CLAIMS

What is claimed is:

1. A fan, comprising:

a neck housing, defining a neck space, wherein the neck housing is configured to be worn to a neck of a user, and the neck is configured to be received in the neck space;

an airflow portion, arranged inside the neck housing and configured to blow an airflow towards the neck space; wherein the airflow portion comprises rotation air blades and a three-phase motor drive assembly driveably connected to the rotation air blades to drive the rotation air blades to rotate to generate the airflow.

2. The fan according to claim 1, wherein,

the airflow portion further comprises a positioning protruding post;

the three-phase motor drive assembly comprises a stator and a rotor sleeving an outside of the stator; the rotor is fixedly mounted on the rotation air blades and is coaxially arranged with the rotation air blades; the stator fixedly sleeves the positioning protruding post.

3. The fan according to claim 2, wherein, the neck housing comprises a connection section and two neck side sections respectively connected to two sides of the connection section; each of the connection section and/or at least one of the two neck side sections is arranged with one respective airflow portion.

4. The fan according to claim 3, wherein,

the connection section is arranged with the respective one airflow portion; the connection section defines a first air guiding cavity therein; the connection section defines a first air outlet communicated with the first air guiding cavity; the first air outlet faces towards the neck space; the positioning protruding post is received in the first air guiding cavity; the rotation air blades are rotatably received in the first air guiding cavity and configured to blow the airflow to the first air outlet;

the connection section defines a first air inlet communicated to the first air guiding cavity; the first air inlet faces towards an end of the rotation air blades; the first air outlet faces towards a side of the rotation air blades;

a plurality of first air guiding ribs are arranged in the connection section; the plurality of first air guiding ribs cooperatively define the first air guiding cavity; the first air outlet comprises a plurality of first air outlets; the plurality of first air outlets are spaced apart from

each other and are located along an extension direction of the connection section; an end of the first air guiding cavity is communicated with the plurality of first air outlets.

5. The fan according to claim 3, wherein,

the rotation air blades defines a fixation hole, and an axis of the fixation hole coincides with an axis of the rotation air blades; the airflow portion further comprises a rotation shaft; a first end of the rotation shaft fixedly extends into the fixation hole; the positioning protruding post defines a positioning hole; an axis of the positioning hole coincides with an axis of the rotation shaft; a second end of the rotation shaft is rotatably received in the positioning hole.

6. The fan according to claim 5, wherein,

at least one airflow portion comprises a bearing portion; an outer ring of the bearing portion is fixed in the positioning hole, and an inner ring of the bearing portion sleeves the second end of the rotation shaft;

the bearing portion comprises a rolling bearing; the airflow portion further comprises a limiting member; the limiting member is mounted on the second end of the rotation shaft; the bearing portion is disposed between the limiting member and the first end of the rotation shaft; the bearing portion comprises a plurality of bearing portions; an inner flange is arranged on an inner wall of the positioning hole; the inner flange is disposed between two adjacent bearing portions of the plurality of bearing portions, the two adjacent bearing portions are spaced apart from each other; or

the bearing portion comprises a slide bearing; the airflow portion further comprises two sealing rings; the two sealing rings both sleeve the rotation shaft and are respectively located on two sides of the slide bearing.

7. The fan according to claim 3, wherein,

each of the two neck side sections is arranged with the respective one airflow portion; a second air guiding cavity is defined in each of the two neck side sections; the neck side section defines a second air outlet communicated with the second air guiding cavity; the second air outlet faces towards the neck space; the positioning protruding post is received in the second air guiding cavity; the rotation air blades are rotatably mounted in the second air guiding cavity and are configured to blow the airflow to the second air outlet;

the neck side section defines a second air inlet communicated to the second air guiding cavity; the second air inlet faces an end of the rotation air blades, and the second air outlet faces a side of the rotation air blades.

8. The fan according to any one of claims 1 to 7, further comprising a power supply portion; wherein, the power supply portion is arranged inside the housing; the power supply portion is electrically connected to the airflow portion; the housing is arranged with a charging port that is electrically connected to the power supply portion.

9. A control circuit of a neck fan, comprising:

a charging and power supply circuit, configured to be electrically connected to an external power source and a battery and receive an external voltage to charge the battery and to output a power supply voltage;

a fan drive circuit, electrically connected to the charging and power supply circuit and a fan to drive the fan to rotate; and

a master control circuit, electrically connected to the charging and power supply circuit and the fan drive circuit.

10. The control circuit according to claim 9, wherein,

the charging and power supply circuit comprises a charging port and a charging management chip; a power end of the charging port receives the external voltage and is electrically connected to a charging input pin of the charging management chip; the power end of the charging port is further electrically connected to a negative electrode of a voltage stabilizing transistor; a positive electrode of the voltage stabilizing transistor is grounded; a switch pin of the charging management chip is electrically connected to a positive electrode of the battery via a first inductor; a boost output pin of the charging management chip is configured to output the power supply voltage; a boost input pin of the charging management chip is connected to a node between the battery and the first inductor via a first connection resistor and is further grounded via a first grounding capacitor; and

a keypad input end of the charging management chip is electrically connected to the master control circuit; a first LED drive pin of the charging management chip is grounded via sequentially a first grounding resistor and a second grounding resistor; a second LED drive pin of the charging management chip is connected to the battery via a second connection resistor; a first indicator light pin of the master control circuit is grounded via a first indicator branch; a

second indicator branch is grounded via a second indicator light branch; each of the first indicator branch and the second indicator branch comprises a current limiting resistor and an indicator that is in series connected to the current limiting resistor.

11. The control circuit according to claim 9 or 10, further comprising a refrigeration control circuit, wherein,

the refrigeration control circuit is electrically connected to a refrigeration member and the charging and power supply circuit to drive the refrigeration member to generate coldness; the refrigeration control circuit comprises a first control switch; a first conductive end of the first control switch is configured to receive, via the refrigeration member, an output voltage from the battery or receive the power supply voltage; a second conductive end of the first control switch is grounded; and

the master control circuit is electrically connected to the refrigeration control circuit; the master control circuit is configured to output a first pulse width control signal to control the first control switch to be conducted or disconnected, so as to further control the refrigeration member to be switched on and switched off intermittently.

12. The control circuit according to any one of claims 9 to 11, further comprising a second control switch, wherein,

a first conductive end of the second control switch is electrically connected to the battery to receive an output voltage from the battery; a control end of the second control switch is configured to receive the external voltage and grounded; a second conductive end of the second control switch is electrically connected to the fan drive circuit; the second control switch is disconnected when receiving the external voltage and is conducted when receiving no external voltage.

13. The control circuit according to any one of claims 9 to 12, wherein,

the control end of the control switch is grounded via a third grounding resistor and is electrically connected to the second conductive end of the control switch and the fan drive circuit via a first diode; the second control switch is a P-Metal-Oxide-Semiconductor (PMOS) field effect transistor;

a control end of the first control switch is electrically connected to a first pulse width signal output end of the master control circuit via a third connection resistor; a node between the control end of the first control switch and the third connection resistor is grounded via a fourth

connection resistor; the first control switch is a N-Metal-Oxide-Semiconductor (NMOS) field effect transistor; the refrigeration member further receives the output voltage of the battery or the power supply voltage via a fifth connection resistor.

14. The control circuit according to any one of claims 9 to 13, wherein,

the control circuit further comprises an encoder, the encoder is connected to the positive electrode of the battery and is grounded; two output ends of the encoder are connected to the master control circuit; the encoder has an infinite adjustment knob to be operated by a user; the infinite adjustment knob is configured to be operated to enable the two output ends of the encoder to output a plurality of digital signals; the master control circuit is configured to control, based on the plurality of digital signals, the first control switch to control a refrigeration intensity of the refrigeration member or to control, based on the plurality of digital signals, the fan drive circuit to control a rotation speed of the fan.

15. The control circuit according to any one of claims 9 to 14, wherein,

the fan drive circuit comprises a second inductor, a third control switch, a second diode, and a boost feedback branch; an end of the second inductor is electrically connected to the charging and power supply circuit to receive the external voltage or receive the output voltage of the battery; the other end of the second inductor is connected to the fan assembly via the second diode; a first conductive end of the third control switch is connected to a node between the second inductor and the second diode; a second conductive end of the third control switch is grounded; a control end of the third control switch is electrically connected to the master control circuit to receive a second pulse width control signal output of from the master control circuit; an end of the boost feedback branch is connected to a node between the second diode and the fan; the other end of the boost feedback branch is grounded; the boost feedback branch comprises a first voltage divider resistor and a second voltage divider resistor that is connected in series to the first voltage divider resistor; a node between the first voltage divider resistor and the second voltage divider resistor is connected to the master control circuit via a third voltage divider resistor; a node between the third voltage divider and the master control circuit is grounded via a second grounding capacitor.

16. The control circuit according to any one of claims 9 to 15, wherein,

the fan drive circuit further comprises a fourth control switch, a third diode, a first feedback resistor, a second feedback resistor; a negative electrode of the third diode is connected to a

positive electrode of the fan; a negative electrode of the fan is connected to a positive electrode of the third diode and a first conductive end of the fourth control switch; a control end of the fourth control switch is electrically connected to a fan enabling end of the master control circuit; a second conductive end of the fourth control switch is grounded via the first feedback resistor; a node between the second conductive end of the fourth control switch and the first feedback resistor is electrically connected to a load feedback end of the master control circuit via the second feedback resistor; a node between the second feedback resistor and the master control circuit is grounded via a third grounding capacitor.

17. A fan drive control circuit of a portable fan, comprising:

a battery power supply, a voltage stabilizing unit, a master control unit, a motor, a USB access circuit, an analog-to-digital converter (ADC) power supply circuit, and a display unit;

wherein the fan drive control circuit further comprises at least one of: a motor drive control unit, a motor drive circuit, a rotor position detection circuit.

18. The fan drive control circuit according to claim 17, wherein,

a permanent magnet is arranged on a rotor of the motor; a first winding, a second winding, and a third winding are connected to each other to form a Y shape and are arranged on a stator of the motor; a MOS transistor switch circuit of the fan drive control circuit is connected to the first winding, the second winding, and the third winding of the motor; the motor drive control unit is configured to control magnitudes of currents, current flowing directions, and a phase relationship of currents flowing through the first winding, the second winding, and the third winding; and

in a motor drive circuit, an end of a first MOS transistor switch is connected to a power supply voltage, and the other end of the first MOS transistor switch is connected to the second winding; conduction of the first MOS transistor switch is controlled by a second MOS transistor switch; an end of the second MOS transistor switch is connected, via a first resistor, to the power supply voltage; and the other end of the second MOS transistor switch is grounded; the second MOS transistor switch is configured to receive a pulse modulation control signal of the motor drive control unit.

19. The fan drive control circuit according to claim 18, wherein,

in the motor drive circuit, an end of a third MOS transistor switch is connected to the first winding; the other end of the third MOS transistor switch is grounded via a current sampling

resistor; the third MOS transistor switch is configured to receive the pulse modulation control signal from the motor drive control unit.

20. The fan drive control circuit according to claim 19, wherein,

the MOS transistor switch is arranged with a reverse diode;

the first MOS transistor switch is a P-type MOS transistor, and each of the second MOS transistor switch and the third MOS transistor switch is a N-type MOS transistor; and

a second resistor is connected to a drain and a source of the second MOS transistor switch, and a third resistor is connected to a drain and a source of the third MOS transistor switch;

in the motor drive circuit, a fourth MOS transistor switch, a fifth MOS transistor switch, and a sixth MOS transistor switch and a fourth resistor, a fifth resistor, and a sixth resistor cooperatively form a MOS transistor switch circuit to control a current to flow into or out of the second winding;

a seventh MOS transistor switch, an eighth MOS transistor switch, and a ninth MOS transistor switch and a seventh resistor, an eighth resistor, and a ninth resistor cooperatively form another MOS transistor switch circuit to control a current to flow into or out of the third winding;

the motor drive control unit comprises a motor drive chip, the motor drive chip is configured to output a motor drive signal to a gate of the MOS transistor of the motor drive circuit;

a control chip of the master control unit is connected to the USB access circuit, the battery voltage detection ADC circuit, and the display unit.