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(54) WASHING MACHINE USING BLDC MOTOR

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(57) ABSTRACT

A washing machine using a BLDG motor is disclosed. The washing machine having a brushless DC motor for rotating a tub includes a case, a dynamic braking resistor, mounted with respect the case, producing heat energy when the brushless DC motor is braked, and a mount, coupled to the case and the dynamic braking resistor, for impeding a transfer of the heat energy of the dynamic braking resistor to the case.

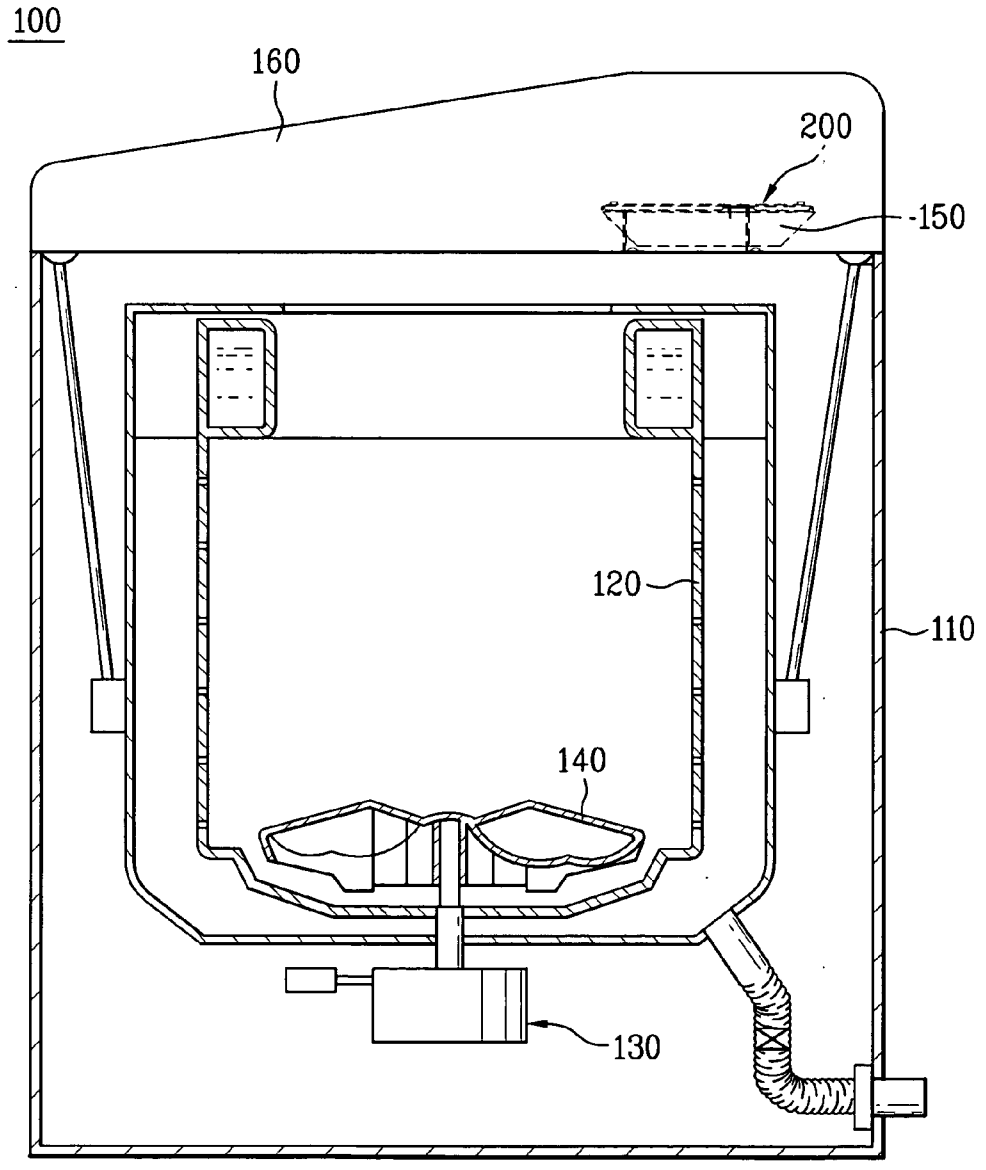


FIG. 1
Related Art

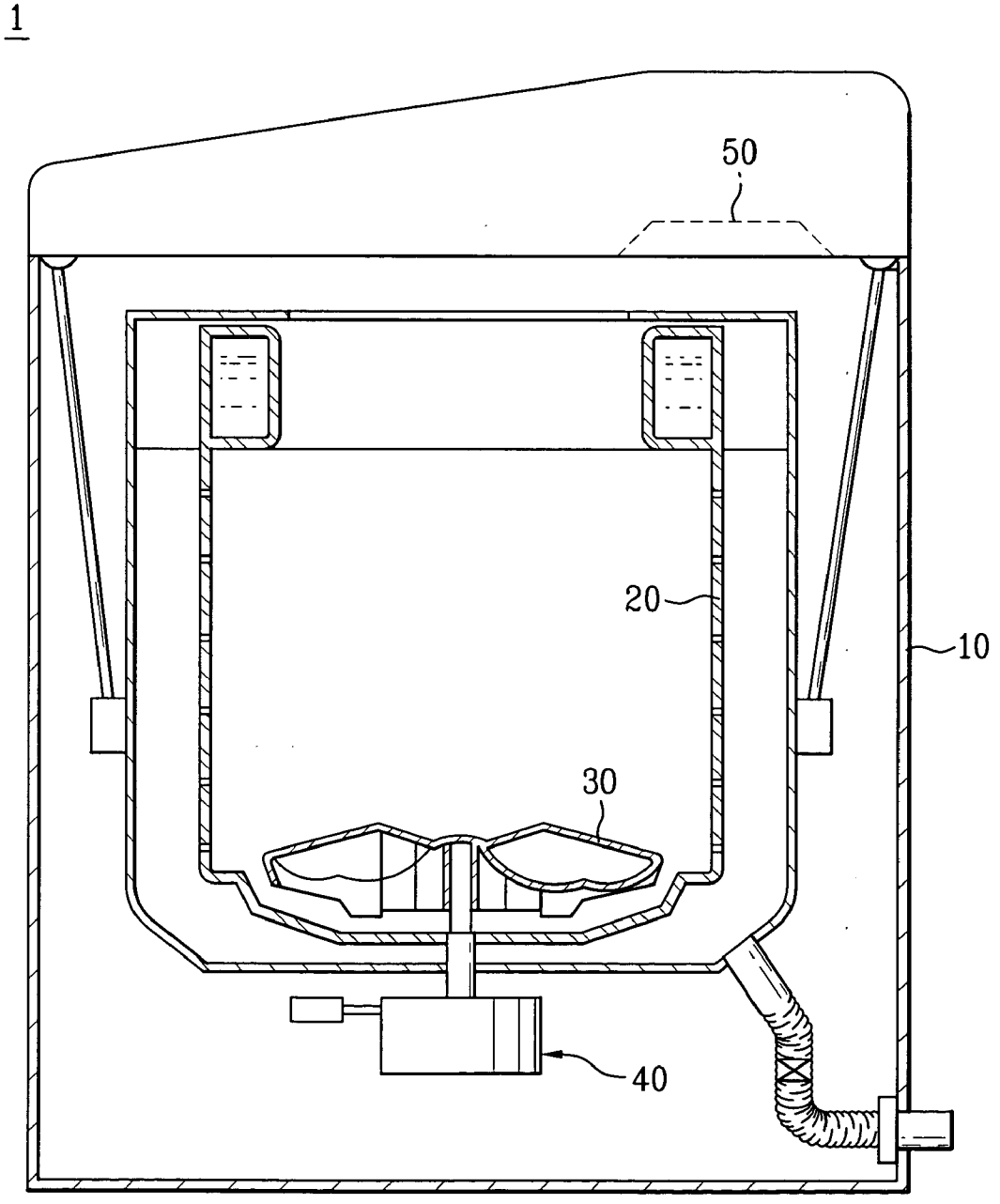


FIG. 2

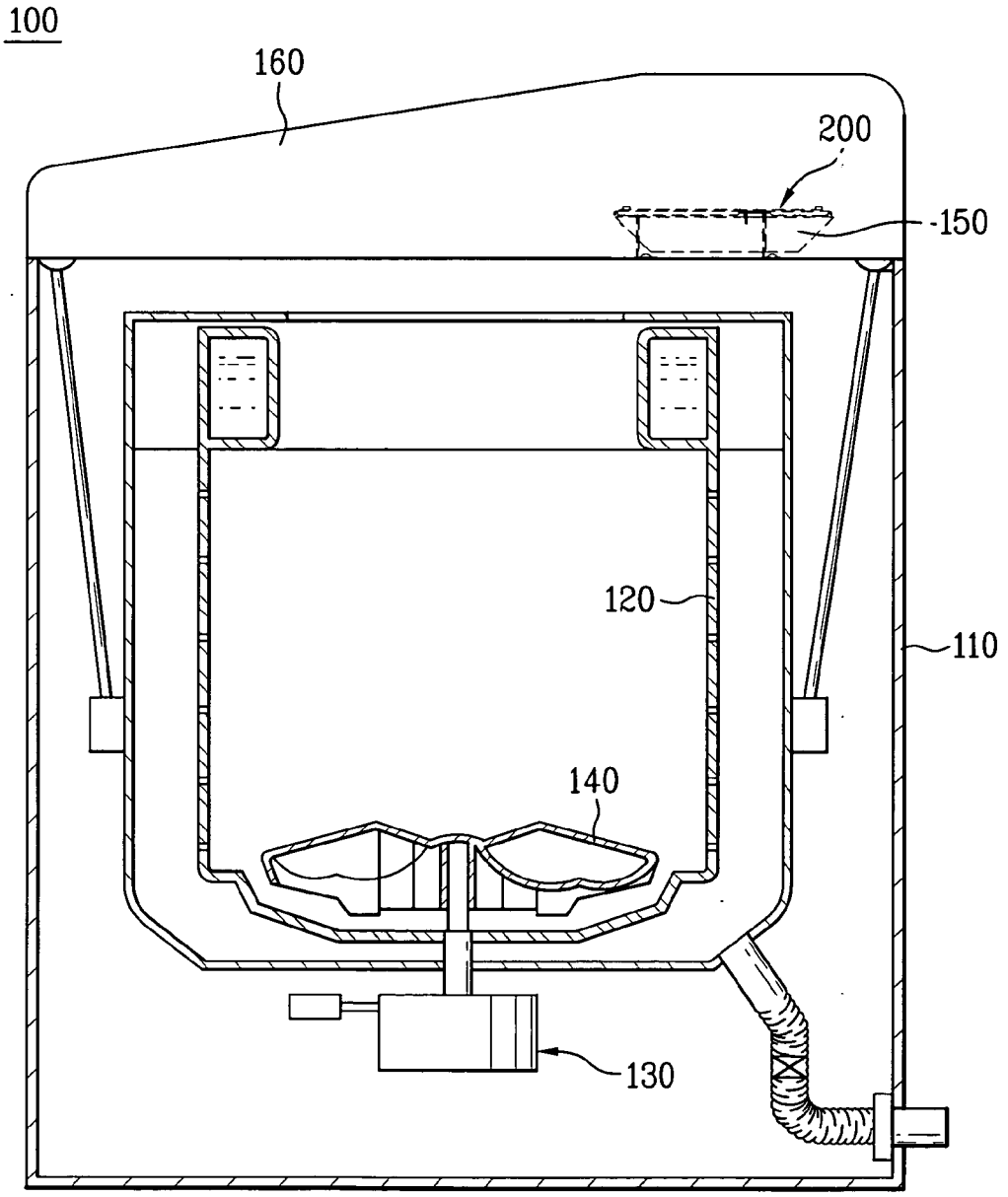


FIG. 3

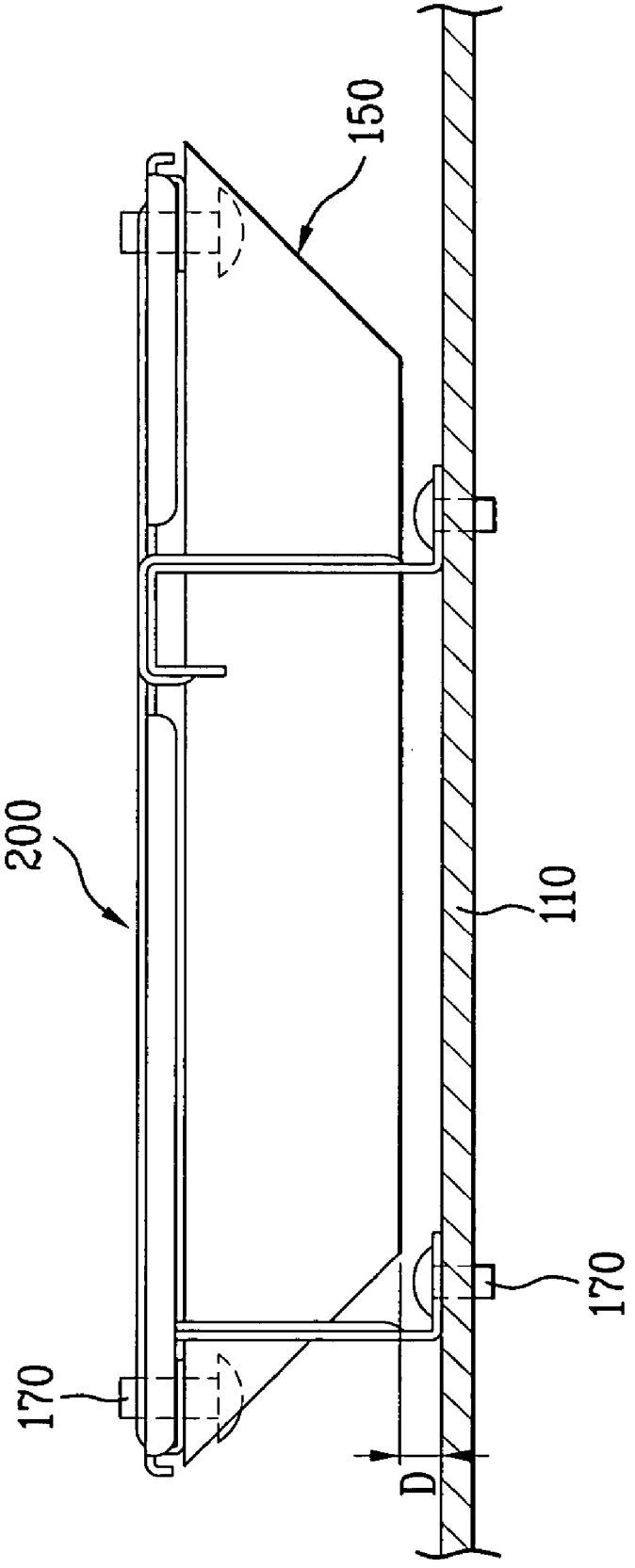
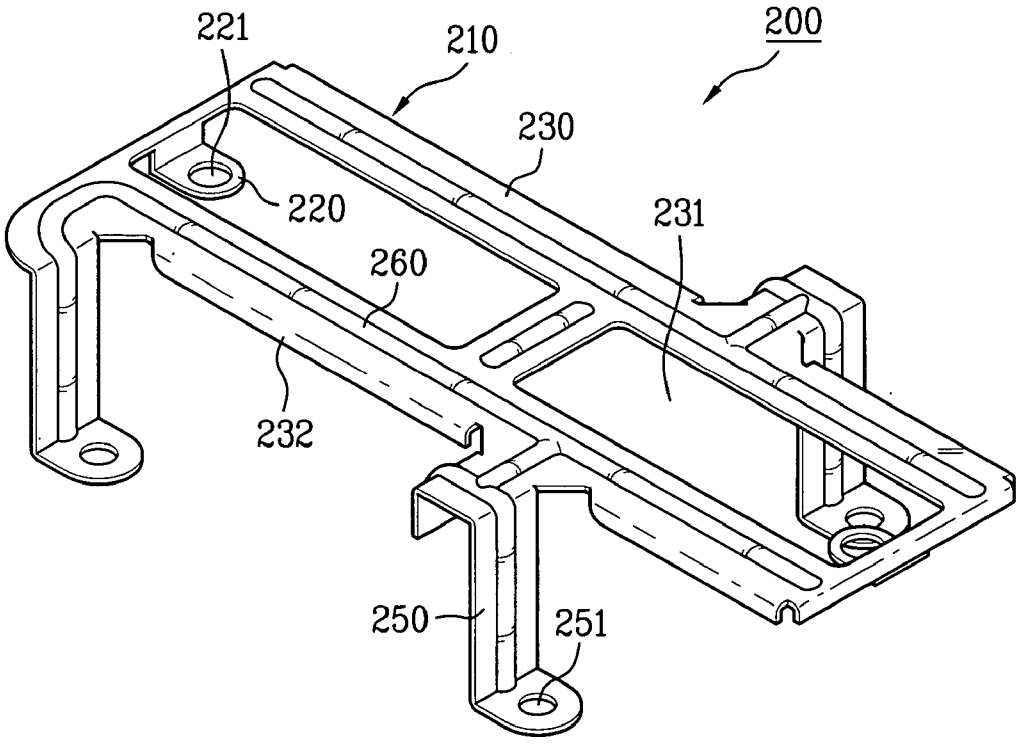


FIG. 4



WASHING MACHINE USING BLDC MOTOR

[0001] This application claims the benefit of Korean Application No. P2003-090700, filed on Dec. 12, 2003, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a washing machine using a BLDC motor, and more particularly, to a mount fixing a dynamic braking resistor of a washing machine.

[0004] 2. Discussion of the Related Art

[0005] Generally, a washing machine as a representative one of home appliances is an apparatus for removing filth or dirt attached to a laundry using interaction between water and detergent. Such a washing machine is categorized into various types according to a laundry-impacting system. A washing machine using a BLDC (brushless direct current) motor removes the dirt attached to the laundry by rotating a tub at a different speed during washing or dewatering by regulating the speed of the BLDC motor. The washing machine is explained in detail by referring to **FIG. 1** as follows.

[0006] **FIG. 1** is a cross-sectional diagram of a washing machine using BLDC motor according to a related art. Referring to **FIG. 1**, a case **10** forms an exterior of a washing machine **1**. A tub **20** is rotatably provided within the case **10**. A pulsator **30** enabling to independently rotate regardless of the tub **20** is provided within the tub **20**. A BLDC motor **40** is provided under the tub **20** to transfer a dynamic force to the tub **20** or pulsator **30**. A dynamic braking resistor **50** is provided to a topside of the case **10**. The dynamic braking resistor **50** is a device for transforming braking energy generated from sudden stop of the BLDC motor into thermal energy to dissipate.

[0007] Specifically, when the BLDC motor **40** is suddenly stopped, a counter electromotive force is generated from the BLDC motor **40** to provide high voltage. The provided high voltage causes damage to the BLDC motor **40**. Hence, a voltage detecting circuit detects the provided high voltage and excessive energy is then dissipated into heat by the dynamic braking resistor **50** that is an energy dissipater. However, the heat generated from the dynamic braking resistor transforms a topside of the case while the dynamic braking resistor thermally dissipates electricity. Moreover, the heat generated from the dynamic braking resistor is transferred to other devices of the washing machine to cause thermal transformation of the corresponding devices.

SUMMARY OF THE INVENTION

[0008] Accordingly, the present invention is directed to a washing machine using a BLDC motor that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0009] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a heat-transfer preventing mount, by which heat generated from a dynamic braking resistor is prevented from being transferred to a case or other devices of a washing machine.

[0010] 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.

[0011] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, a washing machine having a brushless DC motor for rotating a tub includes a case, a dynamic braking resistor, mounted with respect the case, producing heat energy when the brushless DC motor is braked, and a mount, coupled to the case and the dynamic braking resistor, for impeding a transfer of the heat energy of the dynamic braking resistor to the case.

[0012] The mount may include a first mounting member for fixing the dynamic braking resistor, and a second mounting member for separating the fixed dynamic braking resistor from the case. The first and second mounting members are integrally formed as one body. The first mounting member may include a flange fixed to the dynamic braking resistor, and a frame, connected to the second mounting member, for supporting the flange. The frame may have at least one aperture for facilitating air circulation with respect to the dynamic braking resistor. The frame may include a bent perimeter for imparting the frame with rigidity.

[0013] The second mounting member may establish a predetermined distance between the frame and the case, based on the height of the dynamic braking resistor. The second mounting member may have a length greater than the height of the dynamic braking resistor. The flange may extend from the frame to separate the fixed dynamic braking resistor from the frame. The second-mounting member has a length greater than the height of the dynamic braking resistor plus the separation between the fixed dynamic braking resistor and the frame. The second mounting member may be secured to an upper surface of the case.

[0014] The dynamic braking resistor may be disposed between the first mounting member and the upper surface of the case. The dynamic braking resistor may be fixed to the first mounting member using at least one screw. The dynamic braking resistor may be fixed to the first mounting member using two screws. The second mounting member may be secured to the case using at least one screw. And, the second mounting member may be secured to the case using four screws.

[0015] The mount may include a plurality of substantially flat surfaces formed of a rigid material, and a channel, formed in the flat surfaces, for increasing the rigidity of the flat surfaces. Herein, the first mounting member may include parallel sides joined by a central strut, the parallel sides being supported on the second mounting member. The first mounting member may also include a plurality of channels, respectively formed in the parallel sides and the central strut. The second mounting member may include four legs, each leg supporting the first mounting member at a separate point. The second mounting member may also include comprises a plurality of channels, respectively formed in each leg. The dynamic braking resistor may be disposed above the case. And, the mount may be secured to an upper surface of the case. The mount may be formed of a material having a low heat transfer coefficient.

[0016] In another aspect of the present invention, a washing machine having a brushless DC motor for rotating a tub includes a case, a dynamic braking resistor, mounted with respect the case, producing heat energy when the brushless DC motor is braked, a flange fixed to the dynamic braking resistor, a frame, connected to the second mounting member and separated from the flange, for supporting the flange, and at least one leg, having one end connected to the frame and the other end secured to the case, the at least one leg having a length greater than a height of the dynamic braking resistor plus the separation of the flange from the frame.

[0017] Herein, the frame may have at least one aperture for facilitating air circulation with respect to the dynamic braking resistor. And, the flange, the frame, and the at least one leg may be formed as substantially flat surfaces of a rigid material, at least one surface comprising a channel for increasing the rigidity of the flat surfaces. At least one of the flange, the frame, and the at least one leg is formed of a material having a low heat transfer coefficient.

[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 cross-sectional diagram of a washing machine according to the present invention;

[0022] **FIG. 3** is a cross-sectional diagram of a mount according to the present invention; and

[0023] **FIG. 4** is a perspective diagram of a mount according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] 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.

[0025] **FIG. 2** is a cross-sectional diagram of a washing machine using a BLDC motor according to the present invention. Referring to **FIG. 2**, an exterior of a washing machine using a BLDC motor is configured by a case. A washing machine **100** according to the present invention includes a case **110**, a tub **120**, a motor **130**, a dynamic braking resistor **150**, and a mount **200** preventing heat transfer. The case **110** forms an exterior of the washing machine **100** and the tub **120** is rotatably provided within the case **110**. And, a pulsator may be rotatably provided within the tub **120**. Besides, a cover **160** may be further provided to a topside of the tub **120** to open/close the tub **120**. A motor **130** is provided beneath the tub **120** to rotate the tub **120**. In the present invention, the motor **130** is a BLDC (brushless direct current) motor **130**.

[0026] Meanwhile, in the washing machine **100** using the BLDC motor **130** enabling electrical braking without a mechanical braking device, if a user opens the cover **160** in the course of high-speed dewatering, a safety device (not shown in the drawing) makes a sudden stop of the motor **130**. In doing so, the motor **130** plays a role of generator or dynamo to generate a counter electromotive force, whereby high voltage is produced. In order to prevent various devices of the washing machine **100** from being broken, a dynamic braking resistor **150**, which transforms electricity of high voltage into heat to dissipate, is provided within the washing machine **100**. Although the dynamic braking resistor **150** fails to be clearly shown in the drawing, a nicrome wire emitting heat at high temperature is loaded within a glass tube and a space between the nicrome wire and the glass tube is filled with an insulating material.

[0027] And, the mount **200** fixes the dynamic braking resistor **150** to an inside of the washing machine **100** and prevents the heat generated from the dynamic braking resistor **150** from being transferred to other devices of the washing machine **100**. The mount **200** is explained in detail by referring to **FIG. 3** and **FIG. 4** as follows. Referring to **FIG. 3** and **FIG. 4**, the mount **200** includes a first mounting member **210** and a second mounting member **250**. The first mounting member **210** is coupled to the dynamic braking resistor **150**. And, the second mounting member **250** extends from the first mounting member **210** to separate the dynamic braking resistor **150** from a device of the washing machine **100**.

[0028] The first mounting member **210** includes a coupling part **220** coupled to the dynamic braking resistor **150** and a support part **230** supporting the coupling part **220**. In order to reduce a contact area between the dynamic braking resistor **150** and the mount **200**, the coupling part **220** protrudes from the support part **230** to have a predetermined height. Namely, the coupling part **220** protrudes upward or downward from the support part **230** to have the predetermined height different from that of the support part **230**. The coupling part **220** protrudes upward if the dynamic braking resistor **150** is coupled to a topside of the support part **230**. Alternatively, the coupling part **220** protrudes downward if the dynamic braking resistor **150** is coupled to a bottom side of the support part **230**.

[0029] The coupling part **220** includes a hole **221** penetrated by a screw **170** to be coupled to the dynamic braking resistor **150**. Hence, the dynamic braking resistor **150** is coupled to the first mounting member **210**, i.e., the coupling part **220** by the screw **170**. And, the support part **230** includes an opening **221** facilitating the dynamic braking resistor **150** to be smoothly contacted with air to activate cooling. The opening **231** is formed across an overall area of the support part **230**. In order to reinforce rigidity of the support part **230**, a rim **232** of the support part **230** is bent downward.

[0030] As mentioned in the foregoing description, the second mounting member **250** extends from the first mounting member **210**, and more particularly, from the support part **230** to be coupled to a device of the washing machine. Specifically, the second mounting member **250** includes at

least one or more legs. One side of each of the legs is connected to the support part **230** and the other side of each of the legs is coupled to a topside of the case **110**.

[**0031**] In order not to occupy a space excessively, the dynamic braking resistor **150** is coupled to a bottom side of the first mounting member **210**. In doing so, the second mounting member **250** is formed longer than a height of the dynamic braking resistor **150** to separate the dynamic braking resistor **150** from the device of the washing machine **100**. And, the second mounting member **250** is coupled to the device of the washing machine **100** by another screw **170**. Specifically, a tip of the second mounting member **250** is bent parallel to a topside of the device of the washing machine **100**, and more particularly, to the topside of the case **110**. A hole **251** is formed in the bent portion of the second mounting member **250** so that the second mounting member **250** can be coupled to the topside of the case **110**.

[**0032**] Meanwhile, the mount **200** may be bent by the weight of the dynamic braking resistor **150**. In order to prevent the bending of the mount **200**, the mount **200** further includes a bead **260** reinforcing rigidity. Specifically, at least one of the coupling part **220**, support part **230**, and second mounting member **250**, i.e., a plurality of the legs, should further include the bead **260**. In order to facilitate the coupling to the washing machine **100**, the mount **200** is preferably provided to the topside of the case **110**. Moreover, in order to prevent the heat generated from the dynamic braking resistor **150** from being transferred to the case **110** and the device of the washing machine **100**, the mount **200** is formed of a material having a low heat transfer coefficient. Specifically, at least one of the coupling part **220**, support part **230**, and second mounting member **250**, i.e., a plurality of the legs, is formed of a material having a low heat transfer coefficient.

[**0033**] An operation of the washing machine **100** using the BLDC motor **130** according to the present invention is explained as follows.

[**0034**] First of all, the mount **200** having the dynamic braking resistor **150** coupled thereto is fixed to the topside of the case **110**. When the dynamic braking resistor **150** emits heat, the mount **200** prevents the heat from being transferred to the topside of the case **110** and the device of the washing machine **100**. Hence, the topside of the case **100** and the device of the washing machine enable to avoid being transformed by the heat.

[**0035**] Namely, while the dynamic braking resistor **150** is coupled to the first mounting member **210**, the second mounting member **250** extending from the first mounting member **210** is coupled to the topside of the case **110** or the device of the washing machine. In this case, as the second mounting member **250** has the length greater than the height of the dynamic braking resistor **150**, the dynamic braking resistor **150** is separated from the topside of the case **110** or the device of the washing machine to leave a predetermined distance from each other.

[**0036**] Accordingly, the present invention has the following advantages or effects.

[**0037**] First of all, the mount prevents the heat emitted from the dynamic braking resistor from being transferred to the case, whereby the case is not transformed by the heat. Secondly, the mount prevents the heat emitted from the dynamic braking resistor from being transferred to the device of the washing machine, whereby the device of the washing machine enables to avoid being transformed by the heat.

[**0038**] 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 washing machine having a brushless DC motor for rotating a tub, comprising:

a case;

a dynamic braking resistor, mounted with respect the case, producing heat energy when the brushless DC motor is braked; and

a mount, coupled to the case and the dynamic braking resistor, for impeding a transfer of the heat energy of the dynamic braking resistor to the case.

2. The washing machine of claim 1, wherein the mount comprises:

a first mounting member for fixing the dynamic braking resistor; and

a second mounting member for separating the fixed dynamic braking resistor from the case.

3. The washing machine of claim 2, wherein the first and second mounting members are integrally formed as one body.

4. The washing machine of claim 2, wherein the first mounting member comprises:

a flange fixed to the dynamic braking resistor; and

a frame, connected to the second mounting member, for supporting the flange.

5. The washing machine of claim 4, wherein the frame has at least one aperture for facilitating air circulation with respect to the dynamic braking resistor.

6. The washing machine of claim 4, wherein the frame comprises a bent perimeter for imparting the frame with rigidity.

7. The washing machine of claim 4, wherein the second mounting member establishes a predetermined distance between the frame and the case, based on the height of the dynamic braking resistor.

8. The washing machine of claim 7, wherein the second mounting member has a length greater than the height of the dynamic braking resistor.

9. The washing machine of claim 7, wherein the flange extends from the frame to separate the fixed dynamic braking resistor from the frame.

10. The washing machine of claim 9, wherein the second mounting member has a length greater than the height of the dynamic braking resistor plus the separation between the fixed dynamic braking resistor and the frame.

11. The washing machine of claim 4, wherein the second mounting member is secured to an upper surface of the case.

12. The washing machine of claim 11, wherein the dynamic braking resistor is disposed between the first mounting member and the upper surface of the case.

13. The washing machine of claim 2, wherein the dynamic braking resistor is fixed to the first mounting member using at least one screw.

14. The washing machine of claim 2, wherein the dynamic braking resistor is fixed to the first mounting member using two screws.

15. The washing machine of claim 2, wherein the second mounting member is secured to the case using at least one screw.

16. The washing machine of claim 2, wherein the second mounting member is secured to the case using four screws.

17. The washing machine of claim 1, wherein the mount further comprises:

a plurality of substantially flat surfaces formed of a rigid material; and

a channel, formed in the flat surfaces, for increasing the rigidity of the flat surfaces.

18. The washing machine of claim 2, wherein the first mounting member comprises parallel sides joined by a central strut, the parallel sides being supported on the second mounting member.

19. The washing machine of claim 18, wherein the first mounting member further comprises a plurality of channels, respectively formed in the parallel sides and the central strut.

20. The washing machine of claim 2, wherein the second mounting member comprises four legs, each leg supporting the first mounting member at a separate point.

21. The washing machine of claim 20, wherein the second mounting member further comprises a plurality of channels, respectively formed in each leg.

22. The washing machine of claim 1, wherein the dynamic braking resistor is disposed above the case.

23. The washing machine of claim 22, wherein the mount is secured to an upper surface of the case.

24. The washing machine of claim 1, wherein the mount is formed of a material having a low heat transfer coefficient.

25. A washing machine having a brushless DC motor for rotating a tub, comprising:

a case;

a dynamic braking resistor, mounted with respect the case, producing heat energy when the brushless DC motor is braked;

a flange fixed to the dynamic braking resistor;

a frame, connected to the second mounting member and separated from the flange, for supporting the flange; and

at least one leg, having one end connected to the frame and the other end secured to the case, the at least one leg having a length greater than a height of the dynamic braking resistor plus the separation of the flange from the frame.

26. The washing machine of claim 25, wherein the frame has at least one aperture for facilitating air circulation with respect to the dynamic braking resistor.

27. The washing machine of claim 25, wherein the flange, the frame, and the at least one leg are formed as substantially flat surfaces of a rigid material, at least one surface comprising a channel for increasing the rigidity of the flat surfaces.

28. The washing machine of claim 25, wherein at least one of the flange, the frame, and the at least one leg is formed of a material having a low heat transfer coefficient.

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