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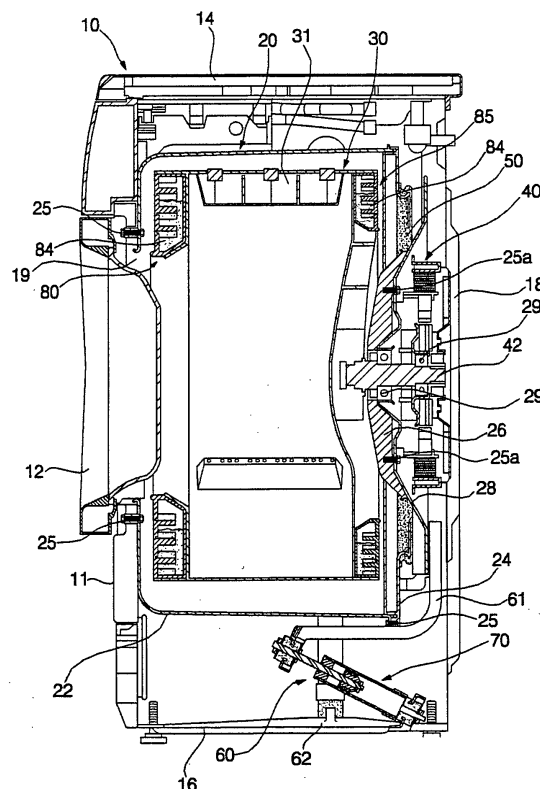
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(54) **Drum type washing machine and drum therefor**

(57) Disclosed herein is a drum type washing machine. The drum type washing machine comprises front and rear balancers (80,85) mounted at the front and rear sides of a drum (30), respectively. Consequently, an eccentric force generated by laundry (90,95) is complementarily eliminated by the front and rear balancers (80,85) even when the laundry (90,95) is eccentrically placed at one side of the drum (30).

FIG. 2



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a drum type washing machine, and, more particularly, to a drum type washing machine having balancers mounted at the front and rear surfaces of a drum for eliminating an eccentric force generated by laundry.

Description of the Related Art

[0002] FIG. 1 is a sectional view illustrating the interior structure of a conventional drum type washing machine.

[0003] As shown in FIG. 1, the conventional drum type washing machine comprises: a cabinet assembly 110 having a base 101 and a door 102; a tub 120 mounted in the cabinet assembly 110; a drum 130 rotatably disposed inside the tub 120; a motor 140 for rotating the drum 130; a spring 150 and a damper 160 for attenuating vibration transmitted to the cabinet assembly 110 from the tub 120; and a balancer 170 for attenuating vibration generated at the drum 130.

[0004] The drum 130 has a plurality of holes 104, through which wash water is introduced into the drum 130 from the tub 120. To the inner circumferential surface of the drum 130 are attached lifts 103. As the drum 130 is rotated, laundry m is lifted in the drum 130 by the lifts 103, which are rotated along with the drum 130.

[0005] The tub 120 is spaced a predetermined distance from the inside surface of the cabinet assembly 110. The upper end of the tub 120 is connected to the cabinet assembly 110 via the spring 150, and the lower end of the tub 120 is connected to the base 101 via the damper 160. The damper 160 is hingedly attached to the base 101. The spring 150 and the damper 160 serve to attenuate vibration transmitted to the cabinet assembly 110 from the tub 120.

[0006] The door 120 of the cabinet assembly 110 is pivotably connected to a front surface 105 of the cabinet assembly 110. At a front surface 125 of the tub 120 is formed an opening 126. At a front surface 135 of the drum 130 is formed another opening 136. The opening 126 of the tub 120 communicates with a hole 106, which is opened and closed by the door 102. Also, the opening 136 of the drum 130 communicates with the hole 106.

[0007] Between the front surface 105 of the cabinet assembly 110, to which the door 102 is connected, and the front surface 125 of the tub 120 is disposed a gasket 180 for preventing leakage of wash water. The gasket 180 serves to seal a space defined by the inside surface of the cabinet assembly 110 and the front surface 125 of the tub 120.

[0008] The motor 140 is mounted at the rear of the tub 120 for rotating the drum 130, which is disposed inside the tub 120.

[0009] The balancer 170, which has predetermined weight, is mounted at the drum 130 for maintaining balance of the drum 130 while the drum 130 is rotated. The balancer 170 provides a centrifugal force to the drum 130, which is rotated at high speed when a dewatering process is performed, to prevent the drum 130 from being vibrated.

[0010] The balancer 170 is a ball balancer mounted at the front end of the drum 130. The balancer 170 comprises: a housing 172 fixed to the drum 130; and balls 174 movably disposed in the housing 172.

[0011] The balancer 170 serves to compensate for eccentricity of the drum 130 generated due to the laundry m when the drum 130 is rotated while the laundry m is gathered at one side of the drum 130. To compensate for the eccentricity of the drum 130 due to the laundry m, the balls 174 move to the other side of the drum 130, which is opposite to the side of the drum where the laundry m is gathered.

[0012] When the laundry m is gathered at the door side where the balancer 170 is mounted, the difference in position between the direction of the centrifugal force generated by the balancer 170 and the direction of the eccentric force generated by the laundry m is small, and therefore, appropriate balancing is accomplished by the balancer 170. When the laundry m is gathered at the motor side as shown in FIG. 1, however, the difference in position between the direction of the centrifugal force generated by the balancer 170 and the direction of the eccentric force generated by the laundry m is large, and therefore, appropriate balancing is not accomplished by the balancer 170, which will be described hereinafter in more detail.

[0013] When the laundry m is gathered in the motor side of the drum 130, the laundry m and the balancer 170 are diagonally opposite to each other, as shown in FIG. 1. At this time, the eccentric force generated by the laundry m is applied in the direction indicated by an arrow f1 at the position adjacent to the motor side, and the centrifugal force generated by the balancer 170 is applied in the direction indicated by an arrow f2 at the position adjacent to the door side. As a result, appropriate balancing is not accomplished by the balancer 170.

[0014] Furthermore, when the laundry m and the balancer 170 are diagonally opposite to each other, vibration generated at the drum 130 is increased by the balancer 170 and the laundry m.

SUMMARY OF THE INVENTION

[0015] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a drum type washing machine that is capable of effectively eliminating an eccentric force generated by laundry when a drum is rotated.

[0016] It is another object of the present invention to provide a drum usable in such a drum type washing ma-

chine.

[0017] In accordance with one aspect of the present invention, the above and other objects can be accomplished by the provision of a drum for drum type washing machines, comprising: a hollow drum body; a drum front mounted in the front of the drum body, the drum front having an opening; a drum back mounted at the rear of the drum body; a hub fixed to the rear surface of the drum back; and front and rear balancers mounted in the front and the rear of the drum body, respectively, for complementarily eliminating an eccentric force generated at the drum body when the drum body is rotated.

[0018] Preferably, the front balancer is attached to the drum front, and the rear balancer is attached to the drum back.

[0019] Alternatively, the rear balancer may be attached to the hub or mounted at the outer circumference of the hub.

[0020] Preferably, at least one of the front and rear balancers is a liquid balancer.

[0021] In accordance with another aspect of the present invention, there is provided a drum type washing machine comprising: a rotatable hollow drum; and front and rear balancers mounted in the front and the rear of the drum, respectively, for providing a centrifugal force to the drum to complementarily balance an eccentric force generated at the drum.

[0022] Preferably, the drum comprises: a drum body; a drum front mounted in the front of the drum body, the drum front having an opening; and a drum back mounted in the rear of the drum body, and the front balancer is attached to the drum front, and the rear balancer is attached to the drum back.

[0023] Preferably, at least one of the front and rear balancers is a liquid balancer.

[0024] In accordance with yet another aspect of the present invention, there is provided a drum type washing machine comprising: a cabinet assembly forming the outer appearance of the drum type washing machine; a tub mounted in the cabinet assembly in a supported fashion; and a drum rotatably disposed inside the tub, wherein the drum comprises: a hollow drum body; a drum front mounted in the front of the drum body, the drum front having an opening; and a drum back mounted in the rear of the drum body; and front and rear balancers mounted in the front and the rear of the drum body, respectively, for complementarily eliminating an eccentric force generated at the drum body when the drum body is rotated.

[0025] Preferably, the front balancer is attached to the drum front, and the rear balancer is attached to the drum back.

[0026] According to the present invention, the front and rear balancers are mounted at the front and rear sides of the drum, respectively, and therefore, the eccentric force generated by the laundry is complementarily eliminated by the front and rear balancers even when the laundry is eccentrically placed at one side of the

drum.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view illustrating the interior structure of a conventional drum type washing machine;

FIG. 2 is a sectional view illustrating the interior structure of a drum type washing machine according to a first preferred embodiment of the present invention;

FIG. 3 is an exploded perspective view illustrating a vibratory body according to a first preferred embodiment of the present invention;

FIG. 4 is an exploded perspective view illustrating a drum according to a first preferred embodiment of the present invention;

FIG. 5 is a perspective view, in section, illustrating the drum according to the first preferred embodiment of the present invention; and

FIG. 6 is an exploded perspective view illustrating a drum according to a second preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Now, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0029] It should be understood that drum type washing machines according to numerous preferred embodiments of the present invention may be proposed, although only the most preferred embodiment of the present invention will be hereinafter described. Also, the basic structure of the drum type washing machine according to the present invention is identical to that of the above-described conventional drum type washing machine, and therefore, a detailed description thereof will not be given.

[0030] FIG. 2 is a sectional view illustrating the interior structure of a drum type washing machine according to a first preferred embodiment of the present invention, FIG. 3 is an exploded perspective view illustrating a vibratory body according to a first preferred embodiment of the present invention, FIG. 4 is an exploded perspective view illustrating a drum according to a first preferred embodiment of the present invention, and FIG. 5 is a perspective view, in section, illustrating the drum according to the first preferred embodiment of the present invention.

[0031] As shown in FIG. 2, the drum type washing ma-

chine according to the first preferred embodiment of the present invention comprises: a cabinet assembly 10 forming the outer appearance of the drum type washing machine; a tub 20 mounted in the cabinet assembly 10 in a supported fashion; a drum 30 rotatably disposed inside the tub 20; a motor 40 mounted at the rear surface of the tub 20 for rotating the drum 30; a rear surface gasket 50 for sealing the interior of the tub 20 and intercepting vibration transmitted to the tub 20 from the drum 30; and a suspension 60 connected to the rear of the tub 20 for attenuating vibration or impact transmitted to the cabinet assembly 10 from the tub 20.

[0032] The cabinet assembly 10 comprises: a cabinet body 18 forming two side surfaces and a rear surface of the drum type washing machine; a cabinet cover 11 mounted in front of the cabinet body 11; a top cover 14 mounted on the cabinet body 18; and a base 16 mounted under the cabinet body 18.

[0033] At the cabinet cover 11 is formed a hole 19, which is opened and closed by a door, which is pivotably connected to the cabinet cover 11. The suspension 60 is disposed between the base 16 and the tub 20.

[0034] As shown in FIGS. 2 and 3, the tub 20 comprises: a tub body 22 disposed inside the cabinet cover 11, the tub body 22 being fixed to the inside surface of the cabinet cover 11 such that the tub body 22 communicates with the hole 19; a tub cover 24 attached to the rear surface of the tub body 22, the tub cover 24 having an opening 23 formed in the inner center part thereof; a tub bracket 26 for closing the opening 23 of the tub cover 24; and a bearing housing 28 mounted at the rear surface of the tub bracket 26 for supporting a motor shaft 42 of the motor 40.

[0035] An opening 21 of the tub body 22 is aligned with the hole 19 of the cabinet cover 11 such that the tub body 22 is aligned with the hole 19 of the cabinet cover 11, and then the tub body 22 is fixed to the cabinet cover 11 by means of screws 25.

[0036] The tub cover 24 is attached to the rear surface of the tub body 22 by means of screws 25a, which are inserted through fixing holes 22a and 24a formed at the outer circumferences of the tub body 22 and the tub cover 24, respectively.

[0037] The opening 23 of the tub cover 24 is sealed by the tub bracket 26 and the rear surface gasket 50. The bearing housing 28 is mounted to the rear surface of the tub bracket 26 by means of the screws 25a. The bearing housing 28 has bearings 29, by which the motor shaft 42 is smoothly rotated. That is, the motor shaft 42 is rotated while being supported by the bearing 29.

[0038] Unexplained reference numeral 22b indicates a fixing member for fixing the tub body 22. The fixing member 22b is fixedly attached to the inside surface of the cabinet body 18.

[0039] The rear surface gasket 50 serves to prevent wash water from flowing out of the tub 20. In addition, the rear surface gasket 50 serves to absorb vibration or impact transmitted to the tub body 22 from the tub bracket

26 when a washing or dewatering process is performed. To this end, the rear surface gasket 50 is made of a resilient material that can be expanded and contracted. Specifically, the rear surface gasket 50 is disposed along the outer circumference of the tub bracket 26 to seal the opening 23.

[0040] The motor 40 is mounted at the rear of the bearing housing 28. The motor shaft 42 of the motor 40 is securely fixed to the rear surface of the drum 30 through the bearing housing 28 and the tub bracket 26.

[0041] The drum 30 is rotated by the motor shaft 42. To the drum 30 are mounted front and rear liquid balancers 80 and 85 for eliminating vibration generated at the drum 30 when the dewatering process is performed.

[0042] The suspension 60 is disposed between the tub 20 and the base 16. To this end, damper brackets 61 and 62 are mounted at the bearing housing 28 and the base 16, respectively, and a damper 70 is disposed between the damper brackets 61 and 62.

[0043] The damper 70 may be vertically mounted to attenuate vertical vibration or impact as shown in FIG. 3, or inclined to attenuate horizontal component force or inclined vibration or impact as shown in FIG. 2.

[0044] As shown in FIGS. 4 and 5, the drum 30 comprises: a cylindrical drum body 32; a drum front 34 mounted in the front of the drum body 32; a drum back 36 mounted at the rear of the drum body 32; a hub 38 fixed to the rear surface of the drum back 36; and front and rear balancers 80 and 85 mounted at the front surface of the drum front 34 and the rear surface of the drum back 36, respectively.

[0045] The drum body 32 is formed in the shape of a cylinder, front and rear ends of which are opened. The cylindrical drum body 32 has a plurality of through-holes 32b, through which wash water is introduced into or discharged from the drum body 32. At the inner circumferential surface of the drum body 32 are attached lifts 31.

[0046] The drum front 34 is formed in the shape of ring. The drum front 34 is attached to the drum body 32 by means of bolts (not shown). The drum front 34 has an opening 34a formed in the inner center part thereof, through which laundry is put into the drum body 32. In addition, the drum front 34 has a location surface 34b, to which the front balancer 80 is securely fixed.

[0047] The drum back 36 is attached to the rear surface of the drum body 32 by means of bolts 35a. The hub 38 is attached to the rear surface of the drum back 36 by means of bolts 35a. The drum back 36 is provided with a plurality of through-holes 36b having the same function as the through-holes 32b of the drum body 32.

[0048] In the illustrated embodiment, the hub 38 is separately manufactured, and is then attached to the rear surface of the drum back 36. Alternatively, the hub 38 may be integrally formed with the drum back 36.

[0049] The outer diameter of the hub 38 is slightly less than that of the drum body 32 and the drum back 36, and the thickness of the hub 38 is equal to or slightly less than that of the rear balancer 85. The hub 38 is

attached to the rear surface of the drum back 36 by means of the bolts 35a. The motor shaft 42 is fixedly fitted in the center part of the hub 38.

[0050] At the edge of the hub 38 are formed fixing holes 38a, through which the bolts 35a are inserted such that the hub 39 is attached to the rear surface of the drum back 36.

[0051] The rear balancer 85 is mounted at the outer circumference of the hub 38, and is attached to the hub 38 by means of the bolts 35a. Preferably, the outer diameter of the rear balancer 85 is equal to that of the drum body 32.

[0052] Alternatively, the rear balancer 85 may be directly fixed to the drum back 36, not to the hub 38.

[0053] Each of the front and rear balancers 80 and 85 is a liquid balancer having fluid contained therein. Each of the front and rear balancers 80 and 85 comprises: a ring-shaped housing 52 having an opening 82a defined at the center thereof; and fluid 84 contained in the housing 82.

[0054] As shown in FIG. 5, the housing 82 is formed in a sealed fashion such that the fluid 84 cannot flow out of the housing 82. The housing 82 has a hollow part 82b, in which partitions 82s are disposed.

[0055] Specifically, the partitions 82 are disposed in the housing 82 such that the fluid can flow in the hollow part 82b. That is, the hollow part 82b is not partitioned by the partitions 82c. To this end, one end of each partition 82c is spaced a predetermined distance from the inner wall of the housing 82.

[0056] In the illustrated embodiment, the fluid is salt water, although various kinds of fluid may be used according to circumstances.

[0057] FIG. 6 is an exploded perspective view illustrating a drum according to a second preferred embodiment of the present invention.

[0058] As shown in FIG. 6, the drum according to the second preferred embodiment of the present invention is identical in structure to the drum according to the first preferred embodiment of the present invention except that the hub 39 has a diameter equal to that of the drum body 32, the hub 39 is mounted at the rear of the drum body 32, and the rear balancer 85 is attached to the outside surface of the hub 39.

[0059] Other components of the drum according to the second preferred embodiment of the present invention are identical in construction and operation to those of the drum according to the first preferred embodiment of the present invention, and therefore, a detailed description thereof will not be given.

[0060] Now, the operation of the balancers mounted to the drum according to the present invention will be described in detail with reference to FIGS. 4 and 5.

[0061] Laundry 90 and 95 is put into the drum 30, and the drum 30 is rotated by the motor 40.

[0062] In the following description, it is assumed that the laundry 90 is placed at the front side of the drum 30, and the laundry 95 is placed at the rear side of the drum

30.

[0063] As shown in FIG. 5, the drum 30 is rotated while being supported by the motor shaft 42. When the laundry 90 and 95 is placed at the lower part of the drum 30, an eccentric force due to the laundry 90 and 95 is generated at the drum 30.

[0064] When the drum 30 is rotated at high speed, the eccentric force is increased while inducing a centrifugal force. Consequently, the eccentric force increases vibration when the drum 30 is rotated.

[0065] At this time, the eccentric force is complementarily eliminated by the front and rear balancers 80 and 85 mounted in the front and the rear of the drum 30, respectively, according to the positions where the laundry 90 and 95 is placed, which will be described herein-after in more detail.

[0066] When the laundry 90 is placed at the front side of the drum 80, the eccentric force generated by the laundry 90 is applied not only to the front balancer 80 but also to the rear balancer 85. However, Most of the eccentric force generated by the laundry 90 is eliminated by the front balancer 80, which is disposed adjacent to the laundry 90, and only a portion of the eccentric force generated by the laundry 90 is eliminated by the rear balancer 95 disposed at the rear side of the drum 30.

[0067] The fluid 84 contained in the front balancer 80 moves toward the direction opposite to the laundry 90, i.e., toward the upper part of the drum 30 in the drawing, to eliminate the eccentric force generated by the laundry 90. Consequently, the drum is rotated while the fluid 84 is opposite to the laundry 90, and therefore, the eccentric force generated by the laundry 90 is effectively eliminated.

[0068] At this time, the fluid 84 contained in the rear balancer 85 moves toward the direction opposite to the laundry 90, i.e., toward the upper part of the drum 30 in the drawing, to eliminate the eccentric force generated by the laundry 90. However, the laundry 90 is spaced a relatively great distance from the rear side of the drum 30. For this reason, a relatively small amount of the eccentric force is applied to the rear side of the drum 30. Consequently, the fluid 84 contained in the rear balancer 85 is not concentrated toward the direction opposite to the laundry 90, and therefore, only a relatively small amount of the eccentric force generated by the laundry 90 is eliminated by the rear balancer 85.

[0069] When the laundry 95 is placed at the rear side of the drum 30, on the other hand, most of the eccentric force generated by the laundry 95 is eliminated by the rear balancer 85 disposed adjacent to the laundry 95, and therefore, only a relatively small amount of the eccentric force generated by the laundry 95 is eliminated by the front balancer 80.

[0070] As can be easily understood from the above description, the front and rear balancers 80 and 85 mounted in the front and at the rear of the drum 80 complementarily perform the balancing operation on the

laundry 90 such that a relatively large amount of the eccentric force generated by the laundry 90 is eliminated by the front balancer 80, which is disposed adjacent to the laundry 90, and a relatively small amount of the eccentric force generated by the laundry 90 is eliminated by the rear balancer 85, which is disposed away from the laundry 90.

[0071] Consequently, the front and rear balancers 80 and 85 mounted to the drum 30 complementarily eliminates the eccentric force generated by the laundry 90 and 95 wherever the laundry 90 and 95 is placed.

[0072] As apparent from the above description, the drum type washing machine according to the present invention has the following effects.

[0073] The front and rear balancers are mounted at the front and rear sides of the drum, respectively, and therefore, the eccentric force generated by the laundry is complementarily eliminated by the front and rear balancers even when the laundry is eccentrically placed at one side of the drum.

[0074] Since the front and rear balancers are mounted at the front and rear sides of the drum, respectively, the eccentric force generated by the laundry placed in the drum is efficiently eliminated.

[0075] Furthermore, the eccentric force generated by the laundry eccentrically placed in the drum is effectively eliminated by the front and rear balancers. Consequently, the present invention has the effect of reducing vibration generated when the drum is rotated.

[0076] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A drum for drum type washing machines, comprising:
 - a hollow drum body (32); and
 - front and rear balancers (80, 85) mounted in the front and the rear of the drum body (32), respectively.
2. The drum as set forth in claim 1, further comprising:
 - a drum front (34) mounted in the front of the drum body (32), the drum front (34) having an opening (34a); and
 - a drum back (36) mounted in the rear of the drum body (32), and wherein the front balancer (80) is attached to the drum front (34), and the rear balancer (85) is attached to the drum back (36).
3. The drum as set forth in claim 2, further comprising:
 - a hub (38) mounted at the rear surface of the drum back (36), wherein the rear balancer (85) is attached to the hub (38).
4. The drum as set forth in claim 2, further comprising:
 - a hub (38) mounted at the rear surface of the drum back (36), wherein the rear balancer (85) is mounted at the outer circumference of the hub (38).
5. The drum as set forth in claim 1, wherein at least one of the front and rear balancers (80, 85) is a liquid balancer.
6. A drum type washing machine comprising:
 - a rotatable hollow drum (30); and
 - front and rear balancers (80, 85) mounted in the front and the rear of the drum (30), respectively, for providing a centrifugal force to the drum to complementarily balance an eccentric force generated at the drum (30).
7. The washing machine as set forth in claim 6, wherein the drum (30) comprises:
 - a drum body (32);
 - a drum front (34) mounted in the front of the drum body (32), the drum front (34) having an opening (34a); and
 - a drum back (36) mounted in the rear of the drum body (32), and wherein the front balancer (80) is attached to the drum front (34), and the rear balancer (85) is attached to the drum back (36).
8. The washing machine as set forth in claim 6, wherein at least one of the front and rear balancers (80, 85) is a liquid balancer.
9. A drum type washing machine comprising:
 - a cabinet assembly (10) forming the outer appearance of the drum type washing machine;
 - a tub (20) mounted in the cabinet assembly (10) in a supported fashion; and
 - a drum (30) rotatably disposed inside the tub (20), wherein the drum (30) comprises:
 - a hollow drum body (32);
 - a drum front (34) mounted in the front of the drum body (32), the drum front (34) having an opening (34a); and
 - a drum back (36) mounted in the rear of the

drum body (32); and
front and rear balancers (80, 85) mounted
in the front and the rear of the drum body
(32), respectively, for complementarily
eliminating an eccentric force generated at 5
the drum body (32) when the drum body
(32) is rotated.

10. The washing machine as set forth in claim 9, where- 10
in the front balancer (80) is attached to the drum
front (34), and the rear balancer (85) is attached to
the drum back (36).

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FIG. 1 (Prior Art)

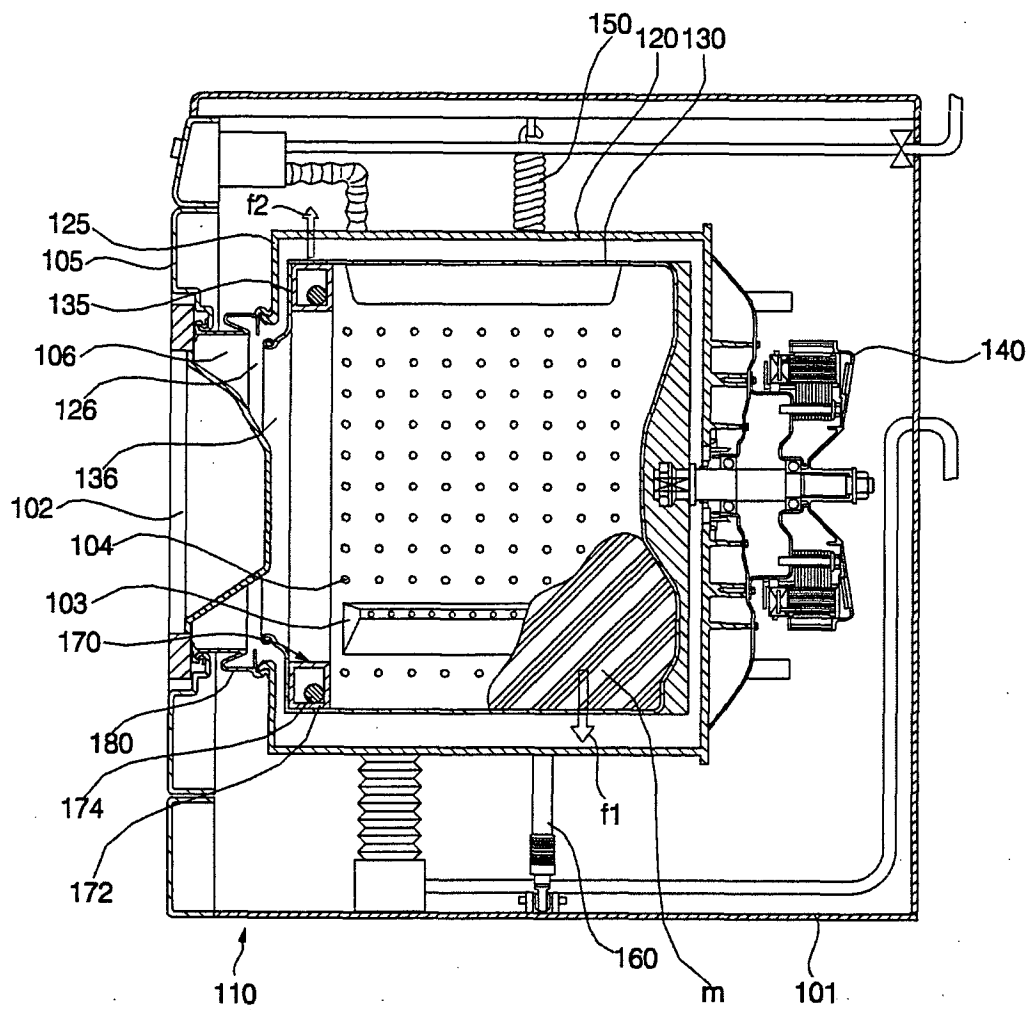


FIG. 2

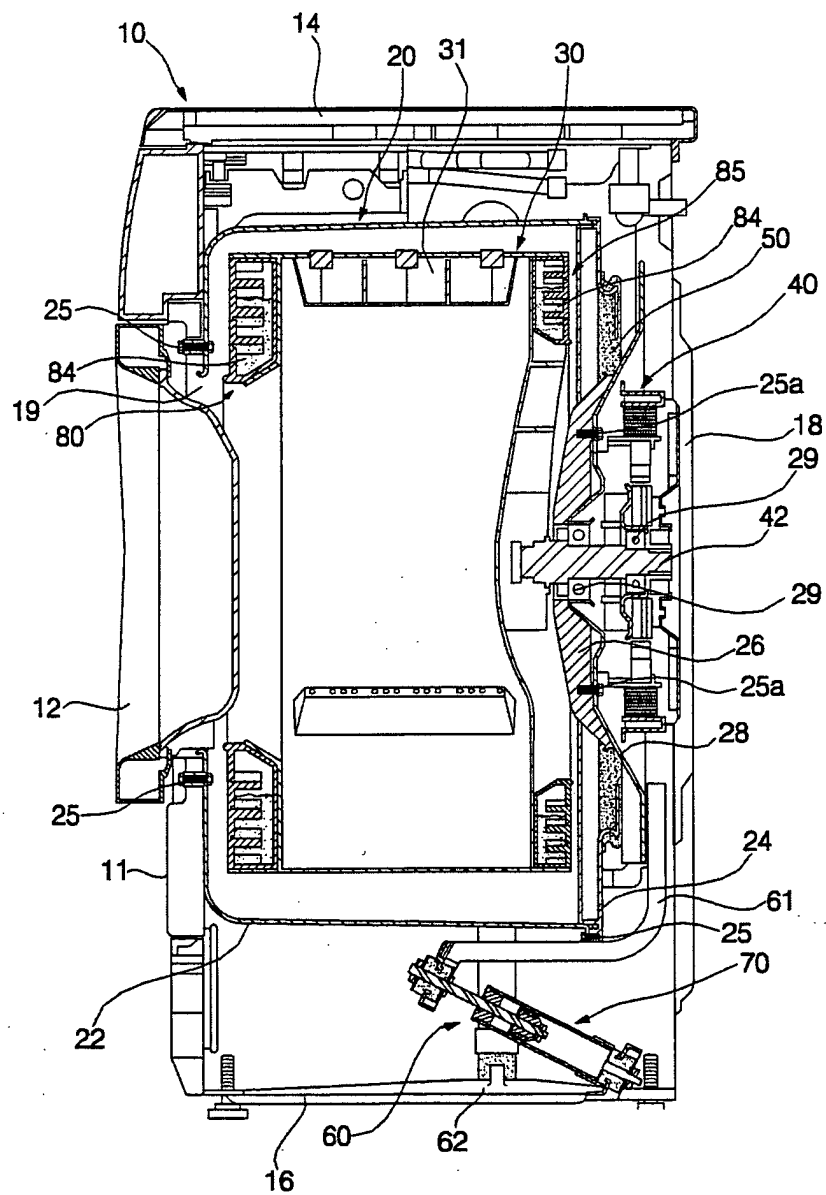


FIG. 3

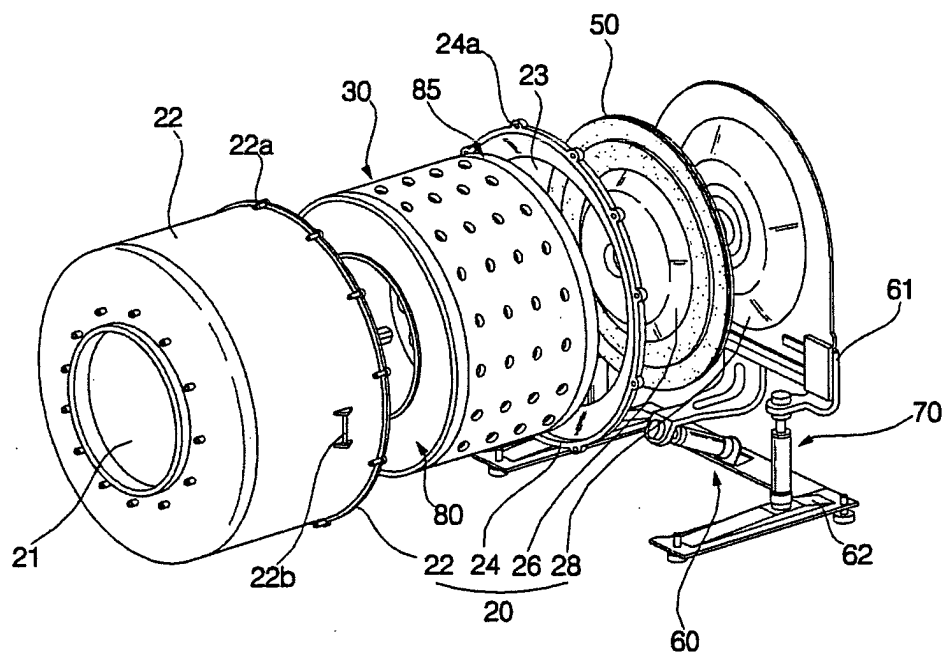


FIG. 4

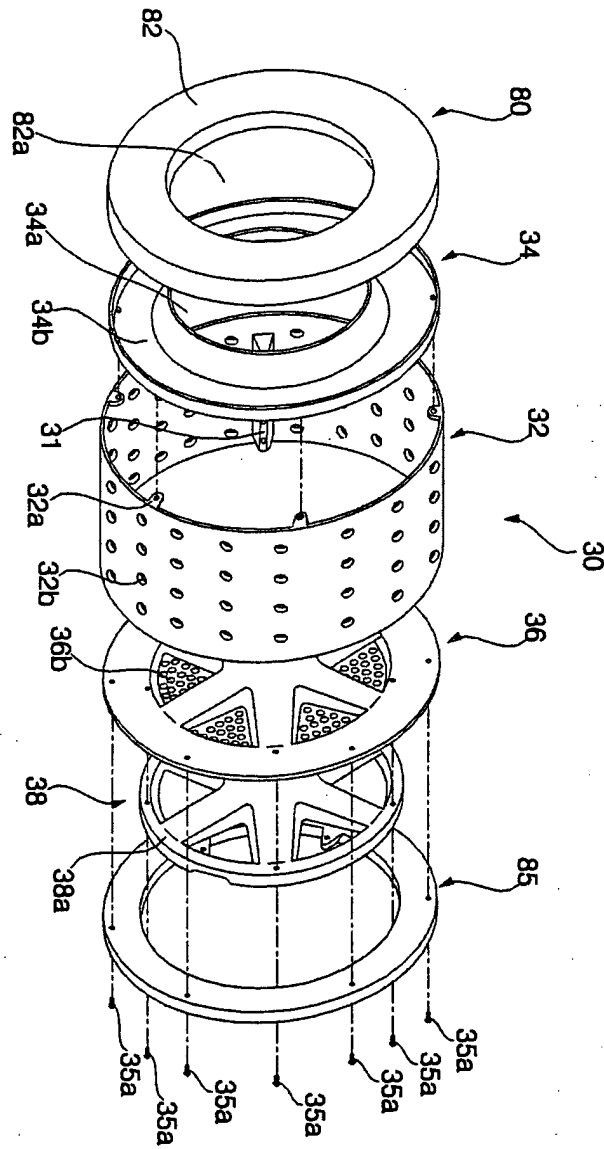


FIG. 5

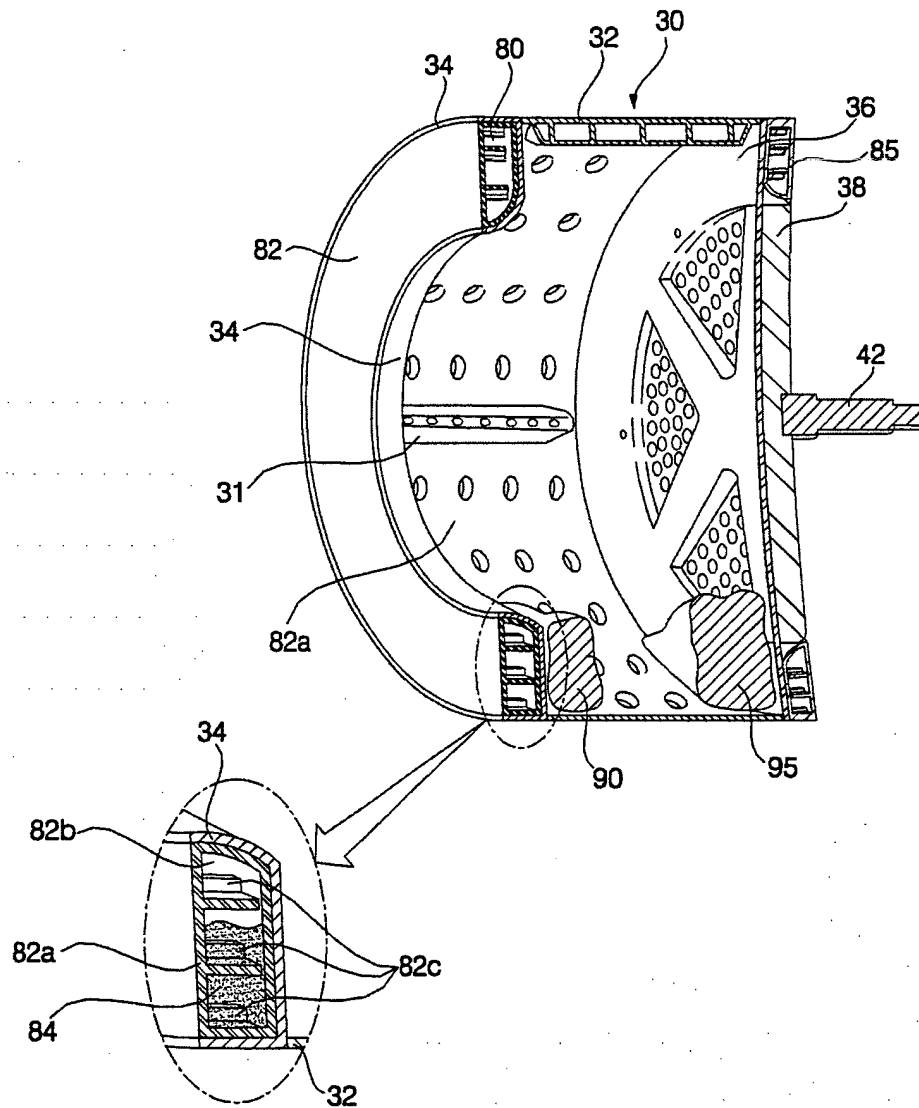


FIG. 6

