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(54) **Porthole door for laundry washing machines and household appliance provided with said porthole door**

(57) Porthole door (1) for laundry washing machines (2) and similar consisting of a substantially basin-shaped body (11) which is made of transparent or semi-transparent plastic material, and is provided with an outer peripheral flange (11a) having a substantially U-shaped transversal cross section, and of an inner annular frame (12) which is made of an opaque plastic material, and is

permanently fixed into the annular seat (11') formed by said outer peripheral flange (11a); the outer peripheral flange (11a) being realized in one piece with the rest of basin-shaped body (11) via an injection molding process, so as to form a unique plastic shell (11); said unique plastic shell (11) and said inner annular frame (12) being over-injected one on the other during the same injection molding process.

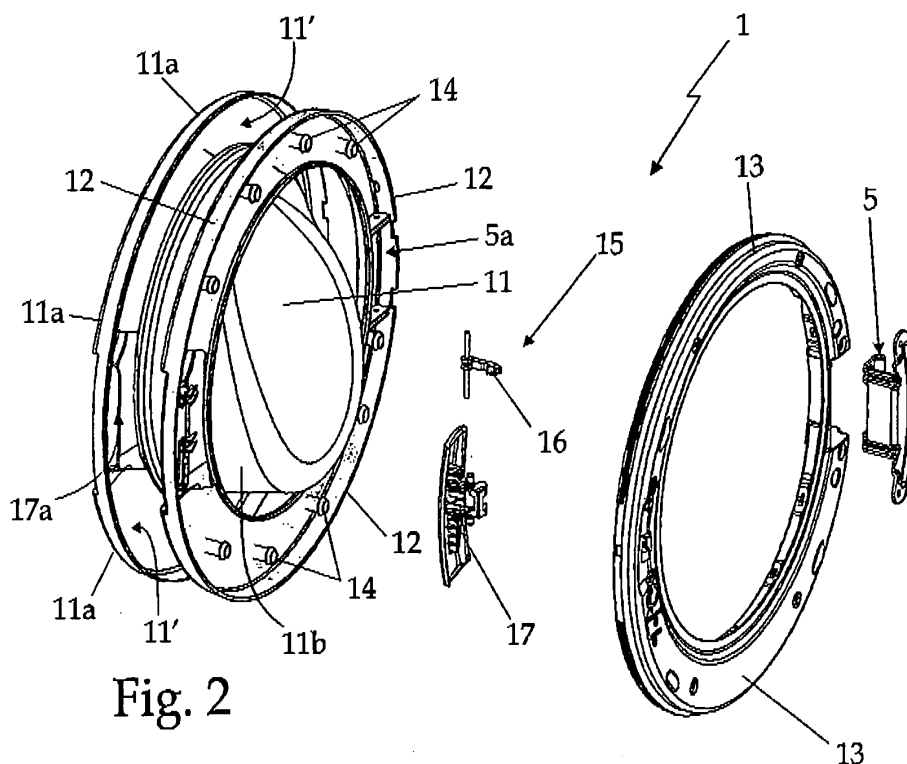


Fig. 2

Description

[0001] The present invention relates to a porthole door for laundry washing machines and to a household appliance provided with said porthole door.

[0002] More specifically, the present invention relates to a porthole door for a home front-loading laundry washing machine, to which the following description refers purely by way of example.

[0003] As is known, front-loading laundry washing machines normally comprise a substantially parallelepiped-shaped outer box casing, which is provided with a substantially circular laundry loading/unloading opening on the front face of the casing; and a porthole door which is hinged to the front face of the casing, close to the peripheral edge of the laundry loading/unloading opening, to rotate about a vertical axis to and from a closing position, in which the peripheral edge of the door rests completely against the front face of the casing to watertight seal the laundry loading/unloading opening.

[0004] The porthole door usually consists of a cup-shaped body which is made of annealed transparent glass and has a flared outer peripheral edge; and of an annular porthole bearing structure which is rigidly coupled to the outer peripheral edge of the cup-shaped body and is hinged to the front face of the casing.

[0005] The annular porthole bearing structure consists of two separate annular frames which are located, coaxial to the cup-shaped body, on opposite sides of the flared outer peripheral edge of the cup-shaped body, and are rigidly coupled to one another via screws or similar so to tightly clamp the outer peripheral edge of the cup-shaped body.

[0006] The rear annular frame, i.e. the porthole annular frame which comes in abutment against the front face of the casing when the door is placed in the closing position, is usually made of metal material and is fixed in swiveling manner to the front face of casing via a hinge; whereas the front annular frame is usually made of plastic material and houses the handle allowing the user to manually unlock the door from the machine casing.

[0007] Despite being intrinsically highly safety, this kind of porthole door is relatively expensive to produce because of the relative large size of the annealed-glass cup-shaped body, and it is quite heavy thus requiring the use of oversized heavy-duty metal hinges. To solve these drawbacks, in the recent years some household appliance manufacturers replaced the annealed-glass cup-shaped body with a cup-shaped body made of transparent plastic material. GB20008624 and US-2003/0110813 disclose this kind of plastic porthole doors.

[0008] Aim of the present invention is to provide a porthole door for laundry washing machines which is cheaper to produce and lighter in weight than today's porthole doors with a plastic cup-shaped body.

[0009] According to the present invention, there is provided a porthole door for laundry washing machines as claimed in Claim 1 and preferably, though not necessarily,

ily, in any one of the dependant Claims.

[0010] According to the present invention, there is also provided a household appliance provided as claimed in Claim 15 and preferably, though not necessarily, in any one of the dependent Claims.

[0011] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a isometric view, with parts removed for clarity, of a front-loading laundry washing machine provided with a porthole door realized in accordance with the teachings of the present invention; Figure 2 shows a larger-scale, partly-exploded isometric view of the Figure 1 porthole door; Figure 3 shows a section view of the Figure 2 porthole door; and Figures 4 and 5 show two larger-scale, detailed views of the Figure 3 porthole door.

[0012] With reference to Figure 1, number 1 indicates as a whole a porthole door suitable to be used in a household appliance provided with a porthole door, like a home front-loading laundry washing and/or drying machine 2.

[0013] The laundry washing and/or drying machine 2 comprises a substantially parallelepiped-shaped outer box casing 3, which is provided with a substantially circular laundry loading/unloading opening 1a formed on its front face 4; and the porthole door 1 is hinged to the front face 4 of casing 3, close to the peripheral edge of the laundry loading/unloading opening 1a, to rotate freely about a preferably, though not necessarily, vertical axis, to and from a closing position, in which the peripheral edge of the porthole door 1 completely rests against the front face 4 of casing 3 and watertight seal opening 1a,

[0014] More specifically, porthole door 1 has a rear face 1r which abuts against the front face 4 of casing 3 when the porthole door 1 is in the closing position, and a front face 1f which faces the outside of casing 3 when the porthole door 1 is in the closing position, and in the example shown it is connected in swiveling manner to casing 3 via a hinge 5 which is rigidly attached to front face 4, close to the peripheral edge of the laundry loading/unloading opening 1a, so to let the porthole door 1 freely rotate about a vertical axis A locally substantially tangent to front face 4.

[0015] Differently from the porthole doors used in today's front-loading laundry washing machines, the porthole door 1 comprises a preferably, though not necessarily, circular, substantially basin-shaped body 11 which is made of transparent or semi-transparent plastic material, forms the front face 1f of the porthole door 1, and is provided with an outer peripheral flange 11a having a substantially U-shaped transversal cross section.

[0016] More specifically, with reference to Figures 2 and 3, the outer peripheral flange 11a forms part of the front face 1f of the porthole door 1, and ends with a preferably, though not necessarily, cylindrical annular collar

which is faced to, and spaced from, the main annular lateral wall 11b of the basin-shaped body 11, so as to delimit, together with the main annular lateral wall 11b of the basin-shaped body 11, an outer annular seat 11' whose concavity faces the outer surface of the main annular lateral wall 11b. In other words, concavity of annular seat 11' faces the front face 4 of casing 3 when the porthole door 1 is placed in the closing position.

[0017] In addition to the above, the outer peripheral flange 11a is realized in one piece with the basin-shaped body 11 via an injection molding process so as to form a unique plastic shell 11 having a preferably, though not necessarily, constant thickness; and the porthole door 1 also comprises an inner annular frame 12 which is made of an opaque plastic material (i.e. a material not allowing light to pass through), and is over-injected into the outer annular seat 11' of the basin-shaped body or shell 11 during the same injection molding process, immediately after the hardening of the plastic material forming the basin-shaped body 11, so as to be permanently fixed to the basin-shaped body or shell 11.

[0018] More specifically, the inner annular frame 12 is over-injected into the annular seat 11' of the basin-shaped body 11 within preferably, though not necessarily, 30 seconds from the complete hardening of the plastic material forming the basin-shaped body 11. Obviously, the melting temperature of the plastic material forming the basin-shaped body or shell 11 is higher than the melting temperature of the plastic material forming the inner annular frame 12.

[0019] With reference to Figure 2, the inner annular frame 12 is structured for being directly coupled to the hinge 5 connecting the porthole door 1 to the front face 4 of casing 3, and is preferably, though not necessarily, shaped so as to form a seat 5a for hinge 5.

[0020] In the example shown, the basin-shaped body or shell 11 is preferably, though not necessarily, made of transparent polyester and/or polycarbonate; whereas the inner annular frame 12 is preferably, though not necessarily, made of opaque polyester and/or polystyrene and/or acrylonitrile-butadiene-styrene (commonly known as ABS).

[0021] With reference to Figures 1 and 2, the porthole door 1 optionally comprises also an auxiliary annular cover 13 which is made of an opaque plastic material, and is structured for covering up the annular seat 11' of the basin-shaped body 11 so to completely hide the inner annular frame 12.

[0022] More specifically, in the example shown the auxiliary annular cover 13 is preferably, though not necessarily, made of an opaque polyester and/or polycarbonate and is formed separately from the inner annular frame 12 via a traditional injection molding process, and is structure for being directly coupled and firmly anchored to the inner annular frame 12 via a number of a snap-lock locking pins or tongues 14 realized on the inner annular frame 12 and/or on the auxiliary annular cover 13. Clearly, in a different embodiment, annular cover 13 may

be firmly anchored to the inner annular frame 12 via metal screw, rivets, welding or gluing.

[0023] Preferably, though not necessarily, the porthole door 1 is finally provided with a manually-operated door-lock device 15 which is structured for selectively lock the porthole door 1 to the machine casing 3 when the porthole door 1 is in the closing position.

[0024] With reference to Figure 2, in the example shown, the inner annular frame 12 is structured for supporting the door-lock device 15, and the door-lock device 15 consists of a hooked catch lever 16 which is fixed in swivelling manner to the inner annular frame 12 of porthole door 1, and protrudes from the inner annular frame 12 towards the front face 4 of casing 3, extending through the auxiliary annular cover 13 if present, so as to enter into a corresponding slot 16a realized in front wall 4, next to the laundry loading/unloading opening 1a, and there firmly engage the machine casing 3; of a spring mechanism (not shown) designed to keep the hooked catch lever 16 in a given rest position allowing the distal end of catch lever 16 to hook on the edge of the machine casing 3, into the slot 16a in front wall 4; and of a manually-operated handle 17 which is housed in a through opening 17a realized on the outer peripheral flange 11a of the basin-shaped body or shell 11, and is fixed in swiveling manner to the inner annular frame 12 so to selectively engage and tilt the hooked catch lever 16, overcoming the elastic force of the spring mechanism.

[0025] In other words, the manually-operated handle 17 is able to selectively move the hooked catch lever 16 away from the rest position, allowing the distal end of catch lever 16 to unlock the edge of the machine casing 3 when the porthole door 1 is placed in the closing position. Thus, acting directly on handle 17, the user can manually release the porthole door 1 from casing 3 and rotate the porthole door 1 about axis A.

[0026] Operation of porthole door 1 and laundry washing and/or drying machine 2 are clearly inferable from the above description, with no further explanation required.

[0027] The production process of porthole door 1, in turn, comprises the step of injecting a given quantity of a transparent or semi-transparent plastic material, into the first mould inner cavity negatively reproducing the shape of the basin-shaped body 11, outer peripheral flange 11a included, so as to form the whole basin-shaped body 11 via a unique injection of plastic material; and the step of over-injecting, immediately after the hardening of the plastic material forming the basin-shaped body 11, a given quantity of an opaque plastic material, into a second mould inner cavity partly delimited by the outer annular seat 11' of basin-shaped body 11 and negatively reproducing the shape of the inner annular frame 12, so to form the inner annular frame 12 directly inside the outer annular seat 11' of basin-shaped body 11.

[0028] The particular structure of porthole door 1 provides several advantages. First of all, assembly of the porthole door 1 is significantly simplified because the in-

ner annular frame 12 is rigidly and permanently fixed to the basin-shaped body or shell 11 during the injection molding process, thus reducing production costs of the porthole door.

[0029] Further the present structure provides a porthole door having an improved aesthetic appearance. Such improved aesthetic effect is due to the peripheral flange 11a being transparent or semi-transparent and forming the front face of the porthole door and due to the inner annular frame 12 being opaque and forming the rear face of the peripheral flange 11a. The contrast between the transparent peripheral flange 11a and the opaque inner annular frame 12 in the background provides the aesthetic effect when the porthole door, -in closed position-, is watched by the user.

[0030] Additionally, the present porthole structure allows manufacturing the transparent shell body 11 with a relatively small thickness thereby reducing the amount of the costly transparent material needed for its production since the inner annular frame 12 made of less costly opaque material provides the supporting function for the hinge 5 and the manually-operated door-lock device 15.

[0031] Moreover, production of basin-shaped body or shell 11 and inner annular frame 12 during the same injection molding process, give designers much more freedom to harmonize the shape of the porthole door to that of the casing front face.

[0032] Clearly, changes may be made either to porthole door 1 or to laundry washing and/or drying machine 2 as described herein without, however, departing from the scope of the present invention.

[0033] For example, in case the melting temperature of the plastic material forming the basin-shaped body or shell 11 is lower than the melting temperature of the opaque plastic material forming the inner annular frame 12, the basin-shaped body 11 is over-inject above the inner annular frame 12, immediately after the hardening of the plastic material forming the inner annular frame 12.

[0034] In other words, since the plastic material having the higher melting temperature is to be injected first, basin-shaped body 11 and inner annular frame 12 are still made during the same injection molding process, but the injection sequence starts with the injection, into the mould, of the plastic material forming the inner annular frame 12. The plastic material forming the basin-shaped body or shell 11 is obviously injected into the mould immediately after the complete hardening of the plastic material forming the inner annular frame 12.

Claims

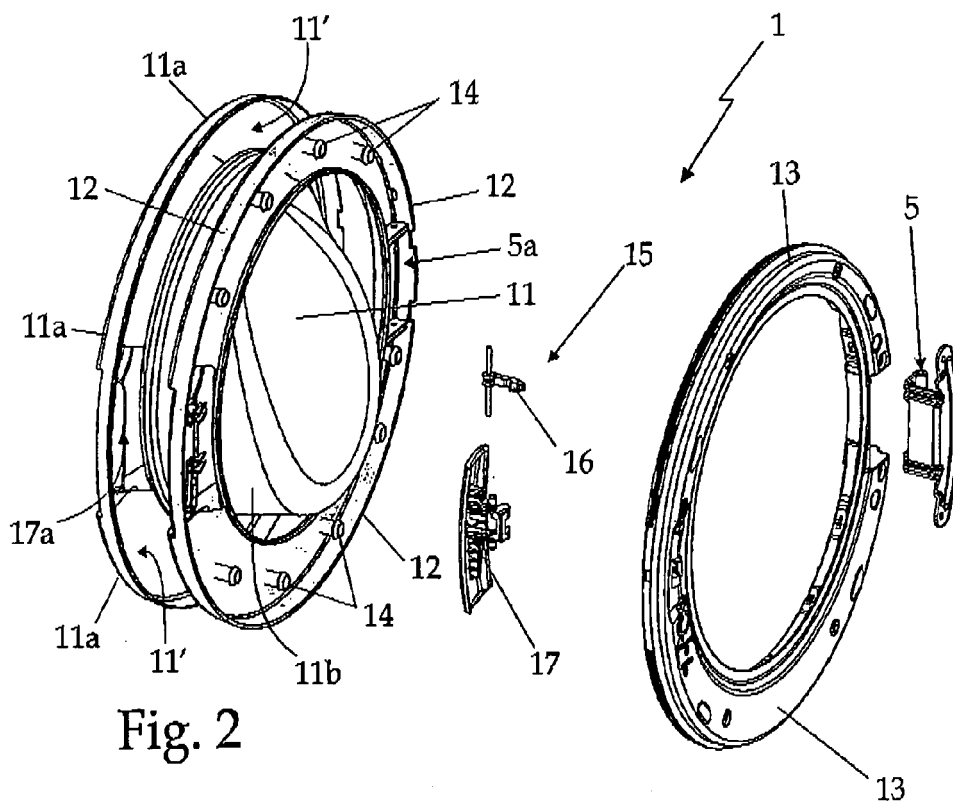
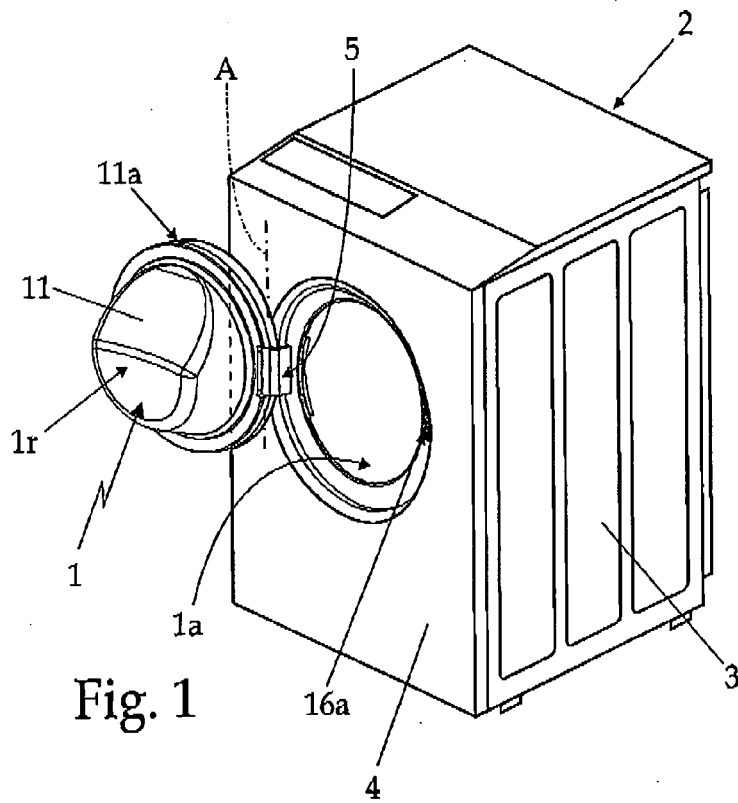
1. Porthole door (1) for laundry washing machines (2) and similar, having a rear face (1r) which abuts against the machine casing (3) when the porthole door (1) is in the closing position, and a front face (1f) which faces the outside of the machine casing (3) when the porthole door (1) is in the closing position;

the porthole door (1) being **characterized by comprising:**

- a shell body (11) which is made of transparent or semi-transparent plastic material, and is provided with an outer peripheral flange (11a) which defines part of the front face (1f) of the porthole door (1), and is provided, on the rear-face side thereof, of an annular seat (11'); and
 - an inner annular frame (12) which is made of an opaque plastic material, and is permanently fixed into the annular seat (11') formed by said outer peripheral flange (11a);
- the outer peripheral flange (11a) being realized in one piece with the rest of shell body (11) via an injection molding process, so as to form a unique transparent or semi-transparent plastic element (11); said unique transparent or semi-transparent plastic element (11) and said inner annular frame (12) being over-injected one on the other during the same injection molding process.

2. Porthole door as claimed in Claim 1, **characterized in that** the outer peripheral flange (11a) has a substantially U-shaped transversal cross section.
3. Porthole door as claimed in Claim 1 or 2, **characterized in that** the shell body (11) is a substantially basin-shaped body (11).
4. Porthole door as claimed in any one of the foregoing Claims, **characterized in that** said inner annular frame (12) is over-injected into the annular seat (11') formed by the outer peripheral flange (11a) of said shell body (11).
5. Porthole door as claimed in any one of the foregoing Claims, **characterized in that** said inner annular frame (12) is structured for being coupled to the hinge (5) connecting the porthole door (1) to the casing (3) of the laundry washing machine (2) or similar.
6. Porthole door as claimed in Claim 5, **characterized in that** said inner annular frame (12) is shaped so as to form a seat (5a) for said hinge (5).
7. Porthole door as claimed in any one of the foregoing Claims, **characterized by** also comprising an auxiliary annular cover (13) which is made of an opaque plastic material, and is structured for covering up the annular seat (11') of the shell body (11) so to hide the inner annular frame (12).
8. Porthole door as claimed in Claim 7, **characterized in that** said auxiliary annular cover (13) is structure for being directly coupled and firmly anchored to the inner annular frame (12).

9. Porthole door as claimed in Claim 8, **characterized in that** said auxiliary annular cover (13) is structure for being firmly anchored to the inner annular frame (12) via a number of a snap-lock locking means (14) realized on the inner annular frame (12) and/or on the auxiliary annular cover (13). 5
10. Porthole door as claimed in any one of the foregoing Claims, comprising a manually-operated door-lock device (15) which is structured for selectively lock the porthole door (1) to the casing (3) of the laundry washing machine (2) or similar, **characterized in that** said inner annular frame (12) is structured for supporting said manually-operated door-lock device (15). 10 15
11. Porthole door as claimed in Claim 10, **characterized in that** said manually-operated door-lock device (15) comprises 20
- a hooked catch lever (16) which is fixed in swivelling manner to the inner annular frame (12) of the porthole door (1), and protrudes from the inner annular frame (12) towards the casing (3) of the laundry washing machine (2) or similar, so as to enter into a corresponding slot (16a) realized in said casing (3); 25
 - a spring mechanism designed to keep the hooked catch lever (16) in a given rest position allowing the distal end of the hooked catch lever (16) to hook on the edge of the casing (3) of the laundry washing machine (2) or similar, into the slot (16a) on said casing (3); and 30
 - a manually-operated handle (17) which is housed in a through opening (17a) realized on the outer peripheral flange (11a) of the shell body (11), and is fixed in swiveling manner to the inner annular frame (12) so to selectively engage and tilt the hooked catch lever (16), overcoming the elastic force of the spring mechanism. 35 40
12. Porthole door as claimed in any one of the foregoing Claims, **characterized in that** the shell body (11) is made of a transparent polyester and/or polycarbonate. 45
13. Porthole door as claimed in any one of the foregoing Claims, **characterized in that** the inner annular frame (12) is made of opaque polyester and/or polystyrene and/or acrylonitrile-butadiene-styrene. 50
14. Household appliance (2) comprising a substantially parallelepiped-shaped outer box casing (3) which is provided with a main opening (1a) on its front face (4), and a porthole door (1) which is hinged to the front face (4) of the casing (3), close to the peripheral edge of said main opening (1a), to rotate about a reference axis to and from a closing position in which the peripheral edge of the porthole door rests against the front face (4) of the casing (3) to seal said main opening (1a); the household appliance (2) being **characterized in that** said porthole door (1) is a porthole door as claimed in anyone of Claims 1-14. 55
15. Household appliance as claimed in Claim 15, **characterized in that** of being a laundry washing and/or drying machine (2).



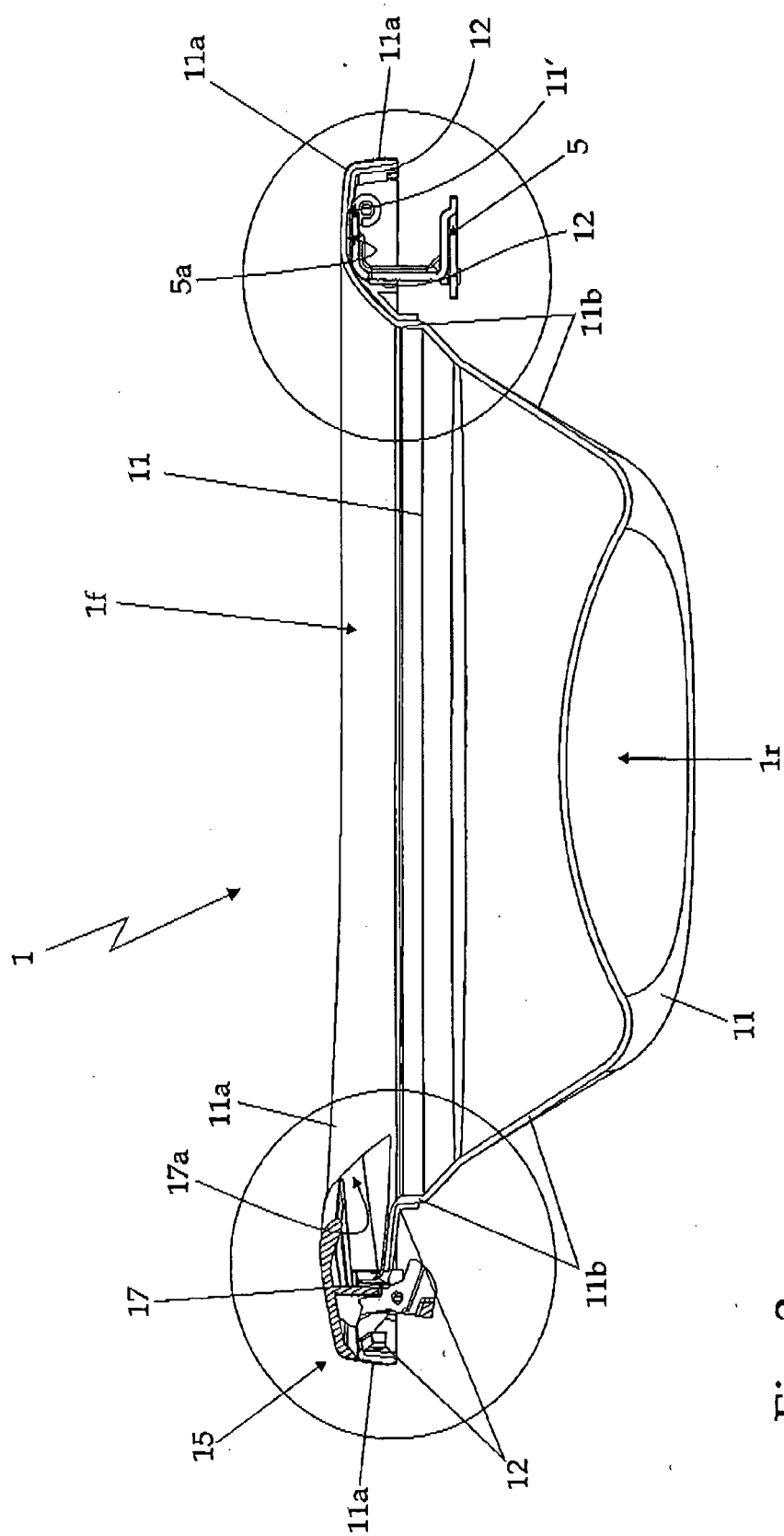
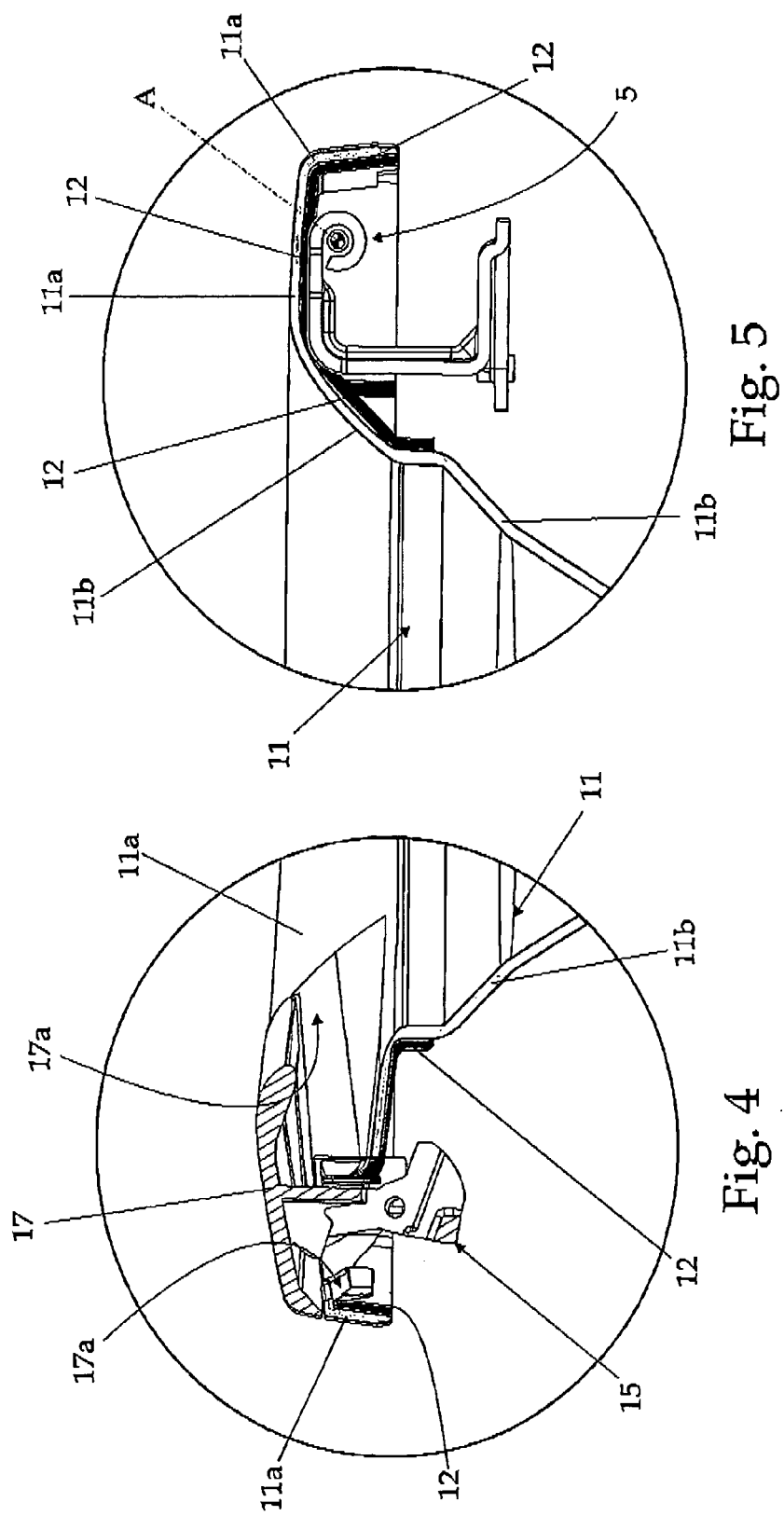


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 5669

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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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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 August 2009	Examiner Kising, Axel
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 00 5669

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