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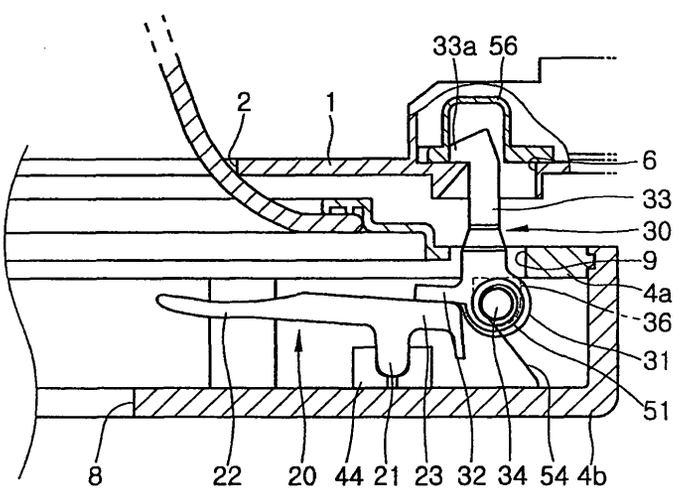
(54) Door locking mechanism

(57) A door locking mechanism is disclosed. It comprises a handle member (20) for attachment to a door and pivotable relative thereto by a user and a latch member (30) including a locking pin (33) and biasing means (50) for attachment to a door spaced from the handle member (20). The latch member (30) is also pivotable relative to the door against a bias provided by the biasing means (50) in response to rotation of the handle member (20) to release the locking pin (35) and unlock the door. The handle member (20) and latch member (30) include cooperating means (23,32) so that the latch member (30) rotates against the bias in response to rotation of the handle member (20) to unlock the door.

FIG. 5



EP 1 486 604 A2

Description

[0001] The present invention relates to a door locking mechanism comprising a handle member for attachment to a door and pivotable relative thereto by a user. The door locking mechanism is primarily intended for use with a washing machine.

[0002] Conventional washing machines are usually of one of two types namely, top-loading washing machines in which a tub is installed in a housing with its longitudinal axis substantially vertical and a front-loading washing machine in which a drum is installed in a housing for rotation within a tub about a horizontal axis. In the top-loading type of washing machine, the tub contains a pulsator which rotates about the vertical axis of the cabinet in opposite directions to generate water currents which wash laundry. The upper end of the housing is open and a door is mounted thereto thus allowing a user to place laundry into, and remove laundry from, the tub.

[0003] A washing machine of the front-loading type is designed such that the drum is mounted with its axis substantially horizontal and is rotated about said horizontal axis in opposite directions. Laundry contained in the drum is agitated as the drum rotates thus washing the laundry.

[0004] In a front-loading washing machine, the drum is rotatably mounted in a tub which receives water during a wash cycle and the drum is rotated by a drive motor. The housing has an opening in its side face and a door is rotatably mounted thereto to enable a user to place laundry into, and remove laundry from, the drum.

[0005] The door is hinged to an edge of the opening and a door locking unit is located opposite the hinge to enable the door to be locked and unlocked.

[0006] A problem with conventional washing machines is that the door locking unit has an excessively complicated construction and takes a long time to assemble. Furthermore, due to its complicated construction, the door locking unit is not particularly reliable and does not always operate smoothly. When the door locking unit malfunctions, it is also difficult to examine and repair it.

[0007] A door locking mechanism according to the present invention is characterised by that a latch member including a locking pin and biasing means for attachment to a door spaced from the handle member and pivotable relative to the door against a bias provided by the biasing means in response to rotation of the handle member to release the locking pin and unlock the door, the handle member and latch member including cooperating means so that the latch member rotates against said bias in response to rotation of the handle member to unlock the door.

[0008] In a preferred embodiment, cooperating means comprise a lever part on the handle member and an arm on the latch member, the arrangement being such that the lever part engages the arm when the handle is pivoted by a user to rotate said latch member against said bias.

[0009] Preferably, the handle member rotates about an axis spaced from and parallel to an axis about which the latch member rotates.

[0010] The present invention also provides a washing machine having a door and the door locking mechanism according to the invention mounted thereto.

[0011] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a front-loading drum type washing machine having a door locking unit, according to a first embodiment of the present invention;

Figure 2 is an exploded perspective view of the door locking unit of Figure 1, with the door locking unit installed in a door;

Figure 3 is an enlarged perspective view to show a handle of the door locking unit of Figure 2, which is coupled to a first hinge unit provided on an inner surface of the door;

Figure 4 is an enlarged perspective view to show a latch of the door locking unit of Figure 2, which is coupled to a second hinge unit provided on the inner surface of the door;

Figures 5 and 6 are sectional views of Figure 2 in which Figure 5 shows the door locked to a cabinet by the door locking unit of Figure 2, and Figure 6 shows the door unlocked from the cabinet by the door locking unit of Figure 2; and

Figure 7 is a perspective view of a latch of a door locking unit, according to a second embodiment of the present invention, in which an elastic unit that is provided on the latch to elastically bias the latch is positioned in a manner different from the first embodiment.

[0012] Figure 1 is a perspective view of a front loading drum type washing machine having a door locking unit 10 according to a first embodiment of the present invention. As shown in Figure 1, the drum type washing machine includes a box-shaped housing 1 having a front opening 2 to allow a user to place laundry into, and remove it from, the housing 1. A water tub (not shown) containing a rotatably mounted drum 3 are disposed in the housing cabinet 1. A door 4 is mounted on the housing 1 to enable the opening to be opened and closed.

[0013] The door 4 is rotatably mounted to the housing 1 by a hinge unit 5 on the edge of the door 4.

[0014] A door locking unit 10 is mounted to the door 4 diametrically opposite the hinge unit 5. The door locking unit 10 locks the door to the housing 1 when closed. To lock and unlock the door locking unit 10, a hook hole 6 is provided in the housing 1 and has an inclined inner wall surface.

[0015] The construction and operation of the door locking unit 10 according to the first embodiment of the

present invention will now be described in the following with reference to Figures 2 to 6.

[0016] As shown in Figure 2, the door 4 includes a transparent part 4a and a frame 4b.

The transparent part 4a has a central portion made of a transparent material to allow the user to see through it into the drum 3 (see Figure 1). The frame 4b has a central opening and is screwed to an edge of the transparent part 4a by screws 7.

[0017] The door locking unit 10 is disposed between the transparent part 4a and the frame 4b and includes a handle 20 and a latch 30. The user can manipulate the handle 20 through the opening 8 in the frame 4b and the latch 30 rotates when the handle 20 is manipulated to lock and unlock the door 4.

[0018] First and second hinge units 40,45 are provided on the inner surface of the frame 4b and are spaced from each other so that the handle 20 is rotatably mounted to the first hinge unit 40, and the latch 30 is rotatably mounted to the second hinge unit 45. Further, a through hole 9 is provided on a portion of the transparent part 4a so the latch 30 of the door locking unit 10 will engage with the hook hole 6 in the housing 1.

[0019] As shown in Figure 3, the handle 20 is positioned on and faces the inner surface of the frame 4b and includes a first hinge shaft 21 extending laterally therefrom. Integrally formed first and second lever parts 22,23 extend from the first hinge shaft 21 in opposite directions. The first lever part 22 is in the form of a paddle and so has a wider width and a longer length than the second lever part 23 to enable the user to easily manipulate it.

[0020] The first hinge unit 40 includes first and second seats 41,42 spaced from each other and rotatably supporting the first hinge shaft 21. Each of the first and second seats 41,42 include a stopper 43 and a plurality of supporting projections 44. The stopper 43 covers an end of the first hinge shaft 21 so that the first hinge shaft 21 is held in the first and second seats 41,42. The plurality of support projections 44 are located between the stopper 43 of each of the first and second seats 41,42 and have an opening 44a to receive the first hinge shaft 21.

[0021] Thus, when opposite ends of the first hinge shaft 21 are respectively seated in the first and second seats 41,42 of the first hinge unit 40, the first hinge shaft 21 is rotatably supported in the openings 44a of the plurality of support projections 44 while being held in the first and second seats 41,42 by the stoppers 43.

[0022] As shown in Figure 4, the latch 30 includes a hub 31 and third and fourth lever parts 32,33 integrate with each other. The hub 31 is supported by the second hinge unit 45, and forms a centre of a rotation of the latch 30. The third lever part 32 extends from the hub 31 towards the handle 20 and the fourth lever part 33 extends from the hub 31 through the transparent part 4a and the frame 4b toward the housing.

[0023] A hinge hole 35 is axially formed through the hub 31, and a second hinge shaft 34 passes through the hinge hole 35 to enable the hub 31 to rotate about the second hinge shaft 34.

[0024] First and second brackets 36 each having a hole 37 upstand from the surface of the transparent part 4a on opposite sides of the through hole 9, and rotatably support the latch 30 on the transparent part 4a via the second hinge shaft 34 between first and second support members 46,47 of the second hinge unit 45.

[0025] The third lever part 32 of the latch 30 is in contact with an inner surface of the second lever part 23 of the handle 20 (see Figures 5 and 6). Thus, when the first lever part 22 of the handle 20 is pulled, the third lever part 32 of the latch 30 is pushed by the second lever part 23.

[0026] The fourth lever part 33 is perpendicular to the third lever 32 and a hook 33a is provided at an end of the fourth lever part 33 perpendicular to the fourth lever part 33. Thus, when the fourth lever part 33 is received in the hook hole 6 in the housing 1, the hook 33a locks in the hook hole 6 thereby preventing the door from being opened. Conversely, when the hook 33a is removed from the hook hole 6, the door 4 is unlocked from the housing 1 to enable opening of the door.

[0027] An elastic unit 50 is provided on the latch 30 so that when the latch 30 rotates, the elastic unit 50 is compressed and, when force applied to the handle 30 is removed, the latch 30 and the handle 20 are restored to their original positions by the elastic unit 50.

[0028] The elastic unit 50 includes first and second coil parts 51,52 through which the second hinge shaft 34 passes. The first and second coil parts 51,52 are compressed by rotation of the latch 30, and provide an elastic force to the latch 30 sufficient to elastically restore the latch 30 to its original position. A connecting part 53 connects the first coil part 51 to the second coil part 52. First and second free ends 54,55 respectively extend from the first and second coil parts 51,52.

[0029] After the first and second coil parts 51,52 of the elastic unit 50 are respectively positioned at opposite sides of the hub 31 of the latch 30, and the connecting part 53 of the elastic unit 50 is placed in contact with the third lever part 32 of the latch 30, the hub 31 of the latch 30 is arranged between the first and second brackets 36 of the transparent part 4a. Thereafter, the second hinge shaft 34 is passed through the holes 37 of the first and second brackets 36 and the hinge hole 35 of the hub 31 of the latch 30. In this way, the latch 30 and the elastic unit 50 are assembled with the transparent part 4a. In this case, the fourth lever part 33 of the latch 30 extends from the through hole 9 of the transparent part 4a toward the cabinet 1 while being perpendicular to the transparent part 4a. The third lever part 32 of the latch 30 extends toward a centre of the transparent part 4a while being parallel to the transparent part 4a.

[0030] The second hinge unit 45 includes the first and second support members 46,47 which project from the frame 4b while being perpendicular to the inner surface of the frame 4b and which are spaced from each other

to support opposite ends of the second hinge shaft 34 so that the second hinge shaft 34 is held in the first and second support members 46,47.

[0031] Thus, when the second hinge shaft 34 is placed between the first and second support members 46,47 of the second hinge unit 45 after the latch 30 having the elastic unit 50 is mounted to the transparent part 4a by the second hinge shaft 34, the hub 31 of the latch 30 is supported by the frame 4b while being rotatably seated between the first and second support members 46 and 47 of the second hinge unit 45.

[0032] Further, when the latch 30 is placed in the second hinge unit 45 of the frame 4b, the third lever part 32 of the latch 30 contacts the second lever part 23 of the handle 20. Thus, the third lever part 32 of the latch 30 is rotated by the operation of the handle 20.

[0033] The operation of the door locking unit 10, according to the first embodiment of the present invention, will be described in the following with reference to Figures 5 and 6.

[0034] As shown in Figure 5, when the door 4 is locked, the first hinge shaft 21 of the handle 20 is seated in the first and second seats 41,42 of the first hinge unit 40 (see Figure 3) and the first and second lever parts 22,23 of the handle 20 are placed parallel to the transparent part 4a and the frame 4b between the transparent part 4a and the frame 4b. Further, the hub 31 of the latch 30 and the elastic unit 50 are supported between the first and second support members 46,47 of the second hinge unit 45 (see Figure 4), while the third lever part 32 of the latch 30 is placed on the second lever part 23 of the handle 20 parallel to the transparent part 4a and the frame 4b. The fourth lever part 33 of the latch 30 passes through the through hole 9 of the transparent part 4a and the hook hole 6 of the housing 1 so that the hook 33a provided at the end of the fourth lever part 33 is locked by the housing 1, thus locking the door 4.

[0035] The first coil part 51 of the elastic unit 50 is wound around the second hinge shaft 34 between the first bracket 36 and the hub 31 of the latch 30 while not being compressed. Further, the second coil part 52 of the elastic unit 50 is wound around the second hinge shaft 34 between the second bracket 36 and the hub 31 of the latch 30 while not being compressed. The connecting part 53 of the elastic unit 50 is provided between the third lever part 32 of the latch 30 and the second lever part 23 of the handle 20. The first and second free ends 54,55 of the elastic unit 50 are in contact with the inner surface of the frame 4b (see Figure 4).

[0036] An actuating part 56 of a locking sensor is provided inside the hook hole 6 of the housing 1. The actuating part 56 is pushed by the hook 33a, and elastically restores an original position of the hook 33a when the hook 33a does not impose a pushing force on the actuating part 56, thus detecting whether the door 4 is locked to the cabinet 1 or not. When the door 4 is locked to the housing 1 by the door locking unit 10, the washing machine can be operated to wash laundry.

[0037] In a state where the door 4 is locked and when the user desires to place laundry into or remove it from the housing 1, the user puts a hand in the opening 8 of the frame 4b to pull the first lever part 22 of the handle 20, as shown in Figure 6. At this time, the first hinge shaft 21 is rotated so that the first and second lever parts 22 and 23 are rotated counter-clockwise. Simultaneously, the second lever part 23 pushes the third lever part 32 of the latch 30 toward the housing 1.

[0038] In this case, the hub 31 of the latch 30 is rotated around the second hinge shaft 34, so that the third and fourth lever parts 32,33 are rotated clockwise, as shown in Figure 6. Thus, the hook 33a of the fourth lever part 33 is moved to a position which is easily removed from the hook hole 6 of the housing 1. Further, the connecting part 53 of the elastic unit 50 is rotated along with the third lever part 32, thus compressing the first and second coil parts 51,52.

[0039] In a state where the first lever part 22 of the handle 20 is pulled as described above, the frame 4b is pulled forward. At this time, the fourth lever part 33 of the latch 30 is removed from the hook hole 6 thus allowing the door 4 to be opened. Further, the actuating part 56 of the locking sensor elastically restores the original position of the locking sensor, thus detecting the opening of the door 4.

[0040] Meanwhile, when the user releases the handle 20, the latch 30 is rotated counter-clockwise by the elastic force of the elastic unit 50, and simultaneously the handle 20 is rotated clockwise, thus allowing the door locking unit 10 to be restored to its original position.

[0041] When the user pushes the opened door 4 toward the housing 1, the hook 33a enters the hook hole 6 of the housing 1. At this time, the fourth lever part 33 of the latch 30 is moved along the inclined surface of the hook hole 6 and rotates clockwise.

[0042] After the hook 33a enters the hook hole 6, the fourth lever part 33 is elastically rotated counter-clockwise. Thus, the door 4 is locked to the housing 1, as shown in Figure 5, thus allowing the washing machine to be operated.

[0043] Figure 7 shows a door locking unit according to a second embodiment of the present invention. The general construction of the door locking unit of the second embodiment remains the same as the door locking unit 10 of the first embodiment, except that an elastic unit 50a is placed in a manner different from the elastic unit 50 of the door locking unit 10 of the first embodiment.

[0044] According to the second embodiment, the elastic unit 50a includes first and second coil parts 51 and 52 which are placed on opposite sides of the hub 31 of the latch 30. A connecting part 53 is provided on an inner surface of the third lever part 32 of the latch 30, and connects the first coil part 51 to the second coil part 52. First and second free ends 54,55 extend upwardly from the first and second coil parts 51 and 52 respectively. Thus, when the third lever part 32 of the latch 30

is rotated clockwise, the connecting part 53 is also rotated, thus compressing the first and second coil parts 51 and 52. Meanwhile, when a force applied to the handle 20 is removed, the latch 30 is rotated counter-clockwise by a restoring force of the first and second coil parts 51,52.

[0045] Since the construction and operation of the door locking unit of the second embodiment is similar to the door locking unit of the first embodiment which is shown in Figures 2 to 6, the door locking unit of the second embodiment will not be described herein in detail.

[0046] According to the above discussed embodiments of the present invention, the door locking unit is applied to the drum type washing machine. However, without being limited to these embodiments, the door locking unit may be applied to devices other than the drum type washing machine, to lock and unlock a door. For example, the door locking unit of the present invention may be used with washing machines of the top-loading type.

[0047] As is apparent from the above description, the present invention provides a washing machine having a door locking unit which includes a handle rotated around a first hinge unit, a latch rotated around a second hinge unit by the operation of the handle, and an elastic unit to provide an elastic force to the latch. The door locking unit is easily mounted to a door, thus enhancing productivity and allows the door to be smoothly and reliably locked to and unlocked from a housing.

[0048] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. A door locking mechanism comprising a handle member (20) for attachment to a door and pivotable relative thereto by a user **characterised by** a latch member (30) including a locking pin (33) and a biasing means (50) for attachment to a door spaced from the handle member (20) and pivotable relative to the door against a bias provided by the biasing means (50) in response to rotation of the handle member (20) to release the locking pin (33) and unlock the door, the handle member (20) and latch member (30) including cooperating means (23,32) so that the latch member (30) rotates against said bias in response to rotation of the handle member (20) to unlock the door.

2. A door locking mechanism according to claim 1 wherein the cooperating means (23,32) comprises a lever part (23) on the handle member (20) and an arm (30) on the latch member (30), the arrangement being such that the lever part (23) engages the arm (32) when the handle is pivoted by a user to rotate said latch member (30) against said bias.

3. A door locking mechanism according to claim 1 or claim 2 wherein the handle member (20) rotates about an axis spaced from and parallel to an axis about which the latch member (30) rotates.

4. A washing machine having a door (4) and the door lock mechanism according to any of claims 1 to 3 mounted thereto.

5. A washing machine comprising a housing having an opening at a first portion of the housing, a door which opens and closes the opening of the housing and a door locking unit which locks and unlocks the door to and from the housing, the door locking unit including a handle hinged to a first hinge unit which is provided on a first position of the door, a latch hinged to a second hinge unit which is provided on a second position of the door, the latch being rotated by an operation of the handle to lock and unlock the door to and from the housing and an elastic unit on the second hinge unit which elastically biases the latch in a direction wherein the latch is locked to the cabinet.

6. The washing machine according to claim 5 wherein the handle includes first and second lever parts which are integrated with each other and rotatable around the first hinge unit, wherein the latch includes third and fourth lever parts which are integrated with each other and rotatable around the second hinge unit, the third lever part being in contact with the second lever part and the fourth lever part being positioned toward an interior of the housing and wherein when the first lever part of the handle is pulled, the elastic unit is compressed and the second lever part of the handle pushes the third lever part of the latch, allowing the fourth lever part of the latch to be unlocked from the housing.

7. The washing machine according to claim 6 wherein the fourth lever part has a hook at a first end thereof and the housing has a hook hole at a first position thereof to receive the hook of the fourth lever part, allowing the hook to be removably locked to the cabinet.

8. The washing machine according to claim 6 wherein the first lever part of the handle has a longer length than the second lever part of the handle, providing mechanical advantage when the first lever part is pulled.

9. The washing machine according to claim 7 wherein the door comprises a transparent part which allows

a user to see an interior of the housing and a frame mounted to an edge of the transparent part, the frame being open at a central portion thereof to allow the user to reach the first lever part of the handle, the first and second hinge units disposed on an inner surface of the frame spaced apart from each other by a first interval, supporting the handle and the latch in a hinging configuration.

10. The washing machine according to claim 9 further comprising a through hole at a first portion of the transparent part to correspond to the hook hole of the housing, allowing the fourth lever part of the latch to pass through the through hole to face the hook hole.

11. The washing machine according to claim 10 wherein the handle further comprises a first hinge shaft which is integrated with the first and second lever parts, the first hinge shaft latitudinally extending at a position between the first and second lever parts and wherein the first hinge unit comprises first and second seats which are spaced apart from each other by a second interval, allowing opposite sides of the first hinge shaft to be seated in the first and second seats respectively.

12. The washing machine according to claim 11 wherein each of the first and second seats comprises a stopper which stops an end of the first hinge shaft so that the first hinge shaft is held in both the first and second seats, and a plurality of support projections at respective positions of the frame inside the stopper, each of the plurality of support projections having an opening at a centre thereof to rotatably support the first hinge shaft.

13. The washing machine according to claim 11 wherein the second hinge unit includes first and second support members which project from the frame spaced apart from each other by a third interval is wider than a width of the latch, rotatably supporting a hub of the latch between the third and fourth lever parts.

14. The washing machine according to claim 13 further comprising a second hinge shaft around which the latch is rotatable and a hinge hole at a position of the hub of the latch to allow the second hinge shaft to pass through the hub of the latch, with opposite ends of the second hinge shaft being respectively supported by the first and second support members, allowing the latch to be rotatably supported on the frame.

15. The washing machine according to claim 14 further comprising first and second brackets provided on opposite sides of the through hole of the transparent part, each of the first and second brackets having a hole to allow the second hinge shaft to pass through the first and second brackets, allowing the latch to be mounted to the transparent part by passing the second hinge shaft through the holes of the first and second brackets and the hinge hole of the hub of the latch while the hub of the latch is placed between the first and second brackets.

16. The washing machine according to claim 15 wherein the elastic unit comprises first and second coil parts, the first coil part between the hub of the latch and the first bracket, and the second coil part between the hub of the latch and the second bracket and a connecting part which connects the first coil part to the second coil part, the connecting part disposed on the third lever part of the latch to be rotated by a rotation of the third lever part, the first and second coil parts being compressed or restored to original states thereof by a rotation of the connecting part, providing an elastic force to the latch.

17. The washing machine according to claim 9 wherein the door locking unit is disposed between the transparent part and the frame and includes the handle and the latch and wherein the latch is rotatable by operating the handle to lock and unlock the door to the housing.

18. The washing machine according to claim 9 wherein the first lever part is wider and longer than the second lever part.

19. The washing machine according to claim 12 wherein the first hinge shaft is rotatably supported in the openings of the support projections while being held in the first and second seats by the stopper.

20. The washing machine according to claim 14 wherein the hub is supported by the second hinge shaft and forms a centre of rotation of the latch.

21. The washing machine according to claim 14 wherein the third lever part extends from the hub horizontally to the transparent part and the frame and wherein the fourth lever part extends from the hub to the interior of the cabinet perpendicularly to the transparent part and the frame.

22. The washing machine according to claim 6 wherein the third lever part of the latch is in contact with an inner surface of the second lever part of the handle and wherein the third lever part of the latch is pushed by the second lever part of the handle when the first lever part of the handle is pulled.

23. The washing machine according to claim 19 wherein the fourth lever part is perpendicular to the third

lever part, the fourth lever part has a hook at one end, the hook being perpendicular to the fourth lever part, the fourth lever part extends outwardly from the through hole of the transparent part facing the housing and the door is locked to the housing when the fourth lever part is inserted into the hook hole of the cabinet making the hook locked by the hook hole.

24. The washing machine according to claim 16 wherein the first and second coil parts are disposed at opposite sides of the hub of the latch, the connecting part of the elastic unit is in contact with the third lever part of the latch, the hub of the latch is disposed between the first and second brackets of the transparent part and the second hinge shaft passes through the holes of the first and second brackets and the hinge hole of the latch.

25. The washing machine according to claim 24 wherein the fourth lever part extends from the through hole of the transparent part toward the housing perpendicularly to the transparent part and the third lever part of the latch extends toward a centre of the transparent part parallel to the transparent part.

26. The washing machine according to claim 13 wherein the first and second support members are spaced apart from each other and supporting opposite ends of the second hinge shaft and the second hinge shaft is held in the first and second support members.

27. The washing machine according to claim 26 wherein the second hinge shaft is disposed between the first and second support members of the second hinge unit, the latch is mounted to the transparent part by the second hinge shaft, and the hub of the latch is supported by the frame and is rotatably seated between the first and second support members and the second hinge unit.

28. The washing machine according to claim 26 wherein the latch is disposed in the second hinge unit of the frame, the third lever part of the latch contacts the second lever part of the handle, and the third lever part of the latch is rotated by an operation of the handle.

29. A door locking mechanism which locks and unlocks a door to and from a housing comprising first and second hinge units disposed at first and second positions of the door respectively, a handle hinged to the first hinge unit, a latch hinged to the second hinge unit, the latch being rotatable by an operation of the handle to lock and unlock the door to and from the housing and an elastic unit on the second hinge unit which elastically biases the latch in a direction where the latch is locked to the cabinet.

30. The door locking mechanism according to claim 29 wherein the handle comprises first and second lever parts which are integrated with each other and rotatable around the first hinge unit.

31. The door locking mechanism according to claim 30 wherein the latch comprises third and fourth lever parts which are integrated with each other and rotatable around the second hinge unit, the third lever part being in contact with the second lever part and the fourth lever part being positioned toward an interior of the housing.

FIG. 1

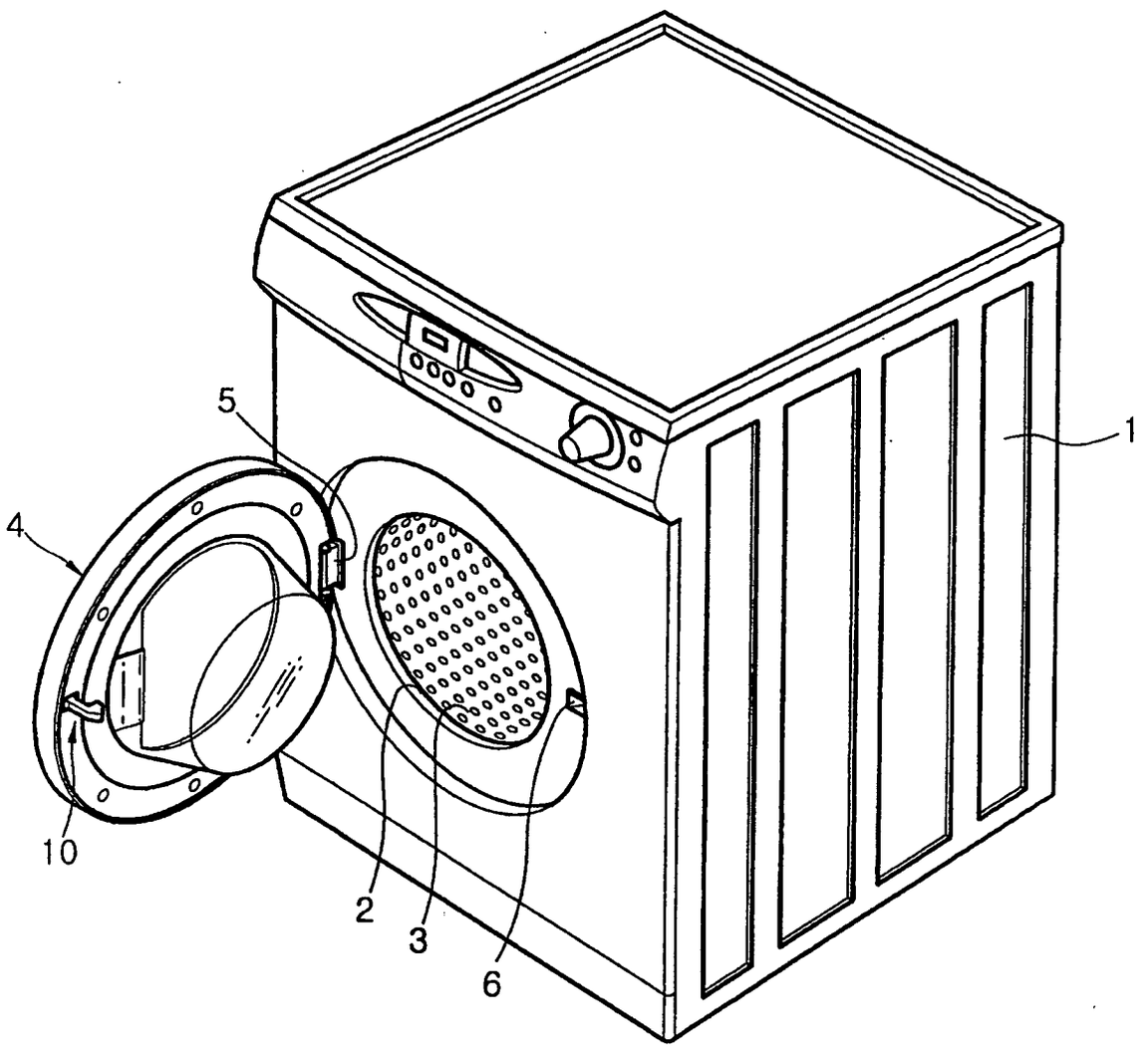


FIG. 2

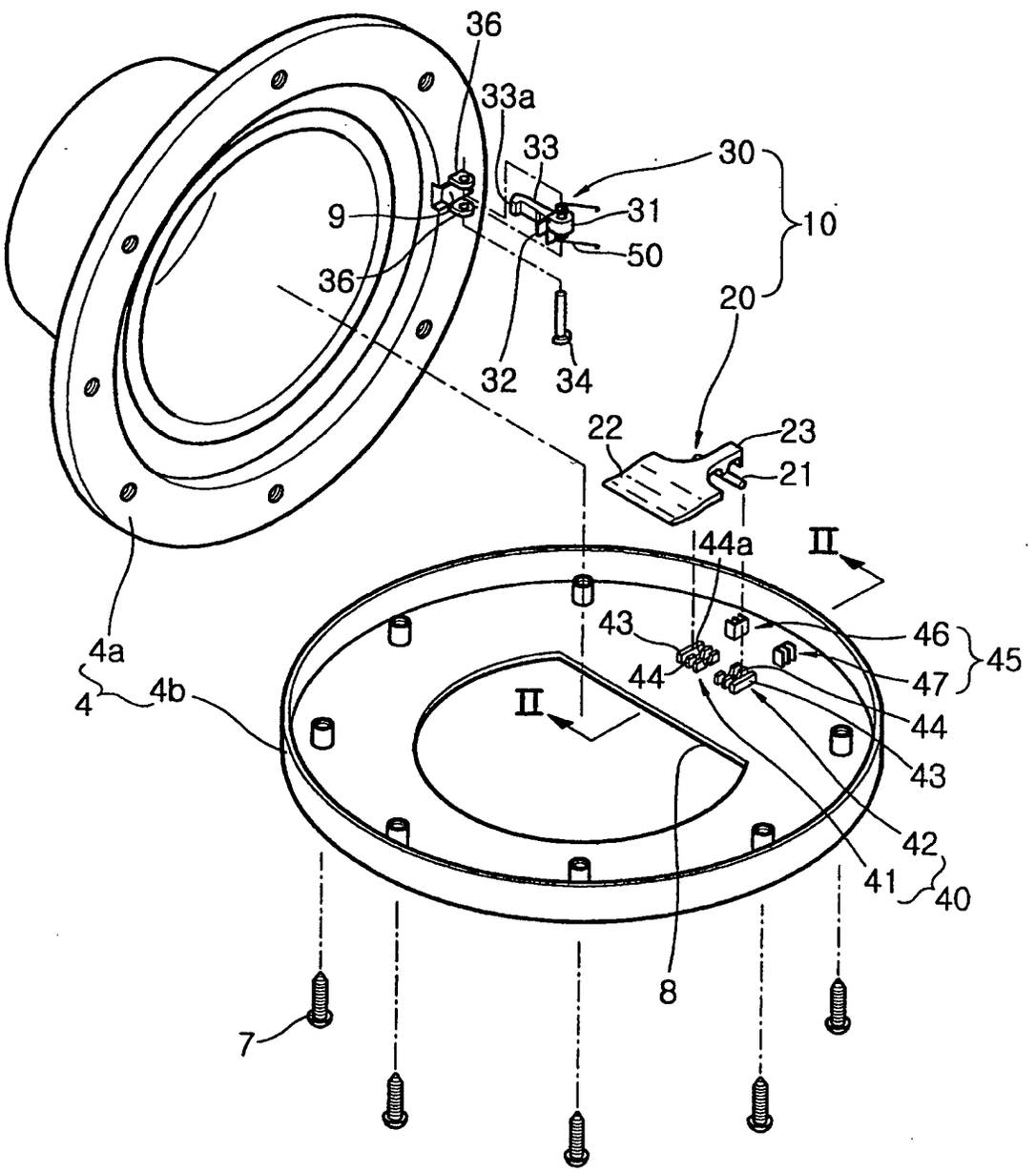

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FIG. 3

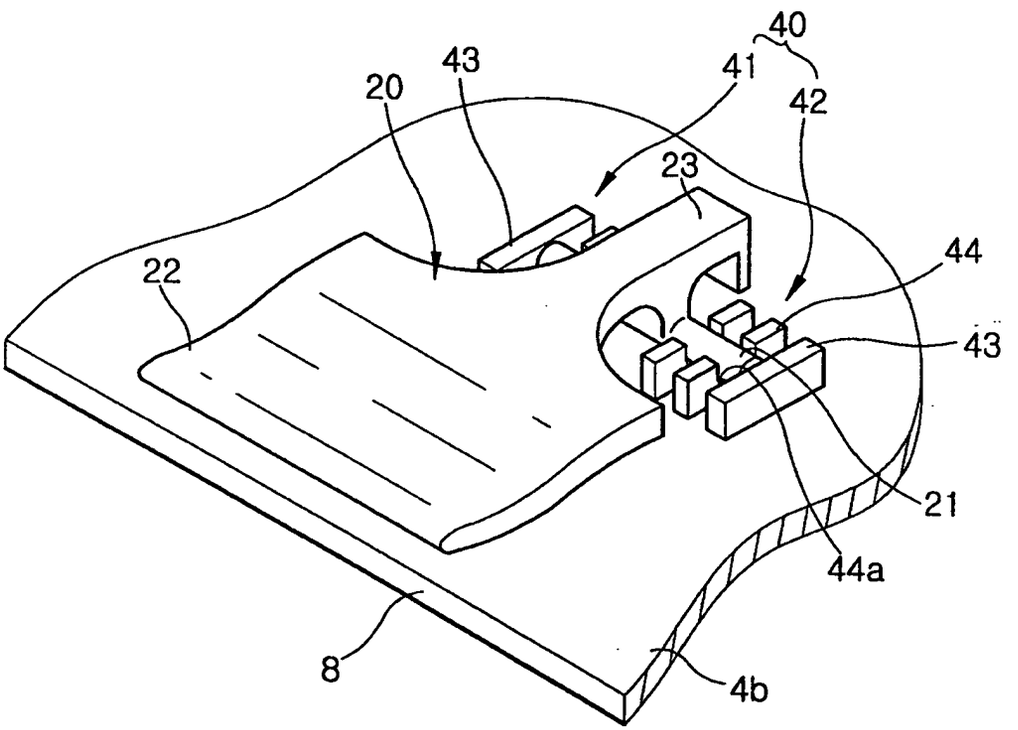

FIG. 4

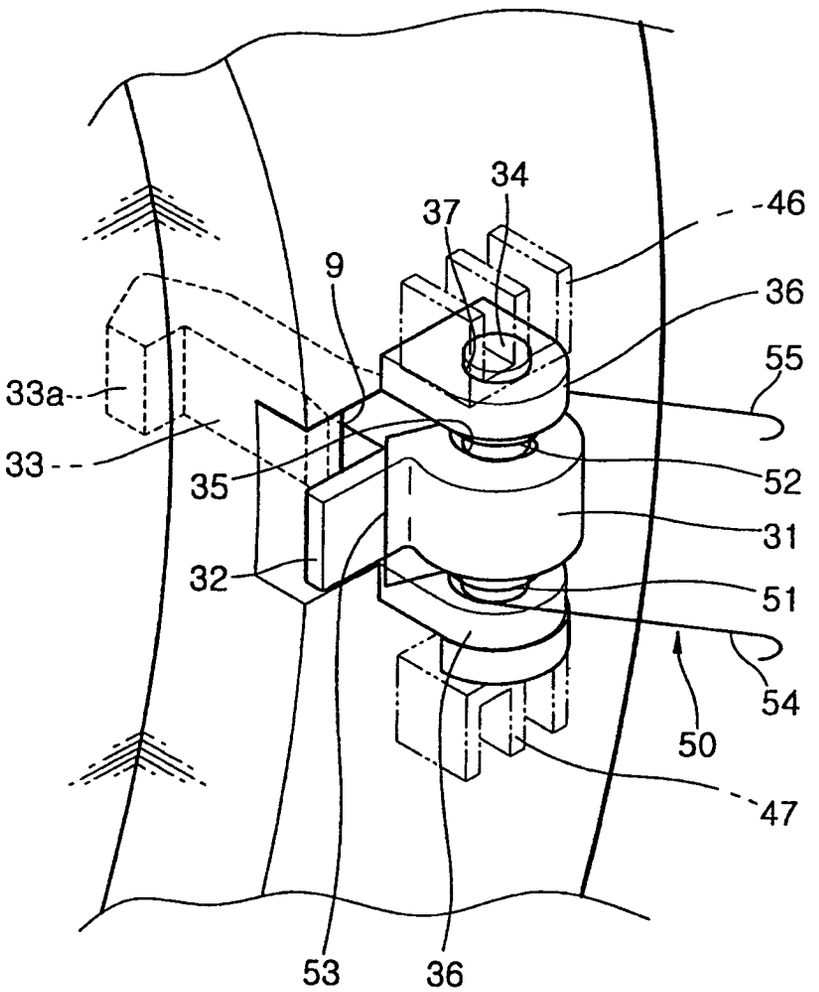

FIG. 5

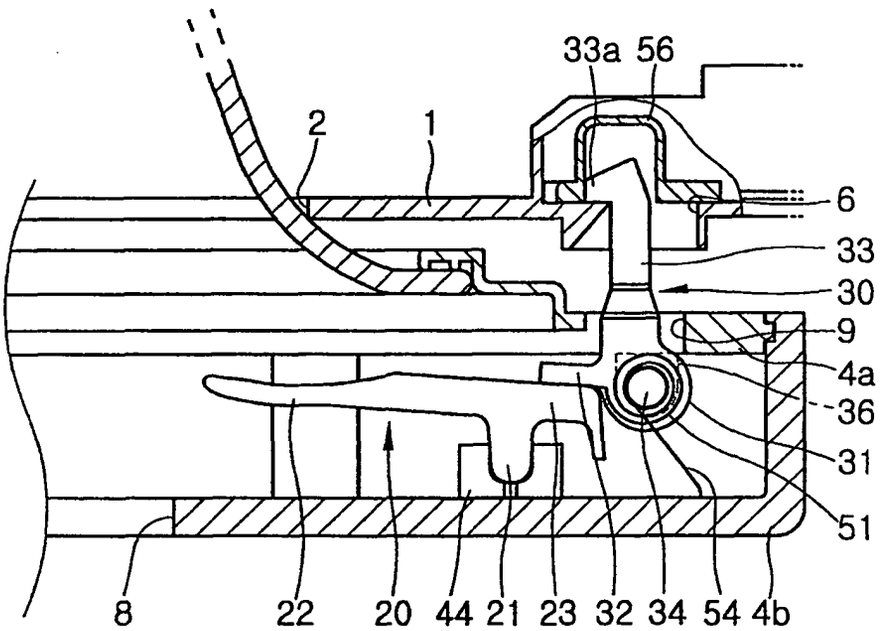

FIG. 6

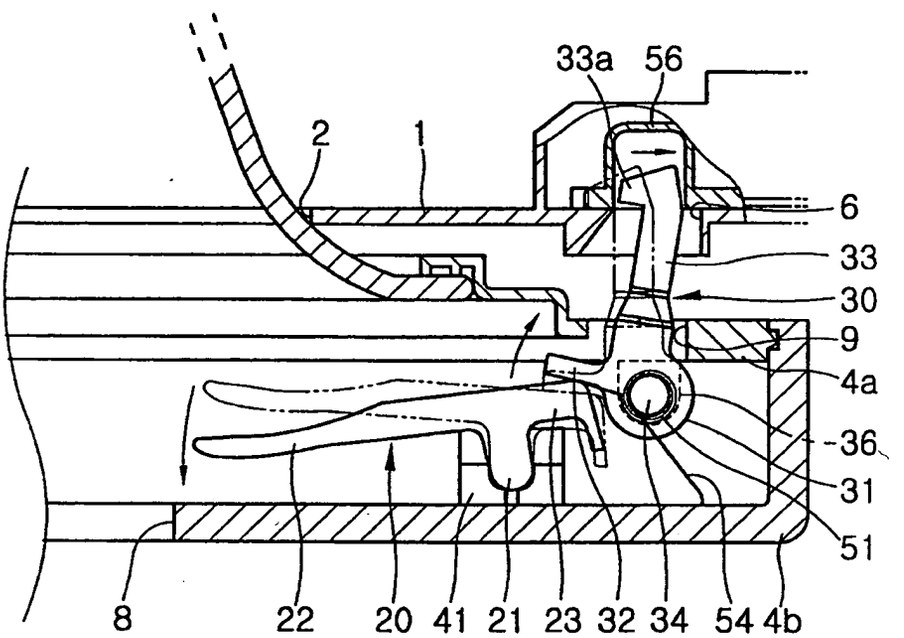

FIG. 7