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(54) **AEROSOL GENERATING SYSTEM**

(57) The present invention provides an aerosol generating system having opposite proximal and distal ends, comprising an aerosol generating device and a power supply device; wherein the aerosol generating device has a longitudinal shape extending from the proximal end to the distal end, and has a first end and a second end opposite to the proximal end and the distal end respectively in the length direction; the first end and the second end are provided with a first atomizer and a second atomizer, respectively; the aerosol generating device is movable with respect to the power source, and has a first position and a second position; the aerosol generating system further comprises a position detecting component for detecting that the aerosol generating device is in the first position or the second position, and a controller; the controller controls the power supply device to output power to one of the first atomizer or the second atomizer according to the position of the aerosol generating device detected by the position detecting component. The aerosol generating system of the present invention accurately detects the position during the switching of suction and controls two atomizers to work separately according to the position, so that the suction can be accurately controlled to prevent false triggering.

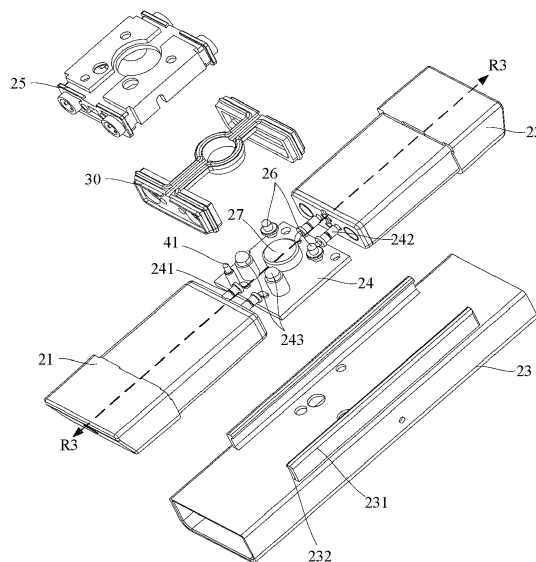


FIG. 10

Description

TECHNICAL FIELD

[0001] The embodiments of the present invention relate to the technical field of electronic cigarettes, and in particular, to an aerosol generating system.

BACKGROUND

[0002] Current electronic cigarette products generally comprise an aerosol generating device for generating inhalable aerosols based on functional requirements, and a power supply device for powering the aerosol generating device; see, for example, WO 2015/079197, US 2017/258138, US 2018/213847, and US 2003/209240. Among many types of products, a flat cigarette product with a more classic structure is shown in FIG. 1, which comprises an aerosol generating device 100 and a power supply device 200 that are assembled with each other in the axial direction, and the overall assembled shape is a flat elongated shape. The power supply device 200 is provided with a spring electrode needle 210, and the aerosol generating device 100 is provided with a corresponding electrode connector. The electrode connector is not shown in FIG. 1 due to the angle, and the electrode connector is used to supply power after being connected with the spring electrode needle 210; the aerosol generating device 100 can be disassembled and replaced after assembly, and the product has a very good user experience when used.

[0003] When this product is used, after the aerosol generating device 100 and the power supply device 200 are assembled, the internal battery and the main board will always be in a conductive state, and releasing the above conductive state can only disassemble the aerosol generating device 100 from the power supply device 200. To meet the needs of more users, it is necessary to meet the non-conductive disconnection state after assembly at the same time to ensure safety and eliminate the possibility of false triggering of the aerosol generating device 100.

[0004] Based on the above circumstances, the applicant proposes an aerosol generating system in the invention patent No. 201910015687.9, which uses a relatively slidable power supply device and an aerosol generating device to achieve the on/off switching of the smoking process. However, in the specific implementation details, the two atomizers of the aerosol generating device are triggered by two microphones, respectively. When in use, in the two slidable suction positions, the atomizer and the circuit board are both in a conductive connection state. At the same time, the microphone is easy to be falsely triggered by the interference of the airflow, which affects the accurate control of the user in the suction process.

SUMMARY

[0005] In order to solve the problem of false triggering of the aerosol generating system in the prior art, embodiments of the present invention provide an aerosol generating system that can accurately control suction.

[0006] Based on the above object of accurately controlling suction, the aerosol generating system of the embodiments of the present invention has opposite proximal and distal ends, comprising an aerosol generating device for generating an aerosol and a power supply device for powering the aerosol generating device; the aerosol generating device has a longitudinal shape extending from the proximal end to the distal end, and has a first end and a second end opposite to the proximal end and the distal end respectively in the length direction; the first end is provided with a first atomizer for heating an aerosol-forming substrate to generate an aerosol, and the second end is provided with a second atomizer for heating the aerosol-forming substrate to generate an aerosol;

the aerosol generating device is movable with respect to the power supply device, and has a first position and a second position opposite to the power supply device;

the aerosol generating system further comprises a position detecting component for detecting that the aerosol generating device is in the first position or the second position, and a controller;

the controller is configured to control the power supply device to output power to the first atomizer or the second atomizer according to the position of the aerosol generating device detected by the position detecting component.

[0007] Preferably, the power supply device has a longitudinal shape extending from the proximal end to the distal end, and has a third end and a fourth end opposite to the proximal end and the distal end respectively in the length direction;

at least a part of the first atomizer protrudes from the third end of the power supply device in the first position, and at least a part of the second atomizer protrudes from the fourth end of the power supply device in the second position.

[0008] Preferably, the controller is configured to control the power supply device to output power to the first atomizer when the position detecting component detects that the aerosol generating device is in the first position; and/or, controls the power supply device to output power to the second atomizer when the position detecting component detects that the aerosol generating device is in the second position.

[0009] Preferably, the position detecting component comprises a conductive connector provided on the aerosol generating device, and a first contact provided on the power supply device;

the conductive connector is conductively connectable to the first contact in one of the first position or the second position;

the position detecting component further comprises a detection circuit for detecting whether the conductive connector is conductively connected to the first contact.

[0010] Preferably, the power supply device comprises a first electrode and a second electrode, the first contact is connected to the first electrode, and the detection circuit comprises a first voltage divider resistor and second voltage divider resistor; wherein the first end of the first voltage divider resistor is connected to the conductive connector, the second end thereof is connected to the first end of the second voltage divider resistor, and the second end of the second voltage divider resistor is connected to the second electrode;

the controller further comprises a voltage sampling terminal for collecting voltage values at both ends of the second voltage divider resistor, the voltage sampling terminal is connected to the first end of the second voltage divider resistor; and the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the collected voltage values.

[0011] Preferably, the position detecting component comprises a magnetic field generator provided on one of the aerosol generating device or the power supply device, and a Hall sensor provided on the other thereof; the magnetic field generator is configured to generate a magnetic field; the Hall sensor is configured to sense a change in the intensity of the magnetic field at the position where it is located to generate a sensing signal; and the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the sensing signal of the Hall sensor.

[0012] Preferably, the position detecting component comprises a reflective photoelectric sensor provided on one of the aerosol generating device or the power supply device; the reflective photoelectric sensor has a light emitting end and a reflected light receiving end, and generates a sensing signal according to the intensity of the reflected light received by the reflected light receiving end;

the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the sensing signal of the reflective photoelectric sensor.

[0013] Preferably, the first atomizer comprises a first suction nozzle provided at a first end, and the second atomizer comprises a second suction nozzle provided at the second end; at least a part of the first suction nozzle protrudes from the third end of the power supply device in the first position, and at least a part of the second suction nozzle protrudes from the fourth end of the power supply device in the second position.

[0014] Preferably, the first atomizer comprises a first

suction port provided on the first suction nozzle for a user to suction, and a first airflow channel transmitting the aerosol generated by the first atomizer to the first suction port; the second atomizer comprises a second suction port provided on the second suction nozzle for a user to suction, and a second airflow channel transmitting the aerosol generated by the second atomizer to the second suction port;

the aerosol generating device further comprises a third airflow channel for communicating the first airflow channel and the second airflow channel.

[0015] Preferably, when the first suction port is sucked by a user, the second suction port is configured as an air inlet into which air flows; and/or, when the second suction port is sucked by a user, the first suction port is configured as an air inlet into which air flows.

[0016] Preferably, the first atomizer comprises a first suction port for a user to suction, and a first airflow channel transmitting the aerosol generated by the first atomizer to the first suction port; the second atomizer comprises a second suction port for a user to suction, and a second airflow channel transmitting the aerosol generated by the second atomizer to the second suction port;

the aerosol generating system further comprises an airflow sensor for sensing airflow in the first airflow channel and the second airflow channel;

the controller is configured to control the power supply device to output power to the first atomizer or the second atomizer according to the sensing signal of the airflow sensor.

[0017] Preferably, the aerosol generating device further comprises a third airflow channel for communicating the first airflow channel and the second airflow channel; the airflow sensor is provided in the third airflow channel.

[0018] Preferably, the aerosol generating device further comprises a fourth airflow channel; the airflow sensor isolates the third airflow channel from the fourth airflow channel, one side of the airflow sensor is communicated with the third airflow channel, and the other side thereof is communicated with the outside atmosphere through the fourth airflow channel.

[0019] Preferably, the airflow sensor comprises a first sensing surface and a second sensing surface; wherein

the first sensing surface is directly or indirectly communicated with the outside atmosphere to sense the first air pressure value of the outside atmosphere; the second sensing surface is communicated with the third airflow channel to sense the second air pressure value of the airflow in the third airflow channel; the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the difference between the first air pressure value and the second air pressure value.

[0020] Preferably, the airflow sensor is an airflow di-

rection sensor, which is configured to sense the airflow direction in the third airflow channel;
the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the airflow direction sensed by the airflow direction sensor.

[0021] Preferably, the controller is configured to: when the airflow direction sensed by the airflow direction sensor is from the second airflow channel to the first airflow channel, control the power supply device to output power to the first atomizer;

and/or, when the airflow direction sensed by the airflow direction sensor is from the first airflow channel to the second airflow channel, control the power supply device to output power to the second atomizer.

[0022] Preferably, the airflow sensor comprises a first sensing surface and a second sensing surface; wherein

the first sensing surface is communicated with the airflow in the first airflow channel to sense the first air pressure value of the airflow in the first airflow channel;

the second sensing surface is communicated with the airflow in the second airflow channel to sense the second air pressure value of the airflow in the second airflow channel;

the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the difference between the first air pressure value and the second air pressure value.

[0023] Preferably, the controller is configured to control the power supply device to output power to the first atomizer when the first air pressure value is less than the second air pressure value, and control the power supply device to output power to the second atomizer when the first air pressure value is greater than the second air pressure value.

[0024] Preferably, the aerosol generating device comprises a flexible seal provided between the first atomizer and the second atomizer, and the flexible seal is provided with a groove or a through hole extending from the proximal end to the distal end; the space of the groove or the through hole forms the third airflow channel.

[0025] Preferably, the flexible seal further comprises an accommodating cavity for accommodating the airflow sensor, and the accommodating cavity is provided on the third airflow channel.

[0026] Preferably, the first atomizer is non-conductively connected to the power supply device in the second position;

and/or, the second atomizer is non-conductively connected to the power supply device in the first position.

[0027] Preferably, the aerosol generating device further has a third position opposite to the power supply device; when the aerosol generating device is in the third position, the first end is flush with the third end of the power supply device, and the second end is flush with

the fourth end of the power supply device.

[0028] Preferably, the aerosol generating device is slidably connected to the power supply device, and is slidable between the first position, the second position, and the third position with respect to the power supply device in the length direction.

[0029] Preferably, the third position is provided between the first position and the second position in the direction from the proximal end to the distal end.

[0030] Preferably, the aerosol generating device is non-conductively connected to the power supply device in the third position.

[0031] Preferably, the power supply device is provided with a second contact and a third contact; the aerosol generating device is provided with a conductive spring needle;

the power supply device is electrically connected to the second contact in the first position through the conductive spring needle to power the aerosol generating device, and is electrically connected to the third contact in the second position through the conductive spring needle to power the aerosol generating device.

[0032] Preferably, the power supply device comprises a battery core and an electrode contact provided on the battery core; the second contact and the third contact are formed by bending at least a part of the electrode contact toward the aerosol generating device.

[0033] Preferably, the electrically heating smoking system further comprises a positioning mechanism for stably maintaining the aerosol generating device and the power supply device in the first position, the second position, and the third position.

[0034] Preferably, the positioning mechanism comprises a positioning spring needle and a positioning hole adapted to the positioning spring needle; one of the positioning hole and the positioning spring needle is provided on the power supply device and the other thereof is provided on the aerosol generating device;

the positioning hole comprises a first positioning hole adapted to the positioning spring needle in the first position, a second positioning hole adapted to the positioning spring needle in the second position, and a third positioning hole adapted to the positioning spring needle in the third position.

[0035] Preferably, the positioning mechanism comprises a first magnetic body provided on one of the power supply device or the aerosol generating device, and a second magnetic body, a third magnetic body, and a fourth magnetic body provided on the other thereof;

the second magnetic body is used to magnetically attract the first magnetic body in the first position, the third magnetic body is used to magnetically attract the first magnetic body in the second position, and the fourth magnetic body is used to magnetically attract the first magnetic body in the third position.

[0036] Preferably, the positioning mechanism comprises a first magnetic body and a second magnetic body provided on one of the power supply device or the aerosol

generating device, and a third magnetic body and a fourth magnetic body provided on the other thereof;

in the first position, the second magnetic body magnetically attracts the third magnetic body;
in the second position, the first magnetic body magnetically attracts the fourth magnetic body;
in the third position, the first magnetic body magnetically attracts the third magnetic body, and the second magnetic body magnetically attracts the fourth magnetic body.

[0037] Preferably, the aerosol generating device further comprises a width direction and a height direction; the aerosol generating device is stacked with the power supply device in the height direction;
both ends of the aerosol generating device in the width direction are flush with the power supply device.

[0038] Preferably, the first atomizer comprises a first heating element for heating an aerosol-forming substrate to generate an aerosol, and the second atomizer comprises a second heating element for heating an aerosol-forming substrate to generate an aerosol;
the first heating element and the second heating element are configured to have different resistance values.

[0039] Preferably, the aerosol-forming substrate of the first atomizer and the aerosol-forming substrate of the second atomizer have different material compositions.

[0040] Preferably, the aerosol-forming substrate comprises a solid matrix or a liquid matrix.

[0041] The above aerosol generating system of the present invention accurately detects the position during the switching of suction and controls two atomizers to work separately according to the position, so that the suction can be accurately controlled to prevent false triggering.

[0042] Based on further ensuring the smooth airflow path of the aerosol generating system during the suction process, an embodiment of the present invention further proposes another aerosol generating system having opposite proximal and distal ends, wherein the proximal end is provided with a first atomizer for heating an aerosol-forming substrate to generate an aerosol, and the distal end is provided with a second atomizer for heating the aerosol-forming substrate to generate an aerosol; the first atomizer comprises a first suction port provided on the first suction nozzle for a user to suction, and a first airflow channel transmitting the aerosol generated by the first atomizer to the first suction port; the second atomizer comprises a second suction port provided on the second suction nozzle for a user to suction, and a second airflow channel transmitting the aerosol generated by the second atomizer to the second suction port;

the aerosol generating system further comprises a third airflow channel for communicating the first airflow channel and the second airflow channel;
when the first suction port is sucked by the user, the

second suction port is configured as an air inlet into which air flows; and/or, when the second suction port is sucked by the user, the first suction port is configured as an air inlet into which air flows.

[0043] Preferably, the aerosol generating system further comprises an airflow sensor for sensing airflow in the third airflow channel;

the aerosol generating system further comprises a power supply and a controller, wherein the controller is configured to control the power supply device to output power to the first atomizer or the second atomizer according to the sensing signal of the airflow sensor.

[0044] Preferably, the aerosol generating device further comprises a fourth airflow channel;

The airflow sensor isolates the third airflow channel from the fourth airflow channel, one side of the airflow sensor is communicated with the third airflow channel, and the other side thereof is communicated with the outside atmosphere through the fourth airflow channel.

[0045] Preferably, the airflow sensor comprises a first sensing surface and a second sensing surface; wherein

the first sensing surface is directly or indirectly communicated with the outside atmosphere to sense the first air pressure value of the outside atmosphere;
the second sensing surface is communicated with the third airflow channel to sense the second air pressure value of the airflow in the third airflow channel;
the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the difference between the first air pressure value and the second air pressure value.

[0046] Preferably, the aerosol generating system comprises a flexible seal between the first atomizer and the second atomizer, and the flexible seal is provided with a groove or a through hole extending from the proximal end to the distal end; the space of the groove or the through hole forms the third airflow channel.

[0047] Preferably, the flexible seal further comprises an accommodating cavity for accommodating the airflow sensor, and the accommodating cavity is provided on the third airflow channel.

[0048] Preferably, the airflow sensor is an airflow direction sensor, which is configured to sense the airflow direction in the third airflow channel;

the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the airflow direction sensed by the airflow direction sensor.

[0049] Preferably, the controller is configured to: when the airflow direction sensed by the airflow direction sensor is from the second airflow channel to the first airflow channel, control the power supply device to output power to the first atomizer;

and/or, when the airflow direction sensed by the airflow direction sensor is from the first airflow channel to the

second airflow channel, control the power supply device to output power to the second atomizer.

[0050] Preferably, the first atomizer comprises a first heating element for heating an aerosol-forming substrate to generate an aerosol, and the second atomizer comprises a second heating element for heating an aerosol-forming substrate to generate an aerosol; the first heating element and the second heating element are configured to have different resistance values.

[0051] Preferably, the controller stores the correlation between the resistance value of the first heating element and the power output from the power supply device to the first atomizer, and controls the power supply device to output power to the first atomizer according to the resistance value of the first heating element; and/or, the controller stores the correlation between the resistance value of the second heating element and the power output from the power supply device to the first atomizer, and controls the power supply device to output power to the second atomizer according to the resistance value of the second heating element.

[0052] Preferably, the aerosol-forming substrate of the first atomizer and the aerosol-forming substrate of the second atomizer have different material compositions.

[0053] Preferably, the aerosol-forming substrate comprises a solid matrix or a liquid matrix.

[0054] In the above aerosol generating system of the present invention, when one of the atomizers is sucked, the suction port and the airflow channel of the other atomizer are used as the air inlet in the airflow design, which can meet the stable airflow path of the first atomizer and the second atomizer at the same time during suction and ensure the smooth airflow during the suction process.

[0055] Further based on the above object of accurately controlling suction, yet another embodiment of the present invention further proposes another aerosol generating system having opposite proximal and distal ends, wherein the proximal end is provided with a first atomizer for heating an aerosol-forming substrate to generate an aerosol, and the distal end is provided with a second atomizer for heating the aerosol-forming substrate to generate an aerosol; the first atomizer comprises a first suction port provided at the proximal end for a user to suction, and a first airflow channel transmitting the aerosol generated by the first atomizer to the first suction port; the second atomizer comprises a second suction port provided at the distal end for a user to suction, and a second airflow channel transmitting the aerosol generated by the second atomizer to the second suction port;

the aerosol generating system further comprises an airflow sensor for sensing airflow in the first airflow channel and the second airflow channel;

the aerosol generating system further comprises a power supply and a controller, wherein the controller is configured to control the power supply device to output power to the first atomizer or the second at-

omizer according to the sensing signal of the airflow sensor.

[0056] Preferably, the aerosol generating system further comprises a third airflow channel for communicating the first airflow channel and the second airflow channel; the airflow sensor is the airflow direction sensor provided in the third airflow channel to sense the airflow direction in the third airflow channel;

the aerosol generating system further comprises a power supply and a controller, wherein the controller is configured to control the power supply device to output power to the first atomizer or the second atomizer according to the airflow direction sensed by the airflow direction sensor.

[0057] Preferably, the controller is configured to: when the airflow direction sensed by the airflow direction sensor is from the second airflow channel to the first airflow channel, control the power supply device to output power to the first atomizer;

and/or, when the airflow direction sensed by the airflow direction sensor is from the first airflow channel to the second airflow channel, control the power supply device to output power to the second atomizer.

[0058] Preferably, the airflow sensor comprises a first sensing surface and a second sensing surface; wherein

the first sensing surface is communicated with the airflow in the first airflow channel to sense the first air pressure value of the airflow in the first airflow channel;

the second sensing surface is communicated with the airflow in the second airflow channel to sense the second air pressure value of the airflow in the second airflow channel;

the controller controls the power supply device to output power to the first atomizer or the second atomizer according to the difference between the first air pressure value and the second air pressure value.

[0059] Preferably, the controller is configured to control the power supply device to output power to the first atomizer when the first air pressure value is less than the second air pressure value, and control the power supply device to output power to the second atomizer when the first air pressure value is greater than the second air pressure value.

[0060] Preferably, the first atomizer comprises a first heating element for heating an aerosol-forming substrate to generate an aerosol, and the second atomizer comprises a second heating element for heating an aerosol-forming substrate to generate an aerosol; the first heating element and the second heating element are configured to have different resistance values.

[0061] Preferably, the aerosol-forming substrate of the first atomizer and the aerosol-forming substrate of the second atomizer have different material compositions.

[0062] Preferably, the aerosol-forming substrate com-

prises a solid matrix or a liquid matrix.

[0063] Preferably, the aerosol generating system comprises an aerosol generating device extending from the proximal end to the distal end, and the aerosol generating device comprises a first end opposite to the proximal end and a second end opposite to the distal end;

the first atomizer is provided at the first end, and the second atomizer is provided at the second end;
the power supply extends from the proximal end to the distal end, and has a third end opposite to the proximal end and a fourth end opposite to the distal end;
the aerosol generating device is movable with respect to the power source, and has at least one moving position with respect to the power source, so that the first atomizer protrudes from the third end of the power source, or the second atomizer protrudes from the fourth end of the power source.

[0064] Preferably, the aerosol generating device is slidable with respect to the power source in the direction extending from the proximal end to the distal end, and has a first sliding position and a second sliding position opposite to the power supply;
the first atomizer protrudes from the third end of the power supply in the first sliding position, and the second atomizer protrudes from the fourth end of the power supply in the second sliding position.

[0065] Using the aerosol generating system of the above embodiment of the present invention, the airflow sensor specifically provided detects the airflow in the first airflow channel and the second airflow channel, thereby identifying the suction action of the first atomizer and the second atomizer from the user, correspondingly controlling the operation of the sucked atomizer, and ensuring accurate control of the sucking process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0066] One or more embodiments are exemplarily illustrated by the figures in the corresponding drawings. These exemplary descriptions do not constitute a limitation on the embodiments, and elements with the same reference numerals in the drawings represent similar elements. Unless otherwise stated, the figures in the drawings do not constitute a scale limitation.

FIG. 1 is a schematic diagram of the structure of existing flat cigarette products;

FIG. 2 is a schematic diagram of the structure of an aerosol generating system according to an embodiment in a state;

FIG. 3 is a schematic diagram of the structure of an aerosol generating system of FIG. 2 in a suction state;

FIG. 4 is a schematic diagram of the structure of an aerosol generating system of FIG. 2 in another suction state;

FIG. 5 is a schematic diagram of the structure of an embodiment of a first atomizer in FIG. 2;

FIG. 6 is a schematic diagram of the structure of yet another embodiment of a first atomizer in FIG. 2;

FIG. 7 is a schematic diagram of the structure of an embodiment of a power supply device in FIG. 2 from a perspective;

FIG. 8 is an exploded schematic diagram of each part of a power supply device shown in FIG. 7 before being assembled;

FIG. 9 is a schematic diagram of the structure of an embodiment of an aerosol generating device in FIG. 2 from a perspective;

FIG. 10 is an exploded schematic diagram of each part of an aerosol generating device shown in FIG. 9 before being assembled;

FIG. 11 is an enlarged schematic diagram of S part in FIG. 8;

FIG. 12 is a schematic diagram of the structure of a detection circuit in a position detecting component according to an embodiment;

FIG. 13 is a schematic diagram of a control structure of an aerosol generating device according to an embodiment;

FIG. 14 is a schematic diagram of the structure of a position detecting component according to another embodiment;

FIG. 15 is a schematic diagram of the structure of a position detecting component according to another embodiment;

FIG. 16 is a schematic diagram showing a reflective photoelectric sensor in FIG. 15 in the third position;

FIG. 17 is a schematic diagram of a positioning structure of an aerosol generating system according to another embodiment;

FIG. 18 is a schematic diagram of a positioning structure shown in FIG. 17 in the second position;

FIG. 19 is a schematic diagram of a positioning structure shown in FIG. 17 in the third position;

FIG. 20 is a schematic diagram of a positioning structure of an aerosol generating system according to another embodiment;

FIG. 21 is a schematic diagram of a positioning structure shown in FIG. 20 in the second position;

FIG. 22 is a schematic diagram of a positioning structure shown in FIG. 20 in the third position;

FIG. 23 is a schematic diagram of the structure of an airflow path of an aerosol generating device shown in FIG. 9;

FIG. 24 is a schematic diagram of an airflow direction of an airflow path of FIG. 23 when the first atomizer is sucked;

FIG. 25 is a schematic diagram of an airflow direction of an airflow path of FIG. 23 when the second atomizer is sucked;

FIG. 26 is a schematic diagram of the structure of a flexible seal forming the third airflow channel in FIGS.

10 and 23;

FIG. 27 is a schematic diagram of the structure of an airflow path of an aerosol generating device after the flexible seal is assembled in FIG. 26;

FIG. 28 is a schematic diagram of an airflow sensor for sensing airflow according to an embodiment;

FIG. 29 is a schematic diagram of an airflow sensor for sensing airflow according to another embodiment;

FIG. 30 is a schematic diagram of an airflow sensor for sensing airflow according to another embodiment;

FIG. 31 is a schematic diagram of the structure of a power supply device according to another embodiment from a perspective;

FIG. 32 is a schematic diagram of the structure of a battery core and an electrode contact in a power supply device of FIG. 31;

FIG. 33 is a schematic diagram of the structure of an aerosol generating system according to still another embodiment in a state;

FIG. 34 is a schematic diagram of the structure of an aerosol generating system of FIG. 33 in a suction state;

FIG. 35 is a schematic diagram of the structure of an aerosol generating system of FIG. 33 in another suction state.

DESCRIPTION OF THE EMBODIMENTS

[0067] In order to facilitate understanding of the present invention, the present invention will be described in more detail with reference to the accompanying drawings and specific embodiments.

[0068] In an aerosol generating system product according to an embodiment of the present invention, the flat cigarette type is exemplified in the following figures; its structural ideas and use can be extended to other types of aerosol generating system products, such as non-combustion baking and heating aerosol generating system products, etc. For the detailed structure and technical implementation of the aerosol generating system of an embodiment, refer to FIG. 2 to FIG. 4 for details.

[0069] The system comprises a power supply device 10 assembled in a detachable connection manner and an aerosol generating device 20 for generating an aerosol; wherein FIG. 2 is a schematic diagram of the structure of the power supply device 10 and the aerosol generating device 20 after being assembled, FIG. 3 is a schematic diagram of the structure of the aerosol generating device 20 in a use state, and FIG. 4 is a schematic diagram of the structure of the aerosol generating device 20 in another use state.

[0070] Referring to FIGS. 2 to 4, the power supply device 10 and the aerosol generating device 20 both have a flat shape. The specific power supply device 10 comprises a length direction, a width direction, and a height direction, which are represented by L direction, W direc-

tion and H direction shown in a coordinate in FIG. 2. The size of the power supply device 10 in the length direction is larger than the size in the width direction and the height direction; the shape of the aerosol generating device 20 is similar to that of the power supply device 10, and based on the exquisite and beautiful appearance of the product, the sizes of the aerosol generating device 20 in the length direction, the width direction and the height direction are the same as those of the power supply device 10.

[0071] When being assembled, the power supply device 10 and the aerosol generating device 20 are stacked and assembled in the height direction to form the combined state shown in FIG. 2. After being assembled, both ends of the aerosol generating device 20 in the length direction are flush with both ends of the power supply device 10 in the length direction, and both ends of the aerosol generating device 20 in the width direction are flush with both ends of the power supply device 10 in the width direction.

[0072] Further, according to the requirements and characteristics of product design and use, the power supply device 10 has a proximal end 110 and a distal end 120 that are opposite in the length direction. Generally, according to the situation of normal product use, the proximal end 110 is generally used as the end that contacts the mouth of the user for suction, and the distal end 120 is the other end away from the user. In use, the aerosol generating device 20 is movable with respect to the power supply device 10 in the length direction, and moves to different positions for suction, respectively. Specifically, taking the non-suction state shown in FIG. 2 as the first position A, the aerosol-generating device 20 moves a certain distance in the length direction toward the proximal end 110 to the second position B shown in FIG. 3, or moves a certain distance in the length direction toward the distal end 120 to the third position C shown in FIG. 4.

[0073] According to the above design feature of the relative mobile type, a first atomizer 21 and a second atomizer 22 for implementing the smoking function are provided at both ends of the aerosol generating device 20 opposite to the proximal end 110 and the distal end 120, respectively, so as to produce aerosols for smokers to smoke. Moreover, in the second position B, at least a part of the first atomizer 21 protrudes from the proximal end 110, and in the third position C, at least a part of the second atomizer 22 protrudes from the distal end 120, thereby facilitating sucking.

[0074] Further according to the design feature of the product, it is more clear or preferable that the suction nozzle parts of the first atomizer 21 and the second atomizer 22 are provided in the opposite directions in the length direction, so that in the second position B, the suction nozzle part of the first atomizer 21 protrudes from the proximal end 110, and in the third position C, the suction nozzle part of the second atomizer 22 protrudes from the distal end 120, thereby facilitating sucking.

[0075] It should be noted here that the first atomizer 21 and the second atomizer 22 are used to receive and

heat the aerosol-forming substrate, thereby generating an aerosol that can be smoked by smokers. The aerosol-forming substrate may be a solid matrix or a liquid tobacco tar matrix. The solid matrix such as volatile tobacco materials which contain volatile tobacco flavoring compounds, are released from the matrix when heated; the solid matrix can also comprise smoke powder, particles, strips, flakes, etc., which can emit smoke after being heated. For example, the liquid tobacco tar matrix contains tobacco tar materials such as glycerin, propylene glycol, flavors, and nicotine salts.

[0076] In one embodiment, the first atomizer 21 is an example of a type in which a liquid tobacco tar matrix is heated and atomized to generate an aerosol that can be smoked by smokers. The example of the functions of each part of the structure is as shown in FIG. 5, comprising:

an upper housing 213 and a lower housing 211, which together forms the external structure of the first atomizer 21; wherein the upper end of the upper housing 213 is a closed end, and the material and the shape of the outer surface of the upper housing 213 can be used in accordance with the requirement of the suction nozzle such that at least a part close to the upper end is used as a suction nozzle part for a user to suction, and a suction nozzle opening 2131 for sucking aerosol is provided at the end; the lower end of the lower housing 211 is an open end, on which an detachable end cap 217 is provided, so as to facilitate the installation of various functional parts inside the lower housing 211.

[0077] A exhaust gas transmission tube 212 is provided in the upper housing 213 and the lower housing 211 in the axial direction, the upper end of which is connected to the suction nozzle opening 2131, and the lower end of which is connected to an atomizing component 214 provided in the lower housing 211, thereby transmitting the aerosol generated by the atomizing component 214 to the suction nozzle opening 2131 and is sucked by the user. The space between the outer wall of the exhaust gas transmission pipe 212 and the inner walls of the upper housing 213 and the lower housing 211 forms a tar storage cavity 2111 for storing tobacco tar.

[0078] The atomizing component 214 in the lower housing 211 comprises a porous ceramic body 2142 at least partially provided in the tar storage cavity 2111. As can be seen from FIG. 5, the porous ceramic body 2142 is in the shape of a column of mesopores, and the outer surface and the inner surface of the porous ceramic body, which extend in the radial direction are respectively configured as a tar absorption surface and an atomization surface; wherein the tar absorption surface is in contact with the tobacco tar in the tar storage cavity 2111 and is used to suck the tobacco tar from the tar storage cavity 2111. A heating element 2141 is provided on the atomization surface for heating and atomizing the tobacco tar sucked by the porous ceramic body 2142 to generate an aerosol for smoking; the tobacco tar is atomized on the atomizing surface and released into the mesopores of

the porous ceramic body 2142, and the aerosol is delivered to the exhaust gas transmission pipe 212 by sucking the airflow until it is sucked at the suction nozzle opening 2131. When the atomizing component 214 is in operation, the transmission path of the tobacco tar is shown by the arrow P1 in FIG. 5, and is absorbed and delivered by the porous ceramic body 2142 to the atomizing surface for atomization.

[0079] In order to seal the tar storage cavity 2111 to prevent tar leakage and to facilitate the installation and fixation of the atomizing component 214, a silicone base 215 located below the tar storage cavity 2111 is further provided in the lower housing 211. The cross-section shape of the silicone base 215 is adapted to the cross-section shape of the lower housing 211 to prevent tobacco tar from leaking. At the same time, a fixed installation structure corresponding to the atomizing component 214 is provided on the silicone base 215, and the atomizing component 214 is installed and fixed on the silicone base 215 to be stably kept.

[0080] Two conductive posts 216 are installed on the end cap 217 for subsequent connection to the positive and negative electrodes of the power supply device 10 during assembly for supplying power. Both ends of the heating element 2141 are connected to the conductive posts 216 through conductive needles 2143, so that the heating element 2141 generates heat under the power supply of the power supply device 10 to realize the atomization of the tobacco tar. At the same time, in order to facilitate the outside air to enter the first atomizer 21 to form a complete air circulation during suction, an air inlet 218 is further provided on the end cap 217. During suction, outside air enters from the air inlet 218, enters the mesopore of the porous ceramic body 2142, and carries the generated aerosol through the exhaust gas transmission tube 212 until it is smoked at the suction nozzle opening 2131. As shown by arrow P2 in FIG. 5, a complete air circulation is formed.

[0081] In yet another embodiment, the first atomizer 21a of a solid matrix as shown in FIG. 6 may also be used. The structure comprises:

an internal hollow cylindrical housing member 211a, wherein the housing member 211a is filled with a smokable material 212a, a cooling filter material 214a, and a suction nozzle core 215a therein in the direction close to the user's proximal end 110 for a user to suction, and a heat generating element 213a is further provided in the smokable material 212a. The smokable material 212a may be a solid matrix such as tobacco paste, tobacco material, tobacco shred, etc. When heated by the heat generating element 213a, an aerosol that can be sucked is generated, which finally escapes from the end of the suction nozzle core 215a to be smoked.

[0082] Of course, in the first atomizer 21a shown in FIG. 6, in order to facilitate smooth airflow and power connection during the suction process, the first atomizer 21a further comprises an end cap 216a provided at the end of the housing member 211a. An air inlet (not shown

in the figure) is provided on the end cap 216a for suction and air inflow, and two electrode posts 217a connected to the heat generating element 213a are further provided on the end cap 216a; after the first atomizer 21a is installed on the aerosol generating device 20, the electrode posts 217a are connected to the positive electrode and the negative electrode of the power supply device 10, respectively, thereby supplying power to the heat generating element 213a.

[0083] In the aerosol generating device 20 of the above double-atomizer structure, based on similar usage scenarios, the first atomizer 21 and the second atomizer 22 can be of a tobacco tar heating type, popularized or replaced by a type of heating and producing smoke through the tobacco/volatile substance. The first atomizer 21 and the second atomizer 22 can have different flavors of tobacco tar to meet the more diverse smoking experience of smokers of electronic cigarettes.

[0084] Further, based on the object of accurately controlling suction in the moving position state, in another embodiment, in terms of the circuit structure or control method, the aerosol generating device 20 is non-conductively connected to the power supply device 10 in the first position A, only the first atomizer 21 is in the state in which the first atomizer can be triggered to operate by the suction action in the second position B, and only the second atomizer 22 is in the state in which the second atomizer can be triggered to operate by the suction action in the third position C. Therefore, according to the above circuit or control method, it can be ensured that at different positions, only the corresponding protruding atomizer can be triggered to operate and achieve suction, thereby avoiding the situation in which another atomizer that does not require suction is triggered and dry burned.

[0085] Based on the idea of the above control, in one embodiment, the electrical connection structure adopts the structure shown in FIG. 7 to FIG. 10. The specific power supply device 10 is provided with a battery core 11, and electrode contacts 12 provided on the battery core 11 and respectively connected to the positive electrode and the negative electrode of the battery core 11; in the preferred design shown in FIGS. 7 and 8, the electrode contacts 12 are in the shape of vertically elongated sheets that are attached to the surface of the battery core 11 and extend in the length direction of the power supply device 10, and are made of copper, silver, gold and other commonly used electrode conductive materials. Moreover, the electrode contact 12 is provided with two contacts formed by at least a part of the electrode contact 12 protruding toward the aerosol generating device 20, and specifically comprises a first contact 121 and a second contact 122. The first contact 121 is used to be conductively connected to the aerosol generating device 20 in the second position B, and the second contact 122 is used to be conductively connected to the aerosol generating device 20 in the third position C. Generally, in terms of beautiful product design and stable maintenance of components, the exterior of the power supply device 10

also has a housing structure. In order to facilitate the first contact 121 and the second contact 122 to be smoothly connected with the aerosol generating device 20 during product use, in terms of structural design, the first contact 121 and the second contact 122 penetrate outside the housing of the power supply device 10 as shown in FIG. 7.

[0086] Corresponding to the structure of the above power supply device 10, the aerosol generating device 20 is provided with an adapted conductive connection device, and a structure for controlling the operation of the first atomizer 21 and the second atomizer 22; as shown in FIG. 9 and FIG. 10, it comprises:

a hollow housing body 23, in which a main substrate 24 and a middle cover 25 for assisting the assembly and fixing of the main substrate 24 are received and installed;

a main substrate 24, which serves as a main circuit board structure for controlling the operation of the aerosol generating device 20, and is respectively provided with a first conductive needle 241 and a second conductive needle 242 along both ends of the aerosol generating device 20. The first conductive needle 241 is used to be connected with the first atomizer 21, and the second conductive needle 242 is used to be connected with the second atomizer 22.

[0087] The main substrate 24 is provided with a conductive elastic needle 243 for supplying power to the main substrate 24. The conductive elastic needle 243 is used to be connected with the first contact 121 and the second contact 122 on the electrode contact 12 of the power supply device 10 in the second position B and the third position C, respectively.

[0088] As for the above design structure in which the aerosol generating device 20 and the power supply device 10 are movable to each other, in the embodiment shown in FIGS. 7 to 10, a sliding fastener 231 is provided on the surface of the housing body 23 opposite to the power supply device 10. A sliding groove 13 on which the sliding fastener 231 slides is provided on power supply device 10 correspondingly. By fitting the sliding fastener 231 to the sliding groove 13, the power supply device 10 and the aerosol generating device 20 are slidable to each other. In detail, a hook portion 232 bent at the front end of the slide fastener 231 keeps hooked to the power supply device 10, so that the power supply device 10 and the aerosol generating device 20 are kept connected when sliding to prevent mutual disengagement. In other embodiments, the sliding guide structure of the above sliding groove 13/sliding fastener 231 can be replaced at their respective positions. Specifically, for example, the sliding groove 13 is changed to be provided on the aerosol generating device 20, and the corresponding sliding fastener 231 is provided on the power supply device 10. In other embodiments, the sliding guide connection structure of the sliding groove 13/sliding fastener 231 can also be replaced with other guide connection

structures such as a push rod, as long as it can be ensured that both the aerosol generating device 20 and the power supply device 10 can provide direction guidance when moving between the first position A, the second position B, and the third position C.

[0089] At the same time, further, in order to facilitate both of the aerosol generating device 20 and the power supply device 10 to keep fixed in the second position B and the third position C, a positioning structure is also designed in the structure; in the embodiment shown in FIG. 7, the housing part of the power supply device 10 is provided with a positioning hole 14, and the aerosol generating device 20 is provided with a positioning spring needle 26 which cooperates with the positioning hole 14; further, as shown in FIG. 6, there are three groups of positioning hole 14, which are the first group of positioning holes 141 for positioning and holding the first position A, the first group of positioning holes 142 for positioning and holding the second position B, and the second group of positioning holes 143 for positioning the third position C, respectively; when sliding in the second position B and the third position C, the positioning elastic needles 26 can be snapped into the corresponding positioning holes 14 under elastic force to achieve positioning and fixing, respectively. Of course, based on the same positioning function, the manner in which the positioning holes 14 and the positioning elastic needles 26 described above used in the embodiment cooperate to position can be replaced with positioning posts/grooves, limiting structures, magnetic attraction, etc. to guide the sliding position.

[0090] Further according to FIGS. 9 and 10, the conductive elastic needle 243 and the positioning elastic needle 26 described above are both provided on the main substrate 24 and penetrate the corresponding assembling holes on the middle cover 25 and the housing body 23 until they are partially exposed outside the surface of the housing body 23, so as to be connected to the electrode contact 12 and the positioning hole 14 on the power supply device 10. In addition, each electronic component provided on the main substrate 24 is directly or indirectly connected to the conductive elastic needle 243 through a printed circuit, thereby ensuring that each electronic component forms a complete electrical connection on the main substrate 24.

[0091] Meanwhile, in order to enable the operation of the first atomizer 21 and the second atomizer 22 to be triggered by the suction action of the user, an airflow sensor 27 is provided on the main substrate 24. The airflow sensor 27 is provided opposite to the air inlet of the first atomizer 21 and/or the second atomizer 22. Based on the design idea, the airflow sensor 27 is only used to sense the airflow generated by the user during suction to generate a sensing signal and respond to the sucking action of the user. The aerosol generating device 20 comprises a first atomizer 21 and a second atomizer 22. When the user sucks one of the first atomizer 21 and the second atomizer 22, the other of the first atomizer 21

and the second atomizer 22 is in a non-operating state to prevent it from dry burning. Therefore, the aerosol generating device 20 further comprises a position detecting component 40 configured to detect the position where the aerosol generating device 20 is located. The position detecting component 40 detects whether the aerosol generating device 20 is in the second position B or in the third position C. If the aerosol generating device 20 is in the second position B, it controls the operation of the first atomizer 21; if the aerosol generating device 20 is in the third position C, it controls the operation of the second atomizer 22.

[0092] Based on the above principle that the first atomizer 21 and the second atomizer 22 are controlled, respectively, an embodiment of the controlled hardware structure can be seen in FIG. 13. The power supply device 10 supplies electric energy to the first atomizer 21 and the second atomizer 22 through a first triode and a second triode; however, the on and off of the first triode and the second triode are controlled by the MCU controller 29 according to the position detected by the position detecting component 40. Of course, the content of this control is described above, so as to ensure the smooth implementation of the above functions.

[0093] Based on the above object, in one embodiment of the present invention, the position detecting component 40 comprises a conductive connector 41 provided on the main substrate 23, as shown in FIGS. 9 to 11, and a third contact 42 which is provided on the electrode contact 12 of the power supply device 10 and can be electrically connected to the conductive connector 41. The third contact 42 is used to be electrically connected with the conductive connector 41 when the aerosol generating device 20 moves to the second position B. Further, it detects whether the conductive connector 41 is conductively connected with the third contact 42 during suction, and it can be confirmed whether the aerosol generating device 20 is in the second position B or the third position C.

[0094] Based on the detection of the conductive connection state of the conductive connector 41 and the third contact 42, a detection circuit 43 is provided on the main substrate 24. Referring to FIG. 12, the detection circuit 43 of the preferred embodiment comprises: a first voltage divider resistor R1 and a second voltage divider resistor R2; wherein

the first end of the first voltage divider resistor R1 is connected to the conductive connector 41, the second end thereof is connected to the first end of the second voltage divider resistor R2, and the second end of the second voltage divider resistor R2 is grounded; the voltage divider resistor R1 and the second voltage divider resistor R2 form a series voltage divider circuit. In addition, the main substrate 24 is further provided with an MCU controller 29, and the first end of the second voltage divider resistor R2 is also connected to a voltage sampling pin of the MCU controller 29; the voltages at both ends of the second voltage divider resistor R2 are sampled by

the MCU controller 29.

[0095] In the implementation, if the third contact 42 is set to the electrode contact 12 connected to the positive electrode of the battery core 11, when the aerosol generating device 20 moves to the second position B, after the conductive connector 41 is connected the third contact 42, the first voltage divider resistor R1 and the second voltage divider resistor R2 may form a voltage divider detection path between the positive electrode and the negative electrode of the battery core 11.

[0096] When the aerosol generating device 20 moves to the third position C, since the first voltage divider resistor R1 is not connected to the circuit, the MCU controller 29 samples the voltage signal at both ends of the second voltage divider resistor R2 as 0. Thus, the MCU controller 29 samples the voltage signal value at both ends of the second voltage divider resistor R2, it can be known whether the conductive connector 41 is conductively connected to the third contact 42 to determine whether the aerosol generating device 20 is in the second position B or the third position C.

[0097] It should be noted that, in the above embodiment, the third contact 42 is set to be connected to the positive electrode of the battery core 11, and the second end of the second voltage divider resistor R2 is grounded to be connected to the negative electrode of the battery core 11. Thus, when the conductive connector 41 is conductively connected to the third contact 42, the above detection circuit forms a loop. In another embodiment, the third contact 42 may be connected to the negative electrode of the battery core 11 by grounding, and the second end of the second voltage divider resistor R2 may be connected to the positive electrode of the battery core 11 to form a loop.

[0098] In another embodiment, the position detecting component 40 may be implemented using the permanent magnet 42a provided on the power supply device 10 and the Hall sensor 41a provided on the aerosol generating device 20 as shown in FIG. 14. The magnetic field generated by the permanent magnet 42a is represented by the magnetic induction line M as shown in broken lines in FIG. 14. When the aerosol generating device 20 moves to the second position B and the third position C, as the Hall sensor 41a has a different distance from the permanent magnet 42a, the magnetic field intensity at the position where the Hall sensor 41a is located will also change accordingly. The Hall sensor 41a outputs voltage signals of different intensities according to the change of the position, and then the magnitude of the voltage signals output by the Hall sensor 41a can determine whether the aerosol generating device 20 is in the second position B or the third position C. The preferred method shown in the figure is that the permanent magnet 42a is provided on the power supply device 10 and the hall sensor 41a is provided on the aerosol generating device 20, while in other modified embodiments, the positions of the permanent magnet 42a and the hall sensor 41a may be provided interchangeably.

[0099] When the Hall sensor 41a and the permanent magnet 42a described above cooperate to detect that the aerosol generating device 20 is opposite to the power supply device 10, the Hall sensor 41a preferably adopts a linear Hall sensor. Under the condition of constant power supply, the linear Hall sensor outputs a voltage signal that is linearly proportional to the intensity of the magnetic field. When used in the product of the embodiment of the present invention, the greater the relative distance between the permanent magnet 42a and the Hall sensor 41a, the lower the intensity of the magnetic field at the location of the Hall sensor 40, and the lower the electrical signal generated; this linear correspondence is used to establish the correspondence between the first position A, the second position B, and the third position C and the electrical signal generated by the Hall sensor 41a, so that when the user sucks, the position where the aerosol generating device 20 is located can be known from the electrical signal of 41a of the Hall sensor.

[0100] In another embodiment, the position detecting component 40 comprises a reflective photoelectric sensor 42b provided on the power supply device 10, as shown in FIGS. 15 and 16; its position is provided near the proximal end 110 or the distal end 120, and the light emitting end and the reflected light receiving end of the reflective photoelectric sensor 42b are directed toward the aerosol generating device 20 during installation and arrangement; correspondingly, when the aerosol generating device 20 is in the second position B or the third position C, the reflective photoelectric sensor 42b is covered or exposed. When the reflective photoelectric sensor 42b is covered or exposed, the intensity signals of the received reflected light are different, thereby generating a sensing signal related to the intensity of the reflected light. Therefore, it can be known whether the reflective photoelectric sensor 42b is covered by the aerosol generating device 20 according to the sensing signal, and then by detecting the signal of the reflective photoelectric sensor 42b, it can be determined whether the position where the aerosol generating device 20 is located is the second position B or the third position C. Of course, based on the variable arranging method, the reflective photoelectric sensor 42b may also be correspondingly provided at the position near both ends of the aerosol generating device 20.

[0101] In addition to the embodiments listed in the above embodiments, the position detecting component 40 for detecting the position where the aerosol generating device 20 is located can also be implemented using more structures and means that can achieve the same purpose, which will not be listed in detail in the description of the present invention. Corresponding to the detection result of the above position detecting component 40, the MCU controller 29 on the main substrate 24 cooperates with the detection result to control the output; at the same time, it is used to control the above electronic components and structures, and more importantly, accurately control the operating state of the first atomizer 21 and

the second atomizer 22.

[0102] In a usage scenario, based on the demand for more smoking experience of the user, the first atomizer 21 and the second atomizer 22 can be configured to have different tobacco/tobacco tar properties, material compositions, or tastes. Both ends of the aerosol generating device 20 are generally the same in identifying the structures of the first atomizer 21 and the second atomizer 22, that is, the positions of the first atomizer 21 and the second atomizer 22 are interchangeable in product design and production and are compatible in structure. However, for example, when the viscosity, taste, material composition, etc. of the tobacco tar are different and it is necessary to control the operation with different operating power and operating temperature, identification is required.

[0103] Based on the above situation, in the above embodiment, the resistance value of the heating element 2141 of the first atomizer 21 may be different from that of the second atomizer 22 and have a certain resistance difference. Correspondingly, the magnitude of the resistance value for measuring the connected atomizer is provided on the main substrate 23 (refer to the specification of Patent 201610156080.9 for details of detection and implementation of the resistance value), so as to identify the type of the atomizer. At the same time, in terms of the controlling method, the magnitude of the resistance value of the heating element and the product information of the atomizer and/or the operation-related physical quantity parameter form a correlativity, and are stored in the MCU controller 29; thus the MCU controller 29 can accurately control the operation of the atomizer correspondingly by the identification of the resistance value.

[0104] Of course, based on the requirements of product control and use, the product information of the atomizer may comprise at least one of the stored taste of the tobacco tar, the viscosity of the tobacco tar, the composition of the tobacco tar, the production date, the amount of smoke, the operating temperature, the operating power or the parameters of the heat generating element. The operation-related physical quantity parameter may comprise at least one of power, power duty cycle, voltage, current, or frequency.

[0105] Further, on the basis of the above embodiments, another embodiment of the present invention further proposes another magnetic positioning structure, as shown in FIGS. 17 to 19; comprising:

a first magnetic body 26a provided on the aerosol generating device 20;

correspondingly, the power supply device 10 is provided with a second magnetic body 141a, a third magnetic body 142a, and a fourth magnetic body 143a, which are sequentially provided in the length direction; wherein

the second magnetic body 141a is used to magnetically attract the first magnetic body 26a on the aerosol generating device 20 when the aerosol gener-

ating device 20 moves to the second position B; the third magnetic body 142a is used to magnetically attract the first magnetic body 26a on the aerosol generating device 20 in the first position A; the fourth magnetic body 143a is used to magnetically attract the first magnetic body 26a on the aerosol generating device 20 in the third position C. The above four magnetic bodies are positioned and stably kept at different positions by magnetic adsorption at different positions, respectively, and the interaction between the first magnetic body 26a and other magnets during the sliding process can also provide damping force during the sliding process, keeping the sliding hand feeling.

[0106] Based on the same idea of the above magnetic attraction method, the number and arranging method of the above magnetic bodies can be changed equivalently with reference to the methods shown in FIG. 20 to FIG. 22; specifically comprising

a first magnetic body 261b and a second magnetic body 262b provided on the aerosol generating device 20;

correspondingly, the power supply device 10 is provided with a third magnetic body 141b and a fourth magnetic body 142b, which are sequentially provided in the length direction; wherein

in the first position A, the first magnetic body 261b and the third magnetic body 141b form magnetic attraction with respect to each other, and the second magnetic body 262b and the fourth magnetic body 142b form magnetic attraction with respect to each other;

in the second position B, the second magnetic body 262b and the third magnetic body 141b form a magnetic attraction with respect to each other, and the first magnetic body 261b and the fourth magnetic body 142b are staggered at both ends with respect to each other;

in the third position, the first magnetic body 261b and the fourth magnetic body 142b form a magnetic attraction with respect to each other, and the second magnetic body 262b and the third magnetic body 141b are staggered at both ends with respect to each other. This magnetic sliding type positioning method has the strongest intensity of magnetic attraction in the first position A in the middle, which provides the best stability in the storage state during non-suction.

[0107] Based on the above embodiment of the structural design having the first atomizer 21 and the second atomizer 22 according to the present invention, when the first atomizer 21 or the second atomizer 22 is sucked, the airflow path is as shown by the arrow R3 in FIG. 10; in terms of the structure, in order to ensure the formation of the above smooth airflow path, in one embodiment, the airflow structure of the aerosol generating device 20

uses the airflow design shown in FIG. 23.

[0108] Specifically, taking the structure of the atomizer adopted based on FIG. 5 as an example, the first atomizer 21 has a first airflow channel Q1, the second atomizer 22 has a second airflow channel Q2, and the first airflow channel Q1 and the second airflow channel Q2 are on the same straight line in the length direction of the aerosol generating device 20. Further, a third airflow channel Q3 connecting the first airflow channel Q1 and the second airflow channel Q2 is formed in the housing body 23 of the aerosol generating device 20 and the space inside the main substrate 24; thereby, a complete airflow circulation path is formed during the suction process of the user.

[0109] During the suction process, refer to FIG. 24 and FIG. 25 for the airflow direction, respectively. When the user sucks the suction nozzle opening 2131 of the first atomizer 21, the suction nozzle opening of the second atomizer 22 opposite to the distal end 120 2231 is used as an air inlet port of the aerosol generating device 20. The outside air enters the second atomizer 22 from the suction nozzle opening 2131 of the second atomizer 22 in the direction indicated by the arrow in FIG. 22, and passes through the second airflow channel Q2, the third airflow channel Q3, and the first airflow channel Q1 sequentially until the air is smoked at the suction nozzle opening 2131 of the first atomizer 21. Conversely, when the user sucks the suction nozzle opening 2231 of the second atomizer 22, the suction nozzle opening 2131 of the first atomizer 21 opposite to the proximal end 110 is used as the air inlet port of the aerosol generating device 20.

[0110] According to the airflow circulation path adopted above, the airflow sensor 27 is provided in the third airflow channel Q3; in order to assist the package of the airflow sensor 27, it is not disturbed by the atmosphere, and the third airflow channel Q3 in which airflow stably flows is accurately formed. As shown in FIGS. 10, 26, and 27, the aerosol generating device 20 is further provided with a flexible seal 30. The flexible seal 30 is provided with a groove 31 extending in the length direction of the aerosol generating device 20. The space of the groove 31 forms the third airflow channel Q3 described above for connecting the first airflow channel Q1 and the second airflow channel Q2.

[0111] In one embodiment described based on the above illustrations and text, the third airflow channel Q3 is formed by the space of the groove 31. In an alternative or equivalent embodiment, a through hole inside the flexible seal 30 may also be used to form the third airflow channel Q3.

[0112] At the same time, the flexible seal 30 is further provided with an accommodating cavity 32 for covering the airflow sensor 27. By accommodating and covering the airflow sensor 27 in the accommodating cavity 32, it can be ensured that the airflow sensor 27 is not interfered by the external airflow, improving sensitivity and accuracy. Based on the object that the airflow sensor 27 senses

the suction airflow, the accommodating cavity 32 is provided in the third airflow channel Q3, and at least a part of the accommodating cavity 32 is communicated with the third airflow channel Q3, so that the airflow can be sensed by the airflow sensor 27 when flowing.

[0113] Furthermore, according to the sensing principle of the airflow sensor 27, in one embodiment of the present invention, the airflow sensor 27 can be implemented using a pressure-differential airflow sensor. Refer to FIG. 28 for the providing structure. The pressure-differential airflow sensor 27 has a first sensing surface 271 and a second sensing surface 272. During installation and arrangement, the first sensing surface 271 can be directly or indirectly communicated with the outside atmosphere to sense the air pressure value of the outside atmosphere; in specific design and production of a product, as shown in FIG. 28, the first sensing surface 271 is communicated with the outside atmosphere through the fourth airflow channel Q4 formed by the pores and the like provided on the housing body 23 to sense the air pressure value of the outside atmosphere. At the same time, the second sensing surface 272 is in contact with the third airflow channel Q3 to form a communication, so as to sense the airflow air pressure value in the third airflow channel Q3. According to the signal principle of the pressure-differential airflow sensor 27, when the user sucks the first atomizer 21 or the second atomizer 22 to form a negative pressure inside the aerosol generating device 20, thereby generating airflow in the third airflow channel Q3, the second sensing surface 272 can sense the air pressure value generated by the airflow in the third airflow channel Q3 resulted from suction; by calculating the difference between the air pressure value and the outside atmosphere sensed by the first sensing surface 271, the MCU controller 29 controls the power supply device 10 to output power to the aerosol generating device 20 according to the air pressure difference. The MCU controller 29 can use two methods to control the power output.

[0114] In one method, the MCU controller 29 compares the above air pressure difference with a preset threshold, and when the air pressure difference exceeds the threshold, the MCU controller controls the power supply device 10 to output power to the aerosol generating device 20; if the air pressure difference is below the threshold, the MCU controller has no response or trigger. In the other method, according to the correlation between the air pressure difference and the output power stored in advance, the power supply device 10 can be controlled to output the corresponding power to the aerosol generating device 20 according to the value of the air pressure difference; for example, the larger the air pressure difference, the stronger the suction action of the user, and the higher the output power.

[0115] Of course, based on the simple demand of conventional triggering, the above airflow sensor 27 can also be carried out by a microphone commonly used in electronic cigarette products in other alternatives. When a

suction airflow is sensed in the third airflow channel Q3, a high level signal is generated to be sent to the MCU controller 29. Moreover, because the microphone structure has two sides that are directly or indirectly communicated to the third airflow channel Q3 and the atmosphere, the microphone can also be installed in the same manner as the pressure-differential airflow sensor 27 in FIG. 28, so that one side thereof is directly communicated with the third airflow channel Q3, and the other side thereof is communicated with the outside atmosphere through the fourth airflow channel Q4 formed by the pores and the like provided on the housing body 23.

[0116] Further, in order to facilitate the airtightness of the airflow during use of the aerosol generating device 20, and to improve the connection between both ends of the third airflow channel Q3 and the air inlet of the first atomizer 21 or the second atomizer 22, the flexible seal 30 is respectively provided with a first sealing part 33 and a second sealing part 34 opposite to the first atomizer 21 and the second atomizer 22; wherein the first sealing part 33 seals the end of the first atomizer 21 opposite to the distal end 120. When being provided, there will be left a certain gap between the first sealing part 33 and the end of the first atomizer 21, and the space formed by the gap is used to smoothly connect the first end 311 of the groove 31 and the air inlet 218 on the end cap 217 of the first atomizer 21.

[0117] Similarly, the second sealing part 34 is similar to the first sealing part 33, and seals the end of the second atomizer 21 opposite to the proximal end 110, so that the air inlet of the second atomizer 21 is smoothly connected to the second end 312 of the groove 31 to form a first airflow channel Q1, a second airflow channel Q2, and a third airflow channel Q3 that are smoothly and completely connected.

[0118] Based on the above design of the same product idea, in the above embodiment, the power supply device 10 and the aerosol generating device 20 slide out of the split aerosol generating system. The air path structure of the above aerosol generating device 20 can be applied to any product types having a first atomizer 21 and a second atomizer 22. For example, an atomizer is provided at both ends of the power supply of the flat cigarette shown in FIG. 1. The air path and the sensing structure are provided in the housing of the power supply according to the third airflow channel Q3 and airflow sensor 27 described above, so that when an atomizer is sucked, another atomizer is used as the air inlet channel, and the airflow sensor that senses the suction action is provided inside the power supply, which can obtain the same effect.

[0119] As described above, the aerosol generating device 20 and the power supply device 10 are moved to relative positions, so as to correspondingly control the operating method of the first atomizer 21 or the second atomizer 22. In another preferred modified embodiment, when sucking in conjunction with the first atomizer 21 and the second atomizer 22 described above, in different

airflow directions in the aerosol-generating device 20, the third airflow channel Q3 in the aerosol-generating device 20 may be provided with an airflow direction sensor 27a as shown in FIG. 29, which is used to detect the airflow direction in the third airflow channel Q3 during suction.

[0120] If the airflow direction sensor 27a detects that the airflow direction is flowing from the second atomizer 22 toward the first atomizer 21, it indicates that the user is sucking the first atomizer 21, and the corresponding MCU controller 29 controls the power device 10 to output power to the first atomizer 21 so as to operate; conversely, if the airflow sensor device 27a detects that the airflow direction is flowing from the first atomizer 21 toward the second atomizer 22, the corresponding MCU controller 29 controls the second atomizer 21 to operate.

[0121] For the above purpose of detecting the airflow direction, the airflow direction sensor 27a can be selected by using a wind direction sensor, and it is generally feasible to use a voltage divider resistance type directional sensor, an electromagnetic type directional sensor, a photoelectric type directional sensor, and the like. The structure of this type of sensors usually has a mechanical structure of a wind vane that rotates with the airflow, and a signal generating part that generates a signal in cooperation with the wind vane; for example, a voltage divider type direction sensor uses a sliding rheostat and a voltage divider to form a voltage divider circuit. The sliding bar of the sliding rheostat is driven by the wind vane (when the wind vane drives the sliding bar to move with the movement of airflow to change the resistance value of the sliding rheostat). When the wind vane rotates, the sliding bar of the sliding rheostat will move with the wind vane, so that the direction of the airflow can be deduced by detecting the different voltage changes generated at both ends of the voltage divider resistor.

[0122] Based on the above situation of the corresponding control that the user identifies the atomizer sucked by the user due to different sucking airflow directions, another embodiment of the present invention further proposes the content to use a pressure difference type airflow sensor to correspondingly identify the atomizer sucked by the user. Specifically, referring to FIG. 30 for the arranging and detection method of the pressure difference type airflow sensor, the first atomizer 21 itself comprises a first airflow channel Q1 transmitting the generated aerosol to the outside for smoking, and the second atomizer 22 itself comprises a second airflow channel Q2 transmitting the generated aerosol to the outside for smoking; the housing body 23 corresponding to the aerosol generating device 20 is provided with a first air inlet hole 233 and a second air inlet hole 234, respectively; and a third airflow channel Q3 for communicating the first air inlet hole 233 and the first airflow channel Q1 and a fourth airflow channel Q4 for communicating the second air inlet hole 234 and the second airflow channel Q2 are provided therein, respectively. At the same time, the first sensing surface 271b of the pressure-differential airflow

sensor 27b provided inside the housing body 23 is communicated with the third airflow channel Q3, and the second sensing surface 272b is communicated with the fourth airflow channel Q4.

[0123] At the same time, as shown in FIG. 30, in terms of space design, the third airflow channel Q3 and the fourth airflow channel Q4 are isolated from each other by the airflow sensor 27b; the third airflow channel Q3 and the fourth airflow channel Q4 are communicated with the atmosphere through the first air inlet hole 233 and the second air inlet 234, respectively. Therefore, during non-suction, the internal air pressure is an atmospheric pressure; and when the user sucks the first atomizer 21, a negative pressure is formed in the third airflow channel Q3. The air flow enters from the first air inlet hole 233 as shown in FIG. 30 and is sucked through the third airflow channel Q3 and the first airflow channel Q1 in sequence. The air pressure P1 of the third airflow channel Q3 sensed by the first sensing surface 271b of the airflow sensor 27b is negative pressure, which is less than the air pressure P2 of the fourth airflow channel Q4 sensed by the second sensing surface 272b; conversely, when the user sucks the second atomizer 22, the air pressure P2 of the fourth airflow channel Q4 sensed by the second sensing surface 272b is less than the air pressure P1 of the third airflow channel Q3 sensed by the first sensing surface 271b; and further, the MCU controller 29 can determine which atomizer is sucked by the user by calculating the pressure difference, and then can control the output power of the power supply device 10 correspondingly.

[0124] Of course, in the above implementation process, the suction action is judged by the pressure difference between the air pressure P1 of the third airflow channel Q3 and the air pressure P2 of the fourth airflow channel Q4. In order to ensure the accuracy of the result, the calculated pressure difference can be compared with a preset threshold. If the pressure difference is less than the threshold, the pressure difference between the air pressure P1 and the air pressure P2 is too small, which may be the change in detection data of the sensor caused by small artificial actions (such as swinging) under non-suction. If the pressure difference is less than the threshold, it will not respond to the trigger signal of the sensor to ensure to control the accuracy of the output.

[0125] Based on the above product usage state, in an embodiment, the aerosol generating system comprises the aerosol generating device and the power supply device 10a. The aerosol generating device and the power supply device 10a can both be in the conductive connection state during the above position state and during the movement process. The first position A, the second position B, and the third position C described above are only used to adjust the aerosol generating device to be in a suction or non-suction placement state.

[0126] For details of the power supply device 10a adapted to the above functions, refer to FIGS. 31 and 32. The electrode contacts 12a on the power supply de-

vice 10a extend in the length direction of the power supply device 10a and are exposed on the outer surface of the power supply device 10a. Its extended length is at least greater than the stroke length of the aerosol generating device sliding from the second position B to the third position C; the conductive elastic needle on the aerosol generating device is always electrically connected with the electrode contacts 12a during sliding. The corresponding aerosol generating device is always in the power supply state, and the moving position is only used to make the atomizer protrude so as to be held by the user's lips for suction.

[0127] The positioning and detection of the moving position and the control of the suction can be adopted and implemented by referring to the content described in the above embodiments, which will not be described in detail in this section.

[0128] Based on the appearance and shape of the above products that can be changed equivalently, the present invention further proposes an aerosol generating system according to an embodiment, whose structure is shown in FIGS. 33 to 35, comprising:

an elongate power supply device 10, wherein both ends of the power supply device 10 in the length direction are respectively configured as a proximal end 110 and a distal end 120 of the product; a through hole 30b penetrating in the length direction is further provided inside the power supply device, and the through hole 30b is used as a space for accommodating and installing the aerosol generating device 20b.

[0129] The shape of the aerosol generating device 20b is adapted to the shape of the through hole 30b, and has a vertically elongated design extending in the length direction of the power supply device 10. Both ends of the aerosol generating device 20b opposite to the proximal end 110b and the distal end 120b are provided with a first atomizer 21b and a second atomizer 22b, respectively.

[0130] Similarly, the aerosol generating device 20b can telescopically slide with respect to the power supply device 10b in the axial direction of the through hole 30b, and three sliding positions are set, which are the first position A, the second position B and the third position C as shown in FIGS. 33 to 35, respectively. In the first position A, both ends of the aerosol generating device 20b are flush with the proximal end 110b and the distal end 120b; in the second position B, at least a part of the first atomizer 21b protrudes from the proximal end 110b, so that it is convenient for a user to suction; in the third position C, at least a part of the second atomizer 22b protrudes from the distal end 120b.

[0131] Similarly, in the implementation of the product, the content that is convenient for position detection and control and the positioning of the sliding position can be implemented using the content described above, which will not be described in detail here.

[0132] It should be noted that the description of the present invention and the accompanying drawings give

preferred embodiments of the present invention, but are not limited to the embodiments described in the present description. Further, those skilled in the art can make improvements or changes according to the above description.

Claims

1. An aerosol generating system, comprising an aerosol generating device (20) for generating an aerosol and an airflow sensor; wherein the aerosol generating device (20) comprises a first atomizer (21, 21a, 21b) for heating a first aerosol-forming substrate to generate an aerosol, and a second atomizer (22, 22b) for heating a second aerosol-forming substrate to generate an aerosol; the airflow sensor (27) comprises a first sensing surface (271) and a second sensing surface (272);
characterized in that:

the first atomizer (21, 21a, 21b) comprises a first airflow channel (Q1) transmitting the aerosol generated by the first atomizer (21, 21a, 21b); the second atomizer (22, 22b) comprises a second airflow channel (Q2) transmitting the aerosol generated by the second atomizer (22, 22b); the aerosol generating system further comprises a third airflow channel (Q3) for communicating the first airflow channel (Q1) and the second airflow channel (Q2); the first sensing surface (271) is directly or indirectly communicated with the outside atmosphere; the second sensing surface (272) is communicated with the third airflow channel (Q3) for sensing airflow change in the third airflow channel (Q3).

2. The aerosol generating system according to claim 1, wherein the aerosol generating device (20) further comprises a fourth airflow channel (Q4); the first sensing surface (271) is communicated with the outside atmosphere through the fourth airflow channel (Q4).

3. The aerosol generating system according to claim 1 or 2, further comprising a power supply device (10) for powering the aerosol generating device (20); wherein

the aerosol generating device (20) is movable with respect to the power supply device (10) and has a first position and a second position with respect to the power supply device (10); the first atomizer (21, 21a, 21b) is non-conductively connected to the power supply device (10) in the second position; and/or,

the second atomizer (22, 22b) is non-conductively connected to the power supply device (10) in the first position.

4. The aerosol generating system according to claim 1 or 2, further comprising a power supply device (10) for powering the aerosol generating device (20); wherein

the aerosol generating device (20) is movable with respect to the power supply device (10) and has a first position and a second position with respect to the power supply device (10); the first atomizer (21, 21a, 21b) is conductively connected to the power supply device (10) in the first position; and/or, the second atomizer (22, 22b) is conductively connected to the power supply device (10) in the second position.

5. The aerosol generating system according to claim 3 or 4, wherein the aerosol generating device (20) further has a third position with respect to the power supply device (10); when the aerosol generating device (20) is in the third position, the aerosol generating device (20) is non-conductively connected to the power supply device (10) in the third position.

6. The aerosol generating system according to any one of claims 1-5, further comprising a controller (29), wherein

the airflow sensor (27) is a pressure-differential airflow sensor or a microphone; the controller (29) is configured to control the power supply device (10) to output power according to a value of an air pressure difference attained by the airflow sensor (27).

7. The aerosol generating system according to claim 6, wherein

the controller (29) is further configured to compare a preset threshold with a value of an air pressure difference between the first air pressure value and the second air pressure value; the controller (29) is further configured to, when the value of an air pressure difference is larger than preset threshold, control the power supply device (10) to output power.

8. The aerosol generating system according to claim 6, wherein

the controller (29) is further configured to adjust the output power according to the value of the air pressure difference;

the controller (29) is further configured to adjust the output power to become larger when the value of the air pressure difference becomes larger.

9. The aerosol generating system according to claim 1, further comprising a controller (29), wherein

the first sensing surface (271) is configured to sense a first air pressure value of the outside atmosphere; the second sensing surface (272) is configured to sense a second air pressure value of the airflow in the third airflow channel (Q3); the controller (29) is configured to calculate the value of the air pressure difference between the first air pressure value and the second air pressure value.

10. The aerosol generating system according to any one of claims 1-5, wherein the aerosol generating system further comprises

a position detecting component (40) for detecting whether the aerosol generating device (20) is in the first position or in the second position, and
a controller (29);
wherein the controller (29) is configured to control the power supply device (10) to output power to the first atomizer (21, 21a, 21b) or the second atomizer (22, 22b) according to the position of the aerosol generating device (20) detected by the position detecting component (40).

11. The aerosol generating system according to claim 10, wherein

the controller (29) is configured to control the power supply device (10) to output power to the first atomizer (21, 21a, 21b) when the position detecting component (40) detects that the aerosol generating device (20) is in the first position; and/or, control the power supply device (10) to output power to the second atomizer (22, 22b) when the position detecting component (40) detects that the aerosol generating device (20) is in the second position.

12. The aerosol generating system according to claim 11, wherein

the position detecting component (40) comprises a conductive connector (41) provided on the aerosol generating device (20) and a first contact (121) provided on the power supply device (10);
the conductive connector (41) is conductively connectable to the first contact (121) in one of the first position or the second position;
the position detecting component (40) further comprises a detection circuit (43) for detecting

whether the conductive connector (41) is conductively connected to the first contact (121).

13. The aerosol generating system according to claim 12, wherein

the power supply device (10) comprises a first electrode and a second electrode; the first contact (121) is connected to the first electrode, and the detection circuit (43) comprises a first voltage divider resistor (R1) and second voltage divider resistor (R2); wherein the first end of the first voltage divider resistor (R1) is connected to the conductive connector (41), the second end thereof is connected to the first end of the second voltage divider resistor (R2), and the second end of the second voltage divider resistor (R2) is connected to the second electrode;
the controller (29) further comprises a voltage sampling terminal for collecting voltage values at both ends of the second voltage divider resistor (R2), the voltage sampling terminal is connected to the first end of the second voltage divider resistor (R2); and the controller (29) controls the power supply device (10) to output power to the first atomizer (21, 21a, 21b) or the second atomizer (22, 22b) according to the collected voltage values.

14. The aerosol generating system according to claim 10, wherein

the position detecting component (40) comprises a magnetic field generator provided on one of the aerosol generating device (20) or the power supply device (10), and a Hall sensor provided on the other thereof;
the magnetic field generator is configured to generate a magnetic field; the Hall sensor is configured to sense a change in the intensity of the magnetic field at the position where it is located to generate a sensing signal; and the controller (29) controls the power supply device (10) to output power to the first atomizer (21, 21a, 21b) or the second atomizer (22, 22b) according to the sensing signal of the Hall sensor.

15. The aerosol generating system according to claim 10, wherein

the position detecting component (40) comprises a reflective photoelectric sensor provided on one of the aerosol generating device (20) or the power supply device (10); the reflective photoelectric sensor has a light emitting end and a reflected light receiving end, and generates a sensing signal according to the intensity of the reflected light received by the reflected light re-

ceiving end;
the controller (29) is configured to control the
power supply device (10) to output power to the
first atomizer (21, 21a, 21b) or the second at-
omizer (22, 22b) according to the sensing signal 5
of the reflective photoelectric sensor.

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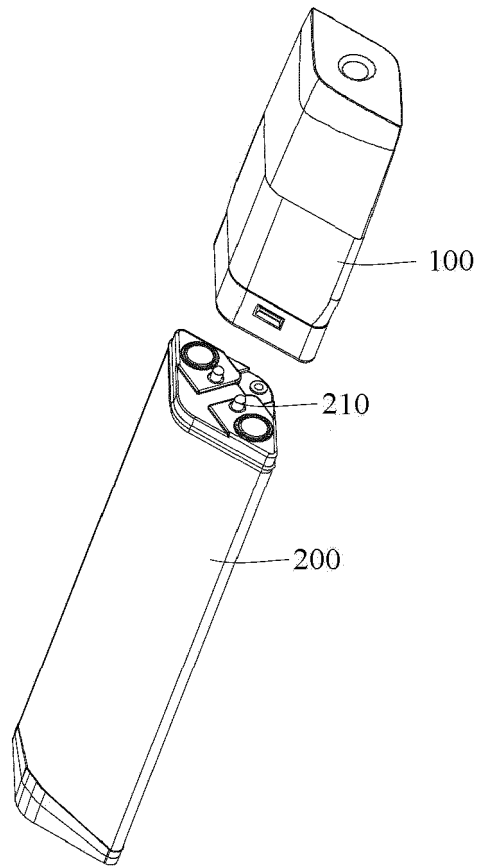


FIG. 1

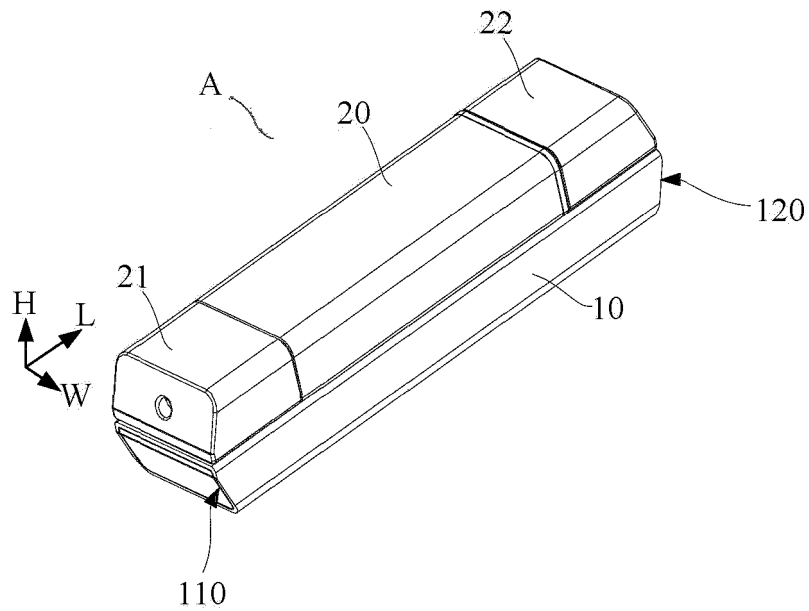


FIG. 2

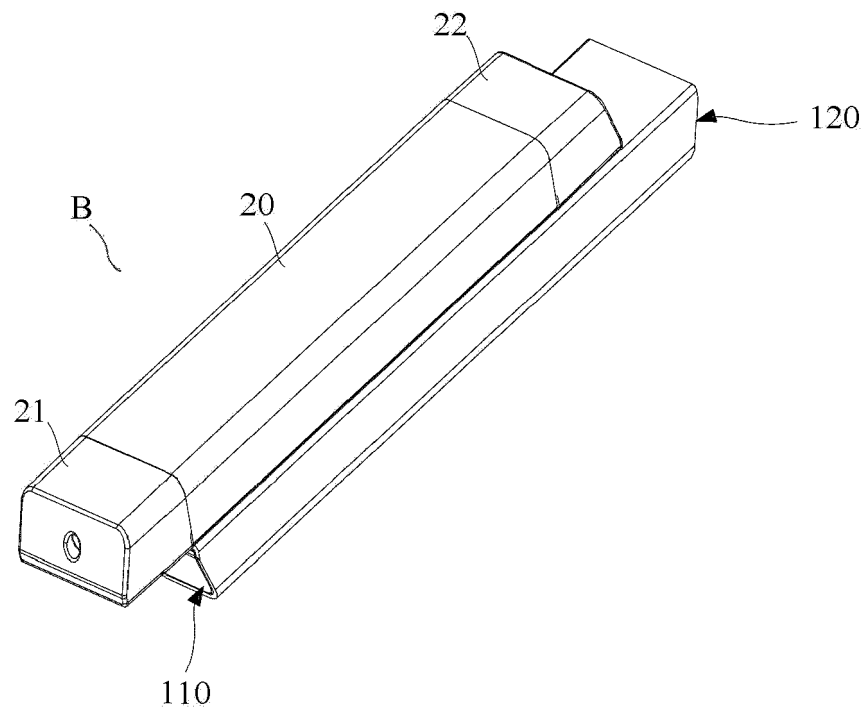


FIG. 3

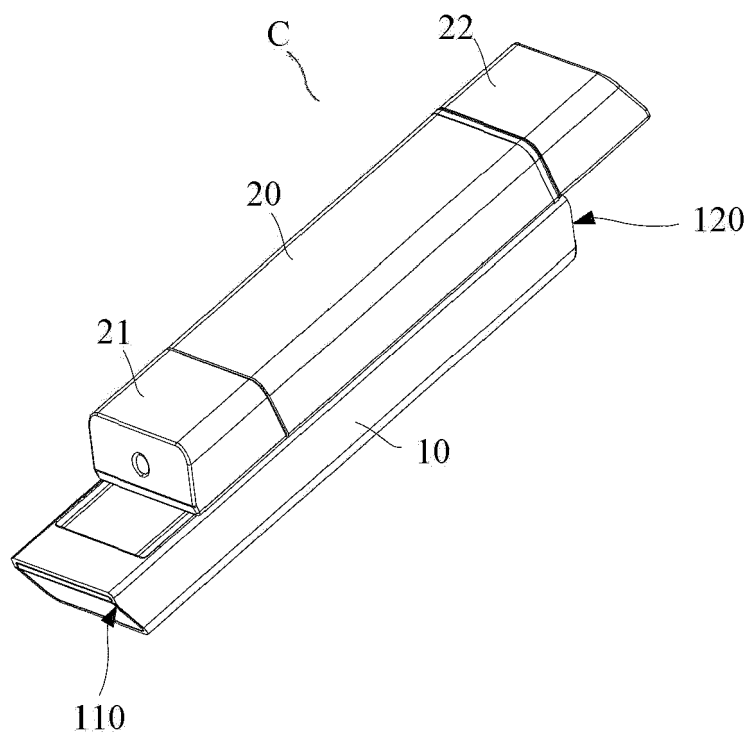


FIG. 4

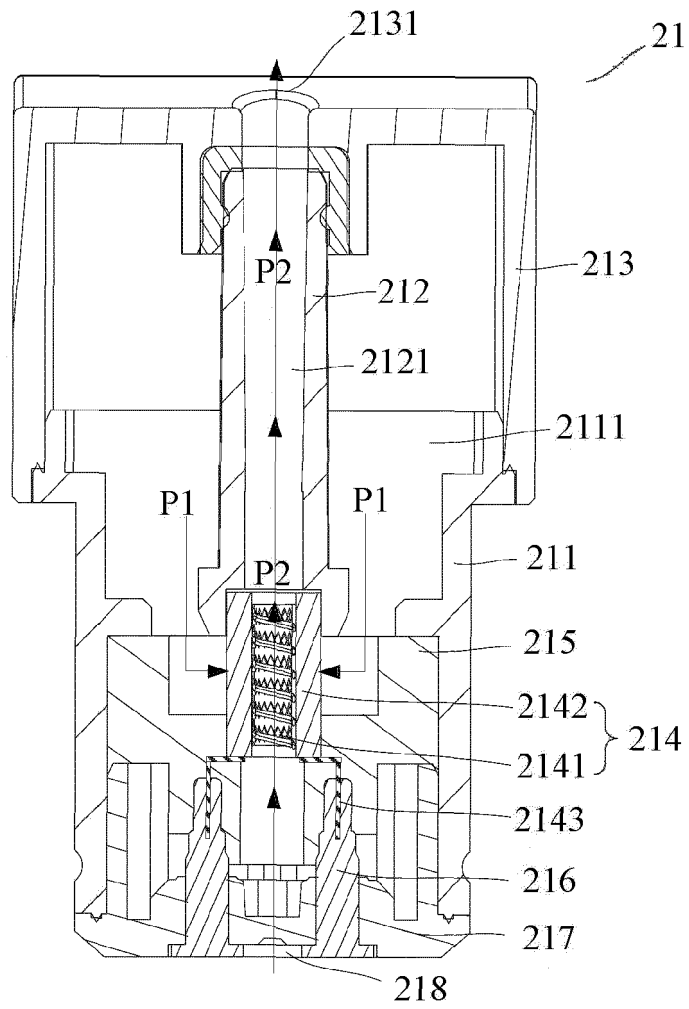


FIG. 5

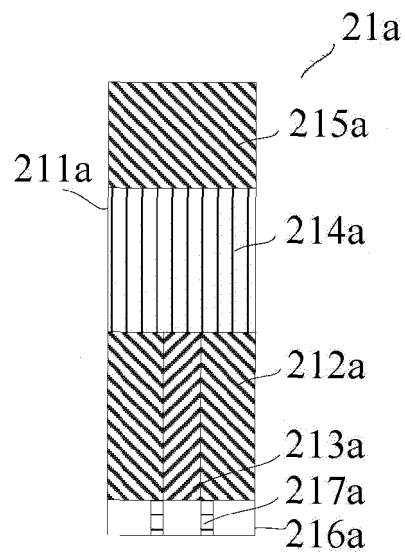


FIG. 6

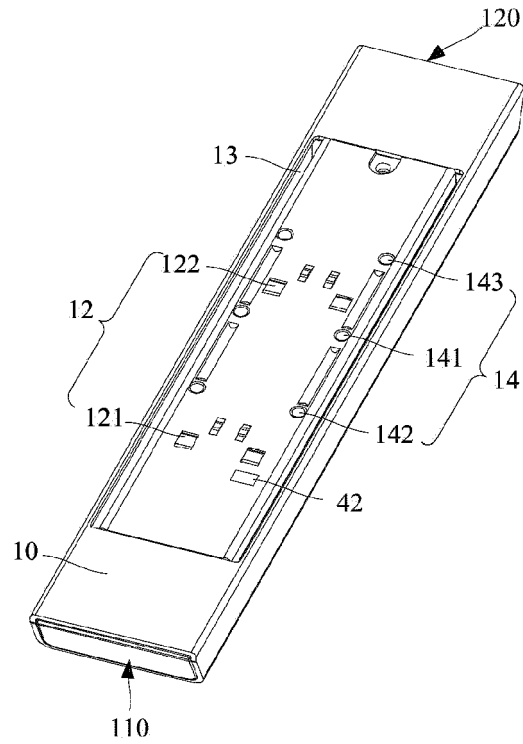


FIG. 7

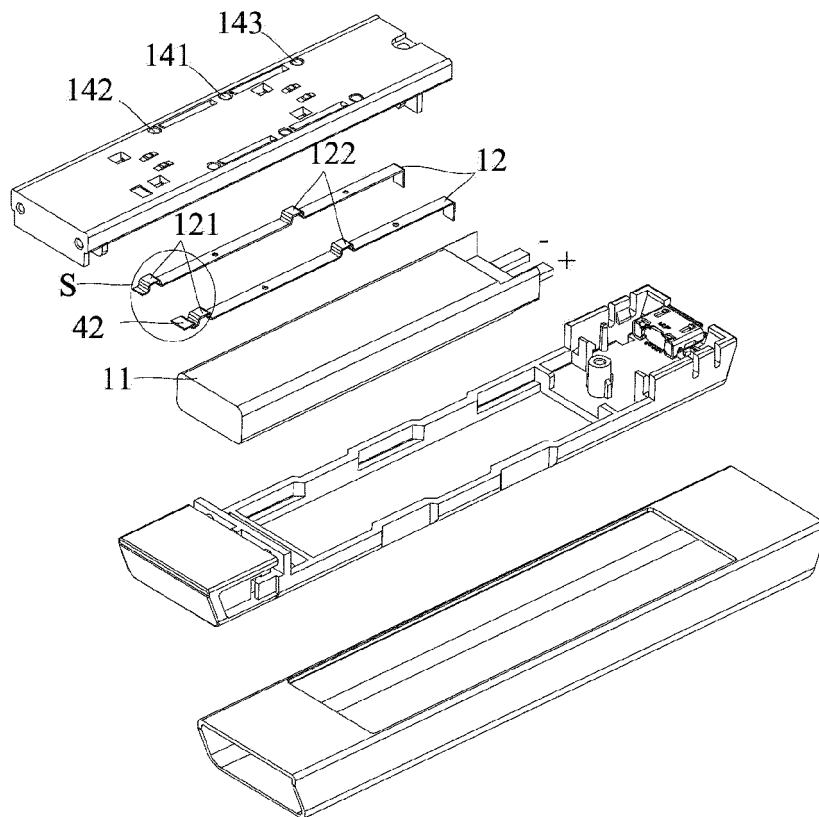


FIG. 8

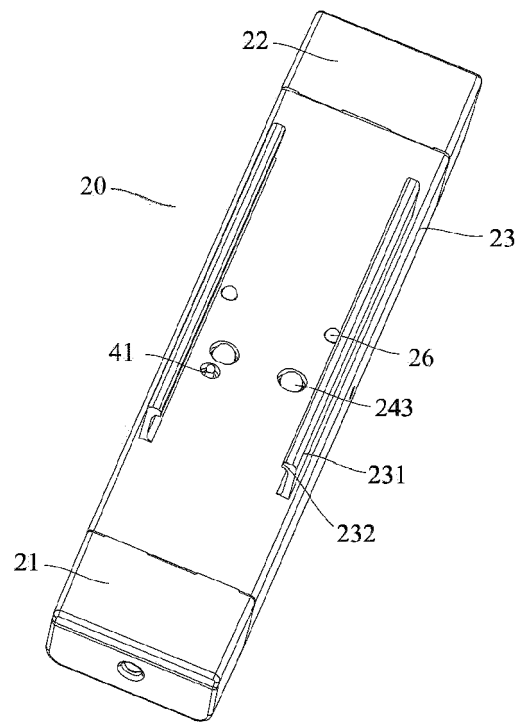


FIG. 9

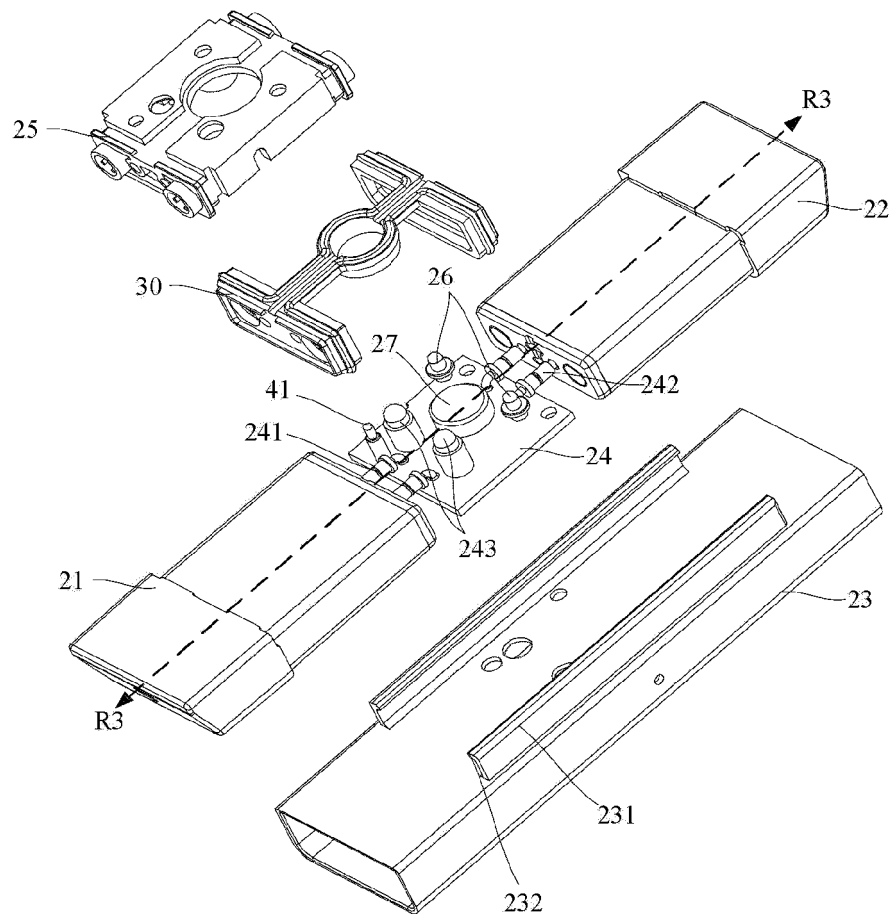


FIG. 10

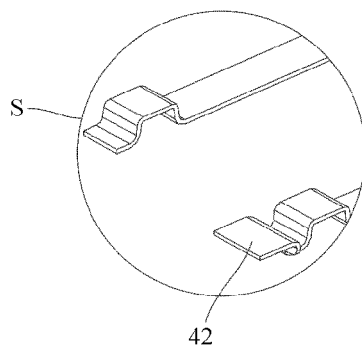


FIG. 11

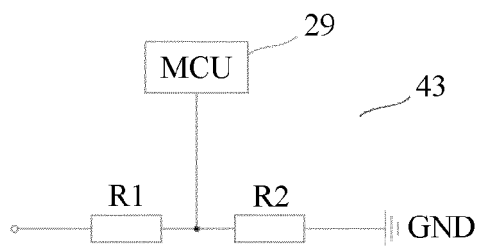


FIG. 12

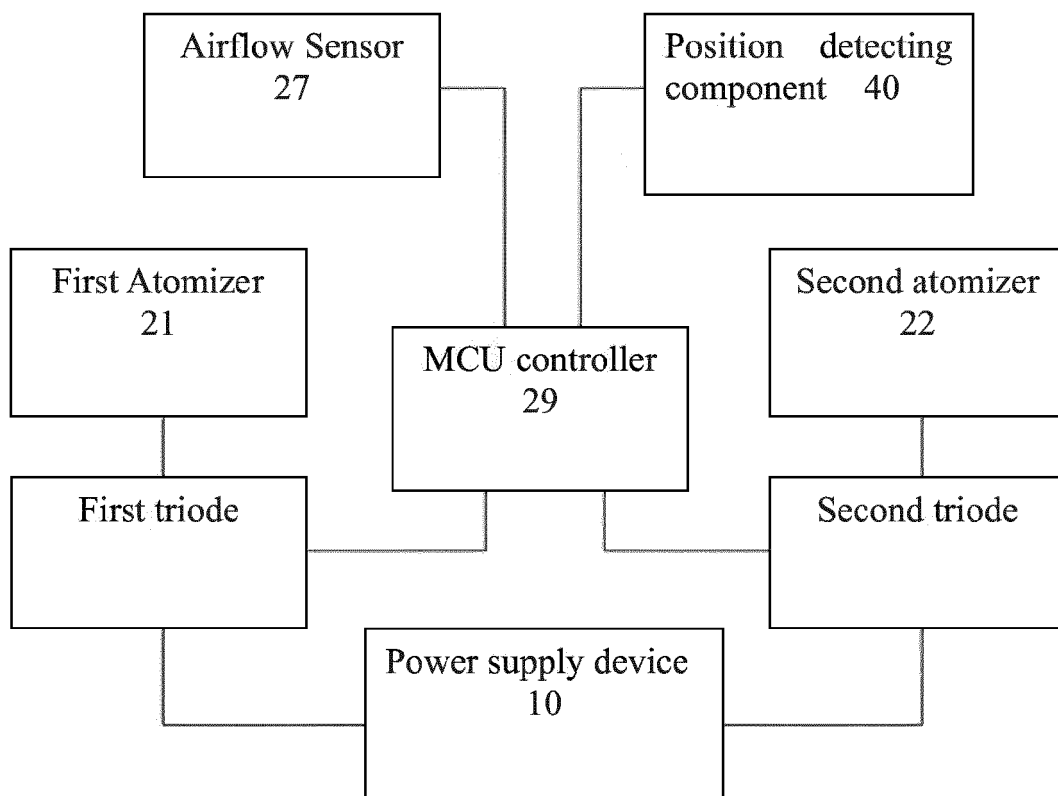


FIG. 13

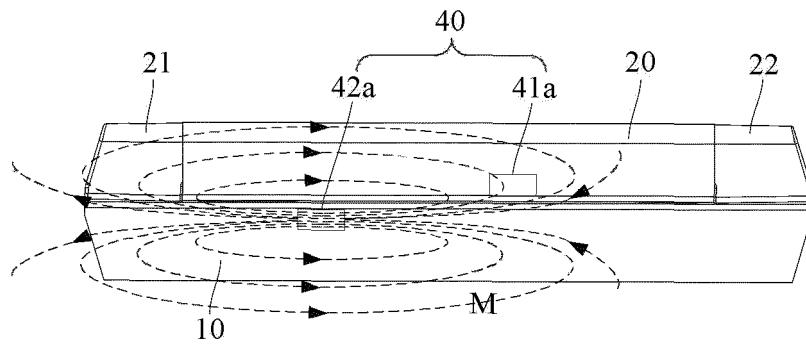


FIG. 14

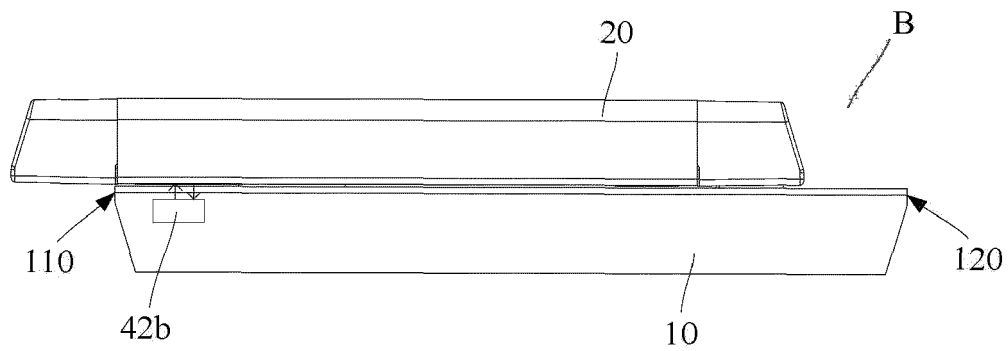


FIG. 15

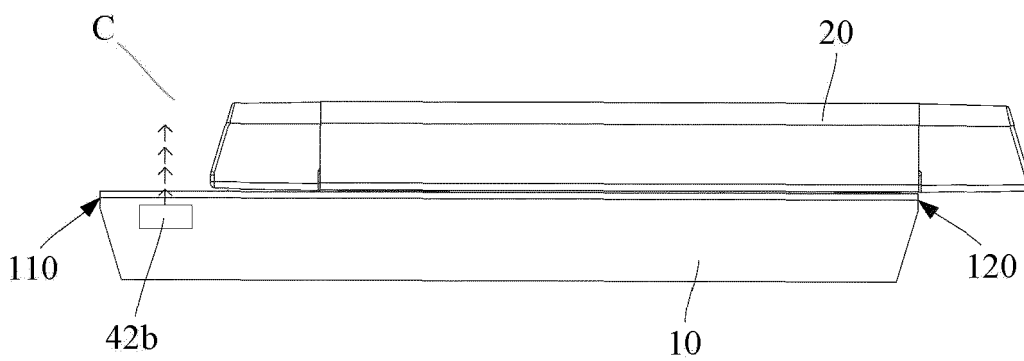


FIG. 16

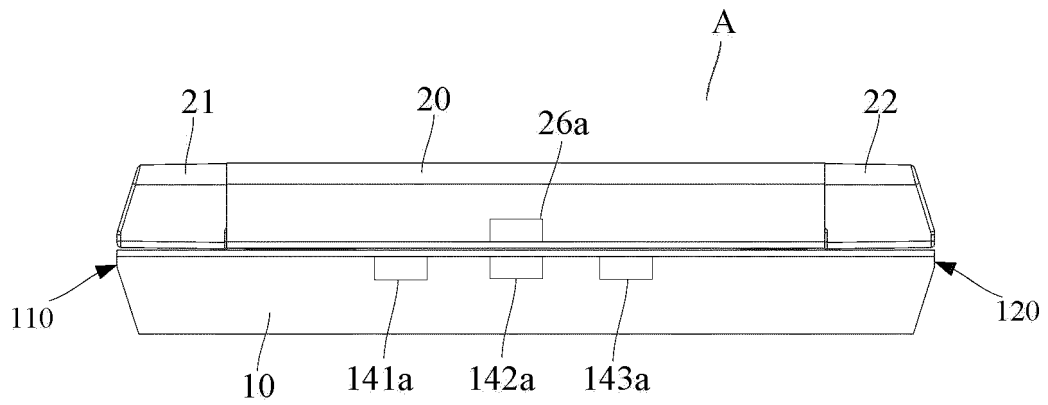


FIG. 17

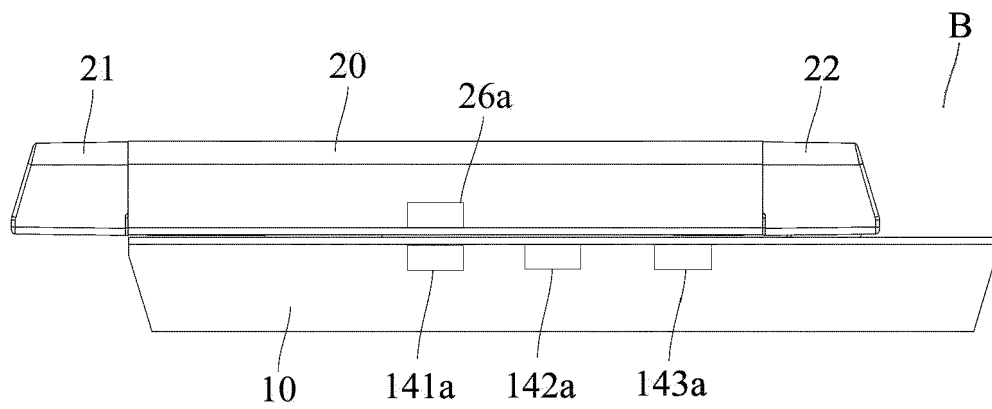


FIG. 18

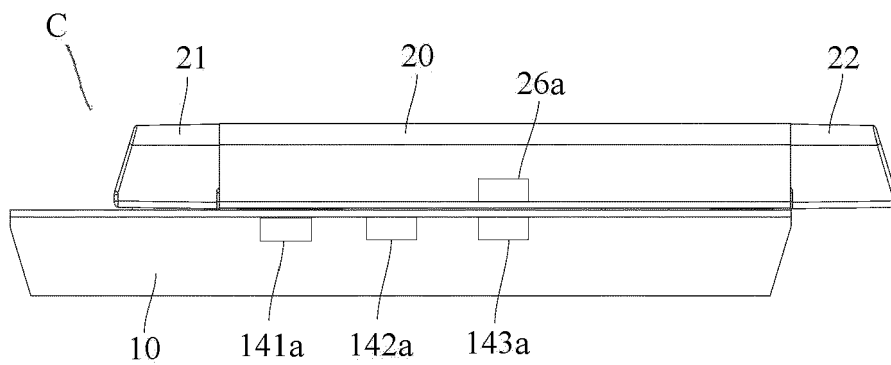


FIG. 19

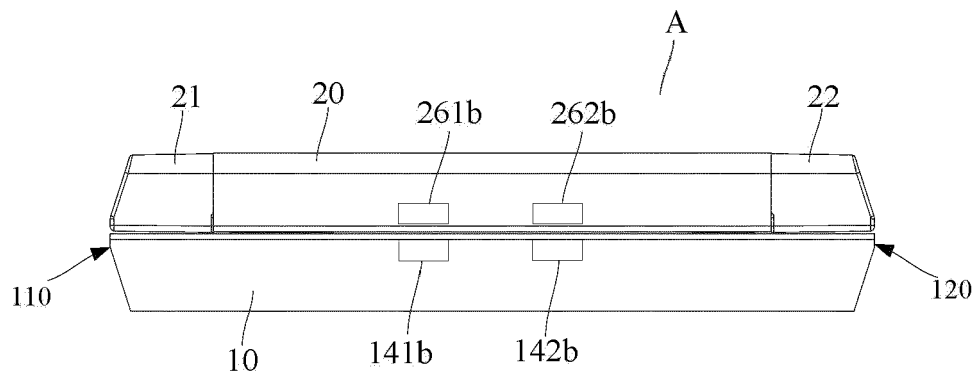


FIG. 20

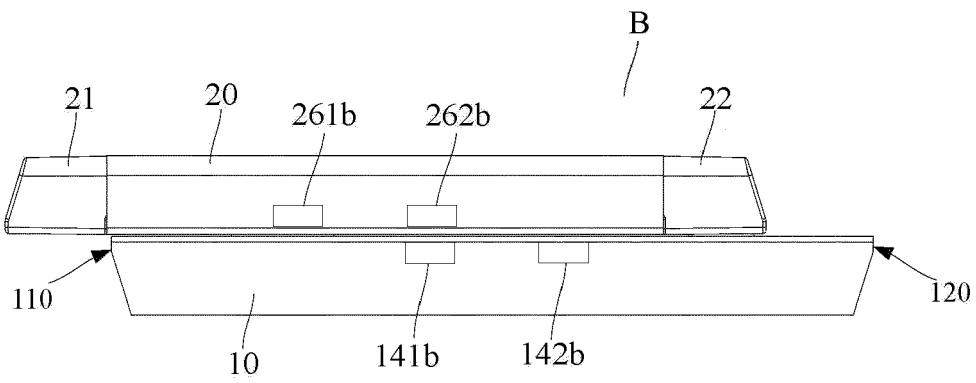


FIG. 21

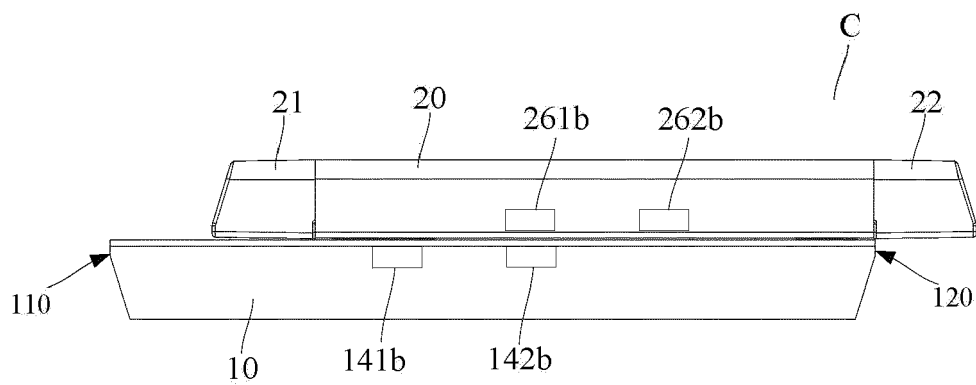


FIG. 22

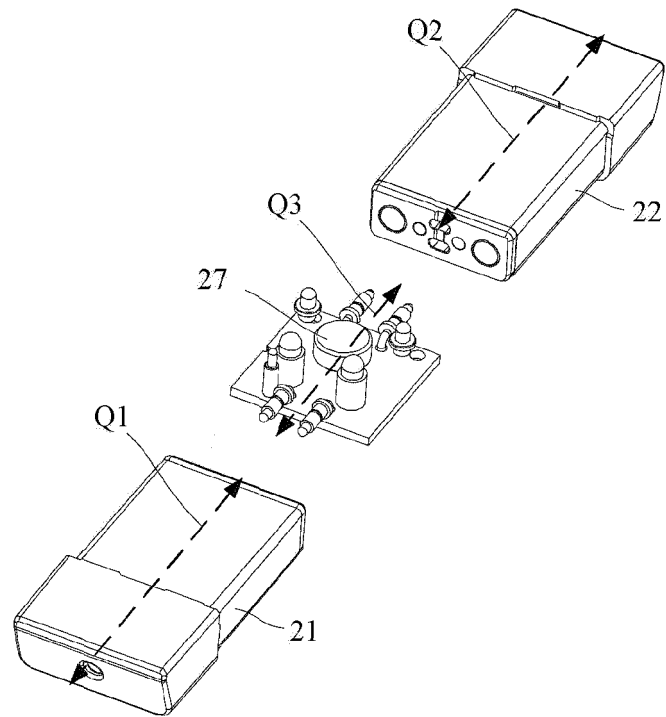


FIG. 23

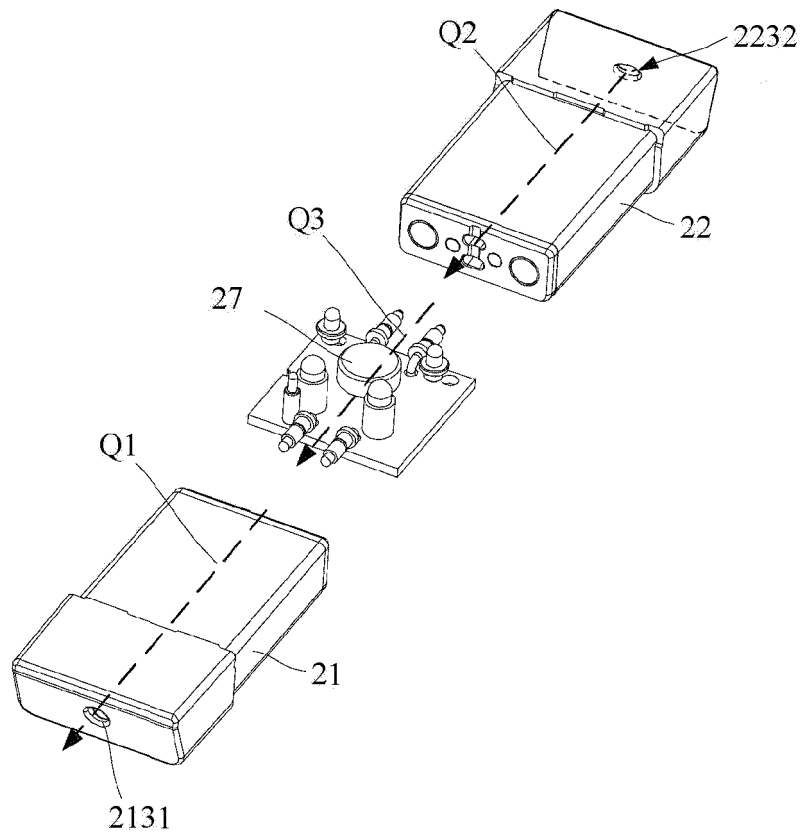


FIG. 24

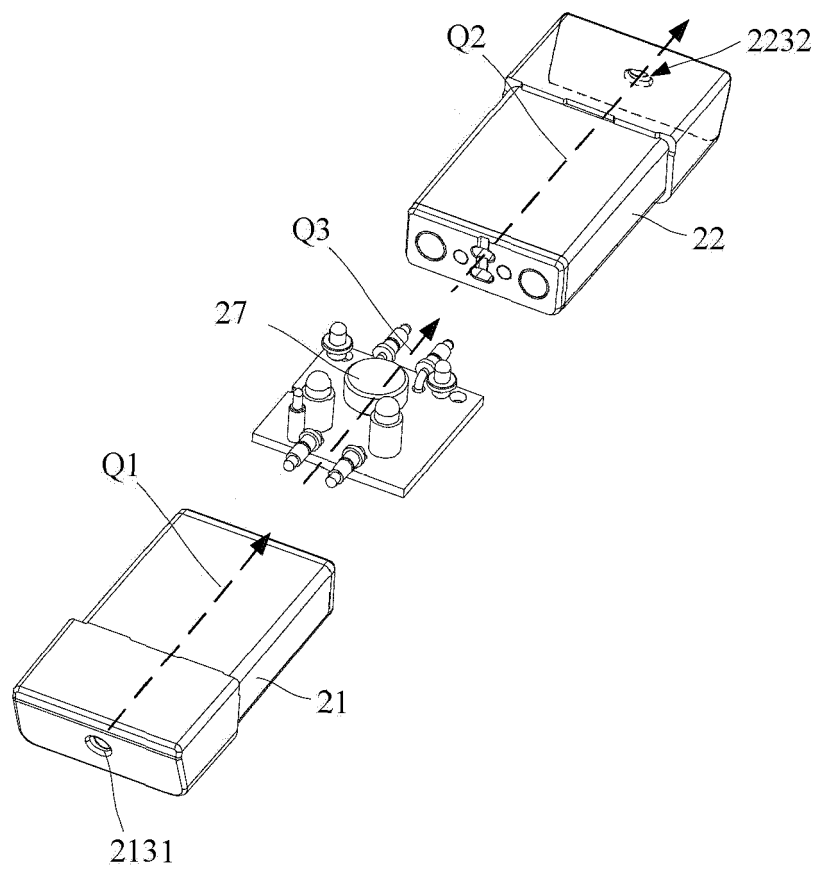


FIG. 25

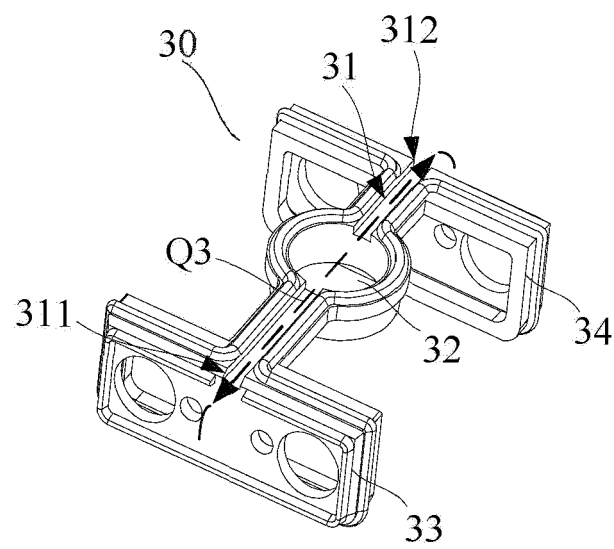


FIG. 26

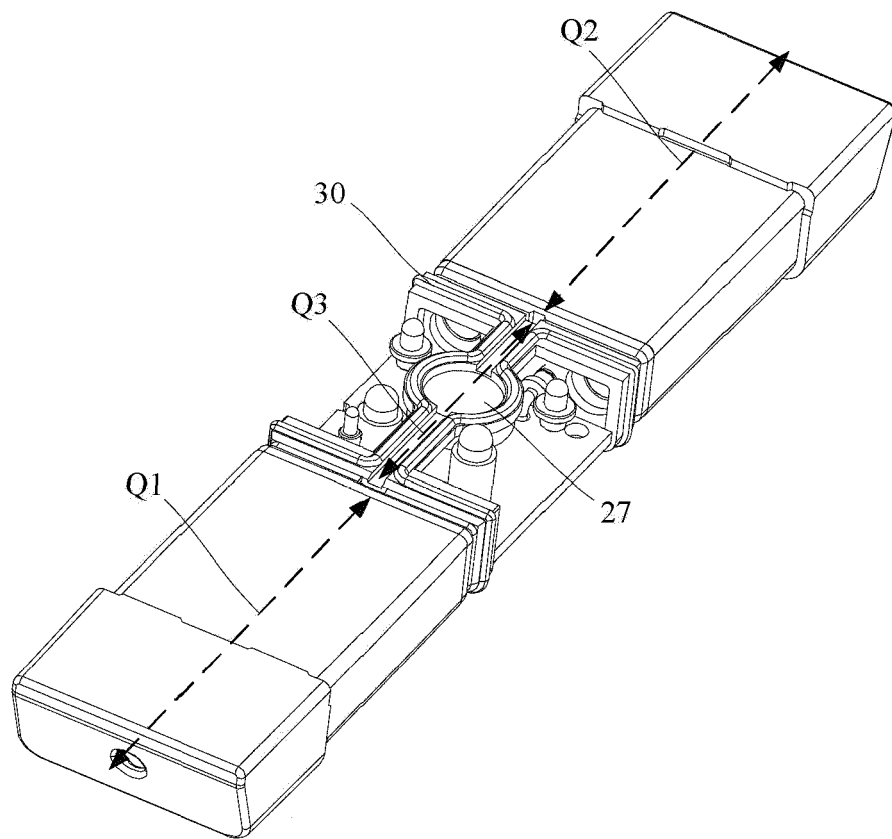


FIG. 27

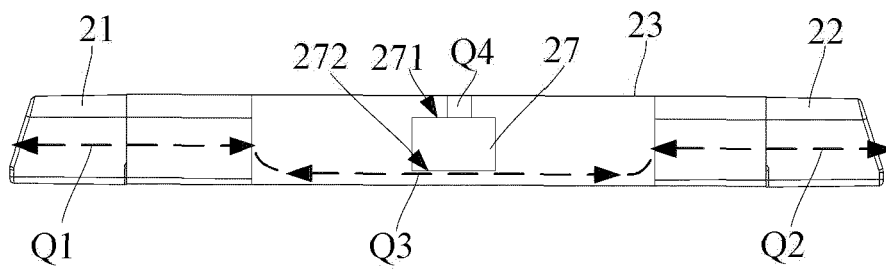


FIG. 28

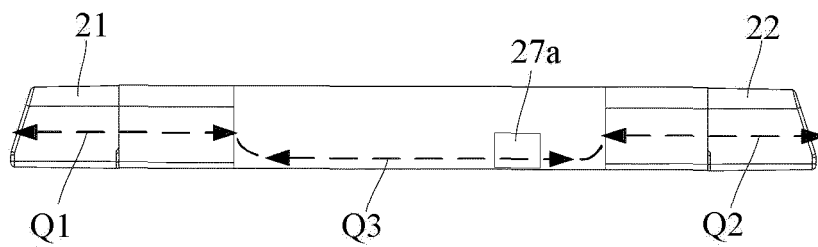


FIG. 29

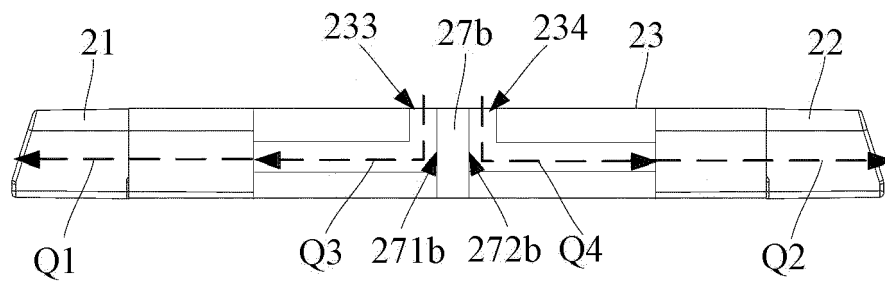


FIG. 30

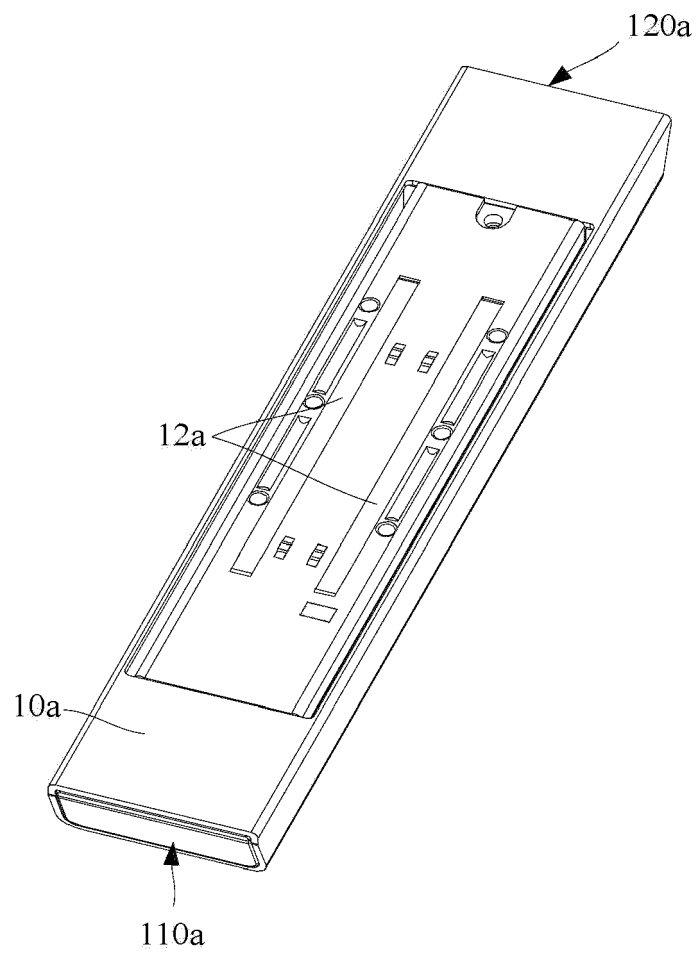


FIG. 31

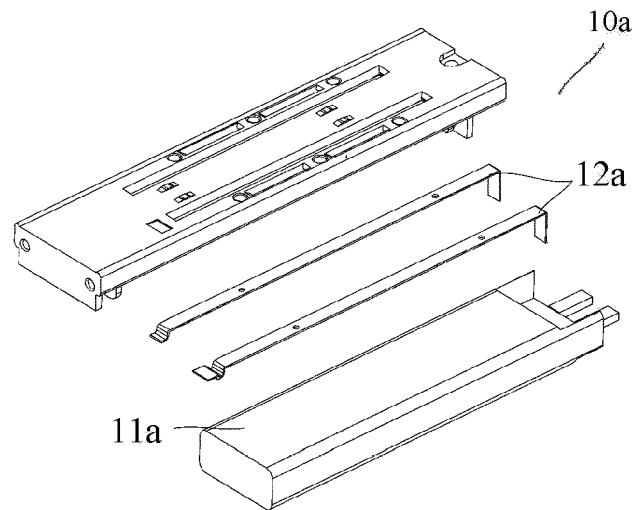


FIG. 32

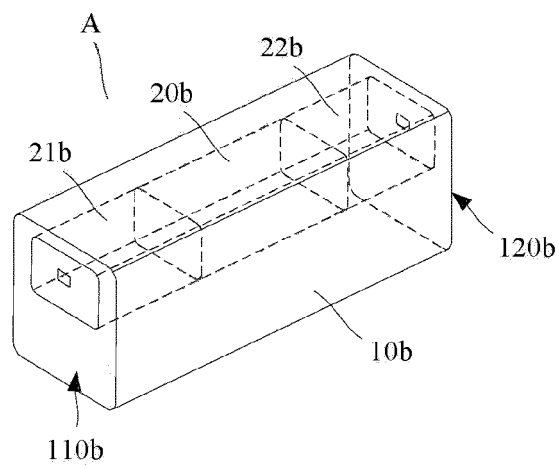


FIG. 33

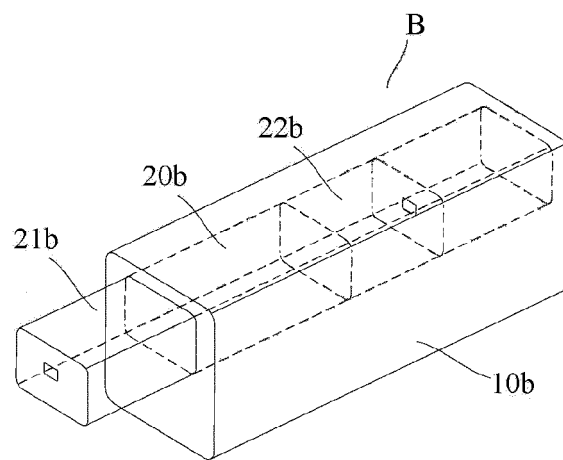


FIG. 34

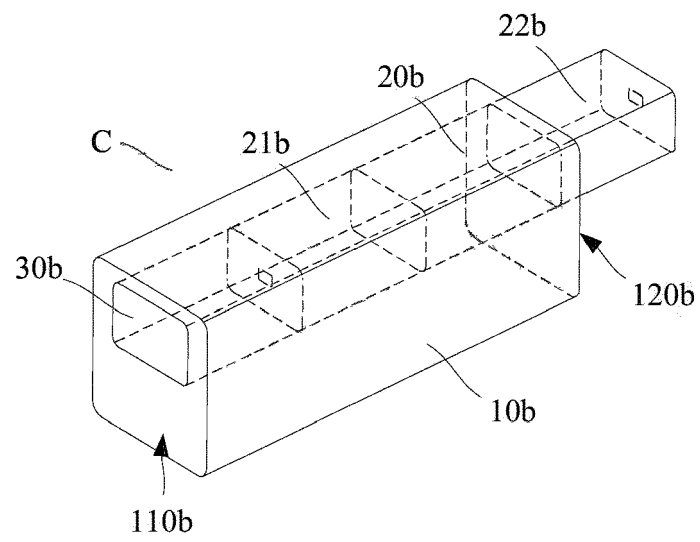


FIG. 35

REFERENCES CITED IN THE DESCRIPTION

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