



US 20050179347A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0179347 A1****Kim et al.**(43) **Pub. Date: Aug. 18, 2005**(54) **DRUM TYPE WASHING MACHINE**(30) **Foreign Application Priority Data**

Feb. 13, 2004 (KR) P 2004-0009699

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Publication Classification

(51) **Int. Cl.⁷** **D06F 29/00**
 (52) **U.S. Cl.** **312/228**

(57) **ABSTRACT**

A drum type washing machine, by which assembly can be carried out more conveniently and by which the noise generation is suppressed. The drum type washing machine includes a cabinet covering rear and both lateral sides of the washing machine, a panel frame provided to an upper front side of the cabinet, the cabinet having at least one hole, and a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole.

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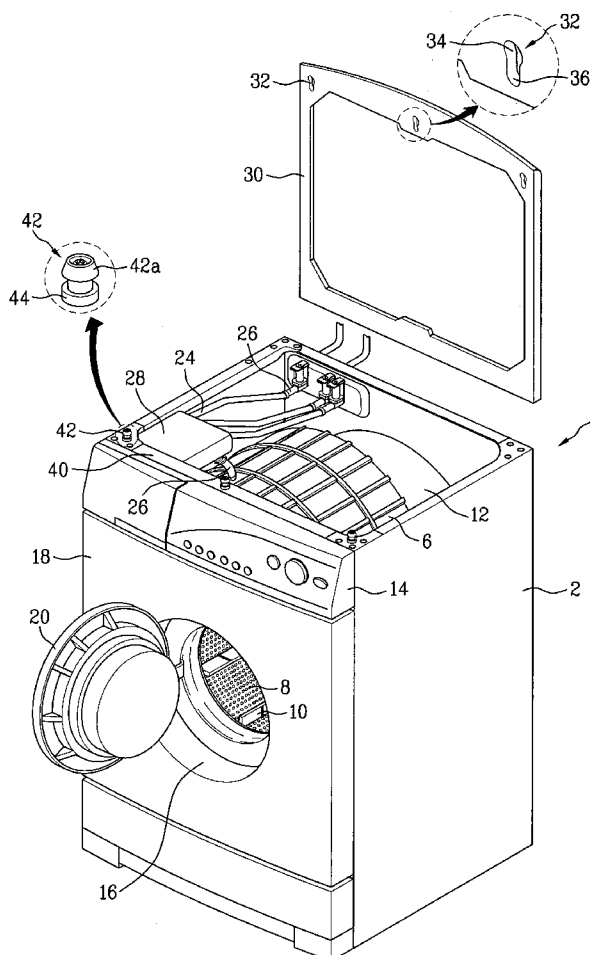
(21) Appl. No.: **10/919,253**(22) Filed: **Aug. 17, 2004**

FIG. 1

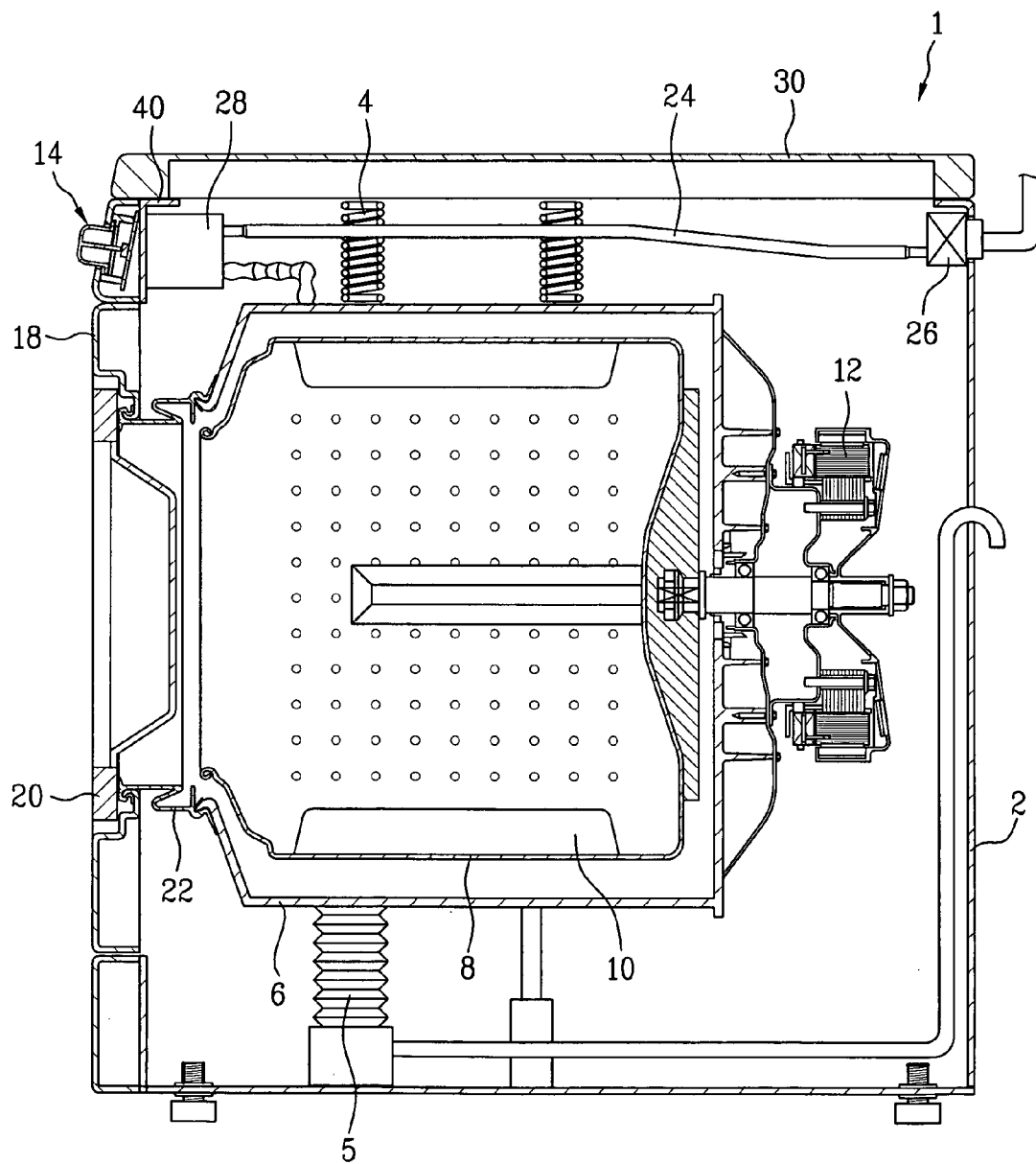


FIG. 2

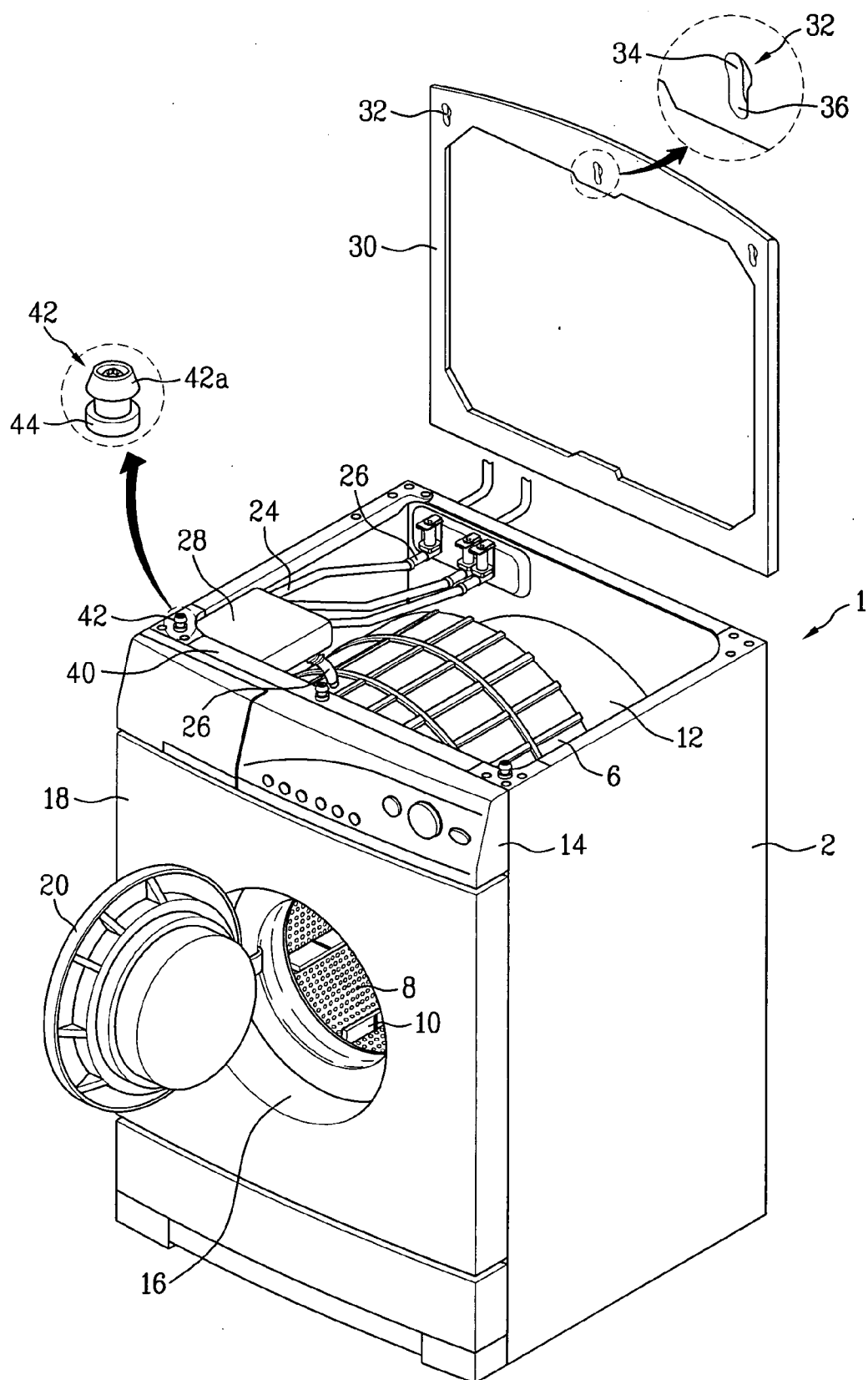


FIG. 3

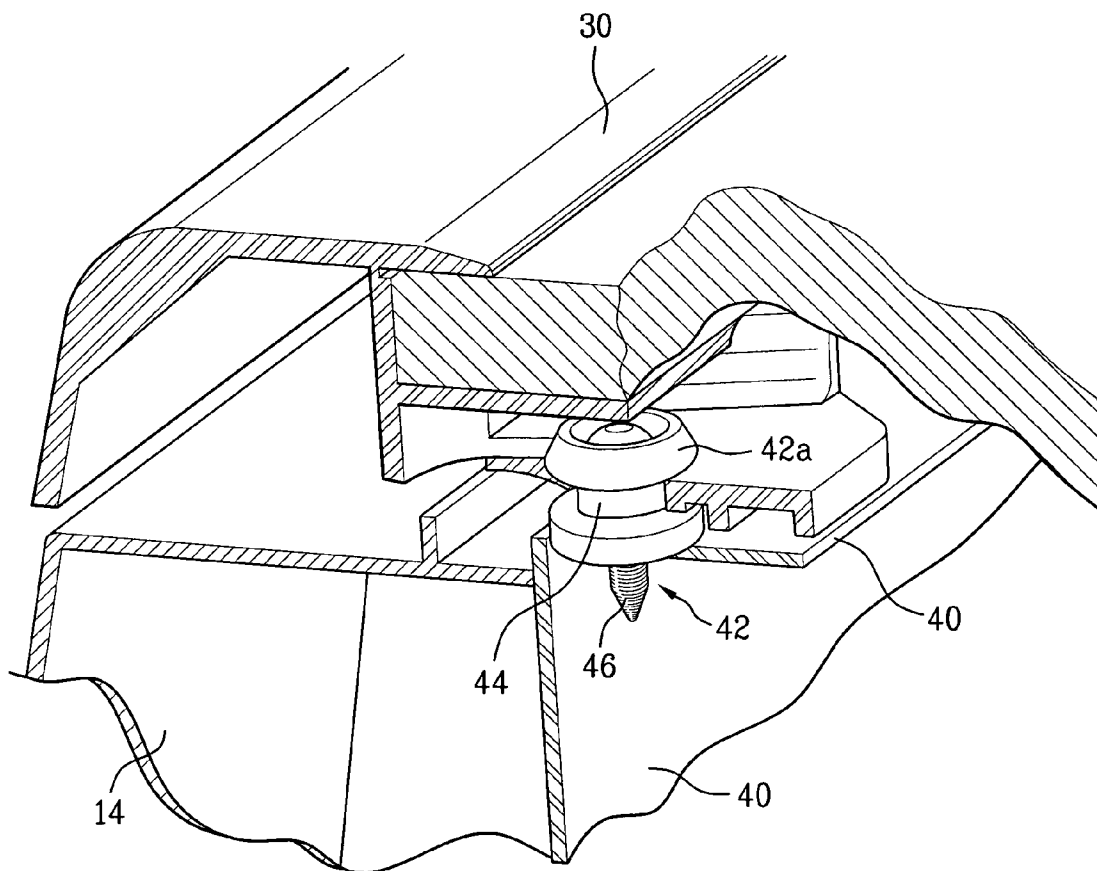


FIG. 4

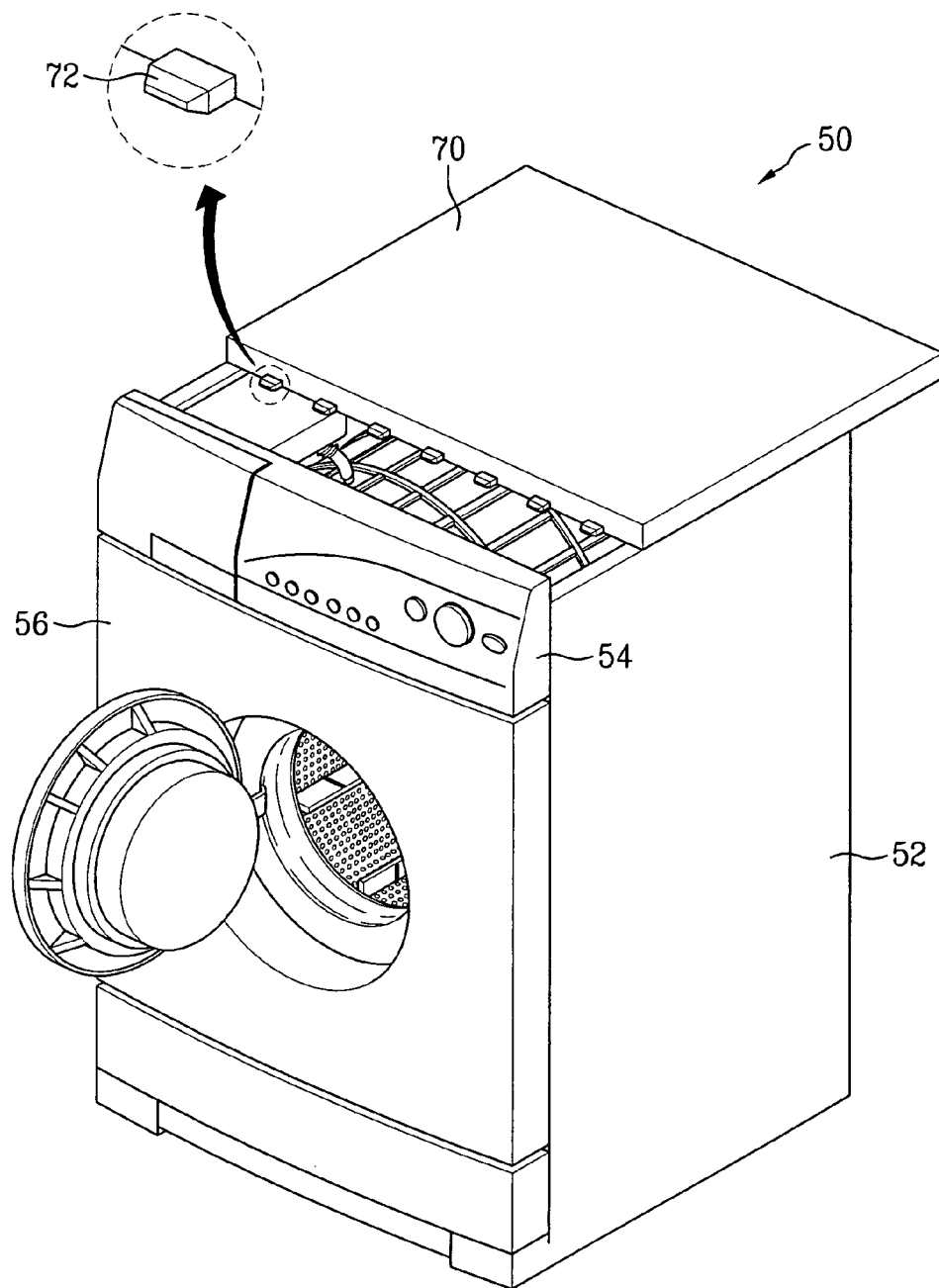


FIG. 5

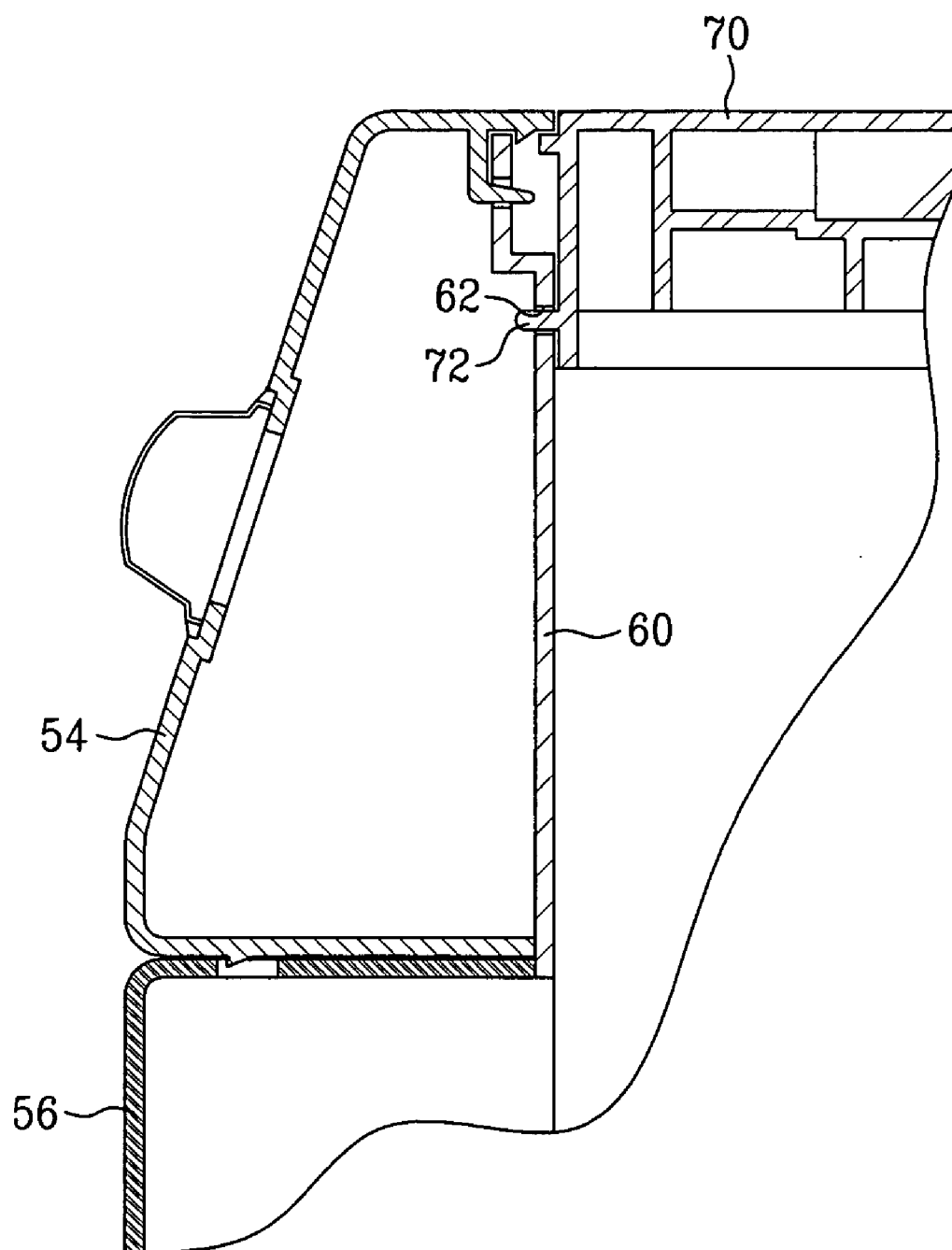
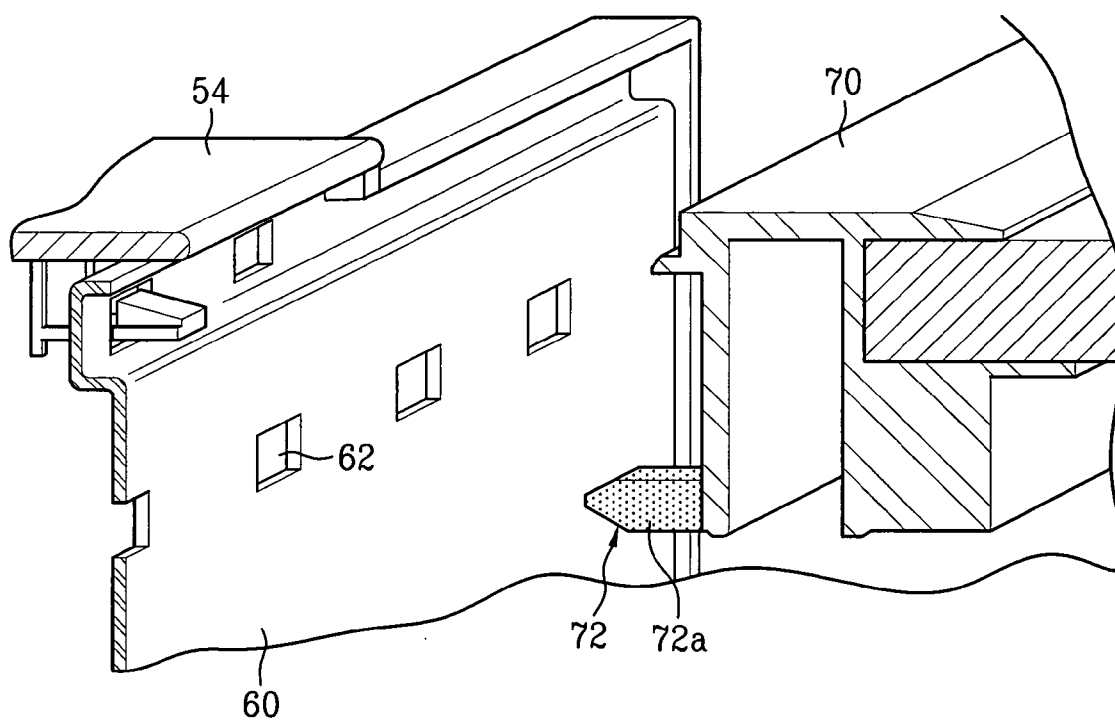


FIG. 6



DRUM TYPE WASHING MACHINE

[0001] This application claims the benefit of Korean Application No. P2004-009699, filed on Feb. 13, 2004, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a drum type washing machine, by which a top plate can be assembled more stably.

[0004] 2. Discussion of the Related Art

[0005] Generally, a drum type washing system performs washing within a drum rotated by a drive force of a motor using friction between water and laundry. In performing washing by the drum type washing system, the laundry is hardly damaged and is not entangled with each other. And, the drum type washing system provides such a washing effect as beating, rubbing, and the like. **FIG. 1** is a cross-sectional diagram of a washing machine according to a related art. Referring to **FIG. 1**, a drum type washing machine **1** consists of a cabinet **2**, a tub **6**, a drum **8**, a lifter **10**, and a motor **12**. The cabinet **2** forms an exterior of the washing machine, and the tub **6** is provided within the cabinet **2** to hold (or contain) water therein. In order to attenuate vibration transferred to the tub **6**, an upper part of the tub **6** is suspended by a spring **4** to be supported, and a lower part of the tub **6** is supported by a damper **5**.

[0006] The drum **8** is rotatably provided within the tub **6** to hold (or contain) laundry therein. At least one or more lifters **10** are provided on an inner circumference of the drum **8** to lift the laundry upward to fall from a predetermined height by gravity. The lifters **10** are provided in an inner circumferential direction of the drum **8** to leave a predetermined distance (or to be equally spaced apart) from each other. And, the motor **12** is provided in rear of the tub **6** to transfer a rotational force to the drum **8**. A control panel **14** is provided to an upper front side of the cabinet **2** to control an operation of the drum type washing machine. A cabinet cover **18** having an opening **16** is provided beneath the control panel **14**.

[0007] In this case, a laundry is put/pulled in/from the drum **8** via the opening **16**. A door **20** is connected to a rim of the opening **16** to open/close the opening **16**. And, a gasket **22** is provided between the door **20** and the tub **6** to attenuate a shock caused by a rotation of the drum **8** and to prevent water leakage. A top plate **30** is provided over the cabinet **2** and control panel **14** to cover a topside of the drum type washing machine. An inlet hose **24**, an inlet valve **26**, and a detergent box **28** are provided under the top plate **30** to supply water or detergent to the tub **6**.

[0008] Meanwhile, the control panel **14** is assembled to an upper part of the top plate **30** as well as the cabinet **2**. In assembling or disassembling the control panel **14**, the control panel **14** should be detachably assembled to the top plate **30**. However, the top plate is assembled to an upper part of the related art washing machine by screw locking, whereby it takes a considerably long time in completing the corresponding assembly as well as an exterior of the topside of the washing machine is ruined. And, if the corresponding screw is loosened, the noise generated from the jointed

portion between the top plate and the cabinet colliding with each other by the vibration of the motor is increased.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present invention is directed to a drum type washing machine that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a drum type washing machine, by which assembly can be done more conveniently and by which the noise generation is suppressed.

[0011] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0012] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, a drum type washing machine includes a cabinet covering rear and both lateral sides of the washing machine, a panel frame provided to an upper front side of the cabinet, the cabinet having at least one hole, and a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole.

[0013] The at least one hole may be arranged in a right-to-left direction of the panel frame to be equally spaced apart from each other, and each protrusion may be provided to confront a corresponding hole. A tilted plane may be provided to an outer circumference of each protrusion to have a slip-fit connection with a corresponding hole. Each protrusion may have a taper shape decreasing in a cross-sectional area, and each protrusion may be formed in one body of the top plate.

[0014] A flexible or elastic material may be provided between each protrusion and a corresponding hole. Herein, the flexible or elastic material may be rubber and may be coated on an outer circumference of each protrusion.

[0015] The drum type washing machine may include a control panel provided to a front side of the panel frame. Herein, each of the panel frame and the control panel may protrude upward at a thickness of the top plate to be higher than an upper end of the cabinet.

[0016] In another aspect of the present invention, a drum type washing machine includes a cabinet covering rear and both lateral sides of the washing machine, a panel frame provided to an upper front side of the cabinet, the panel frame having at least one hole, a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole, and a control panel provided to a front side of the panel frame.

[0017] In a further aspect of the present invention, a drum type washing machine includes a cabinet covering rear and

both lateral sides of the washing machine, a panel frame provided to an upper front side of the cabinet, the panel frame having at least one hole, a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole, a control panel provided to a front side of the panel frame, and a flexible or elastic material provided between each protrusion and a corresponding hole.

[0018] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0020] **FIG. 1** is a cross-sectional diagram of a washing machine according to a related art;

[0021] **FIG. 2** is a perspective diagram of a top plate assembly of a drum type washing machine according to one embodiment of the present invention;

[0022] **FIG. 3** is a cutting diagram of a fixing structure of a top plate according to one embodiment of the present invention;

[0023] **FIG. 4** is a perspective diagram of a top plate assembly of a drum type washing machine according to another embodiment of the present invention;

[0024] **FIG. 5** is a cross-sectional diagram of a fixing structure of a top plate according to another embodiment of the present invention; and

[0025] **FIG. 6** is a cutting diagram of a fixing structure of a top plate according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0027] First of all, a drum type washing machine according to the present invention is explained in detail by referring to **FIGS. 2 to 6** as follows. **FIG. 2** is a perspective diagram of a top plate assembly of a drum type washing machine according to one embodiment of the present invention. Referring to **FIG. 2**, an outer case of a drum type washing machine according to the present invention includes a cabinet cover, a cabinet, and a top plate. The cabinet cover is provided to a front side of the washing machine and an opening is formed in a central part of the cabinet cover. A laundry is put in to and/or pulled out from the washing machine via the opening. A door is provided to a rim of the

opening to open/close the opening. And, the opening communicates with an inside of a drum.

[0028] A tub is provided within the outer case to hold water therein and a motor is provided in rear of the tub. A drum is rotatably provided within the tub to be connected to the motor. And, the drum is rotated by the driven motor. A panel frame **40** is provided to an upper front side of the cabinet to reinforce rigidity of the outer case. A control panel **14** is provided to a front side of the panel frame **40**. Various circuit elements controlling an operation of the washing machine are loaded (or mounted) on the control panel **14**. And, a holder **42** is provided to each lateral side of the panel frame **40**. A recess **32** is formed at a bottom side of the top plate **30** to confront the corresponding holder **42**. When the top plate **30** is loaded on upper ends of the cabinet **2** and the panel frame **40**, the holders **42** are coupled to the recesses **32**, respectively.

[0029] **FIG. 3** is a cutting diagram of a fixing structure of a top plate according to one embodiment of the present invention. Referring to **FIG. 3**, a hanging portion **44** having a stepped shape is provided to a cylindrical outer circumference of the holder **42**, and a tilted surface **42a** decreasing in diameter toward its upper side is provided to an upper part of the holder **42** to be easily inserted in (or to have a slip-fit connection with) the corresponding recess **32**. A locking hole (not shown) is vertically formed to perforate a topside to bottom side of the holder **42** along a central axis of the holder **42**. Referring to **FIGS. 2 and 3**, the recess **32** includes an insertion recess and a holding recess **36**. After having inserted in the insertion recess **34**, the holder **42** is horizontally moved so that the hanging portion **44** of the holder **42** is inserted in the holding recess **36**. The holding recess **36** extends long backward to communicate with the insertion recess **34**.

[0030] A diameter of the insertion recess **34** is greater than that of the holder **42**. And, the holding recess **36** had a diameter smaller than that of the holder **42** but greater than that of the hanging portion **44**, so that the hanging portion **44** can be inserted in the holding recess **36**. The holder **42** is fixed to the upper end of the panel frame **40** using a bolt **46**. Another holder is provided to the panel frame **40**. Three holders **42** are provided to the panel frame **40** in right-to-left direction to leave a predetermined distance from each other. Accordingly, the three recesses **32** are formed at the bottom side of the top plate **30** to confront the three holders **42**, respectively.

[0031] When the top plate **30** is loaded on the upper ends of the cabinet and panel frame, the holders **42** are inserted in the insertion recesses **34**, respectively. Subsequently, once the top plate **30** is pulled forward, the hanging portions **44** of the holders **42** are inserted in the corresponding holding recesses **36**, respectively, so that the top plate **30** can be fixed thereto. Meanwhile, in the above-described embodiment of the present invention, after the holder **42** is inserted in the recess **32** to be fixed thereto after having been locked in the upper end of the panel frame **40** using the locking bolt **46**. Hence, the assembly configuration of the top plate **30** is complicated. Moreover, it is difficult to increase the number of the holders **42** to fix the top plate **30** thereto more concretely. Therefore, limitation is put on suppressing the noise generated from the fixing part of the top plate **30**.

[0032] **FIG. 4** is a perspective diagram of a top plate assembly of a drum type washing machine according to

another embodiment of the present invention. Referring to **FIG. 4**, an outer case of a washing machine includes a cabinet **52**, a cabinet cover **56**, and a top plate **70**. A panel frame (not shown) is provided to an upper part (or a top) of the cabinet cover **56** to reinforce rigidity thereof, and a control panel **54** is provided to a front side of the panel frame. The top plate **70** is loaded on the upper part of the washing machine, and at least one or more protrusions **72** are provided to a front side of the top plate **70**.

[0033] **FIG. 5** is a cross-sectional diagram of a fixing structure of a top plate according to another embodiment of the present invention, and **FIG. 6** is a cutting diagram of a fixing structure of a top plate according to another embodiment of the present invention. Referring to **FIGS. 5 and 6**, the panel frame **6** includes a flat plate and both lateral ends of the panel frame **60** are fixed to an upper front side of the cabinet **52**. Moreover, a lower end of the control panel **54** provided to the front side of the panel frame **60** is coupled to an upper end of the cabinet cover **56**.

[0034] At least one or more holes **62** are formed in the panel frame **60** so that the protrusion **72** is fitted in the corresponding hole **62**. A plurality of the holes **62** are formed to leave a predetermined distance from each other along a surface of the panel frame **60** coming into contact with the front side of the top plate **70**. In order for topsides of the top plate **70**, the control panel **54**, and the panel frame **60** to exist in the same plane continuously, each of the panel frame **60** and the control panel **54** protrudes upward at a predetermined height equal to a thickness of the top plate **70** to be higher than the upper end of the cabinet **52**. By the above-explained configuration, an exterior of the washing machine can be enhanced.

[0035] The rear and two lateral sides of the top plate **70**, as shown in **FIG. 4**, are loaded onto the cabinet **52** and the front side of the top plate **70** is locked in the rear side of the panel frame **60** to be fixed thereto. Specifically, a plurality of the protrusions **72** is provided to the front side of the top plate **70**, and a plurality of the holes **62** is formed on the panel frame **60** to confront a plurality of the protrusions **72**, respectively. The protrusions **72** are fitted in the holes **62**, respectively, so that the front side of the top plate **70** can be supported by the panel frame **60**. A front portion of the protrusion **72** has a tilted plane to facilitate the corresponding protrusion **72** to be inserted in the corresponding hole **62**. In the tilted plane, a cross-section of the protrusion **72** gradually decreases in a front direction. And, the protrusion **72** may have a taper shape.

[0036] An assembling process of the top plate according to another embodiment of the present invention is explained as follows. First of all, the top plate **70** is loaded on the upper part of the cabinet **52** and is then pushed in a front direction of the cabinet **52**. In doing so, the top plate **70** slides forward along both upper ends of the cabinet **52** so that the front side of the top plate **70** approaches the rear side of the panel frame **60**. Subsequently, the protrusions **72** provided to the front side of the top plate **70** are inserted in the holes formed in the panel frame **60**, respectively, whereby the top plate **70** is lead to a correct loading position.

[0037] Once the protrusions **72** are completely inserted in the holes **62**, respectively, the front side of the top plate **70** adheres closely to the rear side of the panel frame **60** to complete the assembly of the top plate **70**. In this case, the

top plate **70** is supported by a plurality of the protrusions **72** inserted in the holes **62**, respectively. Meanwhile, a flexible or elastic material absorbing vibration, as shown in **FIG. 6**, is further provided to an outer circumference of the protrusion **72**. The flexible or elastic material preferably includes a layer **72a** coated on an outside of the protrusion **72**. The flexible or elastic material is not limited to the coating layer **72a**. For instance, a separate member formed of the flexible or elastic material may cover the protrusion **72**. In this case, the flexible or elastic material is rubber. Hence, the flexible or elastic material absorbs the vibration generated from the high speed dewatering of the drum type washing machine, whereby the noise can be suppressed.

[0038] Accordingly, the present invention has the following advantages or effects. First of all, the protrusion is inserted in the hole formed at the panel frame to complete the assembly of the top plate after the top plate has been loaded on the upper end of the cabinet, whereby the assembly configuration of the top plate is simplified. Secondly, a plurality of the protrusions provided to the top plate are inserted in a plurality of the holes formed at the panel frame, respectively, whereby the top plate can be supported by the panel frame more stably. Finally, the flexible or elastic member is provided between the hole and the protrusion, whereby the noise generated from the top plate of the driven drum type washing machine can be suppressed.

[0039] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A drum type washing machine, comprising:

- a cabinet covering rear and both lateral sides of the washing machine;
- a panel frame provided to an upper front side of the cabinet, the cabinet having at least one hole; and
- a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole.

2. The drum type washing machine of claim 1, wherein the at least one hole is arranged in a right-to-left direction of the panel frame to be equally spaced apart from each other, and wherein each protrusion is provided to confront a corresponding hole.

3. The drum type washing machine of claim 1, wherein a tilted plane is provided to an outer circumference of each protrusion to have a slip-fit connection with a corresponding hole.

4. The drum type washing machine of claim 1, wherein each protrusion has a taper shape decreasing in a cross-sectional area.

5. The drum type washing machine of claim 1, wherein each protrusion is formed in one body of the top plate.

6. The drum type washing machine of claim 1, wherein a flexible or elastic material is provided between each protrusion and a corresponding hole.

7. The drum type washing machine of claim 6, wherein the flexible or elastic material is rubber.

8. The drum type washing machine of claim 6, wherein the flexible or elastic material is coated on an outer circumference of each protrusion.

9. The drum type washing machine of claim 1, further comprising a control panel provided to a front side of the panel frame.

10. The drum type washing machine of claim 9, wherein each of the panel frame and the control panel protrudes upward at a thickness of the top plate to be higher than an upper end of the cabinet.

11. A drum type washing machine, comprising:

a cabinet covering rear and both lateral sides of the washing machine;

a panel frame provided to an upper front side of the cabinet, the panel frame having at least one hole;

a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole; and

a control panel provided to a front side of the panel frame.

12. The drum type washing machine of claim 11, wherein each of the panel frame and the control panel protrudes upward at a thickness of the top plate to be higher than an upper end of the cabinet.

13. The drum type washing machine of claim 11, wherein the at least one hole is arranged in a right-to-left direction of the panel frame to be equally spaced apart from each other, and wherein each protrusion is provided to confront a corresponding hole.

14. The drum type washing machine of claim 11, wherein a tilted plane is provided to an outer circumference of each protrusion to have a slip-fit connection with a corresponding hole.

15. The drum type washing machine of claim 11, wherein each protrusion has a taper shape decreasing in a cross-sectional area.

16. The drum type washing machine of claim 11, wherein each protrusion is formed in one body of the top plate.

17. The drum type washing machine of claim 11, wherein a flexible or elastic material is provided between each protrusion and a corresponding hole.

18. The drum type washing machine of claim 17, wherein the flexible or elastic material is rubber.

19. The drum type washing machine of claim 17, wherein the flexible or elastic material is coated on an outer circumference of each protrusion.

20. A drum type washing machine, comprising:

a cabinet covering rear and both lateral sides of the washing machine;

a panel frame provided to an upper front side of the cabinet, the panel frame having at least one hole;

a top plate mounted on a top of the cabinet to cover a topside of the washing machine, the top plate having at least one protrusion, each protrusion having a slip-fit connection with a corresponding hole;

a control panel provided to a front side of the panel frame; and

a flexible or elastic material provided between each protrusion and a corresponding hole.

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