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(54) Adjustable inflation and deflation air pump

(57) The present invention provides an adjustable inflation and deflation air pump consisting of: a pump frame (1), a pump body, a motor (3), blades (16), an air input hole (15), an air output hole (13), and a valve (9). A pump compartment of the present invention consists of an air compartment and a motor compartment. The air compartment is built up by a pump protective shield (6) and a motor protective shield (7). The air compartment is connected to the air input hole (15). The motor compartment is built up by a motor protective shield (7) and is connected to the air output hole (13) at its bottom. On the upper part of the pump is a swing knob (4) which is connected to the pump body. On the lower part of the pump is a curved surface (14). During its working process, the motor is cooled by constant airflows through the motor compartment during both inflation and deflation. Thus, the difficult problem of the motor overheating and being damaged during inflation and deflation has been solved perfectly.

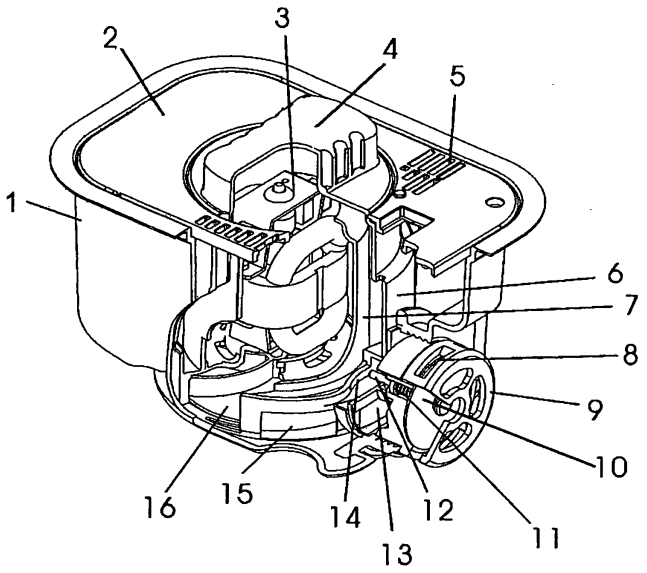

FIG. 1

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Description

FIELD OF INVENTION

[0001] The present invention provides an inflation and deflation air pump used for an air mattress. This adjustable inflation and deflation air pump is especially suitable for an air mattress at home and at sport places. It is an environmentally friendly light industry product.

BACKGROUND OF THE INVENTION

[0002] There are many kinds of mattresses used in daily life, such as a sponge mattress and an air mattress. The air mattress is widely used at home and sports places due to the advantages of being aesthetically pleasing, practicality of use and low cost. An air mattress needs a pump for inflation and deflation.

[0003] There is a kind of such a pump with an automatic valve switch (see China Patent No. ZL01240604.x). The output hole of the valve of such a pump is closed immediately by an automatic switch device after the air mattress is inflated, and this prevents the air from leaking out of the mattress. This kind of valve must be operated manually by inflating and deflating. Also, the outside pump needs to be moved from one position to another. It is therefore troublesome to operate.

[0004] There is another kind of an automatic inflation and deflation pump where the motor easily overheats and is damaged by long inflation time and frequent operation.

[0005] It is therefore desirable to have an adjustable air pump with an automatic switch valve so that it is easy to operate and is robust.

[0006] According to the present invention, this object is achieved by an adjustable inflation and deflation air pump as defined in claim 1. The dependent claims defined preferred and advantageous embodiments of the invention.

SUMMARY OF THE INVENTION

[0007] The present invention provides an adjustable inflation and deflation pump. The pump body consists of two parts: the air storage compartment and the motor compartment. Both input and output air will flow through the motor compartment and thus cool the motor during operation. This design makes the pump easy to operate, protects the motor from overheating and becoming damaged, and makes the pump robust.

[0008] The present pump invention consists of a pump frame, an upper deck, a swing knob, a motor, blades, an air input hole, an air output hole and a valve. The swing knob is mounted on the top of the pump and the motor is mounted in the middle of the pump body. Blades are fixed on the motor. In the lower part of the pump body there are air input and output holes. The valve is mounted on one side of the pump frame bottom.

[0009] The present invention is characterized by a pump compartment that is separated into two parts: an air storage compartment and a motor compartment. The air storage compartment is built up by the pump protective shield and the motor protective shield, and it is connected with the air input hole. The motor compartment is built up by the motor protective shield, and it is connected with the air output hole at its bottom. The swing knob on the top of the pump is fixed on the upper part of the pump protective shield and it is apart of the shield. By revolving the swing knob, the pump body will also be revolved. Consequently, the relative position of the air input and output holes towards the automatic switching valve will be changed.

[0010] At the bottom of the pump protective shield (6) there is a curved surface, the spring rod of the valve is located on the curved surface of the pump body. The valve is mounted on the side of the lower part of the pump frame. There is a spring rod and a closing rubber inside the air valve. The closing rubber is connected to the rod. As the rod moves forwards and backwards, the rubber will open and close the valve accordingly. On the top of the pump frame there is an upper deck, the upper deck having an air hole. A power switch and a power line connection are on the top of the pump frame as well. Through the revolving of the swing knob, the pump body will be revolved, and the position of the rod on the curved surface will change. Consequently, the relative positioning of the air input and output holes towards the automatic switching valve will change (between open and closed positions).

[0011] The following describes how a preferred embodiment of the present invention works. When inflating, revolve the swing knob into the inflate position. The valve rod is placed in the concave part of the curved surface (the valve will be closed under the force of the valve spring while there is no air flow). The motor will inflate the mattress through the blades. The air flow opens the valve and gets into the mattress. Upon completing inflation, the air pressure inside the mattress will be higher than the outside. The air pressure inside the mattress closes the valve, and no air will leak out.

[0012] When deflating, put the swing knob into the deflate position. The valve is facing the air input hole while the valve rod is placed in the convex part of the curved surface. The rod is pushed into the valve, and the valve is opened to allow the air to flow out.

[0013] Compared to conventional pumps, the present invention is easy to operate, easy to inflate and deflate, secure, and solves the problem of the motor overheating and being damaged during the inflating and deflating process. It is low cost, convenient and durable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a schematic view of an air pump structure

according to a preferred embodiment of the invention.

Fig. 2 is a schematic view of an inflating and deflating process of a pump compartment of the pump shown in Fig. 1.

Fig. 3 is a schematic view of an inflating process of a valve of the pump shown in Fig. 1.

Fig. 4 is a schematic view of a deflating process of the valve.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0015] As shown in the Figures, the air pump comprises a pump frame 1; an upper deck 2; a motor 3; a swing knob 4; a plurality of blades 16; an air input hole 15; an air output hole 13, and an air valve 9.

[0016] Swing knob 4 is mounted on a top of the pump, and motor 3 is mounted in a middle of the pump body. Blades 16 are fixed on motor 3. Air input hole 15 and air output hole 13 are located at a lower part of the pump body. Valve 9 is mounted at one side of a bottom of pump frame 1.

[0017] There are two compartments inside the pump body: an air storage compartment and a motor compartment. The air storage compartment is built up by pump protective shield 6 and motor protective shield 7, and it connects to air input hole 15. Air input hole 15, motor protective shield 7, pump protective shield 6 and air output hole 13 of air storage compartment 18 belong to the air storage compartment. The motor compartment is built up by motor protective shield 7. It connects to the air storage compartment on the top and to air output hole 13 on the bottom. Motor protective shield 7, motor 3, blades 16, and air output hole 13 belong to the motor compartment.

[0018] Swing knob 4 on the top of the pump is fixed on an upper part of pump protective shield 6. It is part of pump protective shield 6. By revolving swing knob 4, the pump body will be revolved as well, and thus the relative position of the air input and output hole towards valve 9 will be changed.

[0019] There is a curved surface 14 on a bottom of a pump deck. Spring rod 12 of valve 9 is facing curved surface 14 of the pump body. Valve 9 is mounted on a side of the bottom of pump frame 1. There is a spring rod 12 and a closing rubber 10 inside valve 9. Closing rubber 10 is connected to rod 12. As rod 12 moves forwards and backwards, closing rubber 10 will open and close valve 9.

[0020] On the top of pump frame 1 there is an upper deck 2. There is an air hole 5 in upper deck 2. On a top of pump frame 1 there is a power switch and a power line connection. By revolving swing knob 4, the pump body will be revolved accordingly, thus changing the relative position of rod 13 towards curved surface 14. The relative position of air input 15 and output holes 13 on the bottom of the pump body towards valve 9 are also changed (open or closed positions).

[0021] To inflate, put swing knob 4 into the inflate position and valve rod 9 is placed in the concave part of curved surface 14 (the valve will be closed under the force of the valve spring when there is no air flow). The air flows from air input hole 15 into the air storage compartment, then through the channel inside protective shield 17, and then through output hole 18 of the air storage compartment and then into the motor compartment. Motor 3 will inflate the mattress through blades 16. The air flows through output hole 13 and opens valve 9 and inflates the mattress through a valve output hole 8. Upon completion of the inflating, the air pressure inside the mattress becomes higher than the outside. The air pressure inside the mattress will close valve 9, and no air will leak out.

[0022] To deflate, swing knob 4 is put into the deflate position. Valve 9 will face air input hole 15, while valve rod 12 is placed on the convex part of curved surface 14. When rod 12 is pushed into valve 9, valve 9 will open, and air will flow out through output hole 13 of valve 9 into the motor compartment in an opposite direction. Air then flows through the air storage compartment and finally through an air hole 5 in upper deck 2 to the outside. Thus the mattress is deflated.

[0023] With this pump design, the air flows through the motor compartment both during inflation and deflation, thereby cooling the motor by the air flow. The problem of the motor overheating and being damaged during the inflating and deflating process is therefore solved.

Claims

1. An adjustable inflation and deflation air pump, comprising
   a pump frame (1),
   an upper deck (2),
   a swing knob (4),
   a motor (3),
   blades (16),
   air input and output holes (13; 15), and
   a valve (9),
   wherein the swing knob (4) is mounted on the top of the pump, the motor (3) is mounted in the middle of the pump body, the blades (16) are fixed on the motor (3),
   wherein in the lower part of the pump body there are the air input and output holes (13; 15),
   wherein a pump compartment is divided into an air storage compartment and a motor compartment,
   wherein the air storage compartment is built up by a pump protective shield (6) and a motor protective shield (7), and is connected to the air input hole (15),
   wherein the air input hole (15), the motor protective shield (7), the pump protective shield (6) and the air

output hole (13) belong to the air storage compartment, and
wherein the motor compartment is built up by the motor protective shield (7), and is connected to the air output hole (13) on the bottom and the air storage compartment on the top, wherein the motor protective shield (7), the motor (3), the blades (16), and the air output hole (13) belong to the motor compartment.

2. The adjustable inflation and deflation air pump of claim 1, further comprising the swing knob (4) on the top of the air pump fixed on the upper part of the pump protective shield (6) and forming a part of the pump protective shield (6), wherein by revolving the swing knob (4) the pump body is revolved accordingly, and the relative position of the air input and output holes (13; 15) at the bottom of the pump towards the valve (9) are changed accordingly.

3. The adjustable inflation and deflation air pump of claim 1 or 2, further comprising a curved surface (14) on the bottom of the pump protective shield (6), the spring rod (12) of the valve (9) being placed on the curved surface (14) of the pump body.

4. The adjustable inflation and deflation air pump of any one of claims 1 - 3, further comprising the valve (9) mounted on the side of the bottom of the pump frame (1), a spring rod (12) and a closing rubber(10) inside the valve (9), the closing rubber (10) being connected to the spring rod (12), wherein the closing rubber (10) opens or closes the valve (9) following a forwards and backwards move of the spring rod (12).

5. The adjustable inflation and deflation air pump of any one of claims 1 - 4, further comprising the upper deck (2) on the top of the pump frame (1) and the air hole (5) in the upper deck (2), a power switch and a power line connection on the top of the pump frame (1).

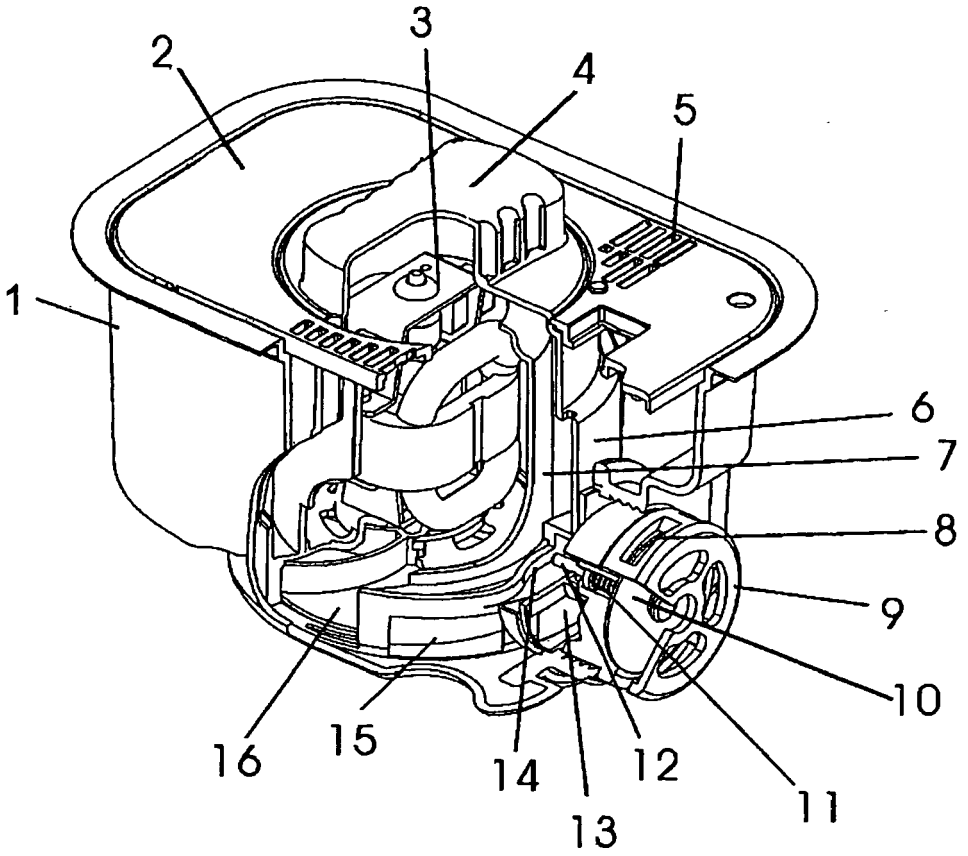

FIG. 1

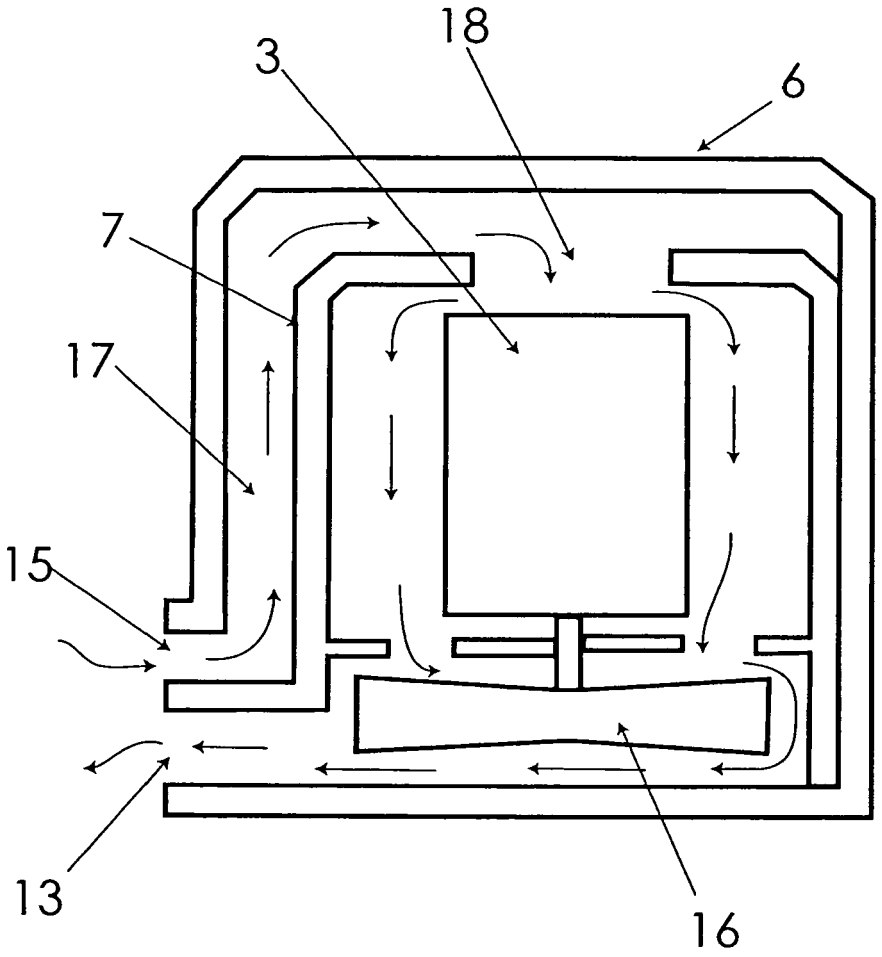

FIG. 2

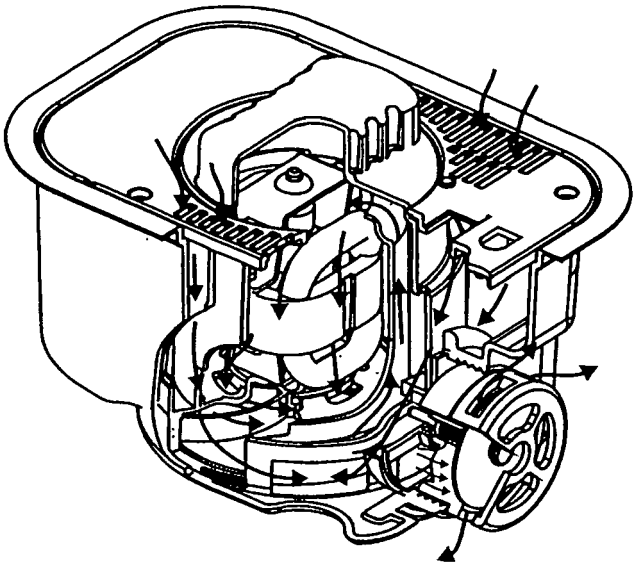

FIG. 3

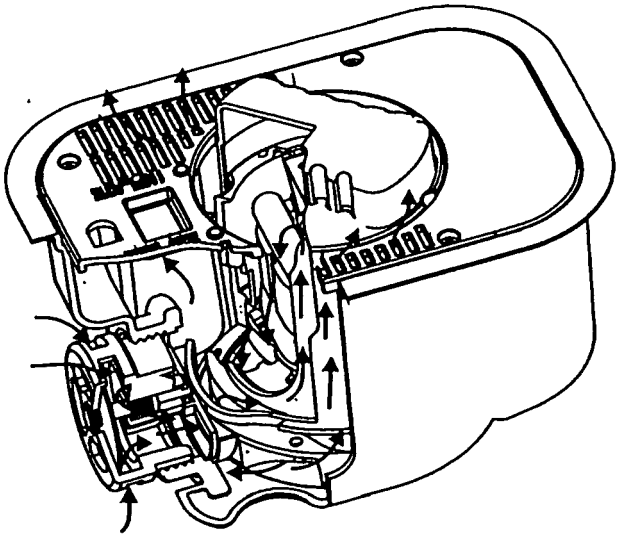

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 06 00 3490

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TECHNICAL FIELDS SEARCHED (IPC)

F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 May 2006	Olona Laglera, C

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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