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(54) **HEAT PUMP WATER HEATER AND AIR SUPPLY STRUCTURE THEREOF**

WÄRMEPUMPENWASSERERHITZER UND LUFTVERSORGUNGSSTRUKTUR DAFÜR
CHAUFFE-EAU À POMPE À CHALEUR ET SA STRUCTURE D'ALIMENTATION EN AIR

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EP 3 974 742 B1

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Description

[0001] The present invention belongs to the field of heat pump water heaters, and in particular relates an air supply structure of a heat pump water heater comprising the features of the preamble portion of claim 1 and further to a heat pump water heater provided with the air supply structure.

[0002] An air supply structure of a heat pump water heater in the prior art is complex, includes a fan, a volute and associated supporting and connecting parts, and is cumbersome in installation process and low in installation efficiency. For the installation of the fan and the volute, corresponding supporting structures need to be designed, and connection and fastening are achieved by means of screws. The installation process is complicated and the structural parts are large in number, thus increasing installation difficulty and reducing the overall reliability.

[0003] In addition, some types of heat pump water heaters have higher requirements on air supply structures, for example, integrated air guiding type air-energy heat pump water heaters. An integrated air guiding type air-energy heat pump water heater is typically installed in the indoor environment. During working of the water heater, an air duct discharges cold air out of a room, and the cold air is prevented from being making contact with indoor air for causing a drop in indoor temperature and affecting the user's comfort. Thus the integrated air guiding type air-energy heat pump water heater requires the air duct to have good sealing and heat insulation effects, to only exchange heat with outdoor air without affecting the temperature of indoor air during working. At the same time, the integrated air guiding type air-energy heat pump water heater also requires the air duct to have good sound insulation and noise reduction effects as the integrated air guiding type air-energy heat pump water heater is placed indoors.

[0004] However, in an existing air duct, heat insulation cotton is generally pasted to the inner side of a shell for heat insulation and noise reduction, the sealability is poor, the heat insulation cotton is prone to fall off in the pasting process, heat exchange with indoor air is prone to occur, product quality is not easily guaranteed, and user's comfort is impacted. The overall production process has higher requirements on manual installation techniques, thus reducing production speed and affecting the overall production efficiency.

[0005] CN 111380216 A discloses an air duct structure and belongs to the technical field of water heaters. The air supply structure comprises a volute, an air guiding housing and an exhaust ring. The air outlet end of the volute communicates with the air inlet end of the air guiding housing; an air blocking piece is arranged on the edge of the periphery of the volute. The air outlet end of the air guiding housing communicates with an inner arc surface of the exhaust ring. The periphery of the exhaust ring is provided with air guiding fins which are arc-shaped

and are all bent to the same side.

[0006] The air duct structure in the above solution comprises a volute structure, which is complicated in both structure and production and assembly processes. And the fan is arranged inside the volute, and connecting parts such as screws need to be used for fixing during assembling of the fan and the volute, so that the installation process is complicated. The air duct cannot play the role of heat preservation and heat insulation effects well.

[0007] EP 2 354 709 A2 discloses an air supply structure of a heat pump water heater comprising the features of the preamble portion of claim 1. More specifically, EP 2 354 709 A2 discloses an air/water heat pump for external assembly. The air/water heat pump comprises an air duct made of two parts, which are connected with each other by means of brackets. The cross-section of the air duct transitions from a rectangular or square contour to a round contour. In the area of the round contour fan mounts are provided for securing a fan within the air duct. An air inlet and an air outlet are provided opposite to each other in axial direction of an axis of rotation of an impeller of the fan.

[0008] Another air supply structure of a heat pump is known from DE 20 2016 003 295 U. The air supply structure includes a housing for an air space of the heat pump. The housing comprises at least one upper part and one lower part. At least one fan is arranged in the air space. The housing of the air space unit is designed in several parts and comprises a slide-like insert and an air duct, the slide-like insert and the air duct being air tightly connected to the upper and lower parts of the housing are connected and fixed by means of detents.

[0009] Further heat pumps are known from EP 3 611 440 A1, EP 3 128 252 A1 and EP 2 775 227 A1.

[0010] The technical problem to be solved by the present invention is to provide an air supply structure of a heat pump water heater, which is simple in structure, convenient to install, and has good heat insulation and noise reduction effects.

[0011] This technical problem is solved by a heat pump water heater comprising the features of claim 1 and further to a heat pump water heater according to claim 11. Advantageous embodiments are indicated in further claims.

[0012] By adopting the above solution, the casing of the air supply structure is composed of two housings, compared with the integrated housing in the prior art, the two housings can be installed in steps, thus reducing the installation difficulty and simplifying the installation process. In addition, the fan is clamped in the chamber, instead of achieving the connection between the fan and the casing using screws or connectors in the prior art, thus simplifying the installation structure, reducing the number of installation parts, and reducing the production costs.

[0013] Further, the chamber includes a clamping groove for clamping the fan and an air cavity for forming an air path for the fan and provided with an air inlet and

an air outlet. The clamping groove and the air inlet are opposite arranged in an axial direction of the fan.

[0014] By adopting the above solution, the chamber can both guarantee normal operation of the fan and provide support for the fan, thus improving the stability of the fan while not impeding operation of the fan. A supporting portion used for supporting the fan is set in the form of a clamping groove, and instead of fixing of the fan and the casing using connecting parts such as screws in the prior art, thus the installation speed is accelerated, the number of installation parts is reduced, and the production cost is reduced.

[0015] Further, the fan includes a working portion and a clamping portion. The working portion includes a motor and an impeller. And the clamping portion is embedded in the clamping groove, and the motor is mounted on the clamping portion.

[0016] By adopting the above solution, the fan can be fixed on the casing and can be guaranteed to drive the impeller to rotate normally in a steady state.

[0017] In a preferred embodiment, the clamping groove is formed on an inner wall of the first cavity or an inner wall of the second cavity. Alternatively, the clamping groove is formed by combining a first groove body formed on an inner wall of the first cavity and a second groove body formed on an inner wall of the second cavity.

[0018] By adopting the above solution, the arrangement form of the clamping groove can be selected according to the actual situation for fixing the fan.

[0019] In another preferred embodiment, the air inlet is formed on the first housing or the second housing. Or, the air inlet is formed by combining a first air hole formed on the first housing and a second air hole formed on the second housing; the first air hole is communicated with the first cavity, and the second air hole is communicated with the second cavity.

[0020] In yet another preferred embodiment, the casing is provided with an air guiding structure for guiding air into the air cavity through the air inlet. Preferably, the air guiding structure is an air guiding chamber with an opening.

[0021] By adopting the above solution, due to the arrangement of the air guiding structure, air can be gathered and enters the air cavity through the air inlet, and the air guiding portion is set in the form of an air guiding chamber with an opening, which increases the air guiding amount and improves the efficiency of air gathering.

[0022] In yet another preferred embodiment, the air guiding chamber is formed on the first housing or the second housing. Alternatively, the air guiding chamber is formed by combining a first air concave part formed on the first housing and a second air concave part formed on the second housing.

[0023] In yet another preferred embodiment, the first housing is provided with a first connecting portion, the second housing is provided with a second connecting portion. The first connecting portion is connected with the second connecting portion for connecting the first

housing with the second housing. Preferably, the first connecting portion is in inserted connection or clamped connection with the second connecting portion for connecting the first housing with the second housing.

[0024] By adopting the above solution, the connecting portions positioned on the two housings connect the two housings together to form the casing, thus ensuring the integration of the casing, preventing the air inside the air cavity from escaping from the joint to affect the tightness and stability of the air supply structure.

[0025] In yet another preferred embodiment, the first housing and the second housing are separately formed by foaming a thermoplastic foamed material. Preferably, the thermoplastic foamed material includes at least one of a plastic foamed material and a rubber foamed material.

[0026] By adopting the above solution, the first housing and the second housing are formed by foaming the thermoplastic foamed material, thus avoiding complex assembly between parts, simplifying the assembly process of the casing, improving the efficiency of batch production, and omitting associated connecting parts for connection.

[0027] On the other hand, foamed plastic and foamed rubber have good heat insulation and noise reduction effects, can effectively separate the inside environment from the outside environment of the air cavity, can prevent heat exchange between the air inside the air cavity and the indoor air to cause a drop in the temperature of the indoor environment, and can prevent the adverse effect caused to the user by the noise generated by the fan. In addition, the casing made of the foam material is light in weight, installation and transportation are facilitated, and the weight of the whole machine is also effectively reduced. The disadvantages that in the prior art, heat insulation cotton is used to be pasted to the inner wall of the casing for heat insulation and noise reduction, the effect is poor, the heat insulation cotton is prone to fall off in the pasting process, the product quality cannot be easily guaranteed, and the like are ameliorated.

[0028] The present invention has the following beneficial effects compared with the prior art.

1. The casing of the air supply structure is divided into the first housing and the second housing, in addition, the two housings are connected by the connecting portions to form a complete casing structure after combination, thus facilitating the assembly of the casing and the fan while ensuring integration of the air cavity, the fan and the casing can be quickly connected, the operation is simple and convenient and fast, and the installation process of the air supply structure is simplified.

2. The chamber is arranged in the casing, the fan is clamped in the chamber, and the clamping groove of the chamber provides support for the fan instead of connection between the casing and the fan using connecting parts such as bolts in the prior art, so that

the air supply structure is simplified, the speed of installation is increased, the efficiency of installation is improved, the number of installation parts is reduced and the cost of production is reduced.

3. The casing may be formed by foaming the thermoplastic foamed material, thus avoiding complex assembly between parts, simplifying the assembly process of the casing, improving the efficiency of batch production, and omitting associated connecting parts for connection. In addition, heat exchange between the air in the air cavity and the indoor air is prevented, the heat insulation and noise reduction effects of the casing are improved, the weight of the casing is reduced, the disadvantages that in the prior art, heat insulation cotton is used to be pasted to the inner wall of the casing for heat insulation and noise reduction, the effect is poor, the heat insulation cotton is prone to fall off in the pasting process, the product quality cannot be easily guaranteed, and the like are ameliorated.

[0029] Ways for carrying out the invention will be described in further detail below in conjunction with the accompanying drawings.

[0030] The accompanying drawings serve to provide a further understanding but do not constitute an undue definition. The accompanying drawings in the following description are merely some embodiments, and for those of ordinary skill in the art, other accompanying drawings can also be obtained from these accompanying drawings without paying creative labor.

[0031] In the drawings:

Fig. 1 is an assembled schematic diagram of an air supply structure for a heat pump water heater according to an embodiment of the present invention; Fig. 2 is a structural schematic diagram of a casing according to an embodiment of the present invention;

Fig. 3 is a structural schematic diagram of a first housing according to an embodiment of the present invention;

Fig. 4 is a structural schematic diagram of a second housing according to an embodiment of the present invention;

Fig. 5 is a structural schematic diagram of a fan according to an embodiment of the present invention;

Fig. 6 is an installation structural schematic diagram of an air supply structure for a heat pump water heater according to an embodiment of the present invention.

[0032] In the drawings: 1, first housing; 11, fixing seat; 12, casing; 13, first cavity; 14, heat exchanger; 15, first groove body; 16, first air hole; 17, first air concave part; 18, first connecting portion; 2, second housing; 23, second cavity; 25, second groove body; 26, second air hole; 27, second air concave part; 28, second connecting por-

tion; 6, air inlet; 7, air guiding chamber; 9, air outlet; 10, fan; 101, clamping portion; 102, impeller; 1021, fan cover.

[0033] In order to make the objects, technical solutions and advantages of embodiments of the present disclosure clearer, technical solutions in embodiments will now be clearly and completely described in conjunction with the accompanying drawings in embodiments of the present disclosure, the following embodiments are illustrative of the present disclosure but not intended to limit the scope of the present disclosure.

[0034] In the description of the disclosure, it should be noted that, the terms "upper", "inner", "outer", and the like indicate orientations or positional relationships based on those shown in the drawings, are merely for ease of description of the disclosure and simplifying the description, and are not intended to indicate or imply that the devices or elements referred to must have a particular orientation, be constructed and operate in a particular orientation, and therefore cannot be interpreted as limiting the present disclosure.

[0035] Throughout the description of the present disclosure, it should be noted that, unless otherwise clearly specified and limited, the terms "connected" and "connection" should be broadly understood, e.g., it can be fixed connection or detachable connection or integral connection, can also be mechanical connection or electrical connection, and can also be direct connection or indirect connection through a medium. The specific meaning of the above terms in the present disclosure can be understood by those of ordinary skill in the art in accordance with specific conditions.

[0036] As shown in Figs. 1 to 6, a heat pump water heater of the present disclosure includes a heat exchanger 14, a fixing seat 11 and an air supply structure. The air supply structure includes a fan 10 and a casing 12. The casing 12 includes a first housing 1 and a second housing 2. The first housing 1 is provided with a first cavity 13, the second housing 2 is provided with a second cavity 23, and the first cavity 13 and the second cavity 23 cooperatively define a chamber. The first housing 1 cooperates with the second housing 2 to clamp the fan 10 in the chamber. The chamber includes a clamping groove and an air cavity. The clamping groove is used for clamping the fan 10; and the air cavity is used for forming an air path for the fan 10. The air cavity is provided with an air inlet 6 and an air outlet 9; the clamping groove and the air inlet 6 are opposite arranged in an axial direction of the fan 10.

[0037] The clamping groove is formed on the inner wall of the first cavity 13 or the inner wall of the second cavity 23. Or, the clamping groove is formed by combining a first groove body 15 formed on the inner wall of the first cavity 13 and a second groove body 25 formed on the inner wall of the second cavity 23. The first groove body 15 is of insertion groove structure formed on the inner wall of the first cavity 13, and the second groove body 25 is of insertion groove structure formed on the inner wall of the second cavity 23. An opening, for clamping

the fan, of the first groove body 15 is consistent with an open end of the first cavity 13 in orientation, and an opening, for clamping the fan, of the second groove body 25 is consistent with an open end of the second cavity 23 in orientation.

[0038] The air inlet 6 can be formed only on the first housing 1 or the second housing 2. The air inlet 6 can also be formed by combining a first air hole 16 formed on the first housing 1 and a second air hole 26 formed on the second housing 2. The first air hole 16 is communicated with the first cavity 13, and the second air hole 26 is communicated with the second cavity 23.

[0039] The clamping groove is preferably a sunken cavity in one side wall of the air cavity, and the air cavity is communicated with the clamping groove.

[0040] In the case of the air inlet 6 being formed by combining the two housings, the first air hole 16 and the second air hole 26 are respectively notches located at an open end of the first cavity 13 and the second cavity 23. In addition, a shape of the air inlet 6 can be designed as desired, and can be circular, square, oval, and the like.

[0041] The fan 10 includes a working portion including and a clamping portion 101. The working portion includes a motor and an impeller 102. The clamping portion 101 is embedded in the clamping groove. The motor is mounted on the clamping portion 101. One end of the motor is fixed by the clamping portion 101, and then the motor drives the impeller 102 to rotate. The impeller 102 is arranged at a port of the air inlet 6 for extracting air at the air inlet 6. Preferably, the impeller 102 is located between the clamping portion 101 and the air inlet 6.

[0042] The casing 12 is provided with an air guiding structure for guiding air into the air cavity through the air inlet 6. The air guiding structure can be an air guiding chamber 7 with an opening. The air guiding chamber 7 is formed on the first housing 1 or the second housing 2. Alternatively, the air guiding chamber 7 is formed by combining a first air concave part 17 formed on the first housing 1 and a second air concave part 27 formed on the second housing 2. The air guiding structure is arranged outside a side wall, provided with the air inlet 6, of the casing 12, and is located around the air inlet 6, ensuring that air discharged from the heat exchanger 14 of the heat pump water heater can enter the air inlet 6 as much as possible.

[0043] Preferably, the casing 12 is integrally connected with the air guiding structure.

[0044] The air guiding chamber 7 can be a chamber formed by a protruding plate structure on a side wall of the first housing 1 and/or the second housing 2, or a chamber formed by a plate structure extending from an adjacent wall of the side wall towards the air inlet direction.

[0045] The first housing 1 is provided with a first connecting portion 18, and the second housing 2 is provided with a second connecting portion 28. The first connecting portion 18 is connected with the second connecting portion 28 to connect the first housing 1 with the second

housing 2. Preferably, the first connecting portion 18 is in inserted connection or clamped connection with the second connecting portion 28 to connect the first housing 1 with the second housing 2. The structure of the connecting portion has a variety of forms, including a buckle structure, a hook structure, a screw structure, an inserting structure, and the like.

[0046] The first housing 1 and the second housing 2 are separately formed by foaming a thermoplastic foamed material. The thermoplastic foamed material includes at least one of a plastic foamed material and a rubber foamed material.

[0047] The thermoplastic foamed material may be an expanded polypropylene material (an EPP material for short) or an expanded polystyrene material (an EPS material for short) or the like.

[0048] When the casing 12 is processed, the first housing 1 and second housing 2 can be formed integrally by directly foaming plastic foamed materials according to the design graphics of the first housing 1 and the second housing 2 respectively, without connection by connecting parts.

[0049] Working principle: air discharged from the heat exchanger 14 enters the air cavity through the air inlet 6 under the air guiding action of the air guiding chamber 7, and the impeller 102 of the fan 10 rotates to accelerate flowing of the air in the air cavity so that the air is eventually discharged from the air outlet 9 arranged on the first housing 1 (see Fig. 6).

[0050] Installation method: first clamping the clamping portion 101 of the fan 10 into the second groove body 25 of the second housing 2 correspondingly, placing the working portion of the fan 10 into the second cavity 23, then enabling the first groove body 15 of the first housing 1 to sleeve the clamping portion 101 from an upper part, then buckling all portions of the first housing 1 with all portions of the second housing 2 in a one-to-one matching manner correspondingly, and finally connecting the first housing 1 with the second housing 2 via the connecting portions to form a complete casing 12.

[0051] As one implementation mode, as shown in Figs. 1 to 5, an air supply structure of a heat pump water heater includes a fan 10 and a casing 12. The casing 12 includes a first housing 1 and a second housing 2. The first housing 1 is connected to the second housing 2 in an up-down manner so that the first housing 1 is arranged at the upper part of the second housing 2 when the first housing 1 is to be connected with the second housing 2.

[0052] As a preferred solution, as shown in Figs. 2 to 5, the first housing 1 is provided with a first cavity 13, and the second housing 2 is provided with a second cavity 23. The first cavity 13 and the second cavity 23 are combined to form a chamber of which a cross section is rectangular. The chamber includes an air cavity and a clamping groove formed on an inner wall of the air cavity by recessing. The clamping groove is formed by combining a first groove body 15 formed on the inner wall of the first cavity 13 and a second groove body 25 formed on the

inner wall of the second cavity 23.

[0053] One side wall of an open end of the first cavity 13 is provided with a first air hole 16 of a semi-circular notch structure. One side wall of an open end of the second cavity 23 is provided with a second air hole 26 of a semi-circular notch structure. The first air hole 16 and the second air hole 26 are combined to form a circular air inlet 6.

[0054] The fan 10 includes a clamping portion 101 and a working portion connected to the clamping portion 101. The working portion includes a motor and an impeller 102, and the motor is mounted on the clamping portion 101. The working portion is placed in the air cavity, and the clamping portion 101 is clamped into the clamping groove for supporting the fan 10.

[0055] Further, end faces of open ends of the cavities of the first housing 1 and the second housing 2 are provided with concave chambers respectively. The concave chambers are combined to form a wiring hole. The clamping portion 101 is also provided with a wiring hole. Wire is connected to the motor of the fan 10 through the wiring holes.

[0056] Further, a side wall, provided with the first air hole 16, of the first housing 1 is provided with a first air concave part 17. The first air concave part 17 is of an open structure, and an opening faces the open end of the first cavity 13 and the heat exchanger 14. The first air concave part 17 encloses the side wall on its three sides. A side wall, provided with the second air hole 26, of the second housing 2 is provided with a second air concave part 27. The second air concave part 27 is of an open structure, and an opening faces the open end of the second cavity 23 and the heat exchanger 14. The second air concave part 27 encloses the side wall on its three sides. Two air concave parts cooperate to be buckled onto the heat exchanger 14 of the heat pump water heater for guiding air discharged from the heat exchanger 14 into the air cavity from the air inlet 6 (see Fig. 6).

[0057] By adopting the above solution, the clamping groove is composed of two groove bodies formed on two cavities together. The stability of the casing 12 is improved to facilitate support of the fan 10 by the casing 12 to provide a more secure connection between the fan 10 and the casing 12. In addition, the air guiding chamber 7 is formed by combining two air concave parts formed on the first housing 1 and the second housing 2 to draw air into the air cavity as much as possible, and the air guiding effect of the casing 12 is improved to facilitate air gathering.

[0058] As one implementation mode, as shown in Figs. 1 to 5, an air supply structure of a heat pump water heater includes a fan 10 and a casing 12. The fan 10 includes a clamping portion 101 and a working portion, and the working portion includes an impeller 102 and a motor. The motor is arranged in the middle of the clamping portion 101 via a positioning device, and the impeller 102 is connected to the motor and rotates under a driving action of the motor. A fan cover 1021 is arranged on blades of

the impeller 102, sleeves the peripheries of the blades and rotates along with the blades. The impeller 102 rotates under the driving of the motor to extract air through the air inlet 6. The flowing path of the air is from the air inlet 6 to the blades through the fan cover 1021, and into the air cavity through gaps between the blades under rotation of the blades. Since the fan cover 1021 rotates with the blades, the fan cover 1021 is arranged at a port, facing the air cavity, of the air inlet 6 for receiving air from the air inlet 6 when the fan 10 is installed. An outer diameter of the fan cover 1021 is smaller than a diameter of the air inlet 6. The fan cover 1021 is preferably of a circular structure.

[0059] As a preferred solution, the clamping portion 101 is a fan fixing plate arranged at an end far away from the fan cover 1021, and the fan fixing plate is polygonal in shape. The clamping groove is of a groove structure in the air cavity, and communicates with the air cavity, and the groove structure is matched with the fan fixing plate in shape to clamp the fan fixing plate into the chamber of the casing 12.

[0060] In addition, an air outlet 9 is formed in the first housing 1, is opposite to the first cavity 13. The air outlet 9 faces a radial direction of the fan 10, and communicates with the air cavity for discharging the air in the air cavity out of the air supply structure.

[0061] Further, the air supply structure is also provided with an air discharge pipeline in matched connection with the air outlet 9 for further discharging the air at the air outlet 9 out of the chamber.

[0062] By adopting the above solution, the fan cover 1021 is arranged at the air inlet 6 and has a certain air gathering action to assist the blades in extracting air from the air inlet 6 to a certain extent. And in addition, the circular fan cover 1021 can reduce the resistance of the air flow and reduce the energy consumption.

[0063] As one embodiment, as shown in Figs. 1 to 5, an air supply structure of a heat pump water heater includes a fan 10 and a casing 12. The casing 12 includes a first housing 1 and a second housing 2. The first housing 1 is provided with a first connecting portion 18, and the second housing 2 is provided with a second connecting portion 28. Multiple groups of the first connecting portion and the second connecting portion are arranged on the first housing 1 and the second housing 2.

[0064] As a preferred solution, four groups of the first connecting portion and the second connecting portion are arranged. The first connecting portions 18 and the second connecting portions 28 are arranged at a connected end of the first housing 1 and a connected end of the second housing 2 respectively. The first connecting portions 18 and the second connecting portions 28 are connected by means of insertion. The connecting portions include bumps and grooves. The first connecting portions 18 are respectively a groove structure formed in an end surface of an open end of the first cavity 13, a bump structure arranged on the first air concave part 17 at two sides of the first cavity 13, and a bump structure

arranged on the middle part of an outer wall of the first housing 1. The second connecting portions 28 are matched with the first connecting portions 18 in position and are respectively a bump structure arranged on an end surface of an open end of the second cavity 23, a groove structure formed in the second air concave part 27 at two sides of the second cavity 23, and a groove structure formed in the middle part of an outer wall of the second housing 2.

[0065] Further, sealing glue is coated to the end surface of the open end of the first cavity 13 and the end surface of the open end of the second cavity 23 respectively. The first housing 1 is buckled to the second housing 2 to form the complete casing 12, which further prevent the air in the air cavity from escaping from a junction of the open end of the first cavity 13 and the open end of the second cavity 23 to affect the sealability of the casing 12.

[0066] In the above solution, arranging four groups of connecting portions here is merely an implementation mode. The present disclosure does not limit the number of the connecting portions which are arranged at four positions, namely the left, middle and right of the first housing 1 and the second housing 2 and the end faces of the open ends of the two cavities respectively, for ensuring that the two connecting portions can firmly connect the first housing 1 and the second housing 2 to form a complete casing 12, and ensuring the stability and tightness of the casing 12.

[0067] In addition, the first connecting portions 18 and the second connecting portions 28 are set in the structural form of bumps and grooves, so that when the first housing 1 is connected to the second housing 2, it is only necessary to correspondingly insert the bumps into the matched grooves, thereby allowing convenient disassembly while ensuring the connecting effect of the first housing 1 and the second housing 2.

[0068] As an implementation mode, as shown in Fig. 6, an installation structure of an air supply structure of a heat pump water heater includes the air supply structure, a heat exchanger 14 and a fixing seat 11 for fixing the air supply structure. The air supply structure includes a casing 12, and the casing 12 includes a second housing 2 arranged on the fixing seat 11. And the second housing 2 is preferably connected to the fixing seat 11 by clamping and inserting. A bottom wall of the second housing 2 is provided with a connecting part for being connected with the fixing seat 11. The connecting part is preferably of a convex-concave matched connection structure of bump and groove.

[0069] As an implementation mode, as shown in Figs. 1 to 5, an air supply structure of a heat pump water heater includes a casing 12. The casing 12 includes a first housing 1 and a second housing 2 that are formed by directly foaming an expanded polypropylene material (an EPP material for short). The shape of an outer wall of the casing 12 is matched with the shape of an inner wall of a shell for covering the heat pump system, for preventing

a situation that perfect buckling cannot be achieved due to mismatch in the shape of the outer wall of the casing 12 when the shell is used for covering the heat pump system.

[0070] The processing process is complicated by the need to combine and connect the various parts during the production and processing of the casing, and there is also a risk of loosening and disjoining the connection relationship between the various parts of the casing, thus reducing the stability of the casing. On the other hand, since some types of heat pump water heaters have higher requirements on the heat insulation and noise reduction functions of the casing of the air supply structure, after the casing is connected and processed by using connecting parts, heat insulation cotton is also required to be pasted to an inner side wall of the casing for heat insulation and noise reduction. The heat insulation cotton is less effective in heat insulation and noise reduction effects and is prone to fall off during installation. And the assembly process among various parts is complicated and less efficient, thus affecting the entire production cycle.

[0071] By adopting the above solution, the first housing 1 and the second housing 2 of the casing 12 are formed by directly foaming an expanded polypropylene material, thus avoiding complex assembly of parts, simplifying the assembly process of the air supply structure, improving the efficiency of batch production, omitting associated connecting parts for connection, and simplifying the production process of the air supply structure.

[0072] On the other hand, the expanded polypropylene material (an EPP material for short) has good heat insulation and noise reduction effects, can effectively separate an inside from an outside of the air cavity, can prevent heat exchange between the air inside the air cavity and the indoor air to cause a drop in the temperature of the indoor environment, and can prevent the adverse effect caused to the user by the noise generated by the fan 10. In addition, the air supply structure is light in weight, installation and transportation are facilitated, and the weight of the whole machine is also effectively reduced. The disadvantages that in the prior art, heat insulation cotton is used to be pasted to the inner wall of the casing 12 for heat insulation and noise reduction, the effect is poor, the heat insulation cotton is prone to fall off in the pasting process, the product quality cannot be easily guaranteed, and the like are ameliorated.

[0073] The above embodiments are only preferred embodiments of the disclosure, and are not intended to limit the disclosure in any form. Although the disclosure has been disclosed above in terms of preferred embodiments, the embodiments are not used for limiting the disclosure. Any person familiar with this patent, without departing from the scope of the technical solution of the disclosure, can make some changes to the proposed technical contents or modify the embodiments to equivalent embodiments of equivalent variations, the implementation solutions in the above embodiments can be

further combined or substituted, any simple changes, and modifications made to the above embodiments without departing from the content of the claims.

Claims

1. An air supply structure of a heat pump water heater, comprising a fan (10) and a casing (12), wherein the casing (12) comprises,

a first housing (1), provided with a first cavity (13); and
a second housing (2), provided with a second cavity (23);
the casing (12) is internally provided with a chamber formed by the first cavity (13) and the second cavity (23);
the first housing (1) is matched with the second housing (2);
the chamber comprises,

a clamping groove, for clamping the fan (10); and

an air cavity, for forming an air path for the fan (10), and provided with an air inlet (6) and an air outlet (9);

the clamping groove and the air inlet (6) are opposite arranged in an axial direction of the fan (10);

the fan (10) comprises,

a working portion, comprising a motor and an impeller (102); and

a clamping portion (101), embedded in the clamping groove;

wherein the motor is mounted on the clamping portion (101);

characterized in that

the first housing (1) is matched with the second housing (2) to clamp the fan (10) in the chamber; the air outlet (9) faces a radial direction of the fan (10);

the clamping portion (101) is a fan fixing plate polygonal in shape and the clamping groove is matched with the fan fixing plate in shape to clamp the fan fixing plate into the chamber of the casing (12); and

the impeller (102) is located between the clamping portion (101) and the air inlet (6).

2. The air supply structure of the heat pump water heater according to claim 1, wherein the clamping groove is formed on an inner wall of the first cavity (13) or an inner wall of the second cavity (23);
or,

the clamping groove is formed by combining a first groove body (15) formed on an inner wall of the first cavity and a second groove body (25) formed on an inner wall of the second cavity.

3. The air supply structure of the heat pump water heater according to claim 1 or 2, wherein the air inlet (6) is formed on the first housing (1) or the second housing (2);
or,

the air inlet (6) is formed by combining a first air hole (16) formed on the first housing and a second air hole (26) formed on the second housing; the first air hole (16) is communicated with the first cavity (13), and the second air hole (26) is communicated with the second cavity (23).

4. The air supply structure of the heat pump water heater according to any one of claims 1 to 3, wherein the casing (12) is provided with an air guiding structure for guiding air into the air cavity through the air inlet (6).

5. The air supply structure of the heat pump water heater according to claim 4, the air guiding structure is an air guiding chamber with an opening.

6. The air supply structure of the heat pump water heater according to claim 4 or 5, wherein the air guiding chamber is formed in the first housing or the second housing;

or,

the air guiding chamber is formed by combining a first air concave part (17) formed in the first housing (1) and a second air concave part (27) formed in the second housing (2).

7. The air supply structure of the heat pump water heater according to any one of claims 1 to 6, wherein the first housing (1) is provided with a first connecting portion (18), the second housing (2) is provided with a second connecting portion (28), and the first connecting portion (18) is connected with the second connecting portions (28) for connecting the first housing with the second housing.

8. The air supply structure of the heat pump water heater according to claim 7, the first connecting portion (18) is in inserted connection or in clamped connection with the second connecting portions (28) for connecting the first housing with the second housing.

9. The air supply structure of the heat pump water heater according to any one of claims 1 to 8, wherein the first housing (1) and the second housing (2) are separately formed by foaming a thermoplastic foamed material.

10. The air supply structure of the heat pump water heater according to claim 9, the thermoplastic foamed material comprises at least one of a plastic foamed material and a rubber foamed material.
11. A heat pump water heater, provided with the air supply structure according to any one of claims 1 to 10.

Patentansprüche

1. Luftzufuhrstruktur eines Wärmepumpenwassererhitzers, die ein Gebläse (10) und ein Gehäuse (12) umfasst, wobei das Gehäuse (12) umfasst:

ein erstes Gehäuse (1), das mit einem ersten Hohlraum (13) versehen ist; und
ein zweites Gehäuse (2), das mit einem zweiten Hohlraum (23) versehen ist;
wobei das Gehäuse (12) im Inneren mit einer Kammer versehen ist, die durch den ersten Hohlraum (13) und den zweiten Hohlraum (23) gebildet wird;
das erste Gehäuse (1) mit dem zweiten Gehäuse (2) zusammengefügt ist;
wobei die Kammer umfasst:

eine Klemmnut zum Festklemmen des Gebläses (10); und
einen Lufthohlraum, der einen Luftweg für das Gebläse (10) bildet und mit einem Lufteinlass (6) und einem Luftauslass (9) versehen ist;
wobei die Klemmnut und der Lufteinlass (6) in axialer Richtung des Gebläses (10) gegenüberliegend angeordnet sind;

wobei das Gebläse (10) umfasst:

einen Arbeitsabschnitt, der einen Motor und ein Flügelrad (102) umfasst; und
einen Klemmabschnitt (101), der in die Klemmnut eingebettet ist;
wobei der Motor an dem Klemmabschnitt (101) montiert ist;

dadurch gekennzeichnet, dass

das erste Gehäuse (1) mit dem zweiten Gehäuse (2) zusammengefügt ist, um das Gebläse (10) in der Kammer festzuklemmen;
der Luftauslass (9) in radialer Richtung des Gebläses (10) ausgerichtet ist;
der Klemmabschnitt (101) eine polygonale Gebläsebefestigungsplatte ist und die Klemmnut in ihrer Form an die Gebläsebefestigungsplatte angepasst ist, um die Gebläsebefestigungsplatte in die Kammer des Gehäuses (12) zu klemmen; und

sich das Flügelrad (102) zwischen dem Klemmabschnitt (101) und dem Lufteinlass (6) befindet.

2. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 1,

wobei die Klemmnut an einer Innenwand des ersten Hohlraums (13) oder einer Innenwand des zweiten Hohlraums (23) ausgebildet ist;
oder,
die Klemmnut durch Kombination eines ersten Nutkörpers (15), der an einer Innenwand des ersten Hohlraums ausgebildet ist, und eines zweiten Nutkörpers (25), der an einer Innenwand des zweiten Hohlraums ausgebildet ist, gebildet wird.

3. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 1 oder 2, wobei der Lufteinlass (6) an dem ersten Gehäuse (1) oder dem zweiten Gehäuse (2) ausgebildet ist;
oder,

der Lufteinlass (6) durch Kombination eines ersten Luftlochs (16), das an dem ersten Gehäuse ausgebildet ist, und eines zweiten Luftlochs (26), das an dem zweiten Gehäuse ausgebildet ist, gebildet wird;
wobei das erste Luftloch (16) mit dem ersten Hohlraum (13) in Verbindung steht und das zweite Luftloch (26) mit dem zweiten Hohlraum (23) in Verbindung steht.

4. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach einem der Ansprüche 1 bis 3, wobei das Gehäuse (12) mit einer Luftführungsstruktur zum Führen von Luft in den Lufthohlraum durch den Lufteinlass (6) versehen ist.

5. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 4, wobei die Luftführungsstruktur eine Luftführungskammer mit einer Öffnung ist.

6. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 4 oder 5, wobei die Luftführungskammer in dem ersten Gehäuse oder dem zweiten Gehäuse ausgebildet ist;
oder,
die Luftführungskammer durch Kombination eines ersten konkaven Luftteils (17), der in dem ersten Gehäuse (1) ausgebildet ist, und eines zweiten konkaven Luftteils (27), der in dem zweiten Gehäuse (2) ausgebildet ist, gebildet wird.

7. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach einem der Ansprüche 1 bis 6, wobei das erste Gehäuse (1) mit einem ersten Verbindungsab-

schnitt (18) versehen ist, das zweite Gehäuse (2) mit einem zweiten Verbindungsabschnitt (28) versehen ist, und
der erste Verbindungsabschnitt (18) mit den zweiten Verbindungsabschnitten (28) verbunden ist, um das erste Gehäuse mit dem zweiten Gehäuse zu verbinden.

8. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 7, wobei der erste Verbindungsabschnitt (18) mit den zweiten Verbindungsabschnitten (28) zur Verbindung des ersten Gehäuses mit dem zweiten Gehäuse in Steck- oder Klemmverbindung steht.

9. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach einem der Ansprüche 1 bis 8, wobei das erste Gehäuse (1) und das zweite Gehäuse (2) separat durch Aufschäumen eines thermoplastischen aufgeschäumten Materials ausgebildet sind.

10. Luftzufuhrstruktur des Wärmepumpenwassererhitzers nach Anspruch 9, wobei das thermoplastische aufgeschäumte Material mindestens eines aus einem aufgeschäumten Kunststoffmaterial und einem aufgeschäumten Kautschukmaterial umfasst.

11. Wärmepumpenwassererhitzer, der mit der Luftzufuhrstruktur nach einem der Ansprüche 1 bis 10 versehen ist.

Revendications

1. Une structure d'alimentation en air d'un chauffe-eau à pompe à chaleur, comprenant un ventilateur (10) et un boîtier (12), dans lequel le boîtier (12) comprend,

un premier boîtier (1), pourvu d'une première cavité (13); et

un deuxième boîtier (2), pourvu d'une deuxième cavité (23);

le boîtier (12) est pourvu à l'intérieur d'une chambre formée par la première cavité (13) et la deuxième cavité (23);

le premier boîtier (1) est adapté au deuxième boîtier (2);

la chambre comprend,

une rainure de serrage, pour fixer le ventilateur (10); et

une cavité d'air, destinée à former un trajet d'air pour le ventilateur (10), et pourvue d'une entrée d'air (6) et d'une sortie d'air (9); la rainure de serrage et l'entrée d'air (6) sont disposées en face l'une de l'autre dans une direction axiale du ventilateur (10);

le ventilateur (10) comprend,

une partie de travail, comprenant un moteur et une roue (102); et

une partie de serrage (101), encastrée dans la rainure de serrage;

dans lequel le moteur est monté sur la partie de serrage (101);

caractérisée en ce que

le premier boîtier (1) est adapté au deuxième boîtier (2) pour fixer le ventilateur (10) dans la chambre;

la sortie d'air (9) fait face à une direction radiale du ventilateur (10);

la partie de serrage (101) est une plaque de fixation de ventilateur de forme polygonale et la rainure de serrage correspondance en forme à la plaque de fixation de ventilateur pour fixer la plaque de fixation de ventilateur dans la chambre du boîtier (12); et

la roue (102) est située entre la partie de serrage (101) et l'entrée d'air (6).

2. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 1, dans laquelle la rainure de serrage est formée sur une paroi interne de la première cavité (13) ou sur une paroi interne de la deuxième cavité (23);

ou

la rainure de serrage est formée en combinant un premier corps de rainure (15) formé sur une paroi interne de la première cavité et un deuxième corps de rainure (25) formé sur une paroi interne de la deuxième cavité.

3. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 1 ou 2, dans laquelle l'entrée d'air (6) est formée sur le premier boîtier (1) ou le deuxième boîtier (2);

ou

l'entrée d'air (6) est formée en combinant un premier trou d'air (16) formé sur le premier boîtier et un deuxième trou d'air (26) formé sur le deuxième boîtier;

le premier trou d'air (16) communique avec la première cavité (13), et le deuxième trou d'air (26) communique avec la deuxième cavité (23).

4. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon l'une quelconque des revendications 1 à 3, dans laquelle le boîtier (12) est pourvu d'une structure de guidage d'air pour guider l'air dans la cavité d'air à travers l'entrée d'air (6).

5. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 4, la struc-

ture de guidage d'air est une chambre de guidage d'air ayant d'une ouverture.

6. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 4 ou 5, dans laquelle la chambre de guidage de l'air est formée dans le premier boîtier ou le deuxième boîtier; ou la chambre de guidage d'air est formée en combinant une première partie concave à air (17) formée dans le premier boîtier (1) et une deuxième partie concave à air (27) formée dans le deuxième boîtier (2). 5
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7. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon l'une quelconque des revendications 1 à 6, dans laquelle le premier boîtier (1) est pourvu d'une première partie de connexion (18), le deuxième boîtier (2) est pourvu d'une deuxième partie de connexion (28), et la première partie de connexion (18) est reliée aux deuxièmes parties de connexion (28) pour relier le premier boîtier au deuxième boîtier. 15
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8. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 7, la première partie de connexion (18) est en connexion insérée ou en connexion serrée avec les deuxièmes parties de connexion (28) pour relier le premier boîtier au deuxième boîtier. 25
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9. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon l'une quelconque des revendications 1 à 8, dans laquelle le premier boîtier (1) et le deuxième boîtier (2) sont formé séparément par moulage d'un matériau en mousse thermoplastique. 35

10. La structure d'alimentation en air du chauffe-eau à pompe à chaleur selon la revendication 9, le matériau en mousse thermoplastique comprend au moins un matériau en mousse plastique et un matériau en mousse de caoutchouc. 40

11. Un chauffe-eau à pompe à chaleur, pourvu de la structure d'alimentation en air selon l'une quelconque des revendications 1 à 10. 45

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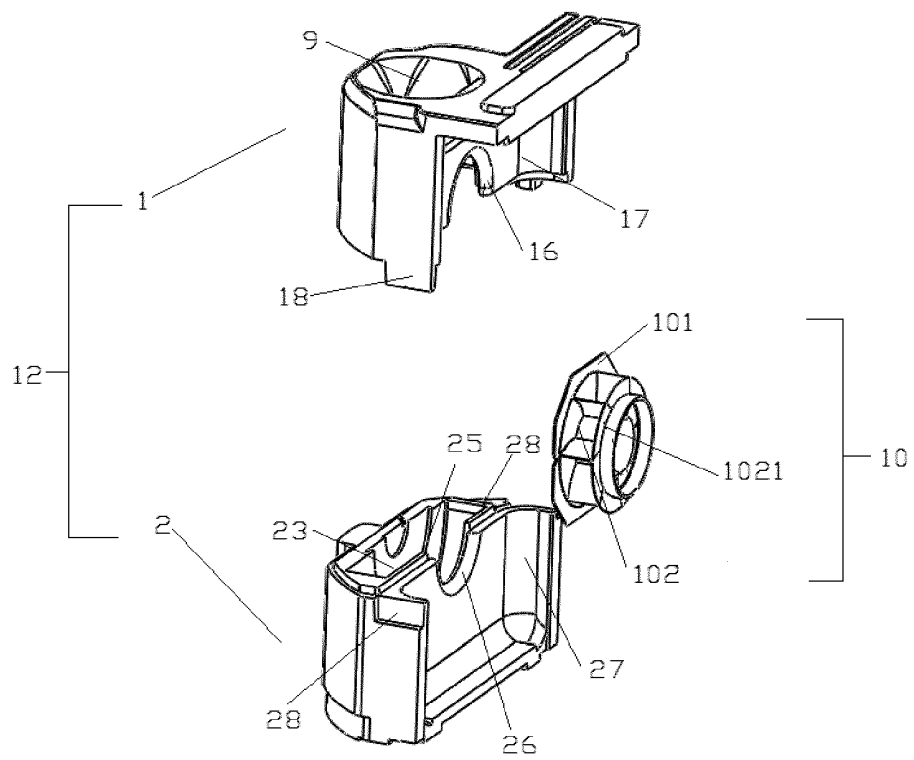


Fig. 1

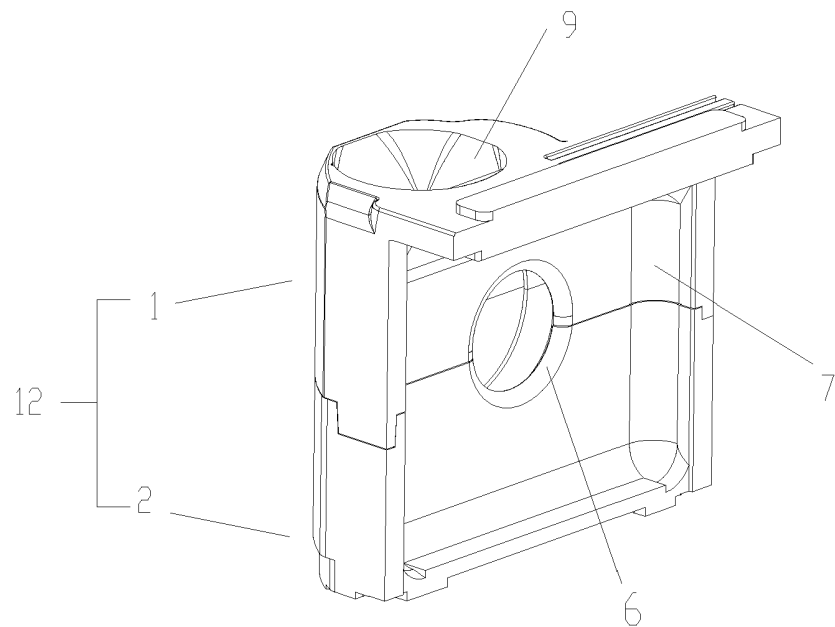


Fig. 2

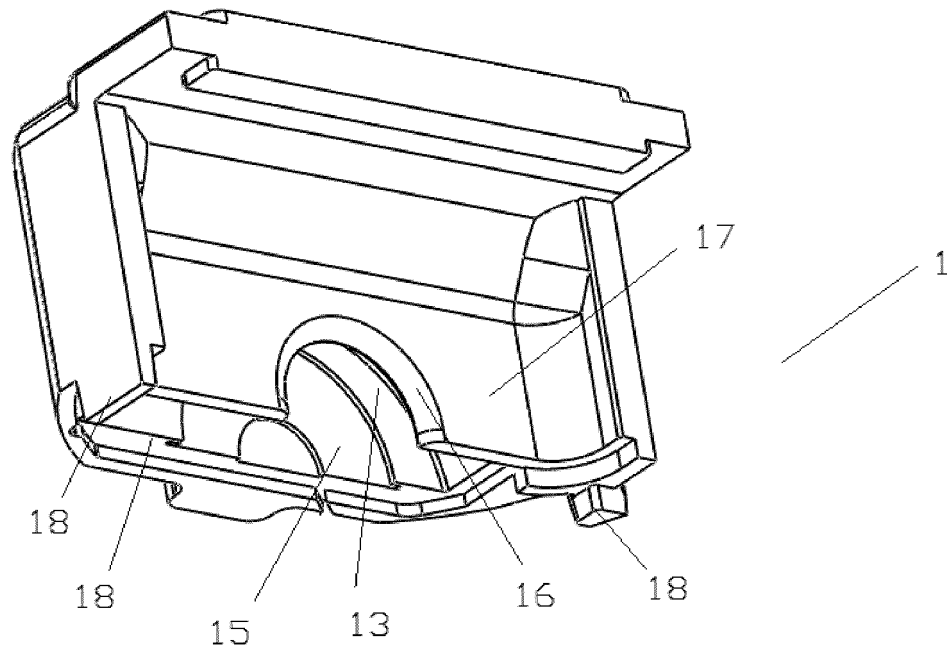


Fig. 3

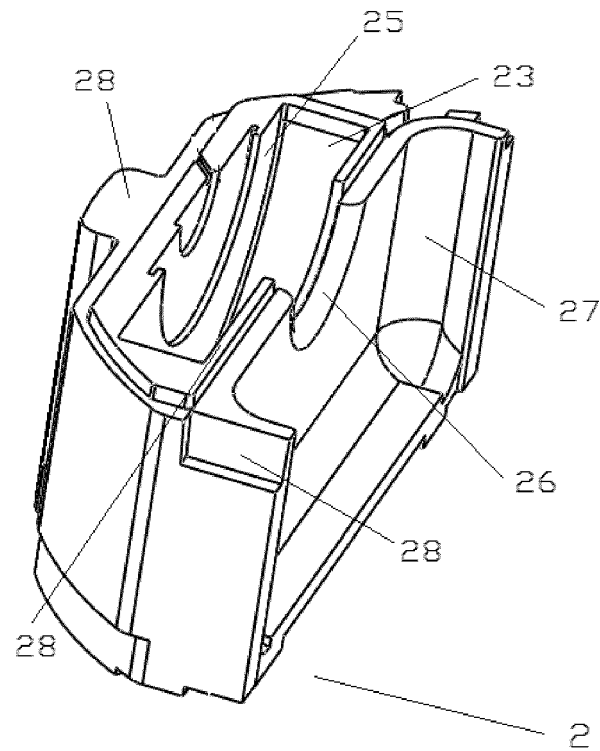


Fig. 4

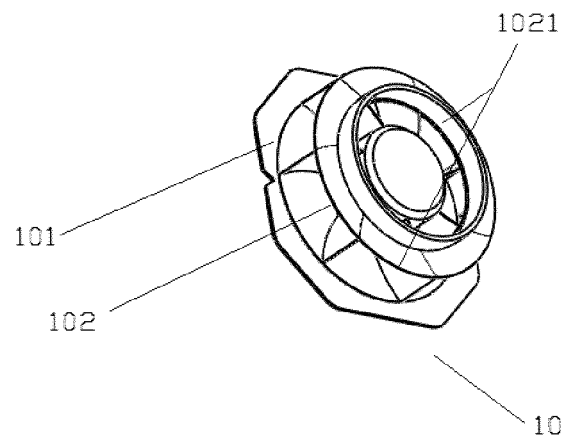


Fig. 5

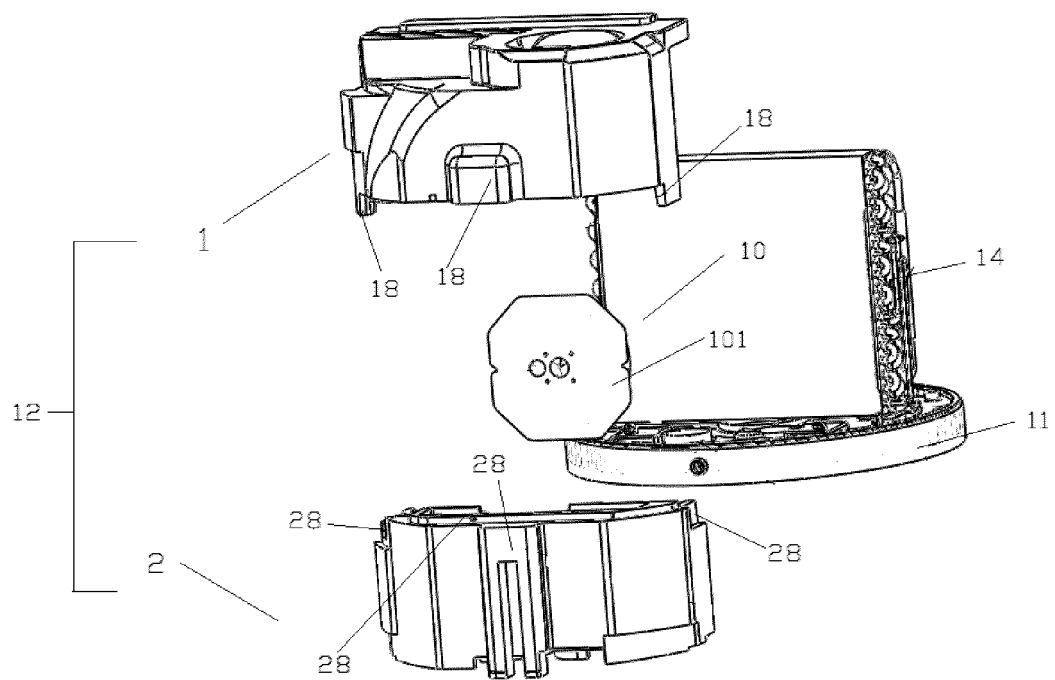


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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