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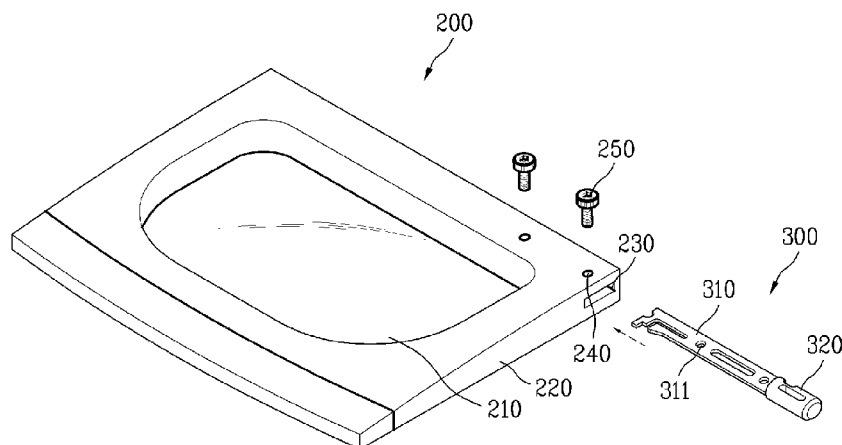
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(54) Title: WASHING MACHINE

[Fig. 4]



(57) Abstract: A washing machine is disclosed. A washing machine includes a top cover at which an opening is formed, a lid hingedly coupled to the top cover, the lid opening and closing the opening, and a hinge member comprising a coupling part of a plate shape coupled to the lid and a hinge part of a cylinder shape hingedly coupled to the top cover, wherein a slot is provided at the hinge part. An object of the present invention is to provide a washing machine capable of improving a structure of a hinge member and to prevent damage of a top cover or lid which might be generated during the opening/closing of the top.

Description

WASHING MACHINE

Technical Field

- [1] The present invention relates to a washing machine. More particularly, the present invention relates to a washing machine capable of improving a structure of a hinge member rotatably coupling a lid to a top cover and preventing crack of the lid or top cover accordingly.

Background Art

- [2] Washing machines are electric home appliances which removes various contaminants attached to clothes, cloth items, beddings (hereinafter, laundry), using both friction of water currents generated by rotation of a pulsator and shock applied to laundry by the pulsator.
- [3] A conventional washing machine typically includes a cabinet, a top cover coupled to a top of the cabinet and a lid hingedly secured to the top cover to open and close an opening formed at the top cover.
- [4] FIG. 1 is an exploded perspective view illustrating a top cover 1, a lid 10 and a hinge member 20 coupling the top cover 1 with the lid 10. FIG. 2 is an enlarged view illustrating the hinge member 20.
- [5] In reference to FIGS. 1 and 2, the lid 10 of the conventional washing machine includes an insertion hole 11 and a coupling hole 12. The insertion hole 11 is formed at a side portion of the lid 10 and the hinge member 20 is inserted in the insertion hole 11. A coupling member 15 passes through the coupling hole 12 for the hinge member 20 to be coupled to the lid 10 securely in a state of being inserted in the insertion hole 11.
- [6] The hinge member 20 includes a coupling part 21 and a hinge part 25. The coupling part 21 is inserted in the insertion hole 11 to be coupled thereto. The hinge part 25 is provided at a predetermined portion of the coupling part 21 and it rotates about the top cover 1.
- [7] The coupling part 21 is rectangular-plate-shaped and it is formed at a position, corresponding to the coupling hole 12 formed at the lid 10 when inserted in the insertion hole 11 of the lid 10. Here, the coupling part 21 includes a through hole 22 through which the coupling member 15 passes.
- [8] The hinge part 25 is cylinder-shaped for the lid 10 coupled thereto by the coupling member 20 to rotate relatively with respect to the top cover 1.
- [9] The lid 10 is seated on the top cover 1 and a lid seating surface 2 is recessed at the top cover 1 to a predetermined depth to seat the lid 10 thereon. Here, the recessed

depth of the lid seating surface 2 is identical to the thickness of the lid 10 such that an upper surface of the top cover 1 may be formed smooth when the lid 10 is closed.

- [10] A user should lift the lid 10 to open the lid 10 and the lid 10 rotates about the hinge member 20.

Disclosure of Invention

Technical Problem

- [11] However, if the user takes off his/her hands from the lid 10, the lid 10 will fall a predetermined height. If the lid 10 falls only to be bumped into the top cover 1, the force corresponding to the weight of the lid 10 is applied to the hinge member 20 and the force applied to the hinge member 20 is transmitted to the top cover 1.

- [12] When the user drops the lid 10 free to close, crack might be generated at the lid or the top cover 1.

- [13] The reason why the crack is generated at the lid or top cover 1 is that the shock applied to the hinge member 20 is transmitted directly to the lid 10 or top cover 1 because the hinge member 20 is designed to improve only strength.

Technical Solution

- [14] Accordingly, the present invention is directed to a washing machine.

- [15] An object of the present invention is to provide a washing machine capable of improving a structure of a hinge member and to prevent damage of a top cover or lid which might be generated during the opening/closing of the top.

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

- [17] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a washing machine includes a top cover at which an opening is formed; a lid hingedly coupled to the top cover, the lid opening and closing the opening; and a hinge member comprising a coupling part of a plate shape coupled to the lid and a hinge part of a cylinder shape hingedly coupled to the top cover, wherein a slot is provided at the hinge part.

- [18] The slot may be substantially perpendicular to the coupling part.

- [19] The slot may be formed horizontally along a longitudinal direction of the hinge part.

- [20] A cut part may be provided at the hinge part, the cut part formed by cutting a portion of a circumferential surface of the hinge part.

- [21] The cut part may be formed by cutting the portion with a predetermined length from

a border between the coupling part and the hinge part.

[22] The length of the slot may be substantially three or four times of the length between the slot and an end of the hinge part.

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

Brief Description of Drawings

[24] The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the disclosure and together with the description serve to explain the principle of the disclosure. In the drawings:

[25] FIG. 1 is an exploded perspective view illustrating a lid and top cover of a conventional washing machine;

[26] FIG. 2 is a plane view illustrating a hinge member hingedly coupling the lid with the top plate shown in FIG. 1;

[27] FIG. 3 is a perspective view illustrating a washing machine according to an exemplary embodiment of the present invention;

[28] FIG. 4 is a perspective view illustrating a lid and a hinge member of the washing machine shown in FIG. 3;

[29] FIGS. 5 to 11 are plane views illustrating hinge members of experimental groups 1 to 7, respectively; and

[30] FIG. 12 is a table of shock values measured through experiments of applying shock to the top cover, lid and hinge member when the hinge members of experimental groups 1 to 7.

Best Mode for Carrying out the Invention

[31] Reference will now be made in detail to the specific embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[32] FIG. 3 is a perspective view schematically illustrating a washing machine according to an exemplary embodiment of the present invention.

[33] As shown in FIG. 3, a washing machine 100 provided with a hinge assembly according to an exemplary embodiment includes a cabinet 110, a top cover 120, a tub 130 and a leg 140. The cabinet 110 defines an exterior appearance of the washing machine and various parts of the washing machine 100 may be mounted in the cabinet 110. The top cover 120 is placed on a top of the cabinet 110. The tub 130 is installed in the cabinet 110 and laundry to wash is received in the tub 130. The leg 140 is attached

to a lower surface of the cabinet 110 and it prevents the washing from tumbling and maintains the washing machine to be leveled.

[34] The top cover 120 includes an opening 121 and a control panel 122. The opening 121 is formed at a center of the top cover and a user may load the laundry into the tub 130 through the opening 121. The control panel 122 is provided on a predetermined portion of the top cover 120. At the control panel 122 are provided a display part displaying an operational state of the washing machine and a button part for the user to input a washing condition. In addition, a detergent box 125 is provided at an inner rear surface of the top cover 120 to supply detergent or fabric softener to the laundry received in the tub 130 and the detergent box 125 is connected with a water supply hose such that the detergent received in the detergent box 125 and water may be mixedly supplied to the tub 140.

[35] A lid 200 is hingedly coupled to a top of the top cover 120.

[36] As shown in FIG. 4, the lid 200 includes glass 210 formed of transparent material and a frame 220 having a seating surface where the glass 210 is seated. The transparent glass 210 allows the user to look into the tub 130 conveniently. The glass 210 has a convex shape with a bulging center portion and thus wash water dropped at an inner upper surface of the lid 200 can flow along a rim thereof.

[37] A lid seating part 123 is formed in the top cover 120 and the lid seating part 123 is recessed inward to a predetermined height for the lid 200 to be seated in. the height of the lid seating part 123 is substantially identical to the height of the lid 200. As a result, when the lid 200 is seated in the lid seating part 123, an upper surface of the top cover 120 and an upper surface of the lid 200 are high to be level.

[38] Next, an operation of the washing machine according to the exemplary embodiment of the present invention will be described.

[39] The user turns on the washing machine 100 and lifts the lid 200 upward to open the opening 121. Then, the user loads the laundry into the tub 130 through the opening 121 and puts the lid 200 downward to close the opening 121. Hence, if the user inputs a corresponding washing condition at the control panel 122 and pushes a start button, the washing machine 100 is put into operation according to the input condition.

[40] After washing and dry-spinning cycles, the user lifts the lid 200 again to open the opening 121 and unloads the washed laundry. Then, the user puts the lid 200 down again and closes the opening 121.

[41] Next, in reference to FIG. 4 will be described a hinge member 300 coupling the lid 200 to the top cover 120 for the lid 200 to open and close the top cover 120 and the coupling structure between the lid 200 and the hinge member 300.

[42] The lid 200 includes an insertion hole 230 and a coupling hole 240 and both are provided at a side portion of the lid 200. The hinge member 300 is inserted in the

insertion hole 230 and a coupling member 250 passes through the coupling hole 240 for the hinge member 300 being inserted in the insertion hole 230 to be securely coupled with the lid 200.

- [43] The hinge member 300 includes a coupling part 310 and a hinge part 320. The coupling part 310 is inserted in the insertion hole 210 of the lid 200 and the hinge part 320 rotates with respect to the top cover 120.
- [44] The coupling part 310 of the hinge member 100 is rectangular plate shaped. Because of that, if the lid 200 is rotated after the coupling part 310 is inserted in the insertion hole 230, the hinge member 30 is rotated together with the lid 200.
- [45] A through hole 311 is provided at a portion of the coupling part 310 which is corresponding to the coupling hole 240 formed at the lid 200 and the coupling member 250 passes through the through hole 311.
- [46] The hinge part 320 is hinge securing part 127 formed at the top cover 120 such that the lid 200 coupled to the hinge member 300 may be rotated relatively with respect to the top cover 120.
- [47] The user typically lets the hands holding the lid 200 off from the lid 200. If then, the lid 200 is dropped a predetermined height and a shock corresponding to the weight of the lid 200 is transmitted to the hinge member 300 and the shock transmitted to the hinge member 300 is transmitted to the lid 200 and the top cover 120.
- [48] The inventor has studied the hinge member 300 having a structure capable of minimizing damage of the lid 200 or the top cover 120 because of the shock generated when the user closes the lid 200. the inventor found out that the conventional hinge member is fabricated only to improve the strength and that the lid 200 or top cover 120 could damage because of the shock transmitted to the lid or the top cover 120 again after having been transmitted to the hinge member 200, which is generated when the lid 200 collides against the top cover 120, accordingly.
- [49] The inventor has been studied the structure of the hinge member 300 capable of minimizing the damage of the lid 200 or top cover 120, especially, has experimented various types of the hinge part 320 to increase the elasticity of the hinge part 320.
- [50] In the experiment performed by the inventor, the conventional hinge member 20 shown in FIG. 2 will be categorized as a control group and seven different hinge members 300 having different shapes of hinge parts 320 shown in FIGS. 5 to 11 will be categorized as experimental group.
- [51] When the hinge member 300 of each experimental group is used in the washing machine 100, the shock applied to the lid 200, the top cover 120 and the hinge member 300 is measured.
- [52] A specific method of the experiment will be explained.
- [53] The experimenter opens and closes the lid repeatedly to suppose that the user opens

and closes the lid 200. Here, the lid 200 in a state of being open is rotated and bumped against the top cover 120, which almost identical to the case in that the user lets his/her hands off from the lid 200. To make experimental conditions identical, the experimenter is changed every 100 times. After repeating the 100 times of opening/closing the lid 200, average values of the shock applied to the lid 200, the top cover 120 and the hinge member 300 are calculated.

[54] The inventor of the present invention performed the experiments, changing three elements to increase the elasticity of the hinge part 320.

[55] First, a slot 321 is provided at the hinge part 320 to increase the elasticity of the hinge part 320. The slot 321 is formed through the hinge part 320, substantially perpendicular to a plane formed by the coupling part 310, and it is formed horizontally in a longitudinal direction of the hinge part 320.

[56] Second, a cut part 322 is provided at the hinge part 320 and a predetermined portion of the hinge part 320 is cut to increase the elasticity of the hinge part 320. The cut part 322 is substantially perpendicular to the plane formed by the coupling part 310. In addition, the cut part 322 is formed by cutting some portion from a border between the coupling part 310 and the hinge part 320 to a predetermined length.

[57] Third, the length of the hinge part 320 is increased to increase the elasticity of the hinge part 320. The length of the hinge part 25 included in the control group is 11.5mm and the length of the hinge part 320 included in the experimental group is 14.5mm, which is increased as much as 3mm.

[58] The seven experimental groups are fabricated, changing at least one of the three elements.

[59] The experimental group 1 shown in FIG. 5 includes the slot 321, not changing the other elements.

[60] The experimental group 2 shown in FIG. 6 includes the cut part 322, not changing the other elements.

[61] The experiments group 3 shown in FIG. 7 includes both of the slot 321 and the cut part 322 formed simultaneously, not changing the length of the control group.

[62] The experiment group 4 shown in FIG. 8 has the increased length.

[63] The experiment group 5 shown in FIG. 9 includes the slot 321, simultaneously with the increased length. Here, the length of the stop (A) is three or four times of the length from the slot 321 to an end of the hinge part 320.

[64] The experiment group 6 shown in FIG. 10 includes the cut part 320, simultaneously with the increased length.

[65] The experiment group 7 shown in FIG. 11 includes both of the slot 321 and the cut part 322, with the increased length.

[66] FIG. 12 shows the values of the shock transmitted to the top cover 120, the lid 200

and the hinge member 300, when each hinge member according to the control group and the experimental groups is applied to a washing machine and when the lid 200 is dropped and collided against the top cover 120.

[67] The shock transmitted to the lid 200 is reduced but the shock transmitted to the top cover 120 is increased in the experiment group 1, compared with the control group.

[68] The shock transmitted to the lid 200 is reduced but the shock transmitted to the top cover 120 is increased in the experiment group 2, compared with the control group.

[69] The shock transmitted to the lid 200 is reduced but the shock transmitted to the top cover 120 is increased in the experiment group 3 also, compared with the control group.

[70] Both the shock transmitted to the lid and the shock transmitted to the top cover 120 are reduced simultaneously in the experimental group 4, compared with the control group.

[71] Both the shock transmitted to the lid and the shock transmitted to the top cover 120 are reduced simultaneously in the experimental group 5, compared with the control group.

[72] The shock transmitted to the lid 200 is reduced but the shock transmitted to the top cover 120 is increased in the experimental group 6, compared with the control group.

[73] Both the shock transmitted to the lid and the shock transmitted to the top cover 120 are reduced simultaneously in the experimental group 7, compared with the control group.

[74] In reference to the experimental groups 1 to 7, the experimental groups 4, 5 and 7 are ones having the shock transmitted to the lid 200 and the shock transmitted to the top cover reduced simultaneously. Among these three groups, the experimental group 7 has the least shocks transmitted to the lid 200 and the top cover 120.

[75] The inventor finds out that the hinge member 300 of the experimental group 7 is the most proper one to reduce the shocks transmitted to the lid and the top cover 120.

[76] That is, the length of the cylindrical hinge part 320 is increased 3mm from 11.5mm to 14.5mm and both of the slot 321 and the cut part 322 are formed at the hinge part 320.

[77] As mentioned above, according to the washing machine 100 adapting the hinge member 300 of the present invention, the shock received by the lid 200 and the top cover 120 may be reduced and damage of the lid 200 and the top cover 120 may be prevented accordingly, even if the user drops the lid 200 to close the opening 121 of the top cover 120.

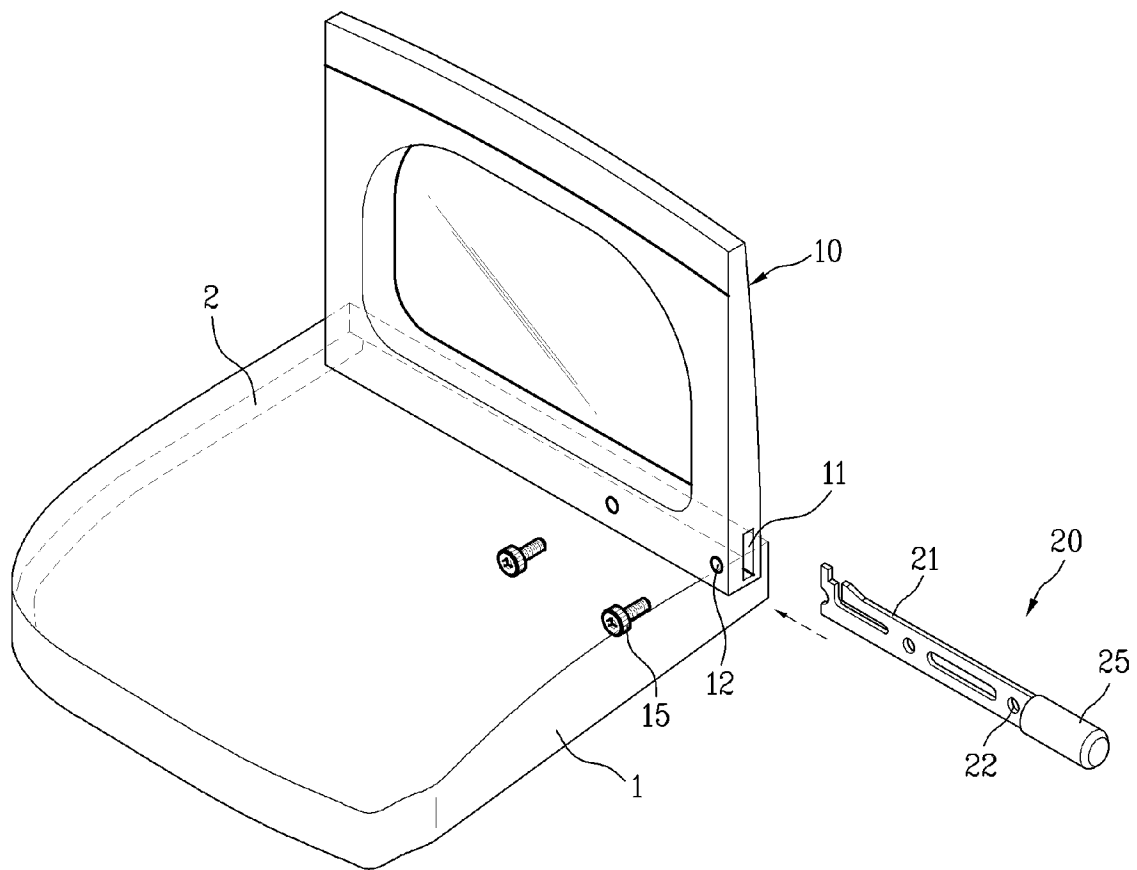
[78] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and

variations of this invention provided they come within the scope of the appended claims and their equivalents.

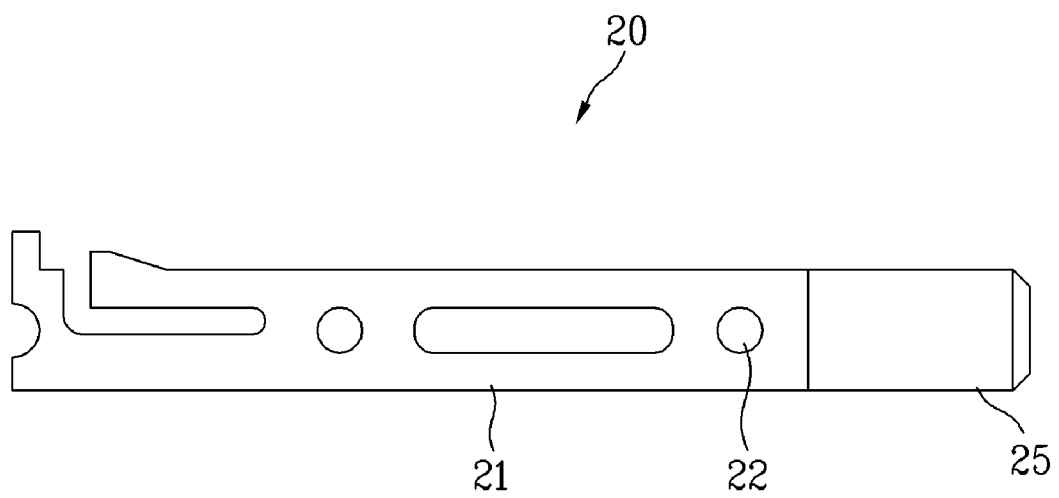
Claims

- [1] A washing machine comprising:
a top cover at which an opening is formed;
a lid hingedly coupled to the top cover, the lid opening and closing the opening;
and
a hinge member comprising a coupling part of a plate shape coupled to the lid
and a hinge part of a cylinder shape hingedly coupled to the top cover, wherein a
slot is provided at the hinge part.
- [2] The washing machine of claim 1, wherein the slot is substantially perpendicular
to the coupling part.
- [3] The washing machine of claim 2, wherein the slot is formed horizontally along a
longitudinal direction of the hinge part.
- [4] The washing machine of claim 1, wherein a cut part is provided at the hinge part,
the cut part formed by cutting a portion of a circumferential surface of the hinge
part.
- [5] The washing machine of claim 4, wherein the cut part is formed by cutting the
portion with a predetermined length from a border between the coupling part and
the hinge part.
- [6] The washing machine of claim 1, wherein the length of the slot is substantially
three or four times of the length between the slot and an end of the hinge part.

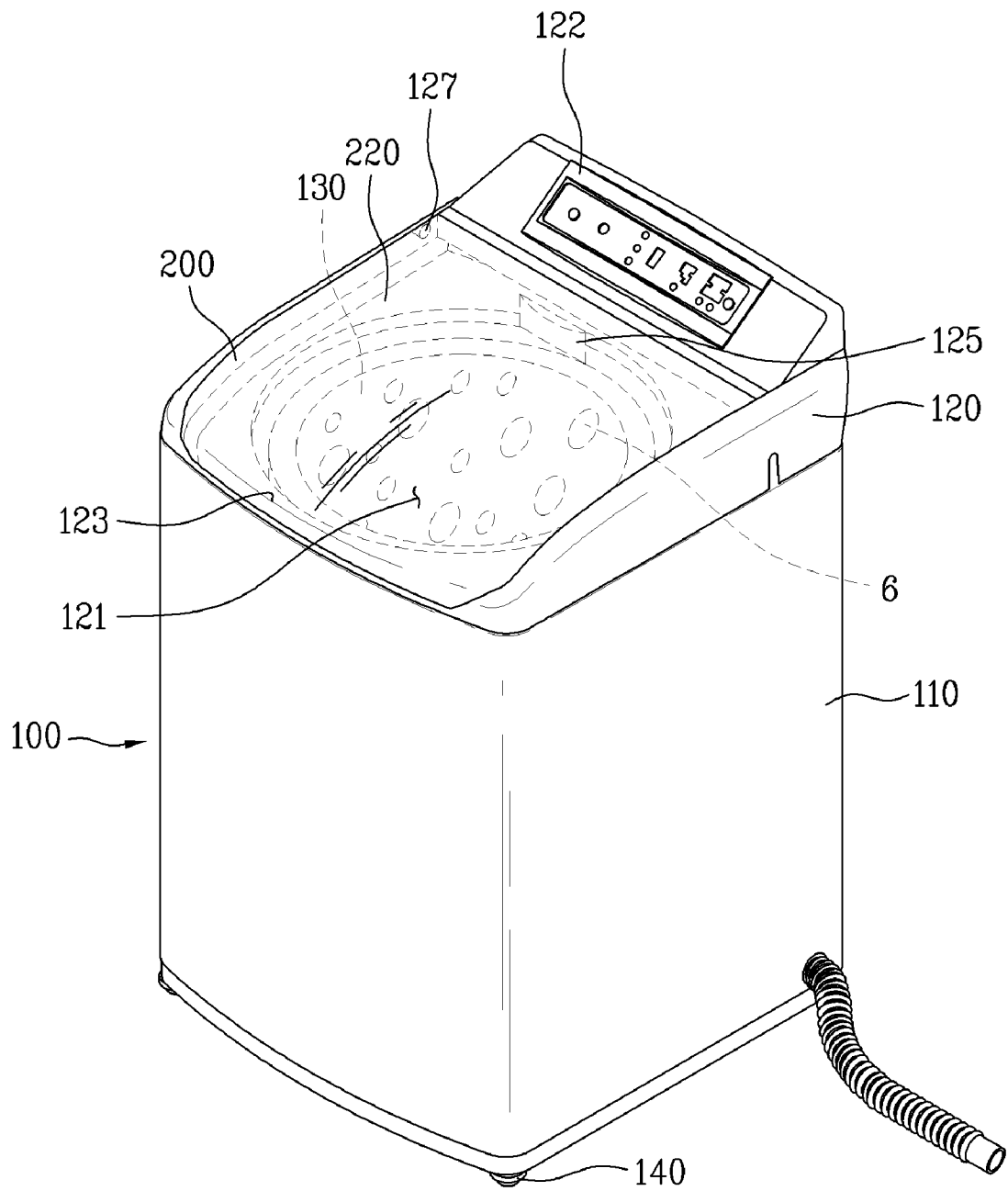
[Fig. 1]



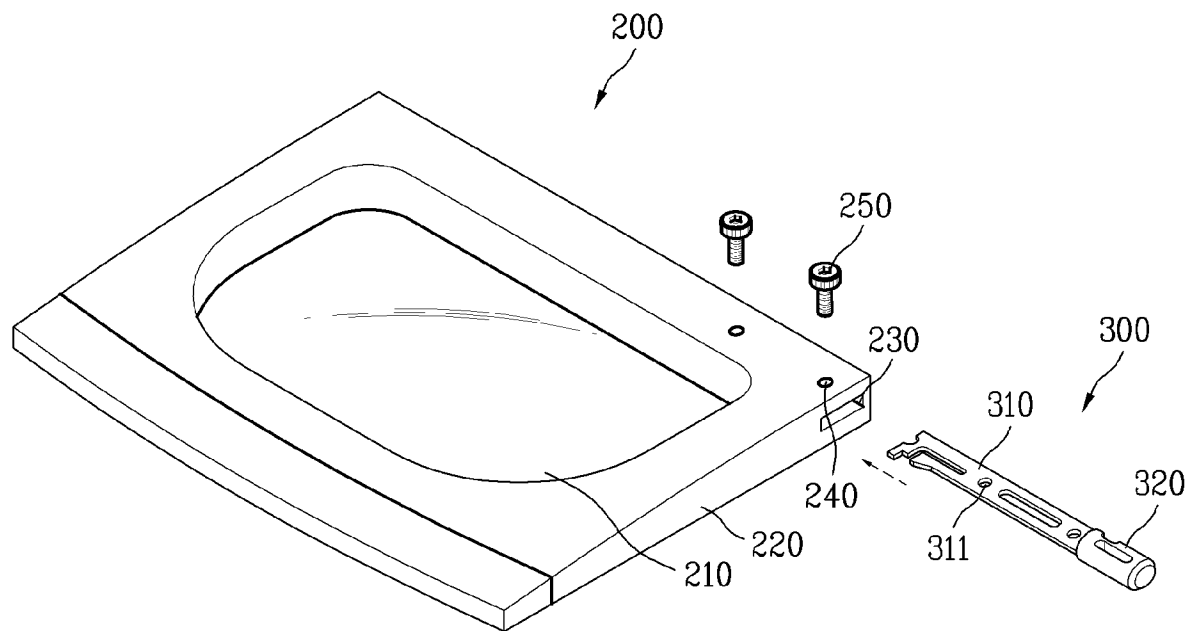
[Fig. 2]



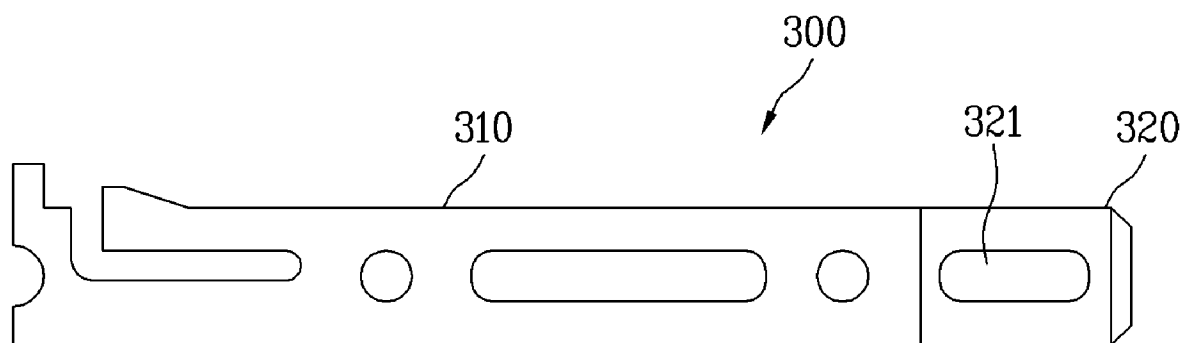
[Fig. 3]



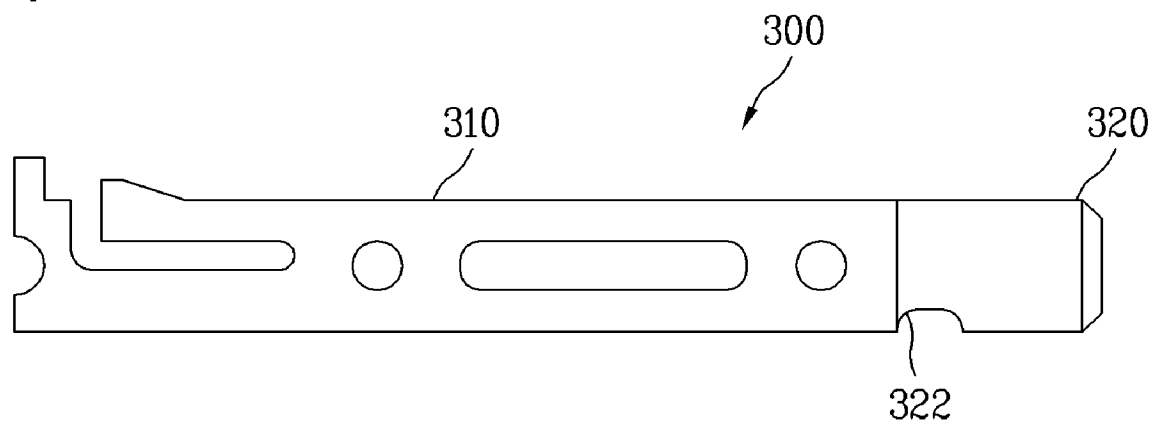
[Fig. 4]



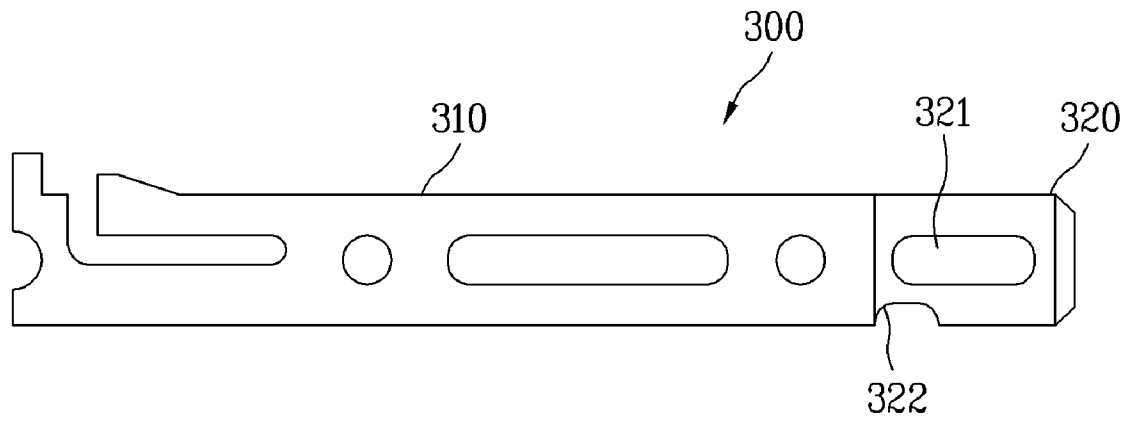
[Fig. 5]



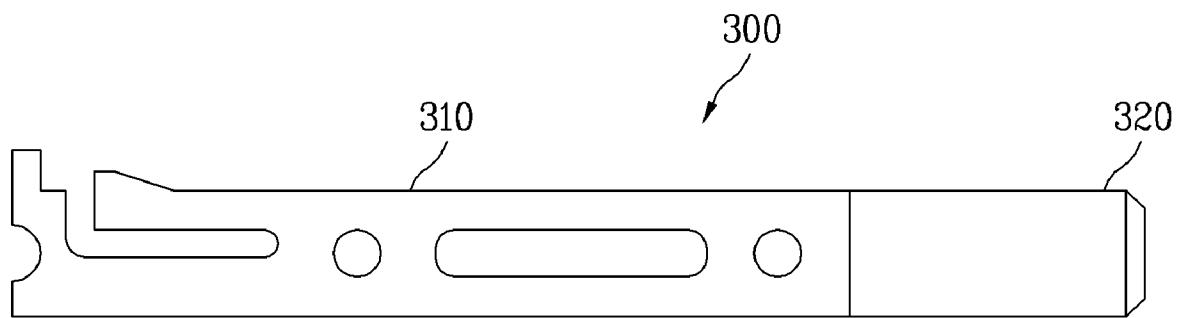
[Fig. 6]



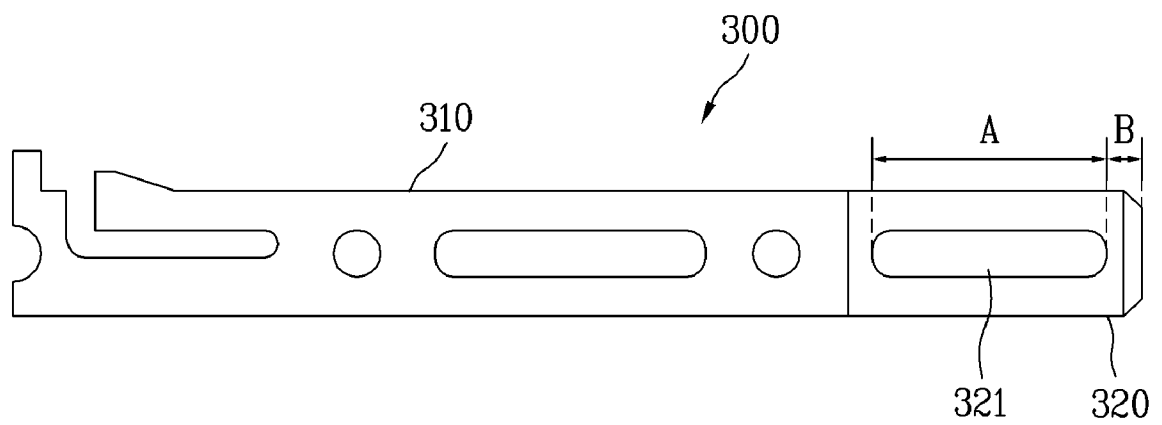
[Fig. 7]



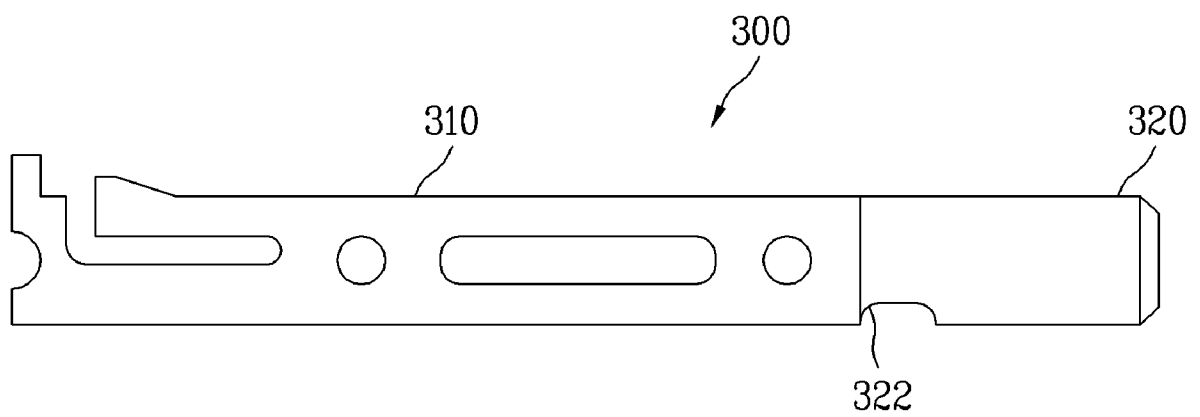
[Fig. 8]



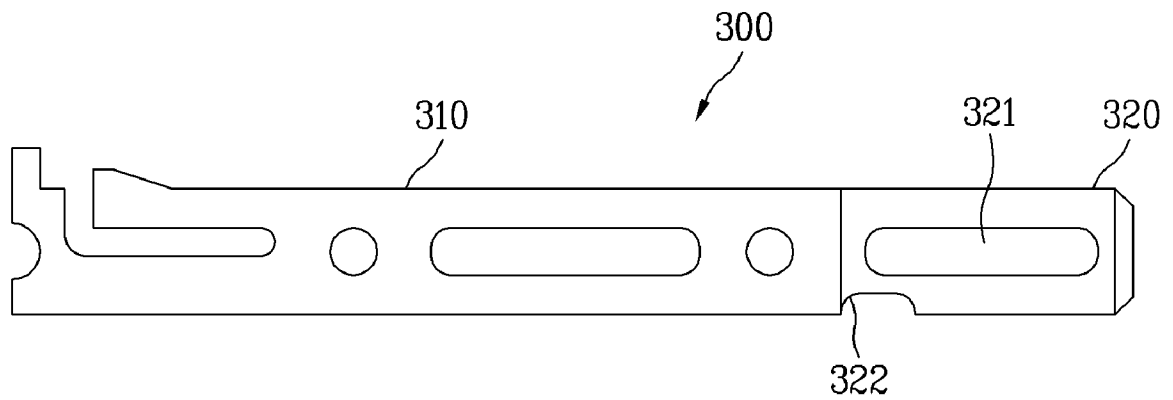
[Fig. 9]



[Fig. 10]



[Fig. 11]



[Fig. 12]

[UNIT kgf/mm²]

Control group / Experimental group	Top cover	Lid	Hinge
Control group	3.72	0.66	2.55
Experimental group 1	4.31	0.57	6.27
Experimental group 2	4.53	0.51	3.55
Experimental group 3	4.29	0.55	4.73
Experimental group 4	3.38	0.53	2.58
Experimental group 5	3.29	0.58	2.29
Experimental group 6	4.82	0.49	5.53
Experimental group 7	3.03	0.51	4.55