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SUMMARY

However, in the conventional configuration, the washing tub (not shown) is rotatably provided in water tub 71, and rotates in a direction of the arrows in FIG. 16 during a spin-drying operation. This rotation of the washing tub causes a flow of the washing liquid in the direction of the arrows in FIG. 16.

Since a support portion of heater 72 of fixing portion 74 is disposed in a direction orthogonal to the flow of the washing liquid, the washing liquid collides with the support portion of heater 72. This causes turbulence, prevents a favorable rotation of the washing tub, and causes vibration. Otherwise, spin-drying failure occurs due to an increase in rotational resistance because of abnormal occurrence of foam.

The present disclosure provides a washing machine capable of suppressing vibration and abnormal occurrence of foam during a spin-drying operation.

According to an aspect, there is provided a washing machine comprising a housing; a water tub provided in the housing; a washing tub rotatably provided on a vertical axis of a rotating shaft in the water tub; a driving device that drives the washing tub to rotate; a drain port that is provided on a bottom surface of the water tub and drains a washing liquid in the water tub, and a heating device that is provided at a bottom of the water tub and heats the washing liquid, wherein the bottom of the water tub has a recess disposed in a substantially arc shape around the rotating shaft so as to be lower than the bottom surface of the water tub, and an attachment portion disposed so as to bulge upward from a bottom surface of the recess, and the drain port is disposed at a first end of a leading position in a rotation direction during spin-drying of the washing tub in the recess and the heating device is attached to the attachment portion so as to extend to a second end of the recess~~are provided apart from each other~~.

According to an~~other aspect~~ example, there is provided a washing machine comprising:

a housing; a water tub provided in the housing; a washing tub rotatably provided in the water tub; a driving device that drives the washing tub to rotate; and

a heating device that is provided in the washing tub and heats the washing liquid, wherein the housing has an opening that is openably closed by a door, the water tub is provided with an attachment portion to which the heating device is attached, and the attachment portion is disposed with an attachment opening through which the heating device is inserted into the water tub from outside of the water tub at a position facing the opening.

According to an aspect, there is provided heated water generation device comprising: a water tub; a heating device that is provided at a bottom of the water tub and heats a liquid in the water tub; a temperature sensor provided in the heating device; and a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature sensor.

According to an aspect, there is provided washing machine comprising: a housing; a water tub provided in the housing; a washing tub rotatably provided in the water tub; a driving device that drives the washing tub to rotate; a water supply device that supplies a washing liquid into the water tub; a heating device that is provided at a bottom of the washing tub and heats the washing liquid; a temperature sensor provided in the heating device; and a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature sensor.

~~According to an aspect, there is provided a heated water generation device comprising:~~

~~a water tub;~~

~~a heating device that is provided at a bottom of the water tub and heats a liquid in the water tub;~~

~~a temperature sensor provided in the heating device; and~~

~~a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature~~

~~sensor. According to an aspect, there is provided washing machine comprising:~~

~~a housing;~~

~~a water tub provided in the housing;~~

~~a washing tub rotatably provided in the water tub;~~

~~a driving device that drives the washing tub to rotate;~~

~~a water supply device that supplies a washing liquid into the water tub;~~

~~a heating device that is provided at a bottom of the washing tub and heats the washing liquid;~~

~~a temperature sensor provided in the heating device; and~~

~~a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature sensor.~~ According to an ~~aspect~~example, there is provided a washing machine comprising:

a housing;

a water tub provided in the housing;

a washing tub rotatably provided in the water tub;

a pulsator rotatably provided at an inner bottom of the washing tub;

a driving device that drives the washing tub and the pulsator to rotate;

a circulation path that circulates the washing liquid in the washing tub;

a circulation pump that forms a flow of the washing liquid in the circulation path;

a heating device that is provided in the water tub and heats the washing liquid; and

a control device that controls the driving device, the circulation pump, and the heating device, wherein the control device operates the circulation pump and the heating device simultaneously.

According to an ~~aspect~~example, there is provided a washing machine comprising:

a housing;

a water tub provided in the housing;

a washing tub rotatably provided in the water tub;

a driving device that drives the washing tub to rotate;

a heating device that is provided in the water tub and heats a washing liquid; and

a circulation path that circulates the washing liquid in the water tub from above into the washing tub, wherein a circulation water port to the circulation path is disposed at a bottom of the water tub

The washing machine of the present disclosure includes a housing, a water tub provided in the housing, a washing tub rotatably provided in the water tub, a driving device that drives the washing tub to rotate, and a heating device that is provided in the water tub and heats a washing liquid. The heating device is attached to an attachment portion disposed in the water tub, and the attachment portion is disposed such that a first side surface substantially orthogonal to a rotation direction of the washing tub during spin-drying is inclined toward the rotation direction of the washing tub.

This configuration can provide a washing machine capable of suppressing vibration and abnormal occurrence of foam during the spin-drying

CLAIMS

1. A washing machine comprising:

a housing;

a water tub provided in the housing;

a washing tub rotatably provided on a vertical axis of a rotating shaft in the water tub;

a driving device that drives the washing tub to rotate;

a drain port that is provided on a bottom surface of the water tub and drains a washing liquid in the water tub, and

a heating device that is provided at a bottom of the water tub and heats the washing liquid,

wherein the bottom of the water tub has a recess disposed in a substantially arc shape around the rotating shaft so as to be lower than the bottom surface of the water tub, and an attachment portion disposed so as to bulge upward from a bottom surface of the recess, and

the drain port is disposed at a first end of a leading position in a rotation direction during spin-drying of the washing tub in the recess and the heating device is attached to the attachment portion so as to extend to a second end of the recess~~are provided apart from each other~~.

2. The washing machine according to claim 1, further comprising a heat shield plate that shields transmission of heat generated by the heating device to the bottom surface of the water tub is provided between the bottom surface of the water tub and the heating device.

3. The washing machine according to claim 1 or 2, further comprising a heating plate that covers an upper side of the heating device is provided between the bottom surface of the washing tub and the heating device.

4. The washing machine as claimed in claim 3, wherein the heating device is attached to attachment portion so as to extend to the second end of a tail position in the rotation direction during spin-drying of the washing tub in the recess.~~A washing machine comprising:~~

~~a housing;~~

~~a water tub provided in the housing;~~

~~a washing tub rotatably provided in the water tub;~~

~~a driving device that drives the washing tub to rotate; and~~

~~a heating device that is provided in the washing tub and heats the washing liquid, wherein~~

~~the housing has an opening that is openably closed by a door,~~

~~the water tub is provided with an attachment portion to which the heating device is attached, and~~

~~the attachment portion is disposed with an attachment opening through which the heating device is inserted into the water tub from outside of the water tub at a position facing the opening.~~

~~5. The washing machine according to claim 4, wherein the opening is disposed on a rear surface of the housing.~~

~~6. The washing machine according to claim 4, wherein the opening is disposed on a side surface of the housing.~~

~~7. A washing machine according to any one of claims 4 to 6, further comprising a heat shield plate that shields transmission of heat generated by the heating device to a bottom surface of the water tub is provided between the bottom surface of the water tub and the heating device.~~

~~8. The washing machine according to any one of claims 4 to 7, further comprising a heating plate that covers an upper side of the heating device is provided between a bottom surface of the washing tub and the heating device.~~

~~9. A heated water generation device comprising:~~

~~a water tub;~~

~~a heating device that is provided at a bottom of the water tub and heats a liquid in the water tub;~~

~~a temperature sensor provided in the heating device; and~~

~~a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature sensor.~~

~~10. A washing machine comprising:~~

~~a housing;~~

~~a water tub provided in the housing;~~

~~a washing tub rotatably provided in the water tub;~~

~~a driving device that drives the washing tub to rotate;~~

~~a water supply device that supplies a washing liquid into the water tub;~~

~~a heating device that is provided at a bottom of the washing tub and~~

heats the washing liquid;

a temperature sensor provided in the heating device; and

a heating plate provided above the heating device to cover the heating device, wherein the heating plate has a passage hole disposed substantially above the temperature sensor.

11. A washing machine comprising:

a housing;

a water tub provided in the housing;

a washing tub rotatably provided in the water tub;

a pulsator rotatably provided at an inner bottom of the washing tub;

a driving device that drives the washing tub and the pulsator to rotate;

a circulation path that circulates the washing liquid in the washing tub;

a circulation pump that forms a flow of the washing liquid in the circulation path;

a heating device that is provided in the water tub and heats the washing liquid; and

a control device that controls the driving device, the circulation pump, and the heating device, wherein the control device operates the circulation pump and the heating device simultaneously.

12. The washing machine according to claim 11, wherein

the control device operates the circulation pump and the heating device simultaneously when an amount of water in the washing tub is larger than a predetermined amount, and

the control device operates only the heating device when the amount of

~~water in the washing tub is smaller than the predetermined amount.~~

~~13. The washing machine according to claim 11 or 12, wherein~~

~~the control device operates the circulation pump and the heating device simultaneously when an amount of clothes in the washing tub is larger than a predetermined amount, and~~

~~the control device operates only the heating device when the amount of clothes in the washing tub is smaller than the predetermined amount.~~

~~14. The washing machine according to any one of claims 11 to 13, wherein~~

~~the washing machine has a discharge port located in a middle of the washing tub,~~

~~the control device operates only the pulsator after energizing the heating device when the amount of water in the washing tub is smaller than the predetermined amount, and~~

~~the control device operates the circulation pump simultaneously with energization of the heating device when the amount of water in the washing tub is larger than the predetermined amount.~~

~~15. The washing machine according to any one of claims 11 to 14, wherein~~

~~the control device operates the pulsator after energizing the heating device when the amount of clothes in the washing tub is smaller than the predetermined amount, and~~

~~the control device operates the circulation pump simultaneously with energization of the heating device when the amount of clothes in the washing~~

~~tub is larger than the predetermined amount.~~

~~16. A washing machine comprising:~~

~~a housing;~~

~~a water tub provided in the housing;~~

~~a washing tub rotatably provided in the water tub;~~

~~a driving device that drives the washing tub to rotate;~~

~~a heating device that is provided in the water tub and heats a washing liquid; and~~

~~a circulation path that circulates the washing liquid in the water tub from above into the washing tub, wherein a circulation water port to the circulation path is disposed at a bottom of the water tub.~~

~~17. The washing machine according to claim 16, wherein the circulation water port is disposed near the heating device.~~

~~18. The washing machine according to claim 16 or 17, wherein the circulation water port is disposed to project upward from a bottom surface of the water tub toward the heating device.~~