement enables a venting provision to be created for letting out air and steam forming inside the washing tub and generally seeping out from the lid of the machine, which must be exhausted outside without other internal parts of the machine being affected by it. In addition, by selecting the portion of the gasket on the rear side of the lid to locate such gap, the resulting vent will not let out steam directly into the space where the user generally stands.

[0024] It has been furthermore found experimentally that, among the most favourable conditions in view of overinjecting said gasket onto the counter-lid, the optimum ones are attained when the material which the counter-lid 7 is made of is polypropylene, in particular of the type known on the market under the trade name of "CARBORAN", as well as when the material used to overinject the gasket 10 is a thermoplastic material containing propylene, rubber, additives, oil, etc.

[0025] With reference to Figure 9, it should further be noticed that, in certain embodiments, the hopper 4 does not join directly with the upper portion of the outer casing, but rather extends upwards until it joins up with a joining member 14 that seals and joins horizontally the upper edge of said hopper with the outer upper edge 5 of said outer casing 3. It will in this case be appreciated that this gasket 10, along with all above-described improvements and embodiments thereof, refers to a similar or equivalent type of gasket, which however extends between said counter-lid and said joining member 14.

Claims

1. Top-loading clothes washing machine, or combined clothes washing a drying machine, comprising:

   - a tub (1) for holding and washing the clothes,
   - a drum housed and rotatably supported in said tub, and an upper lid (2) enabling access to be gained into the interior of said drum,
   - an outer casing (3),
   - a hopper (4) situated in correspondence to said upper lid (2) and possibly provided with a joining member (14) that seals the upper edge of said hopper against the upper edge (5) of said outer casing (1),
   - an upper lid (6) provided with a counter-lid (7) on the lower side thereof,
   - elastic gasket means provided between said counter-lid (7) and an upper portion of said hopper (4), or between said counter-lid and said joining member (14),
   - a groove (9) extending along the inner surface of said counter-lid and adapted to receive said elastic gasket means, **characterized in that** said elastic gasket means are formed by a ring of a suitable thermoplastic material over-injected into said groove (9) extending in the lower surface of said counter-lid (7), and in proximity of the outer edges thereof.

2. Top-loading clothes washing machine according to claim 1, **characterized in that** the portion (11) of said loop-like gasket (10) that protrudes from said groove (9) comprises two distinct lips (11A, 11B), one of which (11A) is oriented inwards and the other one (11B) is oriented outwards with respect to said gasket (10).

3. Top-loading clothes washing machine according to claim 1 or 2, **characterized in that** the thickness of the outer portion of said gasket (10) is not constant, and that said thickness is larger (M) **in that** portion of periphery (b) of said gasket which lies farther away from the hinge of said upper lid (6), whereas it is smaller (m) **in that** portion of periphery (a) of said gasket which lies closer to said hinge.

4. Top-loading clothes washing machine according to any of the preceding claims, **characterized in that** a material interruption or gap (12) is provided in said loop-like gasket (10) so as to allow gas to escape therethrough from said hopper into the outside ambient when said lid is closed.

5. Top-loading clothes washing machine according to claim 4, **characterized in that** said material interruption or gap (12) is provided in the rear side of said gasket (10).

6. Top-loading clothes washing machine according to any of the preceding claims, **characterized in that** said counter-lid (7) is made of polypropylene, and that said thermoplastic material of said gasket (10) contains propylene, rubber, additives, oil.

Amended claims in accordance with Rule 86(2) EPC.

1. Top-loading clothes washing machine, or combined clothes washing a drying machine, comprising:

   - a tub (1) for holding and washing the clothes,
   - a drum housed and rotatably supported in said tub, and an upper lid (2) enabling access to be gained into the interior of said drum,
   - an outer casing (3),

- a hopper (4) situated in correspondence to said upper lid (2),
- a further upper lid (6) provided with a counter-lid (7) on the lower side thereof,
- elastic gasket means provided between said counter-lid (7) and an upper portion of said hopper (4),
- a groove (9) extending along the inner surface of said counter-lid and adapted to receive said elastic gasket means, which are formed by a ring of a suitable thermoplastic material over-injected into said groove (9) extending in the lower surface of said counter-lid (7), and in proximity of the outer edges thereof, **characterized in that** a portion (11) of said loop-like gasket (10) protrudes outwardly from said groove (9) comprises two distinct lips (11A, 11B), one of which (11A) is oriented inwards towards the central vertical axis of the machine and the other one (11B) is oriented outwards away from the central axis of the machine with respect to said gasket (10).

2. Top-loading clothes washing machine according to claim 1, **characterized in that** the thickness of the outer portion of said gasket (10) is not constant, and that said thickness is larger (M) **in that** portion of periphery (b) of said gasket which lies farther away from the hinge of said upper lid (6), whereas it is smaller (m) **in that** portion of periphery (a) of said gasket which lies closer to said hinge.

3. Top-loading clothes washing machine according to any of the preceding claims, **characterized in that** a material interruption or gap (12) is provided in said loop-like gasket (10) so as to allow gas to escape therethrough from said hopper into the outside ambient when said lid is closed.

4. Top-loading clothes washing machine according to claim 3, **characterized in that** said material interruption or gap (12) is provided in the rear side of said gasket (10).

5. Top-loading clothes washing machine according to any of the preceding claims, **characterized in that** said counter-lid (7) is made of polypropylene, and that said thermoplastic material of said gasket (10) contains propylene, rubber, additives, oil.

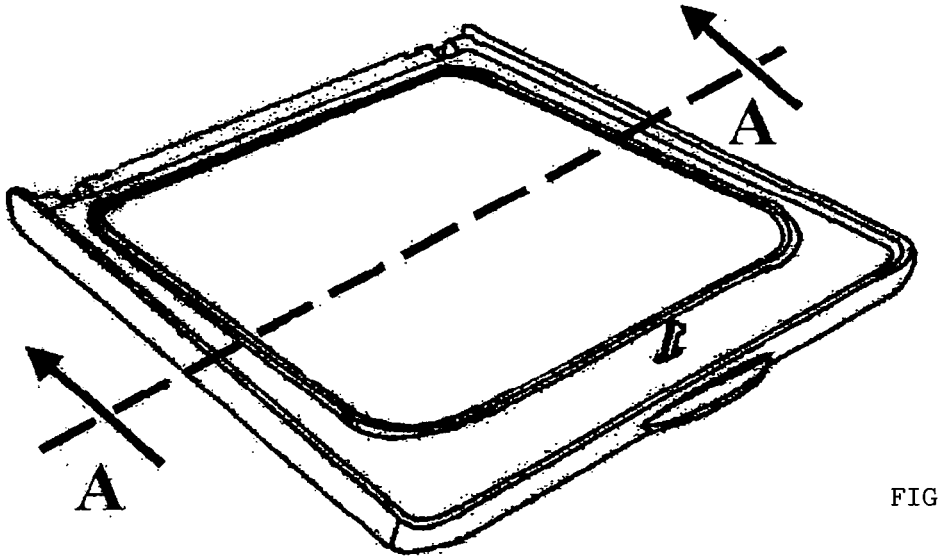

FIG 1

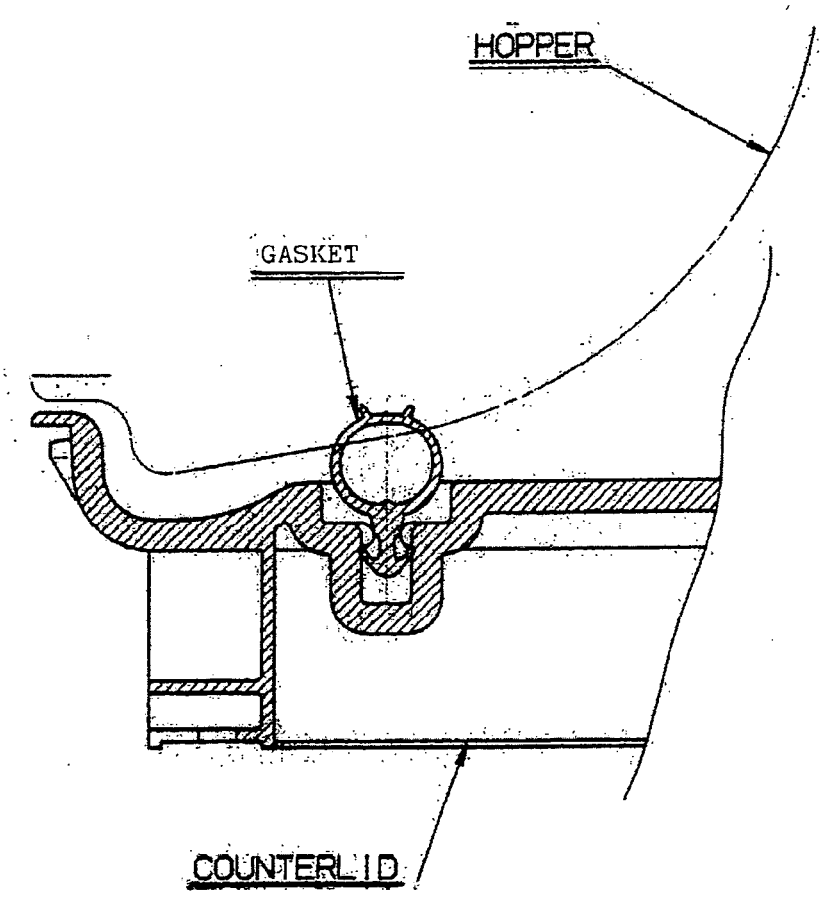

FIG 2
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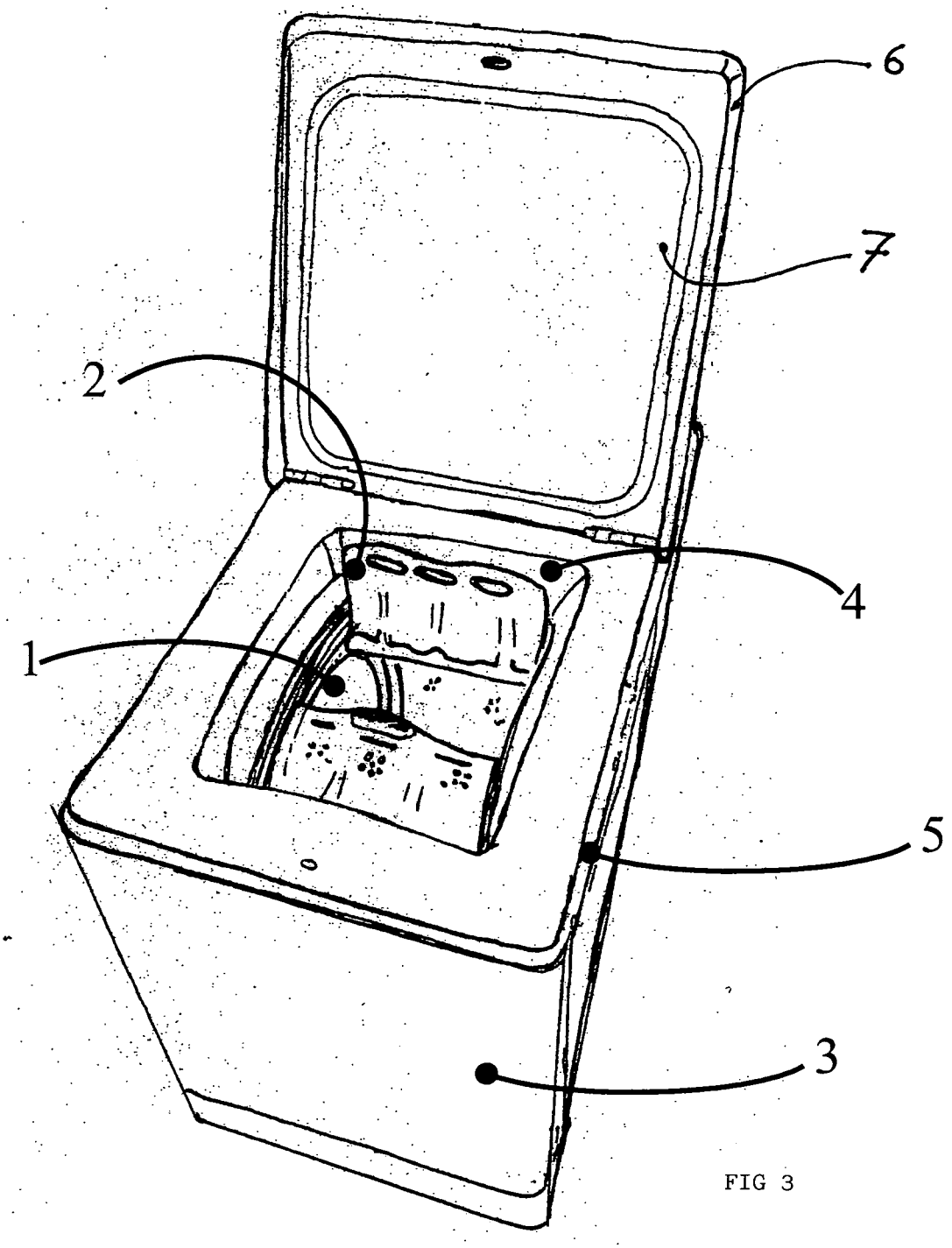

FIG 3

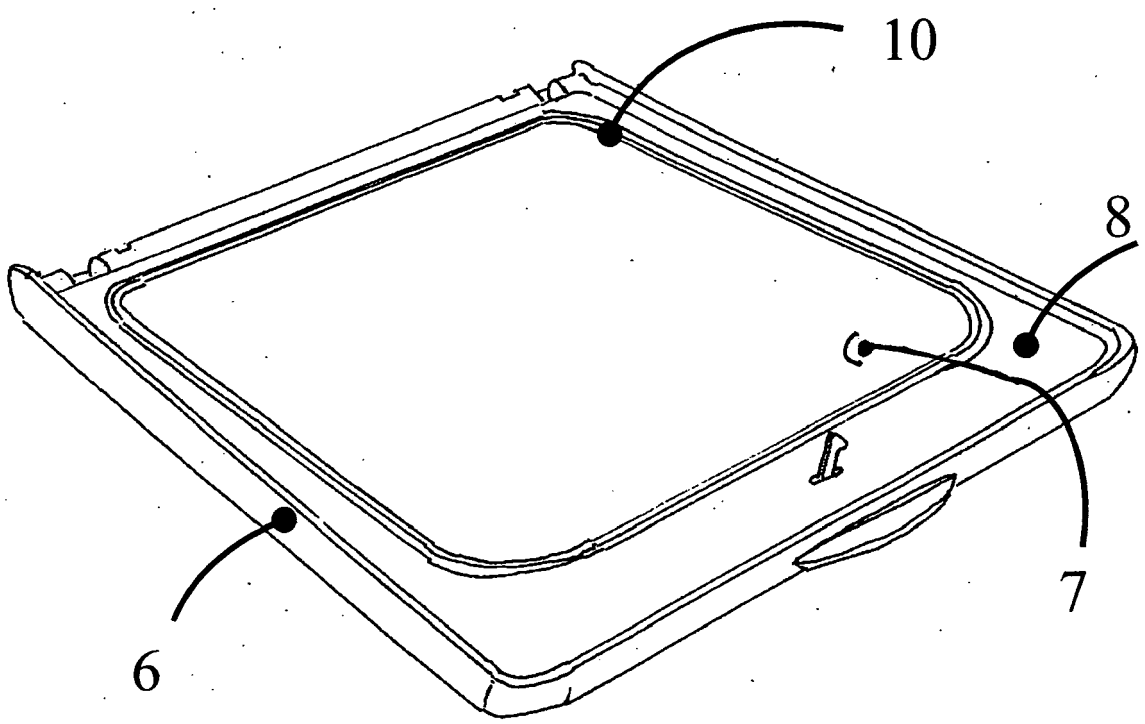

FIG 3/A

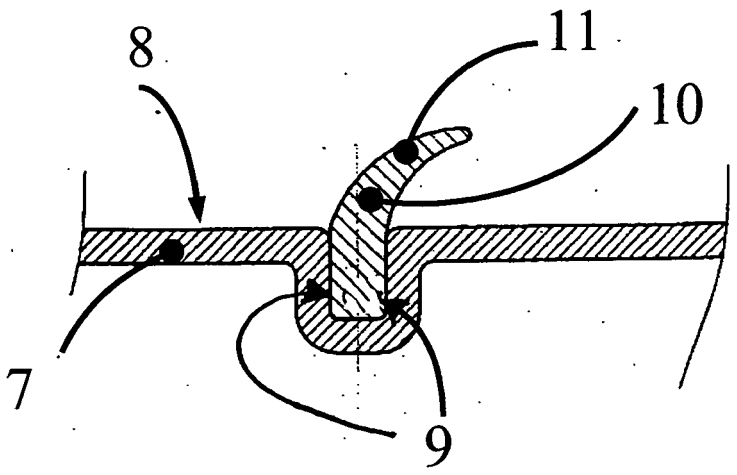

FIG 4

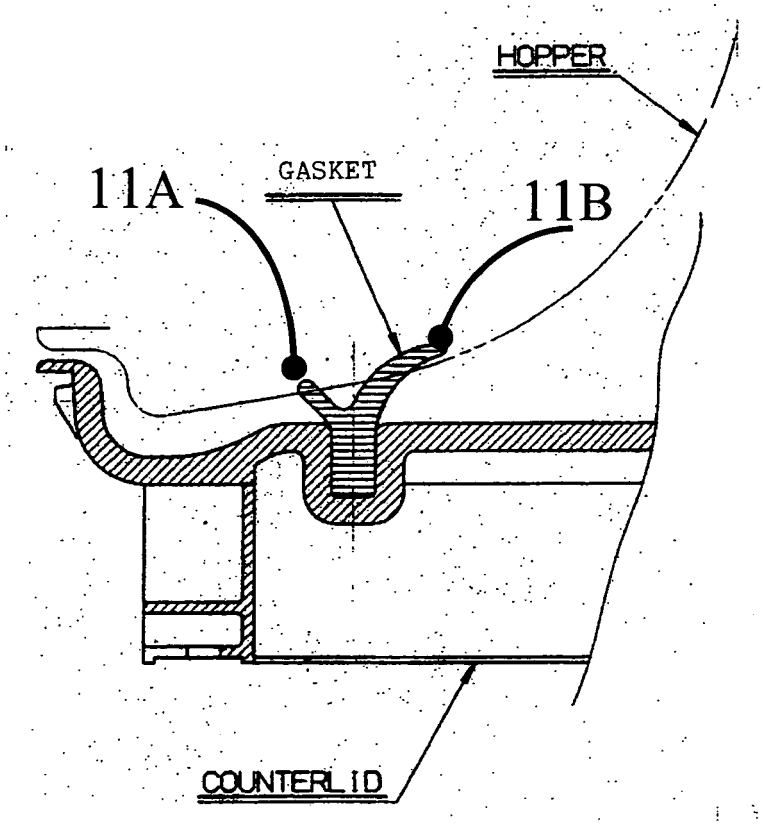

FIG 5

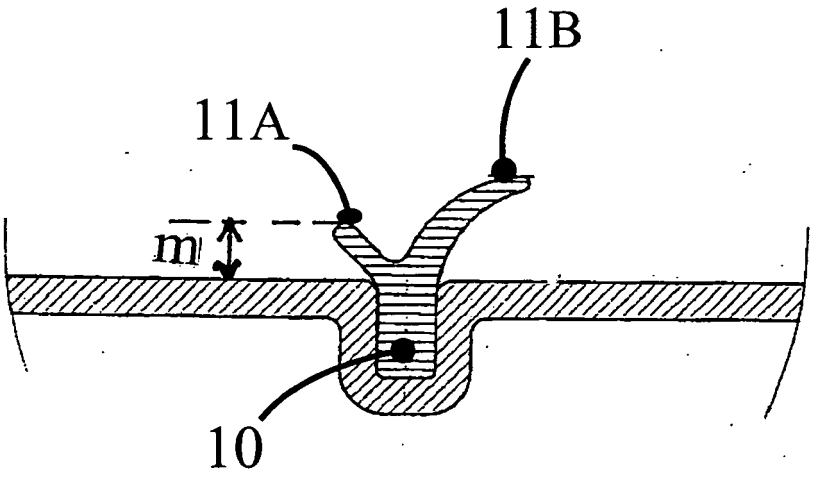

FIG 6

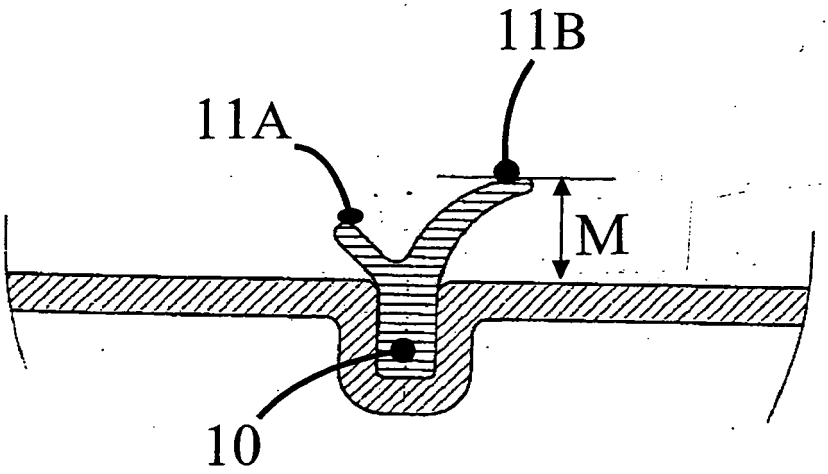

FIG 7

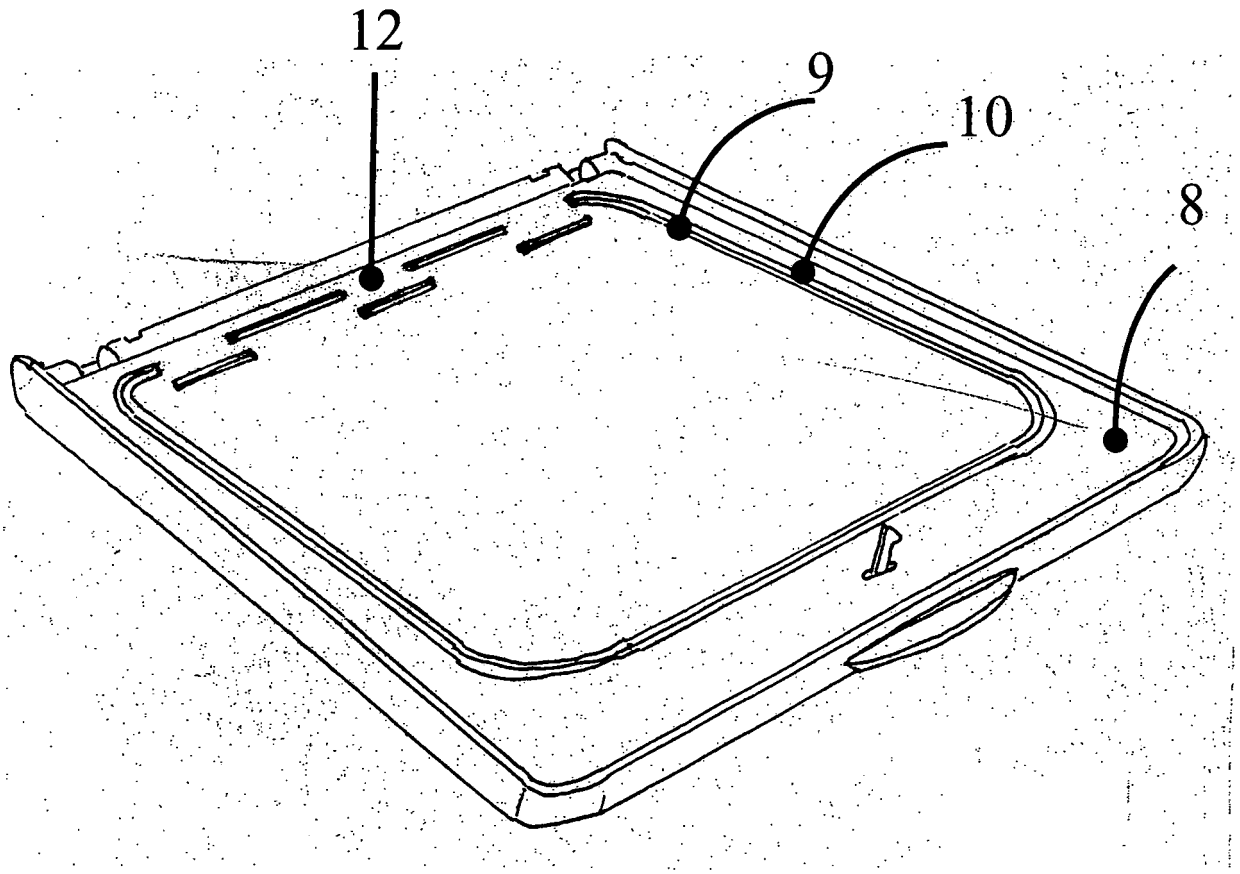

FIG 8

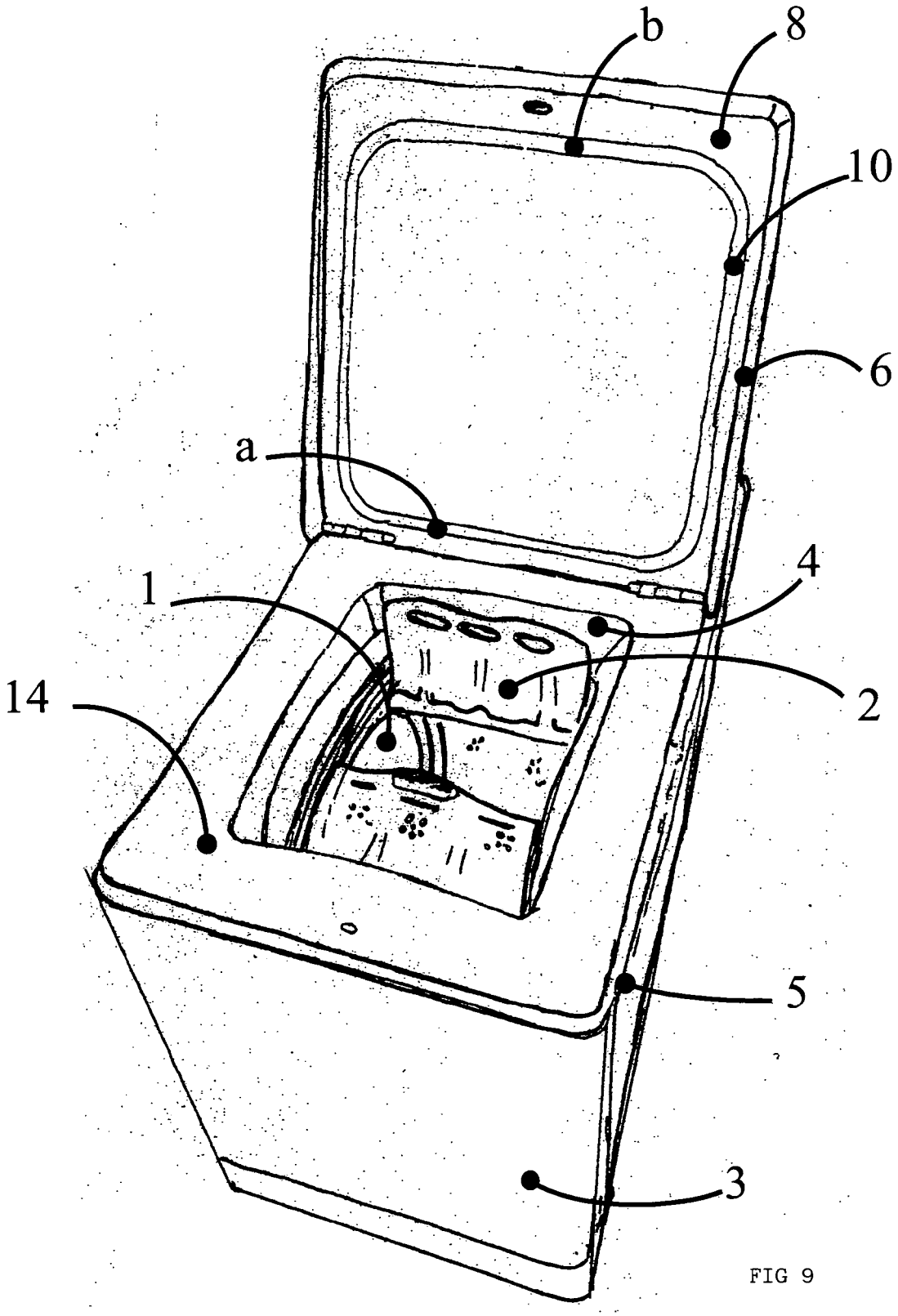

FIG 9

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EUROPEAN SEARCH REPORT

Application Number
EP 04 02 2493

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 March 2005	Norman, P

CATEGORY OF CITED DOCUMENTS

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