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(54) **A WASHING MACHINE COMPRISING A FILTERING MEMBER**

WASCHMASCHINE MIT EINEM FILTERELEMENT

MACHINE À LAVER COMPRENANT UN ÉLÉMENT DE FILTRATION

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Description

[0001] The present invention relates to a washing machine comprising a filtering member for filtering the washing water.

[0002] In washing machines, the laundry is loaded into a drum disposed in a washing tub supplied with detergent-water mixture and is washed in the drum which is rotated. During the washing process, fibers separated from the laundry subjected to both mechanical and chemical effects are discharged, together with the water discharged at the end of the washing process, to the waste water line whereto the washing machine is connected. In traditional washing machines, each washing process causes approximately 1 milligram of fibers to be discharged to the waste water line. It is determined that more than half of microplastic accumulation in the nature is caused by waste waters originating from washing machines. Especially, taking into account the damage caused by synthetic fibers and particles in the nature, it is observed that waste waters originating from washing machines causes a critical environmental pollution. Therefore, the use of filtering members which filter the washing water is becoming widespread. One of the problems caused by the state of the art filtering members is the need for requiring the user to check if the filter is full. If the user cannot determine if the filter is full, the filtering member can be replaced before or after the proper time. Another problem caused by the state of the art filtering members is the bad appearance caused by the fibers accumulating and drying on the filter. This bad appearance causes a decrease in the quality perception of the users. Therefore, a washing machine is needed, wherein the clogging of the filter is automatically detected without requiring user intervention.

[0003] In the state of the art Korean Patent Application No. KR20070063996, a washing machine is disclosed, comprising a filter which is positioned under the detergent dispenser.

[0004] In the state of the art Chinese Patent Application No. CN106319880A, a filtering device of a flocculation washing machine is disclosed.

[0005] In the state of the art Chinese Patent Application No. CN201172752, a washing machine is disclosed, comprising a filter which is disposed into the detergent compartment.

[0006] The aim of the present invention is the realization of a washing machine wherein the clogging of the filter is detected with great accuracy without requiring the user intervention.

[0007] The washing machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a filtering member disposed into a housing arranged on the body so as to be accessed by the user and having a receptacle which receives the circulation water taken through a water inlet, at least one filter which filters the fibers and particles carried in the circulation water filling

in the receptacle, a water outlet which discharges the filtered water and an overflow outlet which allows some of the water in the receptacle to fill therein; a chamber which opens into the receptacle through the overflow outlet; a level sensor which detects the level of the water fill in the chamber; and a control unit which determines the clogging status of the filter by means of the data received from the level filter. The overflow outlet is positioned between the water inlet and the water outlet in the flowing direction of the water such that some of the water in the receptacle is delivered to the chamber before reaching the water outlet. The filter is preferably a microfilter suitable for filtering microparticles. As the amount of fibers and particles accumulated on the filter increases, in other words as the filter is filling up, the permeability of the filter decreases and more water is collected in the receptacle. Thus, when the filter is at least partially filled, the level of the water in the receptacle reaches the level of the overflow outlet and excess water starts to fill in the chamber. Thereby, the control unit can determine the fullness status of the filter according to the amount of circulation water reaching the chamber by means of the level sensor. Consequently, the fullness status of the filter can be quickly and accurately determined and the operation of the washing machine is regulated according to the detected fullness status of the filter.

[0008] In the present invention, the chamber is divided into two compartments in fluid communication, that is a first compartment wherein the water coming through the overflow outlet flows, and a second compartment wherein the level sensor takes measurements. The water coming through the overflow outlet passes through the first compartment to fill in the second compartment. Thus, the water coming through the overflow outlet is prevented from dropping directly onto the level sensor, avoiding any inaccurate measurements.

[0009] In an embodiment of the present invention, the first compartment and the second compartment are separated from each other by means of a wall whereon at least one opening allowing water passage is arranged. Thus, the circulation water passing through the opening is enabled to regularly flow into the second compartment and measurement errors originating from instantaneous changes in the water level are avoided.

[0010] In an embodiment of the present invention, the opening is in the form of a slit extending almost along the wall. By means of the thin slit form of the opening, fibers and large particles which can be carried with the circulation water are prevented from reaching the second compartment. Thus, moreover, in case the circulation water contains detergent, the foam is enabled to collapse while the circulation water passes through the slit. Consequently, measurement errors which may be caused by the presence of fiber and foam in the second compartment are prevented.

[0011] In an embodiment of the present invention, at least one hole is arranged on the lower wall of the chamber. The hole is designed small enough to ensure that

the flow rate of the water filling in the chamber through the overflow outlet is higher than the flow rate flowing out of the chamber. Thus, at the end of the filtering process, the water in the chamber is enabled to be automatically emptied under the effect of gravity. Consequently, the need for requiring an additional component for emptying and transferring the water filling in the chamber is eliminated, and it is ensured that no water remains in the chamber before every measurement.

[0012] In an embodiment of the present invention, on the filtering member, a guiding means is provided, which extends from the overflow outlet towards the chamber and which guides the water coming through the overflow outlet towards the vertical wall of the chamber opposite to the water outlet. Thus, the water is enabled to trickle down the wall to fill in the chamber. Consequently, the flow of water is slowed down so as to prevent instantaneous changes in the water level, decreasing measurement errors.

[0013] According to the present invention, the level sensor has a buoy which is disposed in the chamber and which is configured to float on the water. In a preferred embodiment of the present invention the level sensor includes a magnet which is disposed on the buoy; and a magnetic sensor which interacts with the magnetic field of the magnet so as to detect the position of the buoy in the chamber and thus to determine the level of the water in the chamber. By means of the mechanical structure of the level sensor, the level measurement can be performed without being affected by the presence of fibers/particles in the water.

[0014] By means of the present invention, a washing machine is realized, wherein the fullness status of the filter is automatically determined with minimum error. Thus, moreover, since the user is not required to check the filter, the filtering member can be positioned at an inner region of the washing machine, for example behind the detergent dispenser wherein the cleaning agents are loaded, and can be concealed so as to be accessed when required.

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

Figure 1 - is the schematic view of the washing machine related to an embodiment of the present invention.

Figure 2 - is the exploded view of the filtering member related to an embodiment of the present invention.

Figure 3 - is the cross-sectional view of the filtering member, the chamber and the level sensor related to another embodiment of the present invention.

Figure 4 - is the top view of the chamber and the level sensor related to another embodiment of the present invention.

[0016] The elements illustrated in the figures are numbered as follows:

1. Washing machine
2. Body
3. Tub
4. Circulation line
5. Filtering member
6. Receptacle
7. Water inlet
8. Water outlet
9. Overflow outlet
10. Filter
11. Chamber
12. Level sensor
13. Control unit
14. First compartment
15. Second compartment
16. Wall
17. Opening
18. Hole
19. Guiding member
20. Buoy
21. Sensor
22. Delivery line

[0017] The washing machine (1) comprises a body (2); a tub (3) which is disposed in the body (2) and wherein the washing process is performed; a circulation line (4) wherein the water taken from the tub (3) is circulated; and a filtering member (5) having a water inlet (7) through which the water coming from the circulation line (4) is taken, a receptacle (6) wherein the water taken through the water inlet (7) fills, at least one filter (10) which is disposed in the receptacle (6) and which filters the circulation water and a water outlet (8) which enables the water passing through the filter (10) to be discharged out of the receptacle (6). The filtering member (5) is disposable and is positioned in the body (2) so as to be accessed by the user. The circulation water taken through the water

inlet (7) fills in the receptacle (6) and is passed through the filter (10) which filters the fibers and particles therein. The filtered water is delivered back to the tub (3) or out of the body (2) so as to be discharged by means of a delivery line (22) connected to the water outlet (8).

[0018] The washing machine (1) of the present invention comprises an overflow outlet (8) which is arranged on the receptacle (6) so as to be positioned before the water outlet (8) in the flow direction of the water; a chamber (11) wherein the water coming through the overflow outlet (9) fills; a level sensor (12) which detects the level of the water filling in the chamber (11); and a control unit (13) which determines the clogging status of the filter (10) by means of the water level data received from the level sensor (12). When the circulation water collected in the receptacle (6) rises and reaches the level of the overflow outlet (9), the overflow outlet (9) allows some of the circulation water to flow from the receptacle (6) into the chamber (11). The overflow outlet (9) is preferably positioned at the upper side of the receptacle so as to be just after the water inlet (7) in the flow direction of the circulation water. Since the permeability of the filter (10) decreases as the filter (10) getting full, the water level in the receptacle (6) increases more rapidly and the water collected in the receptacle (6) reaches the overflow outlet (9) and starts to fill in the chamber (11). The level sensor (12) detects the level of the water flowing into the chamber (11); and the control unit (13) monitors the change in the level of the water in the chamber (11) by using the water level data received from the level sensor (12). Thus, the control unit (13) measures the change in the level of the water in the chamber (11) which is proportional to the fullness rate of the filter (10) and compares the measurement with the water level data prerecorded in the memory thereof, thus determining the fullness rate of the filter (10). Thus, the fullness rate of the filter (10) can be easily and precisely determined.

[0019] In the present invention, the chamber (11) has a first compartment (14) and a second compartment (15) which are at least partially separated from each other such that the water coming through the overflow outlet (9) flows first into the first compartment (14) and into the second compartment (15), and the level sensor (12) is positioned in the second compartment (15). The first compartment (14) and the second compartment (15) are disposed one after the other in the chamber (11) such that the water coming from the receptacle (6) passes through the first compartment (14) so as to fill in the second compartment (15) wherein the level sensor (12) is positioned. Thus, the water coming through the overflow outlet (9) is prevented from dropping directly onto the level sensor (12), avoiding any measurement errors.

[0020] In another embodiment of the present invention, a wall (16) separates the first compartment (14) and the second compartment (15) from each other, and at least one opening (17) arranged on the wall (16) allows the passage of the water from the first compartment (14) to the second compartment (15). The wall (16) is positioned

between the first compartment (14) and the second compartment (15) so as to almost completely separate the first compartment (14) and the second compartment (15) from each other, and the opening (17) arranged on the wall (16) ensures the water communication between the first compartment (14) and the second compartment (15). Thus, the first compartment (14) and the second compartment (15) are almost completely separated from each other in an advantageous manner, and the water in the second compartment (15) is enabled to be affected least by the flow in the first compartment (14).

[0021] In another embodiment of the present invention, the opening (17) is in the form of a slit extending on the wall (16). The opening (17) is configured in the form of a slit extending almost along the wall (16). By means of the narrow structure in the form of a slit, the opening (17) prevents the possible fibers, particles and foam in the water overflowing from the receptacle (6) from reaching the second compartment (15).

[0022] In another embodiment of the present invention, at the base of the chamber (11), a hole (18) is arranged, which has a cross-sectional area smaller than the cross-sectional area of the overflow outlet (9) and which provides the discharge of the water in the chamber (11). The hole (18) is arranged at the base of the chamber (11), preferably of the second compartment (15), so as to enable the water in the chamber (11) to flow out of the chamber (11) under the effect of gravity. The hole (18) is configured to be small enough, in other words narrower than the overflow outlet (9), to allow the water coming through the overflow outlet (9) to rise in the chamber (11). Thus, the water in the chamber (11) is enabled to be automatically discharged at the end of each measurement.

[0023] In another embodiment of the present invention, the filtering member (5) comprises a guiding means (19) which extends from the overflow outlet (9) towards the chamber (11) and which guides the water coming through the overflow outlet (9) towards a vertical wall of the chamber (11). The guiding means (19) extends outwards from the overflow outlet (9) and guides the water coming through the overflow outlet (9) towards the vertical wall of the chamber (11) extending opposite to the overflow outlet (9). Thus, the water coming from the receptacle (6) at high speed hits the wall of the chamber (11) to be slowed down. Thus, a regular flow into the chamber (11) is ensured, preventing instantaneous changes in the water level.

[0024] In another embodiment of the present invention, the level sensor (12) comprises a buoy (20) which is disposed in the chamber (11) and which is suitable to float on the water so as to rise together with the water filling into the chamber (11), and a sensor (21) which detects the position of the buoy (20) so as to measure the height of the water in the chamber (11). The buoy (20) is disposed in the chamber (11), preferably in the second compartment (15). The sensor (21) is preferably a magnetic sensor and detects the height of the buoy (20) in the chamber (11) by means of a magnet disposed on the

buoy (20). Thus, the level measurement is performed without being affected by impurities in the water such as fibers, particles, detergent, chemicals, etc.

[0025] By means of the present invention, a washing machine (1) is realized, wherein the fullness status of the filter (10) is quickly and accurately determined. Moreover, by means of the present invention, measurement errors which may be caused by an irregular flow of water and particles are prevented. Thus, it is automatically determined whether the filtering member (5) is required to be replaced or cleaned, providing ease of use.

Claims

1. A washing machine (1) **comprising** a body (2); a tub (3) which is disposed in the body (2) and wherein the washing process is performed; a circulation line (4) wherein the water taken from the tub (3) is circulated; a filtering member (5) having a water inlet (7) through which the water coming from the circulation line (4) is taken, a receptacle (6) wherein the water taken through the water inlet (7) fills, at least one filter (10) which is disposed in the receptacle (6) and which filters the circulation water and a water outlet (8) which enables the water passing through the filter (10) to be discharged out of the receptacle (6); an overflow outlet (9) which is arranged on the receptacle (6) so as to be positioned before the water outlet (8) in the flow direction of the water; and a chamber (11) wherein the water coming through the overflow outlet (9) fills; a level sensor (12) which detects the level of the water filling in the chamber (11); and a control unit (13) which determines the clogging status of the filter (10) by means of the water level data received from the level sensor (12) **characterized by** the level sensor (12) having a buoy (20) which is disposed in the chamber (11) and which is suitable to float on the water so as to rise together with the water filling into the chamber (11), and a sensor (21) which detects the position of the buoy (20) so as to measure the height of the water in the chamber (11) and the chamber (11) having a first compartment (14) and a second compartment (15) which are at least partially separated from each other such that the water coming through the overflow outlet (9) flows first into the first compartment (14) and passes through the first compartment (14) to fill into the second compartment (15), and the level sensor (12) which is positioned in the second compartment (15).
2. A washing machine (1) as in Claim 1, **characterized by** a wall (16) which separates the first compartment (14) and the second compartment (15) from each other, and at least one opening (17) which is arranged on the wall (16) and which allows the passage of the water from the first compartment (14) to the second compartment (15).

3. A washing machine (1) as in Claim 2, **characterized by** the opening (17) which is in the form of a slit extending on the wall (16).
4. A washing machine (1) as in any one of the above claims, **characterized by** a hole (18) which is arranged at the base of the chamber (11), which has a cross-sectional area smaller than the cross-sectional area of the overflow outlet (9) and which provides the discharge of the water in the chamber (11).
5. A washing machine (1) as in any one of the above claims, **characterized by** a guiding means (19) which extends from the overflow outlet (9) towards the chamber (11) and which guides the water coming through the overflow outlet (9) towards a vertical wall of the chamber (11).
6. A washing machine (1) as in any one of the above claims, **characterized by** the buoy (20) comprising a magnet and the sensor (21) being a magnetic sensor.

Patentansprüche

1. Eine Waschmaschine (1) umfasst einen Körper (2); eine Wanne (3), die in dem Körper (2) angeordnet ist und in der der Waschvorgang durchgeführt wird; eine Zirkulationsleitung (4), in der das aus der Wanne (3) entnommene Wasser zirkuliert wird; ein Filterelement (5) mit einem Wassereinlass (7), durch den das aus der Zirkulationsleitung (4) kommende Wasser entnommen wird, einen Behälter (6), in den sich das durch den Wassereinlass (7) entnommene Wasser füllt, mindestens einen Filter (10), der in dem Behälter (6) angeordnet ist und das Zirkulationswasser filtert, und einen Wasserauslass (8), der es ermöglicht, das durch den Filter (10) hindurchtretende Wasser aus dem Behälter (6) abzuführen; einen Überlaufauslass (9), der am Behälter (6) in Strömungsrichtung des Wassers vor dem Wasserauslass (8) angeordnet ist; und eine Kammer (11), in die sich das durch den Überlaufauslass (9) kommende Wasser füllt; einen Niveausensor (12), der den Füllstand des Wassers in der Kammer (11) erfasst; und eine Steuereinheit (13), die den Verstopfungszustand des Filters (10) mittels der vom Niveausensor (12) empfangenen Wasserstandsdaten bestimmt, **gekennzeichnet ist es dadurch**, dass der Niveausensor (12) eine Boje (20) aufweist, die in der Kammer (11) angeordnet ist und geeignet ist, auf dem Wasser zu schwimmen, so dass sie zusammen mit dem sich in die Kammer (11) füllenden Wasser steigt, und einen Sensor (21), der die Position der Boje (20) erfasst, um die Höhe des Wassers in der Kammer (11) zu messen, wobei die Kammer (11) ein erstes Abteil (14) und ein zweites Abteil (15) auf-

weist, die zumindest teilweise voneinander getrennt sind, so dass das durch den Überlaufauslass (9) kommende Wasser zunächst in das erste Abteil (14) fließt und durch das erste Abteil (14) hindurchgeht, um sich in das zweite Abteil (15) zu füllen, und wobei der Füllstandssensor (12) in dem zweiten Abteil (15) angeordnet ist.

2. Eine Waschmaschine (1), wie in Anspruch 1 aufgeführt, **ist dadurch gekennzeichnet, dass** eine Wand (16), die das erste Abteil (14) und das zweite Abteil (15) voneinander trennt, und mindestens eine Öffnung (17), die an der Wand (16) angeordnet ist und die den Durchgang des Wassers vom ersten Abteil (14) zum zweiten Abteil (15) ermöglicht.
3. Eine Waschmaschine (1), wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** die Öffnung (17) in Form eines Schlitzes an der Wand (16) verläuft.
4. Eine Waschmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** ein am Boden der Kammer (11) angeordnetes Loch (18), mit einer kleineren Querschnittsfläche als die Querschnittsfläche des Überlaufauslasses (9), für den Abfluss des Wassers in der Kammer (11) sorgt.
5. Eine Waschmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** ein Leitmittel (19), das sich vom Überlaufauslass (9) zur Kammer (11) erstreckt und das das durch den Überlaufauslass (9) kommende Wasser zu einer vertikalen Wand der Kammer (11) leitet.
6. Eine Waschmaschine (1), wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** die Boje (20) einen Magneten umfasst und der Sensor (21) ein magnetischer Sensor ist.

Revendications

1. Une machine à laver (1) comprenant un corps (2) ; une cuve (3) disposée dans le corps (2) et dans laquelle le processus de lavage est effectué ; une conduite de circulation (4) dans laquelle l'eau prélevée dans la cuve (3) est circulée ; un élément de filtration (5) ayant une entrée d'eau (7) à travers laquelle l'eau provenant de la conduite de circulation (4) est prélevée, un réceptacle (6) dans lequel l'eau prélevée par l'intermédiaire de l'entrée d'eau (7) se remplit, au moins un filtre (10) qui est disposé dans le réceptacle (6) et qui filtre l'eau de circulation, et une sortie d'eau (8) qui permet à l'eau passant à travers le filtre

(10) d'être évacuée hors du réceptacle (6) ; un orifice de trop-plein (9) qui est disposé sur le réceptacle (6) de manière à être positionné avant la sortie d'eau (8) dans le sens de l'écoulement de l'eau ; et une chambre (11) dans laquelle l'eau venant par l'intermédiaire de l'orifice de trop-plein (9) se remplit ; un capteur de niveau (12) qui détecte le niveau de l'eau remplissant la chambre (11) ; et une unité de commande (13) qui détermine l'état de colmatage du filtre (10) au moyen des données de niveau d'eau reçues en provenance du capteur de niveau (12), **caractérisée en ce que** le capteur de niveau (12) comporte un flotteur (20) qui est disposé dans la chambre (11) et qui est apte à flotter sur l'eau de manière à monter avec l'eau remplissant la chambre (11), et un capteur (21) qui détecte la position du flotteur (20) de manière à mesurer la hauteur de l'eau dans la chambre (11), et la chambre (11) ayant un premier compartiment (14) et un deuxième compartiment (15) qui sont au moins partiellement séparés l'un de l'autre de telle sorte que l'eau venant par l'intermédiaire de l'orifice de trop-plein (9) s'écoule d'abord dans le premier compartiment (14) et traverse le premier compartiment (14) pour remplir le deuxième compartiment (15), et le capteur de niveau (12) qui est positionné dans le deuxième compartiment (15).

2. Une machine à laver (1) telle que revendiquée dans la revendication 1, **caractérisée par** une paroi (16) qui sépare le premier compartiment (14) et le deuxième compartiment (15) l'un de l'autre, et au moins une ouverture (17) qui est disposée sur la paroi (16) et qui permet le passage de l'eau du premier compartiment (14) au deuxième compartiment (15).
3. Une machine à laver (1) telle que revendiquée dans la revendication 2, **caractérisée par** l'ouverture (17) qui est sous la forme d'une fente s'étendant sur la paroi (16).
4. Une machine à laver (1) selon l'une quelconque des revendications précédentes, **caractérisée par** un trou (18) qui est disposé à la base de la chambre (11), qui a une section transversale plus petite que la section transversale de l'orifice de trop-plein (9) et qui assure la sortie de l'eau de la chambre (11).
5. Une machine à laver (1) selon l'une quelconque des revendications précédentes, **caractérisée par** un moyen de guidage (19) qui s'étend depuis l'orifice de trop-plein (9) vers la chambre (11) et qui guide l'eau venant par l'intermédiaire de l'orifice de trop-plein (9) vers une paroi verticale de la chambre (11).
6. Une machine à laver (1) telle que décrite dans l'une quelconque des revendications précédentes, **caractérisée par le** flotteur (20) comprenant un aimant et le capteur (21) étant un capteur magnétique.

Figure 1

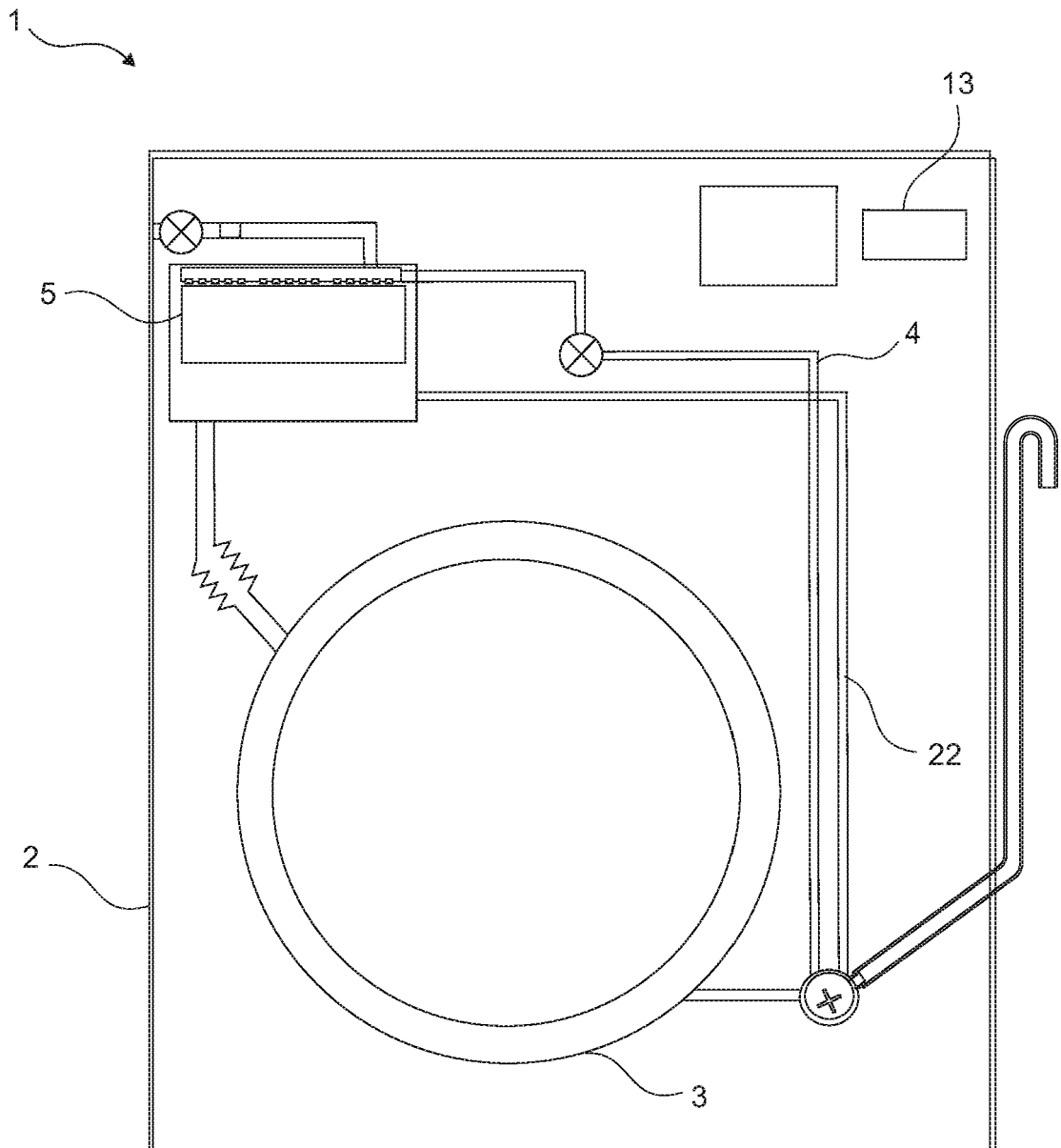


Figure 2

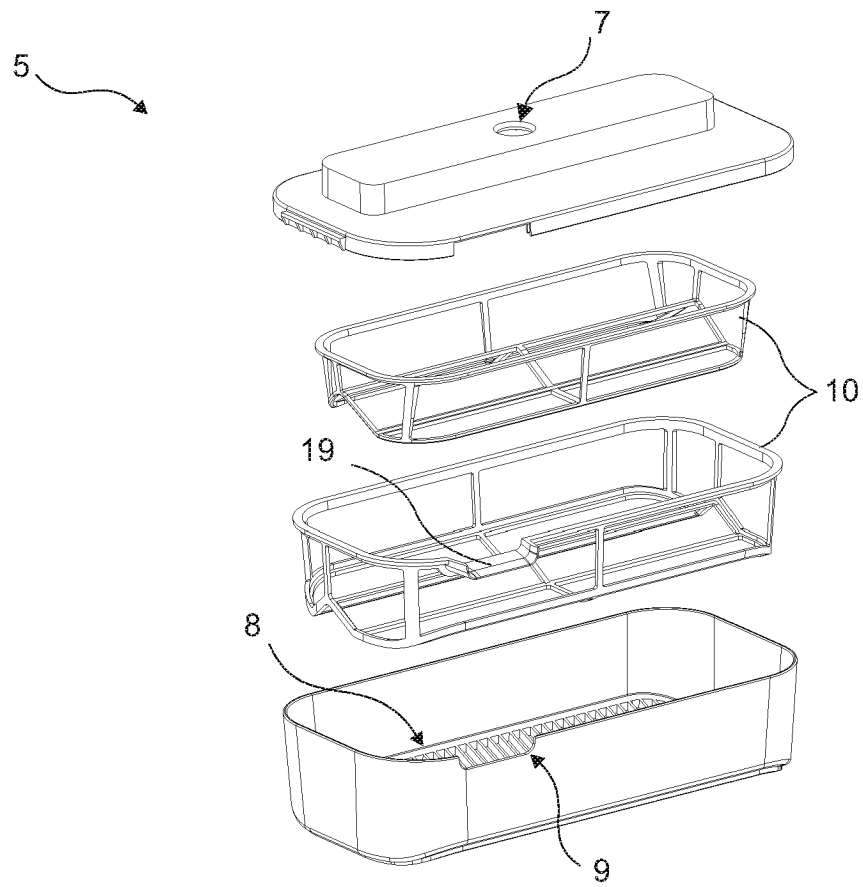


Figure 3

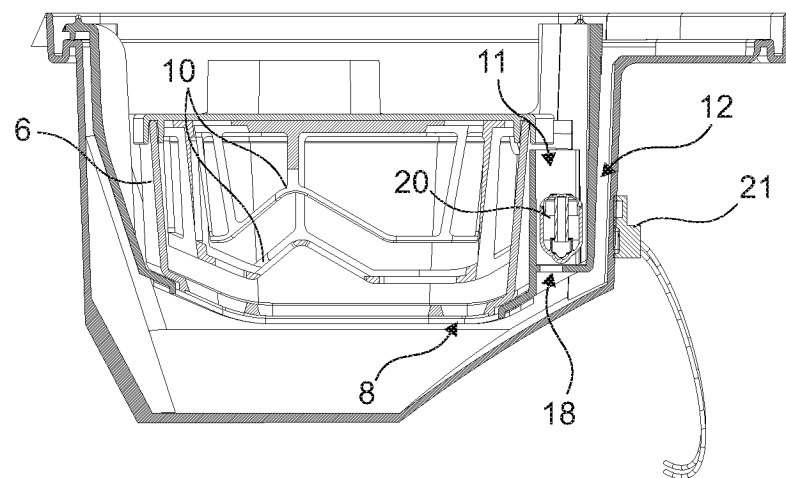
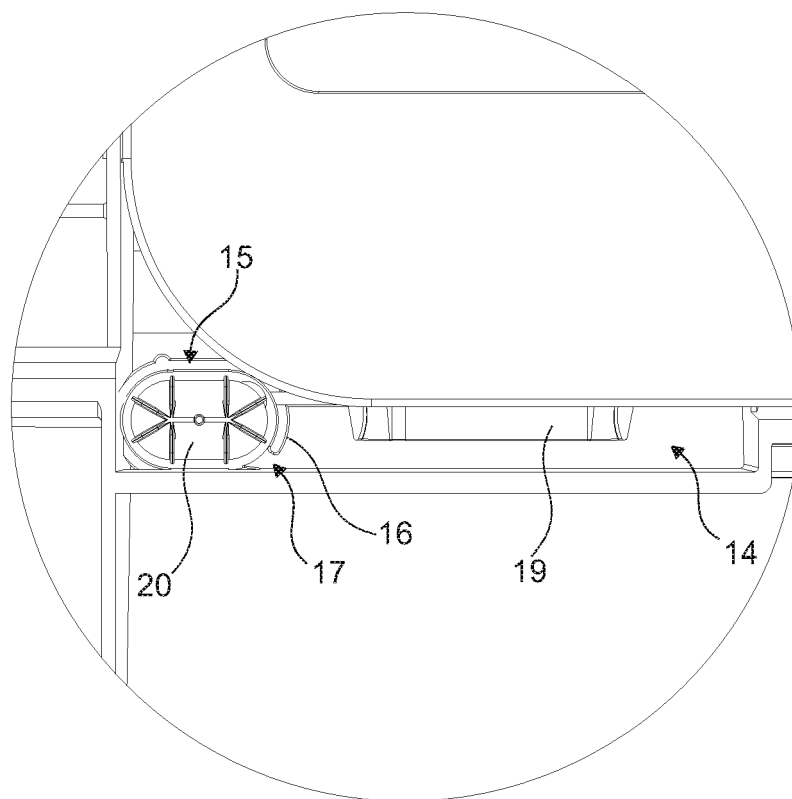


Figure 4



REFERENCES CITED IN THE DESCRIPTION

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