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(54) **PUMP ASSEMBLY AND ELECTRONIC DEVICE COMPRISING SAME**

(57) A pump assembly according to one embodiment comprises: a pump unit; a housing including a bottom surface facing the pump unit and a first opening provided on the bottom surface; a seating surface on which the pump unit is seated; a damper including a coupling region extending in the direction facing the bottom surface from the seating surface and in contact with the bottom surface, and a second opening provided in the coupling region and having a larger diameter than that of the first opening; and a fixing member including a pillar passing through the first opening and the second opening at the same time, and a head for fixing the damper to the bottom surface. Various other embodiments may be possible.

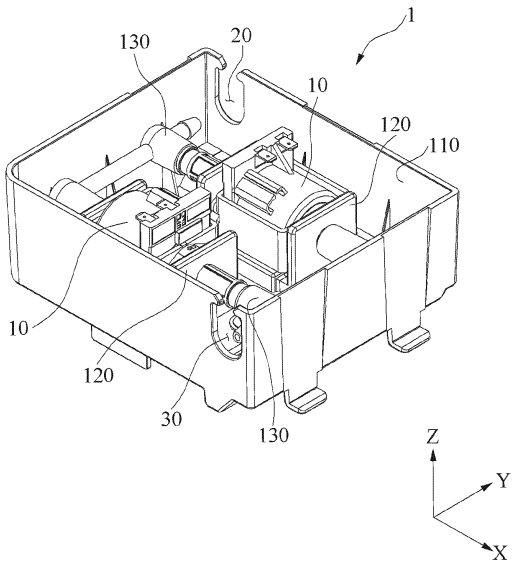

FIG. 1

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Description

Technical Field

[0001] The various embodiments of the present disclosure relate to a pump assembly and an electronic device including the same.

Description of Related Art

[0002] A pump assembly is equipment including a pump unit that provides power for a fluid to move to an external system, and the pump assembly has been used in various industries. The pump assembly has also been applied to electronic devices for home appliances such as washing machines, dryers, ovens, refrigerators, cooking appliances, or air conditioners, in addition to an internal combustion engine in industrial plants or transportation maintenance.

Disclosure of the Invention

Technical Goals

[0003] A pump unit of a pump assembly moves a fluid using a motor or piston, and the pump unit generates vibration and noise due to repeated rotational or reciprocating motion, so a damper is installed to reduce this.

[0004] A damper is connected to a housing to support a pump unit, but since the damper is formed of a material with low hardness such as rubber and silicon, there is a problem of the damper being damaged or deformed while tightening a screw that directly fixes the damper. In addition, it is possible to include a separate bracket to which a screw is fastened to support a damper, but there is a problem that the bracket is damaged due to vibration of a pump unit or a tightening part between the bracket and the screw is weakened, and the process of forming and fastening the bracket is added and the manufacturing cost may increase.

[0005] The technical goals to be achieved through embodiments of the present disclosure are not limited to those described above, and other technical goals not mentioned above are clearly understood by one of ordinary skill in the art from the following description.

Technical Solutions

[0006] A pump assembly according to an embodiment of the present disclosure includes a pump unit, a housing including a bottom surface facing the pump unit and a first opening provided in the bottom surface, a damper including a seating surface on which the pump unit sits, a coupling region extending from the seating surface in a direction facing the bottom surface and in contact with the bottom surface, and a second opening provided in the coupling region and having a larger diameter than that of the first opening, and a fixing member including a pillar penetrating the first opening and the second opening at the same time and a head configured to fix the damper to the bottom surface, and the housing includes a boss protruding from an edge of the first opening to an inside of the second opening on the bottom surface and configured to support the fixing member.

[0007] The pump assembly according to an embodiment of the present disclosure includes a pump unit, a housing including a bottom surface facing the pump unit, an outer surface opposite to the bottom surface, and a through hole penetrating from the bottom surface to the outer surface, and a damper configured to support the pump unit and connect the pump unit to the housing, and the damper includes a seating surface on which the pump unit sits and positioned in the through hole and a coupling region extending from the seating surface in a direction facing the outer surface and in contact with the outer surface.

Effects

[0008] In an embodiment, a pump assembly and an electronic device including the same may have a screw fastened to a boss formed in a housing and stably support a damper.

[0009] In an embodiment, a pump assembly and an electronic device including the same may fix a damper inside a through hole formed in a housing and dispose a coupling region of the damper to be in contact with an outer surface of the housing, so stably support the damper.

[0010] In an embodiment, a pump assembly and an electronic device including the same may reduce the manufacturing cost and improve the manufacturing efficiency by omitting a bracket.

Brief Description of Drawings

[0011]

FIG. 1 is a perspective view of a pump assembly according to an embodiment.

FIG. 2A is a perspective view of a housing of the pump assembly according to an embodiment.

FIG. 2B is a bottom view of the housing of the pump assembly according to an embodiment.

FIG. 2C is a cross-sectional view of the housing of the pump assembly according to an embodiment.

FIG. 3A is a perspective view of a damper of the pump assembly according to an embodiment.

FIG. 3B is a cross-sectional view of the pump assembly according to an embodiment.

FIG. 4 is a plan view of the pump assembly according to an embodiment.

FIG. 5 is a perspective view of a housing of the pump assembly according to an embodiment.

FIG. 6A is an exploded perspective view of a portion of the pump assembly according to an embodiment.

FIG. 6B is a bottom view of the pump assembly according to an embodiment.

FIG. 6C is a cross-sectional view of the pump assembly according to an embodiment.

FIG. 7A is a perspective view of an electronic device according to an embodiment.

FIG. 7B is a perspective view of the electronic device according to an embodiment.

Best Mode for Carrying Out the Invention

[0012] Hereinafter, the embodiments will be described in detail with reference to the accompanying drawings. When describing the embodiments with reference to the accompanying drawings, like reference numerals refer to like elements and any repeated description related thereto will be omitted.

[0013] It should be appreciated that various embodiments of the present disclosure and the terms used therein are not intended to limit the technical features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. In connection with the description of the drawings, like reference numerals may be used for similar or related components. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, "A or B", "at least one of A and B", "at least one of A or B", "A, B or C", "at least one of A, B and C", and "A, B, or C," each of which may include any one of the items listed together in the corresponding one of the phrases, or all possible combinations thereof. Terms such as "first", "second", or "first" or "second" may simply be used to distinguish the component from other components in question, and do not limit the components in other aspects (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wired), wirelessly, or via a third element.

[0014] As used in connection with embodiments of the disclosure, the term "module" may include a unit implemented in hardware, software, or firmware, and may interchangeably be used with other terms, for example, "logic", "logic block", "part", or "circuitry". A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

[0015] Various embodiments as set forth herein may be implemented as software (e.g., the program 120) including one or more instructions that are stored in a storage medium (e.g., an internal memory 136 or an external memory 138) that is readable by a machine (e.g., the electronic device). For example, a processor of the machine (e.g., an electronic device) may invoke at least one of the one or more instructions stored in the storage medium and execute it. This allows the machine to be operated to perform at least one function according to the at least one instruction invoked. The one or more instructions may include a code generated by a compiler or a code executable by an interpreter. The machine-readable storage medium may be provided in the form of a non-transitory storage medium. Here, the term "non-transitory" simply means that the storage medium is a tangible device, and does not include a signal (e.g., an electromagnetic wave), but this term does not differentiate between where data is semi-permanently stored in the storage medium and where the data is temporarily stored in the storage medium.

[0016] According to an embodiment, a method according to various embodiments of the disclosure may be included and provided in a computer program product. The computer program product may be traded as a product between a seller and a buyer. The computer program product may be distributed in the form of a machine-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or be distributed (e.g., downloaded or uploaded) online via an application store (e.g., PlayStore™), or between two user devices (e.g., smartphones) directly. If distributed online, at least part of the computer program product may be temporarily generated or at least temporarily stored in the machine-readable storage medium, such as memory of the manufacturer's server, a server of the application store, or a relay server.

[0017] According to various embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities, and some of the multiple entities may be separately disposed in different components. According to various embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

[0018] FIG. 1 is a perspective view of a pump assembly 1 according to an embodiment.

[0019] Referring to FIG. 1, the pump assembly 1 according to an embodiment may include a pump unit 10, a housing 110, a damper 120, and a tube fitting 130.

[0020] In an embodiment, the pump assembly 1 may provide power to move a fluid to an external system (not shown) or expand and/or compress a refrigerant. The pump assembly 1 may be a part of a higher-order device, such as an industrial facility, an internal combustion engine, an industrial electronic device, or an electronic device for home appliances (e.g., an electronic device 50 in FIG. 7A), or may be formed alone.

[0021] In an embodiment, the pump unit 10 may provide energy to a fluid or slurry in a liquid or gaseous state to move, expand, or compress the fluid. The pump unit 10 may include at least a portion of a motor (not shown), an impeller (not shown), or a piston (not shown) and may perform rotational or reciprocating movement.

[0022] In an embodiment, the housing 110 may form the exterior of the pump assembly 1 or protect other components of the pump assembly 1. The housing 110 may be a case or a support supporting the pump unit 10. The housing 110 may include an inlet 20 and an outlet 30 that are each an opening through which a connection terminal (not shown) passes so that a fluid is introduced into or discharged from the pump assembly 1.

[0023] In an embodiment, the damper 120 may connect the pump unit 10 to the housing 110 and absorb or attenuate vibration generated in the pump unit 10. The damper 120 may contain an elastic material to absorb vibration or provide vibration of a phase opposite to the vibration generated in the pump unit 10 to alleviate the vibration or impact of the pump assembly 1.

[0024] For example, the damper 120 may be formed of an elastic material such as silicon or rubber or formed of a plastic deformation body. The damper 120 may minimize noise and vibration generated in the pump assembly 1 and prevent components of the pump assembly 1 or an external system from being separated or damaged due to the vibration.

[0025] In an embodiment, one side of the tube fitting 130 may be connected to the pump unit 10 and the other side of the tube fitting 130 may be connected to an external system (not shown) and transport or receive a fluid to or from the pump unit 10. The tube fitting 130 may be implemented as one body, and the configuration of the tube fitting 130 is described in detail below with reference to FIG. 4.

[0026] FIG. 2A is a perspective view of a housing 110 of the pump assembly 1 according to an embodiment, FIG. 2B is a bottom view of the housing 110 of the pump assembly 1 according to an embodiment, and FIG. 2C is a cross-sectional view of the housing 110 of the pump assembly 1 according to an embodiment.

[0027] Referring to FIGS. 2A to 2C, the housing 110 may include a bottom surface 111, a first opening 113, and a boss 115.

[0028] In an embodiment, the housing 110 may include the bottom surface 111 supporting components accommodated therein and a side wall 118 extending from the bottom surface 111 in an up direction (e.g., the +Z direction) and preventing components therein. The bottom surface 111 may be a surface in an inward direction of the housing 110 that is surrounded by the side wall 118, and the bottom surface 111 may be a surface supporting a pump unit (e.g., the pump unit 10 in FIG. 1) and facing the pump unit 10. The housing 110 may include an outer surface 112 opposite to the bottom surface 111. The outer surface 112 is one surface in an outward direction opposite to an inward direction in which the pump unit 10 is positioned based on the housing 110 and may be a surface opposite to the bottom surface 111. For example, on one surface of the housing 110 formed of a plate, a surface facing the pump unit 10 may be the bottom side 111 and a surface opposite to the bottom side 111 may be the outer surface 112.

[0029] In an embodiment, at least a partial region of the bottom surface 111 and the outer surface 112 may be a parallel or flat surface and as shown in FIG. 2C, may have a bent structure so that support regions 111a and 112a for supporting a pump unit (e.g., the pump unit 10 in FIG. 1) rise in one direction (e.g., the +Z direction or the direction of the pump unit 10) than other regions 111b and 112b.

[0030] For example, the support regions 111a and 112a may be bent and rise from the other regions 111b and 112b to correspond to a coupling region (e.g., a coupling region 125 in FIG. 3A) of a damper (e.g., the damper 120 in FIG. 3A). When the pump assembly 1 is fixed to an electronic device (e.g., the electronic device 50 in FIG. 7A) or a support body, the pump unit 10 and the damper 120 may be positioned slightly higher than the other regions 111b and 112b of the housing 110 and vibration generated in the pump unit 10 may be transmitted to the other regions 111b and 112b of the housing 110. Through this structure, the pump assembly 1 may control vibration generated in the pump unit 10 more efficiently than when the entire regions 112a and 112b of the outer surface 112 contact an external support body.

[0031] In an embodiment, the first opening 113 may be provided in the bottom surface 111 and may be a region in which a partial region of the bottom surface 111 is penetrated or opened from the bottom surface 111 in the direction of the outer surface 112. For example, as shown in FIG. 2B, the first opening 113 may have a structure in which the inside and the outside of the housing 110 communicate with each other to be opened to the outer surface 112, or as shown in FIG. 2C, have a structure in which the first opening 113 is closed in the direction of the outer surface 112.

[0032] In an embodiment, the housing 110 may include a shaft 117 provided in the bottom surface 111, and the shaft 117 may be formed adjacent to the first opening 113 and inserted into a damper (e.g., the damper 120 in FIG. 1). In an embodiment, the bottom surface 111 may include the plurality of first openings 113 for supporting one pump unit 10 or the plurality of first openings 113 and the plurality of shafts 117.

[0033] In an embodiment, the housing 110 may include the boss 115 protruding from the edge of the first opening

113 in the inward direction (e.g., the +Z direction) of the housing 110 on the bottom surface 111. The boss 115 may have the first opening 113 surrounding an axis on the inner side of the boss 115 and may have a shape of a pillar 145 protruding from the bottom surface 111. In an embodiment, the boss 115 and/or the shaft 117 may be inserted into an opening (e.g., a second opening 126 in FIG. 3A) formed in the damper 120 or a support structure, couple the damper 120 and the housing 110, and support the damper 120.

[0034] In an embodiment, the boss 115 may include at least a portion of a first protrusion region 115a extending in the inward direction of the housing 110 based on the bottom surface 111 and protruding and a second protrusion region 115b extending in the outward direction of the housing 110 based on the outer surface 112 and protruding. A fixing member (e.g., a fixing member 140 in FIG. 3B) penetrating the first opening 113 through the first protrusion region 115a may be inserted into the boss 115, and the boss 115 may support the fixing member 140. In an embodiment, the second protrusion region 115b may extend in the outward direction of the housing 110 corresponding to the length of the pillar 145 of the fixing member 140, stably support the fixing member 140, and improve the bonding force of the fixing member 140.

[0035] FIG. 3A is a perspective view of a damper 120 of the pump assembly 1 according to an embodiment and FIG. 3B is a cross-sectional view of the pump assembly 1 according to an embodiment.

[0036] Referring to FIGS. 3A and 3B, the damper 120 according to an embodiment may include a seating surface 121, the coupling region 125, and the second opening 126 and the pump assembly 1 may include the fixing member 140.

[0037] In an embodiment, the damper 120 may include the seating surface 121 on which the pump unit 10 sits, the coupling region 125 extending from the seating surface 121 in the direction (e.g., the X-Y plane direction) facing the bottom surface 111 of the housing 110 and in contact with the bottom surface 111, and an extension region 123 extending from the seating surface 121 in the direction (e.g., the +Z direction) surrounding the pump unit 10.

[0038] In an embodiment, the seating surface 121 may be implemented in a shape corresponding to the shape of the pump unit 10 and include a region 121a in contact with the pump unit 10. The damper 120 may surround at least a partial region of the pump unit 10 based on the seating surface 121 and be coupled to the housing 110, and the damper 120 may prevent vibration generated in the pump unit 10 from being transmitted outwardly through the housing 110 and suppress noise.

[0039] In an embodiment, the damper 120 may include the second opening 126 and a fastening hole 126. The second opening 126 may be provided in the coupling region 125 and have a larger diameter than that of the first opening 113 of the housing 110. The second opening 126 may be an open region from an upper surface 125a of the coupling region 125 in the up direction (e.g., the +Z direction) to a lower surface 125b that is opposite to the upper surface 125a in the down direction (e.g., the -Z direction). In an embodiment, the lower surface 125b of the damper 120 may face the bottom surface 111 of the housing 110 or a partial region of the lower surface 125b of the damper 120 may contact the bottom surface 111 of the housing 110, and the upper surface 125a of the damper 120 may face the fixing member 140 or a partial region of the upper surface 125a of the damper 120 may contact the fixing member 140.

[0040] The second opening 126 according to an embodiment may have one diameter, and as shown in FIG. 3A, one damper 120 may include a plurality of second openings 126 that may have different diameters from each other. A portion of the plurality of second openings 126 may be disposed to face the first opening 113 of the housing 110 so that the fixing member 140 passes through and the shaft 117 of the housing 110 may pass through another portion of the plurality of second openings 126.

[0041] In an embodiment, the fastening hole 126 may be provided in the extension region 123 and may be interconnected in which a fitting region (e.g., a fitting region in FIG. 4) of the tube fitting 130 penetrates the pump unit 10. For example, as shown in FIG. 3A, the damper 120 may include the extension region 123 surrounding both directions (e.g., the +/-X direction) of the pump unit 10 and the fastening hole 126 may be provided in each extension region 123. As shown in FIG. 3B, the tube fitting 130 may include a first tube fitting 130a injecting a fluid into the pump unit 10 and a second tube fitting 130b receiving a fluid from the pump unit 10, and the first tube fitting 130a and the second tube fitting 130b may pass through the fastening hole 126 and be connected to the pump unit 10.

[0042] In an embodiment, the fixing member 140 may include the pillar 145 penetrating the first opening 113 and the second opening 126 at the same time and a head 141 configured to fix the damper 120 to the bottom surface 111. In an embodiment, the fixing member 140 may be a screw or nail. In an embodiment, the fixing member 140 may fix the damper 120 to the housing 110 so that the head 141 contacts the upper surface 125a of the coupling region 125 of the damper 120.

[0043] For example, the boss 115 of the housing 110 may protrude from the edge of the first opening 113 to the inside of the second opening 126 on the bottom surface 111 and the pillar 145 of the fixing member 140 may be supported by being inserted into the boss 115. Surfaces 132a and 132b of the head 141 of the fixing member 140 in the down direction (e.g., the -Z direction) may include a first region 142a adjacent to the center of the surfaces 132a and 132b and a second region 142b surrounding the first region 142a. The pillar 145 of the fixing member 140 may penetrate the first opening 113 and the second opening 126 and be fixed to the boss 115, the first region 142a may face or contact the first protrusion

region 115a of the boss 115, and the second region 142b may face or contact the upper surface 125a of the coupling region 125 of the damper 120.

[0044] When the pump assembly 1 according to an embodiment does not include the boss 115, the fixing member 140 may be inserted by penetrating the first opening 113 and the second opening 126, and when the fixing member 140 is inserted greater than or equal to a certain numerical value, the upper surface 125a of the damper 120 may be excessively pressed, so the damper 120 may be damaged. In another embodiment, when the pump assembly 1 includes a separate bracket (not shown) connected to the upper surface 125a of the damper 120, the manufacturing cost may increase and the manufacturing efficiency may be reduced as additional components and joining processes are added.

[0045] The pump assembly 1 according to an embodiment of the present disclosure may restrict the pressure at which the fixing member 140 presses the damper 120 by limiting a coupling position of the fixing member 140 by the boss 115 or preventing the pillar 145 of the fixing member 140 from being inserted greater than or equal to a preset numerical value and may prevent the damper 120 from being damaged by the fixing member 140. In addition, the manufacturing cost may be reduced and the manufacturing efficiency may be improved by forming the first opening 113 and the boss 115 in the production process of the housing 110 without adding separate components.

[0046] FIG. 4 is a plan view of the pump assembly 1 according to an embodiment.

[0047] Referring to FIG. 4, the tube fitting 130 according to an embodiment may include fitting regions 131 and 135 and tube regions 133 and 137. In the description of FIG. 4, any repeated description related to the above descriptions about the pump assembly 1 is omitted.

[0048] In an embodiment, the tube fitting 130 may include the fitting regions 131 and 135 connected to the pump unit 10 to transport and receive a fluid to and from the pump unit 10 and the tube regions 133 and 137 supplying a fluid to the outside of the pump housing 110 or receiving a fluid from the outside of the pump housing 110.

[0049] In an embodiment, the pump assembly 1 may include the plurality of pump units 10. A fitting region may include the first fitting region 131 connected to an inlet of one of the plurality of pump units 10 and the second fitting region 135 connected to an outlet of the pump unit 10 that is different from the one of the plurality of pump units 10. The tube regions 135 and 137 may include the first tube region 135 connecting between the first fitting region 131 and the second fitting region 135 and the second tube region 137 connecting the first tube region 135 and the second fitting region 135 to the outside. The second tube region 137 may extend to a position adjacent to either the inlet 20 or the outlet 30 of the pump assembly 1.

[0050] In an embodiment, the pump assembly 1 may include an additional fitting part 139 connected between the second fitting region 135 and the pump unit 10. When receiving a high-pressure fluid from the pump unit 10, the additional fitting part 139 may maintain the pressure of the fluid and seal and connect between the pump unit 10 and the second fitting region 135 so the fluid does not leak.

[0051] In an embodiment, the tube fitting 130 may be formed of one body. For example, the tube fitting 130 may be produced as one structure including the fitting regions 131 and 135 and the tube regions 135 and 137 through injection molding. In another embodiment, when the fitting regions 131 and 135 and the tube regions 135 and 137 of the tube fitting 130 are produced and assembled respectively, the pump assembly 1 may include a clamp (not shown) that seals and couples a connection portion so that a fluid does not leak to the connection portion of the fitting regions 131 and 135 and the tube regions 135 and 137.

[0052] The tube fitting 130 according to an embodiment of the present disclosure may be formed of one body, so the process of producing and coupling each component may be omitted, the defect rate occurring in the additional manufacturing process may be reduced, and the manufacturing cost may be reduced and the productivity may be improved by preventing a defective coupling problem of a clamp (not shown) in advance.

[0053] FIG. 5 is a perspective view of a housing 210 of the pump assembly 1 according to an embodiment.

[0054] Referring to FIG. 5, the housing 210 according to an embodiment may include a bottom surface 211a and a through hole 215. The configuration of the pump assembly 1 including the housing 210 of FIGS. 5 to 6C may be the same or similar to the configuration of the pump assembly 1 including the housing 110 described with reference to FIGS. 1 to 4, and hereinafter, a repeated description thereof is omitted.

[0055] In an embodiment, the housing 210 may include the bottom surface 211 supporting components accommodated therein and a side wall 218 extending from the bottom surface 211 in the up direction (e.g., the +Z direction) to protect the components therein. The bottom surface 211 may be a surface in the inward direction of the housing 210 surrounded by the side wall 218 or may be a surface supporting a pump unit (e.g., the pump unit 10 in FIG. 1) and facing the pump unit 10.

[0056] In an embodiment, the bottom surface 211 may include the through hole 215 penetrating from the bottom surface 211 to an outer surface 212. In an embodiment, the damper 120 may be inserted into the through hole 215, and the damper 120 and the pump unit 10 may be fixed to the housing 210. The coupling of the housing 210 and the damper 120 is described in detail below with reference to FIG. 6A.

[0057] In an embodiment, at least a partial region of the bottom surface 211 may be a parallel or flat surface, and as shown in FIG. 5, may have a bent structure so that a first support region 211a for supporting a pump

unit (e.g., the pump unit 10 in FIG. 1) and a second support region 211c for supporting the tube fitting 130 rise in one direction (e.g., the +Z direction) compared to another region 211b.

[0058] For example, the support regions 211a and 211c may be bent from the other region 211b and rise to correspond to a coupling region (e.g., the coupling region 125 in FIG. 6A) of a damper (e.g., the damper 120 in FIG. 6A). When the pump assembly 1 is fixed to another electronic device 50 (e.g., the electronic device 50 in FIG. 7A) or a support body (not shown), the pump unit 10, the tube fitting 130, and the damper 120 may be positioned slightly higher than the other region 211b of the bottom surface 211 of the housing 210 and vibration generated in the pump unit 10 may be transmitted through the other region 211b of the housing 210. Through this structure, the pump assembly 1 may control vibration generated in the pump unit 10 more efficiently than when the entire regions 211a, 211b, and 211c of the outer surface 212 contact the outside.

[0059] FIG. 6A is an exploded perspective view of a portion of the pump assembly 1 according to an embodiment, FIG. 6B is a bottom view of the pump assembly 1 according to an embodiment, and FIG. 6C is a cross-sectional view of the pump assembly 1 according to an embodiment.

[0060] Referring to FIGS. 6A to 6C, the pump assembly 1 according to an embodiment may include the outer surface 212 in contact with the coupling region 125 of the damper 120.

[0061] In an embodiment, the housing 210 may include the outer surface 212 opposite to the bottom surface 211. The outer surface 212 is one surface in the outward direction opposite to the inward direction in which the pump unit 10 is positioned based on the housing 210 and may be a surface opposite to the bottom surface 211. For example, on one surface of the housing 210 formed of one plate and supporting the pump unit 10, a surface facing the pump unit 10 may be the bottom surface 211 and a surface opposite to the bottom surface 211 may be the outer surface 212.

[0062] In an embodiment, the damper 120 may be inserted into and fixed to the through hole 215 of the housing 210. For example, the seating surface 121 of the damper 120, on which the pump unit 10 sits, may be positioned in the through hole 215, the coupling region 125 of the damper 120 may extend from the seating surface 121 in the direction facing the outer surface 212 of the housing 210, and an upper surface 126a of the coupling region 125 of the damper 120 may contact the outer surface 212.

[0063] In an embodiment, the coupling region 125 of the damper 120 may contact the outward direction of the first support region 211a of the bottom surface 211, and a partial region of the outer surface 212 corresponding to the other region 211b of the housing 210 and a lower surface of the coupling region 125 of the damper 120 may be disposed substantially in parallel.

[0064] In an embodiment, when the pump assembly 1 is coupled to an external support body (not shown), the outer surface 212 of the housing 210 may be disposed to face the external support body (not shown) and the lower surface 125b of the coupling region 125 of the damper 120 may face the external support body (not shown). In an embodiment, the coupling region 125 of the damper 120 may be in close contact with the outside of the housing 210 or at least a partial region of the coupling region 125 of the damper 120 may be disposed to contact the outside of the housing 210, and the seating surface 121 and the extension region 123 may pass through the through hole 215 and be disposed inside the housing 210. In an embodiment, the housing 210 may accommodate and protect the pump unit 10 and the tube fitting 130 therein and the damper 120 may support the pump unit 10 and be fixed to the housing 210 even when the fixing member 140 is omitted.

[0065] In an embodiment, an area of the through hole 215 of the pump assembly 1 may be larger than that of the seating surface 121 of the damper 120 and smaller than that of the seating surface 121 and the coupling region 125. The damper 120 may move in the down direction (e.g., the -Z direction) based on the bottom surface 211 of the housing 210 and be separated from the housing 210. The damper 120 may not be able to move in the up direction (e.g., the +Z direction) or may be limited to move based on the bottom surface 211 of the housing 210 and may be fixed without being separated from the housing 210. The coupling region 125 may contact the outer surface 212 of the housing 210, and an area of the lower region (e.g., the seating surface 121 and the coupling region 125) of the damper 120 may be provided to be greater than an area of an upper region (e.g., the seating surface 121 or the pump unit 10) and the damper 120 may not pass through the through hole 215, and at least a partial region of the coupling region 125 may contact the outer surface 212 of the housing 210 and fix the damper 120 to the housing 210.

[0066] In an embodiment, the damper 120 may include a fixing hole (e.g., the second opening 126 in FIG. 3A) penetrating from an upper surface to a lower surface. The shaft 217 or the fixing member 140 may be inserted into the fixing hole 126, so the damper 120 and the housing 210 may be fixed.

[0067] The housing 210 according to an embodiment may include the shaft 217 provided in the outer surface 212 and having a protruding structure to be inserted into the fixing hole 126, and the damper 120 may be supported by the shaft 217. The housing 210 according to another embodiment may include the first opening 113 formed through from the outer surface 212 and the boss 115 extending from the edge of the first opening 113 and protruding, and the fixing member 140 may penetrate the first opening 113 and the fixing hole 126 at the same time and be supported by the boss 115.

[0068] In an embodiment, the fixing member 140 may fix the damper 120 to the housing 210 while ahead (e.g.,

the head 141 in FIG. 3B) contacts the lower surface of the coupling region 125. In an embodiment, a first region (e.g., the first region 142a in FIG. 3B) of the head 141 of the fixing member 140 may be adjacent to the center of a surface facing the coupling region 125 and contact the boss 115 and a second region (e.g., the second region 142 in FIG. 3B) may surround the first region 142a and contact the lower surface 125b of the coupling region 125. The boss 115 may prevent damage to the damper 120 and stably support the damper 120 by limiting the numerical value into which the fixing member 140 is inserted.

[0069] FIG. 7A is a perspective view of an electronic device 50 according to an embodiment and FIG. 7B is a perspective view of the electronic device 50 according to an embodiment.

[0070] Referring to FIGS. 7A and 7B, the electronic device 50 according to an embodiment may include a cabinet 51, a steam generation unit 70, a storage container 60, and the pump assembly 1. FIGS. 7A and 7B illustrate a steam cooking appliance as an example of a home appliance when describing the electronic device 50 including the pump assembly 1. However, in actual implementation, the disclosure is not limited thereto, and the pump assembly 1 may be included in one type of home appliance or industrial equipment.

[0071] In an embodiment, the cabinet 51 of the electronic device 50 may form an internal space 52, and the internal space 52 may be a space where a task is performed, such as a cooking space or a washing space depending on the type of the electronic device 50. The cabinet 51 may be a body or a frame of the electronic device 50, and the cabinet 51 may accommodate and protect other components of the electronic device 50 and form the exterior of the electronic device 50. The cabinet 51 may include a door 8 coupled to the front and the door 8 may open and close the internal space 52.

[0072] In an embodiment, the electronic device 50 may include a water supply device 54, a first pipe 53, the storage container 60, a second pipe 65, the steam generation unit 70, a third pipe 75, and an injection hole 73.

[0073] In an embodiment, the water supply device 54 may receive a fluid such as water from the outside and be connected to the pump assembly 1 through the first pipe 53 to supply the fluid. In an embodiment, the pump assembly 1 may include the housings 110 and 120 in an embodiment of FIGS. 1 to 6C. The pump assembly 1 may be connected so that the outer surface (e.g., the outer surface 112 in FIG. 2B or the outer surface 212 in FIG. 5) faces the upper surface of the cabinet 51 and be supported by the cabinet 51. In an embodiment, the pump assembly 1 may receive a fluid from the water supply device 54 through the first pipe 53 and transport the fluid to the storage container 60.

[0074] In an embodiment, the storage container 60 may temporarily store the fluid received through the pump assembly 1 and supply a fluid such as water to the steam generation unit 70. The storage container 60 may adjust the flow rate or flow speed of the fluid transported to the steam generation unit 70. The storage container 60 may be connected to the steam generation unit 70 through the second pipe 65 and transport a fluid.

[0075] In an embodiment, the steam generation unit 70 may generate steam using the fluid received through the second pipe 65. The steam generation unit 70 may generate steam and transport the steam to the third pipe 75, the third pipe 75 may transport the steam to the injection hole 73 communicating with the internal space 52 of the cabinet 51, and the steam generation unit 70 may generate steam to the internal space 52 of the cabinet 51.

[0076] The pump assembly 1 according to an embodiment may include the pump unit 10, the bottom surface 111 facing the pump unit 10, the housing 110 including the first opening 113 provided in the bottom surface 111, the seating surface 121 on which the pump unit 10 sits, the coupling region 125 extending from the seating surface 121 in the direction facing the bottom surface 111 and in contact with the bottom surface 111, the damper 120 including the second opening 126 provided in the coupling region 125 and having a large diameter than that of the first opening 113, and the fixing member 140 including the pillar 145 penetrating the first opening 113 and the second opening 126 at the same time and the head 141 configured to fix the damper 120 to the bottom surface 111. In an embodiment, the housing 110 may include the boss 115 protruding from the edge of the first opening 113 to the inside of the second opening 126 on the bottom surface 111 and configured to support the fixing member 140.

[0077] In an embodiment, the coupling region 125 may include the lower surface 125b that is one surface facing the bottom surface 111 and the upper surface 125a that is opposite to the lower surface 125b. In an embodiment, the fixing member 140 may fix the damper 120 while the head 141 contacts the upper surface 125a of the coupling region 125.

[0078] In an embodiment, the head 141 may have the first region 142a adjacent to the center of a surface facing the coupling region 125 and in contact with the boss 115. In an embodiment, the second region 142b surrounding the first region 142a may contact the upper surface 125a of the coupling region 125.

[0079] In an embodiment, the boss 115 may include the protrusion region 115b extending from the outer surface 112 opposite to the bottom surface 111 to the outward direction of the housing 110 and protruding.

[0080] In an embodiment, the housing 110 may have the region 111a in contact with the coupling region 125 of the damper 120 and having a shape that is bent from the other adjacent region 111b and rises in the direction of the pump unit 10.

[0081] In an embodiment, the pump assembly 1 may include the tube fitting 130 including the fitting regions 131 and 135 connected to the pump unit 10 and the tube regions 135 and 137 supplying a fluid from the fitting regions 131 and 135 to the outside of the pump assembly

1 and formed of one body.

[0082] In an embodiment, the damper 120 may include the extension region 123 extending from the seating surface 121 in the direction surrounding the pump unit 10 and the fastening hole 124 provided in the extension region 123 and through which the fitting regions 131 and 135 pass.

[0083] In an embodiment, the pump assembly 1 may include the plurality of pump units 10. In an embodiment, the fitting regions 131 and 135 may include the first fitting region 131 connected to the inlet of one of the plurality of pump units 10 and the second fitting region 135 connected to the outlet of the pump unit 10 that is different from the one of the plurality of pump units 10.

[0084] The electronic device 50 according to an embodiment may include the cabinet 51, the steam generation unit 70 that generates steam to the internal space 52 of the cabinet 51, the storage container 60 that supplies water to the steam generation unit 70, and the pump assembly 1 that supplies water from the storage container 60 to the steam generation unit 70. In an embodiment, the pump assembly 1 may include the pump unit 10 that provides power for the water to flow, the bottom surface 111 facing the pump unit 10, the housing 110 including the first opening 113 provided in the bottom surface 111, the seating surface 121 on which the pump unit 10 sits, the coupling region 125 extending from the seating surface 121 in the direction facing the bottom surface 111 and in contact with the bottom surface 111, the damper 120 including the second opening 126 provided in the coupling region 125 and having a larger diameter than that of the first opening 113, and the fixing member 140 including the pillar 145 penetrating the first opening 113 and the second opening 126 at the same time and the head 141 configured to fix the damper 120 to the bottom surface 111. In an embodiment, the housing 110 may include the boss 115 protruding from the edge of the first opening 113 to the inside of the second opening 126 on the bottom surface 111 and configured to support the fixing member 140.

[0085] The pump assembly 1 according to an embodiment may include the pump unit 10, the bottom surface 211 facing the pump unit 10, the outer surface 212 opposite to the bottom surface 211, the housing 210 including the through hole 215 penetrating from the bottom surface 211 to the outer surface 212, and the damper 120 configured to support the pump unit 10 and connect the pump unit 10 to the housing 210. In an embodiment, the damper 120 may include the seating surface 121 on which the pump unit 10 sits and positioned in the through hole 215 and the coupling region 125 extending from the seating surface 121 in the direction facing the outer surface 212 and in contact with the outer surface 212.

[0086] In an embodiment, the housing 210 may have a region in contact with the coupling region 125 of the damper 120 and having a shape that is bent from another adjacent region and rises to the pump unit 10.

[0087] In an embodiment, the damper 120 may include the upper surface 125a provided in the coupling region 125 and facing the outer surface 212 of the housing 210 and the fixing hole 126 penetrating from the upper surface 125a to the lower surface 125b opposite to the upper surface 125a. In an embodiment, the housing 210 may include the shaft 217 provided in the outer surface 212 and inserted into the fixing hole 126.

[0088] In an embodiment, the damper 120 may include the upper surface 125a provided in the coupling region 125 and facing the outer surface 212 of the housing 210 and the fixing hole 126 penetrating from the upper surface 125a to the lower surface 125b opposite to the upper surface 125a. In an embodiment, the housing 210 may include the first opening 113 penetrating from the outer surface 212 in the direction of the bottom surface 211 and the boss 115 surrounding the first opening 113. In an embodiment, the pump assembly 1 may include the fixing member 140 including the pillar 145 penetrating the first opening 113 and the fixing hole 126 at the same time and the head 141 configured to fix the damper 120 to the outer surface 212.

[0089] In an embodiment, the fixing member 140 may fix the damper 120 while the head 141 contacts the lower surface 125b of the coupling region 125.

[0090] In an embodiment, the head 141 may have the first region 142a adjacent to the center of the surface facing the coupling region 125 and in contact with the boss 115. In an embodiment, the second region 142b surrounding the first region 142a may contact the lower surface 125b of the coupling region 125.

[0091] In an embodiment, the pump assembly 1 may include the tube fitting 130 including the fitting regions 131 and 135 connected to the pump unit 10 and the tube regions 133 and 137 that supply a fluid from the fitting regions 131 and 135 to the outside of the pump assembly 1, and formed of one body.

[0092] In an embodiment, the damper 120 may include the extension region 123 extending from the seating surface 121 in the direction surrounding the pump unit 10 and the fastening hole 124 provided in the extension region 123 and through which the fitting regions 131 and 135 pass.

[0093] In an embodiment, the pump assembly 1 may include the plurality of pump units 10. In an embodiment, the fitting regions 131 and 135 may include the first fitting region 131 connected to the inlet of one of the plurality of pump units 10 and the second fitting region 135 connected to the outlet of the pump unit 10 that is different from the one of the plurality of pump units 10.

[0094] In an embodiment, the pump assembly 1 may include a support body (not shown) disposed to face the outer surface 212 of the pump assembly 1 and to which the housing 210 is fixed. In an embodiment, the damper 120 may have the lower surface 125b facing the support body (not shown) of the coupling region 125 and in contact with the support body (not shown).

[0095] The electronic device 50 according to an embodiment may include the cabinet 51, the steam gener-

ation unit 70 that generates steam to the internal space 52 of the cabinet 51, the storage container 60 that supplies water to the steam generation unit 70, and the pump assembly 1 that supplies water from the storage container 60 to the steam generation unit 70. In an embodiment, the pump assembly 1 may include the pump unit 10 that provides power for the water to flow, the bottom surface 211 facing the pump unit 10, the outer surface 212 opposite to the bottom surface 211, the housing 210 including the through hole 215 penetrating the bottom surface 211 and the outer surface 212, and the damper 120 configured to support the pump unit 10 and connect the pump unit 10 to the housing 210. In an embodiment, the damper 120 may include the seating surface 121 on which the pump unit 10 sits and positioned in the through hole 215 and the coupling region 125 extending from the seating surface 121 in the direction facing the outer surface 212 and in contact with the outer surface 212.

[0096] Although a preferred embodiment is shown and described above, the present disclosure is not limited to a specific embodiment described above, various modification embodiments are possible by one of ordinary skill in the art to which the present disclosure belongs without departing from the gist of the scope of the claims, and these modification embodiments should not be understood individually from technical ideas or perspectives.

Claims

1. A pump assembly comprising:

a pump unit;
a housing comprising a bottom surface facing the pump unit and a first opening provided in the bottom surface;
a damper comprising a seating surface on which the pump unit sits, a coupling region extending from the seating surface in a direction facing the bottom surface and in contact with the bottom surface, and a second opening provided in the coupling region and having a larger diameter than that of the first opening; and
a fixing member comprising a pillar penetrating the first opening and the second opening at the same time and a head configured to fix the damper to the bottom surface,
wherein the housing comprises a boss protruding from an edge of the first opening to an inside of the second opening on the bottom surface and configured to support the fixing member.

2. The pump assembly of one of the preceding claims, wherein

the coupling region comprises a lower surface that is one surface facing the bottom surface and an upper surface opposite to the lower surface, and
the fixing member is configured to fix the damper while the head contacts the upper surface of the coupling region.

3. The pump assembly of one of the preceding claims, wherein the head has a first region adj acent to a center of a surface facing the coupling region and in contact with the boss and a second region surrounding the first region and in contact with the upper surface of the coupling region.

4. The pump assembly of one of the preceding claims, wherein the boss comprises a protrusion region extending from an outer surface opposite to the bottom surface in an outward direction of the housing and protruding.

5. The pump assembly of one of the preceding claims, wherein the housing has a region in contact with the coupling region of the damper and having a shape that is bent from another adjacent region and rises in a direction of the pump unit.

6. The pump assembly of one of the preceding claims, wherein the pump assembly comprises a tube fitting comprising a fitting region connected to the pump unit and a tube region configured to supply a fluid from the fitting region to an outside of the pump assembly and formed of one body.

7. The pump assembly of one of the preceding claims, wherein the damper comprises an extension region extending from the seating surface in a direction surrounding the pump unit and a fastening hole provided in the extension region and through which the fitting region passes.

8. The pump assembly of one of the preceding claims, wherein

the pump assembly comprises a plurality of pump units,
the fitting region comprises:

a first fitting region connected to an inlet of one of the plurality of pump units; and
a second fitting region connected to an outlet of a pump unit that is different from the one of a plurality of pump units.

9. A pump assembly comprising:

a pump unit;
a housing comprising a bottom surface facing the pump unit, an outer surface opposite to the bottom surface, and a through hole penetrating from the bottom surface to the outer surface; and

a damper configured to support the pump unit and connect the pump unit to the housing, wherein the damper comprises:

a seating surface on which the pump unit sits and positioned in the through hole; and a coupling region extending from the seating surface in a direction facing the outer surface and in contact with the outer surface.

10. The pump assembly of one of the preceding claims, wherein the housing has a region in contact with the coupling region of the damper and having a shape that is bent from another adjacent region and rises in a direction of the pump unit.

11. The pump assembly of one of the preceding claims, wherein

the damper comprises an upper surface provided in the coupling region and facing an outer surface of the housing and a fixing hole penetrating from the upper surface to a lower surface opposite to the upper surface, and
the housing comprises a shaft provided in the outer surface and inserted into the fixing hole.

12. The pump assembly of one of the preceding claims, wherein

the damper comprises an upper surface provided in the coupling region and facing an outer surface of the housing and a fixing hole penetrating from the upper surface to a lower surface opposite to the upper surface,
the housing comprises a first opening penetrating from the outer surface in a direction of the bottom surface and a boss surrounding the first opening, and
the pump assembly comprises a fixing member comprising a pillar penetrating the first opening and the fixing hole at the same time and a head configured to fix the damper to the outer surface.

13. The pump assembly of one of the preceding claims, wherein the fixing member is configured to fix the damper while the head contacts a lower surface of the coupling region.

14. The pump assembly of one of the preceding claims, wherein the head has a first region adj acent to a center of a surface facing the coupling region and in contact with the boss and a second region surrounding the first region and in contact with a lower surface of the coupling region.

15. The pump assembly of one of the preceding claims, wherein

the pump assembly comprises a support body disposed to face an outer surface of the pump assembly and to which the housing is fixed, and the damper has a lower surface facing the support body of the coupling region and in contact with the support body.

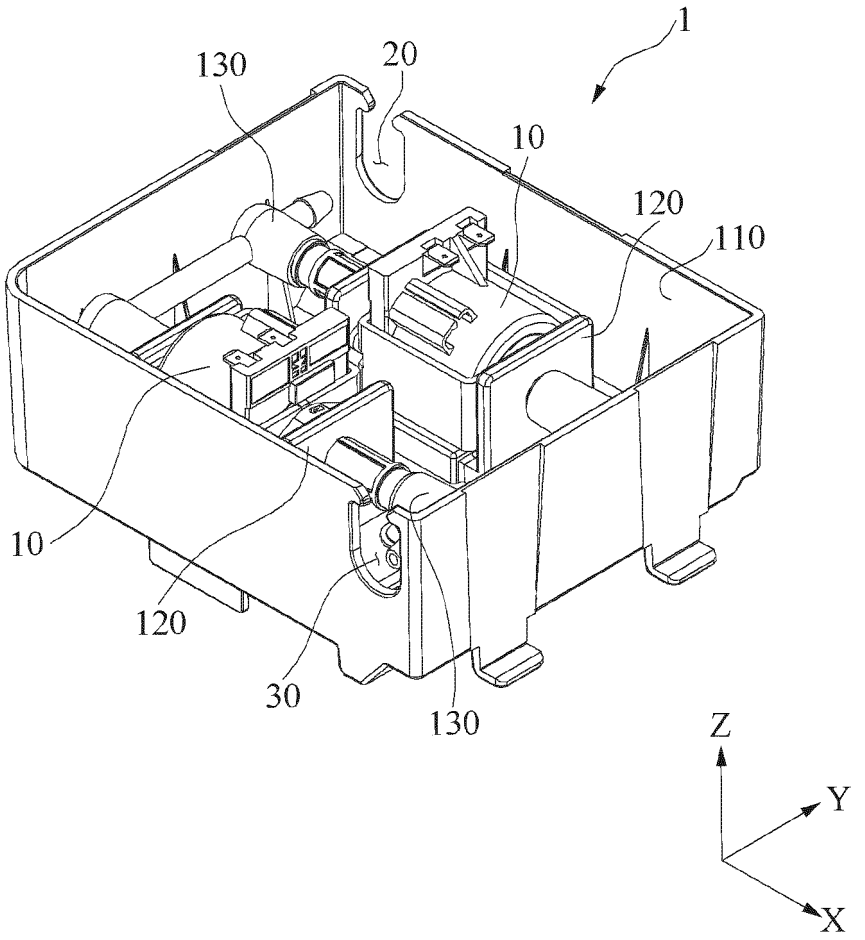


FIG. 1

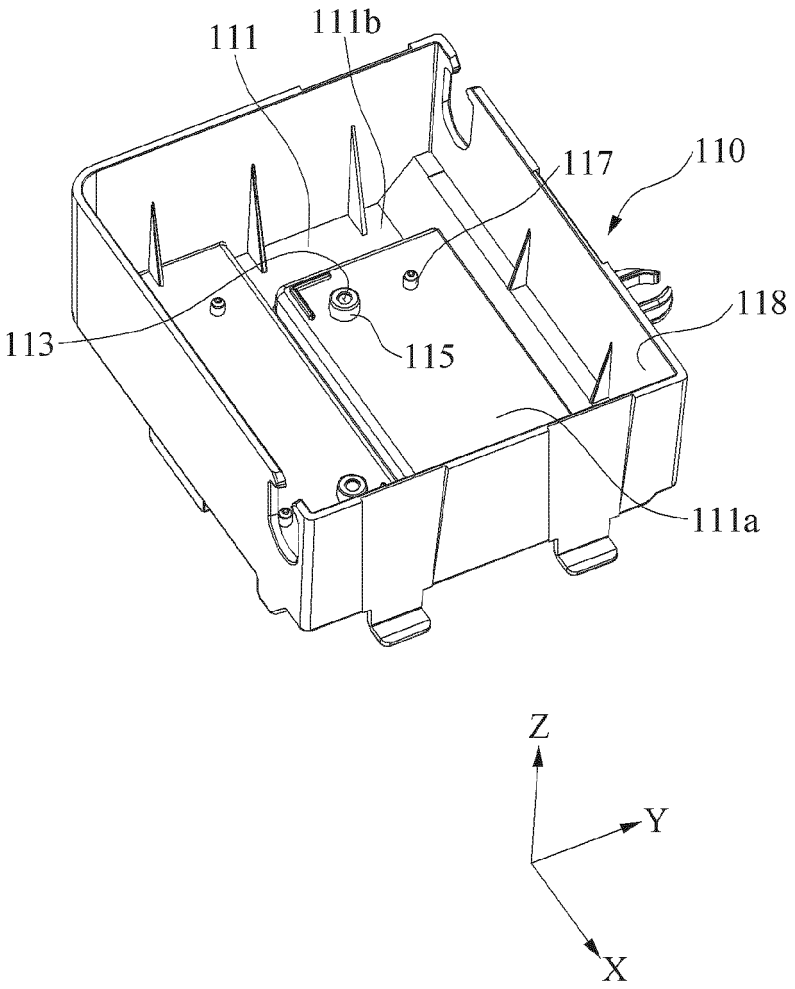


FIG. 2A

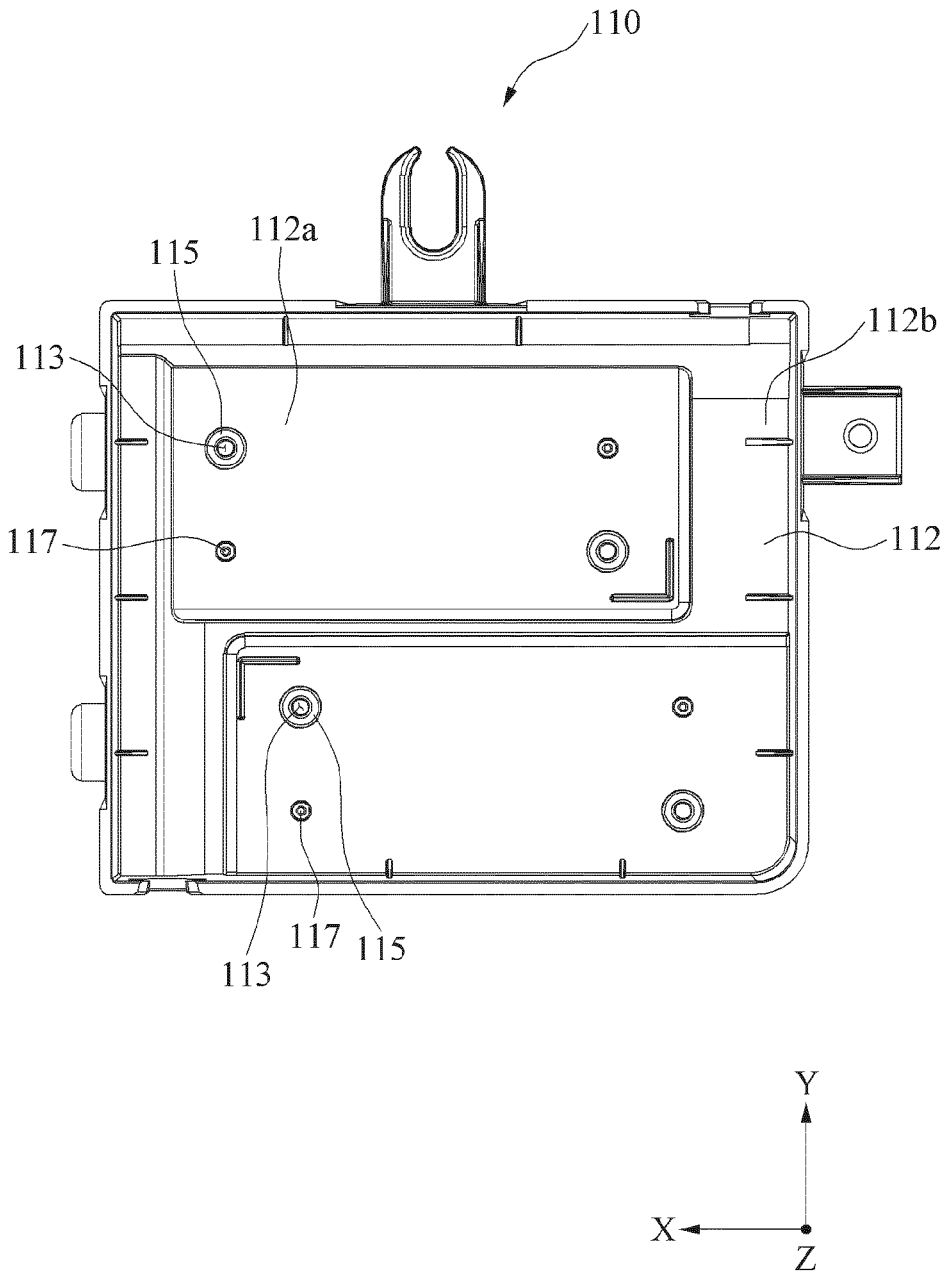


FIG. 2B

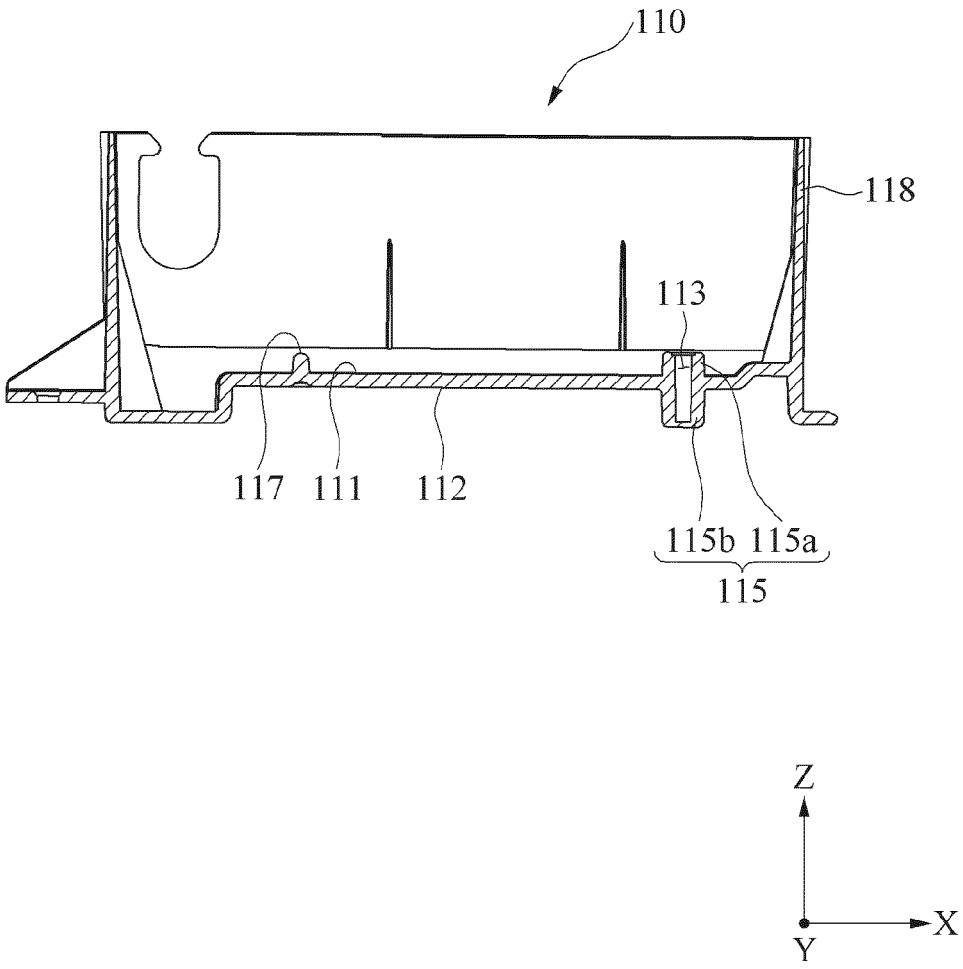


FIG. 2C

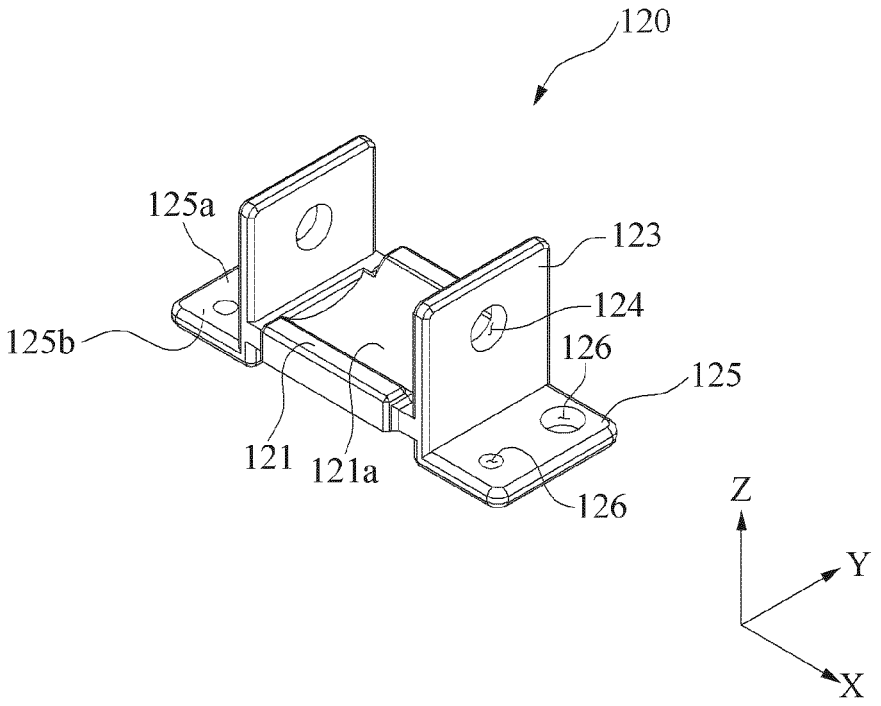
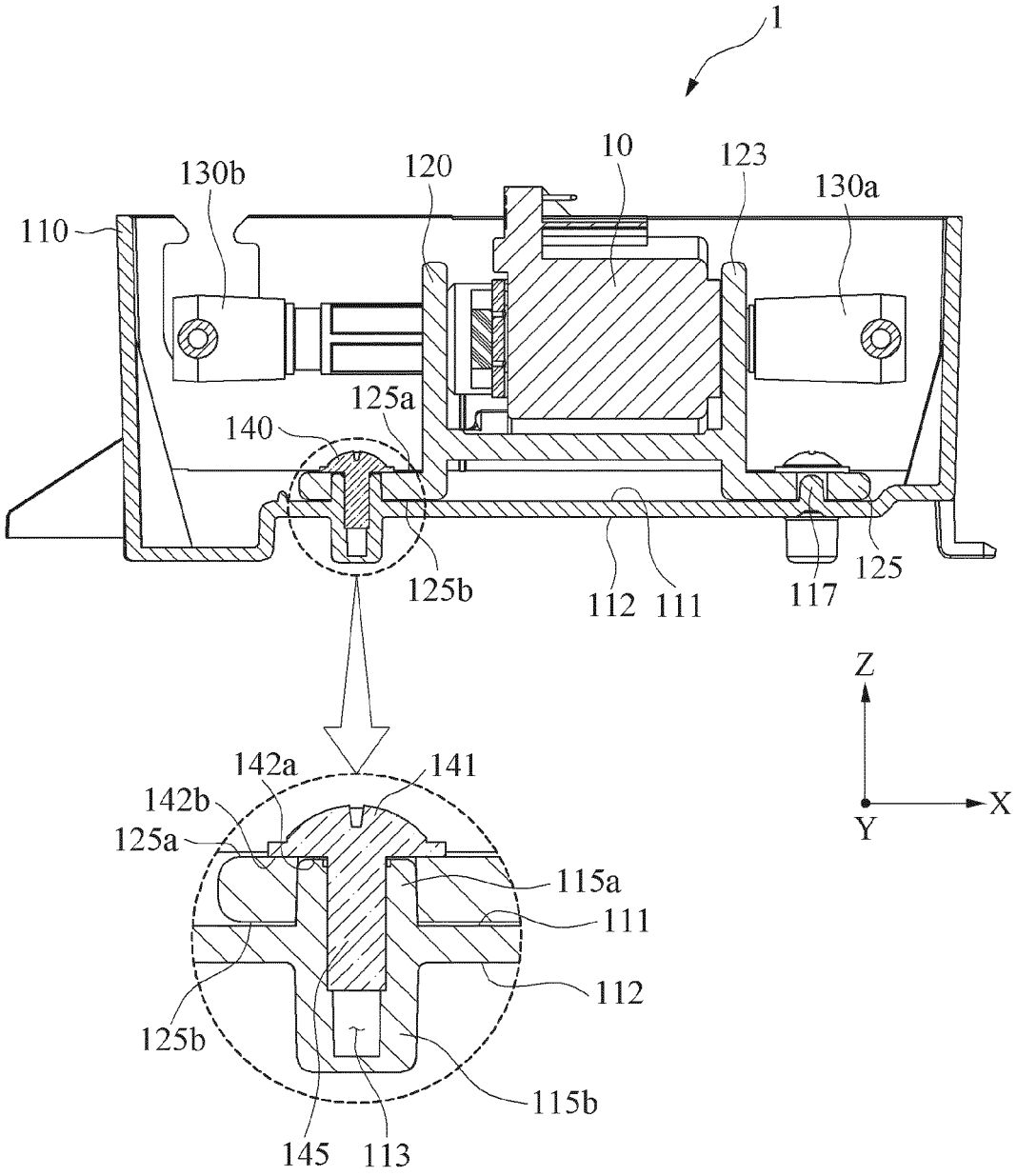


FIG. 3A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130a
130b
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125a
140
125b
112
111
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125
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142a
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142b
125a
115a
111
112
125b
115b
145
113

FIG. 3B

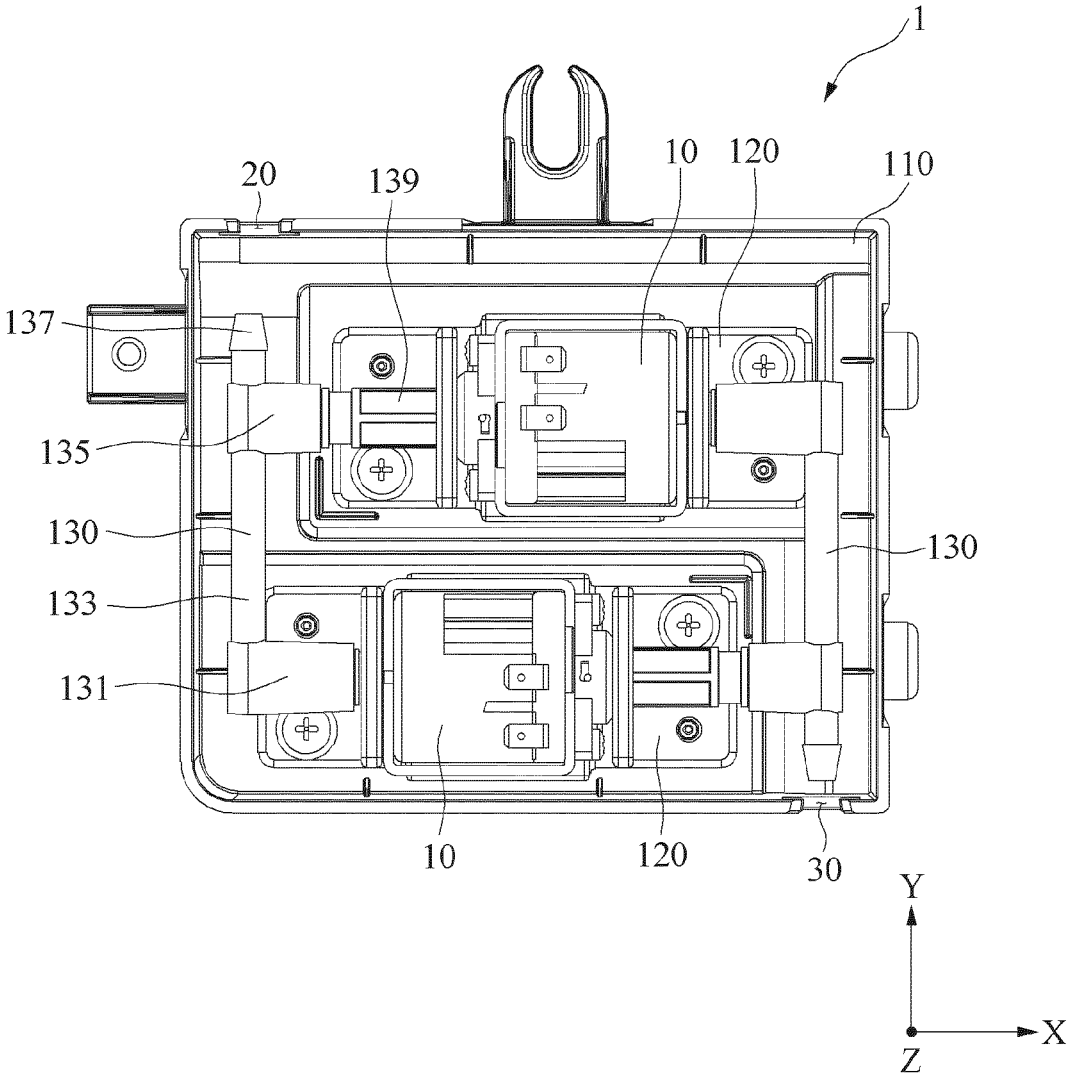


FIG. 4

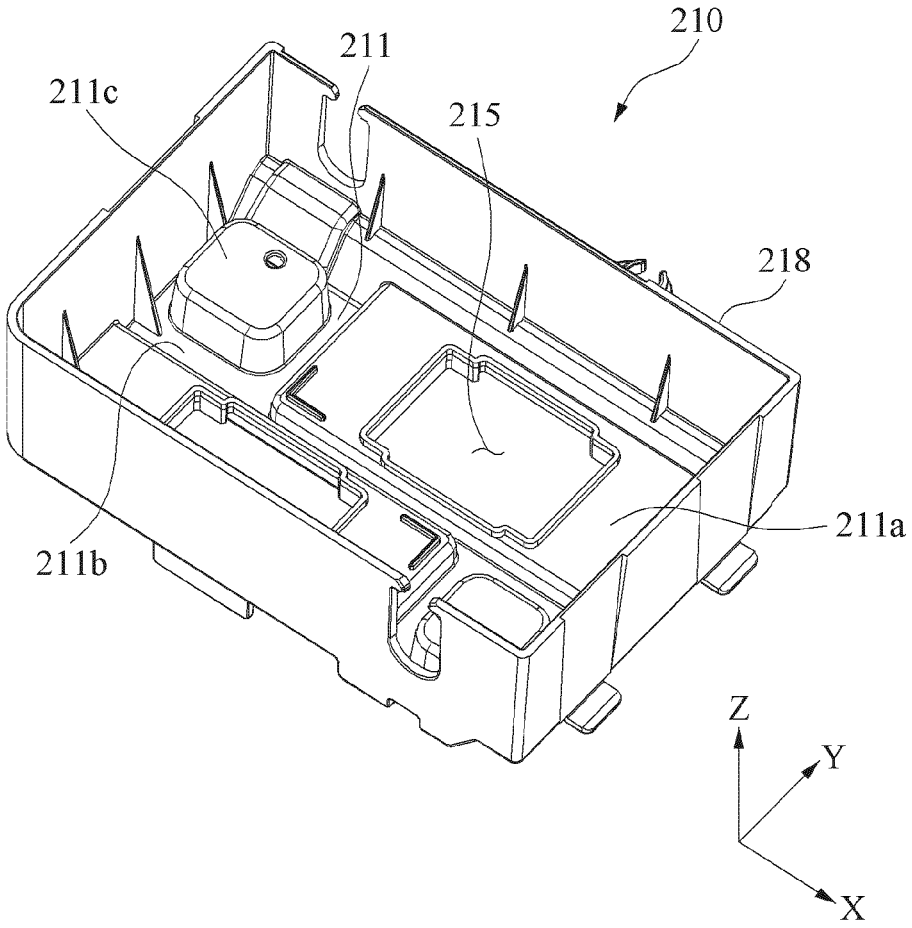
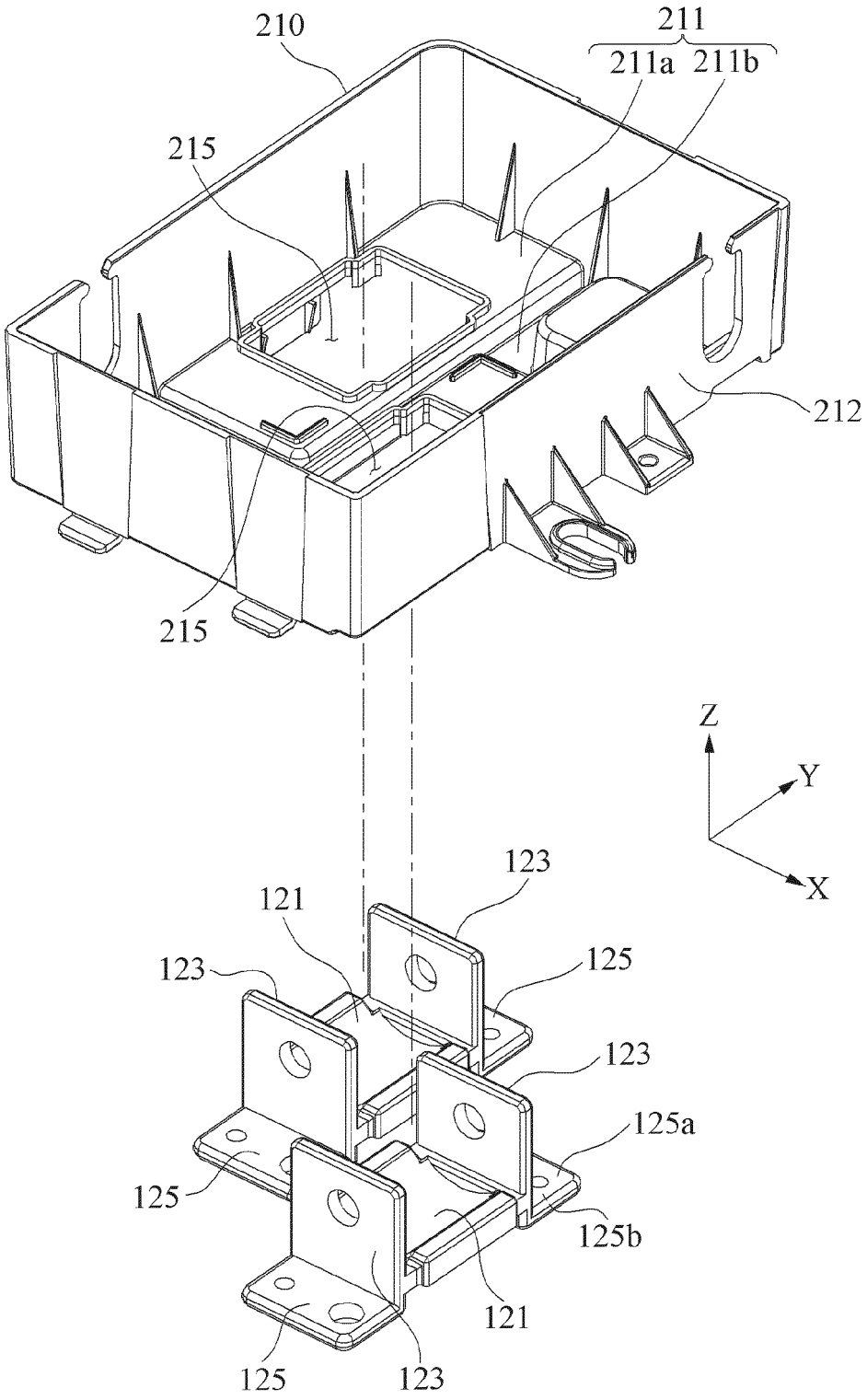


FIG. 5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125a
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125b
121
125
123

FIG. 6A

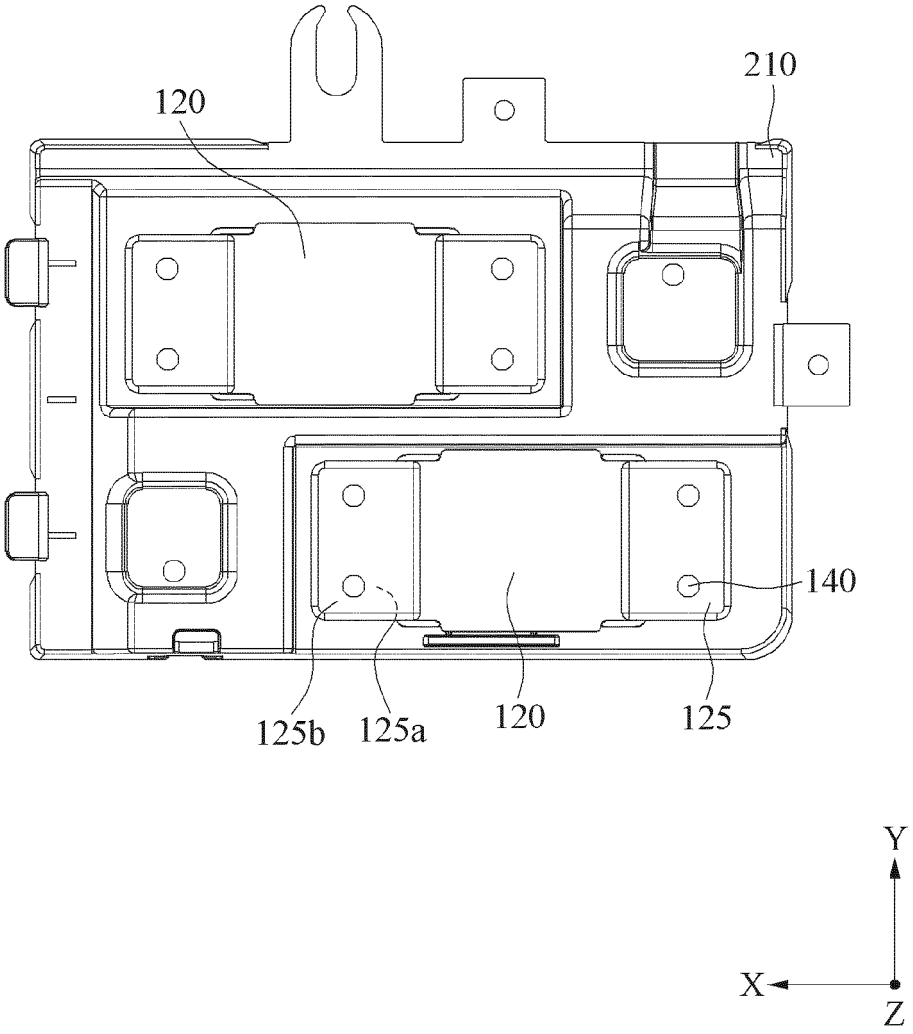
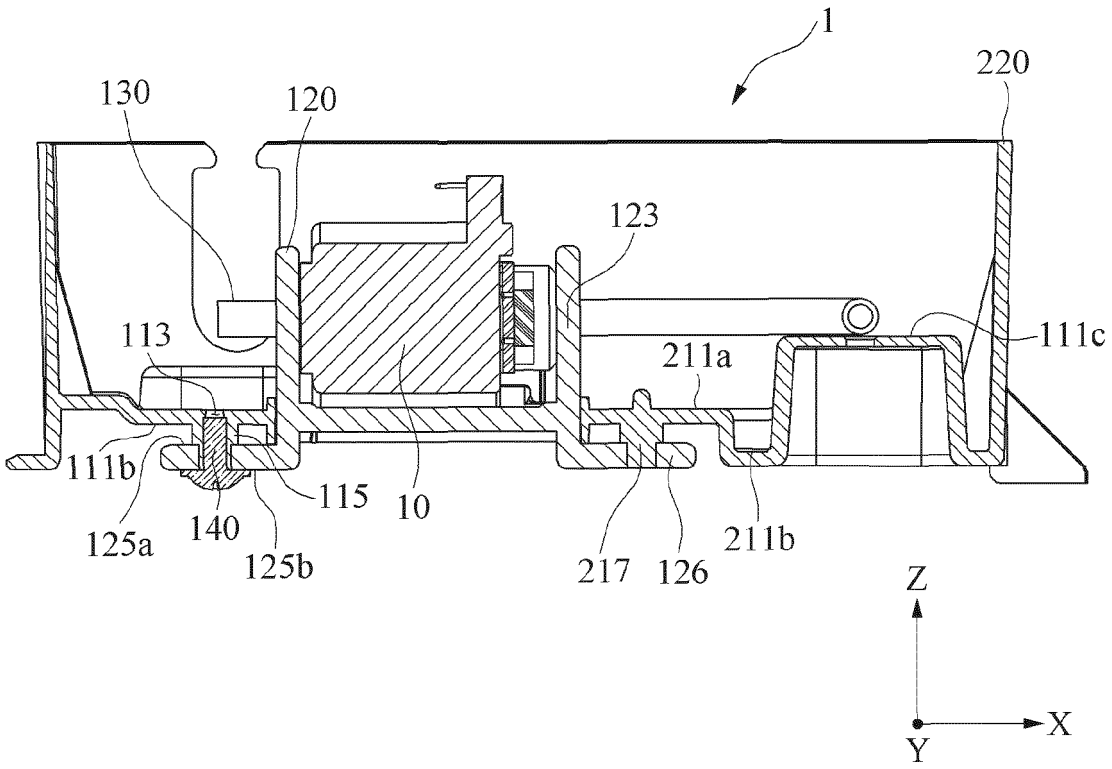


FIG. 6B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125a
140
125b
217
126
211b
Z
X
Y

FIG. 6C

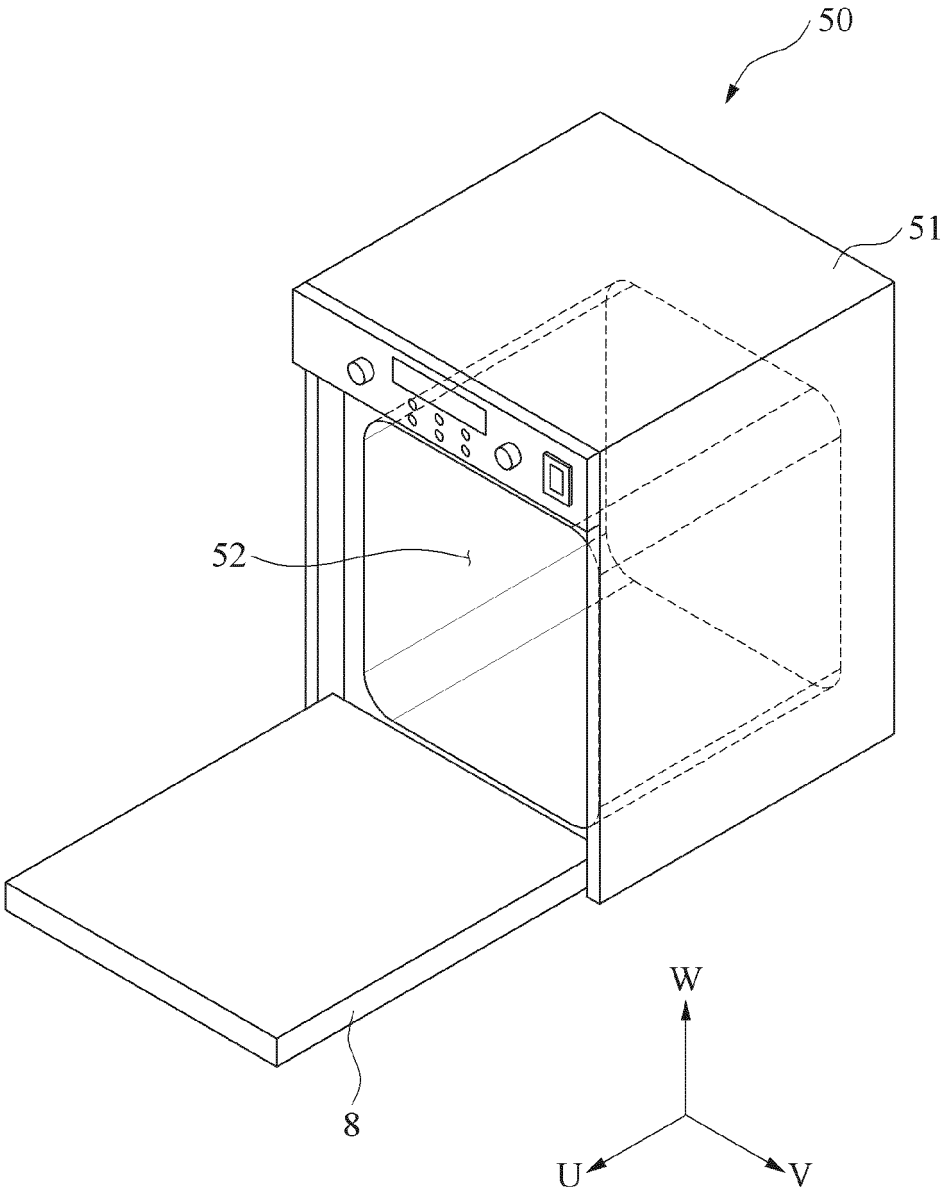

FIG. 7A

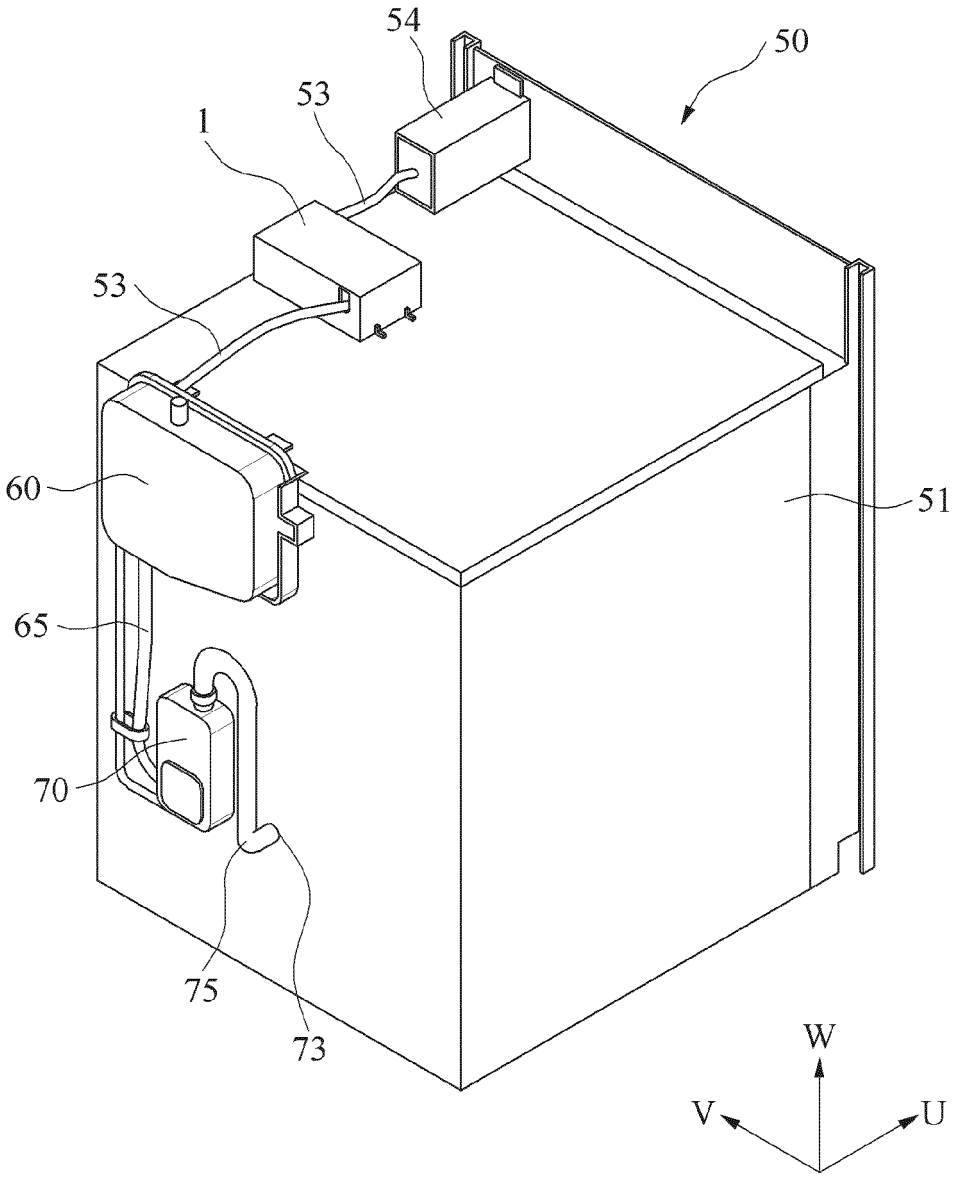

FIG. 7B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/010167

A. CLASSIFICATION OF SUBJECT MATTER

F04D 13/08(2006.01)i; **F04D 29/60**(2006.01)i; **F04D 29/66**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F04D 13/08(2006.01); A61B 1/00(2006.01); F04B 39/00(2006.01); F04B 45/047(2006.01); F04D 29/60(2006.01); F04D 29/62(2006.01); F16F 1/36(2006.01); F16F 15/08(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 펌프 어셈블리(pump assembly), 펌프 유닛(pump unit), 하우징(housing), 개구(opening), 댐퍼(damper), 진동(vibration), 보스(boss), 결합부(coupling unit), 고정 부재(fixing member)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009-144661 A (YAMADA SEISAKUSHO CO., LTD.) 02 July 2009 (2009-07-02) See abstract, paragraphs [0016]-[0026] and figures 1, 2, 4 and 11.	1-3
Y		9
A		4-8,10-15
Y	JP 2013-249925 A (TECHNO TAKATSUKI CO., LTD.) 12 December 2013 (2013-12-12) See paragraphs [0019]-[0022] and figures 1, 3 and 4A.	9
A	JP 09-195937 A (OLYMPUS OPTICAL CO., LTD.) 29 July 1997 (1997-07-29) See paragraphs [0013]-[0032] and figures 1-5.	1-15
A	JP 2020-034120 A (NOK CORP.) 05 March 2020 (2020-03-05) See paragraphs [0003], [0004] and [0023]-[0026] and figures 1-3.	1-15

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 October 2022	**07 October 2022**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/010167

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2018-0126011 A (MEDELA HOLDING AG) 26 November 2018 (2018-11-26) See paragraphs [0033]-[0075] and figures 1-11.	1-15

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/010167

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2009-144661 A	02 July 2009	None	
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KR 10-2018-0126011 A	26 November 2018	AU 2017-234968 A1	23 August 2018
		AU 2017-234968 B2	08 April 2021
		CA 3015141 A1	21 September 2017
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		CN 108778356 B	23 April 2021
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