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(54) A WASHING MACHINE

WASCHMASCHINE

MACHINE À LAVER

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Description

[0001] The present invention relates to a washing machine that comprises a detergent box.

[0002] In washing machines, when starting the washing process, water is first received into the detergent box. Afterwards, water together with the detergent, is poured into the tub by means of a hose and an aperture arranged on the tub. This aperture on the tub that allows entry of water and detergent, also allows exit of air for balancing the tub interior pressure. During washing, in the washing machine, after the pre-wash period, the tub interior temperature increases as the heater is actuated; however, heat is lost from the aperture that provides connection to the detergent box. Due to the heat loss in the tub, the time period necessary for heating the tub interior to a certain temperature is prolonged and more energy is needed. During washing, the tub continues to lose heat from the aperture and the washing effectiveness is reduced. Furthermore, in washing machines, the water heated during washing is vaporized and reaches up to the detergent box by passing through the hose between the tub and the detergent box. The water vapor reaching the detergent box causes the washing powder in the detergent box to become moist and cling to the inner surfaces of the detergent box.

[0003] In the Patent Document No EP0582092, a washing machine is explained wherein the detergent feed from the tray for containing detergent to the tub is improved. An interceptor element is disposed at the opening mouth of the pipe connecting the detergent box to the tub, which is arranged to assume at least two working conditions.

[0004] In the Patent Document No JP2023900, the hot air discharge outlet is closed by a shape memory element in order to prevent water from leaking into the air channel in the washing period. The lid that is closed in the washing period is opened in the drying period. In the Patent Document No JP3297435, shape memory alloy in combination with a lid member of a detergent storing box in a dishwasher is disclosed.

[0005] The aim of the present invention is to realize a washing machine wherein steam output from the tub to the detergent box and loss of heat is prevented in the washing process.

[0006] The washing machine realized in order to attain the aim of the present invention is explicated in the claims.

[0007] The washing machine of the present invention comprises an aperture over the tub whereto the hose coming from the detergent box is attached and a lid mechanism produced partially of a shape memory alloy, which is at least in a partially open position over the aperture when the interior temperature of the tub is low, allowing passage of water and detergent, and changing to the closed position thereby closing the aperture when the interior temperature of the tub increases.

[0008] The lid mechanism opens some amount on the aperture and balances the pressure, when the tub interior temperature continues to increase due to a reason such as overloading or voltage irregularity and exceeds a high temperature corresponding to a predetermined critical pressure.

[0009] The lid mechanism, when in the closed position on the aperture, has the property of changing from the closed position to the open position with the cooling effect of water, by contacting with the intake water when water is received from outside.

[0010] The lid mechanism comprises two arms, produced of shape memory alloy, each changing shape separately, at its own temperature set values and that move the valves connected thereto independently and at least partially close or open the aperture by triggering the valves connected thereto depending on the tub interior temperature.

[0011] The first arm that triggers the first valve has a temperature set value that maintains the first valve to be in the open position when the tub interior temperature is low and to change the first valve from the open position to the closed position when the tub interior temperature increases.

[0012] The second arm that triggers the second valve has a temperature set value that maintains the second valve to be in the closed position when the tub interior temperature increases at the intended level during washing and to change from the closed position to the open position when the tub interior temperature increases excessively, exceeding a certain high temperature.

[0013] In another embodiment of the present invention, the temperature set value for opening of the second valve is greater than the temperature set value for closing of the first valve.

[0014] In another embodiment of the present invention, the surface area of the first valve is greater than the surface area of the second valve.

[0015] The washing machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0016] Figure 1 - is the schematic view of a washing machine.

[0017] Figure 2 - is the schematic view of a tub and a lid mechanism of a washing machine.

[0018] The elements illustrated in the figures are numbered as follows:

1. Washing machine
2. Tub
3. Detergent box
4. Hose
5. Aperture
6. Lid mechanism
7. 107. Valve
8. 108. Arm

[0019] The washing machine (1) comprises a tub (2) wherein the laundry is washed, a detergent box (3) con-

taining the cleaning agents put therein, a hose (4) that is fastened by extending from the detergent box (3) to the tub (2), enabling water to flow from the detergent box (3) to the tub (2) and an aperture (5) arranged on the tub (2) whereto the hose (4) is attached.

[0020] The washing machine (1) of the present invention comprises a lid mechanism (6):

[0021] - disposed on the aperture (5),

[0022] - produced at least partially from shape memory alloy (SMA),

[0023] - which leaves the aperture (5) at least partially open when the tub interior temperature (T) is around ($T \approx T_0$) a lower threshold temperature (T_0) selected to be around room temperature or at a lower temperature ($T < T_0$),

[0024] - which entirely closes the aperture (5) by changing to the closed position when the temperature (T) goes over ($T > T_0$) the lower threshold temperature (T_0),

[0025] - which leaves the aperture (5) at least partially open when the temperature (T) continues to rise and exceeds ($T > T_{max}$) a maximum temperature (T_{max}) that corresponds to a critical pressure predetermined by the producer.

[0026] In the washing machine (1), the water received from outside when the washing program starts, fills into the detergent box (3). The lid mechanism (6) is in the open position while the washing process is just starting since the tub (2) interior temperature (T) is around the lower threshold temperature (T_0) selected to be around room temperature or at a lower temperature ($T < T_0$), and the water filling into the detergent box (3) passes through the aperture (5) together with the detergent and flows into the tub (2). In the washing program, the heater is operated to heat the wash water and the tub (2) interior temperature (T) increases to above ($T > T_0$) the lower threshold temperature (T_0). The lid mechanism (6) over the aperture (5) produced from shape memory alloy is triggered by the increasing tub (2) interior temperature (T) and changes shape thereby closing the aperture (5). Consequently, heat loss from the aperture (5) to outside is prevented and energy savings is provided. Moreover, the water vapor formed in the tub (2) as the temperature rises is prevented from reaching the detergent box (3) by the lid mechanism (6).

[0027] In the washing machine (1), the tub (2) interior temperature may rise excessively in cases of overloading and voltage irregularities, and the tub (2) interior pressure also rises depending on the temperature and the aperture (5) being entirely closed in such a case poses a risk in terms of safety. Therefore, in cases of excessive rise in temperature and pressure, the lid mechanism (6) which closes the aperture (5) should be opened partially. In the washing machine (1) of the present invention, the lid mechanism (6), not only closes the aperture (5) and prevents heat loss but also partially opens the aperture (5) a small amount allowing air to escape when the tub (2) interior temperature exceeds ($T > T_{max}$) the determined maximum temperature (T_{max}) and balances the tub (2) interior pressure.

[0028] When water is received from outside as required by the washing program, the lid mechanism (6), while in the entirely closed position over the aperture (5), contacts with water and changes from the closed position to the open position by the cooling effect of water and allows passage of water through the aperture (5). For example, in the rinsing step, the lid mechanism (6), which has remained in the closed position from the previous washing program, opens due to effect of low temperature by contacting with the water filling into the detergent box (3) during water intake from the outside. In case the heater is operated again by interrupting water intake from outside, for example when hot rinsing is performed, the lid mechanism (6) changes to the closed position again depending on the increasing interior temperature in the tub (2).

[0029] The lid mechanism (6) furthermore comprises two valves (7, 107) disposed over the aperture (5) and two arms (8, 108) produced of shape memory alloy (SMA), each one connected to one valve (7, 107), that triggers the valves (7, 107) separately by changing shape when the tub (2) interior temperature (T) changes and enabling the valves (7, 107) to at least partially open or entirely close the aperture (5).

[0030] The first valve (7) is in the open position when the tub (2) interior temperature (T) is about ($T = T_0$) the lower threshold temperature (T_0) or at a lower temperature ($T < T_0$), and changes to the closed position by the triggering of the first arm (8), closing the aperture (5) when the tub (2) interior temperature increases to over the lower threshold temperature ($T > T_0$).

[0031] The first arm (8) has a temperature set value ($T_{set1} > T_0$) which triggers the first valve (7) to change from the open position to the closed position when the tub (2) interior temperature (T) rises over the lower threshold temperature ($T > T_0$).

[0032] When the tub (2) interior temperature (T) is around ($T \approx T_0$) the lower threshold temperature (T_0), lower than ($T < T_0$) the lower threshold temperature (T_0) and when the tub (2) interior temperature (T) increases by the intended rate in washing, rising over the lower threshold temperature (T_0) ($T > T_0$), the second valve (107) remains closed over the aperture (5) but changes to the open position over the aperture (5) when the tub (2) interior temperature (T) increases excessively, rising over ($T > T_{max}$) the predetermined maximum temperature (T_{max}) by the triggering of the second arm (108).

[0033] The second arm (108) has a temperature set value ($T_{set2} > T_{max}$) which triggers the second valve (107) to change from the closed position to the open position when the tub (2) interior temperature (T) rises over the maximum temperature (T_{max}).

[0034] In this embodiment, when the washing program starts in the washing machine (1) and when the temperature has not yet risen, the first valve (7) is open and the second valve (107) is closed; as the heater operates and

the temperature starts to rise ($T > T_0$), the first valve (7) closes, the second valve (107) continues its closed position; during the washing program, the first valve (7) changes from the closed position to the open position by contacting with cold water in rinsing and the second valve (107) continues its closed position; after rinsing if the heater operates again, the first valve (7) closes and the second valve (107) continues its closed position; but when the temperature rises over the determined maximum value ($T > T_{max}$), this time the first valve (7) continues its closed position and the second valve (107) changes to the open position.

[0035] The temperature set value (T_{set2}) to which the second arm (108) is set for triggering the second valve (107) is greater than ($T_{set2} > T_{set1}$) the temperature set value (T_{set1}) to which the first arm (8) is set for triggering the first valve (7).

[0036] In this case, depending on the temperature (T) changes in the tub (2):

[0037] $T < T_{set1:}$ the first valve (7) is open; the second valve (107) is closed.

[0038] $T_{set1} < T < T_{set2}$: the first valve (7) is closed; the second valve (107) is closed.

[0039] $T > T_{set2}$: the first valve (7) is closed; the second valve (107) is open.

[0040] In an embodiment of the present invention, the surface area of the first valve (7) is greater than the surface area of the second valve (107). Thus, at normal temperature increases of the tub (2) interior, most of the aperture (5) remains closed by the first valve (7) and when the temperature and pressure increases excessively, pressure is balanced by allowing air to exit from the small portion opened by the second valve (107). Since a greater portion of the aperture (5) surface area is closed by the first valve (7), heat loss is considerably prevented in all kinds of temperature increases.

[0041] In the washing machine (1) of the present invention, the heat loss during washing and the steam exit from the tub (2) to the detergent box (3) is prevented, moreover safety is provided against temperature and pressure rise in the tub (2).

Claims

1. A washing machine (1) that comprises a tub (2) wherein the laundry is washed, a detergent box (3) containing the cleaning agents put therein, a hose (4) that is fastened by extending from the detergent box (3) to the tub (2), enabling water to flow from the detergent box (3) to the tub (2) and an aperture (5) arranged on the tub (2) whereto the hose (4) is attached and **characterized by** a lid mechanism (6):

   - disposed on the aperture (5),
   - produced at least partially from shape memory alloy,
   - having two valves (7, 107) disposed over the aperture (5) and the said valves (7, 107) being in open or closed positions on the aperture (5) related to the interior temperature (T) of the tub (2),
   - which leaves the aperture (5) at least partially open when the tub (2) interior temperature (T) is around a lower threshold temperature ($T = T_0$) selected to be around room temperature or at a lower temperature ($T < T_0$),
   - which entirely closes the aperture (5) by changing to the closed position when the temperature (T) rises over the lower threshold temperature ($T > T_0$),
   - which leaves the aperture (5) partially open when the temperature (T) continues to rise and exceeds a maximum temperature ($T > T_{max}$) that corresponds to a predetermined critical interior pressure of the tub (2).

2. A washing machine (1) as in Claim 1, **characterized by** the lid mechanism (6) having two arms (8, 108) produced of shape memory alloy (SMA), each one connected to one valve (7, 107), that triggers the valves (7, 107) separately by changing shape when the tub (2) interior temperature (T) changes and maintaining the valves (7, 107) to at least partially open or entirely close the aperture (5).

3. A washing machine (1) as in Claim 2, **characterized by** the first valve (7) that is in the open position when the tub (2) interior temperature (T) is about the lower threshold temperature ($T = T_0$) or at a lower temperature ($T < T_0$), and changes to the closed position by the triggering of the first arm (8), closing the aperture (5) when the tub (2) interior temperature (T) increases over the lower threshold temperature ($T > T_0$).

4. A washing machine (1) as in Claim 3, **characterized by** the first arm (8) having a temperature set value ($T_{set1} > T_0$) which triggers the first valve (7) to change from the open position to the closed position when the tub (2) interior temperature (T) rises over the lower threshold temperature ($T > T_0$).

5. A washing machine (1) as in any one of the Claims 2 to 4, **characterized by** the second valve (107) that remains closed over the aperture (5) when the tub (2) interior temperature (T) is around the lower threshold temperature ($T \approx T_0$), or lower than the lower threshold temperature ($T < T_0$) or when the tub (2) interior temperature (T) increases by the intended rate in washing, rising over the lower threshold temperature ($T > T_0$), but changes to the open position over the aperture (5) when the tub (2) interior temperature (T) increases excessively, rising over the predetermined maximum temperature ($T > T_{max}$) by the triggering of the second arm (108).

6. A washing machine (1) as in Claim 5, **characterized by** the second arm (108) having a temperature set value which triggers the second valve (107) to change from the closed position to the open position when the tub (2) interior temperature (T) rises over the maximum temperature ($T_{set2} > T_{max}$).

7. A washing machine (1) as in any one of the Claims 2 to 6, **characterized by** the lid mechanism (6) wherein the temperature set value (T_{set2}) to which the second arm (108) is set for triggering the second valve (107) is greater than the temperature set value ($T_{set2} > T_{set1}$) to which the first arm (8) is set for triggering the first valve (7).

8. A washing machine (1) as in any one of the Claims 2 to 7, **characterized by** the lid mechanism (6) wherein the surface area of the first valve (7) is greater than the surface area of the second valve (107).

Patentansprüche

1. Waschmaschine (1), umfassend einen Waschbehälter (2), in dem die Wäsche gewaschen wird, einen Waschmittelkasten (3), der das hinein gegebene Waschmittel enthält, einen Schlauch (4), der befestigt ist, indem er sich vom Waschmittelkasten (3) zum Waschbehälter (2) erstreckt und es erlaubt, dass Wasser vom Waschmittelkasten (3) zum Waschbehälter (2) fließt, und eine Öffnung (5), die am Waschmittelbehälter (2) angeordnet ist, an dem der Schlauch (4) angebracht ist, und **gekennzeichnet durch** einen Deckelmechanismus (6):

   - der an der Öffnung (5) angeordnet ist,
   - der wenigstens teilweise aus einer Legierung mit Formgedächtnis hergestellt ist,
   - der zwei Ventile (7, 107) aufweist, die über der Öffnung (5) angeordnet sind, wobei die Ventile (7, 107) sich im Zusammenhang mit der Innentemperatur (T) des Waschbehälters (2) in geöffneter oder geschlossener Position an der Öffnung (5) befinden,
   - der die Öffnung (5) wenigstens teilweise offen lässt, wenn die Innentemperatur (T) des Waschbehälters (2) sich in der Nähe einer unteren Schwellentemperatur ($T \approx T_0$) befindet, die derart ausgewählt ist, dass sie sich in der Nähe der Raumtemperatur oder einer niedrigeren Temperatur ($T < T_0$) befindet,
   - der die Öffnung (5) vollständig verschließt, indem er in die geschlossene Position wechselt, wenn die Temperatur (T) über die untere Schwellentemperatur ($T > T_0$) ansteigt,
   - der die Öffnung (5) teilweise offen lässt, wenn die Temperatur (T) weiter ansteigt und eine Höchsttemperatur ($T > T_{max}$) übersteigt, die einem im Voraus bestimmten kritischen Innendruck des Waschbehälters (2) entspricht.

2. Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Deckelmechanismus (6) zwei Arme (8, 108) aufweist, die aus einer Legierung mit Formgedächtnis (LMF) hergestellt sind, und von denen jeder mit einem Ventil (7, 107) verbunden ist und die Ventile (7, 107) separat betätigt, indem er seine Form ändert, wenn die Innentemperatur (T) des Waschbehälters (2) sich ändert, und die Ventile (7, 107) derart hält, dass sie die Öffnung (5) wenigstens teilweise öffnen oder vollständig schließen.

3. Waschmaschine (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** das erste Ventil (7) sich in der offenen Position befindet, wenn die Innentemperatur (T) des Waschbehälters (2) sich in der Nähe der unteren Schwellentemperatur ($T \approx T_0$) oder einer niedrigeren Temperatur ($T < T_0$) befindet, und mittels Betätigung durch den ersten Arm (8) in die geschlossene Position wechselt und die Öffnung (5) schließt, wenn die Innentemperatur (T) des Waschbehälters (2) über die untere Schwellentemperatur ($T > T_0$) ansteigt.

4. Waschmaschine (1) nach Anspruch 3, **dadurch gekennzeichnet, dass** der erste Arm (8) einen Temperatureinstellwert ($T_{set1} > T_0$) aufweist, der das erste Ventil (7) betätigt, so dass es aus der offenen Position in die geschlossene Position wechselt, wenn die Innentemperatur (T) des Waschbehälters (2) über die untere Schwellentemperatur ($T > T_0$) ansteigt.

5. Waschmaschine (1) nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** das zweite Ventil (107) über der Öffnung (5) geschlossen bleibt, wenn die Innentemperatur (T) des Waschbehälters (2) sich in der Nähe der unteren Schwellentemperatur ($T \approx T_0$) befindet oder unter der unteren Schwellentemperatur ($T < T_0$) ist, oder wenn die Innentemperatur (T) des Waschbehälters (2) beim Waschen, Ausspülen um die vorgesehene Rate ansteigt, über die untere Schwellentemperatur ($T > T_0$) ansteigt, aber mittels Betätigen durch den zweiten Arm (108) in die offene Position über der Öffnung (5) wechselt, wenn die Innentemperatur (T) des Waschbehälters (2) übermäßig ansteigt und über die im Voraus bestimmte Höchsttemperatur ($T > T_{max}$)ansteigt.

6. Waschmaschine (1) nach Anspruch 5, **dadurch gekennzeichnet, dass** der zweite Arm (108) einen Temperatureinstellwert aufweist, der das zweite Ventil (107) betätigt, so dass es aus der geschlossenen Position in die offene Position wechselt, wenn die Innentemperatur (T) des Waschbehälters (2) über die Höchsttemperatur ($T_{set2} > T_{max}$) ansteigt.

7. Waschmaschine (1) nach einem der Ansprüche 2 bis 6, **dadurch gekennzeichnet, dass** bei dem Deckelmechanismus (6) der Temperatureinstellwert (T_{set2}), auf den der zweite Arm (108) zum Betätigen des zweiten Ventils (107) eingestellt ist, größer ist als der Temperatureinstellwert ($T_{set2} > T_{set1}$), auf den der erste Arm (8) zum Betätigen des ersten Ventils (7) eingestellt ist.

8. Waschmaschine (1) nach einem der Ansprüche 2 bis 7, **dadurch gekennzeichnet, dass** bei dem Deckelmechanismus (6) die Fläche des ersten Ventils (7) größer als die Fläche des zweiten Ventils (107) ist.

Revendications

1. Une machine à laver (1) qui comprend une cuve (2) dans laquelle le linge est lavé, un bac à produit (3) contenant les produits de nettoyage mis dans celui-ci, un tuyau (4) qui s'étend du bac à produit (3) à être fixé à la cuve (2), en permettant à l'eau d'écouler du bac à produit (3) à la cuve (2) et une ouverture (5) disposée sur la cuve (2) à laquelle le tuyau (4) est fixé et **caractérisée par** un mécanisme de couvercle (6) :

- disposé sur l'ouverture (5),
- produit au moins partiellement d'un alliage à mémoire de forme,
- ayant deux vannes (7, 107) disposées sur l'ouverture (5) et lesdites vannes (7, 107) étant en position ouverte ou fermée sur l'ouverture (5) en fonction de la température intérieure (T) de la cuve (2),
- qui laisse l'ouverture (5) au moins partiellement ouverte lorsque la température intérieure (T) de la cuve (2) est d'environ une plus basse température de seuil ($T \approx T_0$) sélectionnée à être d'environ la température ambiante ou une plus basse température ($T < T_0$),
- qui entièrement ferme l'ouverture (5) en changeant la position fermée lorsque la température (T) dépasse la plus basse température de seuil ($T > T_0$),
- qui laisse l'ouverture partiellement ouverte lorsque la température (T) continue à augmenter et dépasser une température maximale ($T > T_{max}$) qui correspond à une pression critique intérieure prédéterminée de la cuve (2).

2. Une machine à laver (1) selon la Revendication 1, **caractérisée par** le mécanisme de couvercle (6) ayant deux bras (8, 108) produits d'un alliage à mémoire de forme (AMF), chacun relié à une vanne (7, 107), qui déclenchent les vannes (7, 107) séparément en changeant la forme lorsque la température intérieure (T) de la cuve (2) change et en permettant aux vannes (7, 107) d'ouvrir au moins partiellement ou fermer entièrement l'ouverture (5).

3. Une machine à laver (1) selon la Revendication 2, **caractérisée par** la première vanne (7) qui est dans la position ouverte lorsque la température intérieure (T) de la cuve (2) est d'environ la plus basse température de seuil ($T \approx T_0$) ou à une plus basse température ($T < T_0$), et qui change à la position fermée par le déclenchement du premier bras (8), tout en fermant l'ouverture (5) lorsque la température intérieure (T) de la cuve (2) dépasse la plus basse température de seuil ($T > T_0$).

4. Une machine à laver (1) selon la Revendication 3, **caractérisée par** le premier bras (8) ayant une valeur de consigne de température ($T_{set1} > T_0$) qui déclenche la première vanne (7) pour changer de la position ouverte à la position fermée lorsque la température intérieure (T) de la cuve (2) dépasse la plus basse température de seuil ($T > T_0$).

5. Une machine à laver (1) selon l'une quelconque des revendications de 2 à 4, **caractérisée par** la deuxième vanne (107) qui reste fermée sur l'ouverture (5) lorsque la température intérieure (T) de la cuve (2) est d'environ la plus basse température de seuil ($T \approx T_0$), ou inférieure à la plus basse température de seuil ($T < T_0$) ou lorsque la température intérieure (T) de la cuve (2) augmente en fonction du taux destiné au cours du lavage, tout en dépassant la plus basse température de seuil ($T > T_0$), mais qui change à la position ouverte sur l'ouverture (5) lorsque la température intérieure (T) de la cuve (2) augmente excessivement, en dépassant la température maximale prédéterminée ($T > T_{max}$) par le déclenchement du deuxième bras (108).

6. Une machine à laver (1) selon la Revendication 5, **caractérisée par** le deuxième bras (108) ayant une valeur de consigne de température qui déclenche la deuxième vanne (107) pour changer de la position fermée à la position ouverte lorsque la température intérieure (T) de la cuve (2) dépasse la température maximale ($T_{set2} > T_{max}$).

7. Une machine à laver (1) selon l'une quelconque des revendications de 2 à 6, **caractérisée par** le mécanisme de couvercle (6) où la valeur de consigne de température (T_{set2}) à laquelle le deuxième bras (108) est réglé pour déclencher la deuxième vanne (107) est supérieure à la valeur de consigne de température ($T_{set2} > T_{set1}$) à laquelle le premier bras (8) est réglé pour déclencher la première vanne (7).

8. Une machine à laver (1) selon l'une quelconque des revendications de 2 à 7, **caractérisée par** le méca-

nisme de couvercle (6) où la superficie de la première vanne (7) est supérieure à la superficie de la deuxième vanne (107).

Figure 1

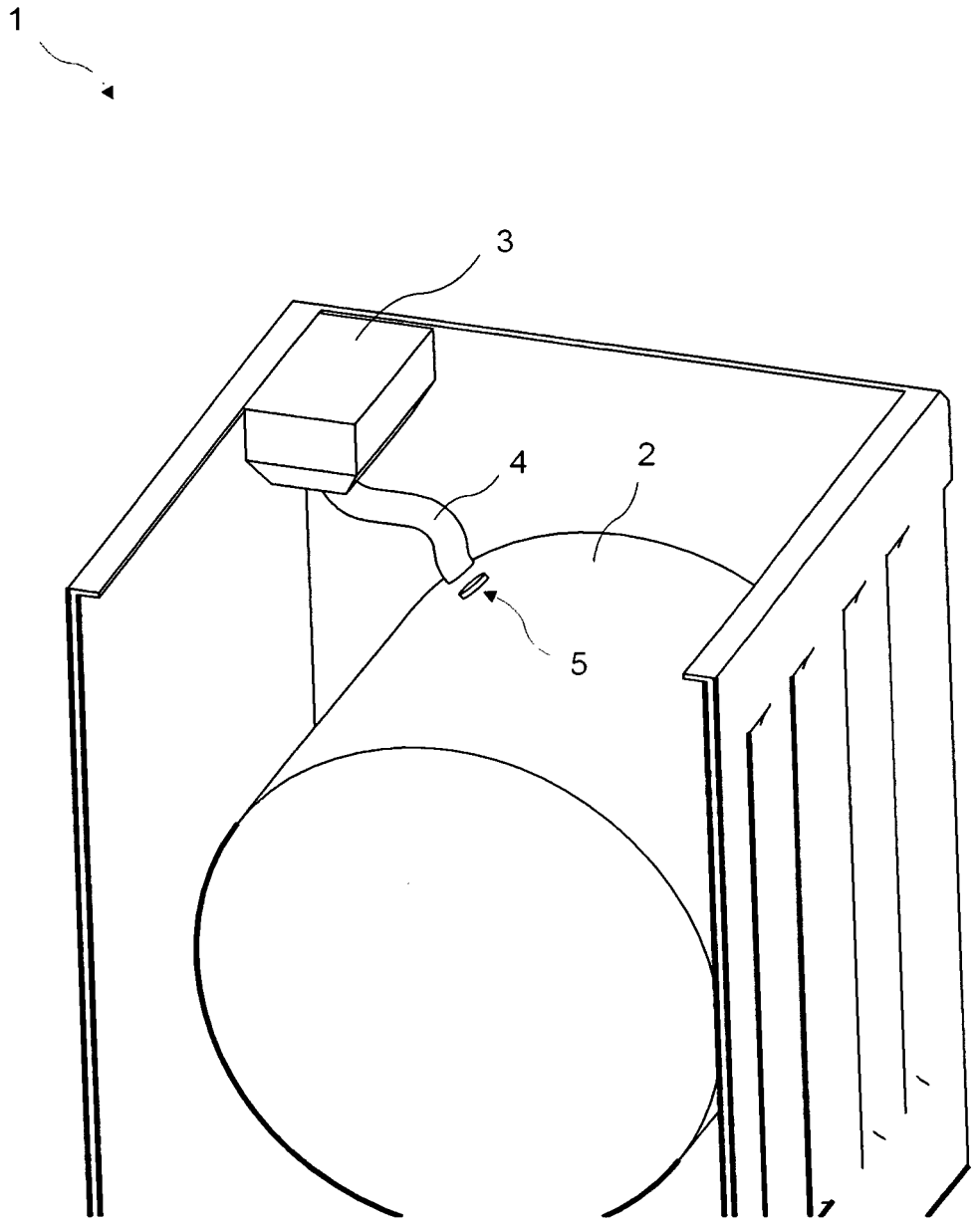
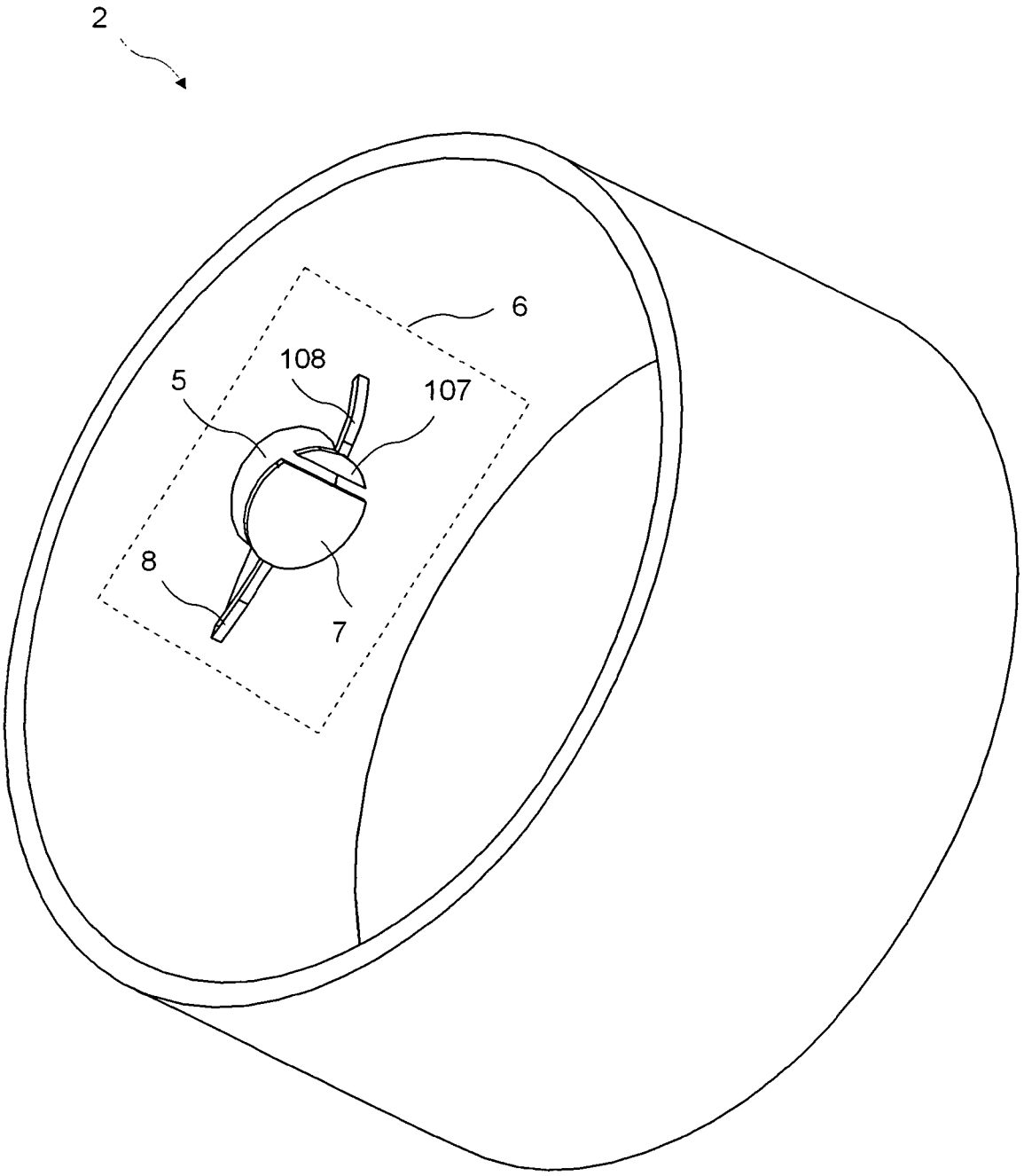


Figure 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0582092 A **[0003]**
- JP 2023900 A **[0004]**
- JP 3297435 B **[0004]**