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(54) **Laundry treatment device including a control-panel assembly**

(57) The invention relates to a laundry treatment device (100) comprising: a casing (2) including a front wall (4) defining a continuous front surface (4a) and having a panel aperture (15); a control panel assembly (1) for controlling operation of the laundry treatment device (100), said control panel assembly including an outer dashboard (11) which is structured to be coupled to said front wall (4) at said panel aperture (15) and to be operated by a user. In addition, laundry treatment device (100)

further includes a mechanical coupling device of a first type (20) and a mechanical coupling device of a second type (30), said first type being different from said second type, so configured to couple said outer dashboard (11) to said front wall (4) at said panel aperture (15). The invention is also relative to a method to couple a control-panel assembly (1) to a front wall (4) of a laundry treatment device (100).

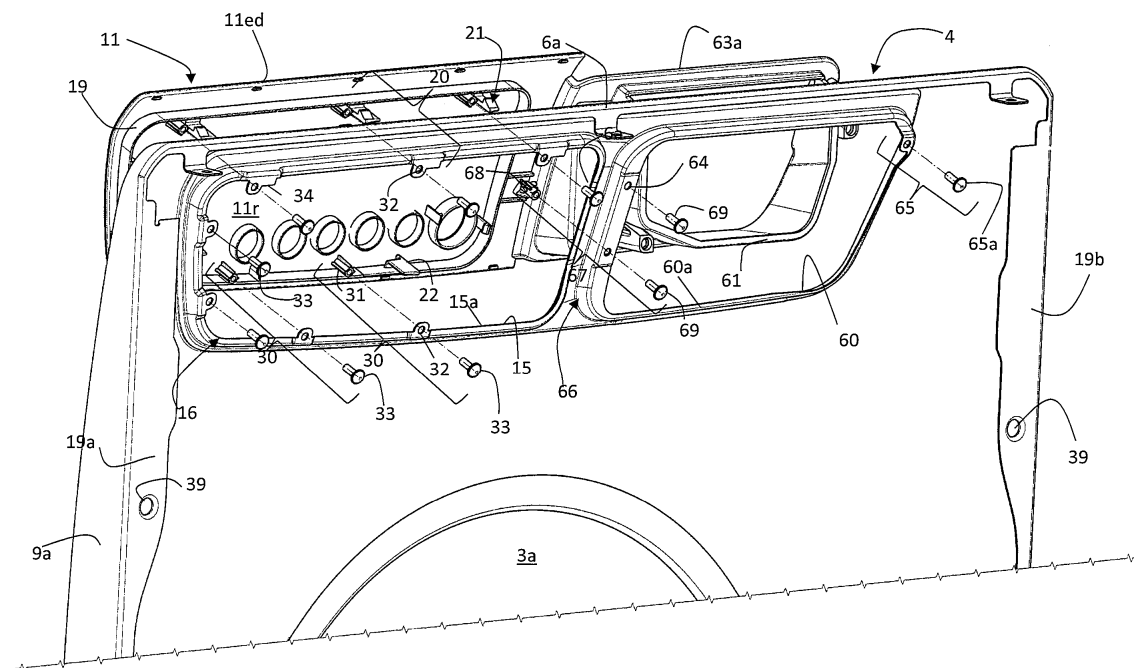


FIG. 5

Description

Field of the invention

[0001] The present invention generally relates to laundry treatment devices, such as front/top loading washing machines, washers/dryers, dryers, both for domestic and professional use. More particularly, the present invention relates to a laundry treatment device including a control-panel assembly.

Background of the invention

[0002] It is known that the aesthetical appearance of laundry treatment devices is important and represents a characteristic that might determine the appliance's choice by the user. Generally, laundry treatment devices include a casing defining a front wall. Front walls formed as a single integral piece, without any visible seam, so as to appear as a continuous uniform external surface, are increasingly popular and appreciated by the users.

[0003] In these front walls, also called "full front", an aperture for the loading/unloading of the laundry treatment device is generally formed, which can be preferably opened/closed by a suitable door, as well as an additional aperture, to which a control panel is associated.

[0004] As known, the control panel of a laundry treatment device typically is connected to an inner printed circuit board (or PCB) that is electrically connected to electronic components and control members, as well as a power supply, associated therewith for implementing corresponding control functionalities, e.g. powering, driving, activation, deactivation of operative loads including electric, electronic, electro-mechanical and/or electro-hydraulic parts of the appliance (such as motor, solenoid valve, further PCBs and the like).

[0005] The control panel is operated by the user by means of an outer dashboard, which also represents the external visible surface of the assembly, positioned at the front wall. On the dashboard, displays, knobs, touch screens and/or any other input devices are formed in order to control the operative status of the appliance and/or for example select the appropriate programs or cycles and the parameters thereof. In addition, openings are present to visualize light coming from light sources present in the PCB.

[0006] Therefore there should be a spatial correspondence between the push-buttons, knobs, apertures for light, seats, etc. present in the dashboard and buttons, switches, warning lights and/or alphanumeric displays all located on a face of the printed circuit board.

[0007] In the mounting of the control panel assembly, therefore, a good alignment between the various control panel assembly components and between the control panel assembly and the casing of the appliance where the control panel is attached is required in order to achieve a good functioning of the appliance itself.

[0008] However, it is known that dryers and/or washing

machines are subject to vibrations, for example in a washing or drying machine in particular due to the rotation of the drum which can revolve at a rather high speed. Therefore, the required alignment could be lost during operation, e.g. after many washing and/or drying cycles.

[0009] In addition, an unpleasant noise due to the rattling of the dashboard on the front wall of the laundry treatment device due to the vibrations of the latter can take place as well, if the connection between the dashboard and the front wall is not tight enough.

Summary of the invention

[0010] Applicant has realized that an improvement is needed in the way in which the dashboard is coupled to the casing of the laundry treatment device. In particular, there is a need of a coupling which is firm and not subject to vibrations, but at the same time which is easy to assemble and does not need any special expensive components for the assembly.

[0011] Moreover, a goal of the invention is to provide a laundry treatment device with a control panel assembly which is perfectly aligned, i.e., in which the input devices present in the dashboard are perfectly aligned to the mechanical and/or electrical components of the rest of the assembly, in particular of a printed circuit board, and in which such alignment remains stable for a relatively long time.

[0012] Moreover, another aim of the present invention is to provide a control panel assembly which is cost-effective to produce.

[0013] Not least, another goal is to provide a laundry treatment device which has an improved aesthetical appearance.

[0014] In compliance with the above aims, according to an aspect of the present invention, there is provided a laundry treatment device comprising:

- a casing including a front wall defining a continuous front surface and having a panel aperture;
- a control panel assembly for controlling operation of the laundry treatment device, said control panel assembly including an outer dashboard which is structured to be coupled to said front wall at said panel aperture and to be operated by a user;
- wherein it further includes a mechanical coupling device of a first type and a mechanical coupling device of a second type, said first type being different from said second type, so configured to couple said outer dashboard to said front wall at said panel aperture.

[0015] The laundry treatment device of the invention includes for example washing machines, dryers, combined washer/dryers, etc. Preferably, the laundry treatment device is of the front loading type.

[0016] The laundry treatment device includes a casing

delimiting the appliance and a front wall of the same. The front wall of the casing has a front surface which is a continuous surface having at least an aperture which is called panel aperture. This front surface represents the external front surface of the appliance and it is construed as a single continuous surface holed by the panel aperture. In other words, there is a single piece of front wall which hosts, via appropriate opening, a control panel assembly. "Single piece" means that there are no junctions or seams in the front surface connecting different pieces together. These front walls are in jargon also called "full front". However, the front wall can also include additional element(s) separated from the portion of the front wall defining the continuous front surface. As an example, the front wall could include a first portion having a panel aperture to host the control-panel assembly which is positioned in the top-most part of the front wall, and a second portion, separated from the first, which covers the lowermost part of the front wall.

[0017] The terms "top", "middle" and "bottom" or "upper" and "lower" are herein used with reference to the standard standing configuration of the laundry treatment device when in use.

[0018] The control panel assembly is manually operated by a user in order to select the programs or to input any data relative to the functioning of the appliance. The control panel assembly can also display warning messages or instruction for maintenance coming directly from the laundry treatment device.

[0019] In addition, the front wall, in the portion defining the continuous front surface, preferably includes further apertures. As an example, the front surface includes an opening for the access into the appliance, e.g. in a washing machine or dryer the opening is used to load and/or unload the laundry.

[0020] Preferably, the front wall and the dashboard are made of different materials.

[0021] Advantageously, the outer dashboard defines an outer surface which, in an assembled configuration, preferably substantially forms a geometrical continuation of the front surface of the front wall, e.g. it does not protrudes or sticks out in a significant manner, so that the front wall globally has a pleasant aesthetical appearance.

[0022] The two different coupling devices - of the first and second type - used to couple the dashboard to the front wall are used to satisfy different needs. Having two different types of mechanical couplings for performing the same connection allows to satisfy needs which could be conflicting one to the other at the same time, so that the appliance can include a firm and reliable coupling between the outer dashboard and the front wall, which is also easy to mount.

[0023] The mechanical coupling device of the first type quickly fastens the dashboard in its correct position, while the mechanical coupling device of the second type securely fastens the connection which has been made by the mechanical coupling device of the first type.

[0024] Preferably, said mechanical coupling device of

the first type is a device for automatic coupling.

[0025] In this application a coupling is said to be automatic when, once the outer dashboard is positioned into the panel aperture, further actions by the user are not required in order to make this coupling to operate: in other words, the dashboard is positioned at the aperture and the coupling "activates" by itself, without the need of specific method steps for its performance. Or in further other words, the automatic coupling is "activated" by simply positioning the outer dashboard in the panel aperture. For example, there is no need of screwing, riveting, etc.

[0026] Therefore, no tools or particularly complex procedure is necessary to fasten the outer dashboard to the front wall in correspondence to the panel aperture using the coupling device of the first type. This coupling is relatively "simple" and quick.

[0027] More preferably, said mechanical coupling device of the first type is configured to couple said outer dashboard to said front wall at said panel aperture by application of pressure on said outer dashboard. This pressure is anyway necessary to position the outer dashboard into the panel aperture.

[0028] Even more preferably, said mechanical coupling device of the first type includes a snap-on connecting member.

[0029] In this way, the dashboard is coupled in a simple manner and there is no need of checking the alignment in a stringent way. By application of manual pressure, the outer dashboard snaps into the front wall at the panel aperture (e.g. snap-on connecting member could comprise hooking elements that could be in the dashboard or vice-versa, e.g. hooks could be on the front wall at the panel aperture) and it holds on the same.

[0030] In this advantageous embodiment, said mechanical coupling device of the first type may include a snap-on tongue protruding from one of said dashboard and said front wall in proximity of said aperture and a corresponding flange or seat on the other one of said dashboard and said front wall in proximity of said panel aperture.

[0031] In order to form the coupling, preferably a flange is formed around the aperture in the front wall, where the snap-on element can clip on. The vice-versa is feasible as well.

[0032] More preferably, said outer dashboard includes a rear surface facing, in an assembled configuration, the internal of the casing and wherein said front wall includes a flange extending from an edge of said panel aperture, said mechanical coupling device of the first type includes a plurality of snap-on tongues (preferably disposed along an edge of said outer dashboard) protruding from said rear surface.

[0033] In order to achieve a stable coupling, it is preferred to provide the dashboard with a plurality of snap-on tongues around its periphery so that all sides of the dashboard are coupled in a stable manner to the front wall, without points "weaker" than others.

[0034] In a preferred embodiment, said mechanical

coupling device of the second type includes a screw coupling element.

[0035] The mechanical coupling of the first type, as seen, is quick and simple, however, this type of coupling could suffer from the appliance vibrations, loosening and worsening the alignment. Additionally, the dashboard itself, if coupled using the mechanical coupling of the first type only, could rattle against the front wall during for example drum spinning.

[0036] The mechanical coupling of the second type includes preferably a screw coupling element. Performing a coupling via screws is generally more complex than performing an automatic, e.g. snap-fit, connection, because a better alignment is required between the various elements to be coupled from the beginning (i.e. before applying the screws). On the other hand, a screw coupling is firm and withstands often rather strong vibrations. In the present case, the coupling via the screw element is greatly simplified: the outer dashboard is already coupled to the front wall via the mechanical coupling device of the first type and therefore the precision of the alignment required is much less, being the dashboard substantially already in its final position. In other words, the mechanical coupling of the second type substantially "strengthens" the coupling which is already in place by firmly fixing and fastening the outer dashboard in its correct position in the aperture of the front wall.

[0037] In a preferred embodiment, said outer dashboard includes a rear surface facing, in an assembled configuration, said front wall, said front wall including a panel flange extending from an edge of said panel aperture, and said mechanical coupling device of the second type including screw threads formed in said rear surface, a hole formed in said flange and a screw which is inserted in said hole and screwed in said threads to tighten the coupling of the second type.

[0038] Front walls of the "full front" type are preferably made of metal, for example bending appropriately a single sheet of metal. Fixing screws on metal is rather complex because special screws are needed in order to obtain a firm metal-on-metal coupling. On the other hand, preferably the outer dashboard is made of plastic material, where screws are much more easily fastened. Thus, it is preferred to form the threads of the screw elements on the dashboard, preferably made of plastic, and fasten the screw into it, using standard screw elements.

[0039] Advantageously, said panel flange includes a plurality of spaced apart flaps, and said mechanical coupling device of the second type includes a plurality of bushings projecting from said rear surface, a plurality of corresponding holes, each hole being formed in a single flap, and a plurality of corresponding screws, each screw being inserted in a corresponding hole and bushing to tighten the coupling of said second type.

[0040] It is preferred that the tightening of the coupling via the mechanical coupling of the second type is performed all around the periphery of the outer dashboard.

[0041] Preferably, said front surface includes a drawer

aperture for the coupling to a drawer and said outer dashboard includes a drawer seat for said drawer apt to be coupled in a retractable manner to said front wall at said drawer aperture.

[0042] The drawer might be a detergent dispenser in case of a washing machine or a water collector in case of a dryer. Preferably, the dashboard is a single piece and comprises also the drawer seat.

[0043] According to a different aspect, the invention relates to a method to couple a control-panel assembly to a front wall of a laundry treatment device at a panel aperture formed in a continuous front surface of said front wall, said control panel assembly including an outer dashboard which is structured to be coupled to the front wall at said panel aperture and operated by a user, the method including the steps of:

- coupling said outer dashboard to said front wall at said panel aperture via a mechanical coupling device of a first type;
- then coupling said outer dashboard to said front wall at said panel aperture via a mechanical coupling device of a second type, wherein said first type is different from said second type.

[0044] Preferably, the coupling of the outer dashboard to the front wall is performed in two steps. First, a coupling of a first type is made, followed then by a coupling of the second type, in order to provide a strong and easily obtainable overall final coupling.

[0045] Preferably, said step of coupling said outer dashboard via a mechanical coupling device of a first type includes snapping said outer dashboard on a panel flange extending from an edge of said panel aperture.

[0046] The first coupling is thus made just by snapping the dashboard on the front wall's aperture.

[0047] Advantageously, the step of coupling the outer dashboard via a mechanical coupling device of a second type includes screwing a screwing element into threads formed in the outer dashboard.

[0048] In order to strengthen the already made coupling, screws are preferably used.

Brief description of the drawings

[0049] Further features and advantages of the present invention shall become clearer from the following detailed description of a preferred embodiment thereof, made with reference to the attached drawings and given as an indication and not for limiting purposes.

[0050] In particular, the attached drawings are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification. The drawings together with the description explain the principles of the invention. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In such drawings:

- figure 1 schematically shows a perspective view of a laundry treatment device according to the invention;
- figure 2 shows a perspective view of the laundry treatment device of fig. 1 wherein the panel control assembly is in a disassembled configuration;
- figure 3 shows a perspective view of a front wall of the laundry treatment device of figs. 1-2 in a disassembled configuration;
- figure 4 show a front view of the front wall of fig. 3;
- figures 5-7 show three different perspective views of the coupling of an outer dashboard to the front wall of the laundry treatment device of figs. 1-4;
- figure 8 schematically shows a lateral view in section along line A-A of fig. 7;
- figure 9a and 9b show in an enlarged view a detail of fig. 5-7;
- figure 10 shows a perspective view of front wall and dashboard in a disassembled configuration with some elements removed;
- figure 11 shows a lateral view in section of the laundry treatment device of fig. 10 in an assembled configuration;
- figure 12 shows an enlarged view of a detail of fig. 10 in a partially assembled configuration; and
- figure 13 is a schematic view of an element of figs. 10-12.

[0051] Referring to the drawings, Figure 1 schematically shows a perspective view of a laundry treatment device 100 according to the present invention.

[0052] As it will be better understood by the following description, the teaching of the present invention may be applied to substantially any appliance for laundry treatment, e.g. to washer/dryers, washing machines (as exemplary illustrated in the figures and to which reference will be made in the following by way of a non-limiting example only), dryers, etc.

[0053] The device 100 comprises a casing 2, preferably substantially parallelepiped-shaped, which encloses an inner compartment comprising a laundry treatment chamber, for example a rotating drum 12 for housing the laundry to be treated and, in the case of a washing machine or a washer/drier, a tub encasing the drum 12 (tub is not visible in the appended drawings). Moreover, the device includes an access door 3 provided on a front wall 4 of the casing for accessing the laundry treatment chamber 12 thereby allowing loading/unloading of the laundry

by a user.

[0054] The casing 2 preferably also includes a bottom wall or basement 7, a top wall 6, a back wall (not visible), and two opposite lateral walls (only lateral wall 9 is visible in the drawings). Preferably, lateral walls, front and rear walls, top wall and basement are separated pieces which are then assembled together via suitable fastening means. However, it is also encompassed by the present invention that some of these walls can be a single piece, for example lateral walls and back wall can be a single U-shaped piece. Walls are preferably made of metal, however also plastic is possible. Also, in a non-depicted embodiment, some of the walls can be made of a material, and some other(s) can be made of a different material.

[0055] By the device 100 itself, in a standard operative position, a horizontal plane is defined (plane (XY) in Figure 1), which is generally the plane on which the bottom wall or basement 7 lies and generally it is also parallel to the top wall 6 of the casing 2 in a mounted configuration. The device 100 also extends along a vertical direction denoted with Z (see Figure 1).

[0056] In a preferred embodiment, the front wall 4 of the casing includes an external continuous surface 4a having a plurality of apertures, as better detailed below. According to a preferred embodiment, the front external surface is the external front surface of the device 100.

[0057] Front wall 4 is preferably made of a metallic material, for example in stainless steel.

[0058] The front surface 4a is preferably continuous and even more preferably seamless, at least in the visible portion(s) of the same. Continuous surface means that the surface is formed as a single member. "Seamless" means that, in addition to be continuous, there are no seams which indicate that for example welding has been used to join together different parts. In the covered (i.e. not visible from outside the laundry treatment device 100 in the assembled condition of the latter) portions of the front wall 4, seams can be present. The absence of seams improves the overall appearance of the laundry treatment device 100.

[0059] In addition, the front wall 4 preferably includes four rounded corners 4b, 4c, 4d, 4e along its outer edge. "Rounded corner" means a corner which does not include sharp and abrupt changes in directions of the surfaces forming the same; on the contrary in a rounded corner the surfaces merges smoothly and with continuity. The round corners give a more aesthetically pleasant look to the device 100, and they also make the use of the device safer for the user, which could be injured by sharp corners.

[0060] In an embodiment of the invention, the front wall 4 can be obtained by a single sheet of metal. For example, it can be obtained by a sheet of stainless steel. In addition, the front wall can be coated by suitable coating to prevent corrosion. Moreover, the front wall can be colored of any color and gloss.

[0061] Preferably, the front wall 4 defines a top portion

4a', a middle portion 4a''' and a bottom portion 4a'', the terms "top", "middle" and "bottom" used with reference to the standard standing configuration of the laundry treatment device 100 when in use.

[0062] In a preferred embodiment, not depicted in the drawings, only the top portion 4a' and the middle portion 4a''' of the front wall 4 are a single (or one-piece) element, i.e., having a continuous and/or seamless front surface 4a, while the bottom portion 4a'' can be permanently fixed to it, for example welded to it, or it can even be added as an additional element which can be disassembled from the rest of the front wall.

[0063] In addition, the front wall 4 includes an outer edge which can be divided in a top edge 50a, which is the portion of the outer edge comprised between corners 4b and 4c, a bottom edge 50b, which is the portion of the edge located between corners 4d and 4e, and two lateral opposite edges, 50c and 50d which are the portions of outer edge present between corners 4b and 4e, and 4c and 4d, respectively.

[0064] Front surface 4a includes a laundry opening 3a for the access into the laundry treatment device 100, in particular to the laundry treatment chamber 12 so that laundry can be loaded or unloaded to/from the laundry treatment device 100. The opening 3a is openable and closable by the door 3, which is advantageously hinged to front wall 4.

[0065] Preferably, the door 3 is coupled to a recessed portion 3b of the front wall 4a: in this embodiment, the front wall 4 includes the recessed portion (see figures 3 and 4) in the center of which the door opening 3a is formed. The dimensions of the opening 3a are such to be suitable to accommodate the door 3. The door is then rotatably coupled to the door opening and, when mounted and in a closed position, it preferably does not project substantially beyond the front surface 4a due to the recess presence. In other words, an outer surface of door 3 preferably matches the front surface 4a of front wall 4.

[0066] Preferably, but not necessarily, the door 3 and the recessed portion 3b are located in the middle portion 4a''' of the front wall.

[0067] Advantageously, the front wall 4 is not flat, i.e., it does not lie completely on a single plane. On the contrary, it includes a concavity pointing, in the assembled condition, towards the inside of the casing 2, being convex on the outside. In the depicted embodiment, the front wall 4 - in a section along a plane parallel to plane YZ - has substantially a smoothed trapezoidal shape, the top 4a', the bottom 4a'' and the middle portion 4a''' lying on three different planes which form an angle one with respect to the other(s) and also with the vertical direction Z defined by the casing 2, forming in this way the inward concavity. The three planes are preferably connected smoothly and without sharp corners, as clearly visible in figure 3. However, other layouts of the front wall 4 are possible as well, for example the front wall can include a substantially constant curvature, the concavity still oriented towards the inside of the cabinet. For example, the

front wall could be a portion of a cylindrical mantel.

[0068] Preferably, a first and a second side walls 8a, 9a of the front wall 4, extend from its side edges 50c and 50d and are delimited between corners 4b-4e and 4c-4d, respectively. When the laundry treatment device is in assembled configuration, i.e., when all elements of the casing 2 are mounted, the side walls 8a, 9a are substantially a geometrical continuation of the lateral walls of casing 2. More preferably, side walls 8a, 9a and front wall 4 are formed continuously as one body, i.e., they are not an assembly of different pieces but they are integral one to the others, and more preferably there are no seams of welding separating the front from the side walls. Side walls and front walls are thus formed as a single piece and even more preferably the front surface 4a of the front wall is smoothly connected to the front surfaces 8a', 9a' of the side walls 8a and 9a, e.g. no sharp curvature changes are present.

[0069] Preferably, also an upper wall 6a and a bottom wall 7a extend from the top and bottom edge, 50a and 50b, respectively, of the front wall. Preferably, upper wall and bottom wall are continuous with the front wall. In this way, corners 4b, 4c, 4d, 4e formed where side walls and upper/bottom walls merge into the front wall are seamless, because they are not formed by joining different elements, but they are formed during a single process of forming of the front wall, for example by pressing a single metallic sheet.

[0070] The two side walls 8a, 9a extend from the side edges 50c and 50d of the front wall 4 substantially perpendicularly to the front wall 4 towards the lateral walls 9, so as to be aligned to the latter. Analogously, also upper and bottom walls 6a, 7a extend from the top edge 50a and bottom edge 50b substantially perpendicularly to the front wall 4, respectively towards the top and bottom walls 6, 7 of the casing, preferably so as to be aligned with the latter. At least one of bottom wall 7a and side walls 8a, 9a, more preferably all of them, includes a flange to secure the front wall 4 to the rest of the casing 2.

[0071] Preferably, at least a flange, more preferably each flange, respectively called side flanges 19a, 19b, and bottom flange 19c, extends substantially perpendicularly to the side walls 8a, 9a, or bottom wall 7a, respectively, from which it departs. At least one, preferably all, flanges 19a, 19b, 19c, abuts against a corresponding flange, not visible in the drawings, present respectively on the lateral walls 9 and bottom wall or basement 7 of the casing 2. Flanges can be formed continuously with the wall from which they extend, or they can be welded to the same. In a different embodiment, only some of the flanges are formed continuously while others are fixed to the front wall 4. These flanges are not visible from the outside of the appliance when the front wall 4 is assembled to the rest of the casing, being hidden inside the casing 2 itself.

[0072] Preferably, flanges 19a, 19b, 19c, include coupling holes, all indicated with 39 in the appended drawings, in order to couple the flanges 19a, 19b, 19c of walls

7,9 to the flanges of the rest of the casing, so that the front wall is coupled to the rest of the casing 2 via suitable fastening elements (not visible) inserted or otherwise coupled to the holes 39.

[0073] Further, front wall 4 includes a second aperture 15, called panel aperture. Preferably, the front wall 4 includes also a third aperture, called drawer aperture 60.

[0074] Preferably, the panel aperture 15 and/or the drawer aperture 60 is (are) located at the top portion 4a' of the front wall.

[0075] In a preferred embodiment, better visible in figs. 3 and 4, the panel aperture 15 and the drawer aperture 60 are each substantially a through hole within the front wall, in other words the panel aperture and/or the drawer aperture is(are) completely surrounded in all directions by the front wall. In this way, the panel aperture 15 and/or the drawer aperture 60 includes each an outer edge, 15a and 60a, respectively, which defines a closed curve, such as a loop.

[0076] Preferably, panel aperture 15 and drawer aperture 60 are located one adjacent to the other substantially at the same height along the Z direction on the front wall 4.

[0077] A crosspiece 66 advantageously separates the panel aperture 15 from the drawer aperture 60 (and vice-versa). The crosspiece 66 has preferably an elongated shape with two distal opposite ends 66b, 66c. As visible in the figures, preferably the crosspiece 66 has an elongated shape and has a longitudinal extension substantially parallel to the vertical axis Z. Crosspiece 66 includes a portion of the edge 60a of the drawer aperture 60 and a portion of the edge 15a of the panel aperture 15a, corresponding to its longitudinal opposite edges. Furthermore, crosspiece 66 includes a front surface 66a which is oriented towards the outside of the casing 2.

[0078] In a preferred embodiment, the front surface 66a of the crosspiece 66 and the front surface 4a of the front wall 4 are a continuous uniform surface, and even more preferably this continuous uniform surface is also seamless. In this case, the crosspiece 66 is substantially an integral part of the front wall 4: in the front wall 4 there are two apertures, the drawer and panel aperture, and the crosspiece is the "remaining" portion of front wall (for example during a punching procedure of a metal sheet for obtaining the apertures) between the two.

[0079] In a different embodiment, no visible in the drawings, the crosspiece 66 is attached, for example by means of its opposite longitudinal ends 66b, 66c, to the front wall separating the two apertures 60, 15. In this case, the crosspiece is not an integral piece to the front wall, but a separated element which is then fixed to the front wall 4.

[0080] In a different embodiment, not shown, drawer aperture and panel aperture might be the same aperture, e.g. a single "bigger" aperture can be obtained on the front wall, having the function of the panel and drawer apertures.

[0081] Preferably, but not necessarily, the front wall may comprise a service aperture 99, (shown only in figure

1) preferably covered by a service aperture cover 99a, so that a filter (not visible) of the laundry treatment device 100 might be easily accessible. Preferably, the service aperture 99 is provided at the bottom portion 4a" of the front wall 4.a

[0082] Laundry treatment device 100 further includes a panel control assembly 1.

[0083] In figures 1 and 2, an exemplary control panel assembly 1 in accordance to the invention is shown. The control panel assembly 1 includes an outer dashboard 11, which in the depicted embodiment spans for most of the width of the front surface 4a of the appliance. Preferably, although not necessarily, the dashboard is substantially a basin-shaped rigid shell. Preferably dashboard 11 is structured for being coupled to the outer front wall 4 of the appliance. Preferably, the dashboard 11 is made of plastic material.

[0084] The dashboard 11 is preferably configured for allowing the user to manually control operation of the appliance and ascertain an operational state thereof. The dashboard includes a portion 11ext, external to the casing 2 when laundry treatment device 100 is in the assembled condition (as shown in figure 1), which is the portion of the dashboard 11 visible and operable by the user.

The dashboard external portion 11ext is an exposed part of the control panel assembly also when the device 100 is fully assembled. The dashboard external portion 11ext advantageously includes a plurality of apertures and/or input areas 38 through which manually-operable control members 38a are visible or operable.

[0085] For example, received within, or in registry with, the various apertures 38 formed in the dashboard external portion 11ext, there are a main push button used as a main power control, a plurality of operation push-buttons, control knobs and illumination elements. Although not depicted, the dashboard external portion 11ext might include also a display screen and one or more control knobs.

[0086] The control knob might be rotatable in order to permit the user to select operation cycle settings and other control parameters, with reference to selections indicated by words, icons or other indicia that may be arranged, in printed form or otherwise, on the dashboard.

[0087] Apertures 38 in the dashboard, for example covered by a transparent plastic cover, can also render visible illumination of elements (also called light indicators) to provide a visual indication of a particular operation selection corresponding to a knob or push button position. Alternatively, illumination of elements may indicate the current operation state in the case of a progressive wash/dry operation comprising multiple sequential cycles or stages.

[0088] In the depicted embodiment, the dashboard advantageously includes several arrays of apertures for different light indicators. The light visible within the aperture could be either present or absent, in an on/off manner, or follow a determined pattern, e.g. blinking, can have different intensity, or can change color. The light coming

from different apertures can also have different intensity or color one from the other(s).

[0089] Push buttons, display and apertures to visualize light indicators are known in the art and will not be further detailed below.

[0090] Outer dashboard 11 also includes a rear surface 11r facing the internal of the casing 2, when device 100 is in an assembled configuration. In the latter configuration, the rear surface 11r is located in front of the panel aperture 15 substantially covering (or overlapping) the same. Rear surface 11r is preferably substantially flat.

[0091] Referring now to figure 2, it is shown a perspective exploded view of the control panel assembly 1. As visible from the figures, the control panel assembly 1 also includes a printed circuit board (PCB) 14 for electrically connecting, on a corresponding active surface thereof, the rotatable knobs, the buttons, the display, etc., mentioned with reference to the dashboard.

[0092] Moreover, as generally known in the art, the PCB electrically connects functional components, e.g. electronic circuitry components (not visible in the figures), for implementing corresponding control functionalities of the control panel assembly. Such functionalities can be one or more of powering, driving, activation, deactivation of one or more operative load including electric, electronic, electro-mechanical and/or electro-hydraulic parts of the appliance, such as motor(s), solenoid valve(s), further PCB, all not shown.

[0093] PCB 14 is connected to the rear surface 11r once the control panel assembly is in an assembled configuration, and when the control panel assembly is mounted on casing 2, it is located internally to the casing 2.

[0094] Many other elements can be included in the panel control assembly as well, which are not relevant for the present invention.

[0095] Control panel assembly 1 is coupled to the front wall 4 at the panel aperture 15. The PCB 14 and other possible elements are inserted into the aperture 15. The outer dashboard 11 is then fastened onto the front wall 4. The external portion 11ext preferably remains outside the casing 2, for example abutting against the front surface 4a and/or onto a surface 18 in proximity of the edge 15a of the aperture 15.

[0096] With now reference to figures 2, 10, 11, 12 and 13, the appliance 100 further includes a sealing element 40 interposed between the outer dashboard 11 and the abutment surface 18 (see figure 11) at the edge 15a of the panel aperture 15.

[0097] The sealing element 40 preferably includes a gasket. The sealing element 40 is preferably formed as a strip element and even more preferably it has an annular shape. Advantageously, it is made of an elastic material, so that, under stress, it can undergo a certain amount of elastic deformation.

[0098] Referring to fig. 13, a schematic representation of sealing element 40 is depicted. Preferably, the sealing element 40 includes at least a boss 41, more preferably

a plurality of bosses, located around its perimeter. Correspondingly to the boss (or bosses 41), on the abutment surface 18, e.g. on the portion 18a, a notch (or notches) (not illustrated) is(are) formed, in order to house the boss(es) 41. The design, form and shape of the boss and the notch allow a good positioning of the sealing element on the ridge, facilitating installation in the correct position. The boss/notch coupling also prevents the sealing element to be misplaced during the appliance functioning, which could be caused by vibrations of the appliance.

[0099] During assembly, the outer dashboard 11 and the front surface 4a are pressed together, so that a portion of the rear surface of the external portion 11ext of the outer dashboard and the abutment surface 18 are in turn deforming the sealing element 40 interposed therebetween. Due to the pressure and deformation, the sealing element 40 fills any possible gap present between the rear surface of the external portion 11ext of dashboard and the abutment surface 18 achieving a sealing function.

[0100] In order to support the sealing element 40, from the rear surface 11r of the dashboard 11, a ridge 19 extends: when the control panel assembly 1 is in an assembled configuration on the casing 2, the sealing element 40 is mounted on the ridge 19.

[0101] Advantageously, the ridge 19 is located substantially in proximity of an edge 11ed of the rear surface 11r of the outer dashboard and it follows the same creating an annular ridge, e.g. it forms a closed-loop on the rear surface 11r of the dashboard 11. Preferably, ridge 19 defines two opposite surfaces 19e, 19f, both substantially perpendicular to the rear surface 11r, on one of which, surface 19e, the sealing element 40 abuts. Surface 19f is an inner surface of the ridge 19, e.g. it is the surface that faces itself being in the inside of the loop, while surface 19e is the external surface of the loop.

[0102] Preferably the dimensions of the loop formed by the sealing element 40 are slight smaller than the dimensions of the loop formed by ridge 19, so that the sealing element 40 is mounted with interference on the ridge 19 and the risk of accidental unwanted removals is minimized.

[0103] In the depicted embodiment of figures 10 and 11, sealing element 40 is a separated element from ridge 19 and it has to be assembled on the latter when the panel control assembly 1 is to be mounted on the casing 2. In a different embodiment, not shown in the appended drawings, the sealing element 40 can be over-molded on the surface 19e of the ridge 19, so that fewer elements have to be assembled.

[0104] At the front wall 4, from edge 15a of panel aperture 15, a flange 16 extends. The flange 16 includes the abutments surface 18. Flange 16 has substantially an L-shape, with a first portion 18a substantially parallel to the external surface 19e of the ridge 19, and a second portion 18b substantially parallel to the rear surface 11r, when the laundry treatment device is in an assembled configuration.

[0105] The flange 16 and the ridge 19 are so dimensioned that, in an assembled configuration, the sealing element 40 is sandwiched and compressed between the external surface 19e of the ridge 19 and the first portion 18a of abutment surface 18.

[0106] Advantageously, in order to securely fasten the control panel assembly 1 to the panel aperture 15, mechanical coupling device of the first and the second type 20, 30 are preferably used. In the mentioned drawings, sealing element 40 is not shown (anyway it can be provided or not), for clarity purposes to better visualize the mechanical coupling devices now described.

[0107] The mechanical coupling device of the first and second type 20, 30 couples the outer dashboard 11 to flange 16 extending from the edge 15a of panel aperture 15.

[0108] In the depicted embodiment, the mechanical device of the first type 20 is an automatic coupling device that simply requires pressure on the dashboard when the latter is positioned in front of the aperture 15. It includes one or more snap-on connecting member 21, such as snap-on tongues 22 provided on the dashboard 11, which are - in an assembled configuration of the laundry treatment machine - clipping on flange 16 formed around the edge 15a of said panel aperture 15.

[0109] Preferably, as visible in figure 8, tongues 22 protrude from the inner surface 19f of the ridge 19 and hook the flange 16 in a plurality of different positions around the end 15a of aperture 15, in an assembled configuration. Thus, when the ridge 19 is inserted inside aperture 15, it is located internally to flange 16 and a simple application of pressure on dashboard 11 couples the outer dashboard 11 to the front wall 4 due to the fact that tongues 22, which are inwardly elastically bended during the insertion, as soon as they reach the free space behind flange 16, snap on the latter, thereby locking the dashboard onto the front wall 4 in its correct position.

[0110] Moreover, the device 100 includes the mechanical coupling device of the second type 30, which preferably is activated, e.g. it is used to fasten the dashboard onto the front wall, after the coupling is already obtained by the mechanical coupling device of the first type 20. The device of the second type 30 includes preferably a screw element, such as, in the depicted embodiment, screw threads 31 provided in the rear surface 11r of the dashboard 11, a hole 32 provided in the flange 16 formed around the panel aperture 15, and a screw 33 which is inserted in the hole and screwed in the threads to tighten the already obtained coupling.

[0111] Preferably, more than such a device 30 is provided, and even more preferably a plurality of devices of the second type are arranged in proximity of the outer edge 11ed of the rear surface 11a of dashboard 11, so that a strong and firm "double" coupling is present along the whole edge 11ed of the dashboard 11.

[0112] In a preferred embodiment, the screw threads 31 are obtained in a bushing protruding substantially in a perpendicular manner from rear surface 11r. Bushing

31 (bushing and screw threads have the same reference number in the drawings) is preferably located within the loop formed by ridge 19. Preferably bushing is integral with the dashboard. Advantageously, the number of bushings is equal to the number of mechanical coupling devices of the second type 30.

[0113] Flange 16 further preferably includes one or more flaps 34 protruding from the same, and advantageously they extend from its second L portion 18b parallel to the rear surface 11r. The number of flaps 34 is preferably equal to the number of devices of the second type, so that each flap 34 is perforated by the hole 32 in which screw 33 is inserted and then screwed into bushing 31.

[0114] Thus, using a plurality of screwing elements 31, 32, 33 around the whole edge 11ed of dashboard 11, the fastening of the dashboard on the flange 16 is secured in all directions.

[0115] During the mounting of the dashboard on the front wall, first of all the sealing element 40 is mounted on the ridge 19. Then the dashboard is brought in contact to the flange 16 and pressure is applied to the same towards the front wall, till the snap-on tongues snap onto the flange. Then, screws 33 are inserted into holes 32 and screwed into bushings 31.

[0116] Furthermore, with reference to figures 5-7, the outer dashboard 11 is preferably fastened to the crosspiece 66 via a first mechanical coupling system 67. The crosspiece 66 advantageously comprises at least an element, part or portion of such first mechanical coupling system. In this specific embodiment, the crosspiece includes a hole 64 of the first mechanical coupling system 67, on which a screw 69 is inserted and fastened into a screw thread 68 provided on the rear surface 11a of the outer dashboard 11. More preferably, two holes 64, preferably one on top of the other in the vertical direction Z, are provided also on the crosspiece 66, on which two screws are inserted, which are then screwed into two screw threads formed on the rear surface 11r of the outer dashboard.

[0117] Preferably, when the dashboard 11 is coupled to the front wall 4 and it is partly inserted in the casing, the external portion 11ext of the dashboard 11 is flush-mounted on the front wall 4, being flush with the front surface 4a. The aesthetical appearance of the assembled dashboard 11 on the front wall 4 is that of a substantially continuous surface where the external portion 11ext matches the external surface 4a of front wall 4.

[0118] Referring back to figure 2, laundry treatment device 100 also includes a detergent drawer 63. Detergent drawer 63 is retractably mounted to said front wall 4 so that it can be opened and closed. The detergent drawer is generally used to introduce detergents or other products in order to perform a proper washing cycle. Detergent drawer includes a detergent drawer front wall 63a, which also remains external to the casing 2 when the laundry treatment device is in an assembled configuration, and it is so shaped to be easily gripped by the user

in order to open and/or close the drawer 63.

[0119] Drawer 63 is coupled to drawer aperture 60 of front wall 4. In order to couple the drawer to the front wall 4 in a retractable manner, a drawer seat 61 is provided, whose dimensions are optimal to house the drawer 63 in a slidable manner. The drawer seat 61 is thus fixed to the front wall 4 at the drawer aperture 60.

[0120] Drawer seat 61 is preferably made of plastic material.

[0121] Drawer seat 61, after being mounted on the drawer aperture 60, is then covered by the drawer front wall 63a so that drawer seat becomes substantially invisible when the laundry treatment device 100 is in an assembled configuration. Drawer front wall 63a thus is positioned in front of the drawer aperture 60 closing the same. Preferably, the front wall 63a of the drawer is mounted on the drawer seat so that it is substantially flush-mounted on the front wall, i.e., the front surface 4a of the front wall is substantially flush with a front surface of the drawer front wall 63a.

[0122] In an alternative embodiment, non-depicted in the drawings, a single "larger" aperture is provided, as mentioned previously, to house both the control panel assembly 1 and, adjacent to the latter, the detergent drawer 63 (so the crosspiece is not present).

[0123] Drawer seat 61 is inserted into drawer aperture 60 and then fixed to the same. In order to fix the drawer seat 61 to the front wall 4, a mechanical coupling 65 is used. Mechanical coupling 65 includes for example a screw 65a inserted into a hole provided in proximity of the edge 60a of the drawer aperture 60. The screw 65a is thus screwed into a screw thread (not shown) of the drawer seat 61. Any other mechanical coupling can be used as well, in order to firmly fasten the drawer seat to the drawer aperture 60, preferably in proximity of the drawer aperture edge 60a.

[0124] In the depicted embodiment, drawer seat 61 and the external portion 11ext of the outer dashboard 11 form an integral piece. Therefore, mechanical system 67 also fastens the drawer seat to the crosspiece automatically means.

[0125] Preferably, the external portion 11ext of the dashboard 11 and drawer seat 61 are molded together and are made of plastic material.

[0126] General operation of the laundry treatment device 100 is substantially identical to that of a conventional laundry treatment device; therefore no further explanation is required.

[0127] It has thus been shown that the present invention allows all the set objects to be achieved.

[0128] Clearly, changes may be made to the rotatable drum and to the laundry treating machine (including such a rotatable drum) as described herein.

[0129] Although an illustrative embodiment of the present invention have been described herein with reference to the attached drawings, it is to be understood that the present invention is not limited to the specific embodiment illustrated and described herein, and that

various other changes and modifications may be affected therein by one skilled in the art without departing from the scope of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the following claims.

Claims

1. A laundry treatment device (100) comprising:
 - a casing (2) including a front wall (4) defining a continuous front surface (4a) and having a panel aperture (15);
 - a control panel assembly (1) for controlling operation of the laundry treatment device (100), said control panel assembly including an outer dashboard (11) which is structured to be coupled to said front wall (4) at said panel aperture (15) and to be operated by a user;

characterized in that it further includes a mechanical coupling device of a first type (20) and a mechanical coupling device of a second type (30), said first type being different from said second type, so configured to couple said outer dashboard (11) to said front wall (4) at said panel aperture (15).
2. The laundry treatment device (100) according to claim 1, wherein said mechanical coupling device of the first type (20) is a device for automatic coupling.
3. The laundry treatment device (100) according to claim 2, wherein said mechanical coupling device of the first type (20) is configured to couple said outer dashboard (11) to said front wall (4) at said panel aperture (15) by application of pressure on said outer dashboard.
4. The laundry treatment device (100) according to claim 3, wherein said mechanical coupling device of the first type (20) includes a snap-on connecting member (21).
5. The laundry treatment device according to any of claims 2 to 4, wherein said mechanical coupling device of the first type (20) includes a snap-on tongue (22) protruding from one of said outer dashboard (11) and said front wall (4) in proximity of said aperture, and a corresponding panel flange (16) or seat on the other one of said dashboard and said front wall (4) in proximity of said panel aperture (15).
6. The laundry treatment device (100) according to claim 5, wherein said outer dashboard (11) includes a rear surface (11r) facing, in an assembled configuration, the internal of the casing (2) and wherein said front wall (4) includes a flange (16) extending

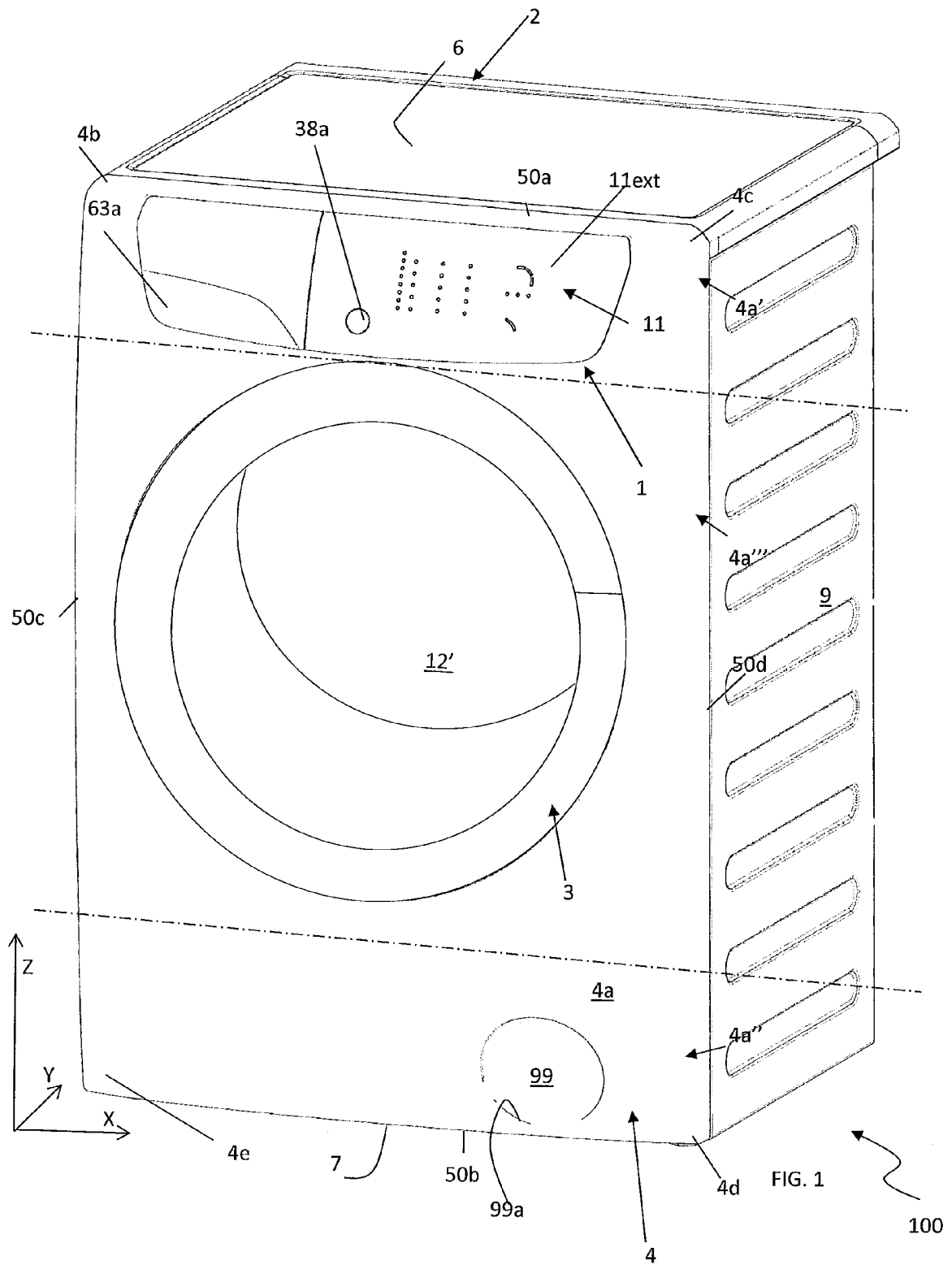
from an edge (15a) of said panel aperture (15), said mechanical coupling device of the first type (20) including a plurality of snap-on tongues (22) protruding from said rear surface (11r).

7. The laundry treatment device (100) according to any of the preceding claims, wherein front wall (4) includes a panel flange (16) extending from an edge of said panel aperture (15) and wherein said mechanical coupling devices of the first and second type (20,30) are so configured to couple said outer dashboard (11) to said panel flange (16). 5
8. The laundry treatment device (100) according to any of the preceding claims, wherein said mechanical coupling device of the second type (30) includes a screw coupling element. 10
9. The laundry treatment device (100) according to claim 8, wherein said outer dashboard (11) includes a rear surface (11r) facing said front wall (4), said front wall (4) including a panel flange (16) extending from an edge (15a) of said panel aperture (15), and said mechanical coupling device of the second type (30) including screw threads (31) formed in said rear surface (11r), a hole (32) formed in said panel flange (16), and a screw (33) which is inserted in said hole (32) and screwed in said threads (31) to tighten the coupling of the second type. 20
10. The laundry treatment device (100) according to claim 9, wherein said panel flange (16) includes a plurality of spaced apart flaps (34), and said mechanical coupling device of the second type (30) includes a plurality of bushings (31) projecting from said rear surface (11r), a plurality of corresponding holes (32), each hole being formed in a single flap (34), and a plurality of corresponding screws (33), each screw being inserted in a corresponding hole and bushing to tighten the coupling of said second type. 25
11. The laundry treatment device (100) according to any of the preceding claims, wherein said front surface (4a) includes a drawer aperture (60) for the coupling to a drawer (63) and said outer dashboard includes a drawer seat (61) for said drawer (63) so that said drawer can be coupled in a retractable manner to said front wall (4) at said drawer aperture. 30
12. The laundry treatment device (100) according to any of the preceding claims, wherein said outer dashboard (11) is made of a plastic material and said front wall (4) is made of a metallic material. 35
13. A method to couple a control-panel assembly (1) to a front wall (4) of a laundry treatment device (100) at a panel aperture (15) formed in a continuous front surface (4a) of said front wall, said control panel as-

sembly (1) including an outer dashboard (11) which is structured to be coupled to the front wall at said panel aperture (15) and operated by a user, the method including the steps of:

- coupling said outer dashboard (11) to said front wall (4) at said panel aperture (15) via a mechanical coupling device of a first type (20);
- then, coupling said outer dashboard to said front wall (4) at said panel aperture (15) via a mechanical coupling device of a second type (30), wherein said first type is different from said second type.

14. The method according to claim 13, wherein said step of coupling said outer dashboard (11) via a mechanical coupling device of a first type (20) includes snapping said outer dashboard (11) on a panel flange (16) extending from an edge of said panel aperture (15). 40
15. The method according to claim 13 or 14, wherein said step of coupling said outer dashboard (11) via a mechanical coupling device of a second type (30) includes screwing a screwing element (33) into threads (31) provided in said outer dashboard (11). 45



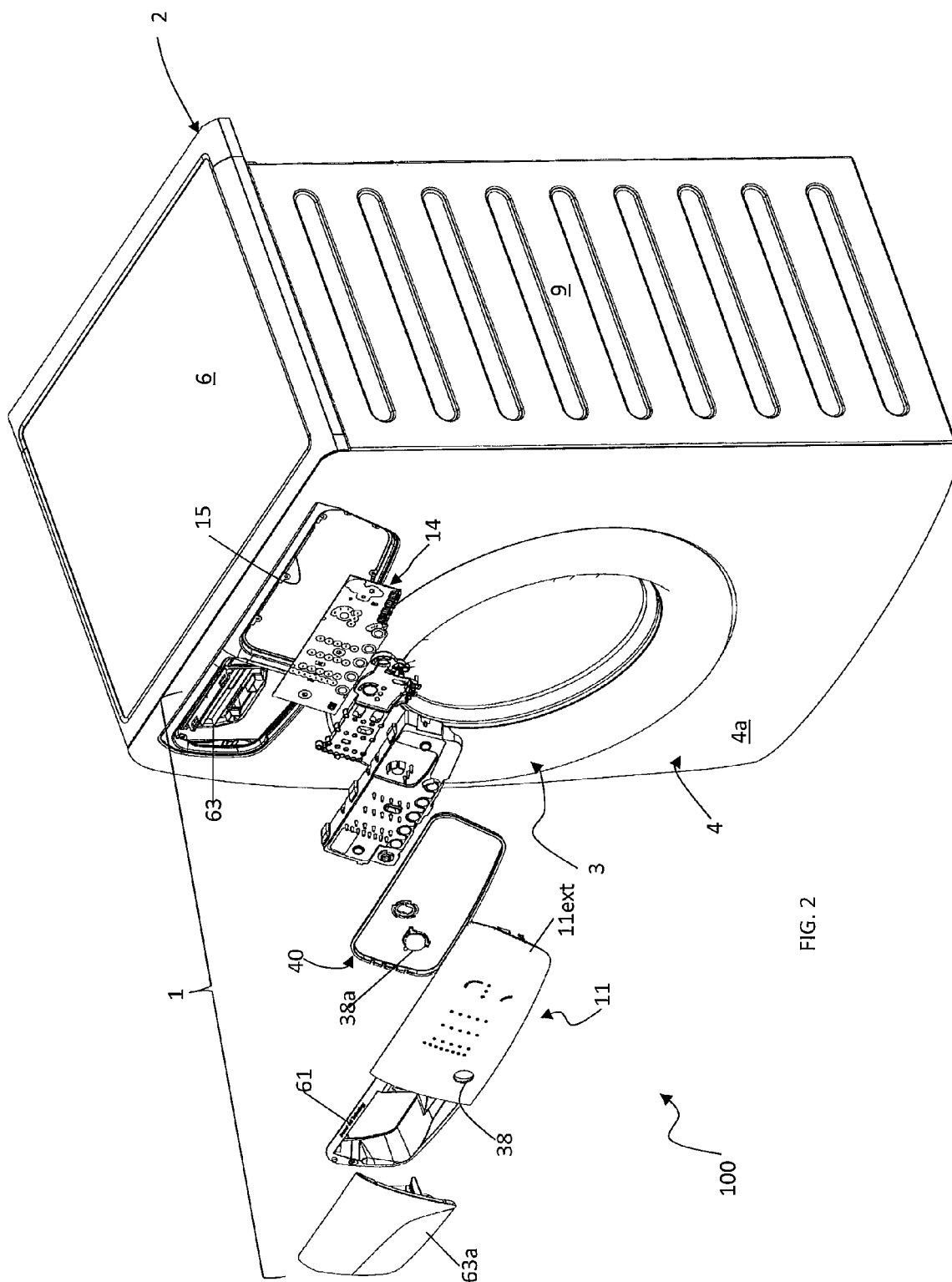


FIG. 2

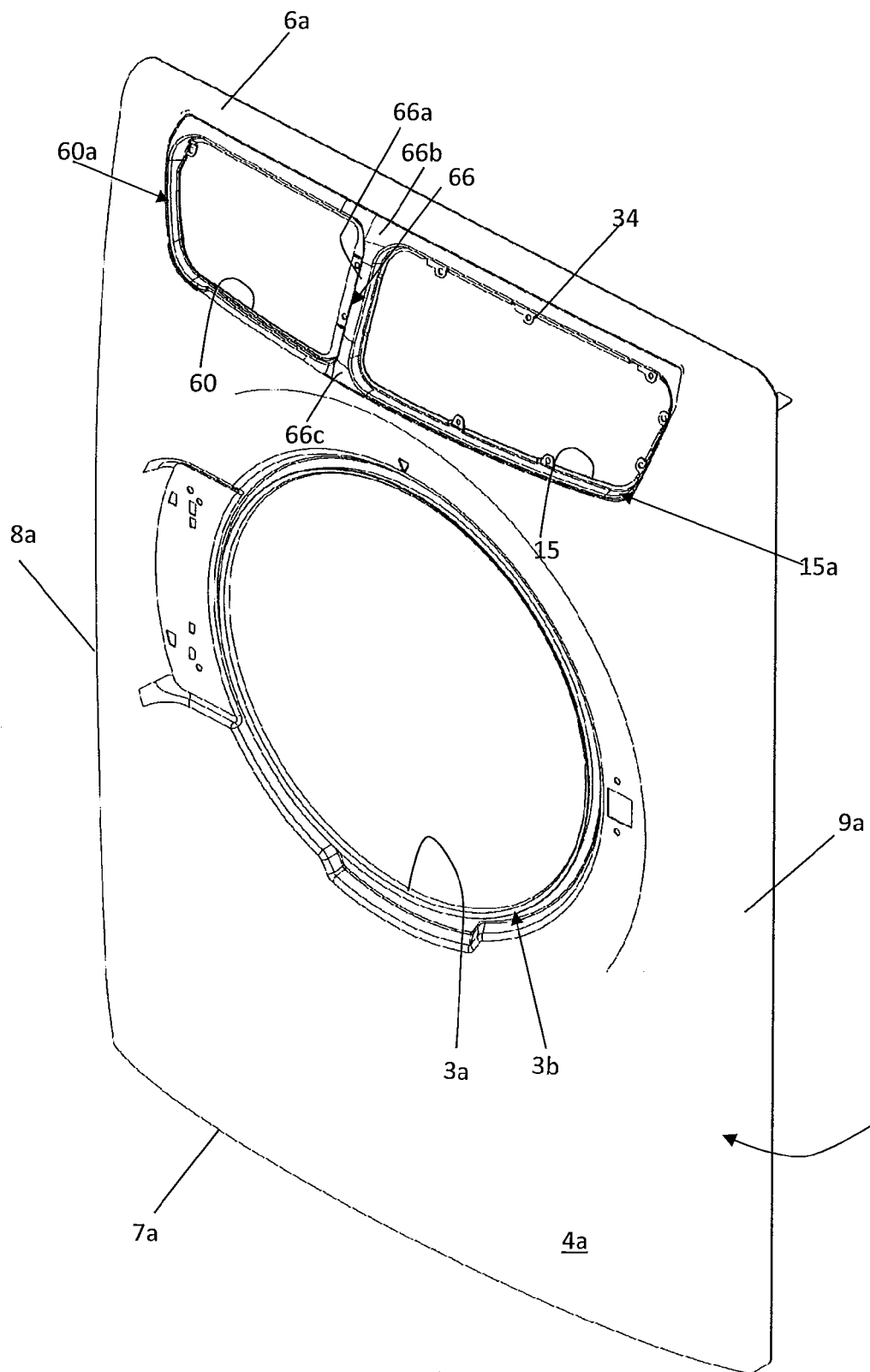
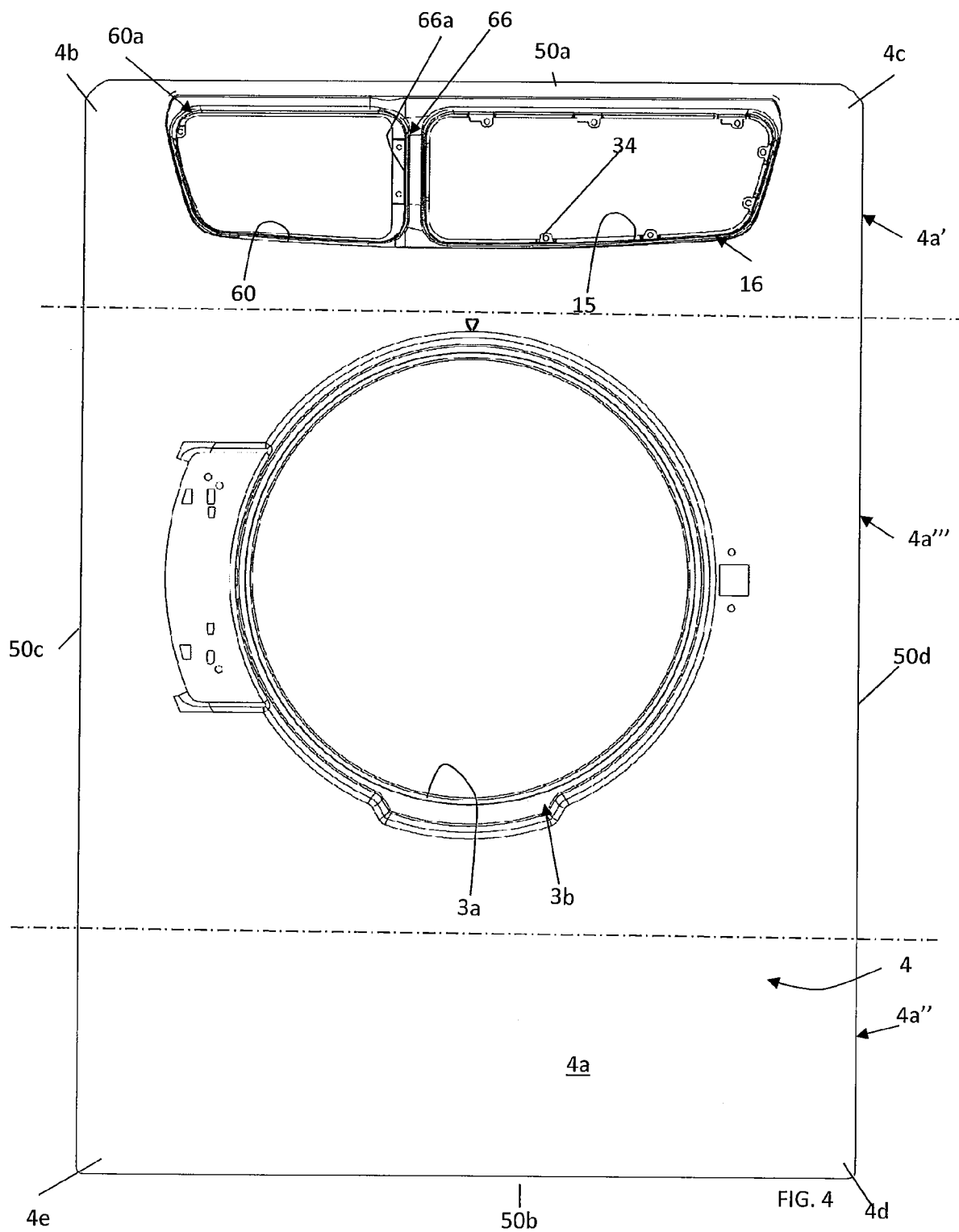


FIG. 3



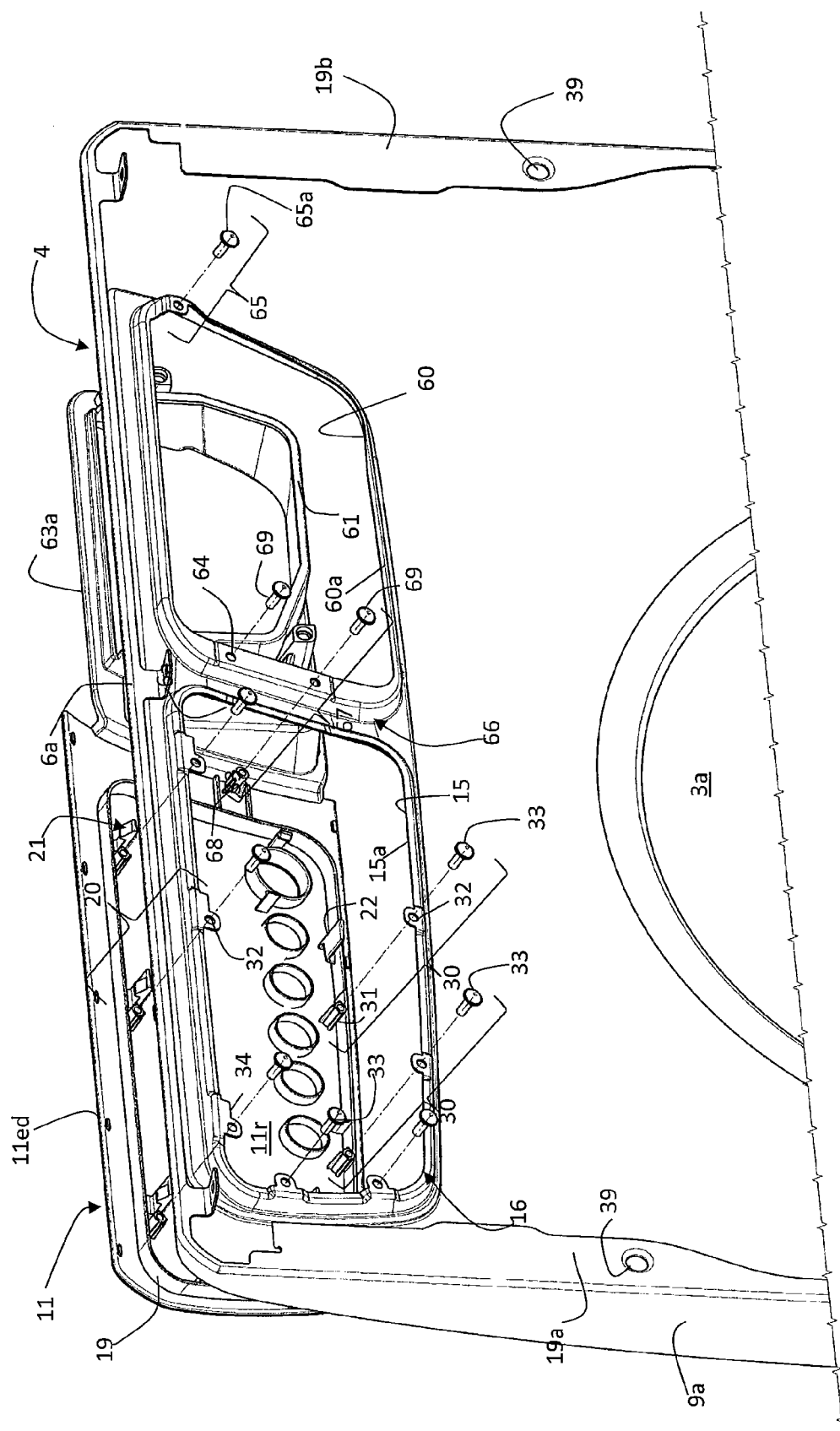


FIG. 5

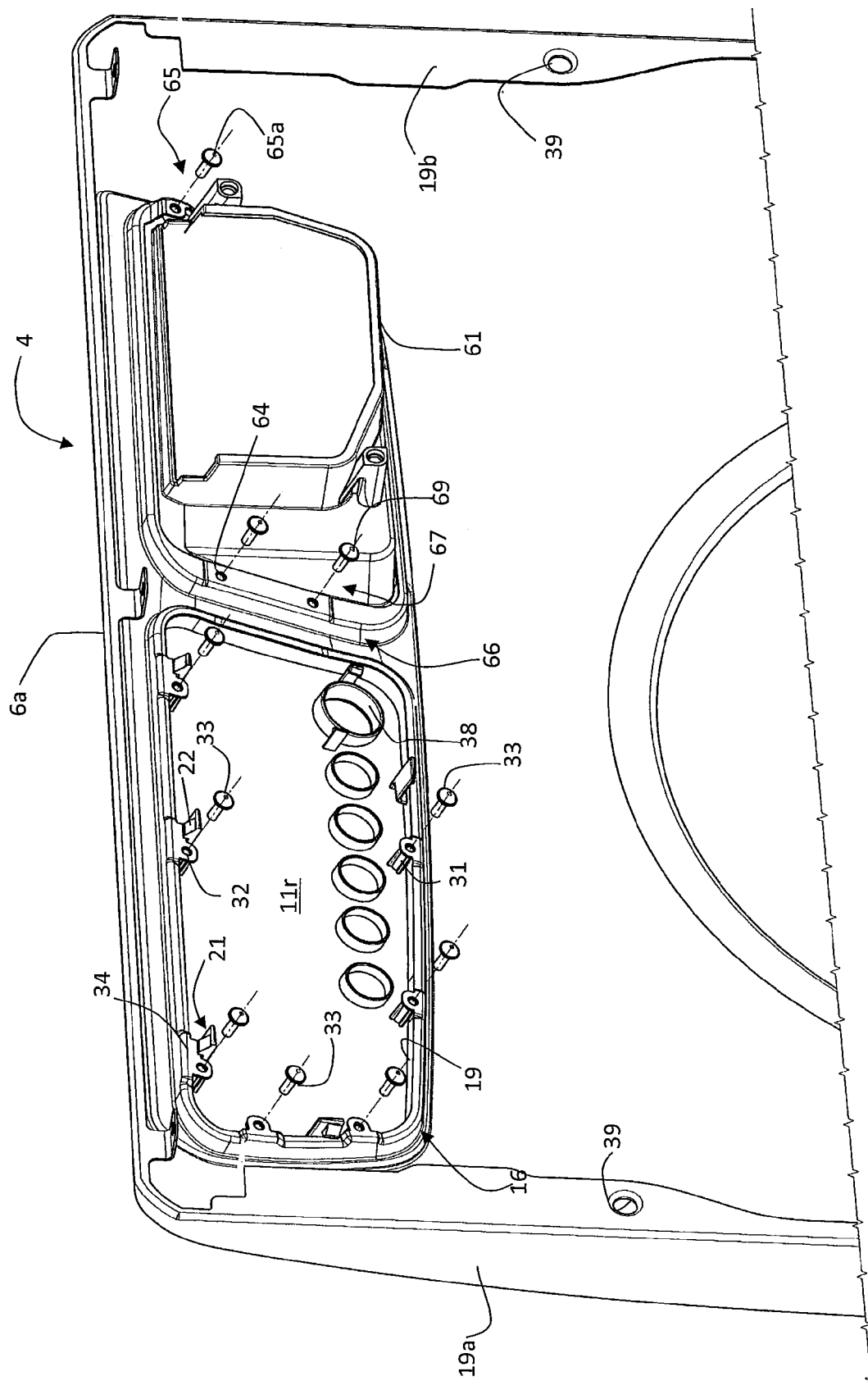


FIG. 6

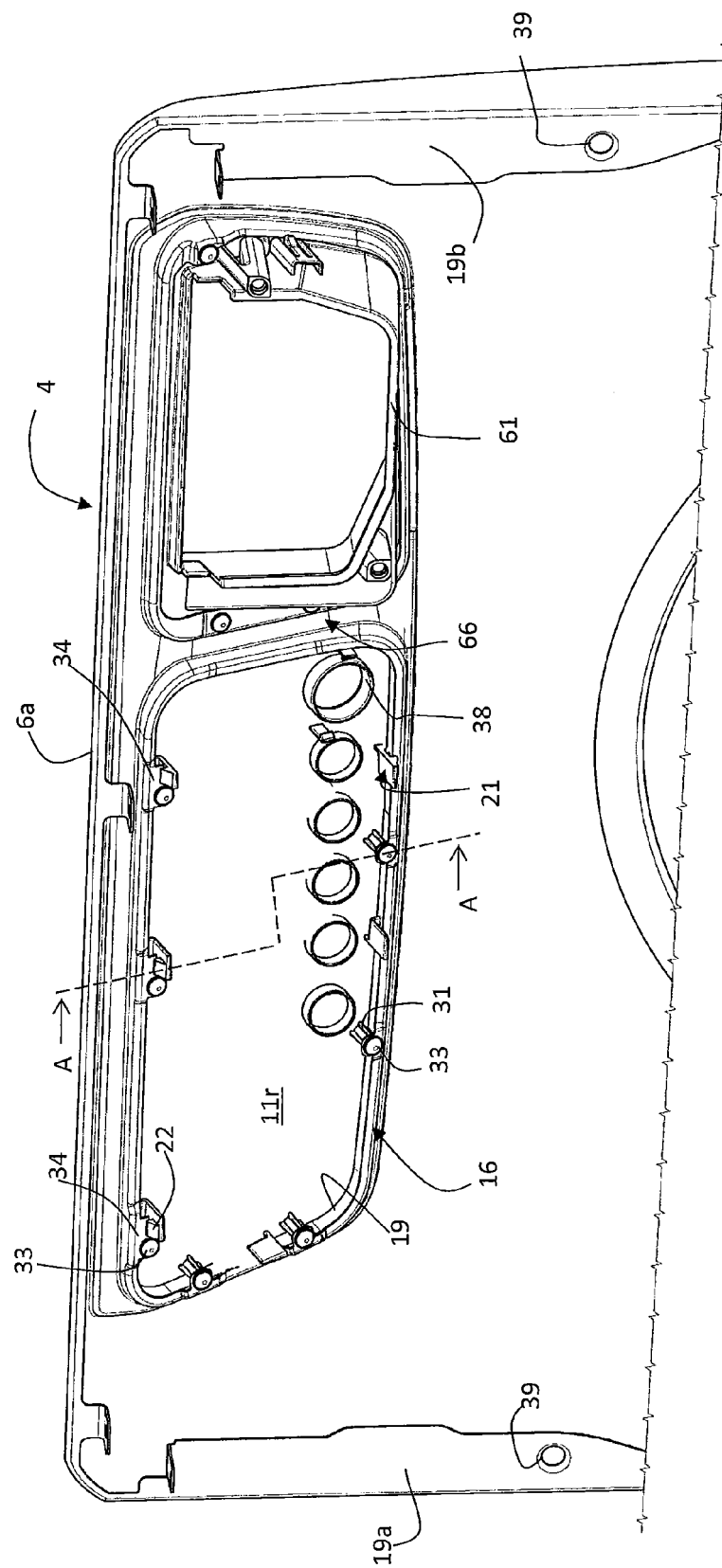
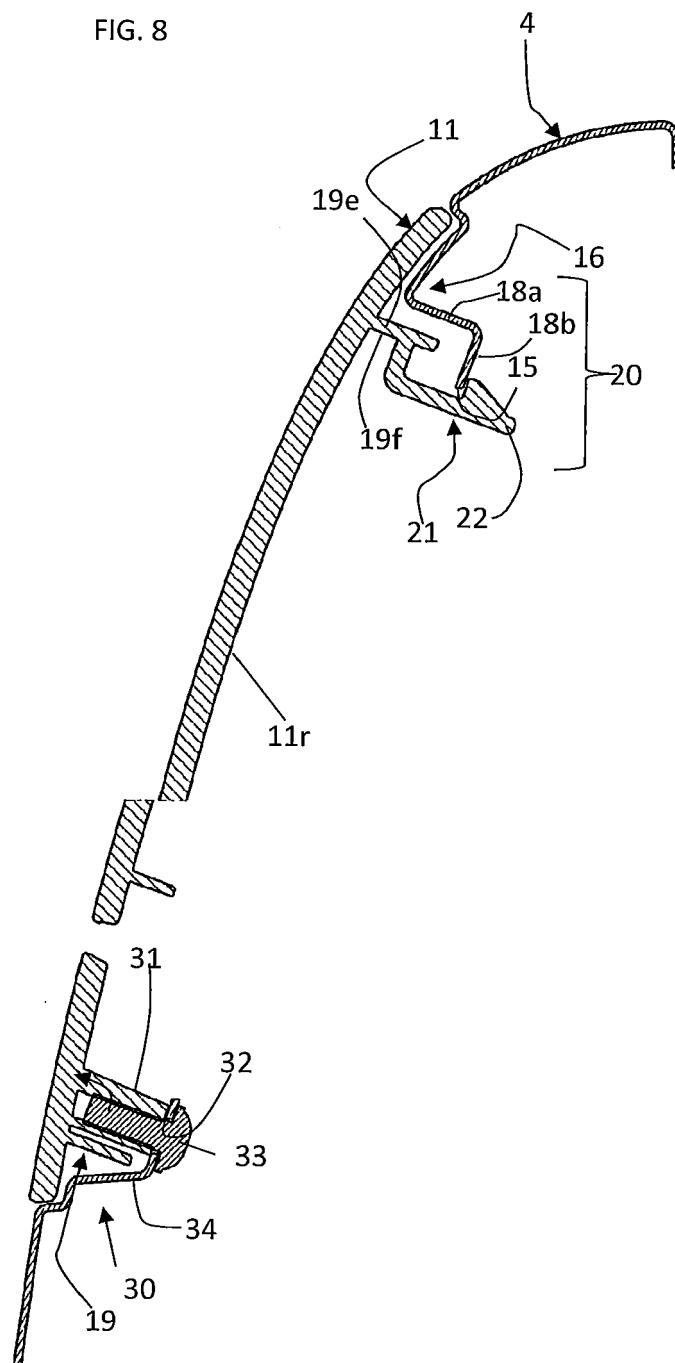


FIG. 7

FIG. 8



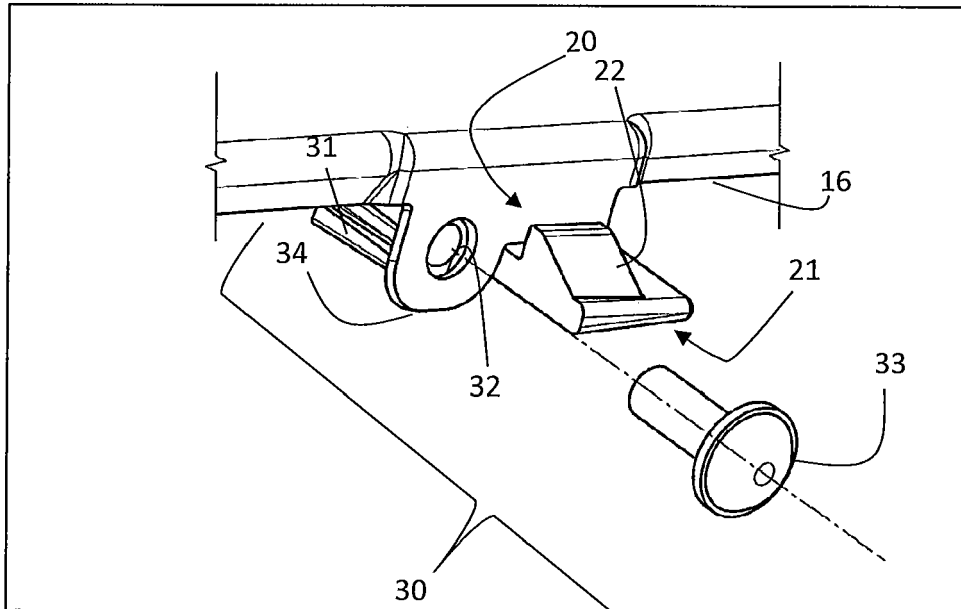


FIG. 9a

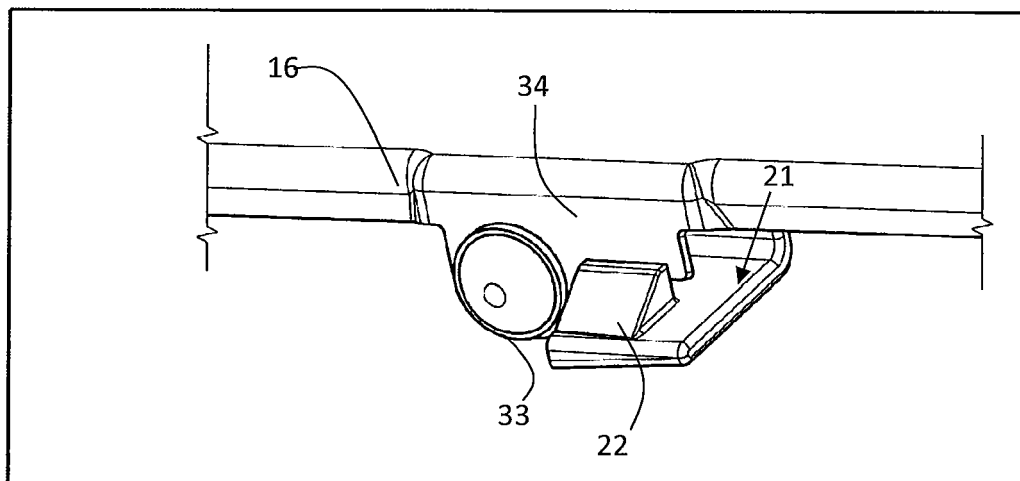
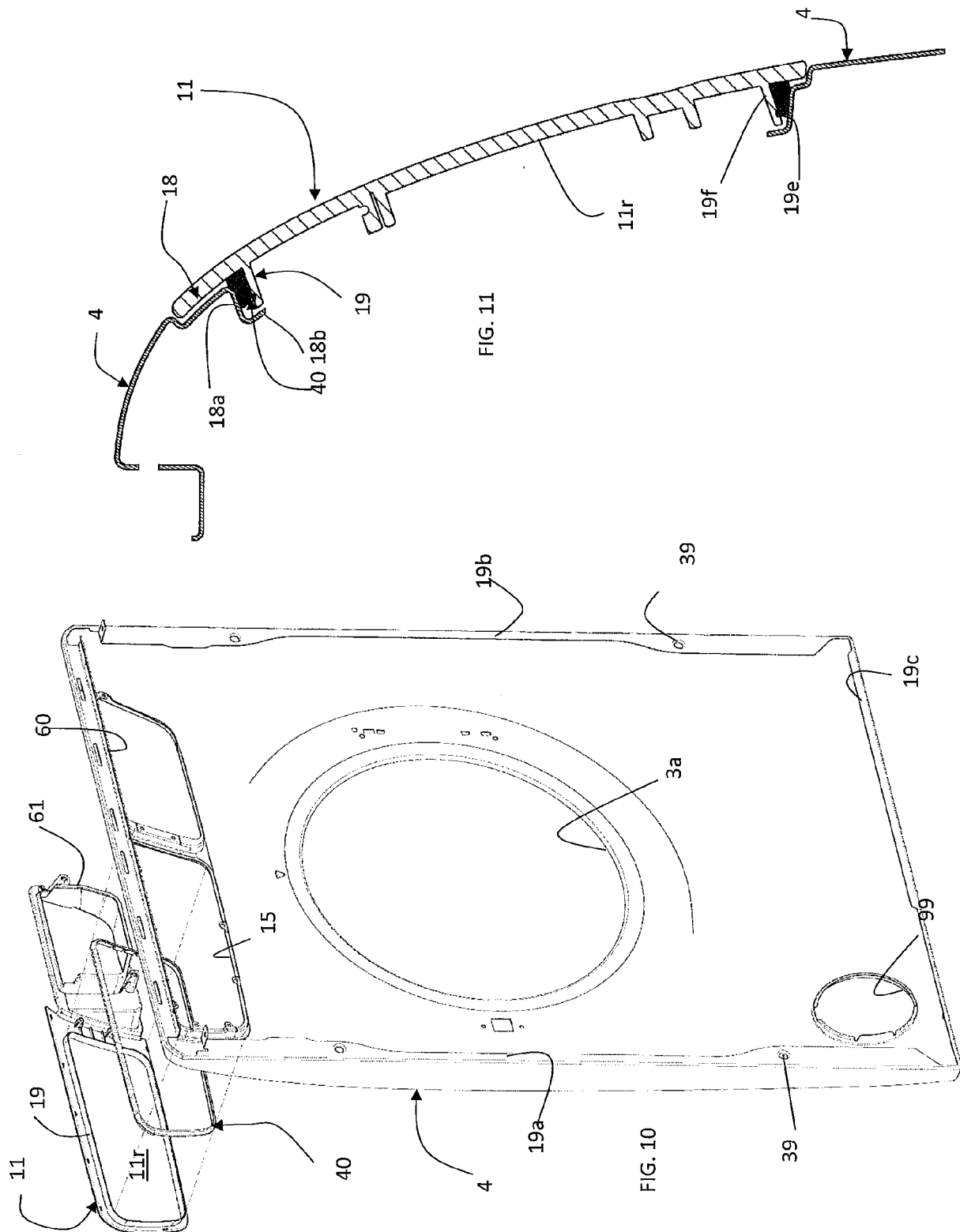


FIG. 9b



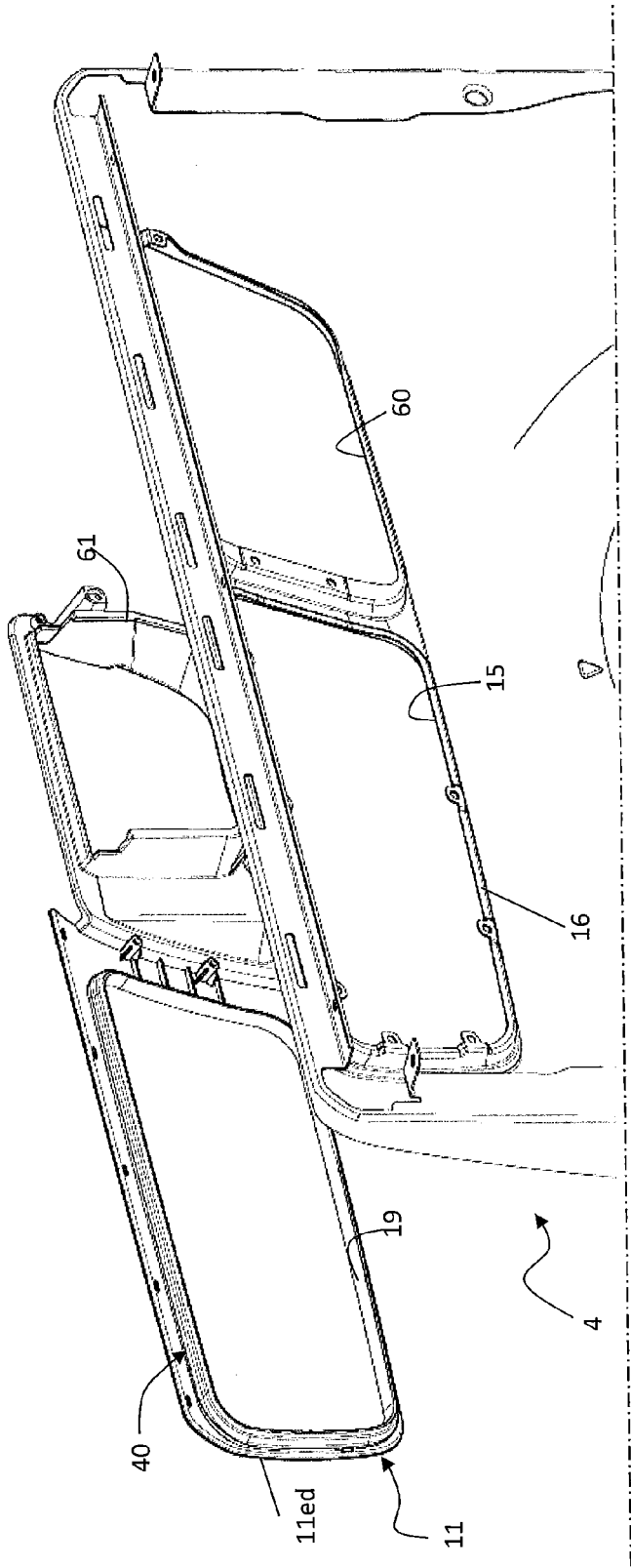


FIG. 12

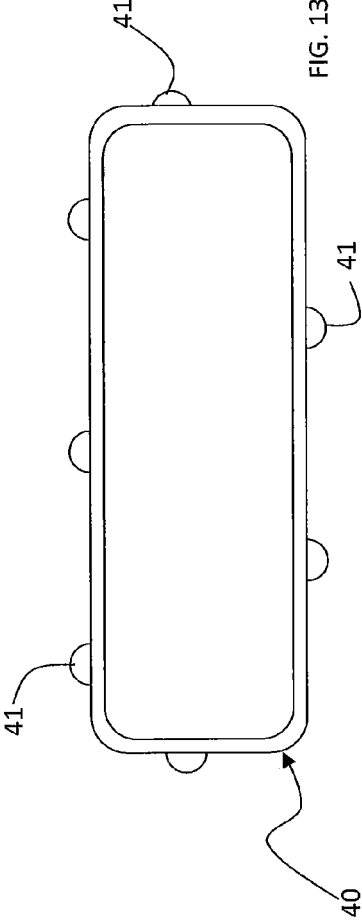


FIG. 13



EUROPEAN SEARCH REPORT

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EP 13 18 0215

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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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Place of search Munich		Date of completion of the search 17 January 2014	Examiner Fachin, Fabiano
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