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Cho et al.(10) **Pub. No.: US 2008/0295544 A1**(43) **Pub. Date: Dec. 4, 2008**(54) **LAUNDRY MACHINE**(30) **Foreign Application Priority Data**(76) Inventors: **Cheon-Soo Cho**, Changwon (KR);
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D06F 37/42 (2006.01)
D06F 39/14 (2006.01)
(52) **U.S. Cl.** **68/12.26; 68/212**(57) **ABSTRACT**

A laundry machine includes: a casing; a door installed on an upper surface of the casing; a tub installed within the casing; and a buffering unit for buffering an impact when the door is closed. A collision noise or vibration of the door or the casing can be reduced and damage of the washing can be prevented. Also, a hinge assembly for connecting the door to a top cover is provided to stably support the door made of a heavy material such as tempered glass and minimizes an impact or noise when the door is closed.

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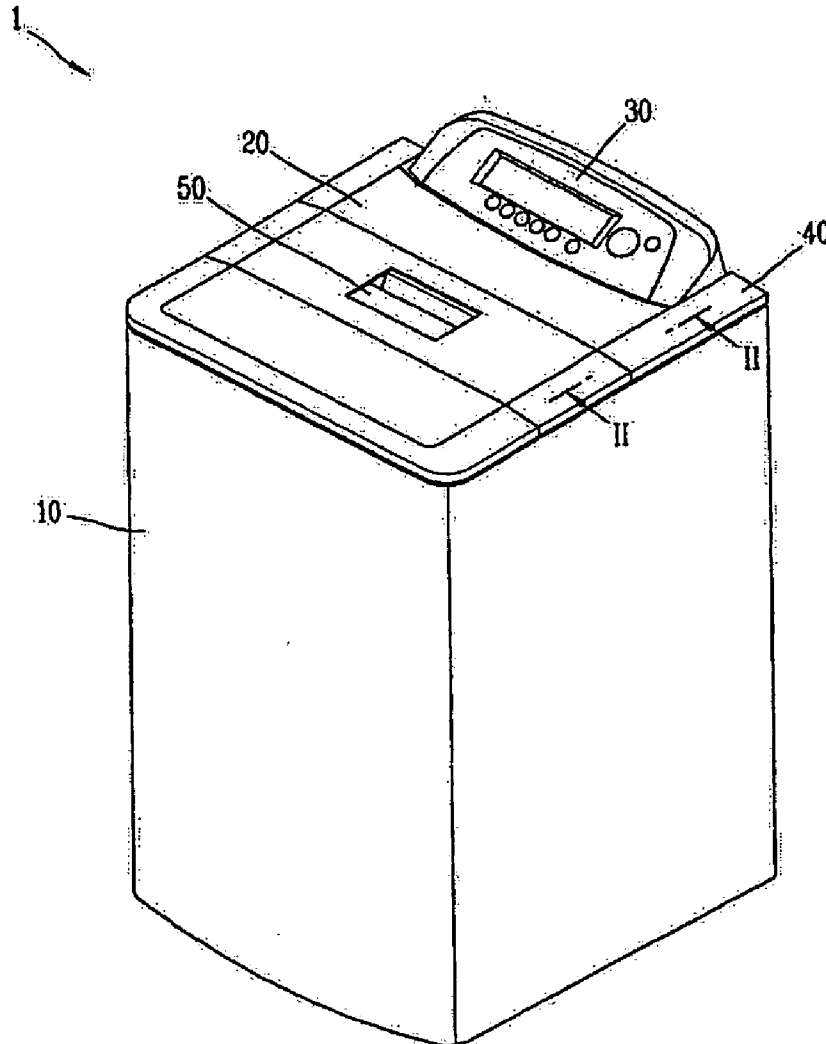
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Chantilly, VA 20153-1200 (US)(21) Appl. No.: **12/127,259**(22) Filed: **May 27, 2008**

Fig. 1

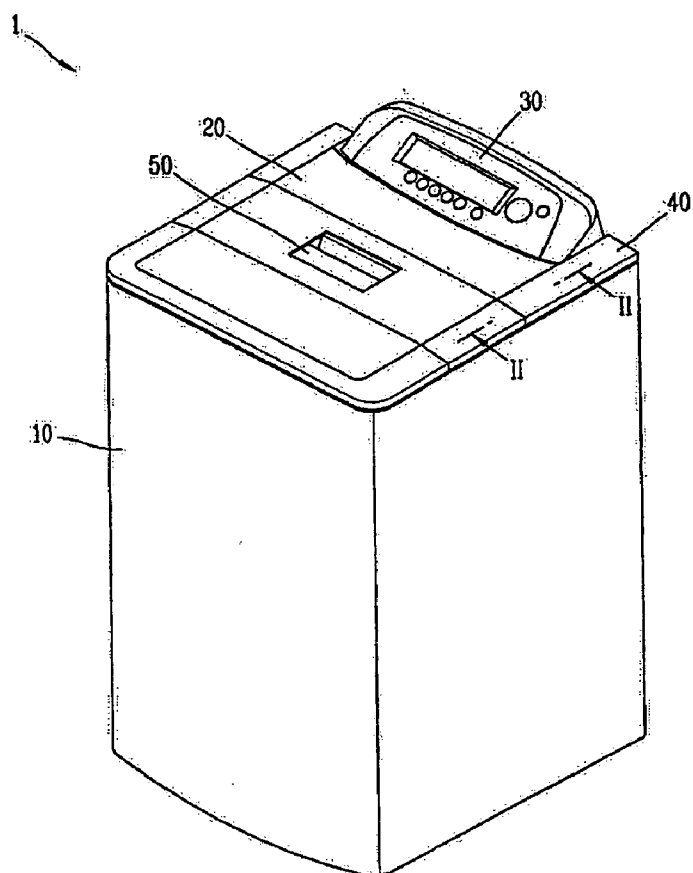


Fig. 2

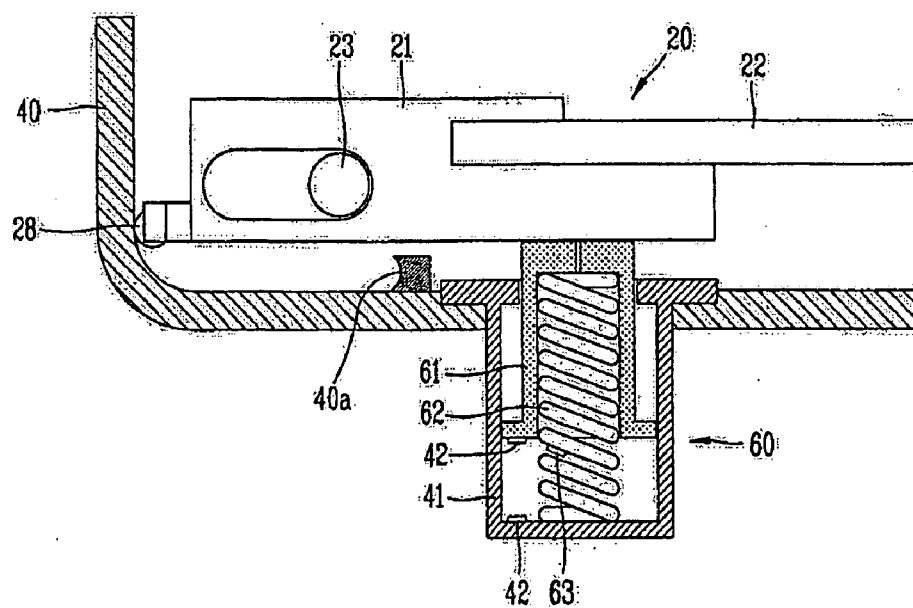


Fig. 3

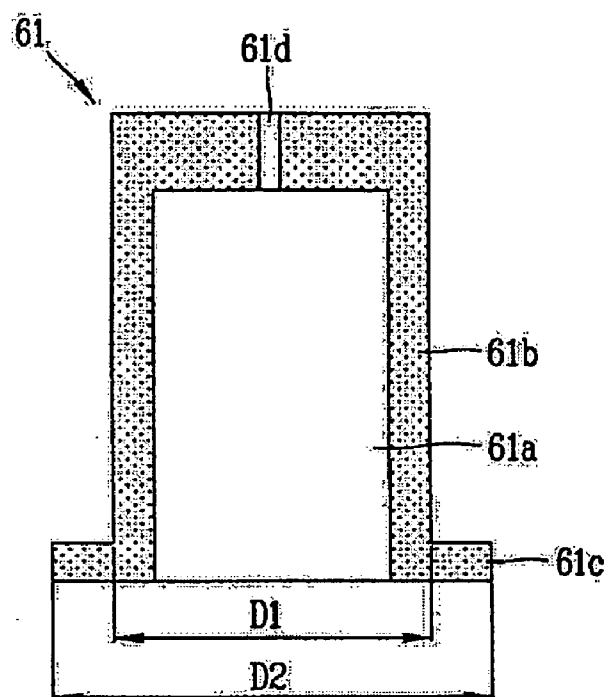


Fig. 4

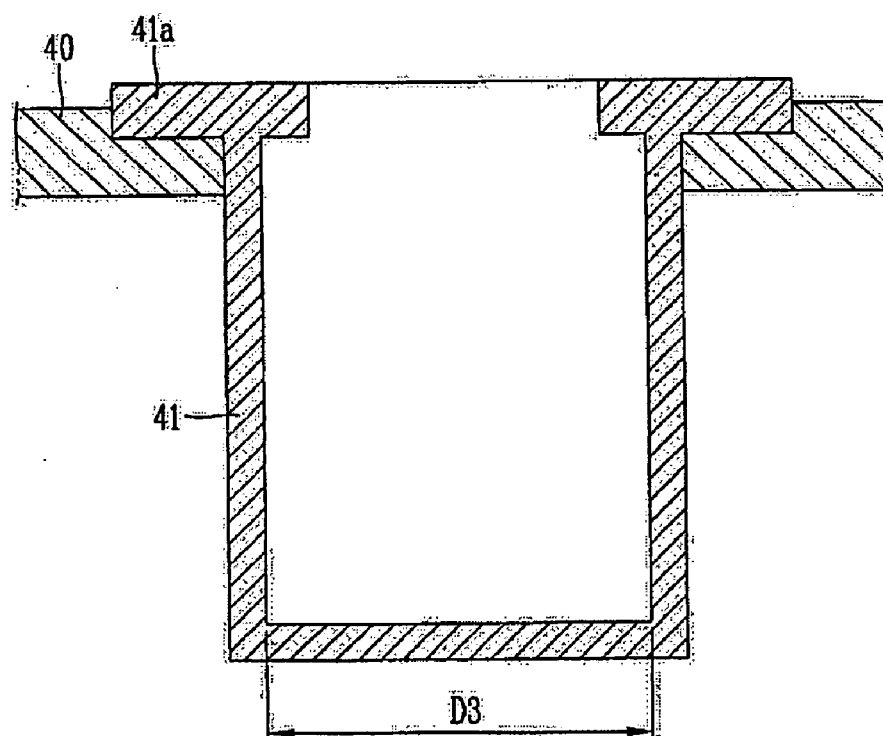


Fig. 5a

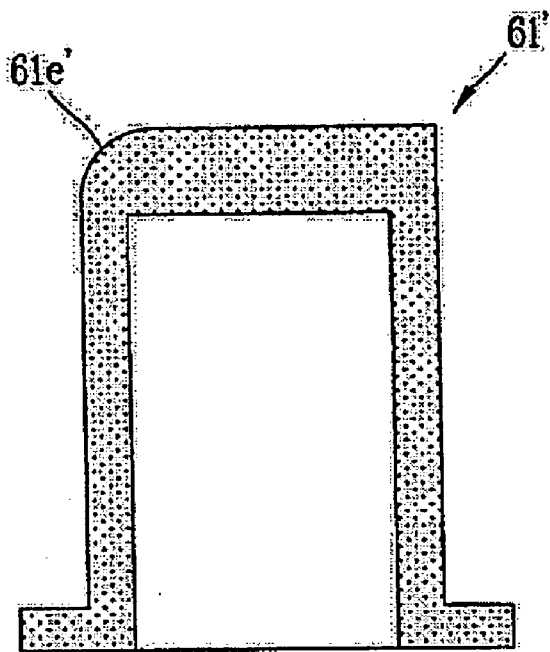


Fig. 5b

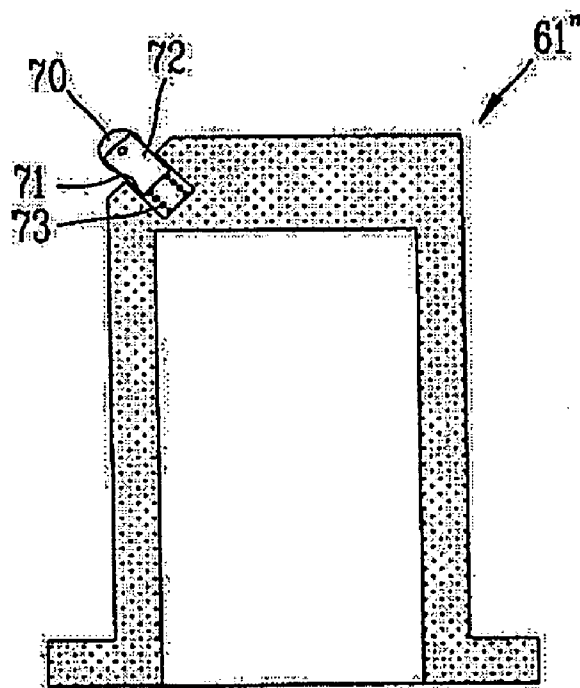


Fig. 6a

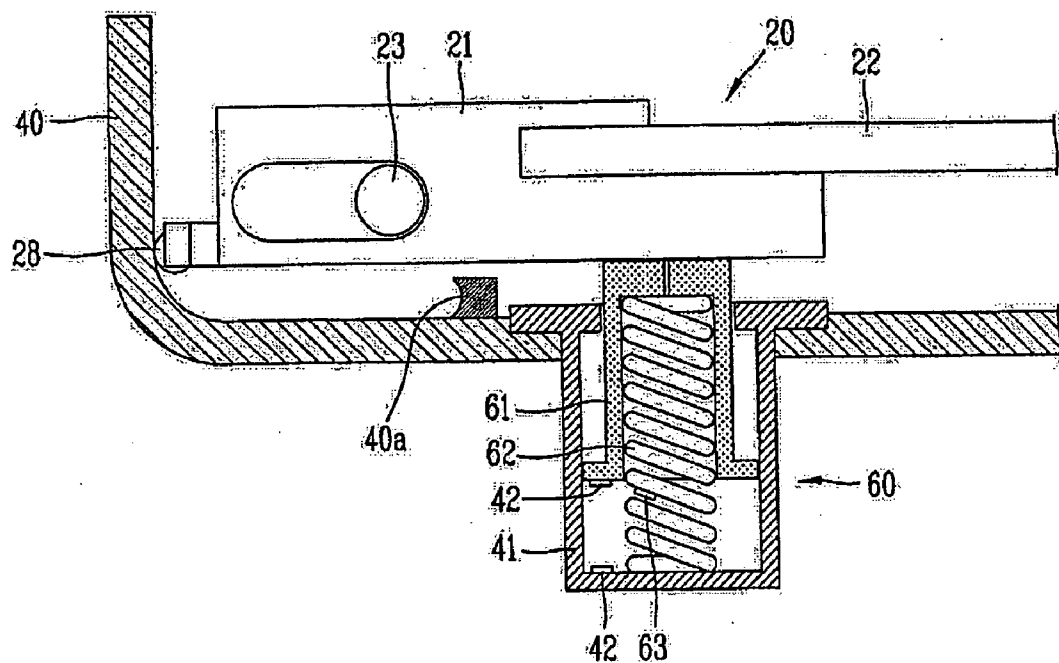


Fig. 6b

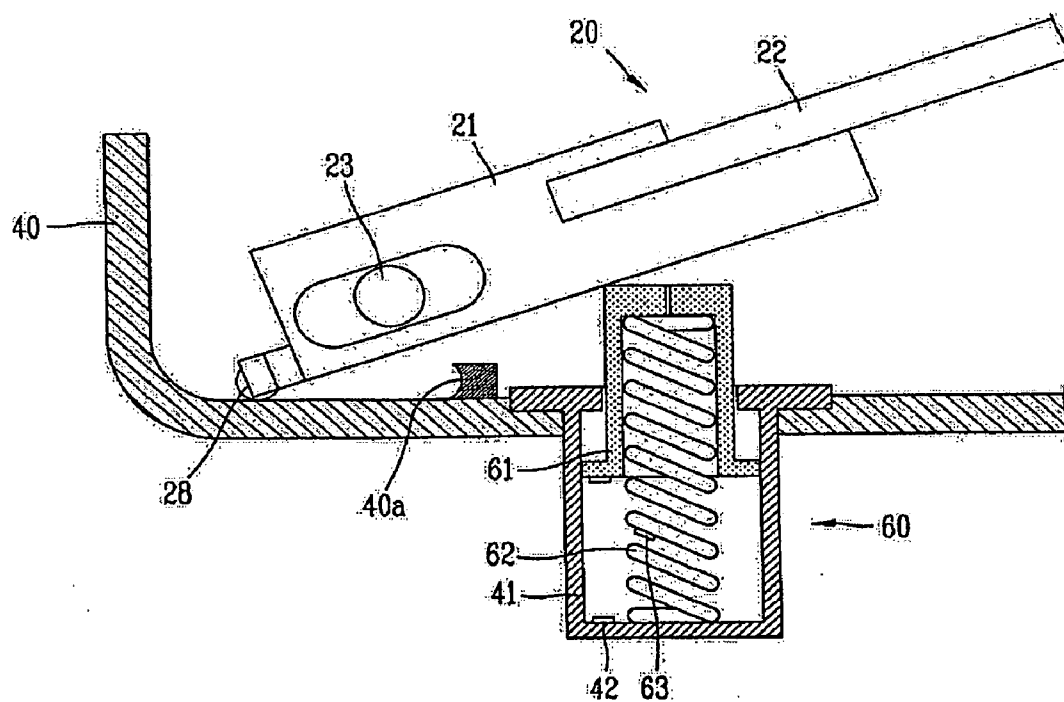


Fig. 6c

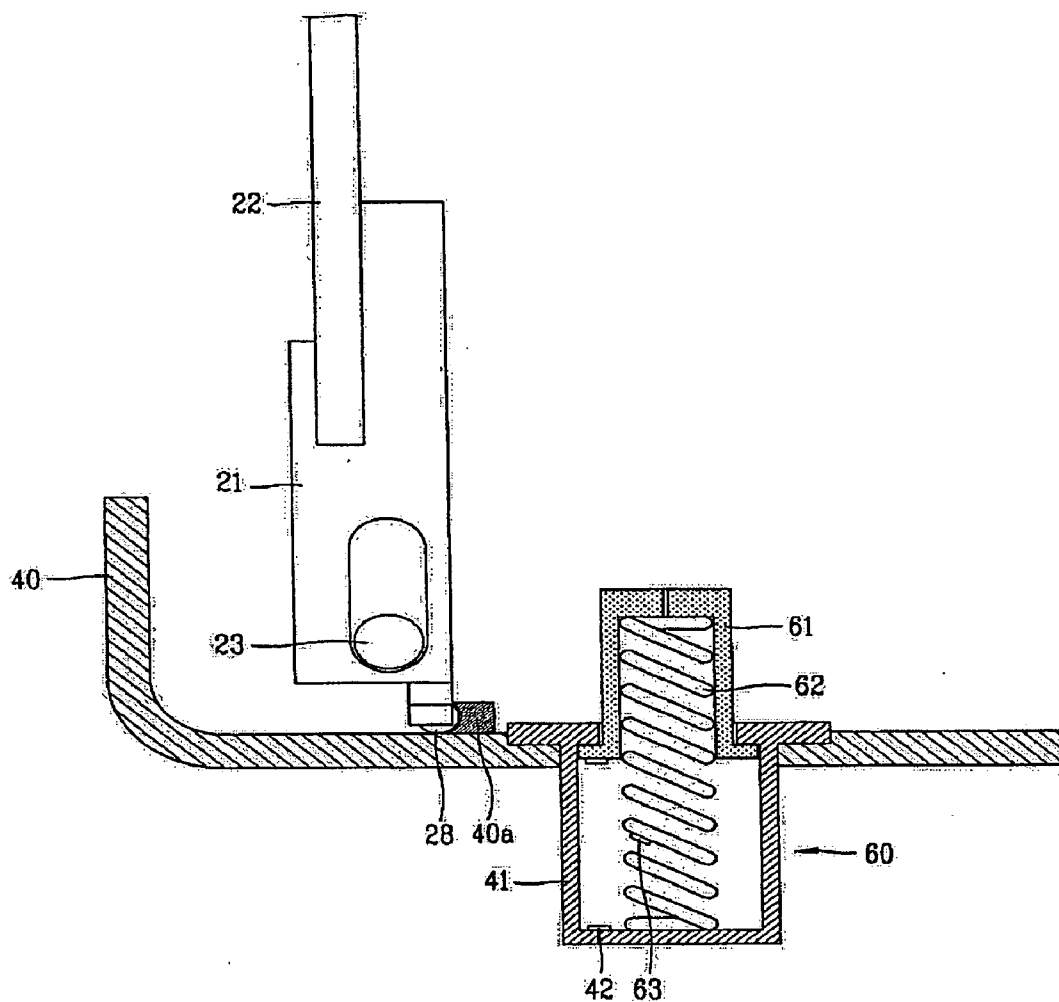


Fig. 7a

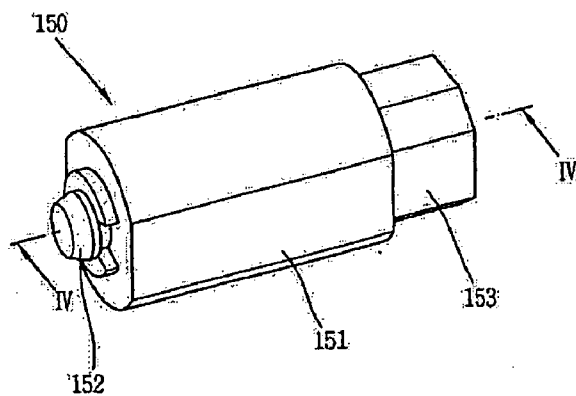


Fig. 7b

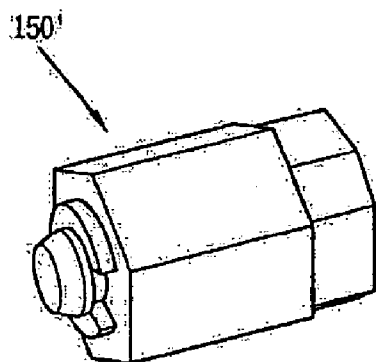


Fig. 7c

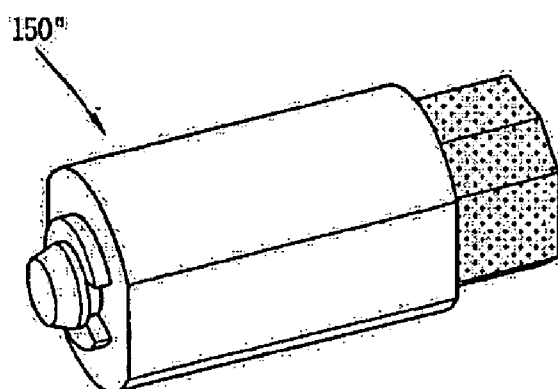


Fig. 8a

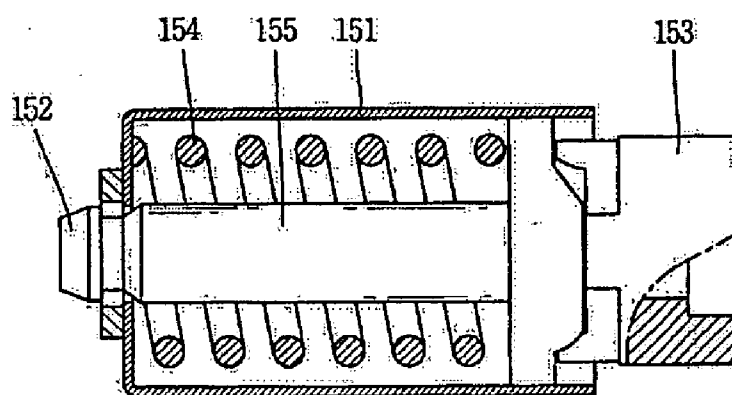


Fig. 8b

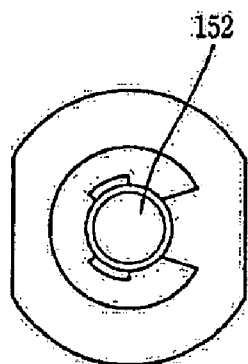


Fig. 8c

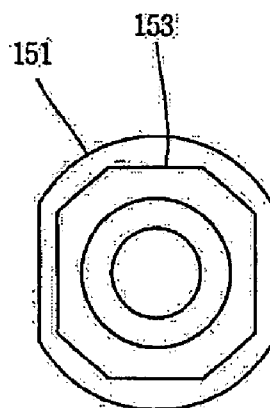
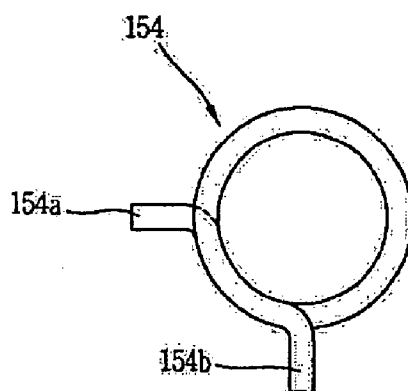


Fig. 9



LAUNDRY MACHINE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a laundry machine and, more particularly, to a laundry machine having a buffering device with a safety unit capable of reducing noise or vibration when a door of the laundry machine is closed and capable of stopping an operation when the door is opened.

[0003] 2. Description of the Related Art

[0004] In general, the laundry machine, a home appliance that washes or dries the clothes and the like is divided into two types depending on whether a rotational shaft of an inner tub or a drum for processing the laundry such as clothes, etc., is vertical or horizontal. The laundry machine having a vertical rotational shaft is called a top loading laundry machine and the laundry machine having a horizontal rotational shaft is called a front loading laundry machine or a drum washer.

[0005] The laundry machines include a door for receiving the laundry, and when the laundry is put into a washing space or taken out of the washing space, collision noise or vibration is generated, damaging the laundry machine.

[0006] In addition, when the door is opened while the laundry machine is operating, the laundry machine is not stopped in operation, hurting a user.

SUMMARY OF THE INVENTION

[0007] Therefore, in order to address the above matters the various features described herein have been conceived. One aspect of the exemplary embodiments is to provide a laundry machine having a buffering device capable of reducing collision of a door of the laundry machine with a casing or a top cover of the laundry machine when the door is closed.

[0008] Another aspect of the present invention is to provide a laundry machine having a safety unit capable of preventing a possible accident by allowing the safety unit to interwork with a buffering device to stop the washing machine if a door of the washing machine is opened unintentionally (against user's intention) while operating.

[0009] Still another aspect of the present invention is to provide a laundry machine capable of simply opening a door by virtue of a restoring force of a buffering device when a door in a closed state is opened.

[0010] This specification provides a laundry machine including: a casing; a door installed on an upper surface of the casing; a top cover opened and closed by the door; a tub installed within the casing; and a buffering unit for buffering an impact when the door is closed, wherein the buffering unit comprises: a door contact member that contacts with the door when the door is closed; and an elastic member that supports the door contact member, wherein a buffering unit mounting part for accommodating the buffering unit is formed at the upper surface of the casing.

[0011] With such a structure, noise or an impact that is generated as the door collides with the casing when closed can be reduced by the buffering unit.

[0012] The buffering unit may include a door contact member that contacts with the door when the door is closed, and an elastic member that supports the door contact member.

[0013] A buffering unit mounting part for accommodating the buffering unit may be formed on one surface of the top cover constituting the upper portion of the casing or the laundry machine. By forming the buffering unit mounting

part, the buffering unit may be easily mounted and the productivity of the laundry machine may be enhanced.

[0014] The door contact member may include a body having a hollow for receiving the elastic member, and a guide portion protruded from an outer circumferential surface of the body and moving up and down along an inner surface of the buffering unit mounting part.

[0015] By forming the door contact member in that manner, the door contact member may have a certain movement and easily mounted with the elastic member.

[0016] An air exhausting hole is formed on one surface of the door contact member in order to prevent the door contact member from being caught at the buffering unit mounting part so it cannot move.

[0017] A door interference preventing unit for preventing frictional contact of the door is formed at a corner of the door contact member that contacts with the door. The door interference preventing unit may be a curved part formed at the corner of the door contact member or a roller mounted at the corner of the door contact member.

[0018] With the door interference preventing unit, the door can be prevented from being damaged by a sharp corner of the door contact member, and the door contact member can be prevented from being abraded.

[0019] The laundry machine includes a safety unit cooperatively operates with the buffering unit, and stops the operation of the laundry machine when the door is opened.

[0020] By having the safety unit interworking with the buffering unit, when the door is opened unintentionally during operation of the laundry machine, the operation of the laundry machine can be stopped, and by installing the safety unit at the buffering unit, a space for installation of the safety unit is not necessary.

[0021] The safety unit may have such a structure that it senses whether or not the door is opened by measuring a displacement of the buffering unit.

[0022] The buffering unit is formed as a spring that is compressed as the door is closed, and the safety may be formed as a contact sensor installed at the spring. Namely, because the contact sensor that contacts according to displacement of the buffering unit, the spring, is used as the safety unit, opening and closing of the door can be accurately sensed.

[0023] The laundry machine may include a hinge assembly that connects the door to the top cover, and the hinge assembly includes a torsion spring. By mounting the hinge assembly, an impact can be reduced when the door is closed. The presence of the hinge assembly is more effective when the door is weighty as it is made of tempered glass.

[0024] One of the hinge assembly may be fixed and the other end thereof may be rotatable, and may include a hollow body part and an elastic member installed within the body part. In this case, the elastic member may be a torsion spring, and the strength of the hinge assembly may be easily adjusted by adjusting the number of windings of the torsion spring. The body part may be a sinter.

[0025] Both sides of the body part may have a different diameter. Here, the portion of the body part having a relatively smaller diameter may be mounted at the side where a space for mounting the hinge assembly is not sufficient.

[0026] The body part may further include a bracket for reinforcing the strength in order to supplement the portion having the relatively smaller diameter.

[0027] A stopper may be formed on at least one of the top cover and the door to restrict the opening degree of the door to

thereby prevent the door and a control panel formed at the laundry machine from colliding with each other.

[0028] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] FIG. 1 is a perspective view schematically showing a laundry machine according to an embodiment of the present invention;

[0030] FIG. 2 is a sectional view taken along line II-II in FIG. 1;

[0031] FIG. 3 is a sectional view showing one example of a door contact member in FIG. 2;

[0032] FIG. 4 is a sectional view showing a buffering unit mounting part in FIG. 2;

[0033] FIG. 5a is a sectional view showing another example of the door contact member in FIG. 3;

[0034] FIG. 5b is a sectional view showing still another example of the door contact member in FIG. 3;

[0035] FIG. 6a is a perspective view showing a state that a door is completely closed;

[0036] FIG. 6b is a perspective view showing a state that the door is opened to a degree;

[0037] FIG. 6c is a perspective view showing a state that the door is completely opened;

[0038] FIG. 7a is a perspective view showing one example of a hinge assembly according to the present invention;

[0039] FIG. 7b is a perspective view showing another example of a hinge assembly according to the present invention;

[0040] FIG. 7c is a perspective view showing still another example of a hinge assembly according to the present invention;

[0041] FIG. 8a is a sectional view taken along line IV-IV in FIG. 7a;

[0042] FIG. 8b is a left sectional view of the hinge assembly in FIG. 7a;

[0043] FIG. 8c is a right sectional view of the hinge assembly in FIG. 7a; and

[0044] FIG. 9 is a side view of a torsion spring used for the hinge assembly in FIG. 7a.

DETAILED DESCRIPTION OF THE INVENTION

[0045] The laundry machine according to the embodiments of the present invention will now be described with reference to the accompanying drawings.

[0046] In describing the present invention, if a detailed explanation for a related known function or construction is considered to unnecessarily divert the gist of the present invention, such explanation has been omitted but would be understood by those skilled in the art.

[0047] FIG. 1 is a perspective view schematically showing a laundry machine according to an embodiment of the present invention.

[0048] As shown in FIG. 1, a laundry machine 1 according to an embodiment of the present invention includes: a casing 10, a door 20 installed on one side of the casing 10 to allow the laundry to be received therethrough, a top cover 40 opened and closed by the door 20, an outer tub (not shown) installed within the casing 10, and an inner tub (not shown) rotatably

installed within the outer tub. The outer tub and the inner tub applied to the laundry machine according to the present invention are the same as those of the general laundry machine, so it is not illustrated in detail.

[0049] The top cover 40, where a detergent input hole is formed, is provided at an upper portion of the casing 10 where the door 20 is installed. A certain portion of the door 20 contacts with the top cover 40. A control panel 30 is protrusively formed at a rear portion of an upper surface of the casing 10, allowing selection of an operation course of the laundry machine. The control panel 30 may be formed at a front portion of the upper surface of the casing 10.

[0050] A handle 50 is formed on the door 20 to allow a user to easily open and close the door

[0051] FIG. 2 is a sectional view taken along line II-II in FIG. 1. The door includes the door body 20 and an opening/closing unit 23 formed in the main body 20. A buffering unit 60 is formed at the top cover 40 formed at the casing 10 or at the upper portion of the casing 10 in order to reduce collision between the door body 20 and the casing 10 or between the door body 20 and the top cover 40 formed at the casing 10.

[0052] A roller 28 is formed at a rear portion of the door body 20 adjacent to the top cover 40 in order to allow the door body 20 and the top cover 40 or the door body 20 and the casing 10 to smoothly contact with each other. A stopper 40a is formed at a certain portion of the top cover 40 to prevent the roller 28 from advancing by more than a certain limit when the door body 20 is opened. Preferably, the stopper 40a is formed at the top cover 40, and may be formed at the casing 10 or the door body 20.

[0053] Here, the door body 20 includes a mold product 12 and tempered glass 22 to be engaged with the mold product 21. Preferably, the door body 20 is mostly the tempered glass 22, to allow the user to observe a cleaning state of the laundry with his eyes.

[0054] Preferably, the mold product 21 has a thickness larger than that of the tempered glass 22. Because the door opening/closing unit 23 is mounted in the mold product 21, the mold product 21 needs to have a sufficiently large thickness.

[0055] The buffering unit 60 includes a door contact member 61 that directly contacts with the door body 20 and an elastic member 62 elastically supporting the door contact member 51.

[0056] Here, preferably, the buffering unit 60 including the door contact member 61 and the elastic member 62 is formed to be recessed on the casing 10 or the top cover 40 of the laundry machine 1. If the buffering unit 60 is protruded from the surface of the casing 10 or the top cover 40, the door body 20 may be damaged. Thus, a buffering unit mounting part 41 is formed in the casing 10 or the top cover 40.

[0057] The elastic member 52 may include a coil spring, and without being limited thereto, as the elastic member 62, an elastic member having elasticity such as a plate spring may be also used.

[0058] When the buffering unit 60 is mounted in the buffering unit mounting part 41, a contact sensor 42 may be installed at a portion where the buffering unit mounting part 41 and the door contact member 61 contact with each other, and if the coil spring is used as the elastic member 62, a contact sensor 63 may be installed at the coil spring. With the presence of the contact sensors 42 and 63, even if the door body 20 is unintentionally opened while the laundry machine 1 is operating, the laundry machine 1 can be stopped.

[0059] Here, the contact sensors 42 and 63 may sense whether the door body 20 is opened or not by measuring displacement of the buffering unit 60. Namely, when the door body 20 is closed, the buffering unit 60 or the elastic member 62 contracts and a lower end of the door contact member 61 approaches or contacts with the buffering unit mounting part 41. In this case, the contact sensor 63 may measure the displacement of the elastic member 62, or the contact sensor 42 may measure the distance between the door contact member 61 and the buffering unit mounting part 41 and store the same. Thereafter, when the door body 20 is opened, the elastic member 62 expands to recover its original state, or when the distance between the door contact member 61 and the buffering unit mounting part 41 is increased, the contact sensors 42 and 63 recognize that the door body 20 is in an opened state and stop the operation of the laundry machine.

[0060] As mentioned above, the contact sensors 42 and 63 stop the operation of the laundry machine 1 when the door body 20 is opened regardless of a user intention, to thus serve as a sort of security device for protecting the user, and such security device interworks with the buffering unit 60.

[0061] The security device is not limited to the contact sensors 42 and 63 and any device can be used as the security device so long as it can operate in the same manner as described above.

[0062] FIG. 3 is a sectional view showing one example of a door contact member in FIG. 2.

[0063] As shown in FIG. 3, the door contact member 61 according to an embodiment of the present invention has a cylindrical shape with one end closed. In detail, the door contact member 61 includes a body 61b with a hollow 61a into which the elastic member 62 is inserted. An outer circumferential surface of the body 61b is moved up and down along an inner circumferential surface of the buffering unit mounting part 41. Namely, because the outer circumferential surface of the body 61b contacts with the inner surface of the buffering unit mounting part 41, the outer circumferential surface of the body 61b itself serves to guide the vertical movement of the door contact member 61. If the vertical movement of the door contact member 61 is not guided within the buffering unit mounting part 41, the door contact member 61 would not be properly moved and the door contact member 61 or the buffering unit mounting part 41 would be abraded.

[0064] An air exhausting hole 61d may be formed at a closed upper end of the door contact member 61. As the door contact member 61 is pressed downwardly in the process of closing the door body 20, air present in the hollow 61a can be exhausted through the air exhausting hole 61d, so the door contact member 61 can be smoothly moved owing to the air present in the hollow 61a.

[0065] The door contact member 61 may include the body 61b with the hollow 61a for accommodating the elastic member 62 and a guide portion 61c protruded from the outer circumferential surface of the body 61b and moving up and down along an inner circumferential surface of the buffering unit mounting part 41.

[0066] Preferably, the guide portion 61c may be protruded from the outer circumferential surface of the body 61b and have a sufficient height to serve as a guide within the buffering unit mounting part 41.

[0067] FIG. 4 is a sectional view showing a buffering unit mounting part in FIG. 2. The buffering unit mounting part 41 may be integrally formed with the casing 10 or the top cover 40, or may be formed as a separate part. If the buffering unit

mounting part 41 is formed as a separate part, preferably, it has a cylindrical shape with its lower end closed. In this case, unlike the closed lower end, a flange portion 41a may be extendedly formed at edges of the opened upper end through which the buffering unit is received.

[0068] The flange portion 41a may be made of a material with elasticity different from that of the other remaining part of the buffering unit mounting part 41. When mounted at the casing 10 or the top cover 40, it is effective that the flange portion 41 is protruded from the surface of the casing 10 or the top cover 40 to a degree.

[0069] With the flange portion 41a protruded from the surface of the casing 10 or the top cover 40, the door body 20 may collide with the protruded portion to thus reduce collision between the door body 20 and the casing 10 or the top cover 40.

[0070] Assuming that the inner diameter of the buffering unit mounting part 41 is D3, the outer diameter of the body 61b of the door contact member 61 is D1, and the outer diameter of the guide portion 61c is D2, preferably, without counting the guide portion 61c of the door contact member 61, the outer diameter D1 of the body 61b is substantially the same as the inner diameter D3 of the buffering unit mounting part 41, and with the guide portion 61c counted, the outer diameter D2 of the guide portion 61c and the inner diameter D3 of the buffering unit mounting part 41 are substantially the same.

[0071] As mentioned above, because the inner diameter D3 of the buffering unit mounting part 41 and the outer diameter D1 of the door contact member 61 or the outer diameter D2 of the guide portion 61c are substantially the same, the vertical movement of the door contact member 61 can be guided.

[0072] Here, when the door body 20 is closed, upper corner portions, etc., of the door contact member 61 and the door body 20 contact with each other to abrade or damage the contact portion, so a door interference preventing unit may be formed at the door contact member 61 in order to prevent such abrasion or damage.

[0073] FIG. 5a is a sectional view showing another example of the door contact member in FIG. 3, and FIG. 5b is a sectional view showing still another example of the door contact member in FIG. 3.

[0074] As shown in FIG. 5a, a curved surface portion 61e' is formed at an upper corner of a door contact member 61'. By allowing the door body 20 to first contact with the curved surface portion 61e', the door body 20 and the door contact member 61' can be effectively prevented from being abraded.

[0075] As shown in FIG. 5b, a roller 70 may be formed at a corner of a door contact member 61" which first contacts with the door body 20. In this case, the roller 70 may be rotatably mounted in a roller support 72, and the roller support 72 may be mounted in a roller mounting part 71 formed to be recessed at the corner of the door contact member 61".

[0076] An elastic support member, such as a spring 73, etc., may be formed between the roller support 72 and the roller mounting part 71.

[0077] The mounting structure of the roller 70 as shown in FIG. 5b shows one example, and the roller 70 may be mounted in any other forms.

[0078] FIGS. 6a to 6c are projective perspective views showing operation states of the buffering unit according to an opening degree of the door. Specifically, FIG. 6a is a perspective view showing a state that a door is completely closed, FIG. 6b is a perspective view showing a state that the door is

opened to a degree, and FIG. 6c is a perspective view showing a state that the door is completely opened.

[0079] The buffering unit or the security device interworking with the buffering unit can be applicable to various other products such as a dish washer or dryer, as well as the laundry machine.

[0080] FIGS. 7a to 7c are views showing various forms of a hinge assembly for reducing an impact when the door is closed while being connected to the top cover. Specifically, FIG. 7a is a perspective view showing one example of a hinge assembly according to the present invention, FIG. 7b is a perspective view showing another example of a hinge assembly according to the present invention, and FIG. 7c is a perspective view showing still another example of a hinge assembly according to the present invention.

[0081] With reference to FIG. 7a, a hinge assembly 150 includes a cylindrical body part 151, a top cover mounting part 152 formed at both ends of the body part 151 along a lengthwise direction, and a door mounting part 153.

[0082] Preferably, the top cover mounting part 152 has a diameter smaller than that of the door 153, because the top cover 40 where the top cover mounting part 152 is mounted is formed as a thin plate, compared with the door 20 where the door mounting part 153 is mounted.

[0083] The top cover mounting part 152 or the door mounting part 153 is advantageously made of metal, but as shown in FIG. 7c, the top cover mounting part or the door mounting part of a hinge assembly 150" may be made of plastic.

[0084] With reference to FIG. 7b, a hinge assembly 150' has a polygonal body part having a larger diameter compared with the hinge assembly as shown in FIG. 7a or FIG. 3c.

[0085] Among the various types of hinge assemblies as described above, an optimum one may be selected in consideration of the thickness of the door or the portion where the door is mounted or depending on whether or not a mounting space is secured.

[0086] The operation mechanisms of the hinge assemblies 150, 150" and 150'" are similar to each other, so only the hinge assembly 150 as shown in FIG. 7a will be described hereinafter.

[0087] One of the top cover mounting part 152 and the door mounting part 153 of the hinge assembly 150 is rotatable while the other is not. Accordingly, either one of different parts connected with the both sides of the hinge assembly 150 may be rotatably moved based another part.

[0088] In this case, which one of the top cover mounting part 152 and the door mounting part 153 would be rotated can be determined in consideration of the operational direction of the elastic force and restoring force of the torsion spring or the elastic member installed within the hinge assembly 150.

[0089] FIG. 8a is a sectional view taken along line IV-IV in FIG. 7a, FIG. 8b is a left sectional view of the hinge assembly in FIG. 7a, and FIG. 8c is a right sectional view of the hinge assembly in FIG. 7a.

[0090] With reference to FIG. 8a, the hinge assembly 150 includes the hollow body part 151 and an elastic member mounted therein. In this case, preferably the elastic member is a torsion spring because the strength of the hinge assembly 150 can be easily controlled by changing the number of windings or the thickness of the coil.

[0091] The body part 151 may be formed of metal such as stainless steel, and it would be effective to form the body part 151 as a sinter for a mass-production.

[0092] As mentioned above, because the top cover 40 is made of a thin steel panel, a space for mounting the hinge assembly 150 is not sufficient. With this situation considered, it would be advantageous in that the diameter of the top cover mounting part 152 of the hinge assembly 150 mounted on the top cover 40 is sufficiently small.

[0093] In addition, a torsion spring support 155 may be additionally formed in the body part 151 to support the torsion spring 154. As the opening and closing operation of the door 140 is repeated, the torsion spring 154 may have a bad influence on the opening and closing operation of the door 20 while it is moved within the body part 151. Thus, in order to prevent such bad influence, the torsion spring 155 may be provided within the body part 151.

[0094] Here, preferably, the diameter or the size of the torsion spring support 155 is the same as or similar to that of the top cover mounting part 152 for convenience of mounting and dismounting.

[0095] If the door 20 is made of heavy tempered glass, the diameter of the body part 151 of the hinge assembly 150 should be 15 mm or greater to tolerate momentum generated when the door 20 is closed. If the diameter of the body part 151 is smaller than 15 mm, a bracket (not shown) may be installed at the circumference of the body part 151 to reinforce the strength of the hinge assembly 150.

[0096] FIG. 9 is a side view of the torsion spring used for the hinge assembly in FIG. 7a. With reference to FIG. 9, both ends 154a and 154b of the torsion spring 154 are protruded so as to be fixed at an inner side of the top cover mounting part 152 or the door mounting part 153.

[0097] As mentioned above, the hinge assembly using the torsion spring can be suitable for the laundry machine that receives the laundry by using the thin platy top cover.

[0098] As the present invention may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

1. A laundry machine comprising:

- a casing;
- a door installed on an upper surface of the casing;
- a top cover opened and closed by the door;
- a tub installed within the casing; and
- a buffering unit to buffer an impact when the door is closed, wherein the buffering unit comprises:
 - a door contact member that contacts with the door when the door is closed; and
 - an elastic member that supports the door contact member, wherein a buffering unit mounting part to accommodate the buffering unit is formed at the upper surface of the casing.

2. The machine of claim 1, wherein the door contact member comprises a body with a hollow in which the elastic member is insertedly positioned, and an outer circumferential surface of the body moves up and down along an inner surface of the buffering unit mounting part.

3. The machine of claim 1, wherein the door contact member comprises a body with a hollow to accommodate the elastic member therein, and a guide portion protruded from an

outer circumferential surface of the body and moving up and down along an inner surface of the buffering unit mounting part.

4. The machine of claim 1, wherein an air exhausting hole is formed on one surface of the door contact member.

5. The machine of claim 1, wherein the elastic member is a spring compressed as the door is closed.

6. The machine of claim 1, wherein a door interference preventing unit for preventing frictional contact of the door is formed at a corner of the door contact member that contacts with the door.

7. The machine of claim 6, wherein the door interference preventing unit is a curved part formed at the corner of the door contact member.

8. The machine of claim 6, wherein the door interference preventing unit is a roller formed at the corner of the door contact member.

9. The machine of claim 1, further comprising:
a safety unit interworking with the buffering unit and stopping the operation of the laundry machine when the door is opened.

10. The machine of claim 9, wherein the safety unit senses whether or not the door is opened by measuring displacement of the buffering unit.

11. The machine of claim 10, wherein the safety unit is a contact sensor installed at the spring.

12. The machine of claim 1, further comprising:
a hinge assembly that connects the door to the top cover and includes a torsion spring.

13. The machine of claim 12, wherein one end of the hinge assembly is fixed and the other end of the hinge assembly is rotatable.

14. The machine of claim 13, wherein the hinge assembly comprises:

a hollow body part; and
an elastic member installed within the body part.

15. The machine of claim 14, wherein both sides of the body part have each different diameter.

16. The machine of claim 14, wherein the body part is a sinter.

17. The machine of claim 14, wherein the body part comprises a bracket to reinforce the strength.

18. The machine of claim 12, wherein a stopper is formed on at least one of the top cover or the door in order to restrict an opening degree of the door.

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