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(54) **Door for electric household-appliance and relative electric household-appliance**

(57) A door (7) for electric household-appliance comprising at least two sectors (8, 9; 71, 72, 73) that are mobile as regards one another and as regards a front

panel (6) of the household-appliance id described. At least one of said sectors (8, 9; 71, 72, 73) is openable by rotation outward around an axis (45, 46; A) fixed to the front panel (6).

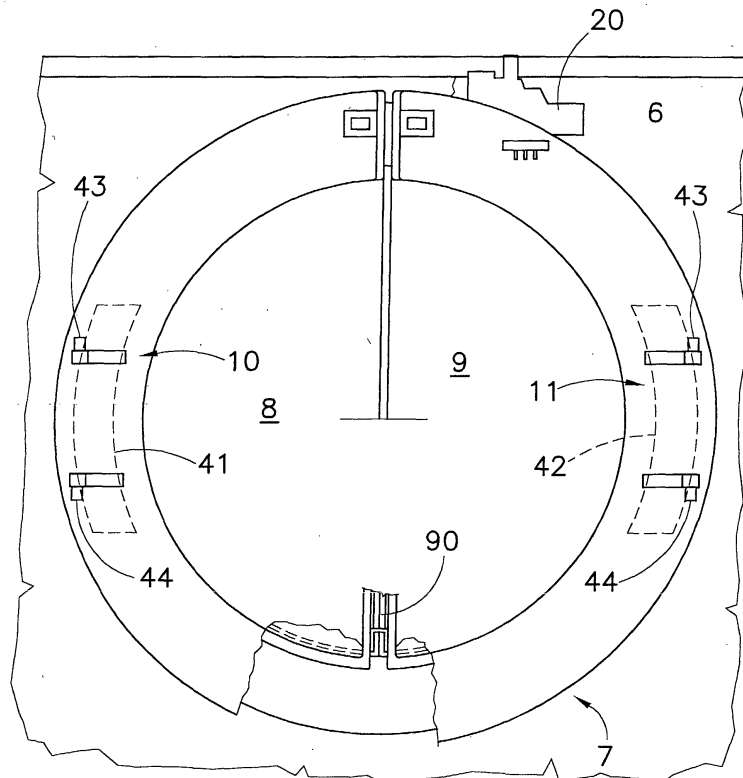


FIG.2

Description

[0001] The present invention refers to a door for electric household-appliance, in particular a machine for the washing and/or drying of laundry, and relative electric household-appliance.

[0002] Currently there are electric household-appliances comprising a structure with a front panel provided with an opening for the access to an internal chamber of the electric household-appliance and a door in order to close said opening.

[0003] Electric household-appliances made this way are, for instance, front load washing-machine in which a drum suitable to contain the laundry to be washed is situated in a central position of the washing-machine and has an opening on the front of the machine. Such drum is revolvingly mounted in a container, called washing tank, destined to contain the washing water and provided with suspension members for its anchorage that allow it to remain suspended inside a cabinet containing the laundry washing-machine.

[0004] The front opening of the washing drum is closed by a door with window that is hinged to the front panel of the cabinet and openable outwards of the machine by means of rotation on an axis parallel to the front panel of the machine. This determines an operating dimension of the same laundry washing-machine larger than the volume relative to the physical dimensions of the machine. In fact, with the washing machine with door open, most part of the door projects from the contour of the cabinet and it is therefore necessary to consider the volume relative to the opening of the door in condition of installation of the washing machine. In particular the front opening volume of the door is the most penalising one since it sums the size of the door to the depth dimension of the household-appliance.

[0005] In view of the state of the art herein described, scope of the present invention is to present a door for electric household-appliance that allows to reduce the volume of the same electric household-appliance.

[0006] According to the present invention, such scope is attained by means of a door for electric household-appliance characterised in that it comprises at least two sectors that are mobile as regards one the other and as regards a front panel of the household-appliance, at least one of said sectors being openable by rotation outwards around an axis fixed to the front panel.

[0007] According to the present invention it is also possible to provide a electric household-appliance comprising a structure with a front panel provided with an opening for the access to an interior chamber of the electric household-appliance and a door to close said opening, characterised in that said door comprises at least two sectors mobile as regards one another and as regards the front panel of the household-appliance, at least one of said sectors being openable by rotation outwards around an axis fixed to the front panel.

[0008] Owing to the present invention it is possible to

provide an electric household-appliance that allows, both when set next and when built-in to contain the volume of the door in the front dimension and to avoid any overlapping of the door on nearby structures or appliances when opening.

[0009] In particular said electric household-appliance is a front load laundry washing-machine that owing to such type of door can be installed in narrow spaces thus limiting the occupied volume as compared with traditional laundry washing-machines.

[0010] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, that is illustrated as a non limiting example in the enclosed drawings, in which:

Figure 1 is schematic front view of a laundry washing-machine provided with a door according to a first embodiment of the present invention;

Figure 2 is a more detailed front view of the door of the laundry washing-machine in Figure 1;

Figure 3 is a schematic side view partially sectioned according to a vertical plane of one part of the laundry washing-machine in Figure 1 with door closed;

Figure 4 is a schematic top view partially sectioned according to a horizontal plane of one part of the laundry washing-machine in Figure 1 with door closed;

Figure 5 is a view similar to the view in Figure 4 but with open door;

Figure 6 is a schematic front view of the locking system of the door;

Figures 7-10 are partially sectioned top views of the locking system in Figure 6 in the different stages of opening and closing of the sectors of the door;

Figure 11 is a schematic side view of an inclined axis laundry washing-machine with provided with a door according to the present invention;

Figure 12 is a schematic front view of a laundry washing-machine provided with a door according to a second embodiment of the present invention;

Figure 13 is a schematic side view of the sole door in Figure 12 with one sector open;

Figure 14 is a schematic front view of a laundry washing-machine provided with a door according to a third embodiment of the present invention;

Figure 15 is a schematic partially sectioned side view of the single door in Figure 14 with one sector open;

Figure 16 is a schematic front view of a laundry washing-machine provided with a door according to a fourth embodiment of the present invention.

[0011] With reference to Figures 1-5, 11-16, there are shown different embodiments of a door for electric household-appliance, in particular for a laundry washing and/or drying machine, which is provided with at least two sectors mobile as regards one another and as re-

gards a front panel of the household-appliance. At least one of the sectors is openable by rotation outwards around an axis fixed to the front panel. In Figure 1 a laundry washing-machine is shown where a washing tank 1 inside of which a revolving drum 2 is mounted is suspended inside a the cabinet 3 by means of appropriate suspension means not visible in figure. The drum 2 suitable to contain the laundry to be washed is provided with an opening 5 on the front panel 6 of the cabinet 3. Said opening is closed by a door 7 according to the first embodiment of the present invention.

[0012] The door 7, better visible in Figures 2-5, is made up of two sectors, a first sector or the left sector 8 and a second sector or right sector 9, preferably with equal size and hinged in 10 and 11 to the front panel 6 of the cabinet 3. Each one of the two sectors 8 and 9 generally comprises a concave central part of glass and a half-ring-like frame generally made of plastic material. Each one of the sectors 8 and 9 is capable to rotate around an axis that is fixed and parallel to the front panel 6 at the point in which each sector is hinged. Each sector 8 or 9 is provided with an abutment edge 80, 90 in its non-circumferential peripheral part of the glass part. The door 7 is made in such a way that the abutment edge 80 of the left sector 8 is lower than the abutment edge 90 of the right sector 9 so that, when the door 7 is closed, the right sector 9 is in abutment on the left sector 8. Preferably the abutment edge 90 of the right sector 9 is provided with a watertight packing 91 along its entire length.

[0013] At the points 10, 11 in which the sectors 8 and 9 are hinged to the front panel 6, the same sectors are provided with brackets 41, 42 with vertical projections 43, 44 provided with cavities for the engagement with vertical hinges 45, 46 integral with the front panel 6. More precisely the front panel 6 has a round recessing 47 in proximity of the opening 5 and the hinges 45, 46 are integral with said recessing at the points 10, 11.

[0014] There can also be provided the use of hinges such as to allow a rotation of each sector around axes parallel to the front panel 6 in such a way so as to obtain a rotation of the sector up until the same becomes parallel to the front panel 6.

[0015] In Figure 6 the locking the device 20 of the sectors 8 and 9 located on the top part of the front panel 6 in its round recessing 47 is shown. Said device 20 comprises a fixed part 21 provided with two holes 22 and 23, in which two hinges 24 and 25 are engaged of which the hinge 24 has one end with oblique tip and the hinge 25 has an end with triangular tip and is provided with a hook 26. The hinges 24 and 25 belong respectively to the left sector 8 and to the right sector 9.

[0016] The device 20 also comprises a part 30 that is longitudinally mobile onto the part 21, associated with a spring 33 anchored to the fixed part 21 and provided with two holes 31 and 32 for the entrance of the two hinges 24 and 25 of the sectors 8 and 9. The device 20 also comprises an L-shape tang 35 longitudinally mobile on

the part 21 and associated with a spring 36 anchored to part 21 too.

[0017] With the door 7 closed, the hinges 24 and 25 are engaged in respective holes 22, 31 and 23, 32 and the hook 26 of the hinge 25 is engaged with the tang 35 (Figure 10). In order to open the door 7 one must operate on the tang 35, for instance by means of an electromechanical control, so as to move it toward the right and to allow the hook 26 of the hinge 25 to disengage from it (Figure 9). The hinge 25 can exit the holes 23 and 32 thus allowing the opening of the right sector 9 (Figure 8). The hinge 24 is free to exit from the holes 22, 31 thus allowing the opening of the left sector 8 (Figure 7). The action of extension of the springs 33 and 36 determines a displacement of the part 30 and of the tang 35 toward the left.

[0018] In order to close the door 7 (Figure 7) it is necessary to close the left sector 8 at first and subsequently the right sector 9. In fact the oblique tip conformation of the end of the hinge 24 allows, by means of thrust action on the left sector 8, its entrance into the hole 31 after passing through the hole 22 (Figure 8). This determines a movement toward the right of the part 30 with consequent compression of the spring 33. The sliding of the part 30 onto the part 21 allows the alignment of the hole 32 with the hole 23; the hinge 25 is free to enter into the hole 32 (Figure 9) and its hook 26 can engage with the tang 35 thus allowing the closing of the right sector 9 and therefore the locking of entire the door 7 (Figure 10).

[0019] Although in Figures 1-5 there is shown a front load laundry washing-machine with horizontal axis provided with the door 7 according to the first embodiment of the invention, such door 7 can be used also for front load laundry washing-machines with inclined axis as visible in Figure 11. In such laundry washing-machines the opening of the door 7 is easier because such door 7 is positioned higher and has a smaller size. The extremely reduced level of water currently used in such laundry washing-machines allows to prevent outflows of water even with small, reduced or without any packing.

[0020] As a variation of the embodiment of the present invention it is possible, even if not shown in the Figures, to hinge the two sectors so that their opening and closing is done according to an axis that is oblique as regards a vertical axis, using the same locking system as the sectors located in a position different from the one mentioned above.

[0021] As an additional variation of the embodiment of the present invention it is possible that the two sectors have a different size so as to rationalise the volume of the laundry washing-machine with reference to its location.

[0022] In Figure 12 a laundry washing-machine with a door according to a second embodiment of the invention is shown. Said door comprises two sectors 8 and 9 of which the sector 9 is hinged to the front panel 6 of the cabinet 3 of the laundry washing-machine and the sector 8 is hinged to the sector 9 by means of an articulated

watertight hinge 81 and is provided with a locking hook 82 in a peripheral part that is coupled with the front panel 6. Each of the sectors 8 and 9 comprises a concave central part generally made of glass and an arc of circumference frame of plastic material. The sector 9 is capable to rotate around an axis fixed and parallel to the front panel 6 at the point in which it is hinged to the panel 6 and the sector 8 is capable to rotate as regards the sector 9 around the hinge 81 articulated toward the outside by flipping over onto the sector 9, as visible in Figure 13.

[0023] In Figure 14 a laundry washing-machine with a door according to a third embodiment of the invention is shown. Said door comprises three sectors 71, 72 and 73 hinged in 74, 75 and 76 to the front panel 6 of the cabinet 3 of the laundry washing-machine. Each one of the sectors 71, 72 and 73 comprises a concave central part generally made of glass and a frame shaped as an arc of circumference generally made of plastic material. Each one of the sectors 71, 72 and 73 is capable to rotate around an axis fixed and parallel to the front panel 6 at the point in which each sector is hinged. Each sector 71, 72 and 73 is provided with an abutment edge 710, 720 and 730 in its non-circumferential peripheral part of the glass part, and at least one of said abutment edges is preferably provided with a watertight packing. The door 7 is made so that the abutment edges 710, 720 and 730 are either lower or higher so as to assure the tightness of the door 7 when the door 7 is closed. A closing device, preferably the already described locking device 20, is coupled with sectors 71 and 72 in such way so as to assure a sequential opening of the sectors 71, 72 and 73 with sequence 71, 72 and 73, and a corresponding sequential closing of the same with sequence 73, 72 and 71. The sector 71 is opened by means of rotation upwards, as shown in Figure 15, and it can also be opened while the laundry washing-machine is in function in order to add any piece of laundry to be washed.

[0024] In Figure 16 a laundry washing-machine with a door according to a fourth embodiment of the invention is shown. Said door comprises two the sectors 8 and 9 both hinged in 95 to the front panel 6 of the cabinet 3 of the laundry washing-machine. Each one of the sectors 8 and 9 generally comprises a concave central part of glass and a frame shaped as an arc of circumference generally of plastic material.

[0025] The door 7 is capable to slide along a direction orthogonal to the front panel 6 of the cabinet 3 up to reaching a certain distance from the same wall. Once said distance has been reached the sectors 8 and 9 are able to rotate around a axis A fixed and orthogonal to the front panel 6 at the point 95 in which they are both hinged to the panel 6, thus describing an opening V-shape.

Claims

1. Door (7) for electric household-appliance **characterised that** it comprises at least two sectors (8, 9; 71, 72, 73) mobile as regards one another and as regards a front panel (6) of the electric household-appliance, at least one of said sectors (8, 9; 9; 71, 72, 73) being openable by outward rotation around an axis (45, 46; A) fixed to the front panel (6).
2. Door according to claim 1, **characterised in that** it comprises at least two sectors (8, 9; 71, 72, 73) both hinged to the front panel (6) of the electric household-appliance in one of their peripheral parts, said sectors (8, 9; 71, 72, 73) being separately openable by rotation outwards around axes (45, 46) parallel to the front panel (6).
3. Door according to claim 2, **characterised in that** said sectors (8, 9; 71, 72, 73) are provided with edges of abutment (80, 90; 710, 720, 730) on the not hinged peripheral part.
4. Door according to claim 3, **characterised in that** at least one (90) of said edges of abutment (80, 90; 710, 720, 730) are provided with a watertight packing (91).
5. Door according to claim 2, **characterised in that** it comprises two sectors (8, 9) hinged to a front panel (6) of the electric household-appliance in one of their peripheral parts.
6. Door according to claim 2, **characterised in that** it comprises three sectors (71, 72, 73) hinged to the front panel (6) of the electric household-appliance in one of their peripheral parts.
7. Door according to claim 1, **characterised in that** it comprises a first (9) and a second (8) sector, the first sector (9) being hinged to the front panel (6) of the electric household-appliance in one of its peripheral parts and the second sector (8) being hinged to the first sector (9) through an articulated hinge (81), said first sector (9) being openable by rotation outwards around an axis parallel to the front panel (6) and the second sector (8) being able to rotate as regards the first sector (9) outwards by flipping over onto the same, said second sector (8) being able to couple with the front panel (6) by means of a locking element (82).
8. Door according to claim 1, **characterised in that** it comprises two sectors (8, 9) hinged in a common point (95) to the front panel (6) of the household-appliance, said door (7) being openable by sliding along one direction orthogonal to the front panel (6) of the cabinet (3) up to reaching a certain distance

from the same panel (6) and subsequent rotation of the two sectors (8, 9) around an axis (A) orthogonal to the front panel (6) in said hinge point (95).

9. Door according to any one of the previous claims, **characterised in that** said door (7) is round and each of said sectors (8, 9; 71, 72, 73) comprises a central part made of glass or similar and a frame shaped as an arc of circumference of plastic material.
10. Electric household-appliance comprising a structure with a front panel (6) provided with an opening (5) for the access to an interior chamber (2) of the electric household-appliance and a door (7) to close said opening, **characterised in that** said door (7) comprises at least two sectors (8, 9; 71, 72, 73) mobile as regards one another and the front panel (6) of the household-appliance, at least one of said sectors (8, 9; 9; 71, 72, 73) being openable by rotation outwards around an axis (45, 46; A) fixed to the front panel (6).
11. Electric household-appliance according to claim 10, **characterised in that** said door (7) comprises at least two sectors (8, 9; 71, 72, 73) both hinged to the front panel (6) of the electric household-appliance in one of their peripheral parts, said sectors (8, 9; 71, 72, 73) being openable separately by rotation outwards around axes (45, 46) parallel to the front panel (6).
12. Electric household-appliance according to claim 11, **characterised in that** said sectors (8, 9; 71, 72, 73) of the door (7) are provided with edges of abutment (80, 90; 710, 720, 730) on the non-hinged peripheral part.
13. Electric household-appliance according to claim 12, **characterised in that** at least one (90) of said edges of abutment (80, 90; 710, 720, 730) are provided with a watertight packing (91).
14. Electric household-appliance according to claim 11, **characterised in that** it comprises a locking device (20) at least two sectors (8, 9; 71, 72) for the sequential closing (8, 9; 73, 72, 71) and opening (9, 8; 71, 72, 73) of the sectors (8, 9; 71, 72, 73) of the door (7), said device (20) comprising a first fixed part (21) provided with holes (22, 23) in which respective hinges (24, 25) of the two sectors (8, 9; 72, 71) are engaged.
15. Electric household-appliance according to claim 14, **characterised in that** said device (20) comprises a second part (30) longitudinally mobile onto the first part (21) by means of an action of compression and extension of first elastic means (33) and a tang (35) longitudinally mobile on the first part (21) by means of action of compression and extension of second elastic means (36), said second part (30) being provided with holes (31, 32) capable to line up with the holes (22, 23) of the first part (21), said two hinges (24, 25) of the two sectors (8, 9; 72, 71) having one (24) a blunt end in order allow its inlet in a respective hole (31) of the second part (30) by means of thrust action on the respective sector (8, 72) thus determining in such a way the longitudinal movement of the second part (30) for the lining up of the other hole (32) with the respective hole (23) of the first part (21) in order to allow the inlet of the other hinge (25), the other hinge (25) being provided with an end hook (26) suitable to engage with said tang (35), said second elastic means (36) associated with said tang (35) being externally controlled for the disengagement of said hook (26).
16. Electric household-appliance according to claim 11, **characterised in that** said door (7) comprises two sectors (8, 9) hinged to a front panel (6) of the electric household-appliance in one of their peripheral parts.
17. Electric household-appliance according to claim 16, **characterised in that** said device (20) is located in proximity of the top part of the opening (5) of the front panel (6) of the household-appliance.
18. Electric household-appliance according to claim 11, **characterised in that** said door (7) comprises three sectors (71, 72, 73) hinged one to the front panel (6) of the electric household-appliance in one of their peripheral parts, and two (71, 72) of said sectors (71, 72, 73) being provided with said locking device (20).
19. Electric household-appliance according to claim 10, **characterised in that** said door (7) comprises a first (9) and a second (8) sector, the first sector (9) being hinged to the front panel (6) of the electric household-appliance in one of its peripheral parts and the second sector (8) being hinged to the first sector (9) through an articulated hinge (81), said first sector (9) being openable by rotation outwards around an axis parallel to the front panel (6) and the second sector (8) being able to rotate as regard the first sector (9) outwards by flipping over onto the same, said second sector (8) being able to couple with the front panel (6) by means of a closing element (82).
20. Electric household-appliance according to claim 10, **characterised in that** said door (7) comprises two sectors (8, 9) hinged into a common point (95) to the front panel (6) of the household-appliance, said door (7) being openable by sliding along a direction

orthogonal to the front panel (6) of the cabinet (3) up to reaching a certain distance from the same panel (6) and subsequent rotation of the two sectors (8, 9) around an axis (a) orthogonal to the front panel (6) at said hinge point (95).

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21. Electric household-appliance according to any one of the claims from 10 to 20, **characterised in that** said door (7) is round and each one of said sectors (8, 9; 71, 72, 73) comprises a central part of glass or similar and a frame shaped as an arc of circumference of plastic material.

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22. Electric household-appliance according to claim 10, **characterised in that** said electric household-appliance is a front load laundry washing-machine and said internal chamber (2) is a drum revolvingly mounted inside a washing tank (1) suspended by means of suspension means inside a cabinet (3).

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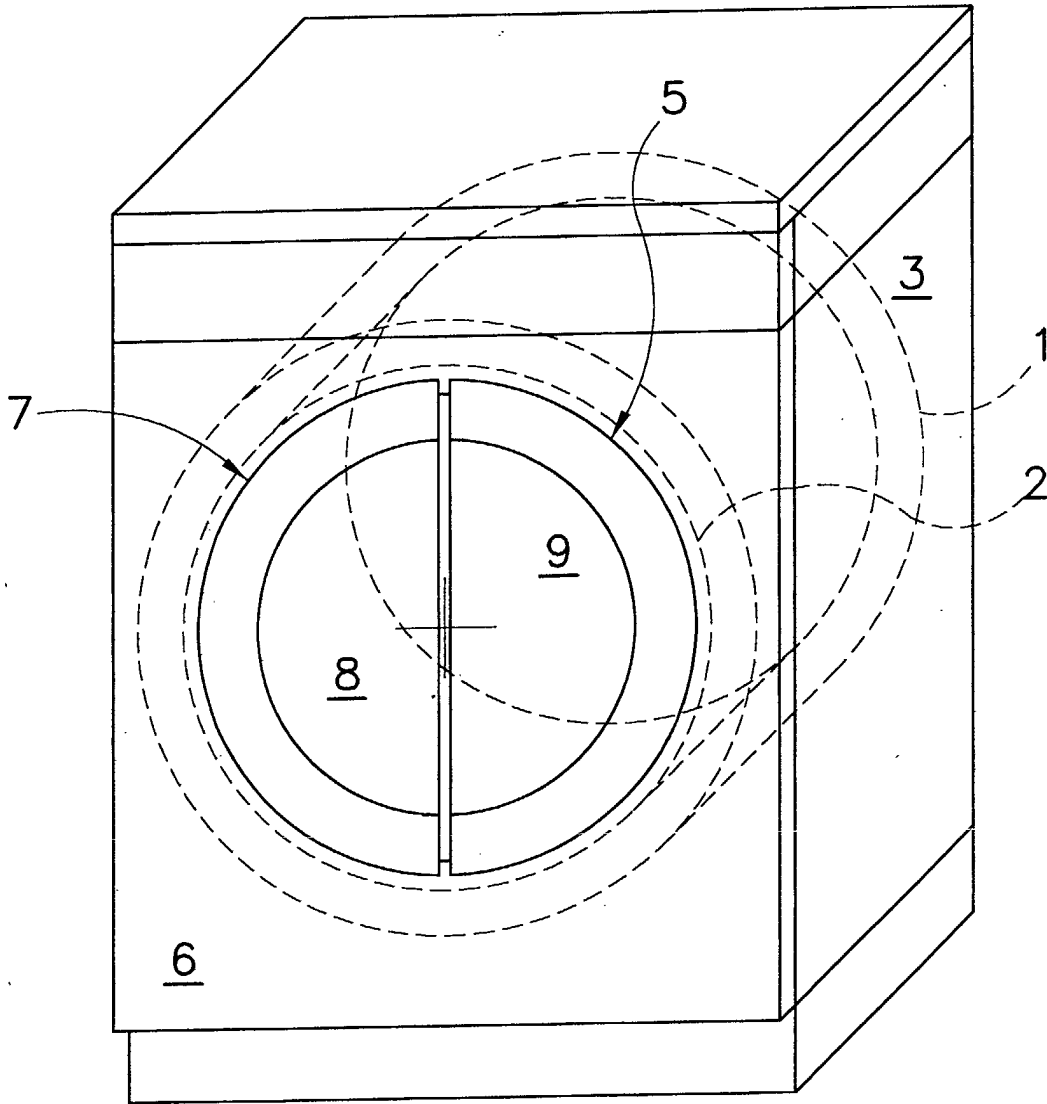


FIG. 1

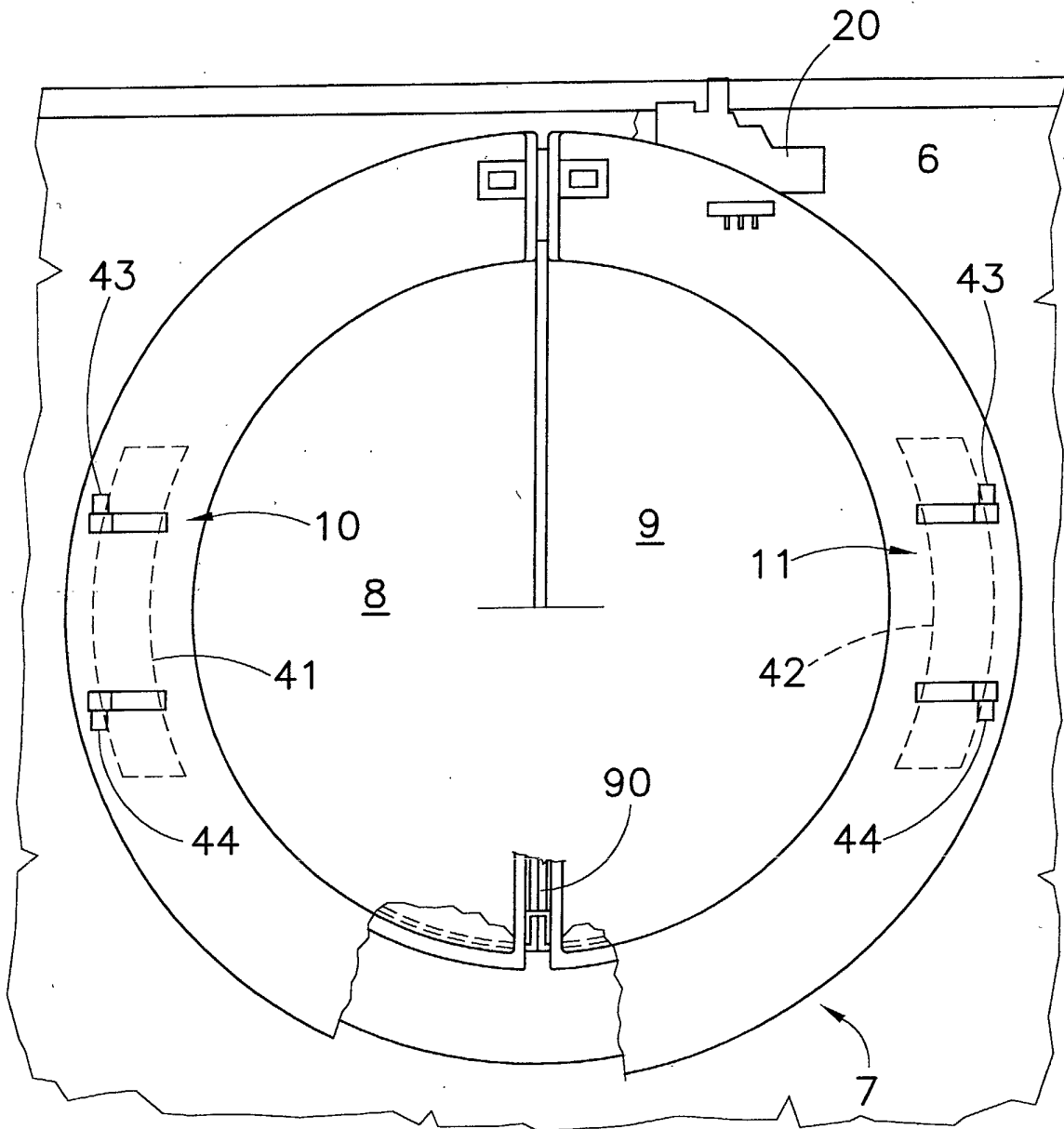
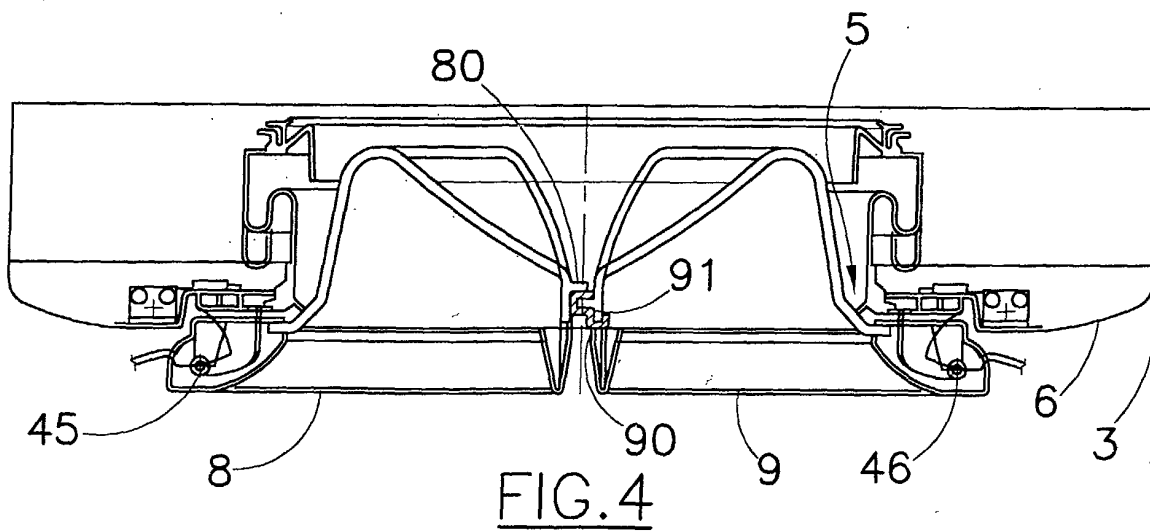
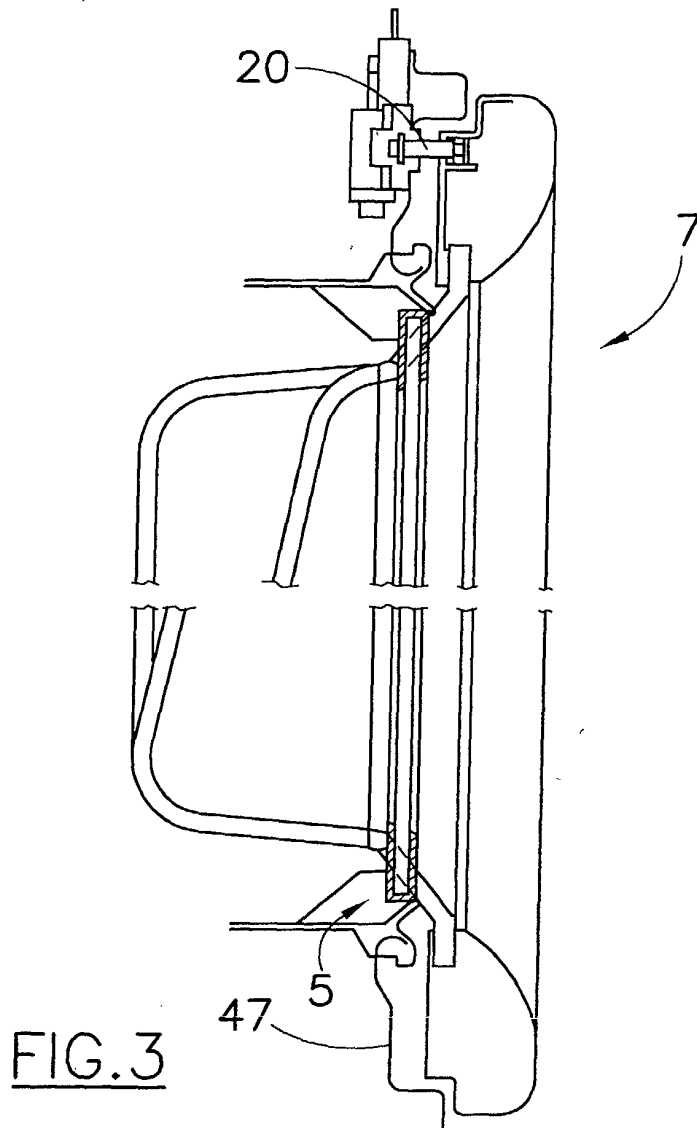


FIG. 2



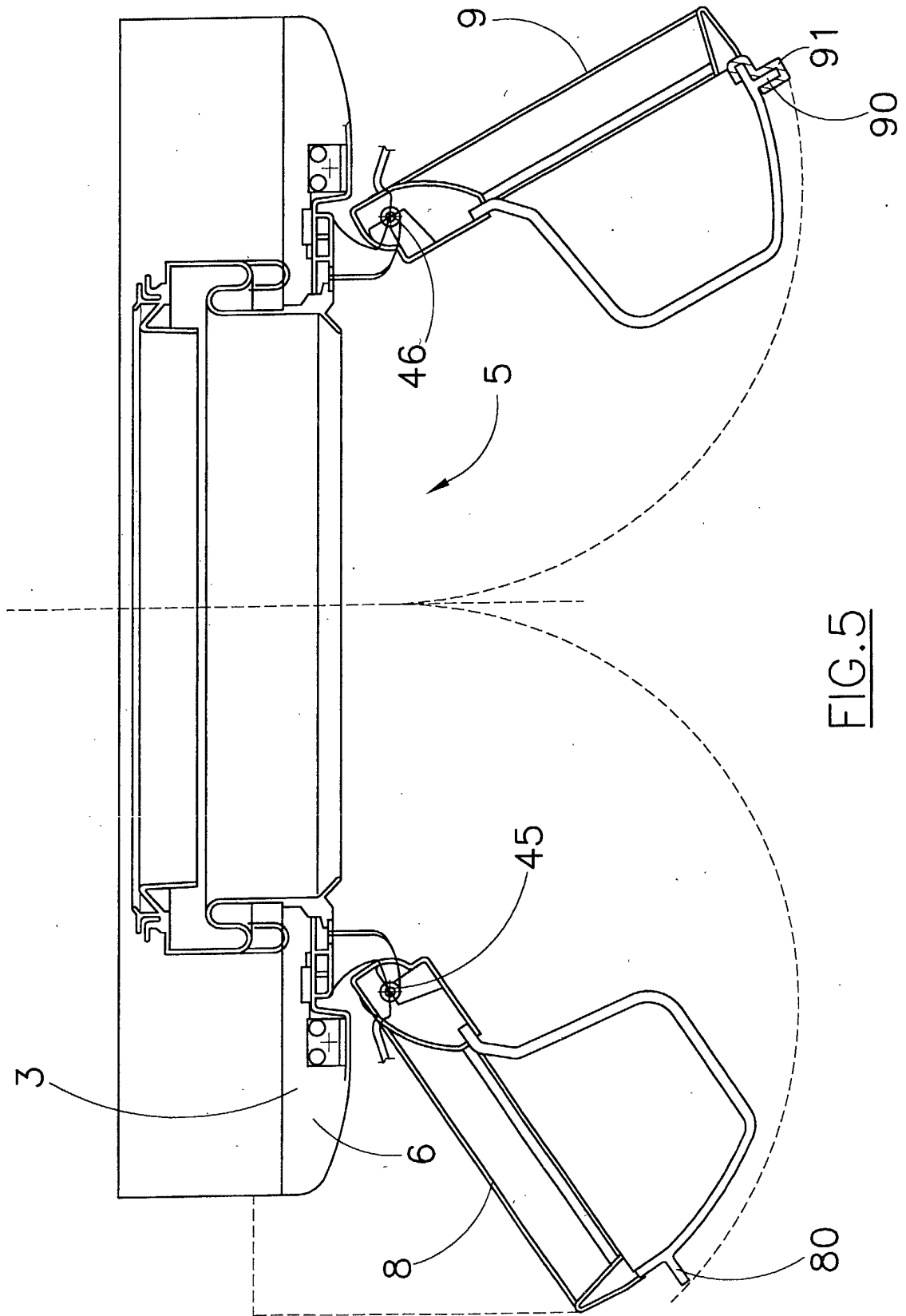


FIG.5

FIG.6

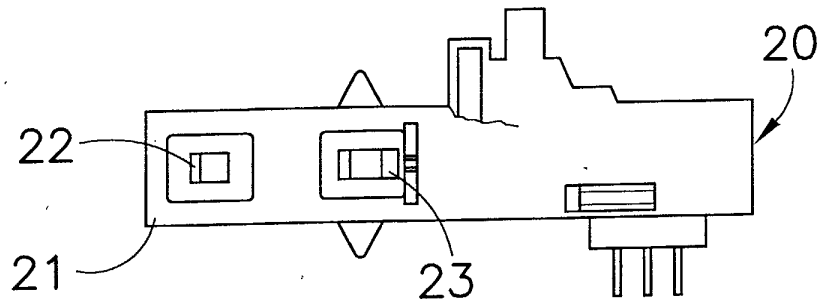


FIG.7

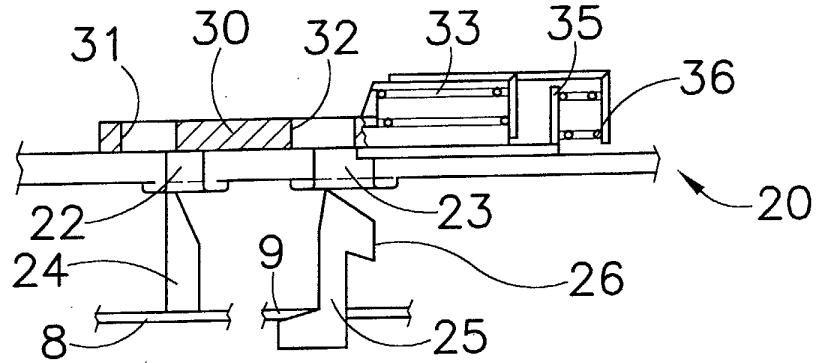


FIG.8

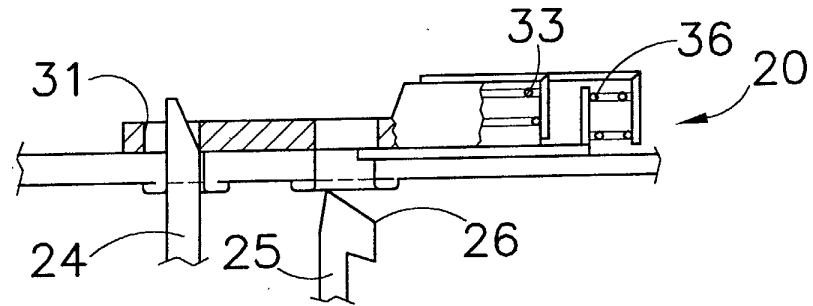


FIG.9

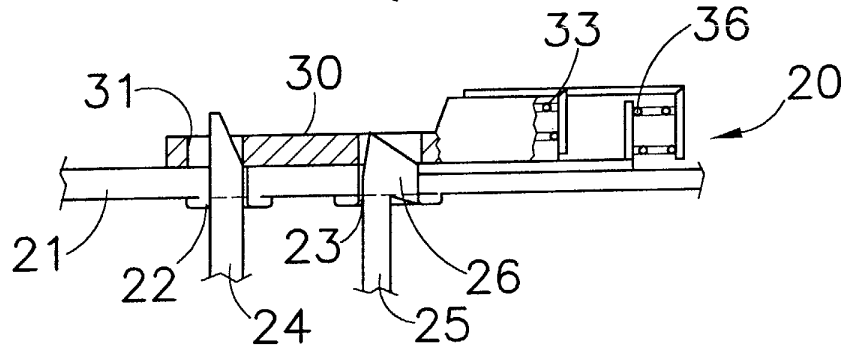


FIG.10

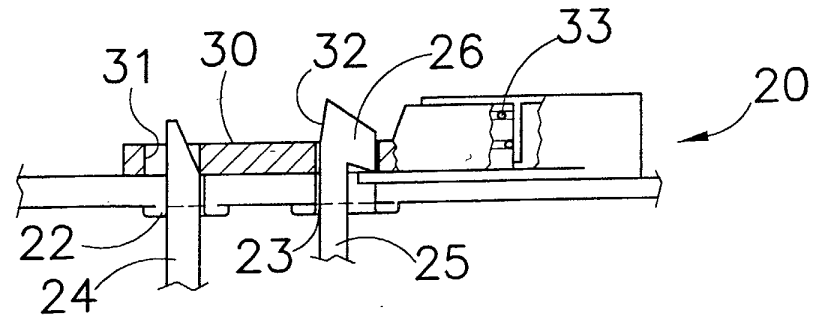


FIG. 11

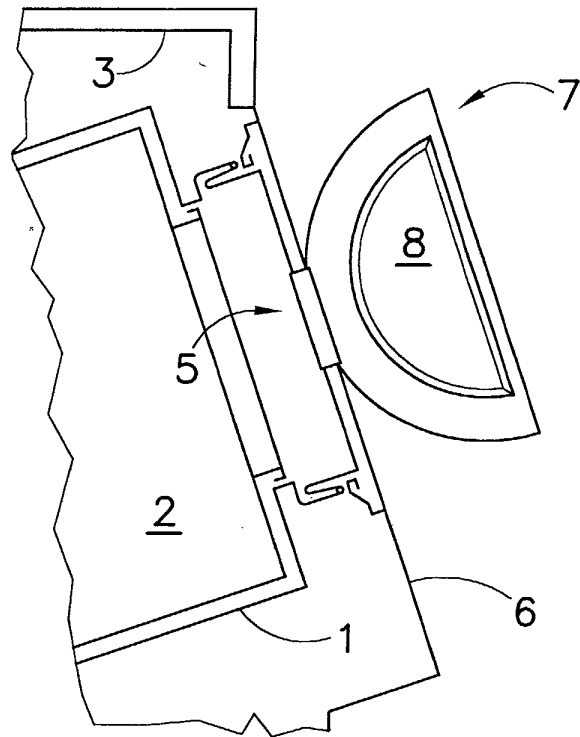


FIG. 12

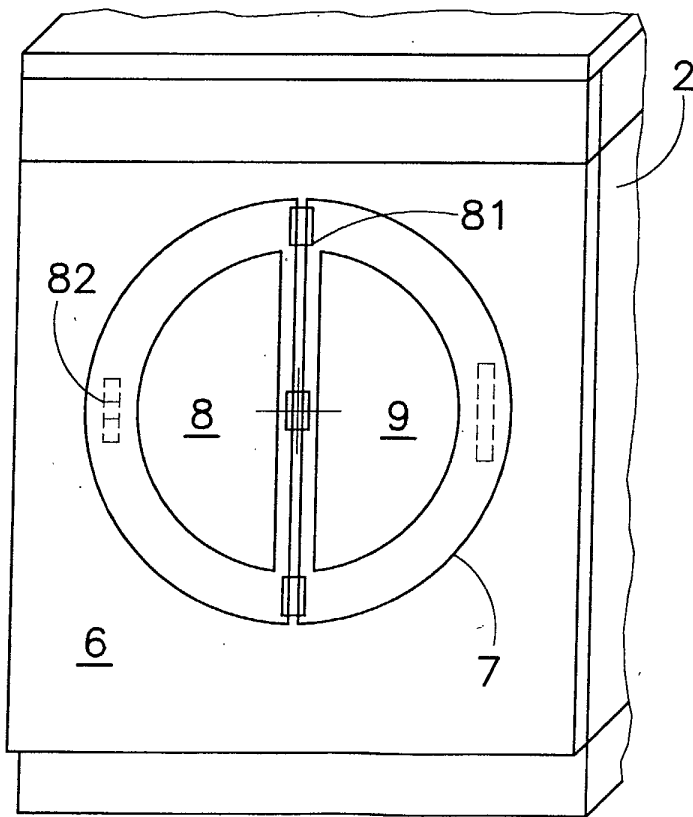
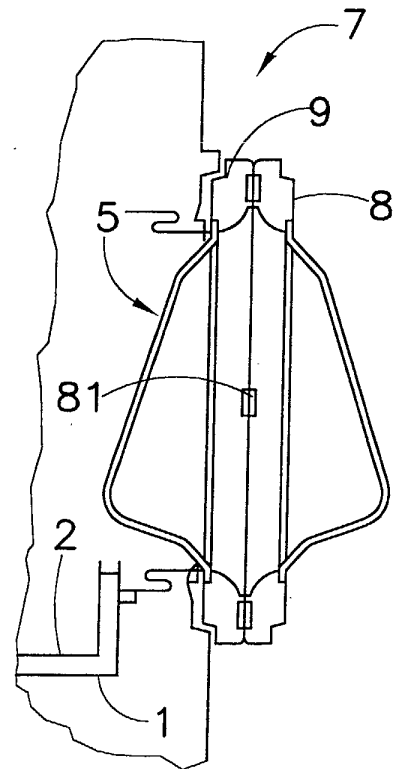


FIG. 13



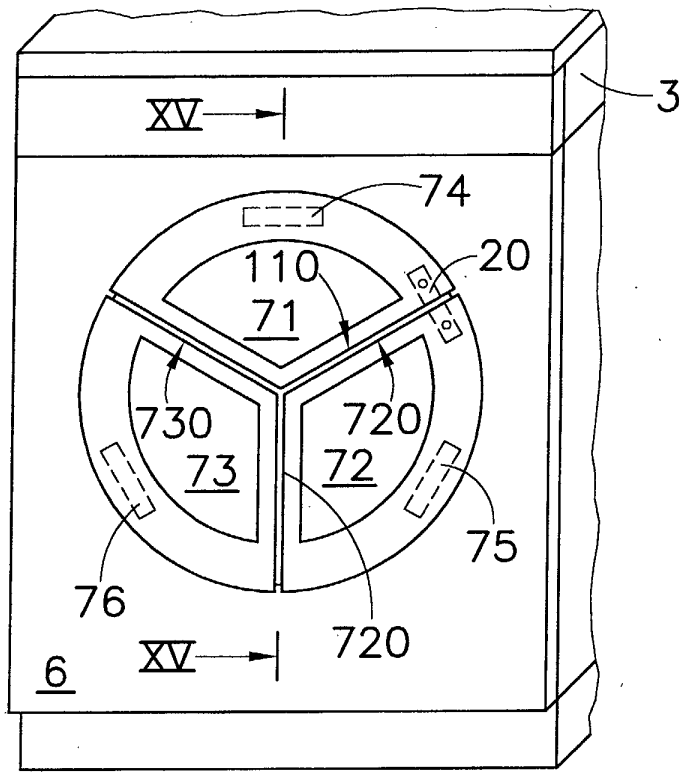


FIG. 14

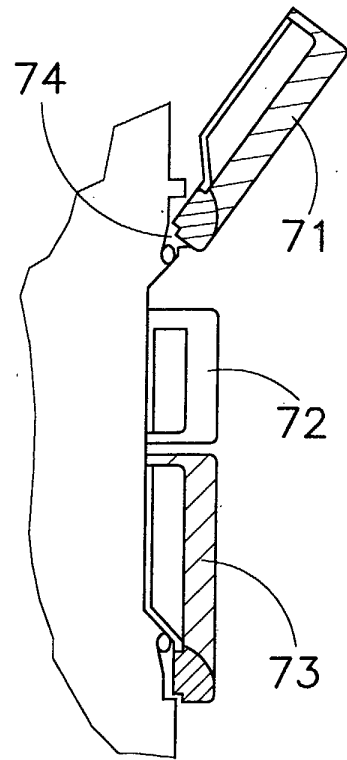


FIG. 15

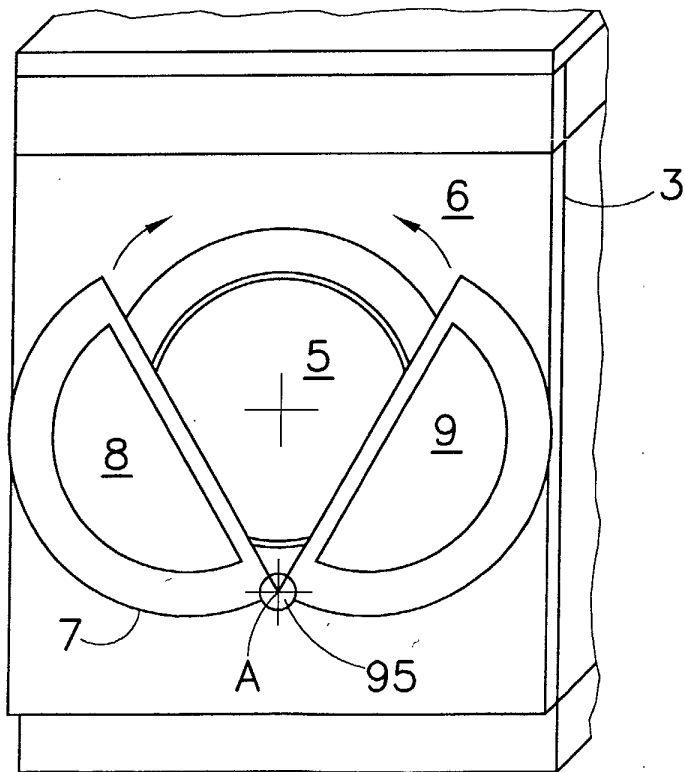


FIG. 16