PORTABLE FAN

TECHNICAL FIELD

Embodiments of the present application relate to the technical field of fans, and more specifically, to a portable fan.

BACKGROUND

A portable fan that is commonly used in the art is assembled by splicing a front shell and a rear shell. When the portable fan malfunctions, the battery may not be replaced easily. Maintenance may not be performed easily, and a battery life may be shortened.

SUMMARY

In view of this, a portable fan is provided in the present application, the portable fan includes an airflow portion and a display screen. The airflow portion includes an air outlet, the air outlet is disposed surrounding a periphery of the display screen. The display screen has an arc-shaped outer surface; and/or the display screen is configured to display at least one of: a remaining battery power level, a current air speed, a battery power level during charging, and an operating state.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1-1 is a perspective view of a portable fan according to an embodiment of the present application.

FIG. 1-2 is an exploded view of the portable fan shown in FIG. 1-1.

FIG. 1-3 is an exploded view of the portable fan shown in FIG. 1-2, where a sleeve is omitted.

FIG. 1-4 is a structural schematic view of a fan base of the portable fan according to an embodiment of the present application.

FIG. 1-5 is a structural schematic view of a pressurizing seat of the portable fan according to an embodiment of the present application.

FIG. 1-6 is a structural schematic view of the sleeve of the portable fan according to an embodiment of the present application.

FIG. 2-1 is a perspective view of a portable fan according to a first embodiment of the present application.

FIG. 2-2 is a cross-sectional view of the portable fan of the first embodiment of the present application.

FIG. 2-3 is an enlarged view of a portion A in FIG. 2-2.

FIG. 2-4 is a cross-sectional view of the portable fan of the first embodiment of the present application.

FIG. 2-5 is a cross-sectional view of the portable fan according to a second embodiment of the present application.

FIG. 2-6 is a cross-sectional view of the portable fan according to a third embodiment of the present application.

FIG. 3-1 is a structural schematic view of an airflow portion according to an embodiment 3-1 of the present application.

FIG. 3-2 is an exploded view of the airflow portion according to the embodiment 3-1 of the present application.

FIG. 3-3 is a cross-sectional view of the airflow portion according to the embodiment 3-1 of the present application.

FIG. 3-4 is a structural schematic view of a display screen according to an embodiment of the present application.

FIG. 3-5 is a structural schematic view of an inner shell that is assembled according to an embodiment of the present application.

FIG. 3-6 is a structural schematic view of the portable fan according to an embodiment 3-2 of the present application.

FIG. 3-7 is a cross-sectional view of the portable fan in the embodiment 3-2.

FIG. 4-1 is a perspective view of a handheld fan according to an embodiment of the present application.

FIG. 4-2 is a perspective view of the handheld fan, being viewed from another viewing angle, according to an embodiment of the present application.

FIG. 4-3 is a perspective structural view of a portion of the handheld fan according to an embodiment of the present application.

FIG. 4-4 is an exploded view of the handheld fan according to an embodiment of the present application.

FIG. 4-5 is a schematic diagram of an air volume adjustment circuit according to an embodiment of the present application.

FIG. 4-6 is a schematic diagram of an air volume adjustment circuit according to an embodiment of the present application.

FIG. 5-1 is a perspective view of the handheld fan according to an embodiment of the present application.

FIG. 5-2 is a perspective view of the handheld fan, being viewed from another viewing angle, according to an embodiment of the present application.

FIG. 5-3 is a perspective view of a portion of the handheld fan according to an embodiment of the present application.

FIG. 5-4 is an exploded view of the handheld fan according to an embodiment of the present application.

FIG. 5-5 is a schematic diagram of an air volume adjustment circuit according to an embodiment of the present application.

FIG. 5-6 is a schematic diagram of an air volume adjustment circuit according to an embodiment of the present application.

FIG. 6-1 is a structural schematic view of a handheld structure for a handheld fan according to an embodiment of the present application.

FIG. 6-2 is a structural schematic view of a mounting bracket and a circuit board assembly in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-3 is a structural schematic view of a gear knob assembly and a battery in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-4 is a structural schematic view of a protective switch button assembly in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-5 is a structural schematic view of a handheld portion and an airflow structure in the handheld structure for the handheld according to an embodiment of the present application.

FIG. 6-6 is a structural schematic view of a clamping plate in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-7 is a structural schematic view of a first support plate a second support plate in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-8 is a structural schematic view of a receiving space in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-9 is a structural schematic view of an isolation plate in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 6-10 is a structural schematic view of a first protrusion and a second protrusion in the handheld structure for the handheld fan according to an embodiment of the present application.

FIG. 7-1 is a structural schematic view of a handheld according to an embodiment of the present application.

FIG. 7-2 is a structural schematic view of a mounting bracket in the handheld fan according

to an embodiment of the present application.

FIG. 7-3 is a structural schematic view of a handheld shell of the handheld fan according to an embodiment of the present application.

FIG. 7-4 is a structural schematic view of a control mechanism in the handheld fan according to an embodiment of the present application.

FIG. 7-5 is a structural schematic view of a mounting groove in the handheld fan according to an embodiment of the present application.

FIG. 7-6 is a structural schematic view of an outer shell of the handheld fan according to an embodiment of the present application.

FIG. 7-7 is a structural schematic view of a first circuit board in the handheld fan according to an embodiment of the present application.

FIG. 7-8 is a structural schematic view of an inner shell in the handheld fan according to an embodiment of the present application.

FIG. 8-1 is a structural schematic view of an airflow component of a handheld fan according to an embodiment of the present application.

FIG. 8-2 is a structural schematic view of a mounting bracket in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-3 is a structural schematic view of a handheld portion in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-4 is a structural schematic view of a wire opening in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-5 is a structural schematic view of a wire receiving groove in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-6 is a structural schematic view of the wire receiving groove in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-7 is a structural schematic view of a gear knob assembly and a protective switch button assembly in the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-8 is a structural schematic view of an inner shell and an outer shell of the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-9 is a structural schematic view of an air inlet and an air outlet of the airflow component of the handheld fan according to an embodiment of the present application.

FIG. 8-10 is an enlarged view of a portion A in FIG. 8-9.

FIG. 8-11 is a structural schematic view of a fan assembly of the airflow component of the

handheld fan according to an embodiment of the present application.

FIG. 9-1 is a structural schematic view of an airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 9-2 is a structural schematic view of a shell and a support bracket of the airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 9-3 is a structural schematic view of a limiting strip in the airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 9-4 is a structural schematic view of the air outlet in the airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 9-5 is a structural schematic view of the air inlet in the airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 9-6 is a structural schematic view of a sleeve and an air inlet cover in the airflow mechanism of the handheld fan according to an embodiment of the present application.

FIG. 10-1 is a structural schematic view of a handheld fan according to an embodiment of the present application.

FIG. 10-2 is an exploded view of the handheld fan according to an embodiment of the present application.

FIG. 10-3 is a structural schematic view of the air inlet cover according to an embodiment of the present application.

FIG. 10-4 is a structural schematic view of formation of an air duct according to an embodiment of the present application.

FIG. 10-5 is a structural schematic view of fan blades according to an embodiment of the present application.

FIG. 10-6 is a bottom view of the airflow portion according to an embodiment of the present application.

FIG. 10-7 is a structural schematic view of a motor shaft and fan blades being integrally formed according to an embodiment of the present application.

FIG. 10-8 is a structural schematic view of a vibration damping spring according to an embodiment of the present application.

FIG. 10-9 is a structural schematic view of the handheld portion and the airflow portion according to an embodiment of the present application.

FIG. 11-1 is a perspective view of the handheld fan according to an embodiment of the present application.

FIG. 11-2 is an exploded view of the handheld fan according to an embodiment of the

present application.

FIG. 11-3 is a perspective view of the air inlet cover of the handheld fan according to an embodiment of the present application.

FIG. 11-4 is a cross-sectional view of the handheld fan, taken along a line A-A, according to an embodiment of the present application.

FIG. 11-5 is a perspective view of the airflow assembly of the handheld fan according to an embodiment of the present application.

FIG. 11-6 is a perspective view of the airflow assembly of the handheld fan according to another embodiment of the present application.

FIG. 12-1 is a perspective view of a handheld fan according to an embodiment of the present application.

FIG. 12-2 is a cross-sectional view of the handheld fan, taken along a line A-A, according to an embodiment of the present application.

FIG. 12-3 is another perspective view of the handheld fan according to an embodiment of the present application.

FIG. 12-4 is a perspective view of the air inlet cover of the handheld fan according to an embodiment of the present application.

FIG. 12-5 is a perspective view of a first side wall of the handheld fan according to an embodiment of the present application.

FIG. 13-1 is a perspective view of a handheld fan according to an embodiment of the present application.

FIG. 13-2 is an exploded view of the handheld fan according to an embodiment of the present application.

FIG. 13-3 is an exploded perspective view of the airflow portion of the handheld fan according to an embodiment of the present application.

FIG. 13-4 is a schematic view of wire arrangement in the handheld fan according to an embodiment of the present application.

FIG. 13-5 is another perspective view of the handheld fan according to an embodiment of the present application.

FIG. 13-6 is a cross-sectional view of the handheld fan according to an embodiment of the present application.

FIG. 14-1 is a schematic view of a handheld fan according to an embodiment of the present application.

FIG. 14-2 is an exploded view of the handheld fan according to an embodiment of the

present application.

FIG. 14-3 is a schematic view of the airflow portion according to an embodiment of the present application.

FIG. 14-4 is a cross-sectional view of the handheld fan according to an embodiment of the present application.

FIG. 14-5 is a schematic view of the airflow assembly according to an embodiment of the present application.

FIG. 14-6 is a schematic view of an impeller assembly according to an embodiment of the present application.

FIG. 14-7 is a schematic view of connection between the handheld portion and the airflow portion according to an embodiment of the present application.

FIG. 15-1 is a perspective view of a handheld fan according to an embodiment of the present application.

FIG. 15-2 is an exploded view of the handheld fan according to an embodiment of the present application.

FIG. 15-3 is an exploded view of the airflow portion of the handheld fan according to an embodiment of the present application.

FIG. 15-4 is another perspective view of the handheld fan according to an embodiment of the present application.

FIG. 15-5 is a schematic view of wire arrangement in the handheld fan according to an embodiment of the present application.

FIG. 15-6 is a cross-sectional view of the handheld fan according to an embodiment of the present application.

FIG. 16-1 is a module diagram of a motor drive control circuit of the portable fan according to an embodiment of the present application.

FIG. 16-2 is a circuit diagram of a voltage stabilization unit according to an embodiment of the present application.

FIG. 16-3 is a circuit diagram of the motor drive control circuit according to an embodiment of the present application.

FIG. 16-4 is a circuit diagram of a rotor position detection circuit according to an embodiment of the present application.

FIG. 16-5 is a circuit diagram of the motor drive control unit according to an embodiment of the present application.

FIG. 16-6 is a circuit diagram of a master control unit according to an embodiment of the

present application.

FIG. 16-7 is a circuit diagram of a display unit according to an embodiment of the present application.

FIG. 17-1 is a module diagram of a battery boost charging circuit of the portable fan according to an embodiment of the present application.

FIG. 17-2 is a circuit diagram of a boost module of the battery boost charging circuit according to an embodiment of the present application.

FIG. 17-3 is a circuit diagram of a charging voltage preset module, an over-temperature protection module, and a charging status indication module of the battery boost charging circuit according to an embodiment of the present application.

FIG. 17-4 is a circuit diagram of a USB interface of the battery boost charging circuit according to an embodiment of the present application.

FIG. 17-5 is a circuit diagram of a signal transmission module of the battery boost charging circuit according to an embodiment of the present application.

FIG. 18-1 is a module diagram of a charging management circuit of the portable fan according to an embodiment of the present application.

FIG. 18-2 is a circuit diagram of the USB interface and a fast charging management unit according to an embodiment of the present application.

FIG. 18-3 is a circuit diagram of the charging management unit according to an embodiment of the present application.

FIG. 19-1 is a side view of a portable handheld fan according to an embodiment of the present application.

FIG. 19-2 is a structural schematic view of a cooling assembly of the portable handheld fan according to an embodiment of the present application.

FIG. 19-3 is a structural schematic view of a spray assembly of the portable handheld fan according to an embodiment of the present application.

DETAILED DESCRIPTIONS OF EMBODIMENTS

To facilitate understanding of the present application, the present application will be described in more detail in the following by referring to the accompanying drawings. The drawings show embodiments of the present application. However, the present application can be implemented in various forms and is not limited to the embodiments described herein. On the contrary, the purpose of providing these embodiments is to enable the present application to be understood more thoroughly and comprehensively.

In the description of the present application, terms “front”, “rear”, “top”, “inner”, “outer”, and so on, indicate an orientation or a positional relationship based on an orientation or a positional relationship shown in the drawings. The terms are used only for describing the present application more simply, and do not indicate or imply that a device or an element must have a specific orientation or configured and operated in a specific orientation. Therefore, the terms shall not be interpreted as limiting the present application.

In the description of the present application, unless otherwise specified, “/” means “or”. For example, A/B can mean A or B; the “and/or” in the text is only a description of an associated relationship of associated objects, indicating that three relationships may exist. For example, A and/or B may mean that A is present alone, A and B are both present, or B is present alone. In addition, in the description of the present application, “a plurality of” means two or more than two. It should be understood that preferred embodiments described herein are only for illustrating and explaining the present application, and are not intended to limit the present application. In addition, features of the embodiments of the present application can be combined with each other without conflict.

It should be understood that although terms “first”, “second”, and so on, may be used herein to describe various elements, components, regions, layers, and/or sections, these elements, components, regions, layers, and/or sections shall not be limited by the terms. The terms are used only to distinguish one element, component, region, layer, or section from another element, component, region, layer, or section. Therefore, without departing from the present application, a first element, a first component, a first region, a first layer, or a first section discussed below may be referred to as a second element, a second component, a second region, a second layer, or a second section. Spatially relative terms such as “below”, “above”, and so on, may be used herein to describe a relationship between one element or feature and another element or feature. It should be understood that, in addition to the orientation shown in the drawings, the spatially relative terms also include various orientations of the device while being in use or in operation. For example, when a device in the drawing is flipped, an element or a feature described as being “below” another element or feature may be oriented to be “above” the another element or feature. Therefore, the term “below” may include both “above” and “below”. The device can be oriented (rotated 90 degrees or in other directions), and the spatially relative description used herein are interpreted accordingly. In the present application, description based on the “first”, the “second”, and so on, is only for the purpose of description, and shall not be understood as indicating or implying relative importance or implicitly indicating the number of technical features indicated. It should be noted that when an element is considered to be “connected” to another element, the

element can be directly connected to the other element, or an intermediate element may be arranged between the two elements.

Furthermore, when an assembly is considered to be “fixed” to another assembly, the assembly can be directly fixed to the another assembly, or an intermediate between two assemblies. When an element is considered to be “connected” to another element, the element can be directly connected to the other element, or an intermediate element may be arranged between the two elements. When an assembly is considered to be “arranged” on another assembly, the assembly can be directly arranged on the another assembly, or an intermediate assembly may be disposed between two assemblies. The term “vertical”, “horizontal”, “left”, “right”, and similar expressions used in the embodiments are only for the purpose of description and are not intended to limit the present application.

Embodiment 1, referring to FIGS. 1-1 to 1-6:

As shown in FIG. 1-1, in the present embodiment, the portable fan 100 is a handheld fan arranged with a handheld portion 11 (not labeled). A user may carry the portable fan 100 by holding the handheld portion 11. Of course, the portable fan 100 may be a clipped fan arranged with a clip, a variable fan arranged with a bendable shaping member for winding, a desktop fan arranged with a stand, or a floor fan arranged with an extendable and retractable stand. A specific type of the portable fan is not limited herein. The handheld portion 11 may be arranged with a semiconductor cooling element (not shown). When the user is carrying the portable fan 100, the semiconductor cooling element may automatically adjust a cooling temperature based on a temperature of a position where the user contacts the portable fan, improving the usage experience. It should be understood that the portable fan 100 is used for heat dissipation and cooling, and the semiconductor cooling element is arranged to improve the usage experience. Of course, a heating element (not shown) may further be arranged on the portable fan 100 for warming the user, and a warming element (not shown) may be provided accordingly to automatically adjust the temperature for the position where the user contacts the portable fan. In this way, a contact body portion can be warmed, and the usage experience is improved.

As shown in FIG. 1-1, in the present embodiment, the handheld portion 11 may receive a battery (not labeled) therein. The handheld portion 11 may be arranged with a switch button (not labeled) and a charging port (not show) that are exposed to an outside. The battery supplies power to the portable fan 100, the switch button is used to adjust an air speed and to turn on/off the portable fan. The charging port is used to connect to an external power source to charge the battery. When the portable fan 100 is in other forms (such as the above-mentioned clipped fan, the variable fan, the desktop fan, and so on), positions where the battery, the switch button, and the charging

port are arranged may be adjusted accordingly.

As shown in FIGS. 1-1 to 1-6, the portable fan 100 includes an airflow portion 10 and the handheld portion 11. The airflow portion 10 and the handheld portion 11 are connected to each other via a fixing member 12. The handheld portion 11 is arranged with a first connecting member 13, and the airflow portion 10 is arranged with a second connecting member 14. The fixing member 12 passes through the first connecting member 13 and the second connecting member 14 to connect the airflow portion 10 with the handheld portion 11. An end of the handheld portion 11 is arranged with a protrusion 16, the protrusion 16 extends along a length direction of the handheld portion 11 and is inserted into the airflow portion 10. The protrusion 16 is arranged with the first connecting member 13. The airflow portion 10 is arranged with a limiting plate 17, and the limiting plate 17 is arranged with the second connecting member 14. The fixing member 12 passes through the first connecting member 13 and the second connecting member 14 to connect the handheld portion 11 with the airflow portion 10. When the handheld portion 11 malfunctions or the battery inside the handheld portion 11 is out of power, the handheld portion 11 alone may be replaced. The replaced handheld portion 11 may be repaired or charged, and a properly-operating handheld portion 11 or a handheld portion 11 having sufficient power may be assembled, such that the battery life is improved.

As shown in FIGS. 1-1 to 1-3, a part of the handheld portion 11 is embedded in the airflow portion 10, or a part of the airflow portion 10 is embedded in the handheld portion 11. The embedding or insertion configuration enhances connection stability between the handheld portion 11 and the airflow portion 10, preventing displacement.

As shown in FIGS. 1-4 to 1-5, the airflow portion 10 includes a fan base 18, a mixed-flow fan 19 arranged on the fan base 18, and a pressurizing seat 25 covering the mixed-flow fan 19. The mixed-flow fan 19 is disposed at a front side of the fan base 18 and rotates around an axis to generate airflow. The pressurizing seat 25 is disposed at a front side of the mixed-flow fan 19 and has a pressurizing surface. A radial size of the pressurizing surface gradually increases along a direction from an end away from the fan base 18 to an end near the fan base 18.

As shown in FIGS. 1-4, the fan base 18 includes an inner ring 20, an outer ring 21, and a plurality of connecting bars 22 connecting the inner ring 20 with the outer ring 21. The inner ring 20 and the outer ring 21 are connected to each other via the plurality of connecting bars 22. The limiting plate 17 is connected between every two connecting bars 22. The limiting plate 17 is arranged with the second connecting member 14. During assembling, the protrusion 16 is inserted between two connecting bars 22 to limit a circumferential displacement of the fan base 18. The first connecting member 13 on the protrusion 16 is aligned with the second connecting member

14 on the limiting plate. The fixing member 12 connects the protrusion 16 with the limiting plate 17 to limit the fan base 18 from moving along an axial direction. In this way, a fixing effect is achieved. It is understood that the fixing member 12 may be a screw, a pin, or glue, as long as the fixing member 12 can fix the protrusion 16 with the limiting plate 17.

In another embodiment, one of the first connecting member 13 and the second connecting member 14 is a connecting slot 23, and the other one of the first connecting member 13 and the second connecting member 14 is a connecting snap 24. The connecting slot 23 and the connecting snap 24 may be configured as any commonly used connecting slot and connecting snap. The handheld portion 11 and the airflow portion 10 are connected to each other via the connecting slot 23 and the connecting snap 24, allowing the assembling to be performed quickly.

As shown in FIGS. 1-4 to 1-5, an outer wall surface of the outer ring 21 of the fan base 18 near the pressurizing seat 25 defines the connecting slot 23, and an end of the pressurizing seat 25 near the fan base 18 is arranged with the connecting snap 24. The pressurizing seat 25 is connected to the fan base 18, such that the assembling is performed conveniently and efficiently.

As shown in FIGS. 1-1 to 1-6, a battery and a circuit board are arranged inside the handheld portion 11. The battery is electrically connected to the circuit board via a wire to control the mixed-flow fan 19 to start rotating.

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As shown in FIGS. 1-3 and 1-6, the airflow portion 10 further includes a sleeve 26. The pressurizing seat 25, the fan base 18, and the mixed-flow fan 19 are mounted inside the sleeve 26, such that the pressurizing seat 25, the fan base 18, and the mixed-flow fan 19 are limited from moving along a radial direction of the sleeve 26 but are allowed to move along only an axial direction thereof at openings of two ends of the sleeve 26. In this way, displacement is prevented, and internal structures are protected.

As shown in FIG. 1-6, a side wall of the sleeve 26 defines an assembly port 27 for the protrusion 16 to pass through. The assembly port 27 is defined to allow the protrusion 16 to pass through.

As shown in FIG. 1-5, an outer side wall of the pressurizing seat 25 is arranged with support columns 28. Two support columns 28 extend along a radial direction of the pressurizing seat 25 and are connected to each other via an arc plate 29. Ends of the two support columns 28 are connected to each other via the arc plate 29. The two support columns 28 and the arc plate 29 support an inner wall of the sleeve 26, preventing the sleeve 26 from being collapsed under an external pressure and preventing the pressurizing seat 25 from being deformed due to being pulled

downward by the handheld portion 11, such that an inner wall of the pressurizing seat 25 is prevented from touching fan blades, and malfunction can be avoided.

The portable fan further includes a three-phase high-speed motor, such that when the portable fan is operating at high rotation speeds and high energy consumption, a battery life can be improved by replacing the handheld portion and/or replacing the battery inside the handheld portion.

Embodiment 2, referring to FIGS. 2-1 to 2-6:

As shown in FIGS. 2-1 and 2-2, the portable fan includes a housing 1, a fan assembly 2, a motor 3, and a drive circuit board 4. The housing 1 defines an air inlet 161, a receiving cavity 162, and an air outlet 163, where the air inlet 161, the receiving cavity 162, and the air outlet 163 are communicated with each other. The fan assembly 2, the motor 3, and the drive circuit board 4 are arranged inside the housing 1. The drive circuit board 4 is electrically connected to the motor 3 to drive the fan assembly 2 to rotate to drive the airflow to flow from the air inlet 161, flowing through the receiving cavity 162, to be discharged out through the air outlet 163.

As shown in FIGS. 2-1 and 2-2, the housing 1 includes a front housing 11 and a rear housing 12. The front housing 11 includes a first airflow housing 111 and a first handheld housing 112, the rear housing 12 includes a second airflow housing 121 and a second handheld housing 122. The first airflow housing 111 and the second airflow housing 121 cooperatively define an air outlet portion 16. The first handheld housing 112 and the second handheld housing 122 cooperatively form a handheld portion 17. It is understood that the first airflow housing 111 and the second airflow housing 121 may be connected to each other in a front-rear direction or in a left-right direction. The first handheld housing 112 and the second handheld housing 122 may be connected to each other in the front-back direction or in the left-right direction. The handheld portion 17 is arranged with a switch 5, an interface 6, and a battery 7. In the present embodiment, the switch 5 is an infinite speed adjustment switch 5. Of course, in other embodiments, the first handheld housing 112 and the second handheld housing 122 may be omitted. Alternatively, the fan may be a desktop fan, a neck fan, a clip fan, a stand fan, or fans in other common forms.

As shown in FIGS. 2-2 to 2-4, the first airflow housing 111 includes a first outer housing and a first inner housing mating with the first outer housing in an inner-outer direction. The first inner housing and the first outer housing may be attached to each other. The first inner housing and the first outer housing both extend horizontally towards the front. The second airflow housing 121 includes a second outer housing and a second inner housing mating with the second outer housing in the inner-outer direction. A rear end of the second inner housing and a rear end of the second outer housing are spaced apart from each other and are connected to each other via a connection

member. The second outer housing extend horizontally towards the front. The second inner housing extend firstly horizontally from the rear towards the front, and subsequently, extend outwardly in a radial direction. A front end of the second inner housing is connected to a front end of the second outer housing. The front end of the second inner housing abuts against the rear end of the first inner housing. In the present embodiment, the first outer housing and the second outer housing are integrally molded to form a one-piece structure. In other embodiments, the first outer housing and the second outer housing may be separately molded. Each of the first airflow housing 111 and the second airflow housing 121 is a double-layered housing. Therefore, a more stable structure is provided. A change in a shape of the second inner housing enables the airflow to be pressurized, such that the airflow is stronger, and an air flowing distance is longer. Of course, in other embodiments, the first airflow housing 111 and/or the second airflow housing 121 may be a single-layered housing 1.

As shown in FIGS. 2-1 and 2-2, the housing 1 further includes a pressurizing member 13 arranged inside the first airflow housing 111. A plurality of connection blades 14 connect the pressurizing member 13 with the front housing 11. A base 131 and a sleeve 132 are arranged inside the pressurizing member 13. The base 131 is disposed between a front end and a rear end of the pressurizing member 13 and defines an avoiding space 1321 backward inside the pressurizing member 13. The base 131 defines a receiving portion 1322 towards the front inside the pressurizing member 13. The sleeve 132 protrudes from the base 131 towards a receiving cavity 162, and that is, the sleeve 132 protrudes backwardly from the base 131, and the sleeve 132 is hollow.

As shown in FIGS. 2-1 and 2-2, the air inlet 161 is located in a radially inward region of the second inner housing. The air outlet 163 is located in a region between the pressurizing member 13 and the radial direction of the first inner housing. The fan assembly 2 includes a hub 21 and a plurality of fan blades 22, and the plurality of fan blades 22 are spaced apart from each other and arranged on an outer surface of the hub 21. The hub 21 includes an airflow guiding surface 212 that is radially increased from the rear to the front. The pressurizing member 13 includes a pressurizing surface 133 that is radially increased from the rear to the front. The airflow guiding surface 212 and the pressurizing surface 133 are disposed in close proximity to each other having an interval therebetween, allowing the airflow to be blown smoothly towards the front. An air duct, that is extending radially outwardly, is formed from the air inlet 161 to the air outlet 163, such that the airflow is pressurized inside the housing 1, and a relatively large air outlet surface is formed.

As shown in FIGS. 2-1 to 2-4, the fan assembly 2 includes the hub 21 and the plurality of

fan blades 22. The plurality of fan blades 22 are spaced apart from each other and arranged on an outer surface of the hub 21. A rotation shaft 23 is fixedly arranged at a center of an inside of the hub 21. The motor 3 includes a stator 31 and a rotor 32. The stator 31 and the rotor 32 are both arranged inside the hub 21. Further, the hub 21 includes an annular extension wall 211 that is arranged inside the hub 21 and extends for one loop of the hub 21. The stator 31 and the rotor 32 are arranged inside the extension wall 211. The stator 31 sleeves an outside of the sleeve 132. The stator 31 includes a coil 311. The rotor 32 is radially disposed between the stator 31 and the hub 21. The rotation shaft 23 is inserted into the sleeve 132, and the extension wall 211, the stator 31 and the rotor 32 extend forwardly into the avoiding space 1321.

As shown in FIGS. 2-1 and 2-2, the extension wall 211 extends forwardly beyond the airflow guiding surface 212. The airflow guiding surface 212 and the pressurizing surface 133 are disposed in close proximity to each other and are spaced apart from each other. Therefore, a gap between the airflow guiding surface 212 and the pressurizing surface 133 is misaligned with the front end of the extension wall 211, and dust may not enter the extension wall 211. The stator 31 and the rotor 32 do not extend forwardly beyond the extension wall 211. The extension wall 211, the stator 31 and the rotor 32 extend forwardly into the avoiding space 1321, such that the extension wall 211, the stator 31 and the rotor 32 are partially received the avoiding space 1321.

As shown in FIGS. 2-1 and 2-2, the drive circuit board 4 is not disposed between the base 131 and the stator 31, the battery 7 is electrically connected to the drive circuit board 4, and the drive circuit board 4 is electrically connected to leads of the coil 311, so as to drive the fan assembly 2 to rotate to drive the airflow from the air inlet 161, flowing through the receiving cavity 162, to be discharged from the air outlet 163. In the present embodiment, the drive circuit board 4 is received in the receiving portion 1322 formed by the base 131 towards the front. The front end of the pressurizing member 13 further includes a front cover 15, the front cover 15 covers the front end of the receiving portion 1322. The front cover 15 is recessed rearwardly to form a negative pressure region 151. By arranging the front cover 15, the receiving portion 1322 is covered to shield and protect the drive circuit board 4. On the other hand, the negative pressure region 151, which is formed by the front cover 15 being recessed rearwardly, compensates air to the air outlet 163 to increase the amount of airflow at the air outlet 163.

As shown in FIGS. 2-1 to 2-4, in this embodiment, the motor 3 is a three-phase motor, and the coil 311 includes twelve windings. The number of the windings is large, and therefore, a space inside the motor 3 is limited. Since the drive circuit board 4 is not disposed between the base 131 and the stator 31, electrical connection between the leads of the coil 311 and the drive circuit board 4 is simpler and more convenient, and in addition, the space between the base 131 and the stator

31 is further reduced, such that utilization of the space inside the portable fan is more reasonable, and the portable fan can be miniaturized.

As shown in FIG. 2-5, a schematic view of the portable fan is shown. In the present embodiment, the drive circuit board 4 is arranged inside the handheld portion 17 and is disposed between the switch 5 and the interface 6. The switch 5 is connected to the drive circuit board 4, or the interface 6 is connected to the drive circuit board 4. Other structures and performance of the present embodiment are substantially the same as those in the first embodiment, and will not be repeated herein.

As shown in FIGS. 2-6, a schematic view of the portable fan is shown. In the present embodiment, the drive circuit board 4 is arranged inside the handheld portion 17 and is disposed below the battery 7. Other structures and performance of the present embodiment are substantially the same as those in the first embodiment, and will not be repeated herein.

In the above embodiment, the drive circuit board is not disposed between the base and the stator, such that the electrical connection between the lead wire of coils and the drive circuit board is simpler and more convenient. Furthermore, the spacing between the base and the stator can be further reduced, enabling an internal space of the portable fan can be utilized more reasonably, allowing the portable fan to be miniaturized.

Embodiment 3-1, referring to FIGS. 3-1 to 3-5:

A portable fan includes an airflow portion 100. As shown in FIGS. 3-1 to 3-3, the airflow portion 100 includes a housing 1 having a receiving chamber, an airflow assembly 2 arranged in the receiving chamber of the housing 1, a display screen 3 disposed at a front end of the housing 1, air outlets disposed around a periphery of the display screen 3, and an air inlet disposed at a rear end of the housing 1. The display screen 3 is configured to display an operating state. It should be noted that in the present embodiment, the front end refers to an end facing towards a user when the portable fan is being in use; and the rear end refers to an end facing away from the user when the portable fan is being in use. The inside refers to a side facing towards a central axis of the housing 1, and the outside refers to a side facing away from the central axis of the housing 1. A top refers to a side of the handheld portion 200 facing towards the airflow portion 100. While in use, the display screen 3 may display a remaining battery power, a current airflow speed, and a power level during charging.

As shown in FIG. 3-4, the display screen 3 is disposed corresponding to a region of the central axis of the receiving chamber. The display screen 3 has a surface that is at least partially concave from the front end to the rear end of the housing 1. In some embodiments, the display screen 3 is concave, along the axial direction, from the central axis towards the rear end of the

housing 1, so that a front surface of the display screen 3 is concave. The front surface of the display screen 3 is concave towards the rear end of the housing 1, such that the airflow from the air outlet is gathered in a region corresponding to the display screen 3, the airflow output from the portable fan is more concentrated, improving the air flowing effect, improving the usage experience, and saving energy, increasing the battery life of the portable fan. As shown in FIG. 3-3, in some embodiments, a plane enclosed by an edge of the display screen 3 is recessed from a plane formed by an edge of the front end of the housing 1. That is, the plane formed by the display screen 3 is disposed closer to the air inlet than the plane formed by the edge of the front end of the housing 1 is. In this way, the display screen 3 is disposed in the receiving chamber of the housing 1, and the display screen 3 can be protected from wear or damage.

As shown in FIGS. 3-2 to 3-5, the housing 1 includes an inner shell 11 and an outer shell 12 sleeving an outside of the inner shell 11. The inner shell 11 includes a first inner shell 111 and a second inner shell 112 that are arranged from front to rear. A connecting seat 4 for mounting the display screen 3 is arranged in the receiving chamber at a position corresponding to a rear of the display screen 3. A plurality of reinforcing plates 41 are disposed between a periphery of the connecting seat 4 and an inner wall of the first inner shell 111. The plurality of reinforcing plates 41 are evenly distributed around the periphery of the connecting seat 4 and divide the air outlet into a plurality of sub-air-outlets that are evenly distributed around the periphery of the display screen 3. In some embodiments, a cross section of each sub-air-outlet, taken along a radial direction of the housing 12, is trapezoidal arc-shaped. The plurality of reinforcing plates 41 provide support for the first inner shell 111 and connect the connecting seat 4 with the inner wall of the first inner shell 111, enhancing strength of the first inner shell 111. Each of an outer wall of the inner shell 11 and an inner wall of the outer shell 12 are arranged with a matching connecting structure. In some embodiments, the matching connecting structure includes a connecting groove extending along an axial direction on the outer wall of the inner shell 11 and a connecting protrusion arranged on the inner wall of the outer shell 12 and mated with the connecting groove. The connecting groove and the connecting protrusion are mated with each other to guide connection between the inner shell 11 and the outer shell 12, preventing relative rotation between the inner shell 11 and the outer shell 12, enhancing connection stability between the inner shell 11 and the outer shell 12.

The display screen 3 and the connecting seat 4 are connected to each other via a first snap-fit assembly. The first snap-fit assembly includes: a first snap 31 arranged on a rear surface of the display screen 3 along a circumferential direction of the display screen 3; and a first snap block 42 arranged at the front end of the connecting seat and mated with the first snap 31.

Further, the first snap extends from the rear surface of the display screen towards the air inlet, and an outer side of a rear end of the first snap 31 is arranged with a slope. The slope reduces resistance when the first snap 31 and the first snap block 42 are mated and connected to each other, reducing assembling difficulty, improving an assembling efficiency, providing a buffering effect, avoiding damage to corners when the first snap 31 and the first snap block 42 are connected, and facilitating demolding during production. In some embodiments, the first snap-fit assembly includes: the first snap block 42 arranged at the rear of the display screen 3; and the first snap 31 defined in the front end of the connecting seat and mated with the first snap block 42.

As shown in FIG. 3-5, a second snap-fit assembly is arranged at a connecting region between the first inner shell 111 and the second inner shell 112. The second snap-fit assembly includes a second snap block 113 arranged at the rear end of the first inner shell 111 and a second snap 114 arranged at the front end of the second inner shell 112 and mated with the second snap block 113. Alternatively, a position where the second snap block 113 is arranged and a position where the second snap 114 is arranged can be exchanged. For example, in some embodiments, the second snap 114 is arranged at the rear end of the first inner shell 111, and the second snap block 113 is arranged at the front end of the second inner shell 112.

As shown in FIGS. 3-2 and 3-3, the airflow assembly 2 includes a drive motor 21 arranged along the central axis of the receiving chamber, a fan rotor 22 arranged on a rotation shaft 211 of the drive motor 21, and fan blades 23 arranged on an outer wall of the fan rotor 22. The fan rotor 22 is hollow and truncated conical, an end of the fan rotor 22 having a larger inner diameter faces towards the air outlet. The fan blades 23 are spiral streamline-shaped, reducing resistance of the airflow flowing from the air inlet to the air outlet, further ensuring an airflow outputting effect of the portable fan. The fan rotor 22 at least partially extends to reach the drive motor 21. A rotating bearing 24 is arranged to sleeve a region of the drive motor 21 corresponding to the fan rotor 22 and is connected to an inner wall of the fan rotor 22. In some embodiments, the fan rotor 22 and the rotation shaft 211 of the drive motor 21 are connected to each other via a connecting member. The fan rotor 22 and the blades 23 are integrally formed as a one-piece structure. The structural configuration of the drive motor 21 and the fan rotor 22 reduces a space occupied by the airflow portion 100. The rotating bearing 24 ensures rotational stability of the fan rotor 22, thereby ensuring overall operational stability of the portable fan.

A cover 115 is arrange at a region of the second inner shell 112 corresponding to the fan blades 23 and sleeves the fan blades 23. A rear end of the cover 115 is fluidly communicated with the air inlet. An inner diameter of the cover 115 gradually decreases from front to rear. The air inlet is covered by a rear cover 5, and the rear cover 5 defines an opening 51 for allowing air to

enter the receiving chamber. Since the cover 115 is fluidly communicated with the air inlet, the air, after entering the receiving chamber, can be guided by the cover 115 to directly flow towards the blades 23 and the fan rotor 22. The fan rotor 22 drives the fan blades 23 to rotate, forming a vortex air channel. The air channel formed by the cover 115, the fan blades 23, and the fan rotor 22 enhances an air guiding effect and improves the air outputting effect. In some embodiments, the rear cover 5 is arranged with a plurality of connecting strips that are scattering outwardly from a central axis to an edge of the rear cover. Gaps between the plurality of connecting strips form the opening 51. Further, in some embodiments, the plurality of connecting strips are convex rearwardly, reducing resistance to the airflow and ensuring an air intaking effect. In some embodiments, the rear cover 5 defines a plurality of holes, which may be circular, square, or in other shapes, to form the opening 51.

Further, as shown in FIGS. 3-2, 3-3, and 3-5, the rear cover 5 and the second inner shell 112 are connected to each other via a fixing ring 116. The rear cover 5 is snapped to a rear end of the fixing ring 116, and a front end of the fixing ring 116 is connected to a rear end of the second inner shell 112 via a third snap-fit assembly. The third snap-fit assembly includes a third snap 117 arranged at the front end of the fixing ring 116 and a third snap block 118 arranged at the rear end of the second inner shell 112 and mated with the third snap 117. As shown in FIG. 3-3, an outer wall of the third snap 117 is arranged with a cut surface to facilitate snapping between the third snap 117 and the third snap block 118, improving a mounting efficiency. In some embodiments, the third snap-fit assembly includes a third snap block 118 arranged at the front end of the fixing ring 116 and the third snap 117 arranged at the rear end of the second inner shell 112 and mated with the third snap block 118.

The portable fan further includes a power supply, which is electrically connected to the display screen 3 and the drive motor 21.

Embodiment 3-2, referring to FIGS. 3-6 and 3-7:

In the present embodiment, a portable fan includes the airflow portion 100 described in the Embodiment 1. As shown in FIGS. 3-6 and 3-7, the portable fan further includes a handheld portion 200 connected to the airflow portion 100. The handheld portion 200 includes a handle 6, an air speed adjustment knob 7, a charging port 8, and a power button 9, where the air speed adjustment knob 7, the charging port 8, and the power button 9 are arranged on the handle 6.

The power supply is arranged inside the handle 6, the handle 6 defines a mounting slot in which the power supply is mounted. The air speed adjustment knob 7, the charging port 8, and the power button 9 are electrically connected to the power supply. The charging port 8 is used to charge the power supply, and the power button 9 controls the drive motor 21, the display screen

3, and the air speed adjustment knob 7 to be connected with the power supply. The air speed adjustment knob 7 is electrically connected to the drive motor 21 to control an output power of the drive motor 21. While in use, by rotating the air speed adjustment knob 7, the output power of the drive motor 21 is adjusted, and the fan rotor 22 is driven by the drive motor 21 to drive the fan blades 23 to rotate at various speeds, such that an air volume of the airflow from the air inlet to the air outlet can be adjusted, such that the air speed is adjusted. In this way, customized air speed control under various application scenarios can be achieved, improving the usage experience. In some embodiments, as shown in FIG. 3-7, the air speed adjustment knob 7 is arranged on a side of the handle 6 facing the user, such that operation can be performed easily. The charging port and the power button are arranged on a side of the handle 6 away from the user. In some embodiments, a dust cover may be arranged to the charging port to prevent dust and water from entering the charging port.

As shown in FIG. 3-7, a top of the handle 6 extends into the housing 1 of the airflow portion 100. Specifically, the top of the handle 6 includes a first connector 61 that extends into the housing 1 corresponding to the air outlet. At the air outlet, a second connector 13 corresponding to the first connector 61 is arranged. The first connector 61 and the second connector 13 are connected to each other via a first fastener 14. In some embodiments, to further enhance connection stability between the handheld portion 200 and the airflow portion 100, the handle 6 further includes a first connection plate 62 that extends into the housing 1 corresponding to the air inlet. At the air inlet, a second connection plate 15 corresponding to the first connection plate 62 is arranged. The first connection plate 62 and the second connection plate 15 are connected to each other via a second fastener 16. The first connection plate 62 and the first connector 61 are disposed opposite to each other.

While in use, the power button 9 is turned on, the display screen 3 is lit on to display the operating state, and the air speed adjustment knob 7 is rotated to adjust the air speed.

It is understood that in some embodiments, the portable fan may include only the airflow portion, which may be connected to some portable components. For example, when the portable fan is a neck-worn fan, the portable fan includes a curved wearable portion connected to the airflow portion.

Embodiment 4, referring to FIGS. 4-1 to 4-6:

In some embodiments, as shown in FIGS. 4-1, 4-3, and 4-4, the handheld fan 101 includes a fan body 1 and a handle 2 connected to the fan body 1. A control circuit board and a control portion 21 connected to the control circuit board are arranged inside the handle 2. The control portion 21 is embedded in the handle 2 and is partially exposed out of the handle 2. The control

portion 21 includes a wheel button 211 and a spring connected to the wheel button. By rolling the wheel button 211, the air volume output from the handheld fan 101 is adjusted; and by pressing the wheel button 211, the operating state of the handheld fan 101 is controlled.

In an embodiment, as shown in FIG. 4-6, the control portion 21 further includes a rotation shaft 213 connected to the wheel button 211 and a wheel rotation encoder 214 connected to the rotation shaft 213. An air volume adjustment circuit is configured on the control circuit board and is connected to the wheel rotation encoder 214, such that the air volume output from the portable fan 100 can be adjusted in a stepless manner.

In an embodiment, as shown in FIG. s 4-1, 4-3, 4-4, and 4-6, the control portion 21 further includes a bearing 212, the rotation shaft 213 connected to an inner ring of the bearing 212, and the wheel rotation encoder 214 connected to the rotation shaft 213. An outer ring of the bearing 212 is connected to the wheel button 211. The air volume adjustment circuit is arranged on the control circuit board and is connected to the wheel rotation encoder 214, such that the air volume output from the handheld fan 101can be adjusted in a stepless manner

The wheel rotation encoder 214 is mounted on the control circuit board. When the wheel button 211 is rolled, the rotation shaft 213 is driven to rotate around a central axis thereof. The wheel rotation encoder 214 outputs a digital signal. The digital signal is processed by the control circuit board to achieve stepless adjustment of the air volume output from the portable fan 100 and the handheld fan 101.

In an embodiment, as shown in FIG. s 4-2 and 4-4, the rotation shaft 213 is connected to a spring (not shown), and a switch control circuit is arranged on the control circuit board. The wheel button 211 is connected to the switch control circuit via the spring. In some embodiments, the control circuit board is vertically arranged, and the spring is arranged in a contact on the control circuit board. The spring is configured to reset the wheel button 211. When the wheel button 211 is pressed, the switch control circuit is conducted, and the handheld fan 101 starts operating. At this moment, rolling the wheel button 211 may steplessly adjust the air volume output from the handheld fan 101. When the wheel button 211 is pressed again, the switch control circuit is disconnected, and the handheld fan 101 stops operating. In this way, safety of the handheld fan 101 is improved, energy consumption is reduced, and consumption caused by accidental activation may be reduced.

In an embodiment, as shown in FIG. 4-4, the bearing 212 includes a body portion 2121 and ring portions 2122 respectively disposed on two opposite sides of the body portion 2121. A cavity is formed between the ring portions 2122 to receive the wheel button 211. In some embodiments, the wheel button 211 is a tire-shaped member and has two circular end faces that are parallel to

each other and a ring-shaped circumference face connecting to the two circular end faces. A plurality of arc-shaped grooves are defined in the ring-shaped circumference face and are evenly distributed along a circumference direction. By defining the plurality of arc-shaped grooves, the user may roll the wheel button 211 easily, enhancing the usage experience. In some embodiments, a diameter of each ring portion is slightly larger than a diameter of the wheel button 211, such that the wheel button 211 can be protected properly, and a service life of the wheel button 211 can be increased.

In an embodiment, the fan body 20 defines a battery compartment 22 therein, a battery 221 is arranged in the battery compartment 22. The control circuit board is connected to the battery 221. In an embodiment, as shown in FIG. s 4-1 and 4-3, the handle 2 defines the battery compartment 22 therein. In some embodiments, the battery is a rechargeable battery, such that the portable fan 100 and the handheld fan 101 can be used more conveniently and are more portable.

In an embodiment, as shown in FIGS. 4-5 and 4-6, the wheel rotation encoder 214 includes a first output terminal 2141 and a second output terminal 2142. The air volume adjustment circuit includes a first adjustment module 201 and a second adjustment module 202. The first output terminal 2141 is connected to the first adjustment module 201, and the second output terminal 2142 is connected to the second adjustment module 202. Both the first adjustment module 201 and the second adjustment module 202 are connected to a positive-electrode terminal of the battery 221.

Further, as shown in FIGS. 4-4, 4-5, and 4-6, the first adjustment module 201 includes a first capacitor C1, a first resistor R1, and a second resistor R2. The second adjustment module 202 includes a second capacitor C2, a third resistor R3, and a fourth resistor R4. The first output terminal 2141 of the wheel rotation encoder 214 is connected to an end of the first resistor R1 and an end of the second resistor R2. The other end of the first resistor R1 is connected to an end of the first capacitor C1, and the other end of the second resistor R2 is connected to the positive-electrode terminal of the battery 221. The other end of the first capacitor C1 is grounded. The second output terminal 2142 of the wheel rotation encoder 214 is connected to an end of the third resistor R3 and an end of the fourth resistor R4. The other end of the third resistor R3 is connected to the positive-electrode terminal of the battery 221, and the other end of the fourth resistor R4 is connected to an end of the second capacitor C2. The other end of the second capacitor C2 is grounded. A third output terminal 2143 of the wheel rotation encoder 214 is grounded. By arranging the wheel rotation encoder 214, the wheel button 211 may be operated to generate a plurality of digital signals to steplessly control rotation speeds of the portable fan 100 and the handheld fan 101, improving the usage experience.

In an embodiment, the portable fan 100 further includes a power button 216 arranged on the fan body 20. The power button 216 is exposed out of the fan body 20 and is configured to adjust the operating state of the portable fan 100. When the power button 216 is pressed, the portable fan 100 starts operating, and at this moment, the wheel button 211 may be rolled to steplessly adjust the air volume output from the portable fan 100. The power button 216 may be pressed again to control the portable fan 100 to stop operating.

In an embodiment, an operating state adjustment circuit is arranged on the control circuit board. The power button 216 is connected to the switch control circuit, such that the operating state of the portable fan 100 can be adjusted by pressing the power button 216. When the power button 216 is pressed, the operating state adjustment circuit is conducted, and the portable fan 100 starts operating. At this moment, the wheel button 211 may be rolled to steplessly adjust the air volume output from the portable fan 100. When the power button 216 is pressed again, the operating state adjustment circuit is disconnected, and the portable fan 100 stops operating. In this way, safety of the portable fan 100 is improved, and energy consumption is reduced.

In an embodiment, as shown in FIG. s 4-1, 4-2, and 4-4, the handheld fan 101 further includes an anti-misoperation button 215 arranged on the handle 2. The anti-misoperation button 215 is exposed out of the handle 2 and is configured to prevent accidental activation of the handheld fan 101. In some embodiments, the anti-misoperation button 215 may be a button switch or a toggle switch. In an embodiment, when the anti-misoperation button is toggled and the wheel button 211 is pressed, the handheld fan 101 starts operating. At this moment, rolling the wheel button 211 may steplessly adjust the air volume output from the handheld fan 101. The dual activation manner based on the anti-misoperation button 215 and the wheel button 211 prevents the handheld fan 101 from being activated due to only the wheel button 211 being pressed by an object, further improving safety and energy efficiency of the handheld fan 101.

In an embodiment, as shown in FIG. s 4-1, 4-2, and 4-4, the anti-misoperation button 215 is located below the fan body 1, and the anti-misoperation button 215 and the wheel button 211 are disposed respectively at two opposite sides of the handle 2. In some embodiments, the wheel button 211 and the anti-misoperation button 215 are located below the handle 2 and at an upper-middle portion of the handle 2, which is more ergonomic, enhancing the usage experience. Arranging the anti-misoperation button 215 and the wheel button 211 respectively at two opposite sides of the handle 2 prevents the anti-misoperation button 215 and the wheel button 211 from being accidentally activated by the object on the same side, such that accidental activation of the handheld fan 101 is prevented.

In an embodiment, a surface of the fan body 20 defines a second opening 24 from which the

wheel button 211 is exposed. In an embodiment, as shown in FIGS. 4-1 and 4-4, the surface of the handle 2 defines the second opening 24 from which the wheel button 211 is exposed. A mounting plate 241 is embedded in the second opening 24. The wheel button 211 is exposed out of the second opening 24 through the mounting plate 241. In some embodiments, a shape of the mounting plate 241 matches a shape of the wheel button 211.

In an embodiment, the surface of the fan body 20 defines a first opening 23 from which the power button 216 is exposed. In an embodiment, as shown in FIGS. 4-1 and 4-4, the surface of the handle 2 defines the first opening 23 from which the anti-misoperation button 215 is exposed. In some embodiments, a shape of the first opening 23 matches a shape of the anti-misoperation button 215, and the anti-misoperation button 215 is exposed out of the handle 2 through the first opening 23. In some embodiments, a bottom of the handle 2 is arranged with a lanyard hole 25, and a lanyard or a lanyard decoration may be arranged through the lanyard hole 25, enabling the handheld fan 101 to be carried easily and enhancing an appearance of the handheld fan 101. In some embodiments, the lanyard hole 25 and the first opening 23 are located on a same side.

In the present embodiment, the control circuit board is arranged inside the fan body of the portable fan, the control circuit board is connected to the control portion, the control portion is embedded in the fan body. The control portion includes the wheel button to steplessly adjust the air volume output out of the fan. In this way, the air volume output out of the fan can be adjusted steplessly, and the air speed can be adjusted freely.

Embodiment 5, referring to FIGS. 5-1 to 5-6:

As shown in FIGS. 5-1, 5-3, and 5-4, the handheld fan 100 includes a fan body 1 and a handle 2 connected to the fan body 1. A control circuit board and a control portion 21 connected to the control circuit board are arranged in the handle 2. The control portion 21 is embedded in the handle 2 and is partially exposed out of the handle 2. The control portion 21 includes a wheel button 211 and a spring connected to the wheel button. By rolling the wheel button 211, the air volume output from the handheld fan 100 is adjusted; and by pressing the wheel button 211, the operating state of the handheld fan 100 is controlled.

In an embodiment, as shown in FIGS. 5-1, 5-3, and 5-4, the control portion 21 further includes a bearing 212, the rotation shaft 213 connected to an inner ring of the bearing 212, and the wheel rotation encoder 214 connected to the rotation shaft 213. An outer ring of the bearing 212 is connected to the wheel button 211. An air volume adjustment circuit is arranged on the control circuit board and is connected to the wheel rotation encoder 214, such that the air volume output from the handheld fan 100 can be adjusted in a stepless manner. The wheel rotation encoder 214 is mounted on the control circuit board. When the wheel button 211 is rolled, the rotation

shaft 213 is driven to rotate around a central axis thereof. The wheel rotation encoder 214 outputs a digital signal. The digital signal is processed by the control circuit board to achieve stepless adjustment of the air volume output from the handheld fan 100.

In an embodiment, as shown in FIGS. 5-2 and 5-4, the rotation shaft 213 is connected to a spring (not shown), and a switch control circuit is arranged on the control circuit board. The wheel button 211 is connected to the switch control circuit via the spring. In some embodiments, the control circuit board is vertically arranged, and the spring is arranged in a contact on the control circuit board. The spring is configured to reset the wheel button 211. When the wheel button 211 is pressed, the switch control circuit is conducted, and the handheld fan 100 starts operating. At this moment, rolling the wheel button 211 may steplessly adjust the air volume output from the handheld fan 100. When the wheel button 211 is pressed again, the switch control circuit is disconnected, and the handheld fan 100 stops operating. In this way, safety of the handheld fan 100 is improved, energy consumption is reduced, and consumption caused by accidental activation may be reduced.

In an embodiment, as shown in FIG. 5-4, the bearing 212 includes a body portion 2121 and ring portions 2122 respectively disposed on two opposite sides of the body portion 2121. A cavity is formed between the ring portions 2122 to receive the wheel button 211. In some embodiments, the wheel button 211 is a tire-shaped member and has two circular end faces that are parallel to each other and a ring-shaped circumference face connecting to the two circular end faces. A plurality of arc-shaped grooves are defined in the ring-shaped circumference face and are evenly distributed along a circumference direction. By defining the plurality of arc-shaped grooves, the user may roll the wheel button 211 easily, enhancing the usage experience. In some embodiments, a diameter of each ring portion is slightly larger than a diameter of the wheel button 211, such that the wheel button 211 can be protected properly, and a service life of the wheel button 211 can be increased.

In an embodiment, as shown in FIGS. 5-1 and 5-3, the handle 2 defines the battery compartment 22 therein, a battery 221 is arranged in the battery compartment 22. The control circuit board is connected to the battery 221. In some embodiments, the battery 221 is a rechargeable battery, such that the handheld fan 100 can be used more conveniently and are more portable.

In an embodiment, as shown in FIGS. 5-1, 5-4, and 5-5, the wheel rotation encoder 214 includes a first output terminal 2141 and a second output terminal 2142. The air volume adjustment circuit includes a first adjustment module 201 and a second adjustment module 202. The first output terminal 2141 is connected to the first adjustment module 201, and the second

output terminal 2142 is connected to the second adjustment module 202. Both the first adjustment module 201 and the second adjustment module 202 are connected to a positive-electrode terminal of the battery 221.

Further, as shown in FIGS. 5-4, 5-5, and 5-6, the first adjustment module 201 includes a first capacitor C1, a first resistor R1, and a second resistor R2. The second adjustment module 202 includes a second capacitor C2, a third resistor R3, and a fourth resistor R4. The first output terminal 2141 of the wheel rotation encoder 214 is connected to an end of the first resistor R1 and an end of the second resistor R2. The other end of the first resistor R1 is connected to an end of the first capacitor C1, and the other end of the second resistor R2 is connected to the positive-electrode terminal of the battery 221. The other end of the first capacitor C1 is grounded. The second output terminal 2142 of the wheel rotation encoder 214 is connected to an end of the third resistor R3 and an end of the fourth resistor R4. The other end of the third resistor R3 is connected to the positive-electrode terminal of the battery 221, and the other end of the fourth resistor R4 is connected to an end of the second capacitor C2. The other end of the second capacitor C2 is grounded. A third output terminal 2143 of the wheel rotation encoder 214 is grounded. By arranging the wheel rotation encoder 214, the wheel button 211 may be operated to generate a plurality of digital signals to steplessly control rotation speeds of the portable fan 100 and the handheld fan 101, improving the usage experience.

In an embodiment, as shown in FIGS. 5-1, 5-2, and 5-4, the handheld fan 100 further includes an anti-misoperation button 215 arranged on the handle 2. The anti-misoperation button 215 is exposed out of the handle 2 and is configured to prevent accidental activation of the handheld fan 100. In some embodiments, the anti-misoperation button 215 may be a button switch or a toggle switch. In an embodiment, when the anti-misoperation button is toggled and the wheel button 211 is pressed, the handheld fan 100 starts operating. At this moment, rolling the wheel button 211 may steplessly adjust the air volume output from the handheld fan 100. The dual activation manner based on the anti-misoperation button 215 and the wheel button 211 prevents the handheld fan 100 from being activated due to only the wheel button 211 being pressed by an object, further improving safety and energy efficiency of the handheld fan 100.

In an embodiment, as shown in FIGS. 5-1, 5-2, and 5-4, the anti-misoperation button 215 is located below the fan body 1, and the anti-misoperation button 215 and the wheel button 211 are disposed respectively at two opposite sides of the handle 2. In some embodiments, the wheel button 211 and the anti-misoperation button 215 are located below the handle 2 and at an upper-middle portion of the handle 2, which is more ergonomic, enhancing the usage experience. Arranging the anti-misoperation button 215 and the wheel button 211 respectively at two opposite

sides of the handle 2 prevents the anti-misoperation button 215 and the wheel button 211 from being accidentally activated by the object on the same side, such that accidental activation of the handheld fan 100 is prevented.

In an embodiment, as shown in FIGS. 5-1 and 5-4, a surface of the handle 2 defines a second opening 24 from which the wheel button 211 is exposed. A mounting plate 241 is embedded in the second opening 24. The wheel button 211 is exposed out of the second opening 24 through the mounting plate 241. In some embodiments, a shape of the mounting plate 241 matches a shape of the wheel button 211.

In an embodiment, as shown in FIGS. 5-1 and 5-4, a surface of the handle 2 defines a first opening 23 from which the anti-misoperation button 215 is exposed. In some embodiments, a shape of the first opening 23 matches a shape of the anti-misoperation button 215, and the anti-misoperation button 215 is exposed out of the handle 2 through the first opening 23. In some embodiments, a bottom of the handle 2 is arranged with a lanyard hole 25, and a lanyard or a lanyard decoration may be arranged through the lanyard hole 25, enabling the handheld fan 100 to be carried easily and enhancing an appearance of the handheld fan 100. In some embodiments, the lanyard hole 25 and the first opening 23 are located on a same side.

Various technical features of the above embodiments can be combined in any manner, and for the sake of conciseness of description, all possible combinations of the various technical features of the above embodiments are not described. However, as long as there is no contradiction in the combination of these technical features, the combination shall be considered to be within the scope of the present application.

According to the above embodiment, the control circuit board is arranged inside the fan body of the portable fan, the control circuit board is connected to the control portion, the control portion is embedded in the fan body. The control portion includes the wheel button and the spring connected to the wheel button to steplessly adjustment the air volume output from the fan and to control the operating state. In this way, the air volume output out of the fan can be adjusted steplessly by rolling the wheel button, and the air volume output from the fan can be adjusted freely.

Embodiment 6-1, referring to FIGS. 6-1 to 6-10:

As shown in FIGS. 6-1 to 6-10, FIG. 6-1 is a structural schematic view of a handheld structure for a handheld fan according to an embodiment of the present application; FIG. 6-2 is a structural schematic view of a mounting bracket 2 and a circuit board assembly in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-3 is a structural schematic view of a gear knob assembly 51 and a battery 4 in the handheld structure

for the handheld fan according to an embodiment of the present application; FIG. 6-4 is a structural schematic view of a protective switch button assembly 52 in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-5 is a structural schematic view of a handheld portion 1 and an airflow structure 6 in the handheld structure for the handheld according to an embodiment of the present application; FIG. 6-6 is a structural schematic view of a clamping plate 14 in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-7 is a structural schematic view of a first support plate 24 and a second support plate 25 in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-8 is a structural schematic view of a receiving space 27 in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-9 is a structural schematic view of an isolation plate 26 in the handheld structure for the handheld fan according to an embodiment of the present application; FIG. 6-10 is a structural schematic view of a first protrusion 22 and a second protrusion 23 in the handheld structure for the handheld fan according to an embodiment of the present application. The present embodiment provides a handheld structure arranged for a handheld fan, including a handheld portion 1 defining a cavity 11 therein, a mounting bracket 2, a circuit board assembly, a battery 4, and a control mechanism, which will be described in detail in the following.

For the handheld portion 1 defining the cavity 11 and the mounting bracket 2:

The handheld portion 1 defines a first slot 12 directly facing a gear knob assembly 51 and a second slot 13 directly facing a protective switch button assembly 52. Clamping plates 14 respectively disposed at two sides of the battery 4 are received in cavity 11, and a sealing cover 15 is received in cavity 11 and is detachably connected to the clamping plates 14. The clamping plates 14 are connected to the mounting bracket 2, the mounting bracket 2 is received in the cavity 11. The clamping plates 14 are arranged with positioning posts 141, and the mounting bracket 2 defines positioning holes 21 in which the positioning posts 141 can be inserted. The sealing cover 15 and handheld portion 1 cooperatively enclose the cavity 11. The mounting bracket 2 includes a first support plate 24, a second support plate 25, a bracket body 28 defining a receiving space 27, and a first protrusion 22 and a second protrusion 23 that are respectively disposed at two sides of the bracket body 28. The first protrusion 22 abuts against the first circuit board 31, and the first circuit board 31 is disposed between the first protrusion 22 and the battery 4. The second protrusion 23 abuts against the second circuit board 32, and the second circuit board 32 is disposed between the second protrusion 23 and the battery 4. The first support plate 24 is snapped with the first circuit board 31, and the protective switch button assembly 52 is mounted on the first support plate 24. The second support plate 25 is snapped with the second circuit board 32. The first circuit

board 31 passes through the receiving space 27 via a wire to be connected to the second circuit board 32. The gear knob assembly 51 is arranged on the second support plate 25. The bracket body 28 is further arranged with an isolation plate 26 disposed between the first circuit board 31 and second circuit board 32. The isolation plate 26 is received in the receiving space 27, and the wire connecting with the first circuit board 31 extends through the isolation plate 26 to be connected to the second circuit board 32.

Specifically, the handheld portion 1 includes a handheld shell disposed at an outer side thereof and the cavity 11 inside the handheld shell. The cavity 11 has a space for receiving the mounting bracket 2, the circuit board assembly, battery 4, and the control mechanism. The first slot 12 and the second slot 13 are defined respectively in two sides of the handheld portion 1. The first slot 12 has a space for receiving the gear knob assembly 51, and the second slot 13 has a space for receiving the protective switch button assembly 52. Two clamping plates 14 are received in the cavity 11 and are slidably mounted on an inner wall of the handheld shell. An end of each clamping plate 14 is arranged with the positioning post 141 that can be inserted into the positioning hole 21 defined in a bottom of the mounting bracket 2. The clamping plates 14 support and secure the mounting bracket 2. The other end of each clamping plate 14 defines a snap groove, and the sealing cover 15 is arranged with a snap mated with the snap groove, allowing the sealing cover 15 to be mounted on or removed from the clamping plates 14. The battery 4 is disposed between the two clamping plates 14. The sealing cover 15 is disposed at a bottom of the battery 4, and the mounting bracket 2 is located at a top of the battery 4. The clamping plates 14, the sealing cover 15, and the mounting bracket 2 limit a periphery of the battery 4, such that an overall structure of the handheld portion 1 is more compact.

It should be noted that two sides of a top of the bracket body 28 may be arranged with a first protrusion 22 and a second protrusion 23 respectively. The first protrusion 22 limits a position of the first circuit board 31 downwardly, and the first circuit board 31 may be arranged between the first protrusion 22 and the battery 4. The first protrusion 22 and the battery 4 may limit the position of the first circuit board 31 in a vertical direction. The first support plate 24 and the first circuit board 31 are snapped with each other. For example, a snap head 241 may be arranged on the first support plate 24, and a snap groove 311 mated with the snap head 241 may be defined in the first circuit board 31. The snap head 241 on the first support plate 24 may be mated with the snap groove 311 on the first circuit board 31. Alternatively, the snap groove 311 may be defined in the first support plate 24, and the snap head 241 mated with the snap groove 311 may be arranged on the first circuit board 31. The snap head 241 on the first circuit board 31 may be mated with the snap groove 311 on the first support plate 24. In this way, the first circuit board 31 may be mounted

and maintained easily, and at the same time, the bracket body 28 and the first support plate 24 may limit the position of the first circuit board 31 in a horizontal direction, preventing the first circuit board 31 from being displaced during usage. Since a structure and a principle of the mating between the second support plate 25 and the second circuit board 32 may be the same as that between the first support plate 24 and the first circuit board 31, detailed description will not be repeated here. Furthermore, the isolation plate 26 arranged on the bracket body 28 may isolate the wire connecting the first circuit board 31 and the second circuit board 32. For example, an end of the wire connecting the first circuit board 31 with the second circuit board 32 is connected to the second circuit board 32, and the other end of the wire may be received in a space between the isolation plate 26 and the first circuit board 31. The isolation plate 26 separates the wire from the gear knob assembly 51, and arrangement of the wires in a limited space may be optimized, preventing the wires from interfering with the gear knob assembly 51.

For the circuit board assembly, the battery 4, and the control mechanism:

The circuit board assembly is arranged on the mounting bracket 2. The circuit board assembly includes the first circuit board 31 and the second circuit board 32. The first circuit board 31 is arranged on the mounting bracket 2 and is connected to the protective switch button assembly 52 and the battery 4. The second circuit board 32 is arranged on the mounting bracket 2 and is connected to the gear knob assembly 51 and the first circuit board 31. The second circuit board 32 and the first circuit board 31 are arranged opposite to each other. The battery 4 is arranged inside the cavity 11. The control mechanism includes the gear knob assembly 51, the protective switch button assembly 52, and a charging port 53. The gear knob assembly 51 is arranged on the mounting bracket 2 and is connected to the battery 4 through the circuit board assembly. The gear knob assembly 51 includes a support block 511 arranged on the mounting bracket 2, a knob 512, and a rotating shaft 513 that is rotatably mounted on the support block 511. The support block 511 defines an opening region 5111. The rotating shaft 513 passes through the knob 512, and the knob 512 is located in the opening region 5111 and directly faces the first slot 12. The protective switch button assembly 52 is arranged on the mounting bracket 2 and is connected to the circuit board assembly. The protective switch button assembly 52 and the gear knob assembly 51 are arranged opposite to each other. The charging port 53 is arranged on the mounting bracket 2 and is connected to the first circuit board 31. The charging port 53 directly faces the second slot 13.

Specifically, the first circuit board 31 and the second circuit board 32 in the circuit board assembly are arranged opposite to each other on the mounting bracket 2. The first circuit board 31 is connected to the protective switch button assembly 52 and the battery 4 in the control mechanism. The protective switch button assembly 52 may control the circuit powered by the

battery 4 to be conducted or disconnected. For example, the protective switch button assembly 52 may be a slide switch. When a button of the protective switch button assembly 52 is slid to one end, the circuit is conducted, and the fan operates. When the button is slid to the other end, the circuit is disconnected, and the fan does not operate, preventing accidental activation of the fan due to unintentional operation on the gear knob assembly 51. The battery 4 may supply power through the first circuit board 31. The second circuit board 32 is connected to the gear knob assembly 51 and the first circuit board 31. After the support block 511 of the gear knob assembly 51 is mounted on the second support plate 25 and the rotating shaft 513 is connected to the knob 512, the knob 512 is rotated to drive the rotating shaft 513 to rotate. An end of the rotating shaft 513 is rotatably mounted on the support block 511. For example, a through hole is defined at connection between the support block 511 and the second circuit board 32 for rotatably mounting the end of the rotating shaft 513. When the knob 512 of the gear knob assembly 51 is rotated, the rotation speed of the fan connected to the first circuit board 31 and the second circuit board 32 can be adjusted, and the air speed is controlled. The other end of the rotating shaft 513 may contact an elastic button arranged on the second circuit board 32. When the knob 512 in the opening region 5111 is pushed towards the first circuit board 31, the knob 512 drives the other end of the rotating shaft 513 to press the elastic button. The pressed elastic button is connected to the second circuit board 32, allowing a power level of the battery 4 to be checked. That is, when the knob 512 of the gear knob assembly 51 is pressed, the power level of the battery 4 can be checked. The charging port 53 may be a USB interface. When the charging port 53 is connected to an external power source, the battery 4 may be charged.

The present application provides the handheld structure for the handheld fan. The mounting bracket 2 and the battery 4 are arranged in the cavity 11 of the handheld portion 1. The circuit board assembly is arranged on the mounting bracket 2. The gear knob assembly 51 of the control mechanism is arranged on the mounting bracket 2 and is connected to the battery 4 through the circuit board assembly. The first slot 12 defined in the handheld portion 1 directly faces the gear knob assembly 51. In this way, the circuit board assembly, the gear knob assembly 51, the mounting bracket 2, and the battery 4 are all received inside the cavity 11 of the handheld portion 1. The gear knob assembly 51 adjusts the circuit board assembly connected to the battery 4 to control the rotation speed of the fan, such that an overall space occupied by the handheld fan is reduced, and the handheld portion 1 may be easily gripped by the user. An overall size and a space occupied by the handheld fan may be reduced, such that the fan may be easily carried by the user. In this way, a small size, small space occupation, and portability of the fan can be achieved.

To provide a detailed description of the present embodiment, the above embodiment

provides a detailed description of the handheld structure for the handheld fan. Based on the same inventive concept, the present embodiment further provides a handheld fan, as shown in an embodiment 6-2.

Embodiment 6-2:

The present embodiment provides a handheld fan, including the handheld structure for the handheld fan and an airflow structure 6 connected to the handheld structure. The airflow structure 6 may be connected to the handheld portion 1.

The present embodiment provides the handheld fan. The mounting bracket 2 and the battery 4 are arranged in the cavity 11 of the handheld portion 1. The circuit board assembly is arranged on the mounting bracket 2. The gear knob assembly 51 of the control mechanism is arranged on the mounting bracket 2 and is connected to the battery 4 through the circuit board assembly. The first slot 12 defined in the handheld portion 1 directly faces the gear knob assembly 51. The handheld portion 1 is connected to the airflow structure 6. Therefore, the circuit board assembly, the gear knob assembly 51, the mounting bracket 2, and the battery 4 are all received in the cavity 11 of the handheld portion 1. The gear knob assembly 51 adjusts the circuit board assembly connected to the battery 4 to control the rotation speed of the fan, and the overall space occupied by the handheld fan is reduced. The handheld portion 1 may be conveniently gripped by the user, the overall size and space occupied by the handheld fan may be reduced. In this way, the fan may be carried easily, such that a small size, small space occupation, and portability of the fan can be achieved.

Embodiment 7, referring to FIGS. 7-1 to 7-8:

The present application provides a handheld fan. An airflow channel 111 is formed in an inner shell 11 of an airflow portion 1. An air inlet and an air outlet are respectively communicated to two sides of the airflow channel 111. The fan assembly 13 is received in the airflow channel 111. The outer shell 12 covers an outside of the inner shell 11. A handheld shell 21 of a handheld portion 2 covers an outside of a mounting mechanism. The handheld shell 21 extends into a mounting port 121 of the outer shell 12. A fixing member 23 sequentially penetrates the outer shell 12 of the airflow portion 1 and the handheld shell 21 and is further connected to the mounting mechanism. In this way, the handheld shell and mounting mechanism of the handheld portion 2 are connected, through the fixing member 23, to the outer shell 12 of the airflow portion 1. The airflow channel 111 formed in the inner shell 11 of the airflow portion 1 allows air to flow through, a structure of the handheld fan is compact, and stability and reliability of the handheld fan during operation may be improved. Therefore, compactness and reliability of the handheld fan are achieved.

As shown in FIGS. 7-1 to 7-8, FIG. 7-1 is a structural schematic view of a handheld according to an embodiment of the present application; FIG. 7-2 is a structural schematic view of a mounting bracket 211 in the handheld fan according to an embodiment of the present application; FIG. 7-3 is a structural schematic view of a handheld shell 21 of the handheld fan according to an embodiment of the present application; FIG. 7-4 is a structural schematic view of a control mechanism in the handheld fan according to an embodiment of the present application; FIG. 7-5 is a structural schematic view of a mounting groove 114 in the handheld fan according to an embodiment of the present application; FIG. 7-6 is a structural schematic view of an outer shell 12 of the handheld fan according to an embodiment of the present application; FIG. 7-7 is a structural schematic view of a first circuit board 4 in the handheld fan according to an embodiment of the present application; FIG. 7-8 is a structural schematic view of an inner shell 11 in the handheld fan according to an embodiment of the present application. The present embodiment provides a handheld fan including an airflow portion 1 and a handheld portion 2. The airflow portion 1 and the handheld portion 2 will be described in detail in the following.

For the airflow portion 1 and the handheld portion 2:

The airflow portion 1 includes an inner shell 11, an outer shell 12 and a fan assembly 13. In the inner shell 11, an airflow channel 111, an air inlet communicated to a side of the airflow channel 111, and an air outlet communicated to the other side of the airflow channel 111 are formed. The fan assembly 13 is received in the airflow channel 111. The outer shell 12 covers an outside of the inner shell 11. The outer shell 12 has a mounting port 121. The inner shell 11 may be arranged with a limit plate 112 and a baffle plate 113, the limit plate 112 and the baffle plate 113 enclose to define a mounting groove 114. An end of the handheld shell 21 is inserted into the mounting groove 114. The handheld portion 2 includes a handheld shell 21, a mounting mechanism and a fixing member 23. The handheld shell 21 covers an outside of the mounting mechanism, and the handheld shell 21 is inserted into the mounting port 121. The fixing member 23 sequentially penetrates the outer shell 12 and the handheld shell 21 to be further connected to the mounting mechanism. The mounting mechanism includes a mounting bracket 221, clamping plates 222 and a sealing cover 223. The mounting bracket 221 is connected to the fixing member 23. The clamping plates 222 are connected to the mounting bracket 221. The sealing cover 223 is detachably connected to the clamping plates 222. The sealing cover 223, the clamping plates 222 and the mounting bracket 221 enclose to form a space for receiving a battery. A first connecting member 115 is arranged on the inner shell 11, a second connecting member 2211 is arranged in the mounting mechanism. The fixing member 23 penetrates the first connecting member 115 and the second connecting member 2211.

Specifically, the airflow channel 111 is formed inside the inner shell 11 for allowing the air to flow through. The air enters the airflow channel 111 from the air inlet, enters the airflow channel 111, and then flows out of the fan from the air outlet. The outer shell 12 overs the outside of the inner shell 11. The mounting port 121 defined in the outer shell 12 has a space for receiving the end of the handheld shell 21 of the handheld portion 2 and the mounting bracket 221 in the mounting mechanism. The limit plate 112 and the baffle plate 113 are disposed in the inner shell 11 at a position directly opposite to the mounting port 121. The mounting groove 114 is formed between the limit plate 112 and the baffle plate 113, and an end of the handheld shell 21 may be embedded in the mounting groove 114. The end of the handheld shell 21 can be limited by the mounting groove 114.

It should be noted that the end of the handheld shell 21 of the handheld portion 2 is inserted, after being mounted into the mounting port 121, into the mounting groove 114. The first connecting member 115 may be arranged on the mounting bracket 221 in the mounting mechanism. The second connecting member 2211 may be disposed on the inner shell 11 at a position corresponding to the mounting bracket 221. The fixing member 23, after penetrating the outer shell 12, the handheld shell 21 and the second connecting member 2211 arranged on the second connecting member 2211, may be further connected to the first connecting member 115 arranged on the mounting bracket 221, and the fixing member 23 may include a bolt. Two clamping plates 222 may be disposed respectively at two sides inside the handheld shell 21. The clamping plates 222 are connected to the mounting bracket 221, and the sealing cover 223 may be detachably connected to the clamping plates 222. For example, a snap head may be arranged on the sealing cover 223, and a snap groove is defined in each clamping plate 222, such that detachable connection between the sealing cover 223 and the clamping plates 222 is achieved. The battery may be received in a space formed by the sealing cover 223, the clamping plates 222, and the mounting bracket 221.

The handheld fan of the present embodiment further includes a control mechanism, a first circuit board 4, a second circuit board 41 and a third circuit board 42. The control mechanism includes a gear knob assembly 31, a protective switch button assembly 32 and a charging port 33. The gear knob assembly 31 is arranged in the mounting mechanism. The handheld shell 21 defines: a first slot 211 directly opposite to the gear knob assembly 31; and a second slot 212 directly opposite to the protection switch button assembly 32. The first circuit board 4 is arranged in the mounting mechanism and is connected to the gear knob assembly 31. The protective switch button assembly 32 is arranged in the mounting bracket 221. The protective switch button assembly 32 and the gear knob assembly 31 are disposed opposite to each other. The second circuit board 41

is arranged in the mounting bracket 221, the second circuit board 41 is connected to the protective switch button assembly 32 and the first circuit board 4. The charging port 33 is arranged in the mounting bracket 221 and is connected to the second circuit board 41. The charging port 33 is directly opposite to the second slot 212. The third circuit board 42 is arranged in the inner shell 11. The third circuit board 42 is connected to the second circuit board 41.

Specifically, the first circuit board 4 and the second circuit board 41 are distributed in opposition to each other on the mounting bracket 221 of the mounting mechanism. The first circuit board 4 is connected to the gear knob assembly 31 in the control mechanism. The second circuit board 41 is connected to the protective switch button assembly 32, the charging port 33, the battery, and the first circuit board 4. The third circuit board 42 is connected to the second circuit board 41, and the third circuit board 42 may further be connected to a motor in the fan assembly 13, and the motor in the fan assembly 13 may drive the fan blades to rotate. The protective switch button assembly 32 may control a circuit powered by the battery to be on or off. For example, the protective switch button assembly 32 may be a slide switch. When a button in the protective switch button assembly 32 is slid to one end, the circuit is conducted, and at this moment, the motor in the fan assembly 13 is operating to drive the fan blades to rotate. When the button in the protective switch button assembly 32 is slid to the other end, the circuit is disconnected, the motor in the fan assembly 13 does not operate, and the fan blades do not rotate. The user may be prevented from accidentally turning on the fan after mistakenly touching the gear knob assembly 31. The gear knob assembly 31 may adjust a rotation speed of the fan blades connected to the third circuit board 42 to control the air speed. When rotating a knob in the gear knob assembly 31, a gear of the air speed may be adjusted. When pressing the knob in the gear knob assembly 31, a battery power level may be checked. The charging port 33 may refer to a USB port, and the charging port 33 may charge the battery when being connected to an external power source.

For the handheld fan of the present embodiment, the airflow channel 111 is formed in an inner shell 11 of an airflow portion 1. The air inlet and the air outlet are respectively communicated to two sides of the airflow channel 111. The fan assembly 13 is received in the airflow channel 111. The outer shell 12 covers the outside of the inner shell 11. The handheld shell 21 of the handheld portion 2 covers the outside of the mounting mechanism. The handheld shell 21 extends into the mounting port 121 of the outer shell 12. The fixing member 23 sequentially penetrates the outer shell 12 of the airflow portion 1 and the handheld shell 21 and is further connected to the mounting mechanism. In this way, the handheld shell and mounting mechanism of the handheld portion 2 are connected, through the fixing member 23, to the outer shell 12 of the airflow portion 1. The airflow channel 111 formed in the inner shell 11 of the airflow portion 1

allows air to flow through, a structure of the handheld fan is compact, and stability and reliability of the handheld fan during operation may be improved. Therefore, compactness and reliability of the handheld fan are achieved.

Embodiment 8-1, referring to FIGS. 8-1 to 8-11:

The present application provides a handheld fan. An air duct 11 is defined in an inner housing 1. Two sides of the air duct 11 are respectively connected to an air inlet 23 and an air outlet 24. At least a portion of a fan assembly 3 is received in the air duct 11. An outer housing 2 covers an outside of the inner housing 1. A side of a wire opening 12 of the inner housing 1 directly faces an electrical connection portion of the fan assembly 3. The other side of the wire opening 12 directly faces an electrical connection portion of a handheld portion 5 of the handheld fan. In this way, the wire opening 12 of the inner housing 1 allows a wire connected to the electrical connection portion of the fan assembly 3 to pass through. After the wire connected to the electrical connection portion of the fan assembly 3 passes through the wire opening 12 from a position directly facing the electrical connection portion of the handheld portion of the handheld fan 5, the wire is then connected to the electrical connection portion of the handheld portion of the fan 5. In this way, a length of the wire is reduced, durability of the wire in improved, an aesthetic appearance of wires is improved. Wires can be arranged stably, an appearance of the wire arrangement is improved, and the durability is improved.

As shown in FIGS. 8-1 to 8-11, FIG. 8-1 is a structural schematic view of an airflow component of a handheld fan according to an embodiment of the present application; FIG. 8-2 is a structural schematic view of a mounting bracket 6 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-3 is a structural schematic view of a handheld portion 5 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-4 is a structural schematic view of a wire opening 12 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-5 is a structural schematic view of a wire receiving groove 21 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-6 is a structural schematic view of the wire receiving groove 21 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-7 is a structural schematic view of a gear knob assembly 71 and a protective switch button assembly 72 in the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-8 is a structural schematic view of an inner shell 1 and an outer shell 2 of the airflow component of the handheld fan according to an embodiment of the present application; FIG. 8-9 is a structural schematic view of an air inlet 23 and an air outlet 24 of the airflow component of the handheld fan according to

an embodiment of the present application; FIG. 8-10 is an enlarged view of a portion A in FIG. 8-9; FIG. 8-11 is a structural schematic view of a fan assembly 3 of the airflow component of the handheld fan according to an embodiment of the present application. The handheld fan of the present embodiment includes an inner housing 1, an outer shell 2, and a fan assembly 3. The inner shell 1, the outer shell 2, and the fan assembly 3 will be described in detail.

For the inner shell 1, the fan assembly 3, and the outer shell 2:

The inner shell 1 defines an air duct 11, an air inlet 23 communicated to a side of the air duct 11, and an air outlet 24 communicated to the other side of the air duct 11. At least part of the fan assembly 3 is received in the air duct 11. The inner shell 1 defines a wire opening 12. A side of the wire opening 12 directly faces an electrical connection portion of the fan assembly 3, the other side of the wire opening 12 directly faces an electrical connection portion of a handheld portion 5 of the handheld fan. The electrical connection portion of the fan assembly 3 is electrically connected to the electrical connection portion of the handheld portion 5 by a wire passing through the wire opening 12. The handheld portion 5 has a mounting opening 4 and is connected to the outer shell 2. The mounting opening 4 directly faces the other side of the wire opening 12. The handheld fan further includes a mounting bracket 6, a second circuit board 73 and a gear knob assembly 71, all of which are arranged in the handheld portion 5. At least a portion of the mounting bracket 6 is received in the mounting opening 4. The mounting bracket 6 is connected to the inner shell 1, and the mounting bracket 6 defines a receiving space 61 allowing the wire to pass through. The electrical connection portion of the handheld portion 5 includes a first circuit board 7, the first circuit board 7 is arranged in the mounting bracket 6. The first circuit board 7 is plugged to the electrical connection portion of the fan assembly 3 by the wire. The second circuit board 73 is arranged in the mounting bracket 6, the second circuit board 73 is plugged to the first circuit board 7 by the wire. The gear knob assembly 71 is arranged in the mounting bracket 6. The gear knob assembly 71 is connected to the second circuit board 73. The second circuit board 73 is disposed opposite to the first circuit board 7. The outer shell 2 is arranged to cover an outside of the inner shell 1. A shielding plate 22 is arranged on the inner shell 1. The shielding plate 22 and the inner shell 1 enclose to form a wire receiving groove 21. At least a portion of the first circuit board 7 is received in the wire receiving groove 21.

Specifically, the air duct 11 defined the inner shell 1 is defined to allow air to flow through. The air enters the air duct 11 from the air inlet 23, and the air entering the air duct 11 is then discharged from the air outlet 24. The outer shell 2 covers the outside of the inner shell 1. The inner shell 1 defines a wire opening 12 allowing the wire to pass through. Two sides of the wire opening 12 respectively face the electrical connection portion of the fan assembly 3 and the

electrical connection portion of the handheld portion 5 of the handheld fan. The electrical connection portion of the fan assembly 3 may refer to a circuit board connected to the fan motor. The wire connected to the circuit board passes through the wire opening 12 and then is connected to the first circuit board 7 of the electrical connection portion of the handheld portion 5. The mounting opening 4 of the handheld portion 5 faces the wire opening 12, the receiving space 61 of the mounting bracket 6 is communicated with the mounting opening 4 of the handheld portion 5. The first circuit board 7 and the second circuit board 73 are disposed opposite to each other and arranged on the mounting bracket 6. The wire passing through the alignment opening 12 passes through the mounting opening 4 of the handheld portion 5 and is then plugged to the first circuit board 7 arranged on the mounting bracket 6. For example, an end of the wire passing through the wire opening 12 is plugged, via a plugger, to the first circuit board 7, facilitating connection or disconnection between the wire and the first circuit board 7. The second circuit board 73 is plugged to the first circuit board 7 by the wire. For example, the second circuit board 73 is connected, via the wire, to the plugger connected to the first circuit board 7, achieving plugging between the second circuit board 73 and the first circuit board 7 and facilitating connection or disconnection between the second circuit board 73 and the first circuit board 7. The gear knob assembly 71 connected to the second circuit board 73 is configured to adjust a rotation speed of fan blades in the fan assembly 3 to control of an airflow speed. For example, when a knob in the gear knob assembly 71 is rotated, a gear of the fan is adjusted. When the knob in the gear knob assembly 71 is pressed, a power level of the battery 8 can be checked. The shielding plate 22 is disposed in the inner shell 1 near the handheld portion 5, a diameter of the inner shell 1 is gradually increased in a direction extending from the air inlet 23 to the air outlet 24. In this way, an end of the inner shell 1 near the air inlet 23 is inwardly recessed to form a recessed space. The shielding plate 22 is arranged at the inwardly recessed space. The inner shell 1 and the shielding plate 22 cooperatively form a wire groove 21. A portion of the first circuit board 7 extends to an inside of the wire receiving groove 21, and the inside of the wire receiving groove 21 provides a space for receiving the wire connected to the first circuit board 7. Alternatively, the entirety of the first circuit board 7 is arranged at an outside of the wire receiving groove 21, and a portion of the wire connected to the first circuit board 7 is received in the wire receiving groove 21. Another portion of the wire extends to the outside of the wire receiving groove 21 and is then connected to the first circuit board 7. In this way, space utilization is improved.

The handheld fan of the present embodiment further includes a protective switch button assembly 72 and a battery 8. The protective switch button assembly 72 is arranged in the mounting bracket 6. The protective switch button assembly 72 is electrically connected to the first circuit

board 7. The battery 8 is arranged in the handheld portion 5. The battery 8 is plugged into the first circuit board 7 via a wire.

Specifically, the battery 8 can be mounted in the handheld portion 5. The battery 8 and the first circuit board 7 are plugged into each other via the wire. The battery 8 can supply power to the fan assembly 3. The protective switch button assembly 72 electrically connected to the first circuit board 7 can control a circuit for power supply through the battery 8 to be conductive or disconnected. For example, the protective switch button assembly 72 is a slide switch. When a button of the protective switch button assembly 72 is slid to an end, the circuit is conducted. In this case, the motor in the fan assembly 3 operates to drive the fan blades to rotate. When the button of the protective switch button assembly 72 is slid to the other end, the circuit is disconnected, and in this case, the motor in the fan assembly 3 does not operate, and the fan blades do not rotate. In this way, the user is prevented from accidentally touching the gear knob assembly 71 to accidentally turn on the fan.

The present application provides the handheld fan. The air duct 11 is defined in the inner shell 1. The two sides of the air duct 11 is communicated to the air inlet 23 and the air outlet 24. At least part of the fan assembly 3 is received in the air duct 11. The outer shell 2 covers the outside of the inner shell 1. A side of a wire opening 12 of the inner housing 1 directly faces an electrical connection portion of the fan assembly 3. The other side of the wire opening 12 directly faces an electrical connection portion of the handheld portion 5 of the handheld fan. In this way, the wire opening 12 of the inner shell 1 allows the wire connected to the electrical connection portion of the fan assembly 3 to pass through. After the wire connected to the electrical connection portion of the fan assembly 3 passes through the wire opening 12 from a position directly facing the electrical connection portion of the handheld portion of the handheld fan 5, the wire is then connected to the electrical connection portion of the handheld portion of the fan 5. In this way, a length of the wire is reduced, durability of the wire in improved, an aesthetic appearance of wires is improved. Wires can be arranged stably, an appearance of the wire arrangement is improved, and the durability is improved.

In order to provide a detailed description of the handheld fan of the present application, the above embodiment 8-1 provides a detailed description of the handheld fan, and based on the same concept, the present application further provides a handheld fan, as detailed in embodiment 8-2.

Embodiment 8-2, referring to FIGS. 8-1 to 8-11:

The embodiment 8-2 provides a handheld fan, including the airflow component of the handheld fan.

The present application provides the handheld fan. The air duct 11 is defined in the inner

shell 1. The two sides of the air duct 11 is communicated to the air inlet 23 and the air outlet 24. At least part of the fan assembly 3 is received in the air duct 11. The outer shell 2 covers the outside of the inner shell 1. A side of the wire opening 12 of the inner housing 1 directly faces the electrical connection portion of the fan assembly 3. The other side of the wire opening 12 directly faces the electrical connection portion of the handheld portion 5 of the handheld fan. The electrical connection portion of the fan assembly 3 is electrically connected to the electrical connection portion of the handheld portion 5 via the wire passing through the wire opening 12. In this way, the wire opening 12 of the inner shell 1 allows the wire connected to the electrical connection portion of the fan assembly 3 to pass through. After the wire connected to the electrical connection portion of the fan assembly 3 passes through the wire opening 12 from a position directly facing the electrical connection portion of the handheld portion of the handheld fan 5, the wire is then connected to the electrical connection portion of the handheld portion of the fan 5. In this way, a length of the wire is reduced, durability of the wire in improved, an aesthetic appearance of wires is improved. Wires can be arranged stably, an appearance of the wire arrangement is improved, and the durability is improved.

Embodiment 9-1, referring to FIGS. 9-1 to 9-6:

The present embodiment provides an airflow mechanism of a handheld fan. An airflow channel 11 is formed in an inner shell 1, and an air inlet 12 and an air outlet 13 are communicated to two sides of the airflow channel 11, respectively. A fan assembly 3 is received in the airflow channel 11. An outer shell 2 covers an outside of the inner shell 11 and is slidably connected to the inner shell 1 along a first axial direction. The first axial direction a direction extending from the air inlet 12 to the air outlet 13. During assembly, the outer shell 2 is pushed along the first axial direction to cover the inner shell 1, allowing the outer shell 2 to slidably cover the inner shell. For maintenance, the outer shell 2 may be slidably separated from the inner shell 1, such that the outer shell 2 may be disassembled easily. In this way, assembling and maintenance can be performed easily, assembly efficiency and maintenance convenience can be achieved, the assembly efficiency is improved, and the maintenance can be performed easily.

As shown in FIGS. 9-1 to 9-6, FIG. 9-1 is a structural schematic view of an airflow mechanism of the handheld fan according to an embodiment of the present application; FIG. 9-2 is a structural schematic view of a shell 16 and a support bracket 17 of the airflow mechanism of the handheld fan according to an embodiment of the present application; FIG. 9-3 is a structural schematic view of a limiting strip 21 in the airflow mechanism of the handheld fan according to an embodiment of the present application; FIG. 9-4 is a structural schematic view of the air outlet 13 in the airflow mechanism of the handheld fan according to an embodiment of the present

application; FIG. 9-5 is a structural schematic view of the air inlet 12 in the airflow mechanism of the handheld fan according to an embodiment of the present application; FIG. 9-6 is a structural schematic view of a sleeve 22 and an air inlet cover 23 in the airflow mechanism of the handheld fan according to an embodiment of the present application.

For the inner shell 1:

In the inner shell 1, the airflow channel 11, the air inlet 12 communicated to one side of the airflow channel 11, and the air outlet 13 communicated to the other side of the airflow channel 11 are formed. The inner shell 1 includes a shell 16 and a plurality of support brackets 17 arranged on the shell 16. The plurality of support brackets 17 are slidably connected to the outer shell 2. The support brackets 17 of the inner shell 1 may define limiting grooves 14 that are mated with limiting strips 21 described below. The shell 16 of the inner shell 1 gradually expands along a direction from the air inlet 12 towards the air outlet 13. The plurality of support brackets 17 are disposed at an end of the shell 16 near the air inlet 12 and spaced apart from each other with an equal interval.

Specifically, the inner shell 1 includes the shell 16 and the plurality of support brackets 17 arranged on the shell 16. The shell 16 gradually expands along the direction from the air inlet 12 towards the air outlet 13, and that is, an inner diameter of an end of the shell 16 near the air inlet 12 is smaller than an inner diameter of the other end of the shell 16 near the air outlet 13. The airflow channel 11 formed inside the shell 16 of the inner shell 1 allows air to flow through. The air enters from the air inlet 12 into the airflow channel 11 and then exits the fan through the air outlet 13. A sleeve 22 in the outer shell 2 is arranged with a plurality of limiting strips 21 therein. The shell 16 of the inner shell 1 defines the plurality of limiting grooves 14 that are mated with the plurality of limiting strips 21. The limiting grooves 14 are defined in a surface of the shell 16 and are recessed towards the airflow channel 11. A space inside the limiting grooves 14 receives the limiting strips 21, allowing the limiting strips 21to be embedded in the limiting grooves 14. A snap groove 15 may be defined the support bracket 17 of the inner shell 1, and the support bracket 17 may provide support for the sleeve 22 of the outer shell 2. A snap head 24 arranged on an air inlet cover 23 of the outer shell 2 snaps into the snap groove 15. In this way, after the snap head 24 snaps into the snap groove 15, the air inlet cover 23 of the outer shell 2 may be connected to the support brackets 17 of the inner shell 1, such that the outer shell 2 may be easily disassembled from the inner shell 1.

For the outer shell 2 and the fan assembly 3:

The outer shell 2 covers the outside of the inner shell 1 and is slidably connected to the inner shell 1 along the first axial direction. The first axial direction is the direction extending from the

air inlet 12 to the air outlet 13. The outer shell 2 is arranged with the plurality of limiting strips 21 that are mated with the plurality of limiting grooves 14. The plurality of limiting grooves 14 extend along the first axial direction, and the plurality of limiting strips 21 are slidably received in the plurality of limiting grooves 14. The plurality of limiting strips 21 and the plurality of limiting grooves 14 are in one to one correspondence with each other. Each of the plurality of limiting strips 21 is embedded in a respective one of the plurality of limiting grooves 14. The outer shell 2 includes the sleeve 22 and the air inlet cover 23. The sleeve 22 is arranged with the inner shell 1, and the plurality of limiting strips 21 are arranged on the sleeve 22. The air inlet cover 23 is detachably connected to the inner shell 1 and is connected to the sleeve 22. The inner shell 1 defines the snap groove 15, and the air inlet cover 23 is arranged with the snap head 24 that is mated with the snap groove 15. A plurality of snap heads 24 are disposed between the sleeve 22 and the inner shell 1 and are distributed along the first axial direction, and correspondingly, a plurality of snap grooves 15 are defined. The plurality of snap heads 24 and the plurality of snap grooves 15 are in one to one correspondence with each other. The plurality of snap heads 24 are spaced apart from each other with an equal interval. The fan assembly 3 is received in the airflow channel 11.

Specifically, the outer shell 2 has an internal space that receives the inner shell 1. The outer shell 2 includes the sleeve 22 and the air inlet cover 23. The limiting strips 21 are arranged on an inner wall of the sleeve 22 near the inner shell 1 and are align with the limiting grooves 14 defined in the inner shell 1. When the sleeve 22 of the outer shell 2 is slidably inserted from one end of the inner shell 1, the limiting strips 21 may be inserted and slide from openings of the limiting grooves 14 at an end. The limiting strips 21 may towards the other end of the limiting grooves 14, driving the sleeve 22 of the outer shell 2 to move along a length direction of the limiting grooves 14 defined in the inner shell 1.

Notably, the plurality of limiting strips 21 may refer to 1, 2, 3, or 4 limiting strips 21, and the plurality of limiting grooves 14 may refer to 1, 2, 3, or 4 limiting grooves 14. When 2 limiting grooves 14 are defined, the 2 limiting grooves 14 may be symmetrically distributed on two sides of the inner shell 1 and are parallel to each other. The 2 limiting strips 21 on the sleeve 22 of the outer shell 2 may slide in 2 corresponding limiting grooves 14. After the sleeve 22 is mounted on the inner shell 1, the 2 limiting strips 21 embedded in the 2 limiting grooves 14 limit the sleeve 22 from two sides thereof, enhancing stability of the sleeve 22 and facilitating the sleeve 22 to be slidably mounted on the inner shell 1. The fan assembly 3 includes a motor and fan blades driven by the motor. The motor may be mounted in the airflow channel 11 of the inner shell 1, and the shell 16 of the inner shell 1 supports the motor. A rotation shaft of the motor drives the fan blades

to rotate, driving air to enter the airflow channel 11 from the air inlet 12 and to flow out of the fan through the air outlet 13. Since the outer shell 2 is connected to the handheld portion 4, the user may grip and carry the handheld fan easily.

The present embodiment provides the airflow mechanism of the handheld fan. The airflow channel 11 is formed in the inner shell 1, and the air inlet 12 and the air outlet 13 are communicated to two sides of the airflow channel 11, respectively. The fan assembly 3 is received in the airflow channel 11. The outer shell 2 covers the outside of the inner shell 11 and is slidably connected to the inner shell 1 along the first axial direction. The first axial direction the direction extending from the air inlet 12 to the air outlet 13. During assembly, the outer shell 2 is pushed along the first axial direction to cover the inner shell 1, allowing the outer shell 2 to slidably cover the inner shell. For maintenance, the outer shell 2 may be slidably separated from the inner shell 1, such that the outer shell 2 may be disassembled easily. In this way, assembling and maintenance can be performed easily, assembly efficiency and maintenance convenience can be achieved, the assembly efficiency is improved, and the maintenance can be performed easily.

In order to provide detailed description of the handheld fan provided by the present application, the above Embodiment 9-1 provides a detailed description of the airflow mechanism of the handheld fan, and the present application further provides a handheld fan based on a same concept, which will be described in detail in Embodiment 9-2.

Embodiment 9-2

The present embodiment provides a handheld fan, including the airflow mechanism of the handheld fan described above.

The present embodiment provides the handheld fan. The airflow channel 11 is formed in the inner shell 1, and the air inlet 12 and the air outlet 13 are communicated to two sides of the airflow channel 11, respectively. The fan assembly 3 is received in the airflow channel 11. The outer shell 2 covers the outside of the inner shell 11 and is slidably connected to the inner shell 1 along the first axial direction. The first axial direction the direction extending from the air inlet 12 to the air outlet 13. During assembly, the outer shell 2 is pushed along the first axial direction to cover the inner shell 1, allowing the outer shell 2 to slidably cover the inner shell. For maintenance, the outer shell 2 may be slidably separated from the inner shell 1, such that the outer shell 2 may be disassembled easily. In this way, assembling and maintenance can be performed easily, assembly efficiency and maintenance convenience can be achieved, the assembly efficiency is improved, and the maintenance can be performed easily.

Embodiment 10, referring to FIGS. 10-1 to 10-9:

As shown in FIGS. 10-1 to 10-9, in order to reduce vibration and noise caused by oscillation

of fan blades during high-speed rotation of the motor, the present application provides a handheld fan, FIG. 10-1 is a structural schematic view of a handheld fan according to an embodiment of the present application, including an airflow portion 10 and a handheld portion 20; FIG. 10-2 is an exploded view of the handheld fan according to an embodiment of the present application, where the airflow portion 10 includes a shell 11, an air inlet cover 12 detachably connected to the shell 11, and a motor 13 arranged inside the shell 11. A motor shaft 131 is received in a shaft hole of the motor 13 and can rotate relative to the motor 13. A top of the motor shaft 131 is connected to fan blades 15. A vibration damping spring 132 is disposed between the motor 13 and the fan blades 15 and sleeves the motor shaft 131.

As shown in FIG. 10-3, FIG. 10-3 is a structural schematic view of the air inlet cover according to an embodiment of the present application. the air inlet cover 12 includes an air inlet plate 121, a first side wall 122 connected to the air inlet plate 121 and surrounding a preset axis, and a second side wall 123 surrounding a periphery of the first side wall 122. FIG. 10-4 is a structural schematic view of formation of an air duct according to an embodiment of the present application. The air duct 16 is formed between the first side wall 122 and the second side wall 123. A minimum inner diameter of the second side wall 123 is greater than a maximum outer diameter of the first side wall 122, ensuring a width of the air duct between the second side wall 123 and the first side wall 122, ensuring an air outputting area and reducing an airflow resistance of the second side wall 123. The airflow in the air duct can be guided properly, such that a high air outputting efficiency is achieved, and the airflow can be output more smoothly.

Specifically, when the user is using the handheld fan, the fan blades 15 are driven by the motor 13 to rotate, guiding the air from the air inlet cover 12 into a space between the first side wall 122 and the second side wall 123 and blowing the air out of the fan from the air outlet. The user may hold the handheld fan to direct the airflow to flow towards a desired cooling region, such that the region may be cooled quickly, and the usage experience is improved.

FIG. 10-5 is a structural schematic view of fan blades according to an embodiment of the present application. The fan blades 15 include a conical cavity 151 and blades 152 arranged on an outer side of the conical cavity 151. The blades 152 are configured in a diagonal flow shape. A diagonal flow channel 153 is formed between every two adjacent blades 152. The diagonal flow channel 153 guides the air from the air inlet cover 12 into the air duct 16 formed between the first side wall 122 and the second side wall 123, reducing an impact performed by the airflow on an inner wall of the air inlet cover, minimizing an airflow loss, and improving an airflow outputting efficiency. In the present embodiment, the blades 152 of the handheld fan are configured in the diagonal flow shape, increasing the air volume, reducing noise, and providing a more compact

structure, such that the fan may be easily held and carried.

FIG. 10-6 is a bottom view of the airflow portion according to an embodiment of the present application. A motor bearing 14 is arranged to sleeve the motor 13 and is received in the conical cavity 151. The motor bearing 14 ensures stability of the motor 13 during high-speed rotation, such that the overall handheld fan may operate stably.

FIG. 10-7 is a structural schematic view of a motor shaft and fan blades being integrally formed according to an embodiment of the present application. The motor shaft 131 and the fan blades 15 are integrally formed as a one-piece structure. A metal ring 17 is fixedly arranged between the motor shaft 131 and the fan blades 15. The metal ring 17 passes through the motor shaft 131 to secure the motor shaft 131 and the fan blades 15. The integral formation of the fan blades 15 and the motor shaft 131 effectively reduces a space occupied by the airflow portion 10.

FIG. 10-8 is a structural schematic view of a vibration damping spring according to an embodiment of the present application. The vibration damping spring 132 is detachably connected to the motor shaft 131, allowing the vibration damping spring 132 to be easily replaced when being damaged. In addition, since desired damping strengths at various positions may be different from each other, an inner diameter of the vibration damping spring 132 and spacings between every two adjacent coils of the spring may vary accordingly.

Specifically, an inner diameter 1321 of an end of the vibration damping spring 132 away from the motor 13 is greater than an inner diameter 1322 of the other end of the vibration damping spring 132 near the motor 13. Spacings 1323 between adjacent coils at the end of the vibration damping spring 132 away from the motor 13 is smaller than spacings 1324 between adjacent coils at the other end of the vibration damping spring 132 near the motor 13.

FIG. 10-9 is a structural schematic view of the handheld portion and the airflow portion according to an embodiment of the present application. The airflow portion 10 includes a first connecting member 18, and the handheld portion 20 includes a second connecting member 21. The airflow portion 10 and the handheld portion 20 are connected to each other via a fixing member 22. The fixing member passes through the first connecting member 18 and the second connecting member 21 to connect the airflow portion 10 and the handheld portion 20. For example, the fixing member 22 can be a screw or any other fixing member used to connect the airflow portion 10 with the handheld portion 20. The present embodiment does not limit a type of the fixing member.

The present embodiment provides a handheld fan, including the airflow portion and the handheld portion. The airflow portion includes the shell, the air inlet cover detachably connected to the shell, and the motor arranged inside the shell. The motor has the shaft hole receiving the

motor shaft, which can rotate relative to the motor. The top of the motor shaft is connected to the fan blades. The vibration damping spring is arranged between the motor and the fan blades, sleeving the motor shaft. The handheld fan generates reduced vibration and noise caused by oscillation of the fan blades during high-speed rotation of the motor, such that a better user experience is provided.

Embodiment 11, referring to FIGS. 11-1 to 11-6:

As shown in FIG. 11-1, the present embodiment provides a handheld fan including an airflow portion 100, a handheld portion 200, and an airflow assembly 300. The handheld portion 200 is connected to the airflow portion 100.

As shown in FIG. 11-2, the airflow portion 100 includes an air inlet cover 110.

As shown in FIG. 11-3, the air inlet cover 110 includes an air inlet cover body 112 and an air guiding portion 111 connected to the air inlet cover body 112 and extending towards the airflow assembly 300. The airflow portion 100 includes a first receiving cavity 120.

FIG. 11-4 is a cross-sectional view of the handheld fan, taken along a line A-A; and FIG. 11-5 is a perspective view of the airflow assembly 300 of the handheld fan being viewed from a viewing angle. The airflow assembly 300 is received in the first receiving cavity 120. An air guiding cone 320 and fan blades 310 arranged on the air guiding cone 320 are received in the first receiving cavity 120. A first gap is formed between the air guiding cone 320 and the air guiding portion 111.

Specifically, the air inlet cover body 112 may be any member that operates cooperatively with the air guiding portion 111 to guide air. For example, the air inlet cover body 112 may be an assembly for guiding air, such as an air guiding plate or air guiding holes. The air inlet cover body 112 may be a base structure that supports the air guiding portion 111 of the air inlet cover 110, enhancing overall stability of the air inlet cover 110. Therefore, a specific structure of the air inlet cover body 112 is not specifically limited, and any ordinary skilled person in the art may determine the structure of the air inlet cover body 112 according to specific needs.

Specifically, the airflow assembly 300 may be a fan motor module. The air guiding cone 320 may be driven by a motor to rotate, such that the fan blades 310 arranged on the air guiding cone 320 may rotate accordingly. In this way, the air entering the first receiving cavity 120, which enters the fan through the air inlet cover 110, may be delivered out of the airflow portion 100 as the fan blades 310 rotate.

It can be understood that the air guiding cone 320 may be conical or truncated conical. For example, the air guiding cone 320 may be a side wall surrounding a certain axis, and an inner diameter of the side wall gradually decreases or increases from one end to the other end.

Specifically, the fan blades 310 may be diagonal flow blades, allowing air to flow along a surface of the air guiding cone 320 and flow through air channels formed between adjacent fan blades 310.

Specifically, the handheld portion 200 may be any structure used to hold the fan, which will not be limited herein.

When no gap is formed between the airflow assembly 300 and the air guiding portion 111 of the air inlet cover 110 extending towards the airflow assembly 300, airflow entering from the air inlet cover 110 forms turbulence, causing flowing air to interfere with each other to generate significant noise. Therefore, in the present embodiment, a gap is formed between the air guiding cone 320 arranged with the fan blades 310 and the air guiding portion 111, turbulence generated by the airflow entering from the air inlet cover 110 may be reduced, such that interference between the flowing air is reduced, and the noise generated by the airflow is reduced.

In an embodiment, as shown in FIG. 11-4, the first gap is greater than 1 mm and less than 14 mm.

It can be understood that by forming the gap between the air guiding cone 320 and the air guiding portion 111, the turbulence between the air guiding cone 320 and the air guiding portion 111 can be effectively reduced. However, when the gap distance between the air guiding cone 320 and the air guiding portion 111 is excessively large, a length of the air channel may be increased, prolonging an air flowing time length from the air inlet cover 110 to the air outlet, such that the air outputting efficiency of the fan is reduced. Therefore, the gap between the air guiding cone 320 and the air guiding portion 111 is between 1 mm and 14 mm, ensuring a proper air outputting efficiency and effectively reducing turbulence and minimizing noise.

In an embodiment, as shown in FIGS. 11-4 and 11-5, the fan blades 310 are located between two end surfaces of the air guiding cone 320.

It can be understood that by arranging the fan blades 310 between the two end surfaces of the air guiding cone 320, the fan blades 310 are prevented from being extending out of the two end surfaces of the air guiding cone 320, such that obstacles, which may cause turbulence between the air guiding cone 320 and the air guiding portion 111, may be prevented, and noise can be avoided.

In an embodiment, as shown in FIG. 11-3, the air guiding portion 111 is columnar. One end of the air guiding portion 111 is received in the first receiving cavity 120. A first gap is formed between the end of the air guiding cone 320 near the air inlet cover 110 and an end of the air guiding portion 111 near the air guiding cone 320.

Specifically, in the present embodiment, the air guiding portion 111 can be a cylinder, a

triangular prism, a cube, or a rectangular prism. Configuring the air guiding portion 111 in various shapes allows the air entering the first receiving cavity 120 to flow along the surface of the air guiding portion 111, such that the air entering the first receiving cavity 120 can be guided. Therefore, in practice, a specific shape of the air guiding portion 111 may be determined according to specific needs.

It can be understood that a length of the air guiding portion 111 extending into the first receiving cavity 120 is determined by a value of the first gap. As the first gap increases, the length of the air guiding portion 111 extending into the first receiving cavity 120 descreases, and vice versa.

In an embodiment, as shown in FIGS. 11-2 and 11-4, an end surface of the air guiding cone 320 near the air inlet cover 110 is circular, and a diameter of the end surface of the air guiding cone 320 near the air inlet cover 110 is smaller than a diameter of a circumcircle of the end surface of the air guiding portion 111.

It can be understood that, compared to the end surface of the air guiding cone 320 near the air inlet cover 110 being a point, the end surface of the air guiding cone 320 near the air inlet cover 110 being circular may improve structural stability of the air guiding cone 320.

It can be understood that the end surface of the air guiding portion 111 may be square, triangular, or circular, which will not be limited herein.

In some embodiments, an axis of the air guiding cone 320 coincides with an axis of the air guiding portion 111. When the diameter of the circumcircle of the end surface of the air guiding portion 111 is greater than the diameter of the end surface of the air guiding cone 320 near the air inlet cover 110, the air, which flows along the surface of the air guiding portion 111 towards the air duct formed by the air guiding cone 320 and the fan blades 310, may not be blocked by the end surface of the air guiding cone 320. Therefore, all air guided by the air guiding portion 111 can be directed into the air duct to improve the air outputting efficiency of the fan.

In an embodiment, as shown in FIG. 11-6, the airflow assembly 300 further includes a rotation shaft 330 received in an inner cavity of the air guiding cone 320. The rotation shaft 330 drives the air guiding cone 320 to rotate around a preset axis, and the preset axis is an air flowing direction of the airflow portion 100.

Specifically, the air guiding cone 320 may be hollow to have the inner cavity. By arranging the rotation shaft 330 in the inner cavity of the air guiding cone 320, a space is effectively utilized, and the rotation shaft 330 is prevented from being arranged outside the air guiding cone 320, such that turbulence is prevented.

In an embodiment, as shown in FIGS. 11-4 and 11-6, the airflow assembly 300 further

includes a plurality of support plates 340 connected between an inner wall of the air guiding cone 320 and the rotation shaft 330.

It can be understood that mounting the plurality of support plates 340 between the inner wall of the air guiding cone 320 and the rotation shaft 330 enhances stability and firmness of connection between the air guiding cone 320 and the rotation shaft 330.

Further, in some embodiments, in order to increase connection stability between the air guiding cone 320 and the rotation shaft 330, the plurality of support plates 340 may be arranged around a periphery of the rotation shaft 330. In addition, the plurality of support plates 340 may be evenly distributed around the rotation shaft 330 to further enhance the connection stability between the air guiding cone 320 and the rotation shaft 330.

In an embodiment, as shown in FIGS. 11-4 and 11-6, the airflow assembly 300 further includes a sleeve 350 sleeving an outside of the rotation shaft 330. The support plates 340 are connected to the rotation shaft 330 via the sleeve 350.

In some embodiments, an end of the sleeve 350 may be connected to an end of the air guiding cone 320 connected to the rotation shaft 330. Since the rotation shaft 330 drives the air guiding cone 320 to rotate, connecting the sleeve 350 between the support plates 340 and the rotation shaft 330 provides vibration damping for the support plates 340, ensuring the connection stability between the support plates 340 and the air guiding cone 320.

In an embodiment, as shown in FIGS. 11-4 and 11-6, the rotation shaft 330, the sleeve 350, and the air guiding cone 320 are integrally formed.

It can be understood that the integral formation of the sleeve 350 and the rotation shaft 330 ensures connection stability between the sleeve 350 and the rotation shaft 330.

Specifically, a first end of the air guiding cone 320 near the air inlet cover 110 may be closed, and an end of the rotation shaft 330 may be integrally formed with the first end of the air guiding cone 320, enhancing connection stability between the air guiding cone 320 and the rotation shaft 330.

In an embodiment, as shown in FIGS. 11-2 and 11-4, the diameter of the circumcircle of the end surface of the air guiding portion 111 is greater than 5 mm and less than 12 mm.

The end surface of the air guiding cone 320 near the air inlet cover 110 is circular, and the diameter of the end surface of the air guiding cone 320 near the air inlet cover 110 is greater than 1 mm and less than 7 mm.

It can be understood that, when the diameter of the circumcircle of the end surface of the air guiding portion 111 is larger than the diameter of the end surface of the air guiding cone 320 near the air inlet cover 110, the air, which flows along the surface of the air guiding portion 111 and

towards the air duct formed by the air guiding cone 320 and the fan blades 310, may not be blocked or minimally blocked by the end surface of the air guiding cone 320 near the air inlet cover 110. In this way, most of the air guided by the air guiding portion 111 is guided into the air duct to improve the air outputting efficiency of the fan.

In addition, when the diameter of the circumcircle of the end surface of the air guiding portion 111 is large, the air guiding portion 111 serves as a support for the air inlet cover body 112, and stability of the air inlet cover body 112 is improved. When the diameter of the end surface of the air guiding cone 320 near the air inlet cover 110 is small, a size of the air guiding cone 320 is reduced, such that the air guiding cone 320 may occupy a reduced space in the first receiving cavity 120, and a size of the air duct formed in the airflow portion 100 is increased. In this way, a larger volume of air can be output through the airflow portion 100, improving the air outputting efficiency of the fan.

In an embodiment, as shown in FIGS. 11-4, the airflow assembly 300 further includes a sleeve ring 360 surrounding the rotation shaft 330. The sleeve ring 360 is disposed between the rotation shaft 330 and the sleeve 350.

It can be understood that the sleeve ring 360 disposed between the rotation shaft 330 and the sleeve 350 enhances firmness of the connection between the rotation shaft 330 and the sleeve 350, preventing slippage and increasing structural strength of the rotation shaft 330.

In an embodiment, as shown in FIG. 11-4, the sleeve ring 360 and the rotation shaft 330 are integrally formed as a one-piece structure.

It can be understood that the integral formation of the sleeve ring 360 and the rotation shaft 330 enhances stability of sleeved connection between the sleeve ring 360 and the rotation shaft 330 and further increases the structural strength of the rotation shaft 330.

Embodiment 12, referring to FIGS. 12-1 to 12-5:

As shown in FIGS. 12-1 to 12-3, FIG. 12-1 is a perspective view of a handheld fan according to an embodiment of the present application; FIG. 12-2 is a cross-sectional view of the handheld fan, taken along a line A-A, according to an embodiment of the present application; and FIG. 12-3 is another perspective view of the handheld fan according to an embodiment of the present application. The handheld fan includes: an air inlet cover 100, an air outlet cover 200, a first housing 300, a handle portion 400, and a fan module 500. The air inlet cover 100 includes a plurality of air guiding plates 110 that are connected to each other and are arranged radially around a preset axial direction. The preset axial direction is an axial direction extending from the air inlet cover 100 to the air outlet cover 200. An air intake gap is defined between every two adjacent air guiding plates 110. Each of the plurality of air guiding plates 110 protrudes away from the air

outlet cover 200.

The first housing 300 is connected between the air inlet cover 100 and the air outlet cover 200. The first housing 300, the air inlet cover 100 and the air outlet cover 200 cooperatively define a first receiving cavity.

An end of the handle portion 400 is connected to the first housing 300.

The fan module 500 is received in the first receiving cavity.

Specifically, the air inlet cover 100 and the air outlet cover 200 may be disposed opposite to each other to ensure an airflow channel to have a high efficiency of guiding an airflow.

Specifically, connection of plurality of air guiding plates 110 may be achieved by connecting first ends of the plurality of air guiding plates 110 to each other and connecting second ends of the plurality of air guiding plates 110 to each other.

Specifically, the handle portion 400 may be any structure that can be held by hand, which is not limited herein.

Specifically, the fan module 500 may be configured as any type of fan, such as an axial fan, a centrifugal fan, a mixed-flow fan, which is not limited herein.

It can be understood that the connection may be integral molding or connection via a connecting member, which is not limited here.

In the present embodiment, the air guiding plates 110 of the air inlet cover 100 protrude away from the air outlet cover 200, and the air guiding plates 110 are connected to each other and are arranged radially around the preset axial direction, such that the air inlet cover 100 is in overall protrude away from the air outlet cover 200. Compared to a situation where the air inlet cover is flat or concave away from the air outlet cover 200, the configuration in the present embodiment effectively increases an air intaking volume of the air inlet cover 100. Therefore, when the fan module 500 in the first receiving cavity operates, an increased volume of air can be drawn into the first receiving cavity through the air inlet cover 100 and delivered out the fan through the air outlet cover 200. In this way, an air intaking efficiency of the air inlet cover 100 and an air outputting efficiency of the air outlet cover 200 are improved, and a cooling efficiency of the handheld fan is improved.

In an embodiment, FIG. 12-4 is a perspective view of the air inlet cover 100 of the handheld fan according to an embodiment of the present application. The air inlet cover 100 further includes a first base 120 and a ring 130 that is surrounding the preset axial direction and is arranged on a periphery of the first base 120. A first end of the first base 120 away from the air outlet cover 200 is a closed end, and the other end of the first base 120 is an open end.

Specifically, the plurality of air guiding plates 110 are connected between the first base 120

and the ring 130, ensuring connection stability of between the air guiding plates 110. Furthermore, since the air guiding plates 110 surrounds and are arranged on the first base 120, connection between the air guiding plates 110 and the first base 120 ensures structural stability of the entire air inlet cover 100.

It can be understood that the closed first end of the first base 120 away from the air outlet cover 200 prevents air from entering an inner cavity of the first base 120. In this way, when the fan module 500 is operating, an impact on the first base 120, caused by a high air speed from the air inlet cover 100, can be avoided, and structural instability of the air inlet cover 100, caused by any impact on the first base 120, may be prevented.

In an embodiment, as shown in FIG. 12-4, the first base 120 is a hollow cylinder.

It can be understood that configuring the first base 120 to be hollow effectively reduces a weight of the handheld fan, increasing portability of the handheld fan. In addition, configuring the first base 120 to be hollow saves material for the first base 120, reducing manufacturing costs.

It can be understood that since the air guiding plates 110 are arranged around and disposed between the first base 120 and the ring 130, configuring the first base 120 to be the cylinder ensures that the plurality of air guiding plates 110 have a same shape and a same length. It is further ensured that air is uniformly distributed through the air inlet cover 100, and the air is uniformly output from the air outlet cover 200, avoiding uneven air output and improving user experience.

In an embodiment, as shown in FIG. 12-4, an end surface of the first end of the first base 120 is recessed inwardly with respect to an end surface of the ring 130 away from the air outlet cover 200.

It should be noted that the recessed end surface of the first base 120 refers to the end surface protruding towards the air outlet cover 200.

It can be understood that the recessed end surface of the first base 120 is recessed inwardly with respect to the end surface of the ring 130 away from the air outlet cover 200, and the air guiding plates 110 are connected between the first base 120 and the ring 130 and protrude towards the side away from the air outlet hood 200. Therefore, a protrusion amount of the air inlet cover 100 protruding towards the side away from the air outlet cover 200 is increased, the air intake area of the air inlet cover 100 is increased without changing a size of the handheld fan, the air intaking efficiency and the cooling efficiency of the handheld fan are improved.

In an embodiment, as shown in FIGS. 12-4, an inner diameter of the ring 130 is greater than an outer diameter of the first base 120, and the inner diameter of the ring 130 gradually decreases along an air outputting direction.

It can be understood that, as the inner diameter of the ring 130 is greater than the outer diameter of the first base 120, an air inlet channel is formed between the ring 130 and the first base 120, such that the air may enter the first receiving cavity through the air inlet channel. The gradually decreasing inner diameter of the ring 130 along the air outputting direction compresses the intaken air, increasing an air pressure and an air speed at the air inlet cover 100, improving the air intaking efficiency of the handheld fan.

In an embodiment, as shown in FIG. 12-4, the plurality of air guiding plates 110 are evenly distributed and are arranged around the first base 120 and are connected between the ring 130 and the first end of the first base 120.

It can be understood that evenly distributing the plurality of air guiding plates 110 around the first base 120 ensures an equal gap is formed between every two adjacent air guiding plates 110. Evenly distributing the plurality of air guiding plates 110 around the first base 120 enables the air inlet cover 100 to intake air more uniformly and stably, avoiding uneven air output and improving user experience.

Connecting the plurality of air guiding plates 110 between the ring 130 and the first end of the first base 120 prevents a part of the first base 120 from being disposed outside the first receiving cavity, such that the size of the handheld fan is not increased, and the handheld fan is more portable.

In an embodiment, as shown in FIG. 12-4, a width of each air guiding plate 110 gradually decreases along a direction from a periphery of the air inlet cover 100 towards a center of the air inlet cover 100.

It can be understood that the width of the air guiding plate 110 ensures structural stability during air guiding, and the gradually decreased width of the air guiding plate 110 saves material, such that manufacturing costs are reduced.

In an embodiment, as shown in FIG. 12-4, the first base 120, the ring 130, and the plurality of air guiding plates 110 are integrally formed as a one-piece structure.

It can be understood that the integral formation of the first base 120, the ring 130, and the plurality of air guiding plates 110 ensures structural stability of the air inlet cover 100 when the air inlet cover 100 is subject to an air inlet impact, such that the air intaking efficiency of the handheld fan is ensured.

In an embodiment, FIG. 12-5 is a perspective view of a first side wall of the handheld fan according to an embodiment of the present application, and in combination with FIGS. 12-1 and 12-4, the first housing 300 includes a first side wall 310 surrounding the periphery of the air inlet cover 100 along the preset axial direction.

An inner edge of the air inlet cover 100 is arranged with a plurality of first snaps 140.

An end of the first side wall 310 near the air inlet cover 100 defines first through holes 311 mated with the first snaps 140. Openings of the first through holes 311 are defined in a side away from the first side wall 310.

Each first snap 140 includes an insertion portion. A second end of the insertion portion is bent to form a chamfer and is disposed away from the air inlet cover 100.

By inserting the insertion portion along the air intaking direction into the first through hole 311 and snapping the chamfer with the inner wall of the first side wall 310, the first side wall 310 is connected to the air inlet cover 100.

It can be understood that an inner side of the air inlet cover 100 and an inner side of the first side wall 310 are sides near the first receiving cavity.

In some embodiments, as shown in FIGS. 12-4 and 12-5, a side edge of the first side wall 310 near the air inlet cover 100 may be arranged with a chamfered surface 313. The chamfered surface 313 extends towards the center of the air inlet cover 100. Connection between the first side wall 310 and the air inlet cover 100 is achieved through the chamfered surface 313 being connected to the air inlet cover 100. Specifically, in the present embodiment, the first through hole 311 may be defined in the chamfered surface 313 of the first side wall 310, such that the first snap 140 arranged on the inner edge of the air inlet cover 100 may be disposed on the inner side of the ring 130. By inserting the first snap 140 into the first through hole 311 and snapping the chamfer with the inner wall of the chamfered surface 313 of the first side wall 310, the air inlet cover 100 is connected to the first side wall 310 from the inside of the first receiving cavity. In this way, a connection structure between the air inlet cover 100 and the first side wall 310 is prevented from being damaged if the air inlet cover 100 and the first side wall 310 are connected to each other from the outside, such that integrity of the air inlet cover 100 and the first side wall 310 is ensured.

In an embodiment, as shown in FIGS. 12-4 and 12-5, the inner edge of the air inlet cover 100 is further arranged with a plurality of first insertion members 150.

An inner side of an end of the first side wall 310 near the air inlet cover 100 defines a plurality of second through holes 312 mated with the plurality of first insertion members 150.

By inserting and fixing the first insertion members 150 into the second through holes 312, the air inlet cover 100 and the first side wall 310 are connected to each other.

It can be understood that the inner side of the air inlet cover 100 and the inner side of the first side wall 310 are sides near the first receiving cavity.

In some embodiments, as shown in FIGS. 12-4 and 12-5, an edge of an end of the first side wall 310 near the air inlet cover 100 is arranged with the chamfered surface 313. The chamfered

surface 313 extends towards the center of the air inlet cover 100. Connection between the first side wall 310 and the air inlet cover 100 is achieved through the chamfered surface 313 being connected to the air inlet cover 100. Specifically, in the present embodiment, the first through hole 311 may be defined in the chamfered surface 313 of the first side wall 310, such that the first snap 140 arranged on the inner edge of the air inlet cover 100 may be disposed on the inner side of the ring 130. By inserting the first snap 140 into the first through hole 311 and snapping the chamfer with the inner wall of the chamfered surface 313 of the first side wall 310, the air inlet cover 100 is connected to the first side wall 310 from the inside of the first receiving cavity. In this way, a connection structure between the air inlet cover 100 and the first side wall 310 is prevented from being damaged if the air inlet cover 100 and the first side wall 310 are connected to each other from the outside, such that integrity of the air inlet cover 100 and the first side wall 310 is ensured.

Embodiment 13, referring to FIGS. 13-1 to 13-6:

As shown in FIGS. 13-1 to 13-6, a handheld fan is provided and can be easily disassembled and assembled, maintenance may be performed conveniently, and a service life of the handheld fan is extended.

Specifically, as shown in FIG. 13-1, FIG. 13-1 is a perspective view of the handheld fan according to an embodiment of the present application. The handheld fan includes: an airflow portion 10 and a handheld portion 20. As shown in FIGS. 13-2 to 13-3, the airflow portion 10 includes a first inner shell 101, a second inner shell 102 engaged with the first inner shell 101, and an outer shell 103. A side of the first inner shell 101 facing the second inner shell 102 is arranged with a plurality of protruding structures 1010 that are distributed evenly. The second inner shell 102 defines a plurality of recessed structures 1020 corresponding to the plurality of protruding structures 1010. The protruding structures 1010 are engaged with the recessed structures 1020 correspondingly. The outer shell 103 covers the first inner shell 101 and the second inner shell 102 to receive the first inner shell 101 and the second inner shell 102. By arranging the protruding structures 1010 on the outer wall edge of the first inner shell 101 facing the second inner shell 102 and the corresponding recessed structures 1020 on the second inner shell 102, the protruding structures 1010 can be tightly engaged with the recessed structures 1020, ensuring tight connection between the first inner shell 101 and the second inner shell 102 and facilitating easy assembling and disassembling between the first inner shell 101 and the second inner shell 102. By arranging the protruding structures 1010 and the recessed structures 1020, the first inner shell 101 and the second inner shell 102 may be easily to disassembled and assembled when maintenance is needed, and maintenance may be performed conveniently.

Further, a fan base 111 is arranged inside the second inner shell 102, and a fan impeller 112

is arranged on a side of the fan base 111 facing the first inner shell 101. The fan impeller 112 is arranged with a conical cavity. A bearing 113 is received in the conical cavity. A motor rotation shaft 114 is arranged inside the bearing 113 and is connected to a motor 115. The bearing 113 surrounds a periphery of the motor shaft 114. When the motor rotation shaft 114 rotates, the bearing 113 effectively reduces an axial offset caused by rotation of the motor rotation shaft 114, ensuring the stability of the motor shaft 114 during rotation and overall stability of the handheld fan during operation.

Specifically, a rear side of the fan base 111 defines a receiving cavity 123, and an air outlet portion 121 is arranged between an outside of the receiving cavity 123 and an inner side of the first inner shell 101. Connecting plates 1230 are arranged on an outer wall of the receiving cavity 123 and are spaced apart from each other. The connecting plates 1230 are connected to an inner wall of the second inner shell 102. The connecting plates 1230 enhance stability between the second inner shell 102 and the receiving cavity 123, improving stability of the fan base 111 during operation.

Further, as shown in FIG. 13-4, a first circuit board 116 is arranged at a rear side of the fan base 111, a second circuit board 204 is arranged inside the handheld portion 20. The fan base 111 defines a first wire channel 117 in a radial direction thereof. The first wire channel 117 is configured to receive wires connecting from the first circuit board 116 to the second circuit board 204. The wires are led out from the first circuit board 116 to the second circuit board 204. The handheld portion 20 is arranged with the second circuit board 204, facilitating wire arrangement. The first wire channel 117 ensures that the wires are not easily bent when connecting circuit boards, extending a service life of the wires. The wires extend along an outside of the fan impeller 112 to be connected to the second circuit board 204 and is prevented from touching the fan impeller 112, such that the wires may not be scratched, and short circuits or poor contact are prevented. During assembly, a middle part of the wires is placed in the first wire channel 117, effectively utilizing a space. Due to an internal space being limited, a space is reserved, and the wires are prevented from damages during assembly.

Specifically, as shown in FIG. 13-5, the handheld portion 20 is arranged with a first connector 203. The airflow portion 10 is arranged with a second connector 105. The airflow portion 10 and the handheld portion 20 are connected to each other via a fixing member 131. The fixing member 131 passes through the first connector 203 and the second connector 105 to connect the airflow portion 10 with the handheld portion 20. A part of the handheld portion 20 is embedded in the airflow portion 10. By embedding the part of the handheld portion 20 in the airflow portion 10 and connecting the first connector 203 with the second connector 105 via the fixing member 131,

overall stability of the handheld fan during use is ensured. For example, the fixing member 131 may be a screw or any other type of fixing member for connecting the airflow portion 10 with the handheld portion 20. A specific type of the fixing member is not limited herein.

Further, as shown in FIG. 13-6, an outer wall of the first inner shell 101 and an outer wall of the second inner shell 102 define a plurality of connecting grooves, and the plurality of connecting grooves are distributed along an axial direction. An inner wall of the outer shell 103 is arranged with a plurality of connecting protrusions 1031 corresponding to the connecting grooves. The connecting grooves and the connecting protrusions 1031 are mated with each other to guide the first inner shell 101 and the second inner shell 102 to be connected to the outer shell 103, and at the same time, rotation of the outer shell 103 with respect to the first inner shell 101 and the second inner shell 102 is prevented, connection stability of the first inner shell 101 and the second inner shell 102 being connected to the outer shell 103 is improved.

Specifically, the airflow portion 10 further includes an air inlet cover 104 covering the second inner shell 102. The air inlet cover 104 is arranged with a ring-shaped protrusion protruding towards an outside. A height of the protrusion is higher than a center of the air inlet cover 104. A gap is formed between the air inlet cover 104 and the fan impeller 112. By defining the gap between the air inlet cover 104 and the fan impeller 112, an air guiding effect is improved. For the air inlet cover 104 in the present embodiment, a plurality of connecting bars are arranged in a scattering pattern, scattering from a central axis towards an edged region, a gap is formed between every two adjacent connecting bars, the air inlet cover 104 has an opening. Each connecting bar is arc-shaped, and an opening of the arc-shaped connecting bar faces the fan impeller 112. By arranging the air inlet cover 104 formed from the arc-shaped connecting bars, a resistance during intaking the air is effectively reduced, improving the air intaking effect of the air inlet cover 104 and enhancing user experience. In other embodiments, the air inlet cover 104 defines a plurality of round, square, or other shaped holes.

Further, a display screen 122 is received in the receiving cavity 123. The air outlet portion 121 surrounds a periphery of the display screen 122. While in use, the display screen 122 displays a remaining battery power level, a current air speed, and a battery level.

Specifically, the first inner shell 101 is trapezoidal. A plurality of trapezoidal cavities are defined in an outer inclined surface of the first inner shell 101 and are spaced apart from each other. By defining the plurality of trapezoidal cavities, vibration of the outer shell 103 caused by rotation of the fan impeller 112 is reduced, improving user experience.

Further, the handheld portion 20 further includes a bracket 201 and a battery 202 arranged inside the bracket 201. The battery 202 is electrically connected to the motor 115 and the display

screen 122. While in use, the battery 202 supplies power to the motor 115 to drive the fan impeller 112 to rotate and operate and supplies power to the display screen 122 to display the remaining battery power level, the current air speed, and the battery level.

Embodiment 14, referring to FIGS. 14-1 to 14-7:

As shown in FIGS. 14-1 to 14-7, a handheld fan is provided, where vibration caused by the fan impeller during operation is reduced, and noise generated by the vibration transmitted to the housing is reduced. As shown in FIG. 14-1, the handheld fan includes an airflow portion 10 and a handheld portion 20. FIG. 14-2 is an exploded view of the handheld fan, wherein the airflow portion 10 includes an outer housing 11 and an inner housing 12 detachably connected to outer housing 11. The outer housing 11 defines a first receiving cavity 111 for receiving the inner housing 12, and the inner housing 12 defines a second receiving cavity 121 for receiving a airflow assembly 30. A vibration damping structure 40 is disposed between the outer housing 11 and the inner housing 12.

Specifically, the outer housing 11 and the inner housing 12 are detachably assembled with each other. The inner housing 12 is received in the first receiving cavity 111 of the outer housing 11, and the airflow assembly 30 is received in the second receiving cavity 121 of the inner housing 12. While using the handheld fan, rotation of the airflow assembly 30 causes vibration of the inner housing 12, and the vibration damping structure 40 disposed between the outer housing 11 and the inner housing 12 effectively reduces transmission of vibration from the inner housing 12 to the outer housing 11, such that noise while using the handheld fan is reduced.

Further, the vibration damping structure 40 is snap-fitted to an inner side of the outer housing 11 and is arranged around a periphery of the inner housing 12. In the present embodiment, the outer housing 11 and the inner housing 12 are detachably connected to each other, and the vibration damping structure 40 is snap-fitted to the inner side of the outer housing 11. The vibration damping structure 40 abuts against the inner side of the outer housing 11. In this way, the vibration generated in the inner housing 12 may be eliminated. Snap-fitting the vibration damping structure 40 to the inner side of the outer housing 11 facilitates easy disassembly, allowing the outer housing 11, inner housing 12, and the air inlet cover 50 to be cleaned conveniently.

Furthermore, the damping structure 40 is integrally formed with the inner housing 12, effectively reducing the transmission of vibration from the inner housing 12 to the outer housing 11 while the airflow assembly 30 is rotating. Furthermore, integral formation of the damping structure 40 and the inner housing 12 simplifies an overall structure of the handheld fan. Therefore, an assembling process of the handheld fan is simplified, improving a production efficiency.

Further, as shown in FIG. 14-3, showing a schematic view of the airflow portion, the vibration damping structure 40 includes at least two trapezoidal protrusions, and the at least two trapezoidal protrusions are spaced apart from each other with an equal interval. The number of the at least two trapezoidal protrusions is determined based on diameters of the outer housing 11 and the inner housing 12, which is not limited herein.

Specifically, in the present embodiment, the vibration damping structure 40 is configured as trapezoidal protrusions. A side of the trapezoidal having a wider cross section faces the outer housing 11, and a side of the trapezoidal having a narrower cross section faces the inner housing 12. The trapezoidal protrusions abuts against the inner side of the outer housing 11, effectively buffering the vibration transmitted from the inner housing 12 to the outer housing 11 while the airflow assembly 30 is rotating, such that a vibration damping effect is achieved.

Moreover, each trapezoidal protrusion is hollow, and an end of the trapezoidal protrusion snap-fitted to the outer housing 11 defines a through hole 41 for ventilation. The hollow trapezoidal protrusion reduces a weight of the trapezoidal protrusion, such that the handheld fan is lighter. Furthermore, hollow trapezoidal protrusion allows a certain space to be left for receiving elastic deformation during the outer housing 11 and the inner housing 12 rotating with respect to each other, enhancing stability of connection between the outer housing 11 and the inner housing 12. The through hole 41 defined in the end of the trapezoidal protrusion snap-fitted to the outer housing 11 ensures that the through hole 41 is not blocked while the vibration damping is achieved.

Further, FIG. 14-4 shows a cross-sectional view of the handheld fan of the present embodiment. The airflow portion 10 further includes an air inlet cover 50 snap-fitted to the inner housing 12. The air inlet cover 50 includes an air inlet plate 501 and a fixing ring 502 snap-fitted around a periphery of the air inlet plate 501. An air duct is formed between the air inlet plate 501 and the airflow assembly 30 and is located within the second receiving cavity 121.

Specifically, the airflow assembly 30 is received in the second receiving cavity 121. While the airflow assembly 30 is operating, air from the air inlet plate 501 is directed out of the second receiving cavity 121, such that the air duct is formed, the air is outputted more uniformly, and the air outputting efficiency of the handheld fan is improved.

Further, as shown in FIG. 14-5, FIG. 14-5 is a schematic view of the airflow assembly according to an embodiment of the present application. The airflow assembly 30 includes a drive motor 31 and an impeller assembly 32. The impeller assembly 32 includes a conical cavity 321 and fan blades 322 arranged around a periphery of the conical cavity 321. A motor bearing 311 is received in the conical cavity 321 and sleeved an outside of the drive motor 31. The motor bearing 311 ensures stability of the drive motor 31 during high-speed rotation and ensuring the overall

stability of the handheld fan during operation.

Specifically, in the present embodiment, when the user is using the handheld fan, the blades 322 is driven by the drive motor 31 to rotate, directing air from the air inlet cover 50 into the air duct inside the second receiving cavity 121 and outputting the air out of the fan through the air outlet. The user may direct the airflow to a desired body portion for rapid cooling, such that the usage experience is improved.

A maximum outer diameter of the impeller assembly 32 is smaller than a maximum outer diameter of the air inlet cover 50. In this way, most of the impeller assembly 32 is covered, a better appearance is provided, fingers or hair are prevented from being pinched, improving user experience. A maximum outer diameter of the outer housing 11 is equal to that of the air inlet cover 50,, ensuring a size of the air inlet cover 50 matching with a size of the outer housing 11, and ensuring stable and secure mounting.

Further, as shown in FIG. 14-6, FIG. 14-6 is a schematic view of the impeller assembly according to an embodiment of the present application. The fan blades 322 are inclined, an inclined air duct 323 is formed between every two adjacent fan blades 322. The inclined air duct 323 guides the air from the air inlet cover 50 into the air duct. The inclined fan blades 322 increases a volume of the airflow, reduces noise, and the handheld fan may have a compact structure and is portable.

Further, as shown in FIG. 14-7, FIG. 14-7 is a schematic view of connection between the handheld portion and the airflow portion according to an embodiment of the present application. The handheld portion 20 is arranged with a first connector 21, and the airflow portion 10 is provided with a second connector 13. The handheld portion 20 and the airflow portion 10 are connected via a fixing member 22. The fixing member 22 passes through the first connector 21 and the second connector 13 to fix the handheld portion 20 with the airflow portion 10. For example, the fixing member 22 may be a screw or any other type of fixing member for connecting the airflow portion 10 with the handheld portion 20, which will not be limited herein.

The handheld fan includes the airflow portion and the handheld portion. The airflow portion includes the outer housing and the inner housing detachably connected to the outer housing. The outer housing includes a first receiving cavity for receiving the inner housing, and the inner housing includes a second receiving cavity for receiving the airflow assembly. A vibration damping structure is disposed between the outer housing and the inner housing. While using the handheld fan, rotation of the airflow assembly causes vibration of the inner housing, and the vibration damping structure disposed between the outer housing and the inner housing effectively reduces transmission of vibration from the inner housing to the outer housing, such that noise

while using the handheld fan is reduced, and the usage experience is improved.

Embodiment 15, referring to FIGS. 15-1 to 15-6:

As shown in FIGS. 15-1 to 15-6, a handheld fan is provided and has a small size and an ideal air outputting effect, and a high cooling efficiency is achieved.

Specifically, as shown in FIG. 15-1, the handheld fan includes an airflow portion 10 and a handheld portion 20. As shown in FIGS. 15-2 to 15-3, the airflow portion 10 includes a first inner housing 101 and a second inner housing 102 that is snap-fitted with first inner housing 101. The first inner housing 101 is disposed near an air inlet side, and the second inner housing 102 is disposed near an air outlet side. A fan base 111 is arranged inside the second inner housing 102, a fan impeller 112 is arranged on a side of the fan base 111 facing the first inner shell 101. The fan impeller 112 is arranged inside the first inner housing 101. An end of the first inner housing 101 near the air inlet side extends beyond an end of the fan impeller 112 near the air inlet side. By arranging the fan impeller 112 inside the first inner housing 101 and arranging the end of the first inner housing 101 near the air inlet side to extend beyond the end of the fan impeller 112 near the air inlet side, an air intake channel is formed between the fan impeller 112 and the air inlet side, improving an air guiding efficiency. The fan impeller 112 is arranged inside the first inner housing 101, such that the intaken air may flow along the fan impeller 112 to be converged at the air outlet side to flow out of the fan, enhancing the air outputting effect of the handheld fan.

Further, the first inner housing 101 is a trapezoidal structure, and an outer inclined surface of the first inner housing 101 defines a plurality of trapezoidal cavities 1011 that are annularly distributed and are spaced apart from each other. A side of the first inner housing 101 facing the second inner housing 102 is arranged with a plurality of protrusions 1010 that are distributed evenly. The second inner housing 102 defines a plurality of recesses 1020 corresponding to the plurality of protrusions 1010. The trapezoidal cavities 1011 reduce overall vibration of the airflow portion 10 during rotation of the fan impeller 112, improving user experience. The protrusions 1010 and the recesses 1020 are tightly engaged with each other, such that the first inner shell 101 and the second inner shell 102 are tightly fastened to each other, and convenient assembling and disassembling between the first inner housing 101 and the second inner housing 102 can be achieved. By arranging the protrusions 1010 and the recesses 1020 to achieve assembling and disassembling between the first inner housing 101 and the second inner housing 102, disassembling and assembling for maintenance may be achieved easily, and the maintenance can be performed conveniently.

Specifically, the airflow portion 10 further includes an outer housing 103 sleeving the first inner housing 101 and the second inner housing 102. Outer walls of the first inner housing 101

and the second inner housing 102 define a plurality of connection grooves that are arranged along an axial direction. An inner wall of the outer housing 103 is arranged with a plurality of connection protrusions mated with the plurality of connection grooves. Mating between the connection grooves and the connection protrusions guides the first inner housing 101 and the second inner housing 102 to be connected to the outer housing 103, preventing the outer housing 103 from rotating relative to the first inner housing 101 and the second inner housing 102, and improving stability of the first inner housing 101 and the second inner housing 102 being connected to the outer housing 103.

Further, the fan impeller 112 includes a conical cavity, and a bearing 113 is received in the conical cavity. A motor rotation shaft 114 is inserted into the bearing 113 and connected to a motor 115. The bearing 113 surrounds an outside of the motor rotation shaft 114. When the motor rotation shaft 114 rotates, the bearing 113 reduces axial deviation caused by rotation of the motor rotation shaft 114, ensuring stability of the motor shaft 114 during rotation and ensuring the overall stability of the handheld fan during operation.

Specifically, the airflow portion 10 further includes an air inlet cover 104 sleeving the second inner housing 102. The air inlet cover 104 includes an annular protrusion extending outwardly, a height of the protrusion is higher than a center of the air inlet cover 104. A gap is formed between the air inlet cover 104 and the fan impeller 112, improving an air guiding efficiency. For the air inlet cover 104 in the present embodiment, a plurality of connecting bars are arranged in a scattering pattern, scattering from a central axis towards an edged region, a gap is formed between every two adjacent connecting bars, the air inlet cover 104 has an opening. Each connecting bar is arc-shaped, and an opening of the arc-shaped connecting bar faces the fan impeller 112. By arranging the air inlet cover 104 formed from the arc-shaped connecting bars, a resistance during intaking the air is effectively reduced, improving the air intaking effect of the air inlet cover 104 and enhancing user experience. In other embodiments, the air inlet cover 104 defines a plurality of round, square, or other shaped holes.

Further, an outer side of the first inner housing 101 is arranged with an air outlet portion 121, and a rear side of the fan base 111 defines a receiving cavity 123 receiving a display screen 122. The air outlet portion 121 surrounds the display screen 122, and the display screen 122 displays an air speed and a battery power level.

Specifically, an outer wall of the receiving cavity 123 is arranged with a plurality of connection plates 1230 that are spaced apart from each other. The plurality of connection plates 1230 are connected to an inner wall of the second inner housing 102. By arranging the connection plates 1230 between the outer wall of the receiving cavity 123 and the inner wall of the second

inner housing 102, vibration, which is caused by operation of the motor 115 connected to the fan base 111, is reduced, such that stability of the fan base 111 during operation is improved.

Further, as shown in FIG. 15-4, the handheld portion 20 is arranged with a first connector 203, and the airflow portion 10 is arranged with a second connector 105. The airflow portion 10 and the handheld portion 20 are connected to each other via a fixing member 131. The fixing member 131 passes through the first connector 203 and the second connector 105 to secure the airflow portion 10 with the handheld portion 20. A part of the handheld portion 20 is embedded within the airflow portion 10. By embedding the part of the handheld portion 20 within the airflow portion 10 and connecting the first connector 203 with the second connector 105 via the fixing member 131, ensuring overall stability of the handheld fan while in use. For example, the fixing member 131 may be a screw or any other type of fixing member for connecting the airflow portion 10 with the handheld portion 20, which will not be limited herein.

Specifically, as shown in FIG. 15-5, a first circuit board 116 is arranged at a rear side of the fan base 111, the fan base 111 defines a first wire channel 117 in a radial direction thereof. A wire is led out from the first circuit board 116 to a second circuit board. The second circuit board 204 is arranged inside the handheld portion 20. In this way, wire arrangement can be performed easily. The first wire channel 117 ensures that the wire is not easily bent when connecting circuit boards, extending a service life of the wire. The wire extend along an outside of the fan impeller 112 to be connected to the second circuit board 204 and is prevented from touching the fan impeller 112, such that the wires may not be scratched, and short circuits or poor contact are prevented. During assembly, a middle part of the wires is placed in the first wire channel 117, effectively utilizing a space. Due to an internal space being limited, a space is reserved, and the wires are prevented from damages during assembly.

Further, as shown in FIG. 15-6, the handheld portion 20 further includes a bracket 201 and a battery 202 mounted inside the bracket 201. The battery 202 is electrically connected to the motor 115 and the display screen 122. While in use, the battery 202 supplies motor 115 to drive the fan impeller 112 to rotate and supplies power to the display screen 122 to display the remaining battery power level, the current air speed, and the battery power level.

Embodiment 16, referring to FIGS. 16-1 to 16-7:

In FIG. 16-1:

A motor drive control circuit for a portable fan includes: a battery power supply, a voltage regulator unit 100, a master control unit 200, a motor drive control unit 300, a motor drive circuit 400, a motor 500, a rotor position detection circuit 600, a USB access circuit 700, an analog-to-digital converter (ADC) power supply circuit 800, and a display unit 900.

The portable fan includes: a hand-held fan, a neck fan, a wearable fan, a waist-mounted fan, a head-mounted fan, a desktop fan, a vehicle-mounted fan, and so on.

In FIG. 16-2:

The voltage regulator unit 100 includes a voltage regulator chip U1, and a power supply voltage VBAT is connected to an IN input pin of the voltage regulator chip U1 through a current limiting resistor R1; an end of a filtering capacitor C1 is connected to the IN input pin 1 of the voltage regulator chip U1, and the other end of the filtering capacitor C1 is grounded; an OUT output pin of the voltage regulator chip U1 is configured to output a VDD operating voltage, for supplying power to a master control chip U2 and a motor driver chip U3; the OUT output pin of the voltage regulator chip U1 is grounded through a capacitor C2 to filter current; a GND pin of the voltage regulator chip U1 is grounded.

The voltage regulator unit 100 is configured to stabilize the power supply voltage and ensure that a constant voltage is output under different load conditions, where the output voltage may be kept constant by automatically adjusting the current according to changes in the power supply voltage. The voltage regulator unit 100 is configured to stabilize a voltage source with large variations to prevent influences of external environmental factors (e.g., temperature, humidity, etc.) on the circuit.

In FIG. 16-3:

In an embodiment, the motor drive control unit 300, the motor drive circuit 400, and the rotor position detection circuit 600 operate cooperatively to drive the operation of the motor 500.

A permanent magnet is arranged on a rotor of the motor 500, and three windings U2, V2, and W2 are arranged on a stator of the motor 500 in the form of a Y-type connection.

The motor drive control unit 300 is configured to output a control signal, and the motor drive circuit 400 is configured to control the magnitude, flow direction, and phase relationship of a current flowing through each phase of the windings U2, V2, and W2 of the motor 500 according to a control signal.

The motor drive circuit 400 includes: capacitors C3, C4, and C5 connected in parallel, with an end being connected to the power supply voltage VBAT, and the other end being grounded to filter the current and stabilize the voltage.

In some embodiments, the motor drive circuit 400 further includes: a MOS tube switch Q1, with an end being connected to the power supply voltage VBAT, and the other end being connected to the winding U2. The turning-on of the MOS tube switch Q1 is controlled by a MOS tube switch Q4, with an end of the MOS tube switch Q4 being connected to the power supply voltage VBAT through a voltage divider current limiting resistor R5, and the other end of the

MOS tube switch Q4 being grounded. The motor drive control unit 300 is configured to output a PWM_AH signal to a drain of the MOS tube switch Q4 to control the turning-on of the MOS tube switch Q4. An end of a MOS tube switch Q7 is connected to the winding U2, and the other end of the MOS tube switch Q7 is grounded through a resistor R11. The motor driver control unit 300 is configured to output a PWM_AL signal to a drain of MOS tube switch Q7 to control the turning-on of the MOS tube switch Q7. A reverse diode is arranged on each of the MOS tube switches Q1, Q4, and Q7 to prevent the MOS tubes from being burned out by the diodes being broken down in reverse before the overvoltage causes damage to the MOS tubes.

In some embodiments, the MOS tube switch Q1 is a P-type MOS tube, and the MOS tube switches Q4 and Q7 are N-type MOS tubes. A resistor R2 is connected to the drain and source of the MOS tube switch Q4, and a resistor R8 is connected to the drain and source of MOS tube switch Q7 to provide a bias voltage for the field effect tubes. Further, an electrostatic charge between the gate and source of the MOS tubes may be discharged to protect the MOS tubes.

The current control principle of the winding U2 is as follows.

The current flowing into the winding U2: the motor drive control unit 300 outputs a PWM_AL low-level signal to the drain of the MOS tube switch Q7, and the MOS tube switch Q7 is in a turned-off state; the motor drive control unit 300 outputs a PWM_AH signal to the drain of the MOS tube switch Q4, and the MOS tube switch Q4 is in a turned-on state; the power supply voltage VBAT is grounded through the voltage divider current limiting resistor R5; the drain of the MOS tube switch Q1 is grounded to input a low-level signal, and the MOS tube switch Q1 is in a turned-on state; the current flows into the winding U2.

The current flowing out of the winding U2: the motor drive control unit 300 outputs a PWM_AH low-level signal to drain of the MOS tube switch Q4, the MOS tube switch Q4 is in a turned-off state; the drain of the MOS tube switch Q1 is connected to a high-level signal, and the MOS tube switch Q1 is turned off; the motor drive control unit 300 outputs a PWM_AL signal to the drain of the MOS tube switch Q7, the MOS tube switch Q7 is turned on, and the current flows out of the winding U2.

In some embodiments, for a MOS tube switch circuit formed by MOS tube switches Q2, Q5, Q8 and resistors R6, R3, R9 for controlling the current to flowing into and out of the winding V2, its circuit structure and control principle are similar to that of the current control circuit of the winding U2; for a MOS tube switch circuit formed by MOS tube switches Q3, Q6, Q9 and resistors R7, R4, R10 for controlling the current to flowing into and out of the winding W2, its circuit structure and control principle are similar to that of the current control circuit of the winding U2.

In some embodiments, a motor overcurrent protection circuit includes: a current sampling resistor R11 for monitoring the current flowing out of the motor 500; the voltage of the resistor R11 is configured to be output to an ISENSE_IN overcurrent protection detection pin of the motor drive control unit 300 through a current limiting resistor R12, and the motor drive control unit 300 is configured to convert the input voltage signal into a corresponding digital signal to obtain a quantized current value of the motor 500; an end of a capacitor C6 is connected to the ISENSE_IN overcurrent protection detection pin of the motor drive control unit 300, and the other end of the capacitor C6 is grounded to filter the current and stabilize the voltage; when the current value of the motor 500 exceeds a maximum operating current, the motor drive control unit 300 adjusts a control signal outputted to the motor drive circuit 400 to reduce the current flowing through the windings U2, V2, and W2 of the motor 500.

In FIG. 16-4:

In some embodiments, in the rotor position detection circuit 600, an end of a resistor R13 is connected to a BEMF_COM pin of the motor drive control unit 300, and the other end of the resistor R13 is grounded through a resistor R19; the winding U2 is connected to a BEMF_U pin of the motor drive control unit 300 through a resistor R14, and the other end of the resistor R14 is grounded through the resistor R19.

For a BEMF counter-electromotive force output circuit formed by resistors R15, R16, R20 for outputting a BEMF counter-electromotive force voltage signal of the winding V2, its circuit structure and control principle is similar to that of the BEMF counter-electromotive force output circuit of the winding U2. For a BEMF counter-electromotive force output circuit formed by resistors R17, R18, R21 for outputting a BEMF counter-electromotive force voltage signal of the winding W2, its circuit structure and control principle is similar to that of the BEMF counter-electromotive force output circuit of the winding U2.

The motor drive control unit 300 is configured to monitor line voltages of the windings U2, V2, and W2 by means of signals inputted through the BEMF_U, BEMF_V, and BEMF_W pins, and calculate the counter-electromotive force of the rotor of the motor 500, thereby calculating and obtaining the position of the rotor of the motor 500.

The driving control principle of the motor 500 is as follows.

The master control unit 200 outputs a motor start signal to an input end of the motor drive control unit 300, and the motor drive control unit 300 outputs a motor drive signal to the gate of the MOS tube of the motor drive circuit 400; the motor drive control unit 300 obtains the current position of the rotor of the motor 500 by means of the counter-electromotive force, controls the phase relationship of the outputs of each phase, and energizes corresponding two-phase windings

each time, with the energizing time of each phase of the windings being a 120-degree electrical angle, so as to make the direction of the stator magnetic chain at an angle to the direction of the rotor magnetic chain, thereby driving the rotation of the rotor of the motor 500.

In FIG. 16-5:

In some embodiments, the motor drive control unit 300 includes a motor drive chip U3, where a VDD power supply pin 12 of the motor drive chip U3 is connected to the VDD operating voltage, and a capacitor C7 is connected to the VDD power supply pin 12 of the motor drive chip U3 to filter the current and stabilize the voltage; a GND pin 5 of the motor drive chip U3 is grounded; a PWM pin 11 of the motor drive chip U3 is configured to receive a motor operation pulse modulation signal PWM, and pins 1-3 and 14-16 of the motor driver chip U3 are each configured to output a motor drive signal to the gate of the MOS tube of motor driver circuit 400; pins 6-8 of the motor driver chip U3 is configured to receive reverse electromotive force signals BEMF_U, BEMF_V, and BEMF_W; a FG pin 13 of the motor driver chip U3 is configured to output motor rotation speed information; an ISENSE_IN pin 9 of the motor driver chip U3 is configured to receive an overcurrent protection signal.

In FIGS. 16-6 to 16-7:

In some embodiments, the USB access circuit 700 includes: a USB voltage VBUS for outputting a USBDET signal through a current limiting resistor R22; and a diode D2, with a positive end being grounded and a negative end being connected to the USB voltage VBUS through the resistor R22, to realize over-voltage protection of the master control unit.

In some embodiments, the battery voltage detection ADC circuit 800 includes: a battery voltage VBAT grounded through resistors R23 and R24, and a capacitor C8 connected in parallel with the resistor R24; an end of the resistor R24 is configured to output an ADC voltage signal V_ADC.

In some embodiments, the motor drive control circuit of the portable fan is arranged with a transfer interface P2; the transfer interface P2 is configured to transmit a P_EN enable signal and gear adjustment signals KEY, KEY_X, KEY_Y of a dip switch to the master control unit 200 of the portable fan, and the VDD power supply is connected to a mode switching roller through current limiting resistors R25, R26.

In some embodiments, the display unit 900 includes: an SMG switch interface and a digital display; adapter interface pins 1-5 of the SMG switch are connected to the master control unit 200 through current limiting resistors R25-R29, for receiving a display control signal and transmitted it to the digital display; the digital display is configured to display an air feeding temperature and remaining power percentage of the portable fan according to the display control signal.

In some embodiments, the master control unit 200 includes a control chip U4, a VDD power supply pin 1 of the control chip U4 is connected to the VDD operating voltage, the VDD power supply pin 1 of the control chip U4 is grounded through a voltage regulator capacitor C9; a VSS pin 16 of the control chip U4 is grounded; pins 4, 6, and 7 of the control chip U4 is configured to receive gear adjustment signals KEY, KEY_X, KEY_Y and send a fan operation status command; a pin 5 of the control chip U4 is configured to output a motor operation pulse modulation PWM signal to the motor driver chip U3; a pin 8 of the control chip U4 is configured to receive a USBDET signal to determine a power supply status; a pin 9 of the control chip U4 is configured to receive an ADC voltage signal V_ADC; pins 2, 12-15 of the control chip U4 are connected to the display unit 900 to output the display control signal.

Embodiment 17, referring to FIGS. 17-1 to 17-5:

In FIG. 17-1:

A battery boost charging circuit for a portable fan includes: a USB interface, a boost module, a boost charging management module, a charging voltage preset module, a charging status indication module, and an over-temperature protection module.

The portable fan includes: a hand-held fan, a neck fan, a waist-mounted fan, a head-mounted fan, a desktop fan, a vehicle-mounted fan, etc.

The USB interface includes an interface J1, and the boost charging management module includes a charging chip U1.

In FIG. 17-2:

In some embodiments, the boost charging management module has the following features: the charging chip U1 integrates a power MOS tube and a synchronous boost circuit.

The boost module circuit includes: an inductor L1, with an end being connected to a USB voltage VBUS, and the other end being connected to an LX external inductor pin 8 of the charging chip U1; a BST bootstrap capacitor pin 7 of the charging chip U1 being connected to the pin 8 through a bootstrap capacitor C2, where the bootstrap capacitor C2 is configured to raise a DC bias voltage in an amplifier circuit and enhance the amplitude of an output signal; an LX external inductor pin 8 of the charging chip U1 being grounded through a resistor R1 and a capacitor C1, where the resistor R1 and capacitor C1 are connected in series to form an RC circuit configured to filter out a high-frequency signal; an current-limiting resistor R2, with an end being connected to the USB voltage VBUS, and the other end being connected to a VIN power supply input pin 6 of the charging chip U1 to introduce an input voltage, where the VIN power supply input pin 6 of the charging chip U1 is grounded through a capacitor C4 to filter out the current; a regulator capacitor C5, with an end being connected to the USB voltage VBUS, and the other end being

grounded. The boost charging circuit is configured to boost-charge a BAT battery through the boost module.

The battery boost charging circuit for a portable fan is further arranged with a voltage regulator filter circuit, including the following. A VOUT boost output pin 2 of the charging chip U1 outputs a charging voltage to charge the BAT battery. Filter capacitors C3, C6 are connected in parallel with each other, where an end is connected to the VBAT voltage, and the other end is grounded. The boost module NC (normally closed) is arranged with the diode D1, where a positive end of the diode D1 is grounded, and a negative end of the diode D1 is connected to the VBAT.

Capacitor C7, C8, C9 are connected in parallel with each other, where an end is connected to a VSYS boost output intermediate node pin 1 of the charging chip U1, and the other end is grounded. By arranging the voltage regulator filter circuit in the charging output filter current, the voltage is stabilized.

A Pin 0 of the charging chip U1 is grounded.

The working principle of the boost module is as follows.

After the MOS tube of the charging chip U1 connected to the inductor L1 is turned on, the inductor L1 is grounded, and the inductor L1 begins to store energy with the increase in current within the inductor L1; after the MOS tube of the charging chip U1 connected to the inductor L1 is turned off, the inductor L1 releases the stored energy, in which case the inductor L1 is connected in series and superimposed with the USB voltage VBUS to play a boosting effect, for charging the BAT battery through the synchronous boost circuit; the MOS tube of the charging chip U1 is controlled by its internal logic, and when the charging chip U1 is not working, the MOS tube shuts down the chip output to prevent the risk of leakage.

In FIG. 17-3:

In some embodiments, the charging voltage preset module has the following features: a resistor R3 is arranged, with an end being connected to a VSET voltage setting pin 4 of the charging chip U1, and the other end being grounded; the charging chip U1 is configured to determine how much charging voltage is to be output according to a detected electrical signal of a R4. The battery boost charging circuit is configured to set the charging voltage through the charging voltage preset module.

In some embodiments, the over-temperature protection module has the following features: an end of the thermistor R4 is connected to an NTC thermistor pin 3 of the charging chip U1, and the other end of the thermistor R4 is grounded; the charging chip U1 is configured to determine the battery temperature by detecting the voltage of the thermistor R4, so as to realize the over-temperature protection function of the charging module. The battery boost charging circuit can

thereby realize the over-temperature protection function through the over-temperature protection module.

In some embodiments, the charging status indication module has the following features: a resistor R5 is arranged, with an end being connected to a LED charging indicator pin 5 of the charging chip U1, and the other end being grounded, where the LED charging indicator pin 5 of the charging chip U1 is configured to output a charging status signal PG. The battery boost charging circuit is configured to output and display the charging status through the charging status indication module.

In FIG. 17-4:

In some embodiments, the battery boost charging circuit is arranged with a charging communication module including the following. A pin 2 of the interface J1 is connected to pin 5 of the interface J1 to output the USB voltage VBUS of the boost charging circuit. A CC1 configuration channel first pin 3 of the interface J1 and a CC2 configuration channel second pin 4 of the interface J1 are connected to a pull-down resistors R6 and R7, respectively. The other ends of the resistors R6 and R7 are both grounded. The voltage values of CC1 and CC2 are detected to realize the identification of cable connection and removal, socket/plug direction, and so on. Pins 1, 6, 7 and 8 of interface J1 are grounded. The battery boost charging circuit is configured to identify the USB voltage through the charging communication module.

Capacitors C10 and C11 have an end connected to the USB voltage VBUS, and the other end of the capacitors is grounded to: filter the current, stabilize the voltage, and avoid spike voltage. The USB voltage VBUS is grounded through a discharge resistor R8 to avoid unnecessary power consumption.

In FIG. 17-5:

In an embodiment, the battery boost charging circuit is further arranged with circuit transfer interfaces BD, P1, P2, to transfer circuit signals from the portable fan.

The interface BD is connected to a dip switch, to receive a P_EN enable signal of the dip switch and transmits it to the master control chip of the portable fan through the interface P2, for controlling the locking or operation of the portable fan.

The interface P1 is configured to receive gear adjustment signals KEY, KEY_X, and KEY_Y of the portable fan and transmits them to the master control chip of the portable fan through the interface P2, for controlling the starting/stopping and gear adjustment of the portable fan.

The interface P2 is configured to receive the VBAT battery voltage, the USB voltage VBUS, and the PG signal transmitted by the charging chip U1 and transmits them to the master control

chip of the portable fan.

Embodiment 18, referring to FIGS. 18-1 to 18-3:

In FIGS. 18-1 to 18-3:

A charging management circuit for a portable fan includes at least one of: a fast-charging management unit 300 and a charging management unit 400; the fast-charging management unit 300 includes a fast-charging communication module, a fast-charging control signal output module, a fast-charging voltage setting module, and a fast-charging current setting module; the charging management unit 400 includes a charging communication module, a charging drive module, a charging current detection module, a termination voltage setting module, a charging status output module, and an over-temperature protection module. The charging management circuit of the portable fan having the fast-charging management unit and the charging management unit may switch between a fast-charging mode and an ordinary boost charging mode.

The portable fan includes: a hand-held fan, a neck fan, a desktop fan, a waist-mounted fan, and a head-mounted fan, and so on.

The charging management circuit further includes: a charging adapter 100, a USB input unit 210, a USB output unit 220, a control unit 500, a battery pack 600, and a charging display unit 700; the charging adapter 100 is connected to the USB input unit 210; the USB output unit 220 is connected to the fast-charging management unit 300 and the charging management unit 400; the fast-charging management unit 300 and the charging management unit 400 are connected to the control unit 500; the fast-charging control signal output module of the fast-charging management unit 300 is connected to a controlled end of a switching circuit; the charging management unit 400 is connected to the battery pack 600, and the fast-charging management unit 300 and the control unit 500 are connected to the battery pack 600 through the charging management unit 400; the charging display unit 700 is connected to the control unit 500.

The portable fan is configured to supply power to the battery pack 600 through the connection with the charging adapter 100, the USB input unit 210, the USB output unit 220, the fast-charging management unit 300, the charging management unit 400, and the control unit 500; the fast-charging management unit 300 and the charging management unit 400 can communicate with the charging adapter 100 through a USB interface.

The USB output unit 220 includes a USB interface J1, the fast-charging management unit 300 includes a power pickup protocol chip (USB PD Sink) U2, and the charging management unit 400 includes a charging chip U1.

A pin A1B12 and a pin A12B1 of the USB interface J1 are grounded; the fast-charging management unit 300 and the charging management unit 400 are connected to VBUS pins A4B9

and A9B4 of the USB interface J1 for the introduction of an external power supply; a DP data pin A6B6 and a DM data pin A7B7 of the USB interface J1 are connected to the fast-charging management unit 300 and the charging management unit 400 for the fast charging management unit 300 and the charging management unit 400 to recognize the external power supply; where the terms of DP (data plus) and DM (data minus) refer to data signal lines of the USB.

In some embodiments, the power pickup protocol chip U2 is communicatively connected to the USB interface J1 through the data signal lines and a configuration channel of the fast-charging communication module. The fast-charging communication module includes: a DP' data pin 2 of the power pickup protocol chip U2 being connected to DP data pins A6B6 of the USB interface J1 through a current limiting resistor R1; a DM' data pin 3 of the power pickup protocol chip U2 being connected to DM data pins A7B7 of the USB interface J1 through a current limiting resistor R2; a CC1 configuration channel first pin 4 being connected to a CC1 configuration channel first pin A5 of the USB interface J1, and a CC2 configuration channel second pin 5 of the power pickup protocol chip U2 being connected to a CC2 configuration channel second pin 5 of the power pickup protocol chip B5 of the USB interface J1; the CC1 configuration channel first pin 4 being grounded through a capacitor C1, and the CC2 configuration channel second pin 5 of the power pickup protocol chip U2 being grounded through a capacitor C2; where the capacitors C1 and C2 are configured to filter the current and stabilize the voltage. The fast-charging communication module of the power pickup protocol chip U2 is connected to the charging adapter 100 through a USB cable to establish a data mode (DM, DP communication) and fast-charging communication mode (Powered Device: PD2.0/3.0, Quick Connect: QC2.0/3.0, Appledivider3, Battery Charge : BC1.2 SDP, Digital Communication Protocol/Charging Downstream Port: DCP/CDP), for applying, recognizing, and monitoring the voltage required to charge the battery pack 600 of the portable fan.

In some embodiments, the fast-charging control signal output module includes: the power pickup protocol chip U2 establishing a fast-charging communication with the charging adapter 100 through the configuration channel pins (pins 4, 5); and outputting a fast-charging drive signal through a fast-charging drive pin 10.

In some embodiments, a VIN chip power supply pin 1 of the power pickup protocol chip U2 is connected to the VBUS through a current limiting resistor R3, and the VIN chip power supply pin 1 of the power pickup protocol chip U2 is grounded through a voltage regulating capacitor C3.

The fast-charging voltage setting module includes: a VSET voltage setting pin 8 of the power pickup protocol chip U2 being grounded through a resistor R4; the power pickup protocol

chip U2 is configured to obtain a voltage signal of the resistor R4 to set the charging voltage of the battery pack 600 in the fast-charging mode; the fast-charging charging voltage of the battery pack 600 can be changed by changing the resistance value of R4.

The fast-charging current setting module includes: an ISET current setting pin 9 of the power pickup protocol chip U2 being grounded through a resistor R5; the power pickup protocol chip U2 is configured to obtain a voltage signal of the resistor R5 to set the charging current of the battery pack 600 in the fast-charging mode; the fast-charging charging current of the battery pack 600 can be changed by changing the resistance value of R5.

The fast-charging mode works as follows.

The power pickup protocol chip U2 establishes a PD fast-charging communication with the charging adapter 100 through the CC1 configuration channel first pin 4 and the CC2 configuration channel second pin 5, sets the fast-charging charging voltage through the monitored signal of the VSET voltage setting pin 8, sets the fast-charging charging current through the monitored signal of the ISET current setting pin 9, and outputs the fast-charging drive signal through the GATE pin 10; a charging socket outputs a high voltage for fast-charging the battery pack 600; a fast-charging charging status is transmitted by means of a connection with an I2C (serial bus) bus and the control unit 500 of the portable fan through a serial data line (SDA) pin 6 and a serial clock line (SCL) pin 7.

The VBUS charging input pin 1 of the charging chip U1 is connected to the VBUS; an end of a voltage regulator capacitor C4 is connected to the VBUS charging input pin 1 of the charging chip U1, and the other end of the voltage regulator capacitor C4 is grounded for filtering the current and stabilizing the power supply.

In some embodiments, the charging communication module includes: a DPC data positive signal pin 5 of the charging chip U1 being connected to a USB data positive signal through a current limiting resistor R6, and a DMC data negative signal pin 6 of the charging chip U1 being connected to a USB data negative signal through a current limiting resistor R7. The charging communication module is configured for the charging chip U1 to recognize a state of the external power supply.

In some embodiments, the charging driver module includes: a SW1 inductor first pin 12 and a SW2 inductor second pin 13 of the charging chip U1 being connected to two ends of a variable voltage storage inductor L1, respectively; a BT1 first bootstrap capacitor pin 11 of the charging chip U1 and a BT2 second bootstrap capacitor pin 14 of the charging chip U1 being connected to the two ends of the variable voltage storage inductor L1 through capacitors C5 and C6, respectively, where the capacitors C5 and C6 are bootstrap capacitors to provide boost bias voltage

for a boost circuit; the two ends of the variable storage inductor L1 are grounded by current limiting resistors R8 and R9, respectively; a RC circuit is arranged on each of two NCs of the charging chip U1 to be grounded in parallel with a corresponding one of R8 and R9, which may be configured to filter out a high-frequency signal.

A VBAT charging output pin 3 of the charging chip U1 is connected to the battery pack 600; filter capacitors C7, C8, C9, C10, C11 are connected in parallel, with an end being connected to the pin 3 of the charging chip U1, and the other end being grounded; a positive end of a diode D2 is grounded, and a negative end of the diode D2 is connected to the VBAT charging output pin 3 of the charging chip U1; the charging chip U1 is configured to charge the battery pack 600 through the charging drive module in the boost charging mode.

The ordinary charging mode works as follows.

The charging adapter 100 is an ordinary charging adapter, and the charging chip U1 communicates with the charging adapter 100 in handshake through the DPC data positive signal pin 5 and the pin 6, requesting a charging voltage; the charging chip U1 controls an internally integrated MOS tube circuit to charge and store the energy for the inductor L1, and then the charging chip U1 turns on the MOS tube circuit to release the energy of the inductor L1, in which case the inductor L1 is connected in series with the VBUS realizing a boosting effect, and the battery pack 600 is charged through the boost circuit.

The charging chip U1 has a function of raising and lowering the voltage. When the input voltage is lower than the charging voltage, the charging chip U1 may raise the voltage to the charging voltage for charging the battery pack 600; when the input voltage is higher than the charging voltage, the charging chip U1 may lower the voltage to the charging voltage for charging the battery pack 600.

In some embodiments, the charging current detection module includes: a CSP current sampling positive pin 20 of the charging chip U1 and a CSN current sampling negative pin 21 being connected through a sampling resistor R10 for induce a charging current; capacitors C12, C13, C14, and C15 being connected in parallel, with an end being connected to the CSP current sampling positive pin 20 of the charging chip U1, and the other end being grounded for filtering the current and stabilizing the voltage; a CSO induction current monitoring pin 19 of the charging chip U1 being grounded through a resistor R11, where the voltage of the CSO induction current monitoring pin 19 of the charging chip U1 is proportional with the induction charging current. The charging chip U1 is configured to detect the value of the charging current of the battery pack 600 through the charging current detection module.

In some embodiments, the termination voltage setting module includes: a CSE battery

termination voltage setting pin 7 of the charging chip U1 being grounded through a resistor R12 and configured to set a battery termination voltage in the charging mode through the resistance value of the resistor R12.

In some embodiments, the over-temperature protection module includes: an NTC thermistor pin 18 of the charging chip U1 being grounded through a resistor R14.

The charging status output module includes: a PG charging status pin 8 of the charging chip U1 being connected to a supply voltage VCC through a pull-up resistor R13, and the charging chip U1 is configured to output a charging status signal through the PG charging status pin 8.

A loop compensation module includes: a COMP loop compensation pin 17 of the charging chip U1 being grounded through a RC circuit formed by a resistor R15 and a capacitor C17, for enhancing the stability and transient response of the circuit.

A VCC chip operating voltage output pin 9 of the charging chip U1 is configured to output an operating voltage, which is grounded through a voltage regulator capacitor C16.

Embodiment 19, referring to FIGS. 19-1 to 19-3:

In FIGS. 19-1 to 19-3:

A portable handheld fan includes a fan body 100 and a handheld portion 200. The fan body 100 defines an air outlet 110 and an air inlet 120.

The air inlet 120 is located at a rear or a side of the fan body 100, and the air outlet 110 is located at a front of the fan body 100. The portable handheld fan includes at least one of: a cooling component and a spray component. The cooling component is substantially configured to cool down an airflow flowing through the fan body 100, and the cooling component is mounted inside the fan body 100. The spray component is substantially configured to increase humidity of the airflow, replenish moisture, and improve user comfort brought by the airflow. The spray component is mounted inside the handheld portion 200. The cooling component and the spray component allow the portable handheld fan to have at least one of: a cooling function and a misting function, enhancing cooling performance of the portable handheld fan and user experience.

In an embodiment, the portable handheld fan is arranged with a mode selection wheel 210 and/or a toggle switch 220. The mode selection wheel 210 and the toggle switch 220 may be arranged at the handheld portion 200. The toggle switch 220 is configured to control the portable handheld fan to enter a "locked" state or a "standby" state. When the toggle switch 220 is in a "locked" position, the mode selection wheel 210 cannot control an operating state of the portable handheld fan. When the toggle switch 220 is in a "standby" position, a fan state signal sent by the mode switching roller 210 is configured to control an operating state of the portable handheld fan. The mode selection wheel 210 is configured to control the portable handheld fan to start or stop

operating and control the operating state of the portable handheld fan, such as a cooling state, a misting state, an air speed adjustment of the portable handheld fan, and so on.

An operating process of the portable handheld fan is as follows.

The toggle switch 220 is configured to control the portable handheld fan to be in the state "locked" or in the "standby" state. When the toggle switch 220 is in the "locked" position, the portable handheld fan cannot operate. When the toggle switch 220 is in the "standby" position, the user can control an operating mode of the portable handheld fan via the mode selection wheel 210. In a standby mode, the user presses the mode selection wheel 210 once to send a "start" signal to a control chip of the portable handheld fan, the control chip captures a "start" command and controls a fan motor to operate, the airflow is output out of the fan through the air outlet 110, and the portable handheld fan is in an "air blowing" mode. In the air blowing mode, the user scrolls the mode selection wheel 210 upward to increase the air speed, or scrolls the mode selection wheel 210 downward to decrease the air speed. In the air blowing mode, the user presses the mode selection wheel 210 again to send a "stop" signal to the control chip, and the control chip captures a "stop" command and stops the fan motor.

The mode selection wheel 210 is further configured to switch between different modes based on usage scenarios, including a strong airflow level, a natural airflow level, a breeze level, a cool airflow level, and a mist airflow level. When the mode selection wheel 210 is turned to the "strong airflow level," the portable handheld fan outputs a high-speed strong airflow. When the mode selection wheel 210 is turned to the " natural airflow level," the air speed is set to a natural airflow speed. When the mode selection wheel 210 is turned to the "breeze level," the air speed is set to a breeze speed. When the mode selection wheel 210 is turned to the "cool airflow level," the cooling component is activated to cool the airflow passing through the fan body 100, and a cool airflow is output out of the fan. When the mode selection wheel 210 is turned to the "mist airflow level," the spray component is activated to cool the airflow and increase humidity to the airflow, a misty airflow is output out of the fan. The cool airflow level and the mist airflow level can be activated separately or simultaneously or activated in combination with any one of: the strong airflow level, the natural airflow level, or the breeze level.

In an embodiment, the cooling component includes a cooling device configured to lower a temperature of surrounding air. The cooling component further includes an air guiding sleeve 400 arranged inside the fan body 100. The air guiding sleeve 400 may be independently mounted inside the fan tube 310 of the fan body 100, or may be integrated formed with a fan tube 310 to form a one-piece structure. The fan tube 310 carries members of the cooling component, and the air guiding sleeve 400 guides the airflow to be evenly output out of the fan, improving the air

outputting efficiency. The spray component includes an air compression device 720, a liquid guide tube 730, and a mist generator 740. The air compression device 720 may be an air compressor or an air compression pump. The air compression device 720 pressurizes liquid, through the liquid guide tube 730, into the mist generator 740. The mist generator 740 atomizes the liquid, and the portable handheld fan outputs the misty airflow.

In FIGS. 19-1 and 19-2:

In an embodiment, the portable handheld fan has the cooling function, and the cooling device includes a temperature conduction mesh 610, a temperature conductor 620, and a semiconductor cooling element 630. The temperature conduction mesh 610 increases a contact area with air, improving a cooling efficiency. The semiconductor cooling element 630 is configured to reduce a temperature of the airflow, generating the cool airflow. The temperature conductor 620 conducts a temperature of the semiconductor cooling element 630. The temperature conduction net 610 and temperature conductor 620 may be separate structures or integrated into a one-piece structure.

In an embodiment, the cooling device is mounted inside the air guiding sleeve 400, and the semiconductor cooling element 630 cools the airflow, generating a reduced temperature. The temperature conductor 620 defines a positioning hole 640 for mounting the semiconductor cooling element 630. The temperature conduction mesh 610 is mounted at an outside of the temperature conductor 620 and is arranged inside the air guiding sleeve 400, such that the contact area with the air inside the air guiding sleeve 400 is increased, and the cooling efficiency is improved.

In FIGS. 19-1 and 19-3:

In an embodiment, the portable handheld fan has the misting function, and a liquid storage tank 710, the air compression device 720, the liquid guide tube 730, and the mist generator 740 are arranged inside the handheld portion 200. The air compression device 720 may be the air compressor or the air compression pump. The fan body 100 defines a mist nozzle 750. The liquid storage tank 710 stores liquid such as purified water, toner, or moisturizer. The air compression device 720 pressurizes the liquid into the liquid guide tube 730, and the liquid guide tube 730 transfers the liquid to the mist generator 740. One or more mist nozzles 750 are defined. The mist generator 740 atomizes the liquid. The mist nozzles 750 outputs the atomized liquid to the fan body 100.

In an embodiment, the liquid storage tank 710 is disposed at a bottom of the handheld portion 200 and stores liquids such as purified water, toner, or moisturizer. The air compression device 720 is arranged in the liquid storage tank 710 and pressurizes the liquid into the liquid guide tube 730. An inlet of the liquid guide tube 730 is arranged in the liquid storage tank 710 and transfers the liquid to the mist generator 740. The mist generator 740 is disposed at a top of the

handheld portion 200. One or more mist nozzles 750 are defined. The liquid transferred by the liquid guide tube 730 is atomized and is output into the fan body 100 through the mist nozzles 750.

In FIGS. 19-1 and 19-2:

In an embodiment, the portable handheld fan has the cooling function, and the fan body 100 includes the fan tube 310, a fan rear cover 320, and a fan blade body 500. The fan tube 310 carries members of the cooling component. The fan rear cover 320 and the fan tube 310 may be separate structures or integrated into a one-piece structure.

In an embodiment, the air guiding sleeve 400 is mounted inside the fan tube 310, and the air guiding sleeve 400 may be independently mounted in the fan tube 310 or integrated formed with the fan tube 310 to form a one-piece structure. The fan tube 310 carries members of the cooling component, and the fan blade body 500 is disposed at a rear or an inside of the air guiding sleeve 400. The fan blade body 500 outputs air into the fan tube 310, and the air is output evenly through the air guiding sleeve 400.

In an embodiment, the fan rear cover 320 is disposed at the rear of the portable handheld fan and is arranged with an air filter. Air enters the fan rear cover 320 through the air inlet 120 and is filtered by the air filter. The air filter may be coated with a layer of photocatalyst for sterilization.

The handheld portion 200 of the portable handheld fan further defines a strap hole 230, a carrying strap or an accessory may be attached through the strap hole 230. The user may securely mount the portable handheld fan through the strap hole 230.

The above embodiments only express some embodiments of the present application, and the embodiments are described in details, but the description shall not be interpreted as a limitation of the scope of the present application. It should be noted that, any ordinary skilled person in the art may perform various modifications and improvements without departing from the concept of the present application, and the modifications and improvements shall belong to the scope of the present application. Therefore, the scope of the present application shall be subject to the appended claims.

What is claimed is:

1. A portable fan, comprising an airflow portion and a display screen, wherein the airflow portion comprises an air outlet, the air outlet is disposed surrounding a periphery of the display screen;

wherein the display screen has an arc-shaped outer surface; and/or the display screen is configured to display at least one of: a remaining battery power level, a current air speed, a battery power level during charging, and an operating state.

2. The portable fan according to claim 1, wherein the outer surface of the display screen is at least partially concaved inwardly.

3. The portable fan according to claim 1, further comprising a handheld portion detachably connected to the airflow portion,

wherein a three-phase high-speed motor is arranged in the airflow portion; a battery is arranged in the handheld portion, the battery is configured to supply power to the three-phase high-speed motor.

4. The portable fan according to claim 3, wherein the airflow portion further comprises a pressurizing member, a receiving portion is formed at a side of the pressurizing member away from the three-phase high-speed motor; the portable fan further comprises a drive circuit board;

the drive circuit board is received in the receiving portion and is disposed between the side of the pressurizing member away from the three-phase high-speed motor and the display screen; or

the drive circuit board is arranged in the handheld portion.

5. The portable fan according to claim 3, wherein the handheld portion is arranged with a wheel button and an anti-misoperation button; the wheel button is configured to be rolled to adjust an air speed in a stepless manner and configured to be pressed to adjust an operating state of the handheld fan; the anti-misoperation button is configured to prevent any operation mistakenly performed to turn on the handheld fan.

6. The portable fan according to claim 5, wherein the handheld portion comprises a handheld shell having an inner cavity; a mounting bracket is received in the inner cavity; a circuit board assembly is mounted on the mounting bracket; the battery and the wheel button are received in the inner cavity; the wheel button is disposed on the mounting bracket; the wheel button is connected to the battery via the circuit board assembly; the handheld shell defines a first through slot having an opening facing towards the wheel button.

7. The portable fan according to claim 3, wherein,

the airflow portion comprises: an inner shell, an outer shell, and a fan assembly; the inner shell defines an airflow channel, an air inlet communicating with a side of the airflow channel, and the air outlet communicating with the other side of the airflow channel; the fan assembly is received in the airflow channel; the outer shell covers an outside of the inner shell and has a mounting opening;

the handheld portion comprises a handheld shell, a mounting mechanism and a fixing member; the handheld shell covers an outside of the mounting mechanism, a part of the handheld shell is extended into the mounting opening, the fixing member extends through the outer shell and the handheld shell sequentially to be connected to the mounting mechanism.

8. The portable fan according to claim 3, wherein,

the airflow portion comprises: an inner shell, an outer shell, and a fan assembly; the inner shell defines an airflow channel; the fan assembly is at least partially received in the airflow channel; the outer shell covers an outside of the inner shell; the inner shell defines a wire opening; a side of the wire opening directly faces an electrical connection part of the fan assembly; the other side of the wire opening directly faces an electrical connection part of the handheld portion; the electrical connection part of the fan assembly is electrically connected to the electrical connection part of the handheld portion via a wire extending through the wire opening.

9. The portable fan according to claim 3, wherein,

the airflow portion comprises: an inner shell, an outer shell, and a fan assembly; the inner shell defines an airflow channel; the fan assembly is received in the airflow channel; the outer shell covers the inner shell and is slidably connected to the inner shell along a first axial direction; the first axial direction is a direction extending from the air inlet to the air outlet;

the outer shell comprises a sleeve and an inlet cover; the sleeve covers the inner shell; the sleeve is arranged with at least one limiting strip; the air inlet cover and the inner shell are detachably connected to each other; the air inlet cover is connected to the sleeve; the inner shell defines at least one snap slot; the air inlet cover is arranged with at least one snap head snapped with the at least one snap slot.

10. The portable fan according to claim 1, wherein,

the airflow portion comprises a first inner shell, a second inner shell engaged with the first inner shell, and an outer shell; a side of the first inner shell facing the second inner shell is arranged with a plurality of protrusions, the plurality of protrusions are evenly distributed; the second inner shell defines a plurality of recessed structures corresponding to the plurality of protrusions; the plurality of protrusions are engaged with the plurality of recessed structures; the outer shell covers an outside of the first inner shell and an outside of the second inner shell.

11. The portable fan according to claim 3, wherein,

the airflow portion comprises a first inner shell, a second inner shell engaged with the first inner shell; the first inner shell is disposed near the air inlet; the second inner shell is disposed near the air outlet; a fan base is arranged inside the second inner shell; a fan impeller is arranged at a side of the fan base facing towards the first inner shell; the fan impeller is arranged inside the first inner shell;

an end of the first inner shell near the air outlet extends beyond an end of the fan impeller near the air inlet.

12. The portable fan according to claim 1, wherein,

the airflow portion comprises a shell, an inlet cover connected to the shell, and a motor arranged inside the shell; the motor defines a shaft hole, a motor rotation shaft is rotatable with respect to the motor and is received in the shaft hole; a top of the motor rotation shaft is connected to fan blades; a vibration damping spring is disposed between the motor and the fan blades; the vibration damping spring sleeves the motor rotation shaft;

an inner diameter of an end of the vibration damping spring away from the motor is greater than an inner diameter of an end of the vibration damping spring near the motor; and/or

a spacing between spring coils of the end of the vibration damping spring away from the motor is smaller than a spacing between spring coils of the end of the vibration damping spring near the motor.

13. The portable fan according to claim 1, wherein,

the airflow portion comprises an air inlet cover and an airflow assembly; the air inlet cover comprises a cover body and an air guiding portion connected to the cover body and extending towards the airflow assembly; the airflow portion defines a first receiving cavity; an air guiding cone and fan blades arranged on the air guiding cone are received in the first receiving cavity; a first gap is formed between the air guiding cone and the air guiding portion.

14. The portable fan according to claim 13, wherein the air guiding portion is columnar, an end of the air guiding portion is received in the first receiving cavity; the first gap is formed between an end of the air guiding cone near the air inlet cover and an end of the air guiding portion near the air guiding cone; the first gap is greater than 1mm and less than 14mm.

15. The portable fan according to claim 13, wherein a diameter of a circumcircle of an end face of the air guiding portion is greater than 5mm and less than 12 mm; an end face of the end of the air guiding cone near the air inlet cover is circular; a diameter of the end face of the end of the air guiding cone near the air inlet cover is greater than 1 and less than 7 mm.

16. The portable fan according to claim 1, further comprising a handheld portion,

wherein the airflow portion comprises an air inlet cover, an outlet cover, a first shell, and a fan module; the air inlet cover comprises a plurality of air guiding plates that are connected to each other and are arranged to be scattered around a preset axis; the preset axis is extending from the air inlet cover to the air outlet cover; an air inlet gap is formed between every two adjacent ones of the plurality of air guiding plates;

each of plurality of air guiding plates protrudes towards a side away from the air outlet cover;

and/or a width of each of plurality of air guiding plates reduces along a direction from a periphery of the air inlet cover towards a center of the air inlet cover.

17. The portable fan according to claim 1, wherein the airflow portion comprises an outer shell and an inner shell detachably connected to the outer shell; the outer shell defines a first receiving cavity that receives the first inner shell; the inner shell defines a second receiving cavity therein to receive an airflow assembly; a vibration damping structure is disposed between the outer shell and the inner shell.

18. The portable fan according to claim 1, further comprising at least one of: a fast charging management unit and a charging management unit; wherein the fast charging management unit comprises a fast charging module, a fast-charging control signal output module, a fast-charging voltage setting module, a fast-charging current setting module;

the charging management unit comprises: a charging communication module, a charging drive module, a charging current detection module, a termination voltage setting module, and an overtemperature protection module.

19. The portable fan according to claim 1, further comprising a battery boost charging circuit, comprising at least one of: a boost module, a boost charging management module, a charging voltage presetting module; an overtemperature protection module, a charging state indication module;

wherein an end of the boost module is connected to an end of the boost charging management module; at least one of the charging voltage presetting module, charging state indication module, and the overtemperature protection module is connected to the other end of the boost charging management module.

20. The portable fan according to claim 3, further comprising at least one of: a cooling component and a spray component, wherein the cooling module is arranged inside the airflow portion, and the spray component is arranged inside the handheld portion.