

(19)



(11)

EP 3 323 928 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
30.08.2023 Bulletin 2023/35

(51) International Patent Classification (IPC):
D06F 39/14 ^(2006.01) **D06F 58/04** ^(2006.01)
D06F 37/42 ^(2006.01)

(21) Application number: **16199838.0**

(52) Cooperative Patent Classification (CPC):
D06F 39/14; D06F 58/04; D06F 37/42

(22) Date of filing: **21.11.2016**

(54) **A DOOR ASSEMBLY FOR A LAUNDRY TREATING MACHINE AND A METHOD TO MODIFY THE POSITION OF A HANDLE IN SAID DOOR ASSEMBLY**

TÜRANORDNUNG FÜR EINE WÄSCHEBEHANDLUNGSMASCHINE UND VERFAHREN ZUR ÄNDERUNG DER POSITION EINES GRIFFS IN DER TÜRANORDNUNG

ENSEMBLE PORTE POUR MACHINE DE TRAITEMENT DE LINGE ET PROCÉDÉ POUR MODIFIER LA POSITION D'UNE POIGNÉE DANS LEDIT ENSEMBLE PORTE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

- **SANTAROSSA, Marco**
33080 Porcia (IT)
- **BUSO, Danny**
33080 Porcia (IT)

(43) Date of publication of application:
23.05.2018 Bulletin 2018/21

(74) Representative: **Electrolux Group Patents**
AB Electrolux
Group Patents
S:t Göransgatan 143
105 45 Stockholm (SE)

(73) Proprietor: **Electrolux Appliances Aktiebolag**
105 45 Stockholm (SE)

- (72) Inventors:
- **BRACONI, Dario**
33080 Porcia (IT)
 - **PRADAL, Luca**
33080 Porcia (IT)

(56) References cited:
EP-A1- 3 034 677 **WO-A1-2016/135285**
US-A1- 2007 075 614 **US-A1- 2011 025 178**

EP 3 323 928 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The present invention relates to a door assembly for a laundry treating machine, in particular for a dryer, a washer-dryer or a washing machine.

[0002] In particular, the present invention relates to a door assembly for a laundry treating machine wherein the position of the handle may be easily changed. Further, the invention relates to a method to change the location of the handle in a door assembly.

BACKGROUND ART

[0003] Conventionally, laundry treating machines include a casing within which a laundry treatment chamber, such as a drum, is located. In the casing, more in particular in a front wall of the same, an opening is made, which gives access to the treatment chamber to load or unload the laundry before and after the drying and/or washing cycle(s).

[0004] A door assembly, also called porthole, is rotatably fixed, for example hinged, to the casing and it is apt to open and close the mentioned opening by operating a handle associated to the door assembly.

[0005] It is also known that, in laundry treating machine, it is desired to be able to change the position of the handle of the door with respect to the machine cabinet to open and/or close the door more opportunely according to the location of the laundry treating machine. For example, depending on the location of the machine in the user's premises, it might be preferable to have a machine with a left-swing opening or, alternatively, a right-swing opening.

[0006] The position of the handle in the two configurations typically differs by a rotation of the handle with respect to the machine cabinet. In addition, in case the handle is not located along a center line of the door, i.e. a line substantially perpendicular to an axis of opening of the door assembly 10, it is also desired to change the position of the handle from a "lower" position to an "upper" position or vice-versa, in case the machine is mounted on the floor or on top of another appliance or piece of furniture. In this case, the circumferential "distance" between the two desired handle positions is less than 180°, generally of about 90°. This need arises for example in case of dryers that are commonly mounted either on the floor of a room or on top of a washing machine.

[0007] Due to these needs, the number and type of parts, steps, time and costs associated with manufacturing and installing a door assembly of known type on a laundry treating machine are relatively high because many different doors with different handle's configurations have to be available, which may affect the efficiency, cost and time of manufacturing the appliance itself. Moreover, different manufacturing lines or stations may be needed to manufacture the different doors, which again

may affect the efficiency, cost and time of manufacturing of the laundry treating machine.

[0008] WO2016135285A1 discloses a laundry drying machine comprising a cabinet housing a chamber for treating laundry. A porthole, with a grip-only handle, is used for providing access to and tightly closing the chamber. The porthole comprises a frame assembly comprising at least one frame and the grip-only handle is configured to be alternatively positionable in one of at least two prefixed positions with respect to said at least one frame of the frame assembly. A drawback posed by the known assemblies is therefore constituted by the fact that they are composed by a great number of pieces.

[0009] This determines a complex structural construction for the assembly which increases the manufacturing costs of the assembly and of the laundry treating machine.

[0010] The object of the present invention is therefore to overcome the drawbacks posed by the known techniques.

[0011] It is a first object of the invention to implement a laundry treating machine that makes it possible to reduce manufacturing time and costs.

[0012] It is a further object of the invention to implement a laundry treating machine equipped with a door assembly wherein a handle is more user-friendly to be moved in different positions compared to known systems.

[0013] It is a further object of the invention to implement a laundry treating machine equipped with a door assembly wherein the position of the handle may be easily changed.

DISCLOSURE OF INVENTION

[0014] The applicant has found that by providing a door assembly for a laundry treating machine comprising a rear frame having a rear aperture, a closing element for closing the rear aperture, a front frame comprising a front supporting structure and an at least partially transparent cap element overlaying the front supporting structure, a covering element having a shaped portion interposed between the rear frame and the front frame, wherein a fastening device allows either the front frame or the rear frame to be connected to said rear frame or front frame respectively, in at least a first and a second alternative positions, it is possible to overcome drawbacks of known techniques.

[0015] The present invention relates, therefore, to a door assembly for a laundry treating machine, apt to open and/or close an opening defined in a wall of the laundry treating machine, the door assembly comprising:

- a rear frame forming a rear surface of the door assembly apt to face said wall when the door assembly closes the opening, the rear frame including a rear frame inner edge defining a rear aperture;
- a closing element connected to the rear frame to close the rear aperture of the rear frame;

- a front frame arranged on a front side of the rear frame and comprising;
- a front supporting structure having an inner edge defining a front aperture;
- an at least partially transparent cap element overlaying a front side of the front supporting structure, and extending over the front aperture, the cap element forming the front surface of the door assembly;
- a handle provided on the front supporting structure and/or the cap element;

the door assembly further comprising:

- a covering element, at least partly covering the closing element, interposed between the rear frame and the front frame;

wherein it comprises a fastening device that allows either the front frame or the rear frame to be connected to said rear frame or front frame respectively, in at least a first and a second alternative positions, so that the handle provided in the front frame can be positioned in at least a first and second different positions relative to the rear frame and so that the rear frame and the front frame can be assembled together in different reciprocal angular positions.

[0016] Preferably, the fastening device comprises coupling elements and corresponding coupling counter-elements formed in the front supporting structure and the rear frame.

[0017] Further preferably, at least a portion of the coupling elements is inserted within the coupling counter-elements or vice-versa;

[0018] In one aspect of the invention, the coupling elements extend from a rear side of the front supporting structure and said coupling counter-elements extend from a front surface of the rear frame, each coupling element or each coupling counter-element including a protruding element.

[0019] Preferably, the protruding element includes a tubular sleeve having an open end. Further preferably, fastening screws are inserted from the rear surface of rear frame into through-holes defined by coupling counter-elements and are screwed into the tubular sleeves of coupling elements to fix the front supporting structure (70) to the rear frame (5).

[0020] In one aspect of the invention, the insertion of the coupling elements into the coupling counter-elements or vice-versa is obtained with interference so that, when a coupling element is inserted in a coupling counter element, or vice-versa, the removal requires the application of an extracting force.

[0021] In another aspect of the invention the covering element comprises an outer edge, which delimits a seat facing an inner edge of the front supporting structure and receiving a portion thereof.

[0022] Preferably, an interspace is defined between the outer edge of the covering element and the inner edge of the front supporting structure.

5 **[0023]** Further preferably, the interspace is covered by an opaque element arranged at a rear side of the cap element.

[0024] In one embodiment of the invention, the covering element is sandwiched between the rear frame and the front supporting structure and comprises holes, which are passed through by coupling elements of the front supporting structure so as to center the covering element and to avoid rotations of the same.

[0025] Preferably, the first and second alternative positions are obtained by rotating reciprocally the front frame and the rear frame by an adjustment angle.

[0026] Further preferably, the adjustment angle is comprised between 0° and 180°.

[0027] In one aspect of the invention, the first and/or the second position of the handle is located at a given angle between 0° and 90° from a center line of the door assembly substantially perpendicular to an axis of opening of the door assembly. In one aspect of the invention, the handle of the door assembly is delimited by a radially outer edge of the front supporting structure and/or the cap element wherein said radially outer edge extends, for the most part thereof, in a circular path around a longitudinal axis X of the door assembly at a first distance therefrom, and a portion of said radially outer edge extends around the longitudinal axis X of the door assembly at a second distance therefrom, said second distance being greater than the first distance.

[0028] In another embodiment of the invention, the handle is formed integral to the front supporting structure and the cap element.

35 **[0029]** Preferably, the closing element is at least partially transparent.

[0030] Further preferably, the closing element is shaped so as to protrude within the opening of the wall of the laundry treating machine.

40 **[0031]** In one embodiment, the fastening device allows reciprocal coupling of the rear frame to the front frame in a removable manner.

[0032] In a further aspect of the invention, an opaque element is over-molded on the rear side of the cap element so as to be seen through the cap element and to form a single unitary body therewith.

[0033] Preferably, the unitary body is welded to the front supporting structure via the opaque element.

50 **[0034]** According to another aspect of the invention, it is provided a laundry treating machine comprising:

- a casing containing a treatment chamber for receiving a laundry load to be treated;
- a front wall covering a side of said casing, said front wall including an opening for accessing said treatment chamber;
- a door assembly associated to said casing for opening and/or closing said opening, said door assembly

having one or more of the above mentioned features.

[0035] According to a further aspect of the invention it is provided a method to modify the position of a handle in a door assembly associated to a laundry treating machine, said door assembly comprising:

- a rear frame forming a rear surface of the door assembly apt to face said wall when the door assembly closes the opening, the rear frame including a rear frame inner edge defining a rear aperture;
- a closing element connected to the rear frame to close the rear aperture of the rear frame;
- a front frame arranged on a front side of the rear frame and comprising:
 - a front supporting structure having an inner edge defining a front aperture;
 - an at least partially transparent cap element overlaying a front side of the front supporting structure, and extending over the front aperture, the cap element forming the front surface of the door assembly;
 - a handle provided on the front supporting structure and/or the cap element;

the door assembly further comprising:

- a covering element, at least partly covering the closing element, interposed between the rear frame and the front frame;

the door assembly comprising a fastening device that allows reciprocal connection of the rear frame and the front frame in a removable manner;

the method comprising the steps of:

- operating the fastening device to release the front frame from the rear frame;
- rotating the front frame with respect to the rear frame from a first position to a second position or rotating the rear frame with respect to the front frame from a first position to a second position,
- arranging the covering element and the closing element such that they remain in an unaltered position relative to a cabinet of the laundry treating machine, and
- operating the fastening device to connect the front frame to the rear frame in the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of a preferred embodiment of the invention, provided with reference to the enclosed drawings. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In such drawings:

- Figure 1 shows a perspective view of a preferred embodiment of a laundry treating machine realized according to the present invention;
- Figure 2 shows a front plan view of a door assembly realized according to the present invention and used in the laundry treating machine of figure 1;
- Figure 3 shows a rear plan view of the door assembly of Figure 2;
- Figure 4 shows the door assembly of Figure 2 sectioned along line IV°-IV°;
- Figure 5 shows a perspective view of the door assembly of figure 2 in a disassembled configuration;
- Figure 6 shows the door assembly in the disassembled configuration of figure 5 from another point of view;
- Figure 7 shows a partial view of the door assembly of Figure 2 sectioned along line VII°-VII°;
- Figure 8 shows a partial view of the door assembly of Figure 2 sectioned along line VIII°-VIII°;
- Figure 9 shows an enlarged view of a detail of Figure 7;
- Figures 10a-10d show plan views of different configurations of the door assembly of the invention;
- Figures 11a-11d show perspective rear views of the door assembly of the invention corresponding to the different configurations represented in Figures 10a-10d.

DETAILED DESCRIPTION OF THE INVENTION

[0037] The present invention has proved to be particularly advantageous when applied to a laundry dryer, as described below. In any case, it should be underlined that the present invention is not limited to laundry dryers. On the contrary, the present invention can be conveniently applied to laundry washing machines or washer-dryers (i.e. laundry washing machines which can also dry laundry).

[0038] With reference to fig. 1 an embodiment of a laundry treating machine realized according to the present invention is globally indicated with 1. In this preferred embodiment, the laundry treating machine 1 is a laundry dryer, however the present teaching can be applied to laundry washing machines or washer-dryers as well.

[0039] The dryer 1 comprises an outer box casing 7 preferably but not necessarily parallelepiped-shaped, and a treatment chamber, such as a drum (not visible in the Figure), for example having the shape of a hollow

cylinder, for housing the laundry and in general the clothes and garments to be dried and/or washed.

[0040] The drum is preferably contained into the casing 7. In a preferred embodiment, the drum can rotate around a preferably horizontal axis (in alternative embodiments, rotation axis may be vertical or tilted).

[0041] Access to the drum is achieved for example via an opening 4 formed on a wall of the casing 7 itself. Opening 4 preferably faces drum and it is apt to be closed - or even sealed - by a door assembly 10.

[0042] The door assembly 10 is adapted to alternatively open and close the laundry loading opening 4 of the dryer 1 and is advantageously pivotally mounted, for example hinged, and thus supported at the casing 7 of the machine 1. Door assembly 10 is operated by a handle 50, as better detailed below.

[0043] Preferably, casing 7 generally includes a front wall 2 to which the door assembly 10 is pivotally mounted.

[0044] The door assembly 10 can have two different operative positions or configurations: a closed position in which it is abutting against the front wall 2 and an open position in which it is separated from the front wall 2, with the exception of the connecting element (e.g. hinge) location. In order to move the door assembly 10 from the closed to the open configuration or vice-versa, handle 50 is used.

[0045] Handle 50 preferably belongs to a system which may be named "pull-to-open" door opening system: the door assembly 10 is provided with a latch 19 and the casing 7, preferably the front wall 2, is provided with a latch retaining mechanism (not shown) that includes a mobile part which is configured to be movable between a retaining position, in which it engages the latch 19 so as to retain the door assembly 10 in the closed condition, and an opening position in which it releases the latch 19 so as to allow the opening of the door assembly 10. The mobile part of the latch allows the releasing of the latch when a releasing force is applied which is greater than a threshold force. The door assembly 10 is therefore opened by pulling it outwards with enough force and can be closed by pushing it towards the inside of the treatment chamber.

[0046] The door assembly 10 comprises a rear frame 5, a front frame 6 arranged on a front side 5a of the rear frame 5, a closing element 40 and a covering element 60. The closing element 40 is interposed between the rear frame 5 and the front frame 6 and the covering element 60 is interposed between the closing element 40 and the front frame 6. The covering element 60 at least partly covers the closing element 40.

[0047] The rear frame 5 is defined as the portion of the door assembly 10 a side of which, called rear side 5b, is substantially in contact with, or immediately in front of, the casing 7 when the door assembly 10 is in the closed operative position, while the front frame 6 is defined as the portion of the door assembly 10 arranged outwardly when the door assembly 10 is closed onto casing 7, i.e. it faces a direction opposite to the casing 7.

[0048] The rear frame 5 includes a rear frame inner edge 8a defining a rear aperture 8. The front frame 6 comprises a front supporting structure 70 and a cap element 33.

5 **[0049]** The front supporting structure 70 preferably has a front side 70a, a rear side 70b and an inner edge 9a defining a front aperture 9.

[0050] The cap element 33 is at least partially transparent and overlays the front side 70a of the front supporting structure 70 and extends over the front aperture 9. The cap element 33 has a rear side 33b and a front side 33a, the latter forming the front surface of the door assembly 10.

10 **[0051]** Transparency allows light to pass through the cap element 33 so that bodies situated behind can be seen.

[0052] The cap element 33, apart from maintaining its at least partial transparency, may also comprise further aesthetic characteristics, such as coloured areas, images, areas with different degree of transparency, etc.

15 **[0053]** The apertures 8, 9 are advantageously defined so that a user can at least partially view the laundry from outside the casing 7 during the treatment cycles, in particular when both the closing element 40 and the cap element 33 are at least partially transparent.

[0054] Rear and front frames 5, 6, in particular the rear frame 5 and the front supporting structure 70, are therefore so mounted that the two apertures 8, 9 overlap, at least partially.

20 **[0055]** Preferably, rear and front frames 5, 6 are coaxial and/or concentric. Analogously, preferably, apertures 8, 9 are coaxial and/or concentric.

[0056] Preferably, rear and front frames 5, 6 and rear and front apertures 8, 9 of door assembly 10 have an arbitrary geometrical shape, for example can be substantially polygonal, such as rectangular, quadratic, triangular, or elliptic when a front view of the same is considered.

25 **[0057]** Preferably, rear and front frames 5, 6 and rear and front apertures 8, 9 are circular, or substantially circular.

[0058] In the preferred embodiment of door assembly 10, the rear aperture 8 in the rear frame 5 is closed by the closing element 40.

30 **[0059]** The closing element 40 is preferably at least partially transparent.

[0060] The closing element 40 is preferably made of plastic and even more preferably it is made of a transparent, or at least semi-transparent, plastic material. The closing element 40 can however be made of glass.

35 **[0061]** In this embodiment, the closing element 40 is also partially covered by the cap element 33.

[0062] In the dryer 1, the temperature of the drying air can reach rather high values, thus the closing element 40 can also reach a substantially elevated temperature which can harm the user in case of contact between a user's body part and the closing element 40. In order to avoid this drawback, a protective element is interposed between the user and the closing element 40. This pro-

tective element is the cap element 33.

[0063] Analogously, in a washing machine, which is a possible non-depicted embodiment of machine 1, the temperature of the water can often reach rather high values, thus the closing element can also reach a substantially elevated temperature that can harm the user in case of contact between a user's body part and the closing element. In order to avoid this drawback, a protective element is interposed between the user and the closing element, i.e. a protective cap element. In a washing machine the closing element is preferably made of glass. The closing element 40 preferably has a bowl shape. In general, preferably, the closing element 40 is shaped so as a portion thereof 41 protrudes within the opening 4 of the front wall 2 of dryer 1.

[0064] In a preferred embodiment illustrated and described herewith, the protruding portion 41 preferably comprises a substantially flat horizontal portion 41a which, when the door assembly 10 is in the closed operative position, is arranged above a filter arrangement of the dryer (not shown) typically arranged downwardly in close proximity of, and accessible from the opening 4, inside the casing 7.

[0065] As said above, the covering element 60 is interposed between the closing element 40 and the front frame 6, preferably between the closing element 40 and the supporting structure 70 of the front frame 6.

[0066] The covering element 60 is opportunely shaped so as to at least partly cover the closing element 40.

[0067] The covering element 60 is provided for keeping the closing element 40 in the correct position in the door assembly and, preferably, has the function of improving the aesthetic appearance of the dryer 1, as better explained below. The covering element 60 and the closing element 40 are preferably sandwiched between the rear frame 5 and the supporting structure 70 of the front frame 6 and kept firmly in position therebetween. In the preferred embodiment illustrated in the figures, no fastening device is used. In further preferred embodiments of the invention, fastening devices may be provided for fixing the covering element and/or the closing element to the rear frame and/or to the supporting structure of the front frame, such as welding, screws, snap devices, etc.

[0068] The rear frame 5 and the front frame 6 are coupled one to the other, in a removable manner, by means of a fastening device 200. In particular, the rear frame 5 and the supporting structure 70 of the front frame 6 are coupled one to the other, in a removable manner, by means of the fastening device 200.

[0069] The fastening device 200 preferably comprises coupling elements 121 and corresponding coupling counter-elements 122 formed in the supporting structure 70 and the rear frame 5, respectively.

[0070] In the depicted embodiment, said coupling elements 121 extend from the rear side 70b of the supporting structure 70 while said coupling counter-elements 122 extend from the front surface 5a of the rear frame 5.

[0071] Preferably, each coupling element 121 includes

a protruding element. Preferably the protruding element 121 includes a tubular sleeve having an open end. Preferably, each coupling counter-element 122 includes a protruding element. Preferably the protruding element 121 includes a tubular sleeve having an open end.

[0072] It is desired that the dimensions of the sleeves are such that the coupling elements 121 can be preferably inserted within the coupling counter-elements 122 or vice-versa.

[0073] Fastening screws 25 are preferably inserted from rear surface 5b of rear frame 5 into the through-holes defined by coupling counter-elements 122 and then screwed into the tubular sleeves of coupling elements 121 to fix the supporting structure 70 to the rear frame 5.

[0074] In further preferred embodiments, the insertion of the coupling elements into the coupling counter-elements or vice-versa is obtained with interference so that, when a coupling element is inserted in a coupling counter element (or vice-versa) the removal requires the application of a non-negligible force, so that the possibility of accidental removals is minimized.

[0075] Preferably, the coupling elements 121 and coupling counter-elements 122 are angularly spaced one from the other, even more preferably with a substantially constant spacing one from the other so that the contour of the door assembly 10 is provided with coupling elements and coupling counter-elements.

[0076] In the preferred embodiment illustrated in the figures, the coupling elements 121 and the coupling counter-elements 122 are twelve angularly spaced one from the other of an angle of 30°. According to the invention, the rear frame 5 and the front frame 6 can be assembled together in different reciprocal angular positions or, in particular, the rear frame 5 and the supporting structure 70 of the front frame 6 can be assembled together in different reciprocal angular positions, as explained in detail later.

[0077] Assembling of the rear frame 5 to the front frame 6 is carried out by rotating the rear frame 5 and the front frame 6 reciprocally up to the desired reciprocal position, aligning the coupling elements 121 to the coupling counter-elements 122 and fixing the rear frame 5 to the front frame 6 by screwing the screws 25. In the preferred embodiment illustrated in the figures, the rear frame 5 and the front frame 6 can be assembled together in different reciprocal angular positions which differ of an adjustment angle AN of 30° one to the other.

[0078] In different embodiments, the adjustment angle AN may be differently set, for example increasing or decreasing the number of coupling elements and coupling counter-elements along the contour of the door assembly.

[0079] The adjustment angle AN is preferably comprised between 0° and 180°.

[0080] The covering element 60 which is sandwiched between the rear frame 5 and the supporting structure 70 preferably peripherally comprises holes 63, which are passed through by coupling elements 121 (protruding

elements) of the supporting structure 70. This arrangement has the function of supporting the covering element 60 and/or improving the centering of the covering element 60 and to avoid rotations of the same.

[0081] The covering element 60 preferably comprises a shaped portion 67 which extends at least partly through the front aperture 9 of the supporting structure 70 of the front frame 6.

[0082] The shaped portion 67 preferably comprises an outermost front side surface 64 which faces the rear side 33b of the cap element 33.

[0083] The outermost front side surface 64 of the shaped portion 67 represents the surface which is arranged most outwardly with respect to the casing 7 when the door assembly is in its closed position. The outermost front side surface 64 represents also the surface of the shaped portion 67 which the closest surface to the rear side 33b of the cap element 33.

[0084] The outermost front side surface 64 preferably extends between a radially inner border line 64a and a radially outer border line 64b. Inner border line 64a and outer border line 64b are preferably circular and the outermost front side surface 64 is consequently preferably an annular rim.

[0085] The shaped portion 67 further preferably comprises a second surface 66 extending away from the first side surface 64 towards the closing element 40. Preferably the second surface 66 is a tapered surface which ends rearwardly by forming a covering element rear aperture 68 facing the closing element 40.

[0086] The second surface 66 therefore extends partially over the closing element 40 which is partially visible through the covering element rear aperture 68 when viewed laterally outwardly from the door assembly 10, i.e. from outside the casing 7.

[0087] The tapered second surface 66 preferably includes a plurality of ribs 66a facing the cap element rear side and at least partially visible through the cap element 33, such ribs 66a give a pleasant aesthetic appearance to the door assembly 10. Furthermore, the shaped portion 67 advantageously overlaps the peripheral zone of the front side 5a of the rear frame 5. Advantageously, the shaped portion 67 hides said peripheral zone of the front side 5a of the rear frame 5 and gives a better aesthetic appearance to the door assembly 10, covering all possible elements that are present in said peripheral zone of the front side 5a of the rear frame 5.

[0088] The covering element 60 comprises an outer edge 69, preferably a substantially cylindrical edge, which delimits a seat 80 facing the inner edge 9a of the front supporting structure 70 and receiving a portion thereof.

[0089] An unfilled interspace 120 is preferably defined between the edge 69 of covering element 60 and the inner edge 9a of the front supporting structure 70.

[0090] According to a preferred aspect of the invention, between the outermost front side surface 64 of the shaped portion 67 of the covering element 60 and the

rear side 33b of the cap element 33 a gap 100 is defined.

[0091] The outermost front side surface 64 of the shaped portion 67 of the covering element 60 is therefore at a given distance from the rear side 33b of the cap element 33.

[0092] Being the cap element 33 at least partially transparent, the outermost front side surface 64 of the shaped portion 67 is visible at a lower degree (as viewed from the front of the door assembly 10) compared to known system, where the outermost front side surface is in contact with the transparent cap element. Advantageously, the visibility of dust and/or dirt which accumulates over the outermost front side surface 64 of the shaped portion 67 and/or scratches over the outermost front side surface 64 of the shaped portion 67 caused by handling is minimized and, therefore, the aesthetic appearance of the door assembly 10 is improved.

[0093] The supporting structure 70 comprises an outer edge 61 and the cap element 33 comprises an outer edge 62.

[0094] Preferably, outer edge 62 of the cap element 33 matches in shape and size outer edge 61 of the supporting structure 70. Outer edge 62 of the cap element 33 and outer edge 61 of the supporting structure 70 defines the outer contour of the door assembly 10.

[0095] According to an aspect of the present invention, the cap element 33 and the supporting structure 70 preferably comprise a sector 150, 151 which defines the handle 50 for the door assembly 10. More preferably, a sector 150 is defined on the outer edge 62 of the cap element 33 and a sector 151 is defined on the outer edge 61 of the supporting structure 70. Said sectors 150, 151 preferably both define the handle 50 for the door assembly 10.

[0096] In the preferred embodiment illustrated and described herewith, said sector 150 of the outer edge 62 of the cap element 33 preferably comprises a portion of the outer edge 62 which projects from the remaining contour of the cap element 33, as a radial protrusion.

[0097] Figure 2 shows the sector 150 embodied as a projecting portion, wherein the remaining contour RC of the cap element 33 is indicated with a dashed line RC.

[0098] In the preferred embodiment here illustrated, the contour RC is preferably circumferentially shaped and the sector 150 embodied as a projecting portion is substantially and preferably defined by an annular rim portion. Preferably, the annular rim portion extends over an angle of about 90°.

[0099] The sector 150 embodied as a projecting portion is preferably inclined relative to the front wall 2 of the casing 7, i.e. towards the volume surrounding the cabinet 7 of the dryer 1, so as to define a bulge in the overall contour of the cap element 33. Inclination of the sector 150 embodied as a projecting portion is better visible in Figure 7.

[0100] Analogously, in the preferred embodiment illustrated and described herewith, said sector 151 of the outer edge 61 of the supporting structure 70 preferably com-

prises a portion of the outer edge 61 that projects from the remaining contour of the supporting structure 70, as a radial protrusion.

[0101] Figure 11a shows sector 151 embodied as a projecting portion, wherein also the remaining contour RC' of the supporting structure 70 is depicted.

[0102] In the preferred embodiment here illustrated, the contour RC' is preferably circumferentially shaped and the sector 151 embodied as a projecting portion is substantially preferably defined by an annular rim portion. Preferably, the annular rim portion extends over the same angle (of about 90°) of the annular rim portion 150 of the cap element 33.

[0103] The sector 151 embodied as a projecting portion is preferably inclined relative to the front wall 2 of the casing 7, i.e. towards the volume surrounding the cabinet 7 of the dryer 1, so as to define a bulge in the overall contour of the supporting structure 70. Inclination of sector 151 embodied as a projecting portion is better visible in Figure 7. The inner side 151a of sector 151 embodied as a projecting portion preferably defines the gripping portion for user fingers.

[0104] Sector 150 of the cap element 33 and sector 151 of the supporting structure 70 which define said handle 50, as described above, are preferably defined by both a radial protrusion and a bulge in the overall contour of the cap element 33 and/or supporting structure 70.

[0105] In different embodiments, nevertheless, the sectors 150, 151 may be defined only by a radial protrusion or only by a bulge. For example, in further preferred embodiments the cap element and the supporting structure could be substantially flat with radial protrusions defining the handle or in further preferred embodiments the cap element and the supporting structure could be circular with bulges defining the handle.

[0106] Preferably, the handle 50 is only provided as a gripping portion to open the door by simply pulling it or closing the door by simply pushing it. In other words, the pulling or pushing action will cause the latch 19 to actuate a latch retaining mechanism provided in the casing 7. In this way, the handle 50, during opening and/or closing movement, does not perform any movement relative to the rear frame 5 and/or the supporting structure 70.

[0107] Preferably, according to the description above, the handle 50 is defined only by the supporting structure 70 and the cap element 33 of the door assembly 10. Realization of the handle 50 as described above allows to reduce the complexity of the door assembly 10 and therefore of the dryer 1.

[0108] In alternative embodiments the complexity of the door assembly 10 can be further reduced by embodying the handle 50 either on the front supporting structure 70 or on the cap element 33.

[0109] Preferably, the handle is delimited by a radially outer edge of the front supporting structure and/or the cap element wherein said radially outer edge extends, for the most part thereof, in a circular path around a longitudinal axis (X) of the door assembly at a first distance

therefrom, and a portion of said radially outer edge extends around the longitudinal axis (X) of the door assembly at a second distance therefrom, said second distance being greater than the first distance.

[0110] This determines a simple structural construction for the assembly which reduces manufacturing costs of the assembly and of the dryer compared to known systems.

[0111] According to a further preferred aspect of the present invention, an opaque element 90 is arranged between the supporting structure 70 and the cap element 33.

[0112] Opacity does not allow or highly reduces an incident light to pass through the opaque element 90 so that it is difficult, or impossible, for a viewer to see any object placed behind the opaque element 90.

[0113] Preferably, the opaque element 90 is fixed to the rear side 33b of the cap element 33, as depicted in Figures 7 and 9, and contribute to form the handle 50..

[0114] The opaque element 90 preferably has, for the most part thereof, an annular shape and comprises a radially outer edge 71 and a radially inner edge 72. The inner edge 72 preferably defines an aperture 73 for the opaque element 90, as indicated in Figure 9. The opaque element 90 is, for the most part thereof, substantially ring-shaped. The outer edge 71 of the opaque element 90 is preferably, for the most part thereof, rounded-shaped.

[0115] In case the cap element 33 is at least partially transparent, the opaque ring 90 is visible from outside, i.e. when viewed laterally outwardly from the door assembly 10 (i.e. according to the viewing direction indicated with "V" in Figures 7 and 9).

[0116] As illustrated in Figures 7 and 8, the outer edge 71 of the opaque ring 90 preferably borders the outer edge 62 of the cap element 33. Preferably, the outer edge 71 of the opaque ring 90 borders also the border edge 62 of the projecting portion 150, as illustrated in particular in Figure 7.

[0117] In a preferred embodiment of the invention, the opaque ring 90 is made of a plastic material and is overmolded on the rear side 33b of the cap element 33 to preferably define a complete, integral, unitary body therewith.

[0118] In different embodiments, the opaque ring may be differently fixed to the cap element in order to define a completed, integral, unitary body therewith, for example by glueing.

[0119] Preferably, the opaque ring 90 and the cap element 33 are connected to the front side 70a of the supporting structure 70. More preferably, the opaque ring 90 and the cap element 33 are fixedly connected to the supporting structure 70 in order to define a complete, integral, unitary member.

[0120] Preferably, the opaque ring 90 at rear side 90b thereof comprises one or more ribs 35, facing the supporting structure 70, the ends of which allow welding of the opaque ring 90 to the supporting structure 70, for example through ultrasonic or vibration welding.

[0121] The unitary body including the opaque ring 90 and the cap element 33 is therefore welded to the supporting structure 70 via the opaque ring 90.

[0122] Preferably, the opaque ring 90 at rear side 90b thereof also comprises centering means 36 comprising pins 36a facing the supporting structure 70 and apt to be received in holes 36b realized in the supporting structure 70. Centering means 36 allow correct alignment of opaque ring 90 to the supporting structure 70 during manufacturing step, preferably during welding.

[0123] Preferably, the opaque ring 90 overlaps the peripheral zone of the front side 70a of the supporting structure 70. Advantageously, the opaque ring 90 hides said peripheral zone of the front side 70a of the supporting structure 70, which is therefore not visible from outside. Advantageously and preferably, the opaque ring 90 also hides ribs 35 for connecting the opaque ring 90 to the supporting structure 70.

[0124] The opaque ring 90, therefore, not only gives a pleasant aesthetic appearance to the door assembly 10, but also covers all possible elements which are present in the peripheral zone of the front side 70a of the supporting structure 70 and/or in the rear side 90b of the opaque ring 90.

[0125] In the preferred embodiment of the invention here illustrated and described, the outer edge 62 of the cap element 33 extends radially outwardly with respect to the outer edge 71 of the opaque ring 90, as illustrated in Figures 7 and 8, i.e. a peripheral portion of the cap element 33 extends radially beyond the opaque ring 90. Furthermore, preferably, the outer edge 61 of the supporting structure 70 also extends radially outwardly with respect to the outer edge 71 of the opaque ring 90, i.e. a peripheral portion of the supporting structure 70 extends radially beyond the opaque ring 90.

[0126] Advantageously, in case the cap element 33 is at least partially transparent, it is possible to see the peripheral zone of the supporting structure 70 through the portion of the cap element 33 that extends beyond the opaque ring 90 when viewed laterally outwardly from the door assembly 10.

[0127] Also, advantageously, in case the cap element 33 is at least partially transparent, it is possible to see the outer edge 71 of the opaque ring 90, through the portion of the cap element 33 which extends beyond the opaque ring 90 when viewed laterally outwardly from the door assembly 10.

[0128] This further gives a pleasant aesthetic appearance to the door assembly 10, in particular when the outer edge 71 is rounded-shaped, as in the present preferred embodiment.

[0129] According to a further preferred aspect of the present invention, the opaque element 90 at least partly fills the gap 100 defined between the outermost front side surface 64 of the shaped portion 67 of the covering element 60 and the rear side 33b of the cap element 33.

[0130] Preferably, as shown in Figure 9, the inner edge 72 of the opaque element 90 is located between the inner

border line 64a and the outer border line 64b of the outermost front side surface 64.

[0131] The opaque element 90 therefore covers the interspace 120 defined between the outer edge 69 of covering element 60 which delimits a seat 80 facing the inner edge 9a of the front supporting structure 70 and receiving a portion thereof. Advantageously, the opaque ring 90 hides the interspace 120, which is therefore not visible from outside. This not only provide a pleasant aesthetic appearance to the door assembly 10, but also prevents dust, moisture or other foreign matter from accumulating within the interspace 120 and being visible through the cap element, and further avoids that connections of door assembly components, such as the front and rear frames 6, 5 are visible through the cap element.

[0132] In a further preferred advantageous embodiment, not illustrated, the opaque element totally fills the gap defined between the outermost front side surface of the shaped portion of the covering element and the rear side of the cap element. Referring to Figure 9, this means that the radially inner edge 72 of the opaque element 90 is aligned to the radially inner border line 64a of the outermost front side surface 64.

[0133] The opaque element therefore still covers the interspace 120 defined between the outer edge 69 of covering element 60 and the inner edge 9a of the front supporting structure 70. Advantageously, the opaque ring 90 hides the interspace 120, which is therefore not visible from outside. This, again, not only gives a better aesthetic appearance to the door assembly 10, but also prevents dust, moisture or other foreign matter from accumulating within the interspace 120 and being visible through the cap element, and further avoids that connections of door assembly components, such as the front and rear frames 6, 5 are visible through the cap element.

[0134] In a further preferred advantageous embodiment, nevertheless, the opaque element may not fill the gap defined between the outermost front side surface of the shaped portion of the covering element and the rear side of the cap element. This means that the inner edge 72 of the opaque element 90 is radially outer than the outer border line 64b of the outermost front side surface 64. Similarly to the embodiments described above, also this embodiment of the invention avoids that connections of door assembly components, such as the front and rear frames 6, 5 are visible through the cap element. In this way, the mechanical arrangements for connecting the door assembly components should not be designed to be, by themselves, hidden to a viewer looking at the door assembly. The choice of such mechanical arrangements is therefore wider.

[0135] The door assembly 10 is preferably provided with an actuator 95 which interacts with a safety device of the dryer 1 (not illustrated), preferably fixed to the casing 7. The actuator 95 preferably comprises a fin protruding from the rear side 5b of the rear frame 5. The protruding fin 95 is apt to operate a switch of the safety device when the door assembly 10 is in the closed position. The

safety device can therefore advantageously detect if the door assembly 10 is in the closed or in the opened position.

[0136] The protruding fin 95 is preferably arranged at the rear side 5b of the rear frame 5 in a vertical upward position.

[0137] A first seat 95a is preferably realized vertically upward at the rear side 5b of the rear frame 5 for the connection of the fin 95 thereto.

[0138] Furthermore, as illustrated in Figures 4 and 6, a second seat 95b is also preferably realized vertically downward at the rear side 5b of the rear frame 5. The second seat 95b is also apt for the connection of the fin 95 thereto. Use of the second seat 95b will be better described later.

[0139] As said above, the door assembly 10 is advantageously hinged and supported at the casing 7 of the machine 1, preferably at front wall 2 of the casing 7.

[0140] Door assembly 10, therefore, preferably comprises a hinge device 160 that is provided to pivot the door assembly 10 to the casing 7 so that it can be opened by rotating it about a hinge axis H, or axis of opening H of the door assembly 10. Hinge device 160 may be any conventional hinge, preferably of the type that is not visible when the door assembly 10 is closed.

[0141] In the embodiment shown in the figures, hinge device 160 preferably comprises a base portion 161 apt to be fixed to the front wall 2 of the casing 7 (for example with screws 163a, 163b) and two knuckles 162a, 162b extending from the base portion 161 which receive a pivot pin (not visible).

[0142] Knuckles 162a, 162b are advantageously received in the door assembly 10. Preferably, the rear frame 5 comprises two apertures 152a, 152b apt to receive knuckles 162a, 162b therethrough.

[0143] Preferably, the covering element 60 comprises two seats 171a, 171b apt to receive knuckles 162a, 162b therethrough.

[0144] Preferably, the supporting structure 70 comprises two seats 181a, 181b apt to receive knuckles 162a, 162b, in particular to receive outer portions of knuckles 162a, 162b when the door assembly 10 is in its closed position.

[0145] Knuckles 162a, 162b and outer portions thereof are advantageously not visible from outside since opaque ring 90 preferably hides the same.

[0146] Preferably, the latch 19 and the hinge device 160 are arranged at opposite side of the door assembly 10 and are preferably aligned along a center line C of the door assembly 10 substantially perpendicular to the axis of opening H of the door assembly 10.

[0147] A vertical median axis V is also defined as the axis parallel to the axis of opening H and passing through the geometrical center O of the door assembly 10, which is a point of the longitudinal axis X of the door assembly. A conventional angular reference system is defined by the center line C and the vertical median axis V. The axes C and V identify four quadrants for the door assembly 10.

[0148] The handle 50 of the door assembly 10 illustrated and described herewith is preferably arranged offset with respect to the center line C, preferably at an upper position thereof and preferably arranged in the first quadrant, i.e. between 0° and 90°. Advantageously, as said above, the handle 50 extends over an angle of about 90° and its central portion is preferably centrally positioned in the first quadrant. This position is indicated with "L1" and it preferably forms an angle of 45° with respect to the center line C.

[0149] Reciprocal arrangement of the handle 50 and of the hinge device 160 as described above, allows to obtain a left-swing configuration for the door assembly 10.

[0150] According to a further preferred aspect of the invention, the door assembly 10 of the invention allows reversibility of the same, i.e. the door assembly 10 may be reversed from a left-swing configuration to a right-swing configuration or vice-versa.

[0151] Furthermore, according to a further preferred aspect of the invention, the door assembly 10 of the invention allows positioning of the handle 50 in a plurality of positions with respect to the center line C of the door assembly 10.

[0152] Figures 10a and 10b illustrate two possible positions for the handle 50 in the left-swing configuration of the door assembly 10 (wherein Figure 10a corresponds to Figure 2).

[0153] Figures 10c and 10d illustrate two possible positions for the handle 50 in the right-swing configuration of the door assembly 10.

[0154] Figure 10a shows the left-swing configuration of the door assembly 10 according to the preferred embodiment above described with the handle 50 arranged at an upper position with respect to the center line C (position L1).

[0155] Figure 10b shows the left-swing configuration of the door assembly 10 with the handle 50 arranged at a lower position with respect to the center line C (position L2).

[0156] Figure 10c shows the right-swing configuration of the door assembly 10 with the handle 50 arranged at an upper position with respect to the center line C (position L3).

[0157] Figure 10d shows the right-swing configuration of the door assembly 10 with the handle 50 arranged at a lower position with respect to the center line C (position L4).

[0158] Figures 11a to 11d show the perspective views of the door assembly configurations illustrated in Figures 10a to 10d, respectively. Reversibility of the door assembly 10, from a left-swing configuration to a right-swing configuration or vice-versa, is obtained by disassembling the door assembly 10 from the casing 7, preferably unscrewing screws 163a, 163b of the hinge device 160, rotating and repositioning the door assembly 10 in a position at 180° with respect to the original position and assembling the door assembly 10 to the casing 7, pref-

erably screwing screws 163a, 163b of the hinge device 160.

[0159] This can be appreciated, for example, by comparing Figure 11a or 11b to Figure 11c or 11d.

[0160] Together with rotation of the door assembly 10, the position of the fin 95 is also moved to another fin seat when passing from a left-swing configuration to a right-swing configuration. In particular, as can be appreciated by comparing

[0161] Figure 11a or 11b to Figure 11c or 11d, the fin 95 is disconnected from the first seat 95a at the rear side 5b of the rear frame 5 and connected to the second seat 95b, which is formed in the rear frame 5 in an opposite position relative to the first seat 95a. The position of the fin 95 relative to the machine cabinet 7 remains constant when passing from a left-swing configuration to a right-swing configuration. In this way, there is no necessity to change the position of the safety device, which is preferably fixed to the casing 7.

[0162] Positioning of the handle 50 in different positions is preferably obtained thanks to the fastening device 200 of the door assembly 10.

[0163] For example, in a left-swing configuration, in order to change the position of the handle 50 as illustrated in Figures 10a and 11a (upper offset position) to the position of the handle 50 as illustrated in Figures 10b and 11b (lower offset position), the following steps are performed:

- unscrewing the fastening screws 25 and releasing the front frame 6 from the rear frame 5;
- rotating the front frame 6 with respect to the rear frame 5 from the original position (upper offset position) to the new position (lower offset position), preferably by rotating the front frame 6 clockwise of 90° with respect to the rear frame 5 or by rotating the rear frame 5 counterclockwise of 90° with respect to the front frame 6;
- screwing the fastening screws 25 to connect the front frame 6 to the rear frame 5 in the new position (lower offset position).

[0164] Analogously, in a right-swing configuration, in order to change the position of the handle 50 as illustrated in Figures 10c and 11c (upper offset position) to the position of the handle 50 of Figures 10d and 11d (lower offset position), the following steps are performed:

- unscrewing the fastening screws 25 and releasing the front frame 6 from the rear frame 5;
- rotating the front frame 6 with respect to the rear frame 5 from the original position (upper offset position) to the new position (lower offset position), preferably rotating the front frame 6 counterclockwise of 90° with respect to the rear frame 5 or by rotating the rear frame 5 clockwise of 90° with respect to the front frame 6;
- screwing the fastening screws 25 to connect the front

frame 6 to the rear frame 5 in the new position (lower offset position).

[0165] In different preferred embodiments of the invention, the handle can be positioned in a higher number of different positions, for example by varying the number of coupling elements and coupling counter-elements along the contour of the door assembly, as explained above.

[0166] It is to be noted that both when the door assembly 10 is reversed from a left-swing configuration to a right-swing configuration or vice-versa, and when the position of the handle 50 is changed, the positions of the covering element 60 and the closing element 40 remain unaltered relative to the cabinet 7.

[0167] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, it makes it possible to provide a laundry treating machine that makes it possible to reduce manufacturing time and costs compared to known technique.

[0168] It is underlined that the dryer illustrated in the enclosed figures is of the front-loading type; however it is clear that the system according to the invention can be applied as well to a top-loading dryer, substantially without any modification. While the present invention has been described with reference to the particular embodiment shown in the figures, it should be noted that the present invention is not limited to the specific embodiment illustrated and described herein; on the contrary, further variants of the embodiment described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. A door assembly (10) for a laundry treatment machine (1), apt to open and/or close an opening (4) defined in a wall (2) of the laundry treatment machine (1), the door assembly (10) comprising:

- a rear frame (5) forming a rear surface of the door assembly (10) apt to face said wall (2) when the door assembly (10) closes the opening (4), the rear frame (5) including a rear frame inner edge (8a) defining a rear aperture (8);
- a closing element (40) connected to the rear frame (5) to close the rear aperture (8) of the rear frame (5);
- a front frame (6) arranged on a front side (5a) of the rear frame (5) and comprising:

- a front supporting structure (70) having an inner edge (9a) defining a front aperture (9);
- an at least partially transparent cap element (33) overlaying a front side (70a) of the front supporting structure (70), and extending over the front aperture (9), the cap element (33) forming the front surface of the

door assembly (10);
 - a handle (50) provided on the front supporting structure (70) and/or the cap element (33);
 - a covering element (60), at least partly covering the closing element (40), interposed between the rear frame (5) and the front frame (6);

characterized in that the door assembly (10) further comprises a fastening device (200) that allows either the front frame (6) or the rear frame (5) to be connected to said rear frame (5) or front frame (6) respectively, in at least a first and a second alternative positions, so that the handle (50) provided in the front frame (6) can be positioned in at least a first and second different positions relative to the rear frame (5) and so that the rear frame (5) and the front frame (6) can be assembled together in different reciprocal angular positions.

2. The door assembly according to claim 1 wherein the fastening device (200) comprises coupling elements (121) and corresponding coupling counter-elements (122) formed in the front supporting structure (70) and the rear frame (5), respectively.
3. The door assembly according to claim 2 wherein at least a portion of the coupling elements (121) is inserted within the coupling counter-elements (122) or vice-versa.
4. The door assembly according to claim 2 or 3 wherein said coupling elements (121) extend from a rear side (70b) of the front supporting structure (70) and said coupling counter-elements (122) extend from a front surface (5a) of the rear frame (5), each coupling element (121) or each coupling counter-element (122) including a protruding element.
5. The door assembly according to claim 4 wherein the protruding element includes a tubular sleeve having an open end.
6. The door assembly according to claim 5 wherein fastening screws (25) are inserted from the rear surface (5b) of rear frame (5) into through-holes defined by coupling counter-elements (122) and are screwed into the tubular sleeves of coupling elements (121) to fix the front supporting structure (70) to the rear frame (5).
7. The door assembly according to any claim 2 to 4 wherein the insertion of the coupling elements (121) into the coupling counter-elements (122) or vice-versa is obtained with interference so that, when a coupling element (121) is inserted in a coupling counter element (122), or vice-versa, the removal requires

the application of an extracting force.

8. The door assembly according to any claim 2 to 7 wherein the covering element (60) comprises an outer edge (69), which delimits a seat (80) facing an inner edge (9a) of the front supporting structure (70) and receiving a portion thereof.
9. The door assembly according to claim 8 wherein an interspace (120) is defined between the outer edge (69) of the covering element (60) and the inner edge (9a) of the front supporting structure (70).
10. The door assembly according to claim 9 wherein said interspace (120) is covered by an opaque element (90) arranged at a rear side (33b) of the cap element (33).
11. The door assembly according to any claim 2 to 10 wherein the covering element (60) is sandwiched between the rear frame (5) and the front supporting structure (70) and comprises holes (63), which are passed through by coupling elements (121) of the front supporting structure (70) so as to center the covering element 60 and to avoid rotations of the same.
12. The door assembly according to any preceding claim, wherein the first and second alternative positions are obtained by rotating reciprocally the front frame (6) and the rear frame (5) by an adjustment angle (AN) comprised between 0° and 180°.
13. The door assembly according to any of the preceding claims, wherein the first and/or the second position of said handle (50) is located at a given angle between 0° and 90° from a center line (C) of the door assembly substantially perpendicular to an axis of opening of the door assembly.
14. The door assembly according to any of the preceding claims, wherein the handle (50) is delimited by a radially outer edge (61) of the front supporting structure (70) and/or the cap element (33) wherein said radially outer edge (61) extends, for the most part thereof, in a circular path around a longitudinal axis (X) of the door assembly (10) at a first distance therefrom, and a portion of said radially outer edge (61) extends around the longitudinal axis (X) of the door assembly (10) at a second distance therefrom, said second distance being greater than the first distance.
15. A laundry treatment device comprising:
 - a casing (7) containing a treatment chamber for receiving a laundry load to be treated;
 - a front wall (2) covering a side of said casing (7), said front wall (2) including an opening (4)

for accessing said treatment chamber;
 - a door assembly (10) associated to said casing (7) for opening and/or closing said opening (4), said door assembly (10) having the features according to one or more of claims from 1 to 14.

16. Method to modify the position of a handle (50) in a door assembly (10) according to any one of claims 1-14 associated to a laundry treatment device according to claim 15, the method comprising the steps of:

- operating the fastening device (200) to release the front frame (6) from the rear frame (5);
- rotating the front frame (6) with respect to the rear frame (5) from a first position to a second position or rotating the rear frame (5) with respect to the front frame (6) from a first position to a second position,
- arranging the covering element (60) and the closing element (40) such that they remain in an unaltered position relative to a cabinet (7) of the laundry treatment device, and
- operating the fastening device (200) to connect the front frame (6) to the rear frame (5) in the second position.

Patentansprüche

1. Türbaugruppe (10) für eine Wäschebehandlungsvorrichtung (1), die zum Öffnen und/oder Schließen einer in einer Wand (2) der Wäschebehandlungsvorrichtung (1) definierten Öffnung (4) ausgeführt ist, wobei die Türbaugruppe (10) Folgendes umfasst:

- einen hinteren Rahmen (5), der eine Rückfläche der Türbaugruppe (10) bildet, die dazu ausgeführt ist, der Wand (2) gegenüberzuliegen, wenn die Türbaugruppe (10) die Öffnung (4) verschließt, wobei der hintere Rahmen (5) einen eine hintere Öffnung (8) definierenden inneren Rand (8a) des hinteren Rahmens aufweist,
- ein mit dem hinteren Rahmen (5) verbundenes Schließelement (40) zum Schließen der hinteren Öffnung (8) des hinteren Rahmens (5),
- einen vorderen Rahmen (6), der an einer Vorderseite (5a) des hinteren Rahmens (5) angeordnet ist und Folgendes umfasst:

- eine vordere Stützstruktur (70) mit einem inneren Rand (9a), der eine vordere Öffnung (9) definiert,
- ein mindestens teilweise transparentes Kappenelement (33), das über einer Vorderseite (70a) der vorderen Stützstruktur (70) liegt und sich über die vordere Öffnung (9) erstreckt, wobei das Kappenelement

(33) die Vorderfläche der Türbaugruppe (10) bildet,
 - einen Griff (50), der an der vorderen Stützstruktur (70) und/oder dem Kappenelement (33) vorgesehen ist,
 - ein Abdeckelement (60), das das Schließelement (40) mindestens teilweise abdeckt und zwischen dem hinteren Rahmen (5) und dem vorderen Rahmen (6) liegt,

dadurch gekennzeichnet, dass die Türbaugruppe (10) ferner eine Befestigungsvorrichtung (200) umfasst, dank derer entweder der vorderer Rahmen (6) oder der hintere Rahmen (5) mit dem hinteren Rahmen (5) bzw. dem vorderen Rahmen in mindestens einer ersten und einer zweiten alternativen Position verbunden werden kann, so dass der in dem vorderen Rahmen (6) vorgesehene Griff (50) in mindestens einer ersten und einer zweiten unterschiedlichen Position bezüglich des hinteren Rahmens (5) positioniert werden kann und so dass der hintere Rahmen (5) und der vordere Rahmen (6) in verschiedenen gegenseitigen Winkelpositionen zusammengebaut werden können.

2. Türbaugruppe nach Anspruch 1, wobei die Befestigungsvorrichtung (200) Koppellemente (121) und entsprechende Gegenkoppellemente (122) umfasst, die in der vorderen Stützstruktur (70) bzw. in dem hinteren Rahmen (5) ausgebildet sind.

3. Türbaugruppe nach Anspruch 2, wobei mindestens ein Abschnitt der Koppellemente (121) in den Gegenkoppellementen (122) eingeführt ist oder umgekehrt.

4. Türbaugruppe nach Anspruch 2 oder 3, wobei sich die Koppellemente (121) von einer Rückseite (70b) der vorderen Stützstruktur (70) erstrecken und sich die Gegenkoppellemente (122) von einer Vorderfläche (5a) des hinteren Rahmens (5) erstrecken, wobei jedes Koppellement (121) oder jedes Gegenkoppellement (122) ein vorragendes Element aufweist.

5. Türbaugruppe nach Anspruch 4, wobei das vorragende Element eine rohrförmige Hülse mit einem offenen Ende aufweist.

6. Türbaugruppe nach Anspruch 5, wobei Befestigungsschrauben (25) von der Rückfläche (5b) des hinteren Rahmens (5) in durch Gegenkoppellemente (122) definierte Durchgangslöcher eingeführt und in die rohrförmigen Hülsen der Koppellemente (121) geschraubt werden, um die vordere Stützstruktur (70) an dem hinteren Rahmen (5) zu befestigen.

7. Türbaugruppe nach einem der Ansprüche 2 bis 4,

- wobei das Einführen der Koppellemente (121) in die Gegenkoppellemente (122) oder umgekehrt mit Presspassung erhalten wird, so dass, wenn ein Koppellement (121) in ein Gegenkoppellement (122) oder umgekehrt eingeführt ist, das Entfernen das Ausüben einer Herausziehungskraft erfordert.
8. Türbaugruppe nach einem der Ansprüche 2 bis 7, wobei das Abdeckelement (60) einen Außenrand (69) umfasst, der einen Sitz (80) begrenzt, der einem Innenrand (9a) der vorderen Stützstruktur (70) zugewandt ist und einen Teil davon aufnimmt.
9. Türbaugruppe nach Anspruch 8, wobei zwischen dem Außenrand (69) des Abdeckelements (60) und dem Innenrand (9a) der vorderen Stützstruktur (70) ein Zwischenraum (120) definiert ist.
10. Türbaugruppe nach Anspruch 9, wobei der Zwischenraum (120) von einem opaken Element (90) abgedeckt ist, das an einer Rückseite (33b) des Kappenelements (33) angeordnet ist.
11. Türbaugruppe nach einem der Ansprüche 2 bis 10, wobei das Abdeckelement (60) zwischen dem hinteren Rahmen (5) und der vorderen Stützstruktur (70) liegt und Löcher (63) umfasst, durch die Koppellemente (121) der vorderen Stützstruktur (70) gehen, um das Abdeckelement (60) zu zentrieren und dessen Drehungen zu verhindern.
12. Türbaugruppe nach einem der vorhergehenden Ansprüche, wobei die erste und die zweite alternative Position erzielt werden, indem der vordere Rahmen (6) und der hintere Rahmen (5) reziprok um einen Verstellwinkel (AN) zwischen 0° und 180° gedreht werden.
13. Türbaugruppe nach einem der vorhergehenden Ansprüche, wobei die erste und/oder die zweite Position des Griffs (50) in einem gegebenen Winkel zwischen 0° und 90° von einer Mittellinie (C) der Türbaugruppe im Wesentlichen senkrecht zu einer Öffnungsachse der Türbaugruppe angeordnet sind.
14. Türbaugruppe nach einem der vorhergehenden Ansprüche, wobei der Griff (50) durch einen radial äußeren Rand (61) der vorderen Struktur (70) und/oder des Kappenelements (33) begrenzt wird, wobei sich der radial äußere Rand (61) zum größten Teil in einer kreisförmigen Bahn um eine Längsachse (X) der Türbaugruppe (10) mit einem ersten Abstand davon erstreckt und sich ein Teil des radial äußeren Rands (61) um die Längsachse (X) der Türbaugruppe (10) mit einem zweiten Abstand davon erstreckt, wobei der zweite Abstand größer als der erste Abstand ist.
15. Wäschebehandlungsvorrichtung, umfassend:
- ein Gehäuse (7), das eine Behandlungskammer zur Aufnahme einer zu behandelnden Wäscheladung enthält,
 - eine vordere Wand (2), die eine Seite des Gehäuses (7) abdeckt, wobei die vordere Wand (2) eine Öffnung (4) zum Zugriff auf die Behandlungskammer aufweist,
 - eine dem Gehäuse (7) zugeordnete Türbaugruppe (10) zum Öffnen und/oder Schließen der Öffnung (4), wobei die Türbaugruppe (10) die Merkmale nach einem oder mehreren der Ansprüche 1 bis 14 aufweist.
16. Verfahren zur Modifizierung der Position eines Griffs (50) bei einer Türbaugruppe (10) nach einem der Ansprüche 1 - 14, die einer Wäschebehandlungsvorrichtung nach Anspruch 15 zugeordnet ist, wobei das Verfahren die folgenden Schritte umfasst:
- Betätigen der Befestigungsvorrichtung (200) zur Freigabe des vorderen Rahmens (6) von dem hinteren Rahmen (5),
 - Drehen des vorderen Rahmens (6) bezüglich des hinteren Rahmens (5) aus einer ersten Position in eine zweite Position oder Drehen des hinteren Rahmens (5) bezüglich des vorderen Rahmens (6) aus einer ersten Position in eine zweite Position,
 - Anordnen des Abdeckelements (60) und des Schließelements (40), so dass sie bezüglich eines Schanks (7) der Wäschebehandlungsvorrichtung in einer unveränderten Position bleiben, und
 - Betätigen der Befestigungsvorrichtung (200), um den vorderen Rahmen (6) in der zweiten Position mit dem hinteren Rahmen (5) zu verbinden.

Revendications

1. Ensemble porte (10) pour une machine de traitement de linge (1), propre à ouvrir et/ou fermer une ouverture (4) définie dans une paroi (2) de la machine de traitement de linge (1), l'ensemble porte (10) comprenant :
- un cadre arrière (5) formant une surface arrière de l'ensemble porte (10) propre à faire face à ladite paroi (2) lorsque l'ensemble porte (10) ferme l'ouverture (4), le cadre arrière (5) comprenant un bord intérieur de cadre arrière (8a) définissant un orifice arrière (8) ;
 - un élément de fermeture (40) raccordé au cadre arrière (5) pour fermer l'orifice arrière (8) du cadre arrière (5) ;
 - un cadre avant (6) disposé sur un côté avant (5a) du cadre arrière (5) et comprenant :

- une structure de support avant (70) comportant un bord intérieur (9a) définissant un orifice avant (9) ;
- un élément formant couvercle (33) au moins partiellement transparent recouvrant un côté avant (70a) de la structure de support avant (70) et s'étendant sur l'orifice avant (9), l'élément formant couvercle (33) formant la surface avant de l'ensemble porte (10) ;
- une poignée (50) placée sur la structure de support avant (70) et/ou l'élément formant couvercle (33) ;
- un élément de recouvrement (60), recouvrant au moins partiellement l'élément de fermeture (40), interposé entre le cadre arrière (5) et le cadre avant (6) ;

caractérisé en ce que l'ensemble porte (10) comprend, en outre, un dispositif de fixation (200) qui permet soit au cadre avant (6), soit au cadre arrière (5) d'être raccordé, respectivement, soit audit cadre arrière (5), soit audit cadre avant (6), dans au moins des première et deuxième positions possibles, de telle sorte que la poignée (50) placée dans le cadre avant (6) peut être disposée dans au moins des première et deuxième positions différentes relativement au cadre arrière (5) et de telle sorte que le cadre arrière (5) et le cadre avant (6) peuvent être assemblés dans différentes positions relatives angulaires.

2. Ensemble porte selon la revendication 1, dans lequel le dispositif de fixation (200) comprend des éléments d'accouplement (121) et des contre-éléments d'accouplement (122) correspondants, respectivement formés dans la structure de support avant (70) et le cadre arrière (5).
3. Ensemble porte selon la revendication 2, dans lequel au moins une partie des éléments d'accouplement (121) est insérée à l'intérieur des contre-éléments d'accouplement (122) ou inversement.
4. Ensemble porte selon la revendication 2 ou 3, dans lequel lesdits éléments d'accouplement (121) s'étendent à partir d'un côté arrière (70b) de la structure de support avant (70) et lesdits contre-éléments d'accouplement (122) s'étendent à partir d'une surface avant (5a) du cadre arrière (5), chaque élément d'accouplement (121) ou chaque contre-élément d'accouplement (122) comprenant un élément saillant.
5. Ensemble porte selon la revendication 4, dans lequel l'élément saillant comprend un manchon tubulaire comportant une extrémité ouverte.
6. Ensemble porte selon la revendication 5, dans lequel

des vis de fixation (25) sont insérées depuis la surface arrière (5b) du cadre arrière (5) dans des trous débouchants définis par les contre-éléments d'accouplement (122) et sont vissées dans les manchons tubulaires des éléments d'accouplement (121) pour assujettir la structure de support avant (70) au cadre arrière (5).

7. Ensemble porte selon l'une quelconque des revendications 2 à 4, dans lequel l'insertion des éléments d'accouplement (121) dans les contre-éléments d'accouplement (122), ou inversement, est obtenue avec serrage de telle sorte que, lorsqu'un élément d'accouplement (121) est inséré dans un contre-élément d'accouplement (122), ou inversement, le retrait requiert l'application d'une force d'extraction.
8. Ensemble porte selon l'une quelconque des revendications 2 à 7, dans lequel l'élément de recouvrement (60) comprend un bord extérieur (69), qui délimite un siège (80) faisant face à un bord intérieur (9a) de la structure de support avant (70) et recevant une partie de celui-ci.
9. Ensemble porte selon la revendication 8, dans lequel un interstice (120) est défini entre le bord extérieur (69) de l'élément de recouvrement (60) et le bord intérieur (9a) de la structure de support avant (70).
10. Ensemble porte selon la revendication 9, dans lequel ledit interstice (120) est recouvert par un élément opaque (90) disposé au niveau d'un côté arrière (33b) de l'élément formant couvercle (33).
11. Ensemble porte selon l'une quelconque des revendications 2 à 10, dans lequel l'élément de recouvrement (60) est pris en sandwich entre le cadre arrière (5) et la structure de support avant (70) et comprend des trous (63), qui sont traversés par les éléments d'accouplement (121) de la structure de support avant (70) de façon à centrer l'élément de recouvrement (60) et à éviter des rotations de celui-ci.
12. Ensemble porte selon l'une quelconque des revendications précédentes, dans lequel les première et deuxième positions possibles sont obtenues en imprimant une rotation relative au cadre avant (6) et au cadre arrière (5) d'un angle d'ajustement (AN) compris entre 0° et 180°.
13. Ensemble porte selon l'une quelconque des revendications précédentes, dans lequel la première et/ou la seconde position de ladite poignée (50) est située à un angle donné entre 0° et 90° par rapport à une ligne médiane (C) de l'ensemble porte sensiblement perpendiculaire à un axe d'ouverture de l'ensemble porte.

14. Ensemble porte selon l'une quelconque des revendications précédentes, dans lequel la poignée (50) est délimitée par un bord radialement extérieur (61) de la structure de support avant (70) et/ou de l'élément formant couvercle (33), ledit bord radialement extérieur (61) s'étendant, pour la plus grande partie, de manière circulaire autour d'un axe longitudinal (X) de l'ensemble porte (10) à une première distance de celui-ci, et une partie dudit bord radialement extérieur (61) s'étendant autour de l'axe longitudinal (X) de l'ensemble porte (10) à une seconde distance de celui-ci, ladite seconde distance étant supérieure à la première distance. 5
10
15. Dispositif de traitement de linge comprenant : 15
- une caisse (7) contenant une chambre de traitement destinée à recevoir une charge de linge à traiter ;
 - une paroi avant (2) couvrant un côté de ladite caisse (7), ladite paroi avant (2) comprenant une ouverture (4) permettant d'accéder à ladite chambre de traitement ; 20
 - un ensemble porte (10) associé à ladite caisse (7) pour ouvrir et/ou fermer ladite ouverture (4), ledit ensemble porte (10) présentant les caractéristiques selon une ou plusieurs des revendications 1 à 14. 25
16. Procédé pour modifier la position d'une poignée (50) dans un ensemble porte (10) selon l'une quelconque des revendications 1 à 14 associé à un dispositif de traitement de linge selon la revendication 15, le procédé comprenant les étapes suivantes : 30
35
- actionner le dispositif de fixation (200) pour libérer le cadre avant (6) vis-à-vis du cadre arrière (5) ;
 - imprimer une rotation au cadre avant (6) par rapport au cadre arrière (5) d'une première position à une seconde position ou imprimer une rotation au cadre arrière (5) par rapport au cadre avant (6) d'une première position à une seconde position, 40
 - disposer l'élément de recouvrement (60) et l'élément de fermeture (40) de telle sorte qu'ils restent dans une position inchangée relativement à une caisse (7) du dispositif de traitement de linge, et 45
 - actionner le dispositif de fixation (200) pour raccorder le cadre avant (6) au cadre arrière (5) dans la seconde position. 50
- 55

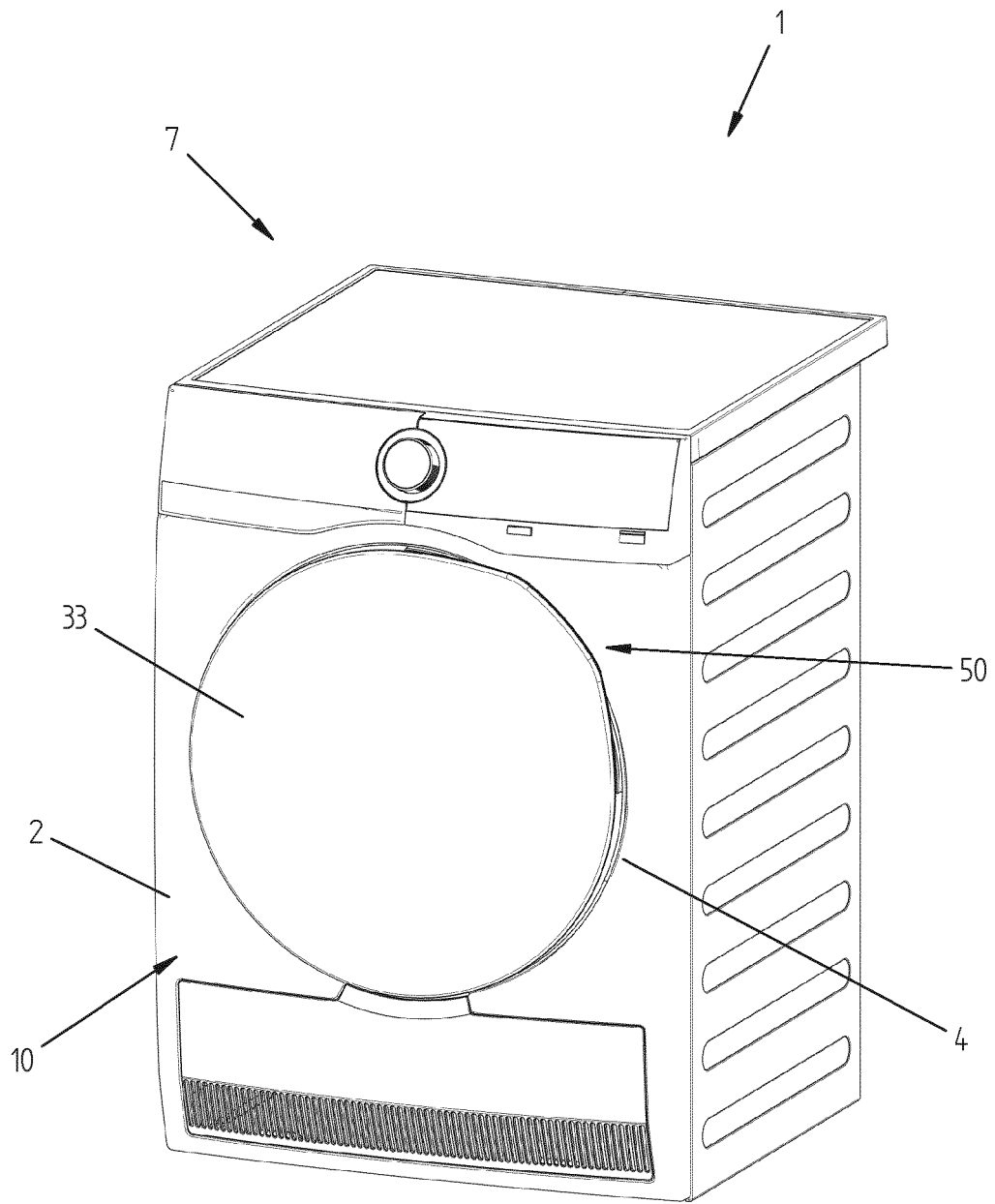


FIG. 1

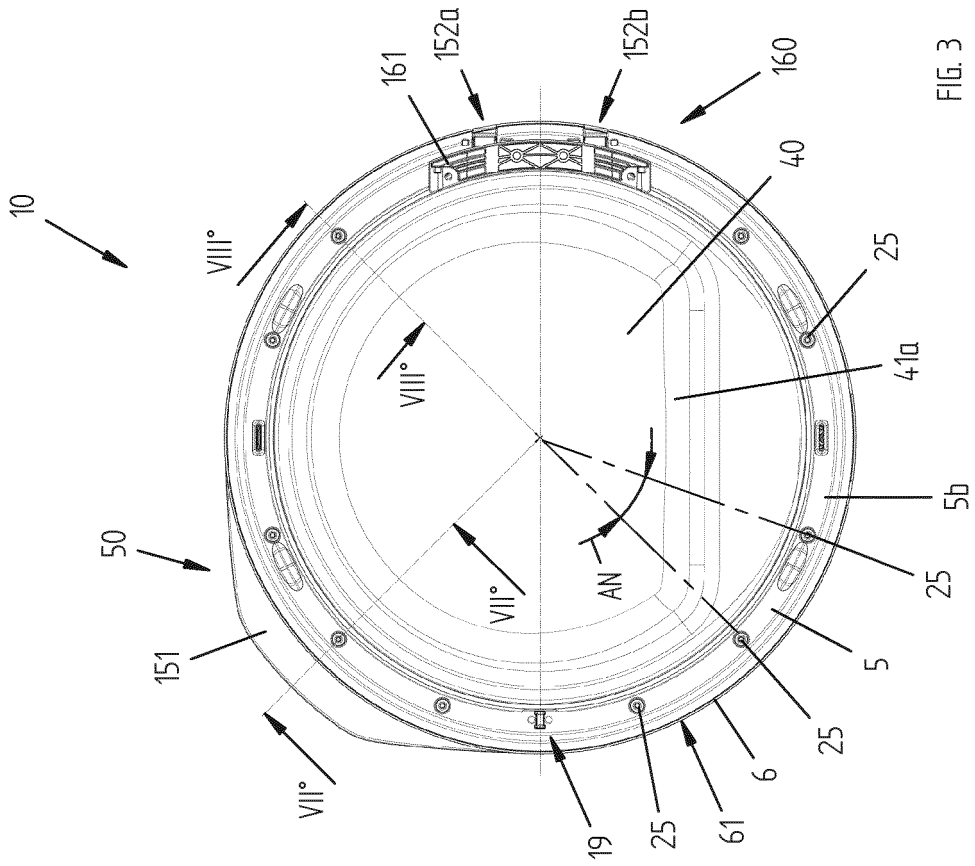


FIG. 3

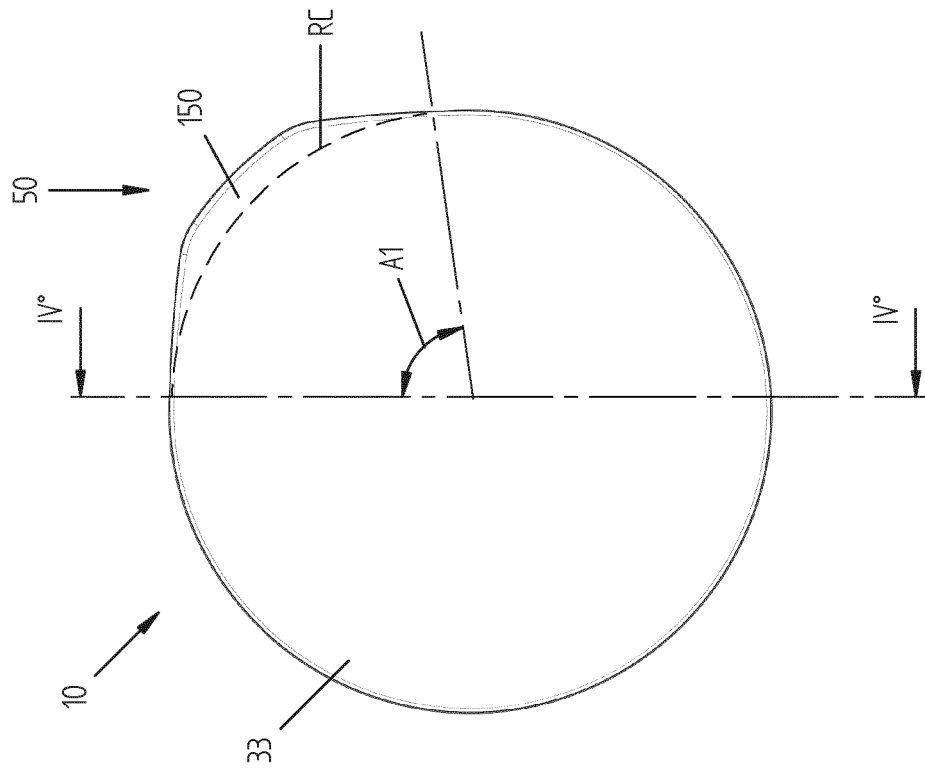
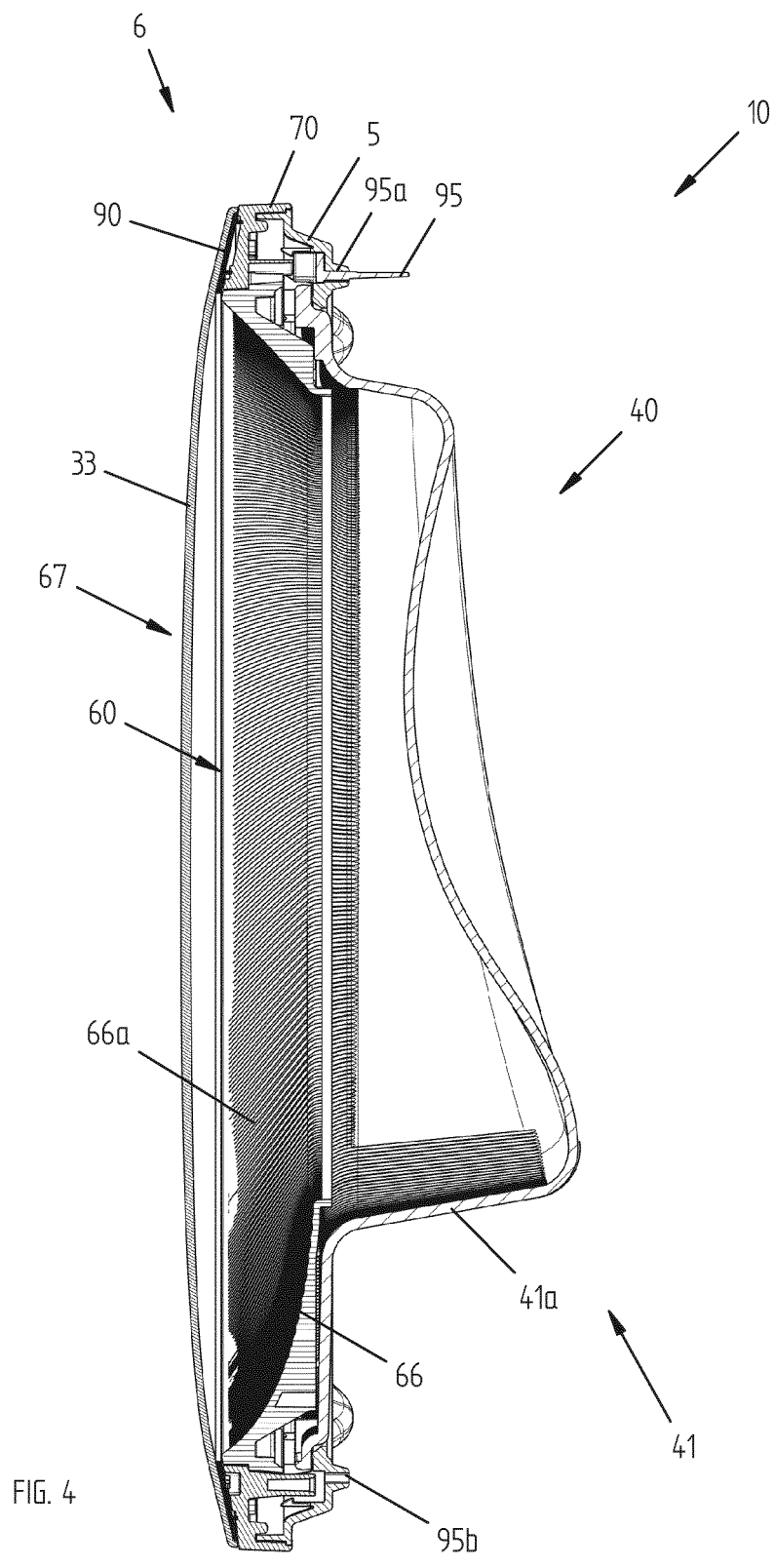


FIG. 2



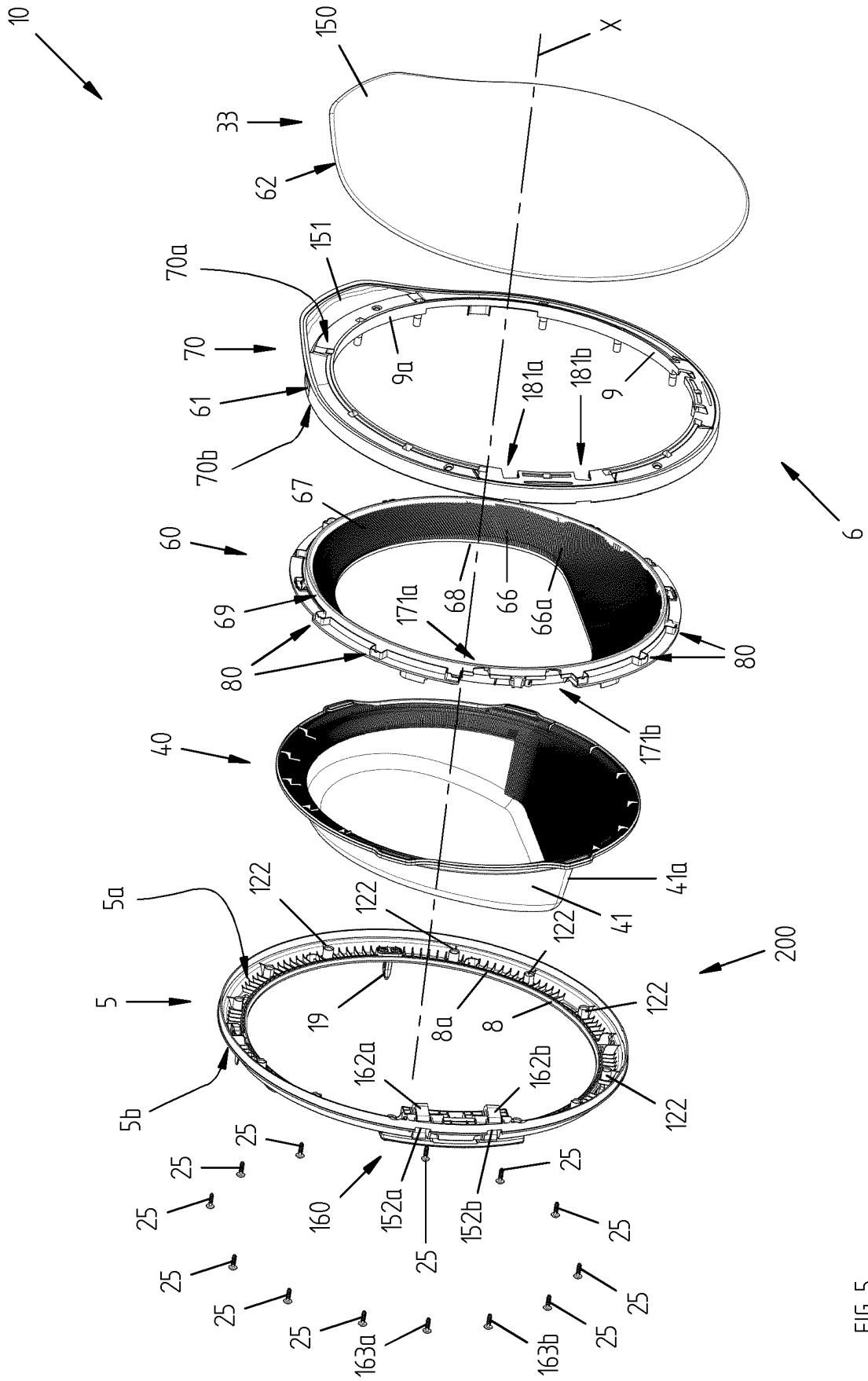


FIG. 5

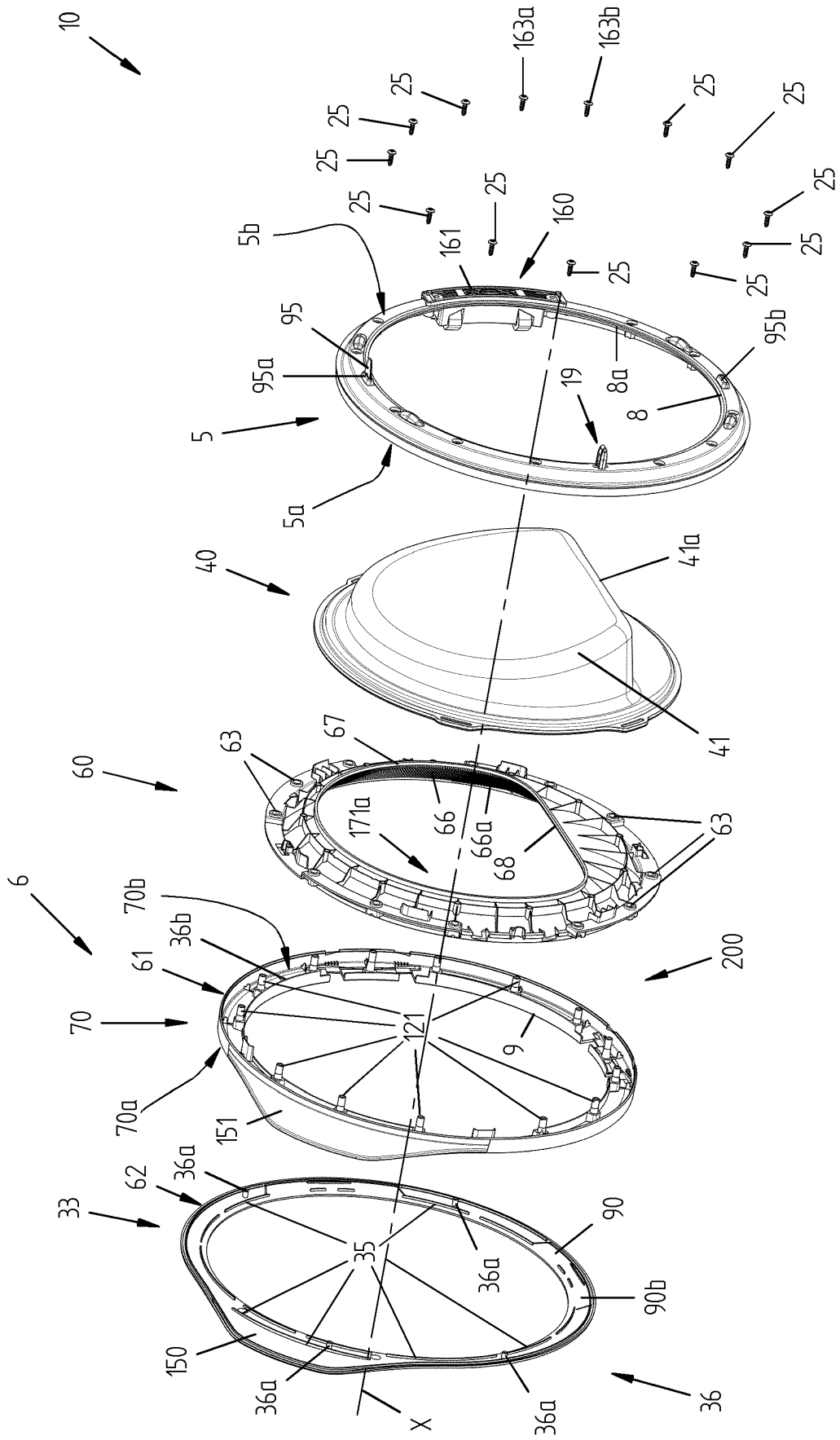


FIG. 6

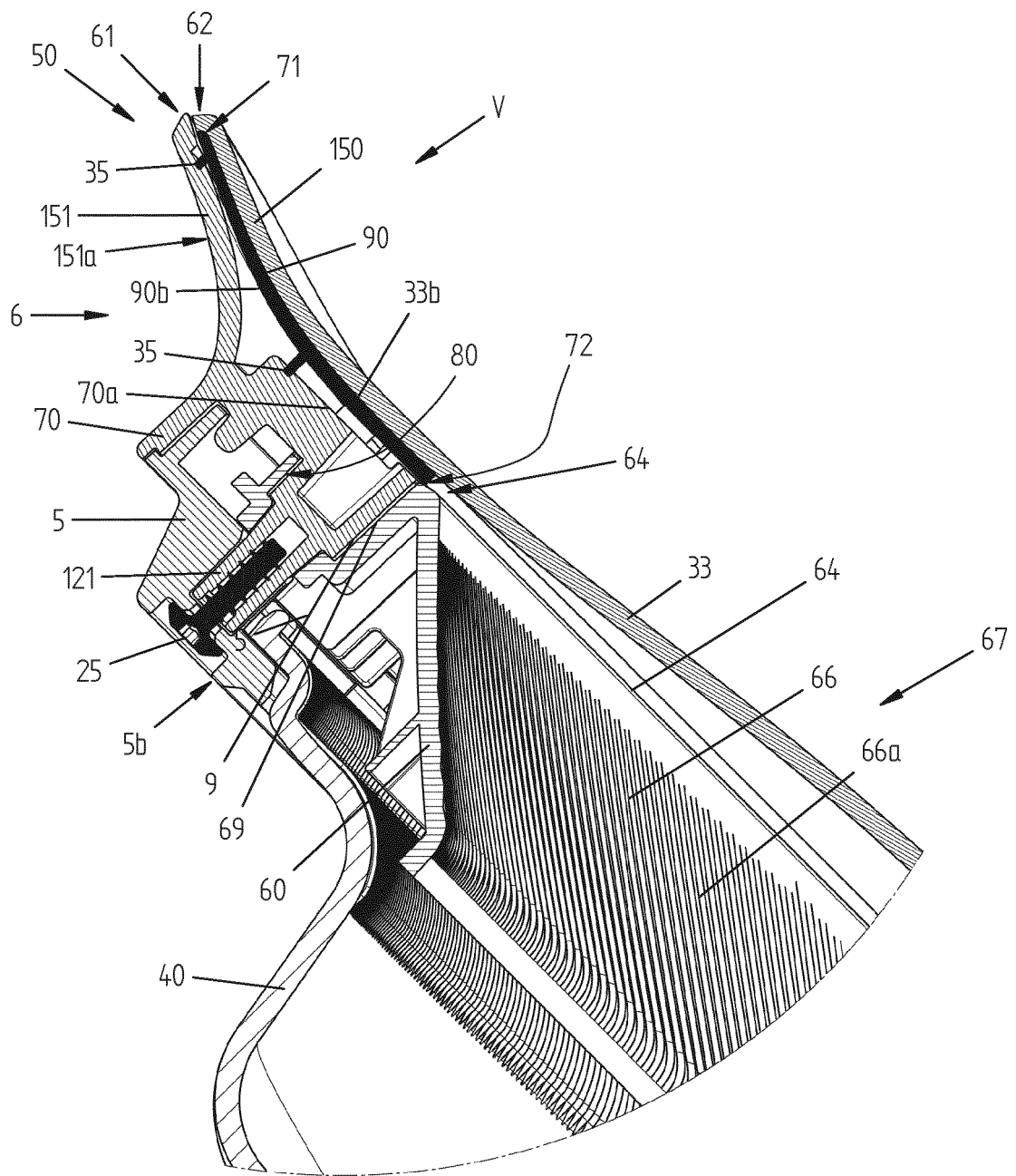


FIG. 7

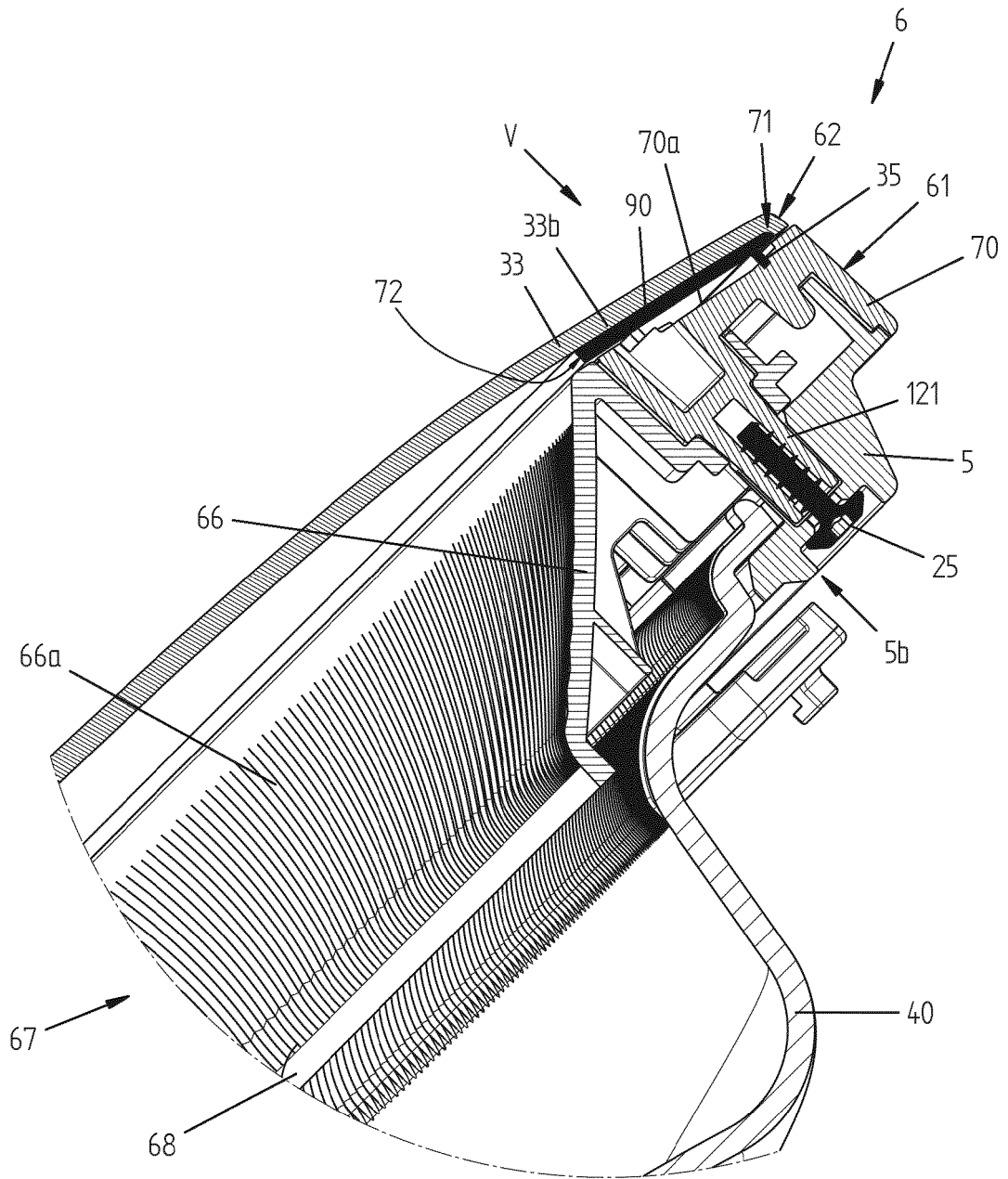


FIG. 8

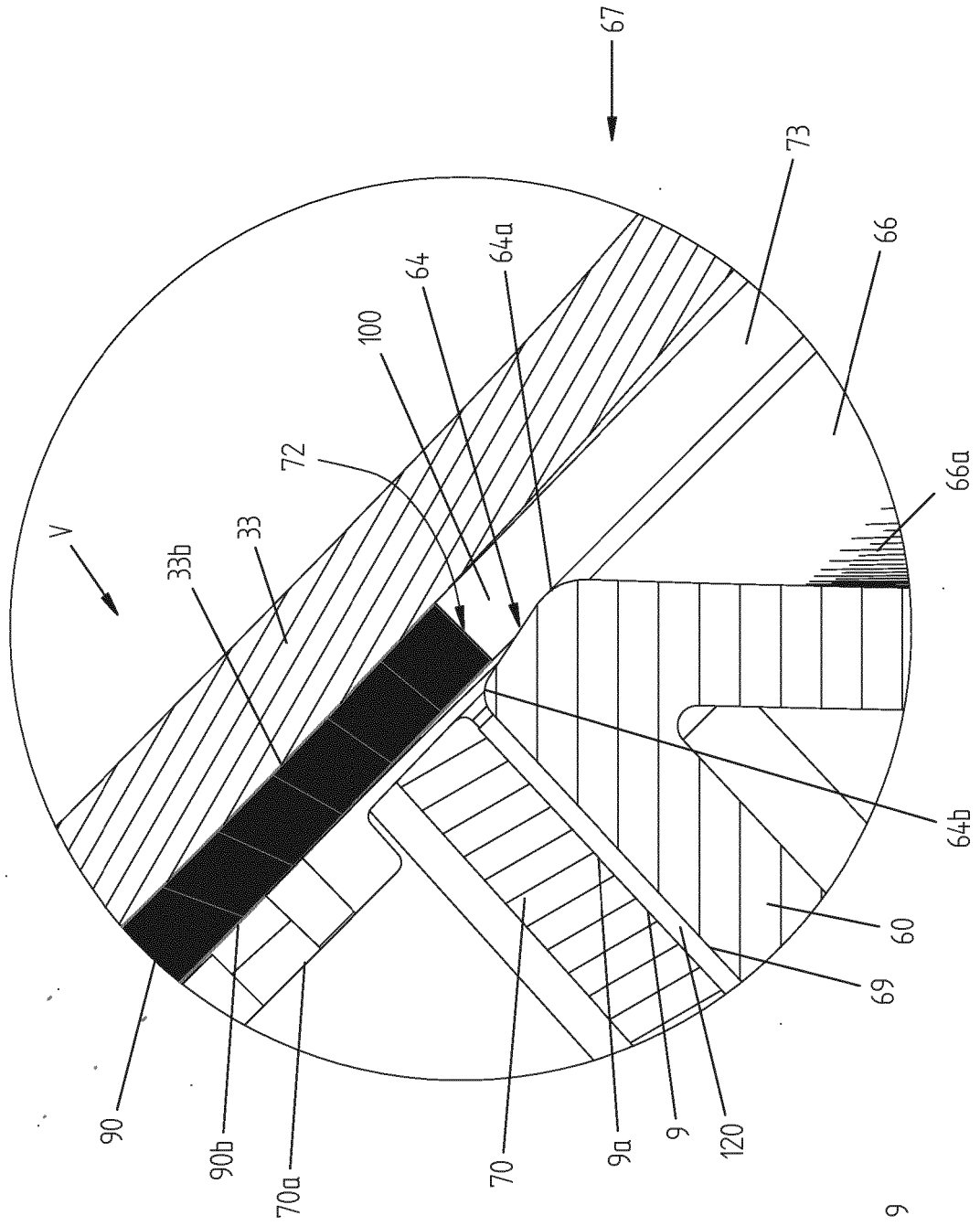


FIG. 9

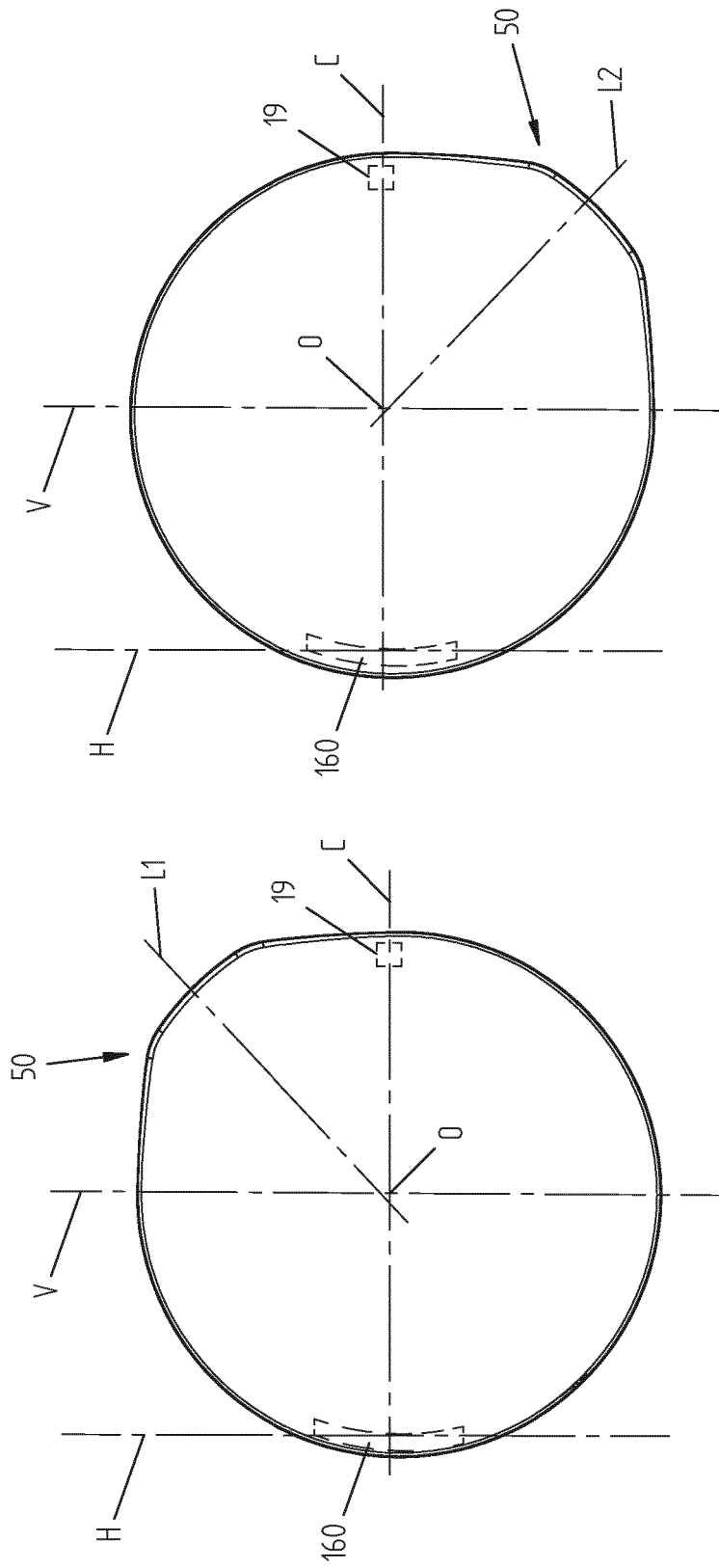


FIG. 10b

FIG. 10a

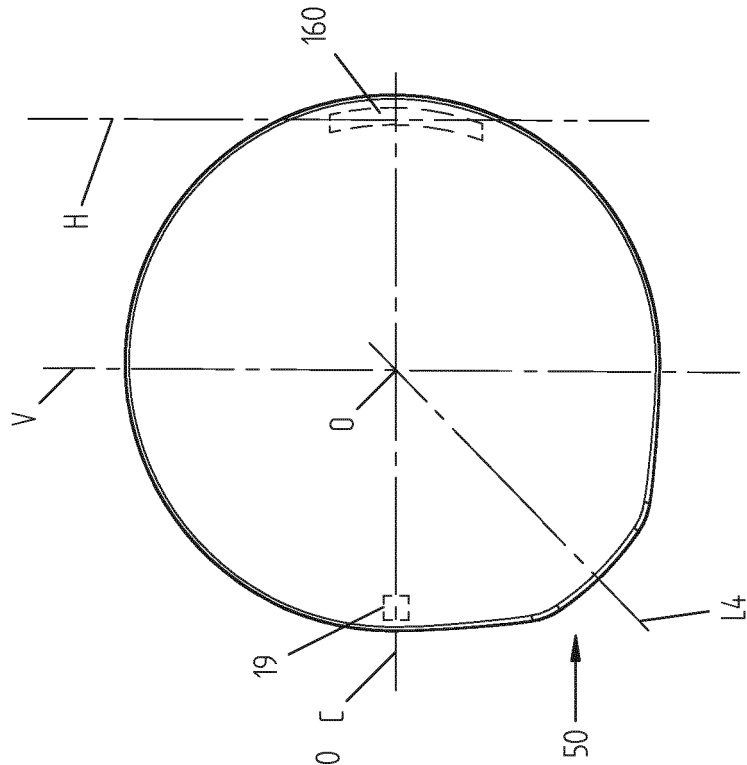


FIG. 10c

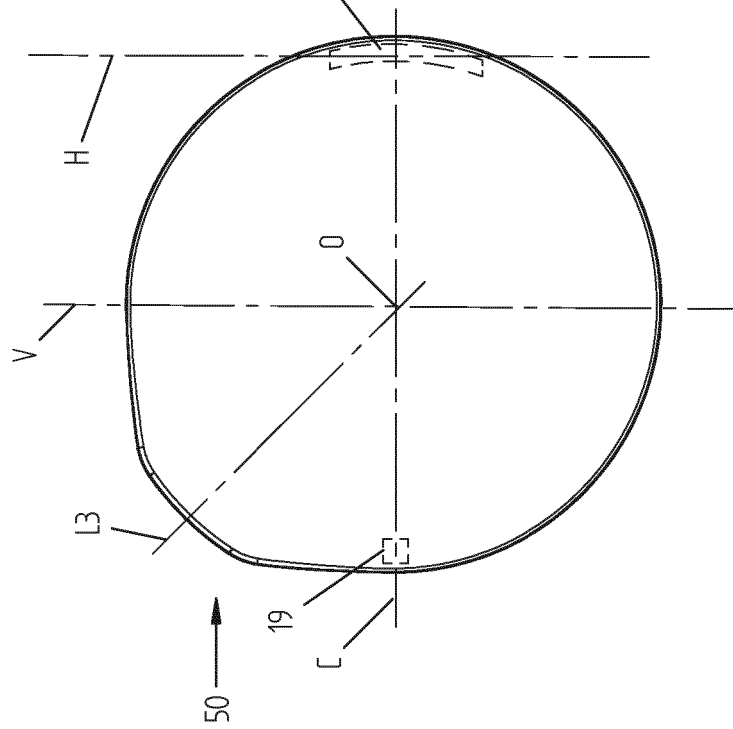


FIG. 10d

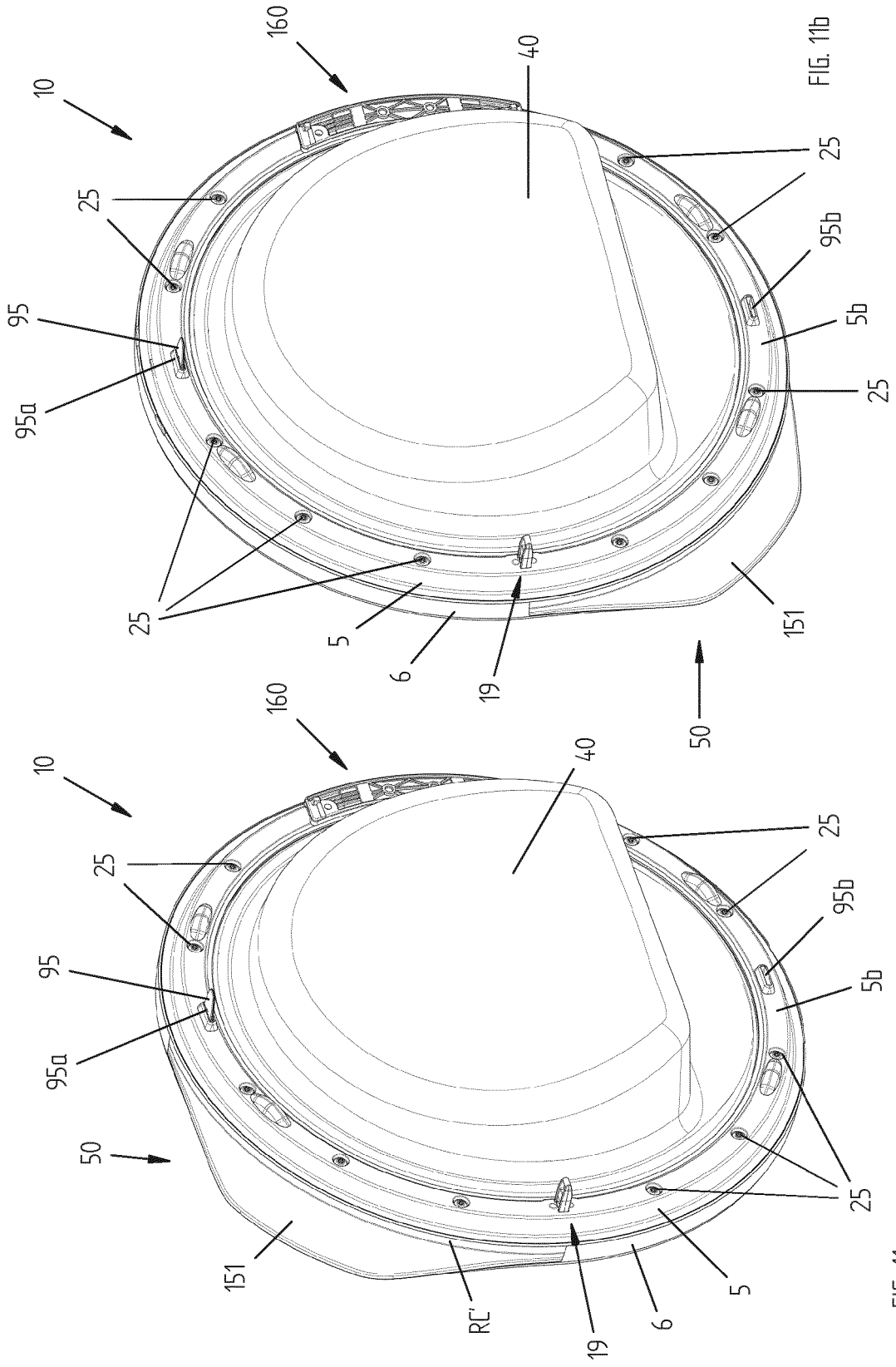
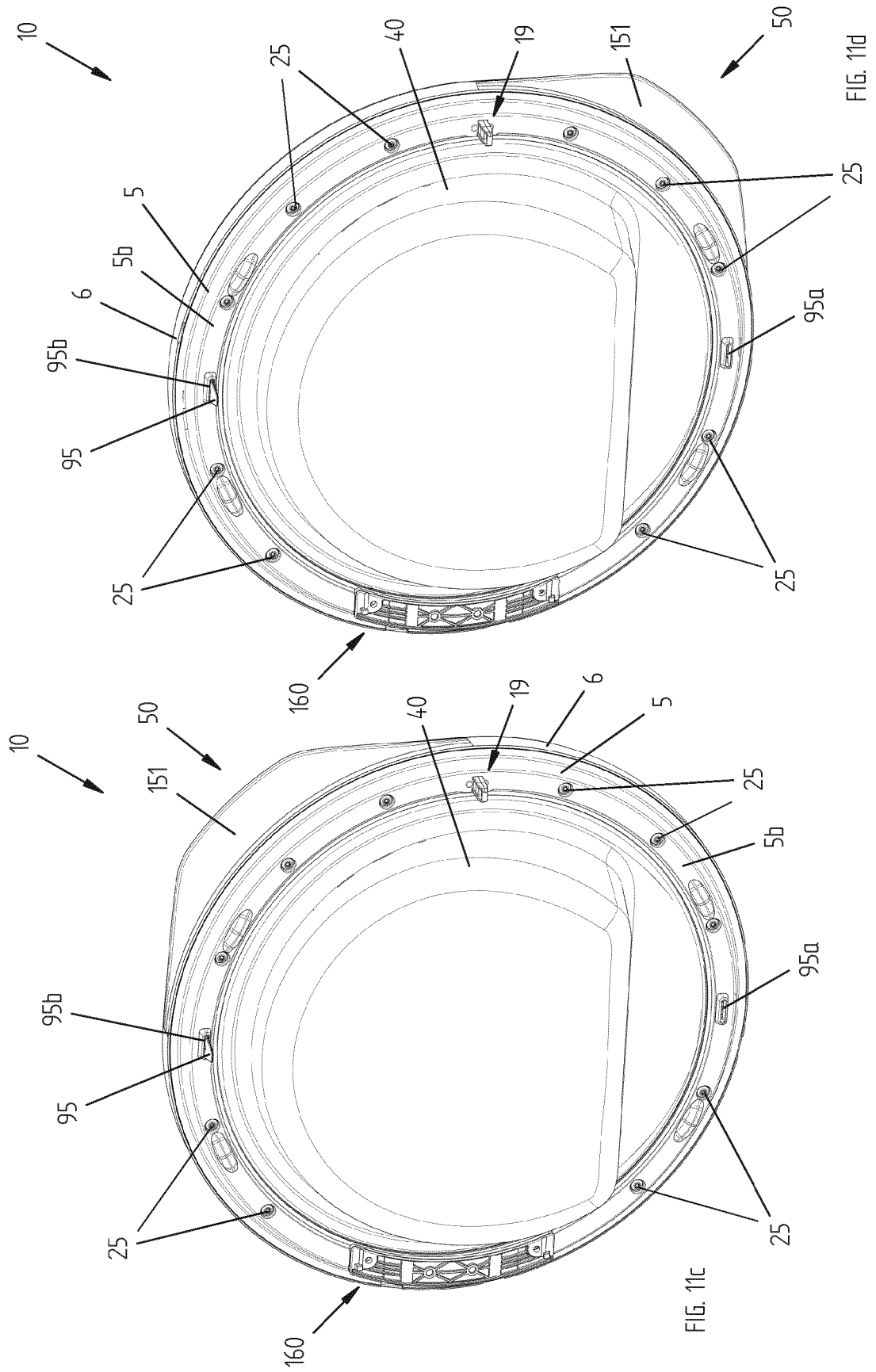


FIG. 11a

FIG. 11b



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2016135285 A1 [0008]