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(54) **Support structure of a rotary drum laundry treating appliance and rotary drum laundry treating appliance including said support structure**

(57) A support structure (110) is disclosed of a rotary drum laundry treating appliance, such as a washing machine, a washing-drying machine or a laundry drier (100). This support structure (110) comprises a base portion (111), a front wall (112) connected to the base portion (111), a rear wall (113) connected to the base portion (111), at least two beam elements (120, 130, 140) independently mounted on the front wall (112) and the rear wall (113) for structurally connecting such walls together

at an upper region of the support structure (110). According to the invention, one of said beam elements (120, 130) comprises a reinforced portion of an upper hopper (114) of the rotary drum laundry treating appliance (100). Thus, the manufacturing of the appliance (100) is made simpler as well as disposal, and a more extensive use of recycled material can be achieved; also, the weight of the appliance (100) can be reduced.

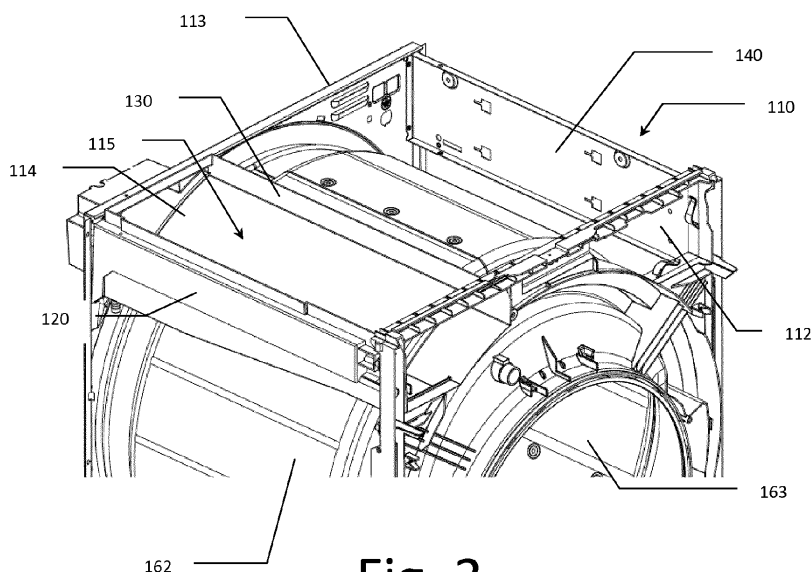


Fig. 3

Description

[0001] The present invention relates to a support structure of a rotary drum laundry treating appliance, such as a laundry washing machine, a laundry washing-drying machine or a laundry drier, and to a rotary drum laundry treating appliance including said support structure.

[0002] Laundry washing machines, laundry washing-drying machines and laundry driers share some structural features as well as some technical issues, due to the very similar overall architecture, based on a rotary drum mounted in a support structure. For this reason, these machines are sometimes referred to as rotary drum laundry treating appliances, when it is intended to refer to any of these three types of machines, like in the present specification.

[0003] A rotary drum laundry treating appliance is made with a support structure that has the task of supporting the rotary drum and all the parts and elements of the appliance, either directly or indirectly, and of transferring the weight of the appliance and all stresses generated during operation to the floor on which the appliance is laid. Normally, the support structure includes a front wall and a rear wall of the appliance, as well as elements that structurally connect these two walls, at different heights so as to ensure that the support structure is sufficiently strong. By the expression "structurally connect" it is meant here that these elements are strong enough to bear mechanical stresses that go well beyond those merely implied by these elements themselves (such as their weight, or the forces necessary to fix them to the walls), so as to be able to transfer significant stresses between the walls, such as stresses due to the rotation of the drum, even at high speed or with somehow unbalanced loads.

[0004] In a first known solution, the supporting structure includes a base portion that connects a front and a rear wall at the bottom of the appliance, and one or more metal beams that connect the two walls at the top of the appliance. A front panel and further two side panels having decorative purpose only cover the machine supporting structure. Such a structure is disclosed in EP 1783266 A1.

[0005] This first solution is used and substantially meets the basic need of structural strength of the appliance. However, it requires specific assembling steps when manufacturing the appliance, and specific disassembling/assembling steps when working on a used appliance that requires maintenance and/or repair of parts that are not readily accessible because of the beams; moreover, the beams -being made of metal- are relatively heavy.

[0006] According to a further known arrangement, the metal beams of the machine support structure are replaced by a single top structure, just beneath the top cover, connected to the front and rear walls and extending from one side to the other of the appliance, thereby interconnecting also the side walls of the appliance. In such

a structure, with the exception of the front and rear wall, all the other walls defining the laundry treating machine box-like cabinet, which encloses the operational components provided for carrying out a treatment on laundry, are made 'structural', i.e. they are designed to support mechanical stresses due to the machine operation. In other words, by removing a 'structural' wall the machine stability and operational integrity are compromised, or even absent. Also this solution substantially meets the basic need of structural strength of the appliance. However, it requires a rather complex and heavy top structure, which, again, becomes an obstacle during maintenance/repair of the appliance. In fact, in case a maintenance/repair intervention is needed, the removal of single top structure or of one side wall of the machine cabinet affects the structural stability of the entire machine. In addition, from the dimensional point of view, a single top structure has to be specifically designed for a single appliance cabinet model, thereby reducing flexibility of the machine support structure to be adapted to different machine models.

[0007] Therefore, there is still a need to improve the support structure of these appliances, not only from the strength point of view but also by improving its dimensional flexibility so as to be adapted to different appliance models. The aim of the present invention is thus to overcome or at least reduce the drawbacks noted above with reference to the prior art appliances. In accordance with a first aspect of the invention, a support structure is thus defined in claim 1; preferred features of the support structure are set forth in dependent claims.

[0008] According to the invention, a support structure of a rotary drum laundry treating appliance comprises a base portion, a front wall connected to the base portion, a rear wall connected to the base portion, at least two beam elements independently mounted on the front wall and the rear wall for structurally connecting the front wall and the rear wall together, at an upper region of the support structure, characterized in that one of the beam elements comprises at least a reinforced portion of an upper hopper of the rotary drum laundry treating appliance.

[0009] The upper hopper is an element that is present in any appliance of this kind; in case of a laundry washing machine or of a laundry washing-drying machine, the upper hopper is a detergent distributor device or a part thereof, while in case of a laundry drier the upper hopper is a housing portion of a condensed moisture containing tank. The upper hopper is arranged to convey liquid towards a drum in a laundry machine able to carry out a washing process, or towards a liquid receptacle in a laundry machine able to carry out a drying process. The upper hopper may be configured for receiving, preferably in a slidable manner, a water bearing device such as a detergent drawer having chambers to receive water and mix such water with a detergent substance, or a condensed moisture water tank. In known appliances, the upper hopper is a non-structural element, i.e. an element whose strength is not enough to bear any stresses other

than those strictly related to the hopper itself, i.e., in practice, stresses due to the forces by which the hopper is fixed to an appliance support structure; stresses due to the rotation of the drum and weight of operational components of the appliance are not transferred to the hopper of known type, which could not bear them.

[0010] By providing that a portion of the upper hopper is structured so as to form a beam element that becomes a part of the support structure, able to transfer stresses between the front and rear wall, the necessary strength of the support structure is ensured in an easier way with respect to the prior art. There is, in fact, no need for mounting a great number of components, nor for a special top structure, therefore, both manufacturing and maintenance/repair are made easier. In addition the support structure may be adapted to appliance models having different overall dimensions. Besides, an overall reduction of weight can be easily achieved. Also, the reinforced portion of the upper hopper can be made by the same polymeric material of which the upper hopper is made; this allows to make a wider use of recycled material when manufacturing the appliance, and also to improve recyclability of the parts of the appliance when it is disposed.

[0011] Preferably, the upper hopper comprises also non-reinforced portions having a mechanical strength that is negligible compared to that of the reinforced portion, in relation to the structural connection of the front wall to the rear wall. Indeed, it is not necessary that the whole upper hopper is involved in transferring stresses between the front and rear walls. In this way, the risk that the upper hopper is somehow deformed by the stresses is confined to the reinforced portion; the rest of the upper hopper is substantially non involved in the transfer of stresses, and therefore the reciprocal coupling of sliding parts within the upper hopper is not affected by the fact that the reinforced portion of the upper hopper is part of the support structure of the appliance.

[0012] Normally, the upper hopper is provided at a side upper region of the rotary drum laundry treating appliance. The reinforced portion can be provided in different positions in the upper hopper, provided it can reach both the front and the rear walls of the support structure. Thus, in a preferred embodiment, one of said at least a reinforced portion of the upper hopper is provided at a first side of the upper hopper, at a side of the support structure, the beam element thus resulting provided at a side upper region of the support structure. Alternatively, or in addition, one of said at least a reinforced portion of the upper hopper is provided at a second side of the upper hopper at a central upper region of the support structure, the beam element resulting provided at a central upper region of the support structure. In both cases, structural connection between the front and rear walls is obtained at a top location of the appliance, thus well supplementing the structural connection obtained at the bottom by the base portion; according to the specific structural needs of the appliance, one position or the other can be selected, or both. A further beam element, other than the rein-

forced portion of the upper hopper, is also provided to enhance the strength of the support structure, e.g. at a side upper region remote from the upper hopper.

[0013] The reinforced portion can be made in different ways within the upper hopper.

[0014] In a preferred embodiment, said at least a reinforced portion comprises two vertical main walls solidly connected by an upper bridge, said at least a reinforced portion having thus a U-shaped cross section in a vertical plane parallel to the front and the rear walls. By "solidly connected", in the present text, a permanent connection is meant, that makes the connected parts as if they are made of one piece, from one and the same material; obviously, in this expression the case is also included in which the parts are actually made of one piece. Preferably, said at least a reinforced portion comprises a plurality of parallel vertical fins, solidly connected to said vertical main walls and to said bridge. The U-shaped cross section allows to easily obtain a strong structure even by using a polymeric material used for upper hoppers, also without the need for particularly thick walls; this is even more the case if the vertical walls are connected by fins.

[0015] In another preferred embodiment, said at least a reinforced portion comprises a vertical main wall solidly connected to an upper bracket, said at least a reinforced portion having thus an inverted L-shaped cross section in a vertical plane parallel to the front and the rear walls. Preferably, said at least a reinforced portion comprises a plurality of parallel vertical fins, solidly connected to said vertical main wall and to said upper bracket. The L-shaped cross section also allows to easily obtain a strong structure even by using a polymeric material used for upper hoppers, also without the need for particularly thick walls; this is even more the case if the vertical wall and the bracket are connected by fins.

[0016] In accordance with other aspects of the invention, a laundry treating machine comprising a support structure is claimed. In particular, the laundry treating machine may be embodied as a laundry washing machine, a laundry drier or a washing and drying machine.

[0017] Further features and advantages of a support structure of a rotary drum laundry treating appliance according to the present invention will be clearer from the detailed description of a preferred embodiment thereof, provided by way of non limiting example, with reference to the annexed drawings, in which:

- fig. 1 is a front-right perspective view of a rotary drum laundry treating appliance according to the invention, in particular a laundry drier, without a top cover;
- fig. 2 is a front-right perspective view of the laundry drier of fig. 1, without external panels and elements, to better show the support structure;
- fig. 3 is a front-left perspective view of part of the laundry drier of fig. 1;

- fig. 4 is a front-left perspective view of the upper hopper of the laundry drier of fig. 1;
- fig. 5 is a rear-right perspective view of the upper hopper of the laundry drier of fig. 1;
- fig. 6 is a partially sectioned front-left perspective view of part of the laundry drier of fig. 1;
- fig. 7 is a section view of part of the laundry drier of fig. 1;
- fig. 8 is a front-right perspective view of a rotary drum laundry treating appliance according to the invention, in particular a washing machine (or washing-drying machine);
- fig. 9 is a section view of part of the washing machine of fig. 8.

[0018] In the following, the support structure of the invention will be mainly described with reference to a laundry drier, as shown in figures 1 to 7, being it clear that the described support structure can be included in a washing machine or in a washing-drying machine; a washing machine is shown in figures 8 and 9.

[0019] With reference to figures 1-7, a laundry drier **100** is shown that includes a support structure **110** on which all the remaining parts and elements of the appliance are mounted, directly or indirectly. The support structure **110** comprises a base portion **111** and two walls, a front wall **112** and a rear wall **113**, structurally connected to the base portion **111** at the bottom of the laundry drier **100**. It is to be noted that, in the following text, reference is made to the position of the appliance as shown in figure 1, so that expressions like up, down, front, rear, left, right, etc. are to be taken according to the position of figure 1.

[0020] The support structure **110** also comprises beam elements, structurally connecting the front wall **112** to the rear wall **113** at an upper location on the support structure **110**.

[0021] A first beam element **120** and a second beam element **130** are reinforced portions of a same upper hopper **114**. The upper hopper **114**, that in the case of the laundry drier **100** forms a housing for a condensed moisture containing tank not shown in the drawings, is provided at a left side upper region of the laundry drier **100**, and includes a main body **115** between said two beam elements **120** and **130**.

[0022] The reinforced portion that forms the first beam element **120** is provided at a left side region of the upper hopper **114**, so that the first beam element **120** results provided at an upper left side region of the support structure **110**. The reinforced portion that forms the first beam element **120** comprises two vertical main walls **121** and **122**, parallel to each other and extended from the front wall **112** to the rear wall **113** of the support structure **110**;

the two main walls **121** and **122** are solidly connected by an upper bridge **123**, so that this reinforced portion has a U-shaped cross section, in a vertical plane parallel to the front wall **112** and the rear wall **113**. Besides, the reinforced portion that forms the first beam element **120** also comprises vertical fins **124**, solidly connected to the vertical main walls **121** and **122** and to the upper bridge **123**. Thus, the first beam element **120** has a box-like structure, open downwards, that ensures the required mechanical strength.

[0023] The reinforced portion that forms the second beam element **130** is provided at a right side region of the upper hopper **114**, so that the second beam element **130** results provided at a central upper region of the support structure **110**. The reinforced portion that forms the second beam element **130** comprises a vertical main wall **131** and an upper bracket **133**, both extended from the front wall **112** to the rear wall **113** of the support structure **110**; the main wall **131** and the bracket **133** are solidly connected to each other, so that this reinforced portion has an L-shaped cross section, in a vertical plane parallel to the front wall **112** and the rear wall **113**. Besides, the reinforced portion that forms the second beam element **130** also comprises vertical fins **134**, solidly connected to the vertical main wall **131** and to the upper bracket **133**. Thus, the second beam element **130** has a semi-box structure, open downwards and to the right, that ensures the required mechanical strength.

[0024] The main body **115** is a non-reinforced portion of the upper hopper **114**. This means that the mechanical strength of the main body **115** is negligible compared to that of the reinforced portions that form the two beam elements **120** and **130**, as far as the structural connection of the front wall **112** to the rear wall **113** is concerned.

[0025] Preferably, the entire upper hopper, including the reinforced portions that form the beam elements **120** and **130** and the non-reinforced portion that form the main body **115**, are obtained by injection molding of a suitable polymeric material, such as polypropylene.

[0026] A third beam element **140** is provided at an upper right side region of the support structure **110**. The third beam element **140** can be made of metal, or preferably of the same mold injected polymeric material as the upper hopper **114**. The third beam element **140** can be mounted/dismounted to/from the front wall **112** and the rear wall **113** independently from the first and second beam elements **120** and **130**, i.e. the third beam element **140** is a separate, independent piece from the first and second beam elements **120**, **130**. This arrangement advantageously allows the use of the same beam elements to provide support structures **110** for appliance having different overall dimensions.

[0027] As mentioned above, the support structure **110** -made by the base portion **111**, the front wall **112**, the rear wall **113**, the first beam element **120**, the second beam element **130** and the third beam element **140**- rests on a floor and supports all remaining parts and elements of the laundry drier **100**. These parts and elements in-

clude in particular a front panel **150**, left and right side panels **151** and **152**, an electric motor **161**, a rotary drum **162** comprising a laundry treatment chamber **163** for receiving laundry to be treated by the appliance, the drum being driven by the electric motor 161. The front and side panels 150, 151 and 152 are mounted to the front and rear walls 112 and 113, but are not involved in the structural connection between these two walls, that is fully achieved by the base portion 111 and the beam elements 120, 130, 140. The front and side panels 150, 151 and 152 are decorative panels. Therefore, in particular, side panels 151 and 152 have a mechanical strength that is negligible compared to that of the reinforced portions of the upper hopper 114 that form the beam elements 120 and 130. The front panel 150 has an opening **164** giving access to the laundry treating chamber 163. Such opening 164 is aligned with a corresponding opening **166** formed on the front wall 112, and both openings 164, 166 are closed by a pivotable door **165**.

[0028] The front wall 112 comprises an air duct **167** provided for conveying air through the laundry treating chamber 163 so as to dry wet laundry.

[0029] Other parts and elements of the laundry drier 100 are not mentioned in detail here, but many of them are shown in the drawings.

[0030] In figures 8 and 9, a washing machine **200** is shown that includes a support structure **210** on which all the remaining parts and elements are mounted, directly or indirectly. The support structure 210 is substantially the same as the support structure 110 of the laundry drier 100 described above, and will not be described nor shown in detail. Therefore, the support structure 210 comprises a base portion **211**, a front wall **212**, a rear wall **213**, first and second beam elements **220**, **230**. A third beam element (not visible in figure 8) is arranged in an upper region of the support structure 210 in a position which is opposite relative to the first beam element 220. As already described with reference to figures 1 to 7, the third beam element is an independent, separate piece from the first and second beam elements 220, 230. Beam elements 220 and 230 are reinforced portions of an upper hopper **214**, which in this case is a component of a detergent distributor device and the upper hopper 214 further includes also a main body **215** that is not reinforced. Beam element 220 comprises two vertical main walls **221** and **222**, an upper bridge **223** and vertical fins **224**. Beam element 230 comprises a vertical main wall **231**, a bracket **233** and vertical fins **234**. The washing machine 200 includes also a front panel **250**, a left side panel **251** and a right side panel **252**, a tub **262**, a drum **262** rotatably mounted within a tub (not shown) adapted to contain a washing liquor. Rotary drum 262 is provided with pass-through apertures **270** for allowing the washing liquor contained in the tub to access a laundry treatment chamber **263** defined by the inner region of the drum 262. The front panel 250 has an opening **264** giving access to the laundry treating chamber 263, the opening **264** is aligned with a corresponding opening **266** formed on the front

wall 212, and both openings 264, 266 are closed by a pivotable door **265**.

[0031] The characteristics and properties of these elements and parts are the same as those of the corresponding parts and elements of the laundry drier 100.

Claims

1. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) such as a washing machine, a washing-drying machine or a laundry drier, comprising a base portion (111; 211), a front wall (112; 212) connected to the base portion (111; 211), a rear wall (113; 213) connected to the base portion (111; 211), at least two beam elements (120, 130, 140; 220, 230) independently mounted on the front wall (112; 212) and the rear wall (113; 213) for structurally connecting such walls together at an upper region of the support structure (110; 210), **characterized in that** one of said beam elements (120, 130; 220, 230) comprises at least a reinforced portion of an upper hopper (114; 214) of the rotary drum laundry treating appliance (100; 200).
2. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to claim 1, wherein the upper hopper (114; 214) comprises non-reinforced portions (115; 215) having a mechanical strength that is negligible compared to that of the reinforced portion, in relation to the structural connection of the front wall (112; 212) to the rear wall (113; 213).
3. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to claim 1 or 2, wherein the upper hopper (114; 214) is provided at a side upper region of the rotary drum laundry treating appliance (100; 200), one of said at least a reinforced portion of the upper hopper (114; 214) is provided at a first side of the upper hopper (114; 214) at a side of the support structure (110; 210), the beam element (120; 220) comprising the reinforced portion thus resulting provided at a side upper region of the support structure (110; 210).
4. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to any preceding claim, wherein the upper hopper (114; 214) is provided at a side upper region of the rotary drum laundry treating appliance (100; 200), one of said at least a reinforced portion of the upper hopper (114; 214) is provided at a second side of the upper hopper (114; 214) at a central upper region of the support structure (110; 210), the beam element (130; 230) comprising the reinforced portion resulting provided at a central upper region of the support structure (110; 210).

5. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to any preceding claim, wherein said at least a reinforced portion comprises two vertical main walls (121, 122; 221, 222) solidly connected by an upper bridge (123; 223), said at least a reinforced portion having thus a U-shaped cross section in a vertical plane parallel to the front (112; 212) and the rear walls (113; 213). 5
6. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to claim 5, wherein said at least a reinforced portion comprises a plurality of parallel vertical fins (124; 224), solidly connected to said vertical main walls (121, 122; 221, 222) and to said bridge (123; 223). 10 15
7. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to any preceding claim, wherein said at least a reinforced portion comprises a vertical main wall (131, 231) solidly connected to an upper bracket (133; 233), said at least a reinforced portion having thus an inverted L-shaped cross section in a vertical plane parallel to the front (112; 212) and the rear walls (113; 213). 20 25
8. Support structure (110; 210) of a rotary drum laundry treating appliance (100; 200) according to claim 7, wherein said at least a reinforced portion comprises a plurality of parallel vertical fins (134; 234), solidly connected to said vertical main wall (131; 231) and to said upper bracket (133; 233). 30
9. Laundry treating appliance comprising a support structure (110; 210) according to any preceding claim wherein said upper hopper (114; 214) is a component of a detergent distributor device or a housing portion of a condensed moisture containing tank. 35
10. Laundry treating appliance according to claim 9 wherein the front and rear walls (112, 113; 212, 213) extend from a top portion of the appliance to said base portion (111; 211) and the front wall (112, 212) is covered by a decorative, non-structural wall (150, 250). 40 45
11. Laundry treating appliance according to claim 9 or 10 having a rotatable drum (162; 262) comprising a laundry treating chamber (163; 263) wherein the front wall (112; 212) has an opening (166; 266) for accessing the laundry treating chamber (163; 263). 50
12. Laundry treating appliance according to any claim 9 to 11 wherein the front wall (112) comprises an air duct (167). 55
13. Laundry treating appliance according to any claim 9 to 12 wherein a drawer-like water bearing device is slidably received in the upper hopper (114; 214).
14. Laundry treating appliance according to any claim 9 to 13 wherein a couple of side panels (151, 152; 251, 252) are connected to the support structure (110; 210) so as to extend perpendicularly to the front and rear walls (112, 113; 212, 213), said side panels (151, 152; 251, 252) having a mechanical strength that is negligible compared to that of said at least a reinforced portion of the upper hopper (114, 214).

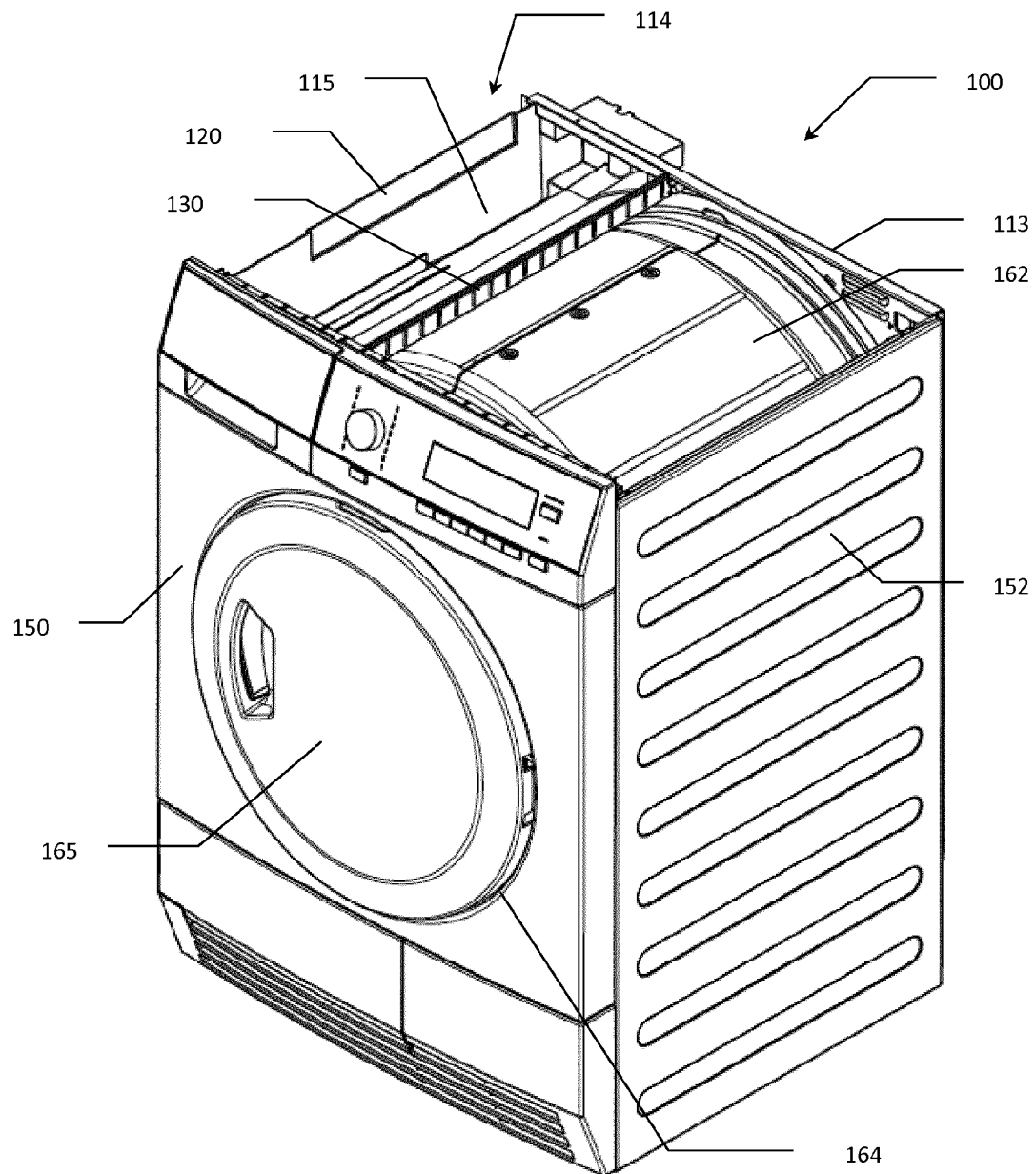


Fig. 1

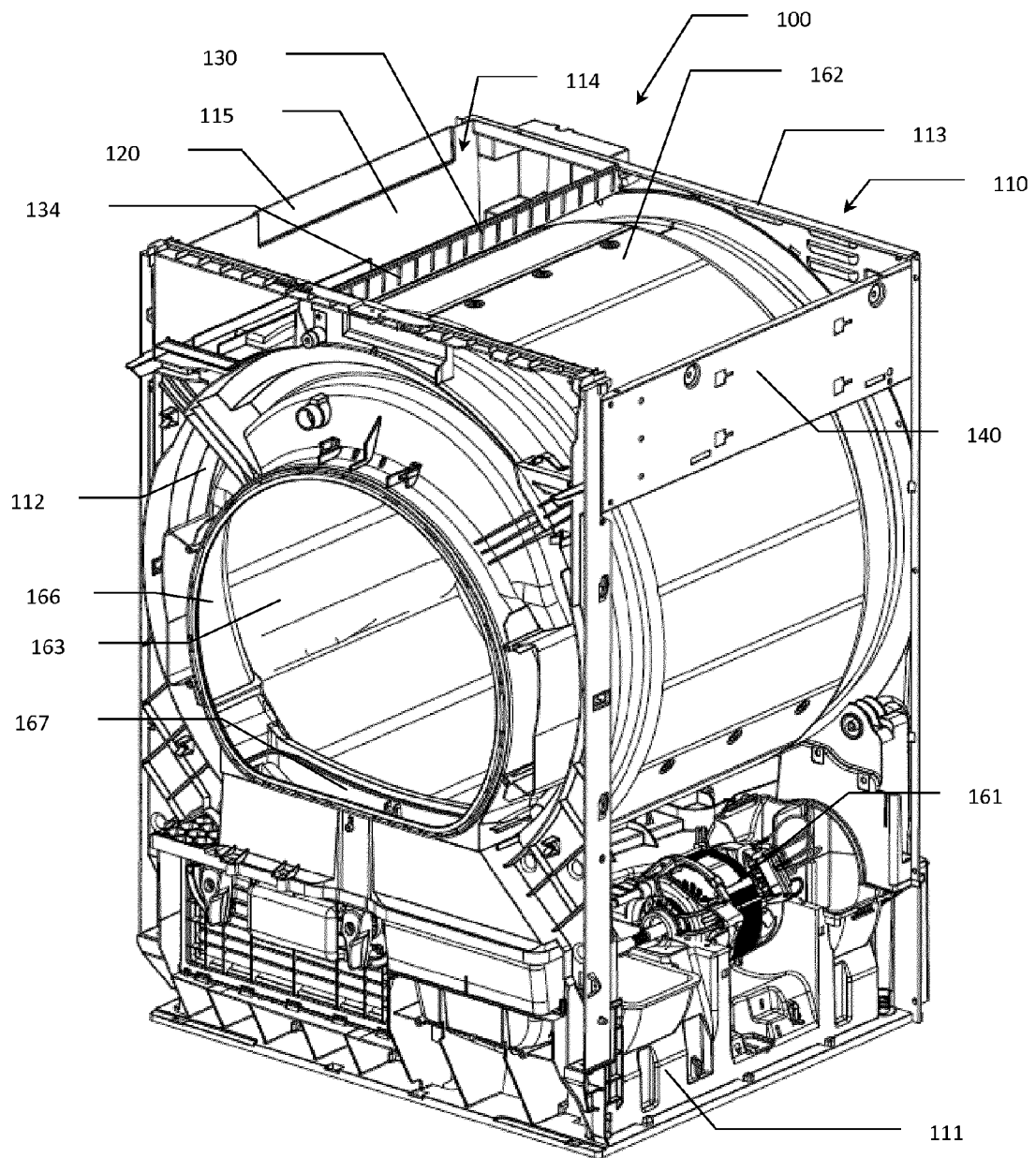


Fig. 2

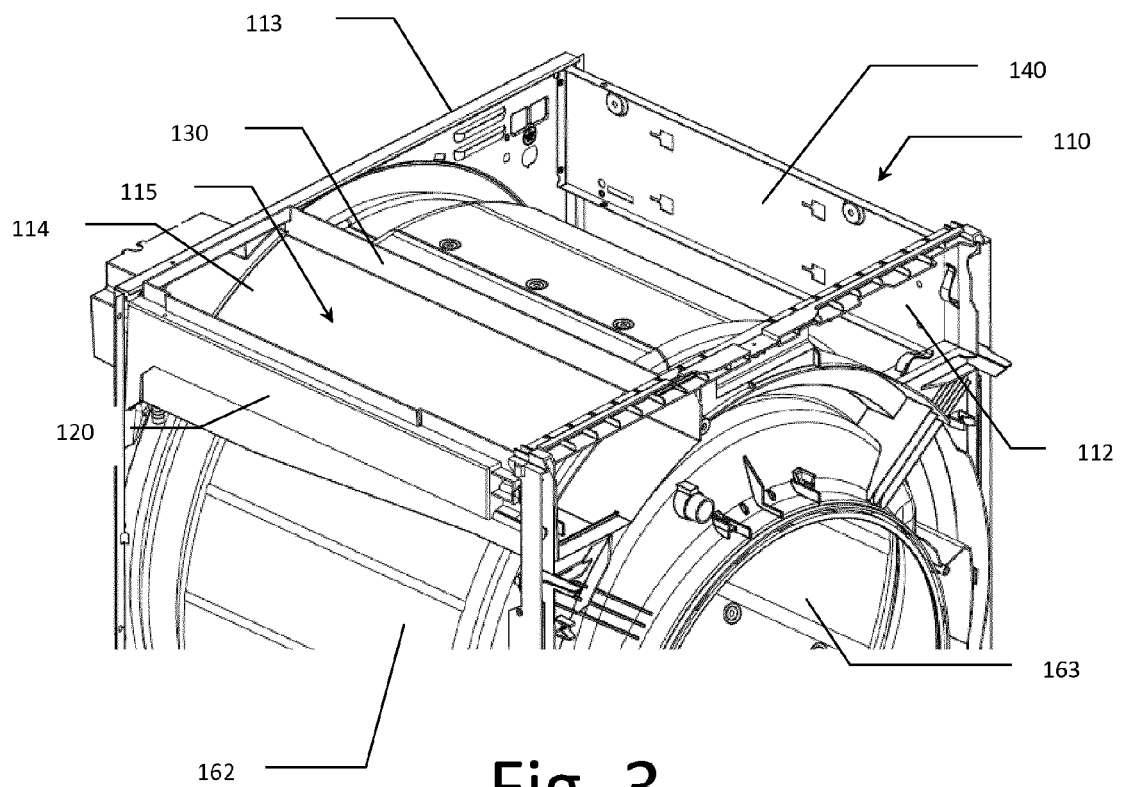


Fig. 3

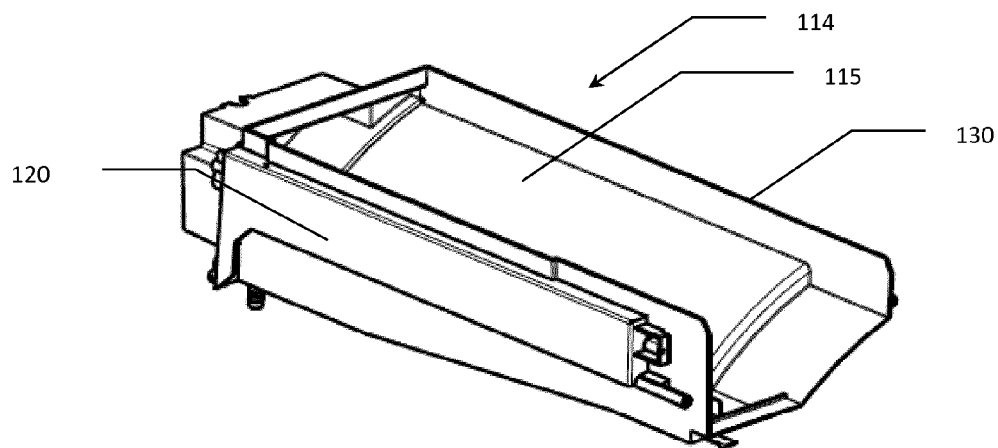


Fig. 4

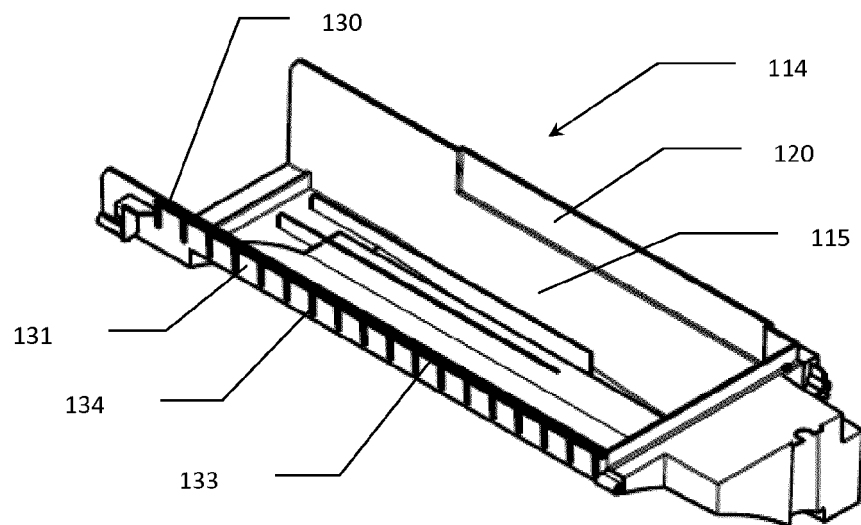


Fig. 5

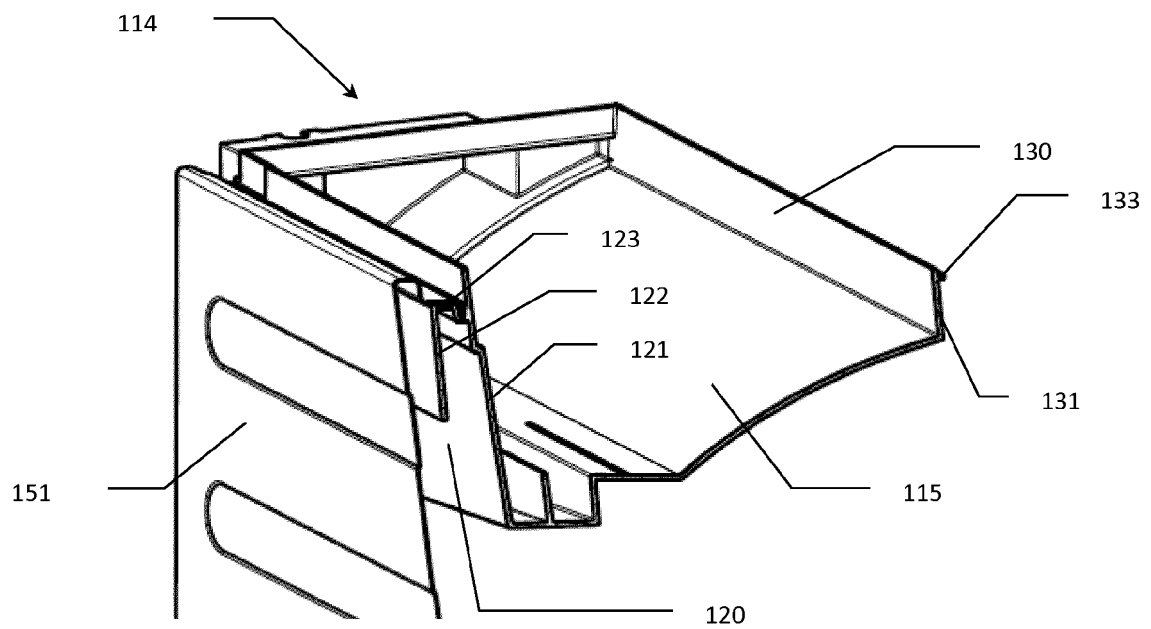


Fig. 6

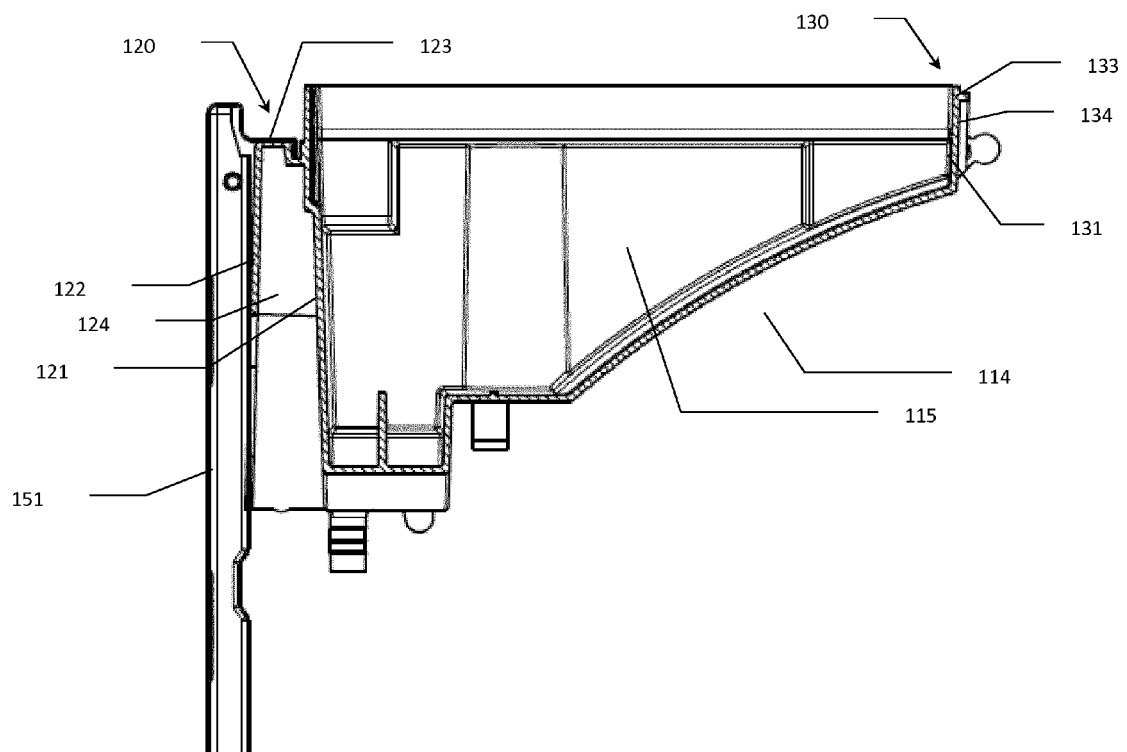


Fig. 7

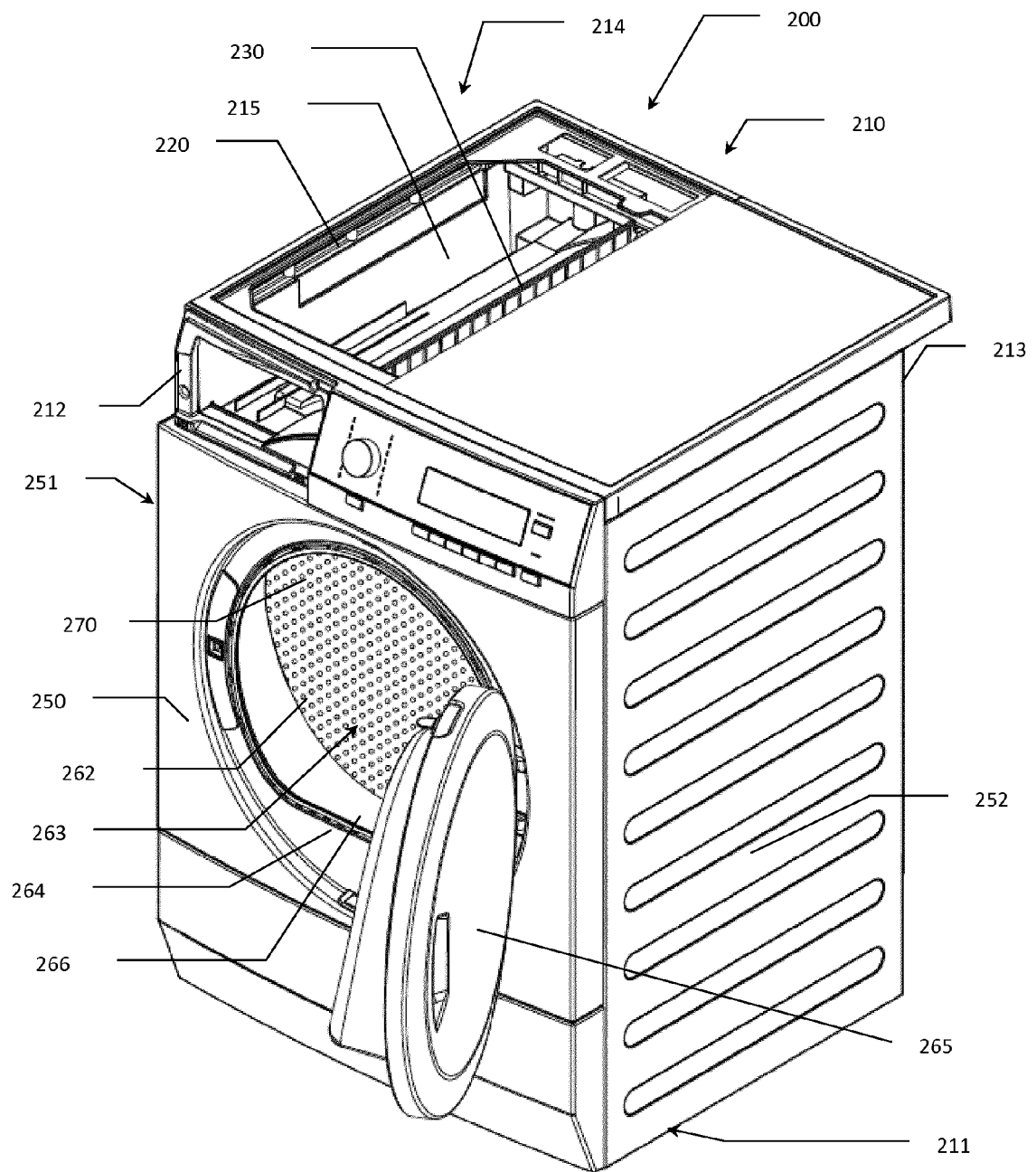


Fig. 8

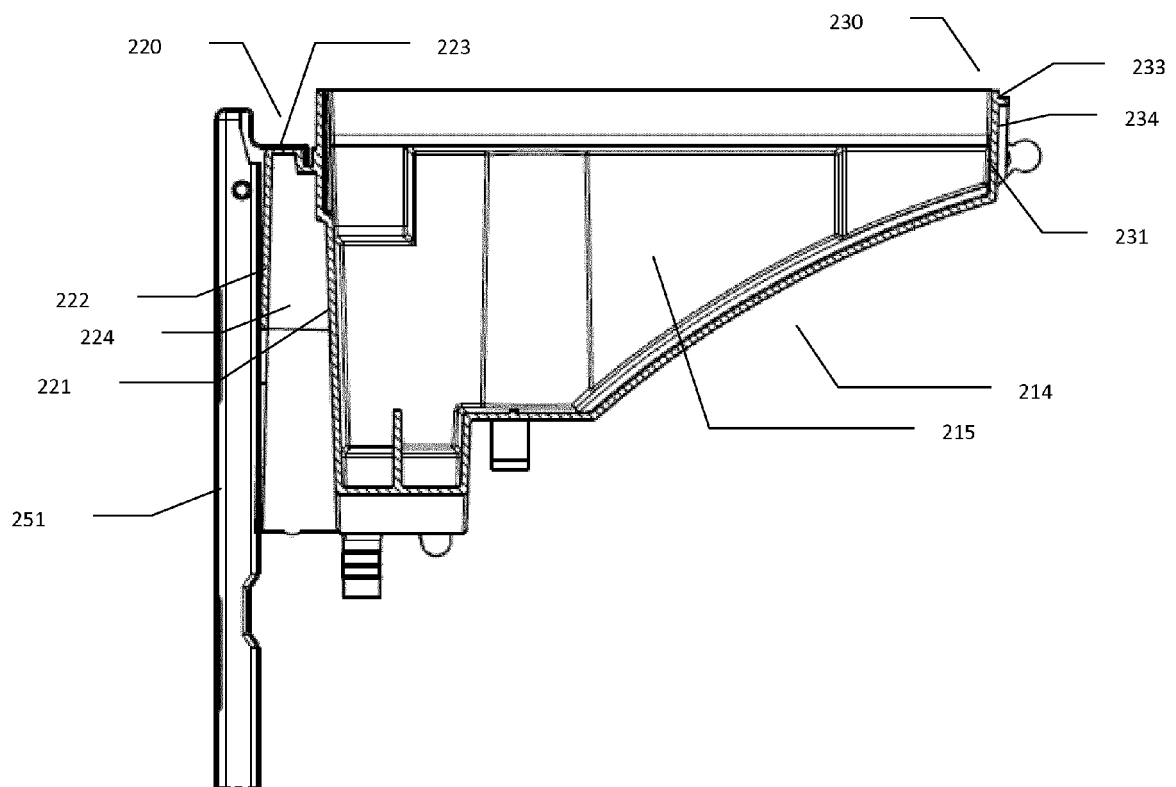


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 12 19 9190

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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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 22 May 2013	Examiner Diaz y Diaz-Caneja
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