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(54) **A WASHING MACHINE COMPRISING A WATER SOFTENING UNIT**

(57) The present invention relates to a washing machine (1) comprising a casing (2) having a front wall (21), two side walls (22) extending opposite to each other and a base (22) extending between said side walls (22); a tub which is disposed in the casing and wherein the washing process is performed; and a water softening unit (3)

having a resin box (31) which is suitable for receiving a water softening member which reduces the hardness of the water to be used in the washing process and a salt box (32) which is suitable for receiving the salt used for regenerating the water softening member.

Description

[0001] The present invention relates to a washing machine which comprises a water softening unit.

[0002] In washing machines, water softening units are used for decreasing the hardness of the washing water and for providing an effective washing. The water softening unit comprises a resin box which contains the resin ensuring the hardness of the water to be removed is placed, and a salt box which is connected to the resin box by means of a regeneration line and which contains the salt used to regenerate the resin in the resin box unit by being kept in brine. The washing machine reaches high speeds during the washing and spin-drying steps. Meanwhile, the components in the washing machine are exposed to high levels of vibration and shock. In order to prevent damage due to the vibrations, the water softening unit should be placed securely in the body.

[0003] In the state of the art Patent Application Document No. WO2018103962 (A1), a washing machine comprising a water softening unit is disclosed.

[0004] The aim of the present invention is the realization of a washing machine wherein the water softening unit is securely fixed in the body.

[0005] The washing machine of the present invention comprises a casing having a front wall, two side walls extending opposite to each other and a base extending between said side walls; a tub which is disposed in the casing and wherein the washing process is performed; and a water softening unit having a resin box which is suitable for receiving a water softening member which reduces the hardness of the water to be used in the washing process and a salt box which is suitable for receiving the salt used for regenerating the water softening member. The water to be used in the washing process is passed through the water softening member in the resin box such that the hardness of the water is reduced. The water softening member can be a resin. The resin in the resin box enables the magnesium and calcium ions in the water to be retained, thus reducing the hardness of the water. The ions in the water are collected on the resin. Upon reaching the total ion holding capacity thereof, the resin can be renewed so as to perform the water softening function again with the regeneration process performed. The regeneration process is carried out by means of the salt in the salt box. The brine formed by passing the water through the salt in the salt box is transferred into the resin box by means of a regeneration line. Thus, the regeneration of the resin is achieved by replacing the sodium ions in the brine solution with the calcium and magnesium ions remaining on the resin. The water softening unit is fixed onto the base by means of a holder. Thus, the water softening unit is enabled to be securely and firmly fixed in the casing. Consequently, the water softening unit is prevented from being damaged due to the vibrations generated during the operation of the washing machine. Moreover, the water softening unit is prevented from displacing or dislodging as a result of shocks which may

occur during the transportation of the washing machine.

[0006] In an embodiment of the present invention, the holder is fixed onto the base by means of a connection means. The connection means can be any mechanical connection means such as a screw. In the preferred version of the present invention, the holder is fixed onto the base by means of two mechanical connection means. The holder is detachably fixed onto the base. The water softening unit is placed onto the holder so as to be at least partially positioned in the holder. Thus, the fixing of the water softening unit on the base is facilitated. Similarly, the water softening unit is detachably fixed onto the holder. Thus, when requested, the water softening unit can be removed from inside the casing by the operator or the service staff. Consequently, when the water softening unit is required to be repaired or replaced, the water softening unit can be easily detached and attached again.

[0007] In an embodiment of the present invention, the holder comprises a seating surface which is suitable for placing the water softening unit thereon, and a circumferential wall which extends from the seating surface and which surrounds the water softening unit when the water softening unit is placed on the holder. The circumferential wall is manufactured from a flexible material. While the water softening unit is being placed on the seating surface, the circumferential wall flexes a little, enabling the water softening unit to be placed therein. After the water softening unit is placed on the seating surface, the circumferential wall squeezes the side walls of the water softening unit. Thus, the water softening unit is fixed on the holder without using any mechanical connection members. Consequently, the water softening unit is prevented from being dislodged as a result of shocks which may occur during the transportation of the washing machine. When the water softening unit is required to be detached from the holder, the circumferential wall is slightly stretched by the operator or the service staff so as to remove the water softening unit.

[0008] In an embodiment of the present invention, the washing machine comprises at least one fixing protrusion which is positioned on an inner surface of the circumferential wall facing the water softening unit, when the water softening unit is placed on the seating surface. The fixing protrusion enables the water softening unit to be fixed on the holder. Thus, the water softening unit is prevented from moving and making noise as a result of shock or vibration which may occur in the washing machine. In an embodiment of the present invention, on the water softening unit, there may be a recess which is suitable for receiving said fixing protrusion. Thus, the water softening unit is fixed on the holder more firmly and rigidly.

[0009] In an embodiment of the present invention, the washing machine comprises a plurality of fixing protrusions which are arranged at intervals on the inner surface of the circumferential wall. Thus, the water softening unit is fixed on the holder more tightly. As the number of fixing protrusions increases, the water softening unit is fixed

more rigidly.

[0010] In an embodiment of the present invention, at least one fixing protrusion is in the form of a semicircle. By means of the semicircular fixing protrusion, the water softening unit is supported pointwise.

[0011] In an embodiment of the present invention, the fixing protrusion extends along the inner surface of the circumferential wall. Thus, the water softening unit is fixed in the holder more firmly. Moreover, the water softening unit is enabled to be supported equally from all angles and is prevented from moving in the holder.

[0012] In an embodiment of the present invention, the holder comprises a cut-out which is provided on the corner of the seating surface which joins with the circumferential wall. Thus, the flexibility of the circumferential wall is increased so as to facilitate the placement of the water softening unit on the seating surface.

[0013] In an embodiment of the present invention, the washing machine comprises a guiding housing which is provided on the circumferential wall and which is suitable for receiving a guiding protrusion provided on the water softening unit. Thus, the water softening unit is prevented from being erroneously attached onto the holder. In other words, an error prevention technique (poka-yoke) is created during the installation of the water softening unit into the holder.

[0014] In an embodiment of the present invention, the washing machine comprises a salt filling line which opens into an inlet opening on the front wall and which extends between the inlet opening and the salt box so as to enable the salt to be filled into the salt box. The salt filling line enables the user to put salt into the salt box. Since fixed on the base, the salt box is not in a position which can be easily accessed by the user from outside. A salt filling line is formed between the salt box and the front wall to enable the user to add salt into the salt box.

[0015] In an embodiment of the present invention, the washing machine comprises a lid which covers the inlet opening. Thus, the salt box is leak-proofingly closed. Consequently, unwanted substances such as water, dirt and dust are prevented from entering the salt box through the salt filling line.

[0016] 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 perspective view of the casing of the washing machine related to an embodiment of the present invention.

Figure 2 - is the perspective view of the casing of the washing machine related to an embodiment of the present invention.

Figure 3 - is the perspective view of the base of the washing machine when the holder is placed thereon related to an embodiment of the present invention.

Figure 4 - is the perspective view of the base of the washing machine when the holder is placed thereon and the water softening unit is placed on the holder related to an embodiment of the present invention.

Figure 5 - is the perspective view of the holder in the washing machine related to an embodiment of the present invention.

Figure 6 - is the sideways schematic view of the base of the washing machine when the holder is placed thereon related to an embodiment of the present invention.

[0017] The elements illustrated in the figures are numbered as follows:

1. Washing machine
2. Casing
 21. Front wall
 22. Side wall
 23. Base
3. Water softening unit
 31. Resin box
 32. Salt box
 33. Guiding protrusion
4. Holder
 41. Seating surface
 42. Circumferential wall
 43. Fixing protrusion
 44. Cut-out
 45. Guiding housing
5. Connection means
6. Salt filling line
 61. Inlet opening
7. Lid
- A. Access opening
- X. Width direction
- Y. Height direction

[0018] The washing machine (1) comprises a casing (2) having a front wall (21), two side walls (22) extending opposite to each other and a base (23) extending between said side walls (22); a tub which is disposed in the casing and wherein the washing process is performed; and a water softening unit (3) having a resin box (31) which is suitable for receiving a water softening member which reduces the hardness of the water to be used in the washing process and a salt box (32) which is suitable for receiving the salt used for regenerating the water softening member. The resin box (31) and the salt box (32) are positioned side by side in the water softening unit (3). A regeneration line which allows fluid communication is provided between the resin box (31) and the salt box (32). As shown in Figure 1 and Figure 2, an access opening (A) which allows external access to the tub disposed in the casing (2) is positioned on the front wall (21). The laundry is loaded into the drum disposed in the tub

through said access opening (A). The front wall (21) extends in the width direction (X) of the washing machine (1). On both sides of the front wall (21), there is a side wall (22) which extends in the height direction (Y) of the washing machine (1). At the bottom of the casing (2), there is a base (23) which extends between the two side walls (22). The base (23) extends in the width direction (X). The base (23) is the lower surface of the casing (2) facing the floor when the washing machine (1) is placed on a floor. In other words, the washing machine (1) is placed on the floor via the base (23).

[0019] The washing machine (1) of the present invention further comprises a holder (4) which enables the water softening unit (3) to be fixed to the base (23). By means of the holder (4), it becomes easier for the operator to fix the water softening unit (3) into the casing (2). Thus, ease of assembly is provided during the production of the washing machine (1). The water softening unit (3) is fixed in the casing (2) so as to remain under the tub. Thus, the water softening unit (3) is prevented from contacting the tub as a result of oscillations of the tub in the width direction (X). The holder (4) fixes the water softening unit (3) to the base (23) in a detachable manner. Thus, the water softening unit (3) can be easily detached from the casing (2) or replaced when required.

[0020] In an embodiment of the present invention, the washing machine (1) comprises the holder (4) which is fixed to the base (23) by means of at least one connection means (5). Thus, the holder (4) is enabled to be placed rigidly on the base (23). On the surface of the holder (4) facing the base (23), there are recesses and protrusions which match the form of the recesses and protrusions provided on the base (23). Thus, the holder (4) can be placed firmly on the base (23) by the snap-fitting method. The holder (4) can be attached to the base (23) by means of a mechanical connection means (5). After the holder (4) is placed on the base (23), the water softening unit (3) is placed on the holder (4) so as to at least partially remain in the holder (4). Thus, the fixing of the water softening unit (3) in the casing (2) is facilitated. Moreover, rigidity and installation problems which may occur while placing the water softening unit (3) directly on the base (23), which has an uneven structure, are prevented.

[0021] In an embodiment of the present invention, the washing machine (1) comprises the holder (4) having a seating surface (41) which is suitable for placing the water softening unit (3) thereon, and a circumferential wall (42) which extends from the seating surface (41) and which surrounds the water softening unit (3) when the water softening unit (3) is placed on the holder (4). The seating surface (41) is preferably a flat surface. Since the lower surface of the state of the art water softening units (3) is also a flat surface, it becomes easier to place the water softening unit (3) on the holder (4) by means of the flat seating surface (41). The holder (4) further comprises a circumferential wall (42) which extends from the seating surface (41) in the height direction (X) and which surrounds the water softening unit (3) when the water softening unit (3) is placed on the seating surface (41). The circumferential wall (42) firmly grips the water softening unit (3) so as to prevent the same from moving as a result of vibrations which may occur while the washing machine (1) is in operation. Thus, the water softening unit (3) is enabled to be fixed on the base (23) firmly.

[0022] In an embodiment of the present invention, the washing machine (1) comprises at least one fixing protrusion (43) which is positioned on an inner surface of the circumferential wall (42) facing the water softening unit (3), when the water softening unit (3) is placed on the seating surface (41). The fixing protrusion (43) extends from the inner surface of the circumferential wall (42) towards the water softening unit (3). The fixing protrusion (43) contacts the water softening unit (3) and squeezes the water softening unit (3) in the holder (3). Thus, the water softening unit (3) is enabled to be fixed on the holder (4).

[0023] In an embodiment of the present invention(1), the washing machine (1) comprises a plurality of fixing protrusions (43) which are arranged at intervals on the inner surface of the circumferential wall (42). Thus, the water softening unit (3) placed on the seating surface (41) is enabled to be fixed on the holder (4) more firmly. As shown in Figure 3 and Figure 5, the fixing protrusions (43) are arranged on the circumferential wall (42) at equal intervals. Thus, the water softening unit (3) is enabled to be supported equally from all points thereof along the circumferential wall (42).

[0024] In an embodiment of the present invention, the washing machine (1) comprises the fixing protrusion (43) which is semicircular. Thus, the fixing protrusion (43) squeezes the water softening unit (3) pointwise. Thus, the water softening unit (3) is ensured to be fixed in the holder (4) in an optimum manner without being damaged. In Figure 3 and Figure 5, the fixing protrusions (43) provided on the inner surface of the circumferential wall (42) are semicircular.

[0025] In an embodiment of the present invention, the washing machine (1) comprises the fixing protrusion (43) which extends along the inner surface of the circumferential wall (42). Thus, the water softening unit (3) is squeezed along the line where the circumferential wall (42) surrounds the same and is fixed in the holder (4). In Figure 6, the fixing protrusion (43) extends along the inner surface of the circumferential wall (42).

[0026] In an embodiment of the present invention, the washing machine (1) comprises a cut-out (44) which is provided on the corner of the seating surface (41) which joins with the circumferential wall (42). As shown in Figure 5, the cut-out (44) is formed on the seating surface (41). By means of a cut-out (44) provided on the corner of the seating surface (41) which joins the circumferential wall (42), the flexibility of the section of the circumferential wall (42) adjacent to said cut-out (44) is increased. Thus, the circumferential wall (42) is enabled to flex while the water softening unit (3) is placed on the seating surface

(41). Consequently, the placement of the water softening unit (3) on the holder (4) is facilitated. After the water softening unit (3) is placed on the seating surface (41), the circumferential wall (42) squeezes the water softening unit (3) while returning to the initial form. Thus, the water softening unit (3) is enabled to be fixed on the holder (4).

[0027] In an embodiment of the present invention, the washing machine (1) comprises a guiding housing (45) which is provided on the circumferential wall (42) and which is suitable for receiving a guiding protrusion (33) provided on the water softening unit (3). As shown in Figure 4, on the water softening unit (3), there is a guiding protrusion (33) which extends outwards from the plane of the water softening unit (3). On the circumferential wall (42), there is a guiding housing (45) which is suitable for receiving said guiding protrusion (33). The guiding protrusion (33) extends at a region different from the center of the water softening unit (3). By means of said guiding protrusion (33) and the guiding housing (45), the water softening unit (3) is enabled to be correctly placed on the holder (4). In other words, the water softening unit (3) is enabled to be placed on the holder (4) only in the correct direction. When the guiding protrusion (33) is placed into the guiding housing (45), the guiding housing (45) surrounds the guiding protrusion (33). In the preferred version of the present invention, there is at least one fixing protrusion (43) on the guiding housing (45). Thus, the water softening unit (3) is supported via the guiding protrusion (33) and fixed firmly on the holder (4).

[0028] In an embodiment of the present invention, the washing machine (1) comprises a salt filling line (6) which opens into an inlet opening (61) on the front wall (21) and which extends between the inlet opening (61) and the salt box (32) so as to enable the salt to be filled into the salt box (32). By means of the salt filling line (6), the user can put salt into the salt box (32). Thus, when the amount of salt in the salt box (32) decreases, the user is enabled to fill the salt box (32) with salt through the inlet opening (61) provided on the front wall (21). In Figure 1 and Figure 2, the inlet opening (61) is positioned below the access opening (A) with respect to the height direction (Y). The inlet opening (61) may be positioned higher than the access opening (A) with respect to the height direction (Y).

[0029] In an embodiment of the present invention, the washing machine (1) comprises a lid (7) which covers the inlet opening (61). The lid (7) has a closed position wherein the same closes the inlet opening (61). When the lid (7) is in the closed position, the salt filling line (6) is closed so as to prevent air entry. Thus, the salt in the salt box (32) is prevented from becoming stale. The lid (7) has an open position wherein the same enables the user to access the inlet opening (61). The lid (7) can be moved between the closed position and the open position.

[0030] By means of the present invention, a washing machine (1) is realized, wherein the water softening unit (3) is placed firmly and easily on the base (23) by means

of a holder (4).

Claims

1. A washing machine (1) **comprising** a casing (2) having a front wall (21), two side walls (22) extending opposite to each other and a base (22) extending between said side walls (22); a tub which is disposed in the casing and wherein the washing process is performed; and a water softening unit (3) having a resin box (31) which is suitable for receiving a water softening member which reduces the hardness of the water to be used in the washing process and a salt box (32) which is suitable for receiving the salt used for regenerating the water softening member,
 - **characterized by** a holder (4) which enables the water softening unit (3) to be fixed to the base (23).
2. A washing machine (1) as in Claim 1, **characterized by** the holder (4) which is fixed to the base (23) by means of at least one connection means (5).
3. A washing machine (1) as in Claim 1 or 2, **characterized by** the holder (4) having a seating surface (41) which is suitable for placing the water softening unit (3) thereon and a circumferential wall (42) which extends from the seating surface (41) and which surrounds the water softening unit (3) when the water softening unit (3) is placed on the holder (4).
4. A washing machine (1) as in Claim 3, **characterized by** at least one fixing protrusion (43) which is positioned on an inner surface of the circumferential wall (42) facing the water softening unit (3), when the water softening unit (3) is placed on the seating surface (41).
5. A washing machine (1) as in Claim 4, **characterized by** a plurality of fixing protrusions (43) which are arranged at intervals on the inner surface of the circumferential wall (42).
6. A washing machine (1) as in Claim 4 or 5, **characterized by** the fixing protrusion (43) which is semi-circular.
7. A washing machine (1) as in Claim 4, **characterized by** the fixing protrusion (43) which extends along the inner surface of the circumferential wall (42).
8. A washing machine (1) as in any one of Claims 3 to 7, **characterized by** a cut-out (44) which is provided on the corner of the seating surface (41) which joins the circumferential wall (42)

9. A washing machine (1) as in any one of Claims 3 to 8, **characterized by** a guiding housing (45) which is provided on the circumferential wall (42) and which is suitable for receiving a guiding protrusion (33) provided on the water softening unit (3). 5
10. A washing machine (1) as in any one of the above claims, **characterized by** a salt filling line (6) which opens into an inlet opening (61) on the front wall (21) and which extends between the inlet opening (61) 10 and the salt box (32) so as to enable the salt to be filled into the salt box (32).
11. A washing machine (1) as in Claim 10, **characterized by** a lid (7) which covers the inlet opening (61). 15

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Figure 1

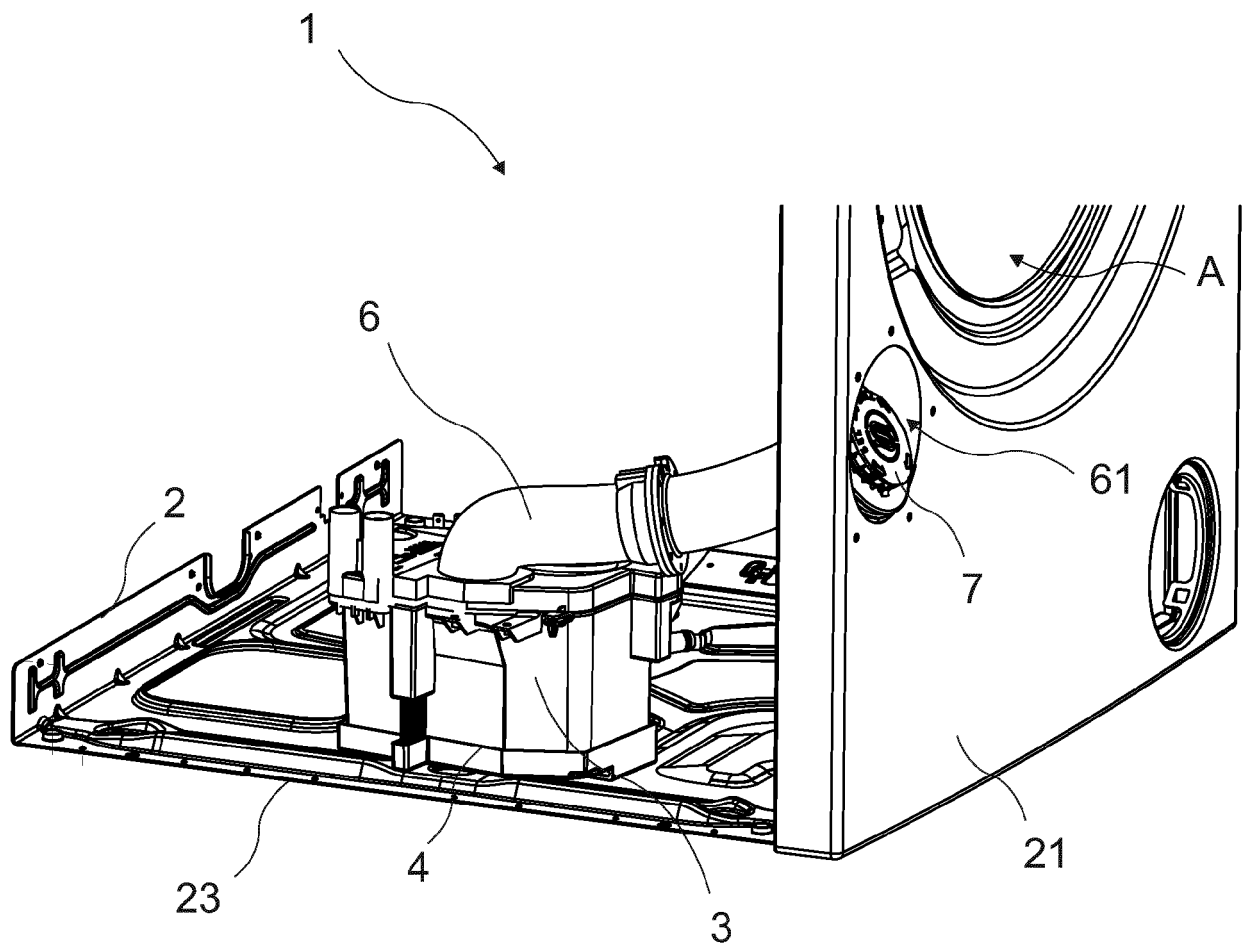


Figure 2

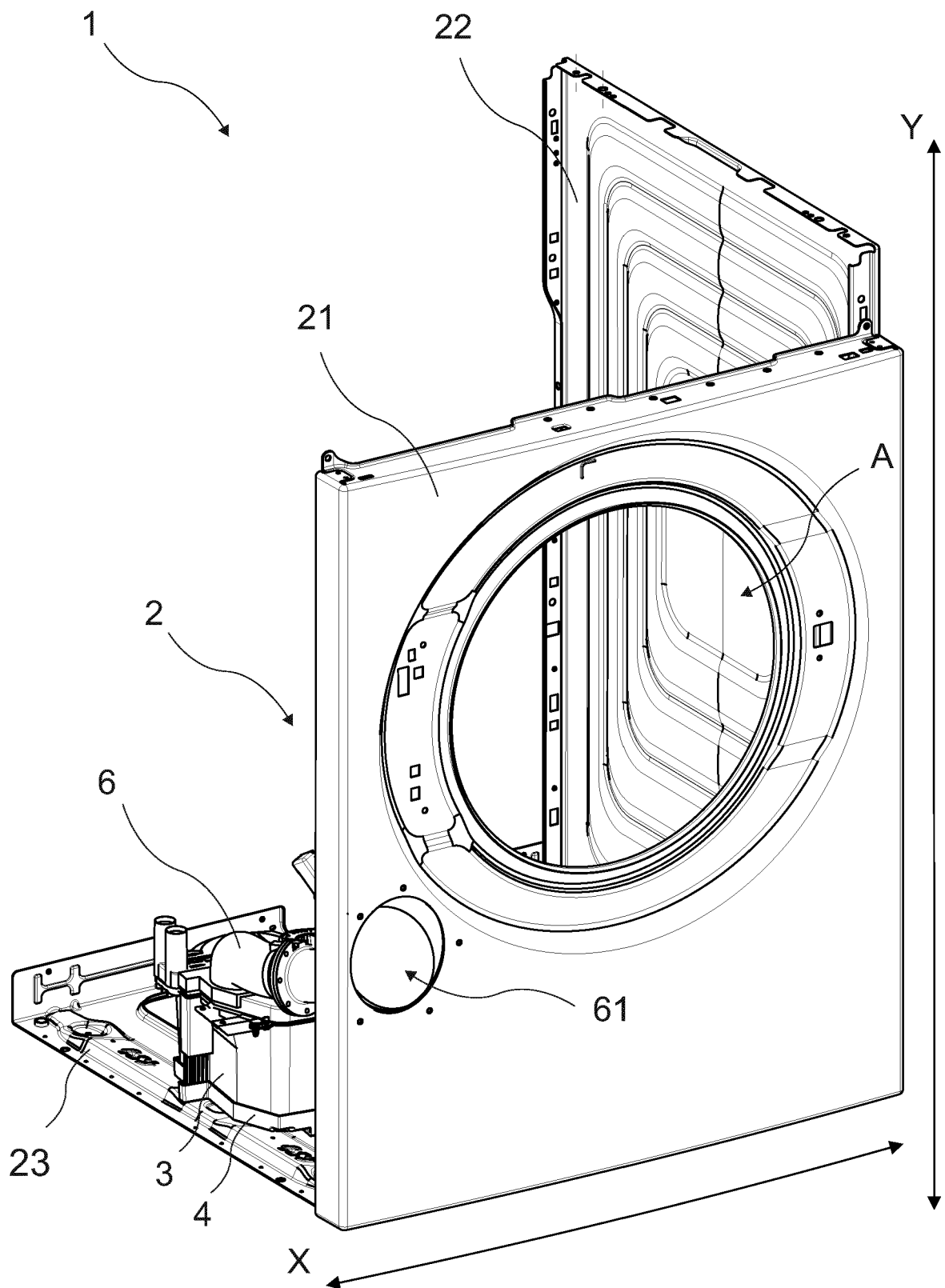


Figure 3

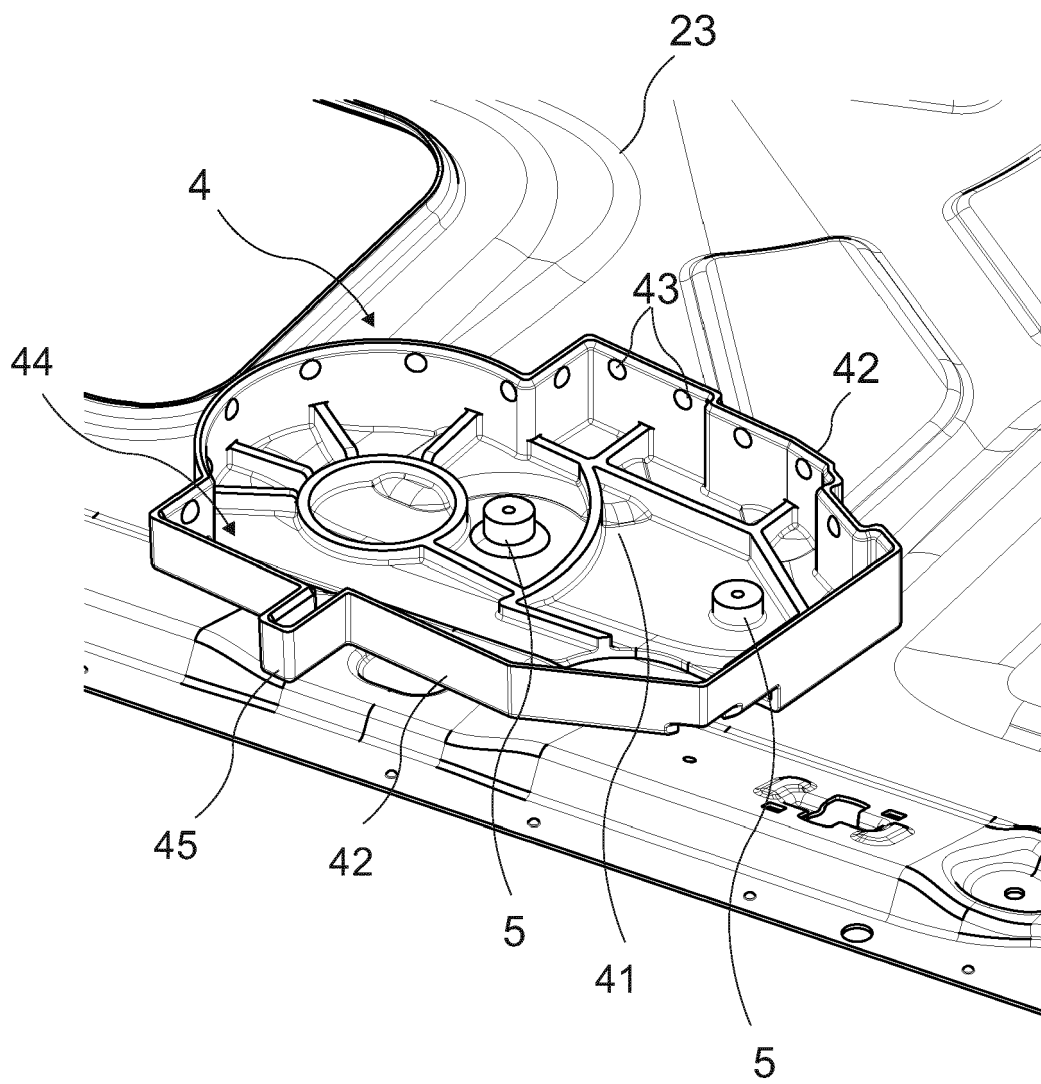


Figure 4

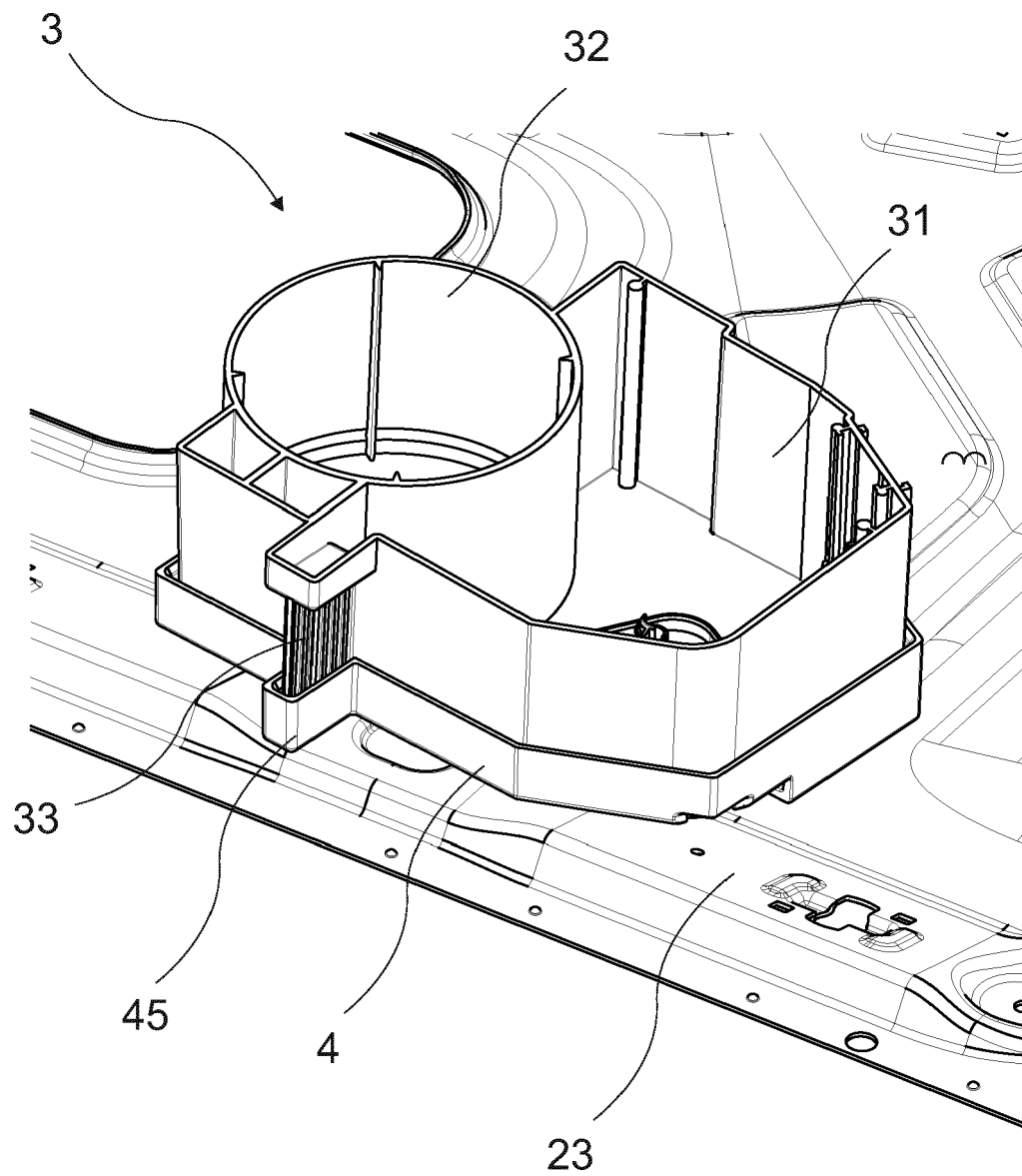


Figure 5

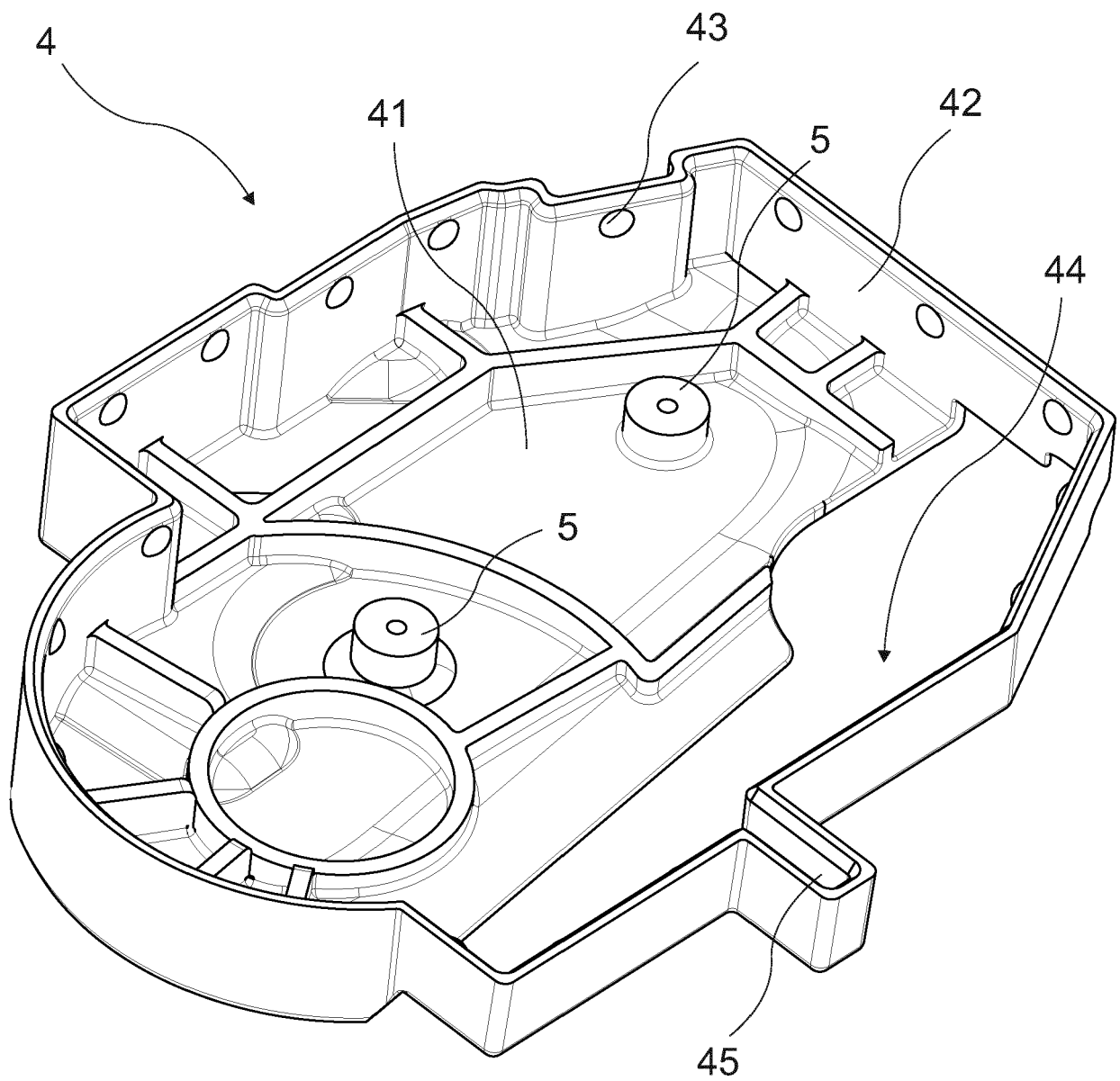
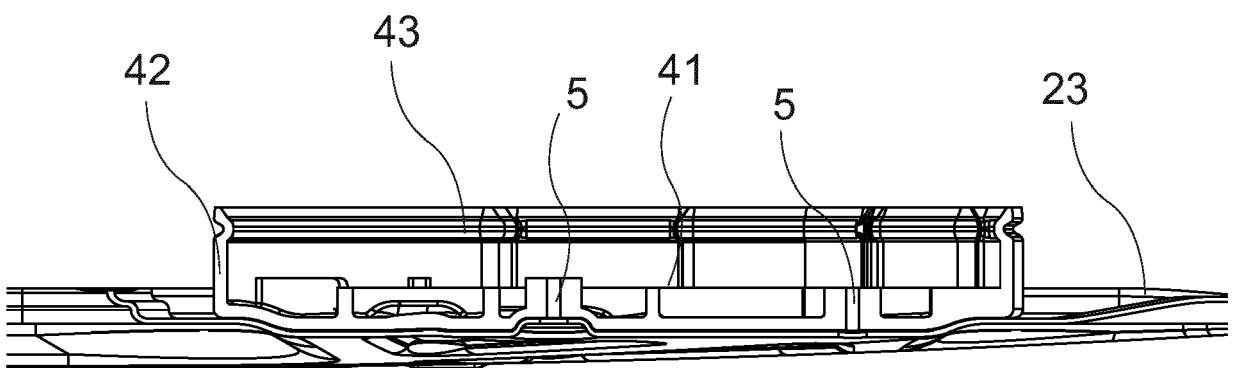


Figure 6





EUROPEAN SEARCH REPORT

Application Number

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EPO FORM 1503 03.82 (P04C01)

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 May 2024	Examiner Popara, Velimir
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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REFERENCES CITED IN THE DESCRIPTION

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