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(71) Applicant: **NICOVENTURES TRADING LIMITED**
[GB/GB]; Globe House, 1 Water Street, London WC2R
3LA (GB).

(72) Inventors: **RUI, Tang**; c/o NICOVENTURES TECHNICAL (SHENZHEN) CO., LTD, Room 3101, Tower A, Gemdale Viseen Tower, No. 16, Gaoxin South 10th Road, High-tech Park, Nanshan District, Shenzhen China

(CN). **YANG, Tan**; c/o NICOVENTURES TECHNICAL (SHENZHEN) CO., LTD, Room 3101, Tower A, Gemdale Viseen Tower, No. 16, Gaoxin South 10th Road, High-tech Park, Nanshan District, Shenzhen China (CN). **ZI QIAN, Yu**; c/o NICOVENTURES TECHNICAL (SHENZHEN) CO., LTD, Room 3101, Tower A, Gemdale Viseen Tower, No. 16, Gaoxin South 10th Road, High-tech Park, Nanshan District, Shenzhen China (CN).

(74) Agent: **DEHNS**; St Bride's House, 10 Salisbury Square, London Greater, London EC4Y 8JD (GB).

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(54) Title: AEROSOL PROVISION DEVICE

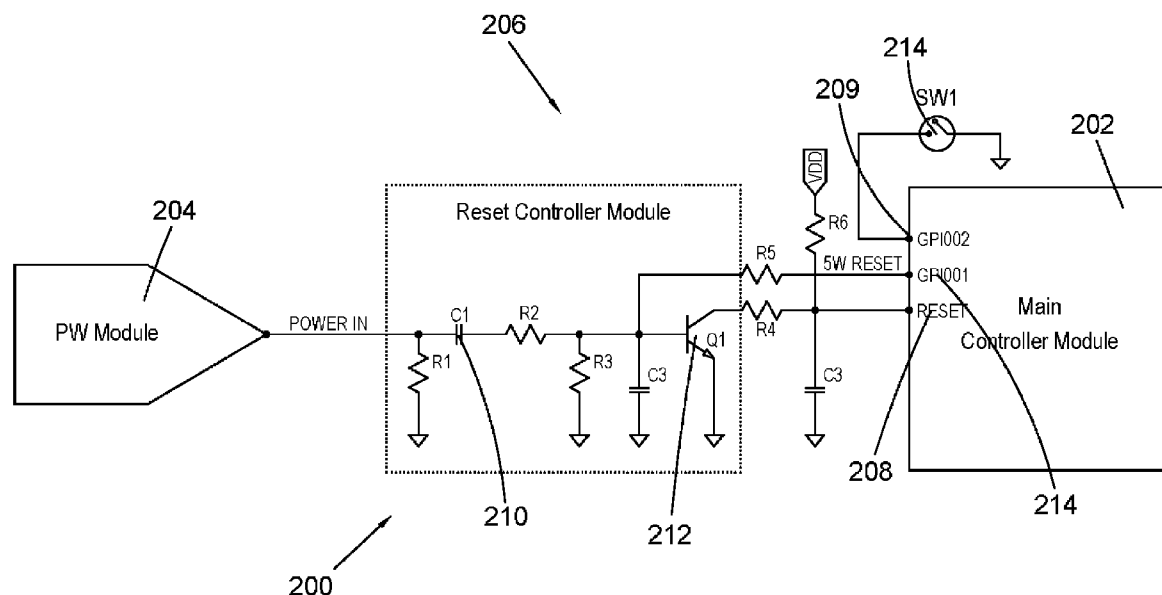


FIG. 2

(57) Abstract: An aerosol provision device (100) comprising: an aerosol generator (116); a processor (202) for controlling the aerosol generator to generate aerosol; a power module (204) connectable to a power supply; and reset circuitry (206) configured to reset the processor in response to the power module being connected to the power supply.

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AEROSOL PROVISION DEVICE

Technical Field

The present invention relates to an aerosol provision device and a method.

5 **Background**

Smoking articles such as cigarettes, cigars and the like burn tobacco during use to create tobacco smoke. Attempts have been made to provide alternatives to these articles that burn tobacco by creating products that release compounds without burning. Examples of such products are heating devices which release compounds by heating, but not burning,
10 the material. The material may be for example tobacco or other non-tobacco products, which may or may not contain nicotine.

Summary

In accordance with the first aspect, there is provided an aerosol provision device comprising: an aerosol generator; a processor for controlling the aerosol generator to
15 generate aerosol; a power module connectable to a power supply; and reset circuitry configured to reset the processor in response to the power module being connected to the power supply.

The reset circuitry may comprise a capacitor, the capacitor configured to charge on
20 connection of the power module to the power supply to reset the processor.

The reset circuitry may comprise a transistor, wherein current flowing from the capacitor during the charging of the capacitor causes the transistor to change state to reset the processor.
25

The current flowing from the capacitor during the charging of the capacitor may cause the transistor to change to a saturated state to reset the processor.

The reset circuitry may be configured to provide a reset signal to a reset pin of
30 processor to reset the processor.

The reset signal may be a low signal.

The reset circuitry may be further configured to reset the processor in response to a
35 further user input.

The aerosol provision device may comprise a device communicator, the device communicator configured to receive the further user input from an external device.

5 The aerosol provision device may comprise a user input element configured to receive the further user input.

The reset circuitry may be configured to receive a reset input from the processor in response to the further user input.

10

The reset input may cause the transistor to change state to reset the processor.

The aerosol provision device may comprise a haptic motor, wherein the processor is configured to control the haptic motor.

15

The aerosol provision device may comprise a temperature sensor configured to sense a temperature of a heater of the aerosol generator, wherein the processor is configured to control the aerosol generator based on the temperature of the heater sensed by the temperature sensor.

20

The reset circuitry may not comprise an integrated circuit.

According to a second aspect there is provided an aerosol provision system comprising the aerosol provision device and an article comprising aerosol generating material.

25

According to a third aspect there is provided a method comprising:
connecting a power module of an aerosol provision device to a power supply; and
using reset circuitry to reset the processor in response to the power module being connected
30 to the power supply.

30

Brief Description of Drawings

Embodiments will now be described, by way of example only, and with reference to the accompanying drawings in which:

35 Fig. 1 shows a front view of an aerosol provision system;

Fig. 2 shows a schematic of circuitry of an aerosol provision device; and

Fig. 3 shows a method of resetting a processor of an aerosol provision device.

Detailed Description

As used herein, the term “aerosol-generating material” is a material that is capable of generating aerosol, for example when heated, irradiated or energized in any other way.

5 Aerosol-generating material may, for example, be in the form of a solid, liquid or gel which may or may not contain an active substance and/or flavourants. Aerosol-generating material may include any plant based material, such as tobacco-containing material and may, for example, include one or more of tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes. Aerosol-generating material also may include
10 other, non-tobacco, products, which, depending on the product, may or may not contain nicotine. Aerosol-generating material may for example be in the form of a solid, a liquid, a gel, a wax or the like. Aerosol-generating material may for example also be a combination or a blend of materials. Aerosol-generating material may also be known as “smokable material”.

15 The aerosol-generating material may comprise a binder and an aerosol former. Optionally, an active and/or filler may also be present. Optionally, a solvent, such as water, is also present and one or more other components of the aerosol-generating material may or may not be soluble in the solvent. In some embodiments, the aerosol-generating material is substantially free from botanical material. In some embodiments, the aerosol-generating
20 material is substantially tobacco free.

The aerosol-generating material may comprise or be an “amorphous solid”. The amorphous solid may be a “monolithic solid”. In some embodiments, the amorphous solid may be a dried gel. The amorphous solid is a solid material that may retain some fluid, such as liquid, within it. In some embodiments, the aerosol-generating material may, for example,
25 comprise from about 50wt%, 60wt% or 70wt% of amorphous solid, to about 90wt%, 95wt% or 100wt% of amorphous solid.

The aerosol-generating material may comprise an aerosol-generating film. The aerosol-generating film may comprise or be a sheet, which may optionally be shredded to form a shredded sheet. The aerosol-generating sheet or shredded sheet may be
30 substantially tobacco free.

According to the present disclosure, a “non-combustible” aerosol provision system is one where a constituent aerosol-generating material of the aerosol provision system (or component thereof) is not combusted or burned in order to facilitate delivery of at least one substance to a user.

In some embodiments, the delivery system is a non-combustible aerosol provision system, such as a powered non-combustible aerosol provision system.

In some embodiments, the non-combustible aerosol provision system is an electronic cigarette, also known as a vaping device or electronic nicotine delivery system (END),
5 although it is noted that the presence of nicotine in the aerosol-generating material is not a requirement.

In some embodiments, the non-combustible aerosol provision system is an aerosol-generating material heating system, also known as a heat-not-burn system. An example of such a system is a tobacco heating system.

10 In some embodiments, the non-combustible aerosol provision system is a hybrid system to generate aerosol using a combination of aerosol-generating materials, one or a plurality of which may be heated. Each of the aerosol-generating materials may be, for example, in the form of a solid, liquid or gel and may or may not contain nicotine. In some
15 embodiments, the hybrid system comprises a liquid or gel aerosol-generating material and a solid aerosol-generating material. The solid aerosol-generating material may comprise, for example, tobacco or a non-tobacco product.

Typically, the non-combustible aerosol provision system may comprise a non-combustible aerosol provision device and a consumable for use with the non-combustible aerosol provision device.

20 In some embodiments, the disclosure relates to consumables comprising aerosol-generating material and configured to be used with non-combustible aerosol provision devices. These consumables are sometimes referred to as articles throughout the disclosure.

In some embodiments, the non-combustible aerosol provision system, such as a
25 non-combustible aerosol provision device thereof, may comprise a power source and a controller. The power source may, for example, be an electric power source or an exothermic power source. In some embodiments, the exothermic power source comprises a carbon substrate which may be energised so as to distribute power in the form of heat to an aerosol-generating material or to a heat transfer material in proximity to the exothermic
30 power source.

In some embodiments, the non-combustible aerosol provision system may comprise an area for receiving the consumable, an aerosol generator, an aerosol generation area, a housing, a mouthpiece, a filter and/or an aerosol-modifying agent.

In some embodiments, the consumable for use with the non-combustible aerosol provision device may comprise aerosol-generating material, an aerosol-generating material storage area, an aerosol-generating material transfer component, an aerosol generator, an aerosol generation area, a housing, a wrapper, a filter, a mouthpiece, and/or an aerosol-modifying agent.

An aerosol generating device can receive an article comprising aerosol generating material for heating. An "article" in this context is a component that includes or contains in use the aerosol generating material, which is heated to volatilise the aerosol generating material, and optionally other components in use. A user may insert the article into the aerosol generating device before it is heated to produce an aerosol, which the user subsequently inhales. The article may be, for example, of a predetermined or specific size that is configured to be placed within a heating chamber of the device which is sized to receive the article.

With reference to Fig. 1, an aerosol provision system 10 comprises an aerosol provision device 100 for generating aerosol from an aerosol generating material. The aerosol provision system 10 further comprises a replaceable article 110 comprising the aerosol generating material. In broad outline, the aerosol provision device 100 may be used to heat the article 110 to generate an aerosol or other inhalable medium, which is inhaled by a user of the device 100.

The aerosol provision device 100 comprises a body 102. A housing arrangement surrounds and houses various components of the body 102. An article aperture 104 is formed at one end of the body 102, through which the article 110 may be inserted for heating by an aerosol generator 116.

The device 100 may also include a user-operable control element 150, such as a button or switch, which operates the device 100 when pressed. For example, a user may turn on the device 100 by operating the switch 150.

The aerosol generator 116 defines a longitudinal axis, which aligns with an axis of the article 110.

In use, the article 110 may be fully or partially inserted into the aerosol generator 116 where it may be heated by one or more components of the aerosol generator 116.

The device 100 includes an apparatus for heating aerosol-generating material. The apparatus includes an aerosol generating assembly, a controller (control circuit), and a power source. The apparatus forms part of the body 102. The aerosol generating assembly is configured to heat the aerosol-generating material of an article 110 inserted through the

article aperture 104, such that an aerosol is generated from the aerosol generating material. The power source supplies electrical power to the aerosol generating assembly, and the aerosol generating assembly converts the supplied electrical energy into heat energy for heating the aerosol-generating material. The power source may be, for example, a battery, such as a rechargeable battery or a non-rechargeable battery. Examples of suitable batteries include, for example, a lithium battery (such as a lithium-ion battery), a nickel battery (such as a nickel-cadmium battery), and an alkaline battery.

The power source may be electrically coupled to the aerosol generating assembly to supply electrical power when required and under control of the controller to heat the aerosol generating material. The control circuit may be configured to activate and deactivate the aerosol generating assembly based on a user input. The user input may be via a button press or opening a door of the device (for example, a door covering a consumable receiving receptacle). The control circuit may be configured to activate and deactivate automatically, for example on insertion of an article.

The aerosol generating assembly may comprise various components to heat the aerosol generating material via an inductive heating process. Induction heating is a process of heating an electrically conducting heating element (such as a susceptor) by electromagnetic induction. An induction heating assembly may comprise an inductive element, for example, one or more inductor coils, and a device for passing a varying electric current, such as an alternating electric current, through the inductive element. The varying electric current in the inductive element produces a varying magnetic field. The varying magnetic field penetrates a susceptor (heating element) suitably positioned with respect to the inductive element, and generates eddy currents inside the susceptor. The susceptor has electrical resistance to the eddy currents, and hence the flow of the eddy currents against this resistance causes the susceptor to be heated by Joule heating. In cases where the susceptor comprises ferromagnetic material such as iron, nickel or cobalt, heat may also be generated by magnetic hysteresis losses in the susceptor, i.e. by the varying orientation of magnetic dipoles in the magnetic material as a result of their alignment with the varying magnetic field. In inductive heating, as compared to heating by conduction for example, heat is generated inside the susceptor, allowing for rapid heating. Further, there need not be any physical contact between the inductive element and the susceptor, allowing for enhanced freedom in construction and application.

With reference to Fig. 2, there is shown circuitry 200 comprised in the aerosol provision device 100. It will be understood that the aerosol provision device 100 comprises additional circuitry not shown in Fig. 2. The circuitry 200 comprises a processor 202 (also

referred to as a control module or main control module), a power module 204 and reset circuitry 206 (also referred to as a reset control module).

The processor 202 is configured to control various components of the aerosol provision device 100, including, for example, the aerosol generator 116, a haptic motor (not shown) and an indicator such as an LED (not shown). The processor 202 is configured to receive data from various components of the aerosol provision device 100, including, for example, a temperature sensor (for sensing a temperature of the aerosol generator 116 to permit its control) and a memory (not shown).

In the present example the processor 202 comprises a microcontroller. The processor 202 comprises a reset pin 208 and an additional reset pin 209 (among other not shown pins of the processor 202). As described below, the processor 202 is configured to reset on receipt of a reset signal at the reset pin 208. The processor 202 is configured to reset on receipt of an additional reset signal at the additional reset pin 209. In order to reset, the processor 202 is configured to shut down and restart. During the reset, the processor 202 may be configured to clear its memory, for example, clearing an error state. During the reset, the processor 202 may provide an indication (e.g. haptic or light) to the user on restart.

The power module 204 is connectable to a power supply (not shown) via a power connector (not shown). The power connector may comprise a charging port (e.g. a USB port) to connect to the power supply. The power supply may be a direct current (DC) power supply. Connecting the power supply to the power module 204 in this way may permit an energy storage (e.g. a battery, not shown) of the aerosol provision device 100 to be charged.

The reset circuitry 206 comprises a capacitor 210. The capacitor 210 is electrically connected to the power module 204.

The reset circuitry 206 comprises a switch 214. The switch 214 is configured to selectively connect the additional reset pin 209 to earth. The switch 214 may comprise the user controllable element 150.

The reset circuitry 206 comprises a transistor 212. The capacitor 210 is electrically connected to the transistor 212. The capacitor 210 is electrically connected to a base of the transistor 212. The capacitor 210 is connected between the power module 204 and the transistor 212. The transistor 212 is connected to the reset pin 208. A collector of the transistor 212 is connected to the reset pin 208. The transistor 212 is connected between the capacitor 210 and the processor 202. Some components may be connected between the power module 204, the capacitor 210 and the processor 202, and direct connection between them is not required.

The reset circuitry 206 comprises various other components, such as resistors and capacitors, some of which are shown in Fig. 2. Description of those components is omitted. The reset circuitry 206 does not comprise an integrated circuit.

With reference to Fig. 3, there is shown a method 300 of operating the aerosol provision device 100. The method 300 comprises a device running step 302, a power module connection step 304, a command receipt step 306, a power module reset step 308 and a command reset step 310.

In the device running step 302, the processor 202 controls components of the aerosol provision device 100 according to normal operation. For example, the processor 202 controls the aerosol generator 116 to generate aerosol.

The power supply is not connected to the power module 204. This means that the capacitor 210 is not charged and the voltage between the base and emitter of the transistor 212, $V_{be} = 0$. This causes the reset pin 208 to float, with no input being provided. Additionally, no input is provided via the switch 214, which causes the additional reset pin 209 to float. As such, no signals are sent to the reset pin 208 or the additional reset pin 209 and the processor 202 does not reset.

Connection of the power module 204 to the power supply may occur in the power module connection step 304. The capacitor 210 begins to charge and within a short time period may be considered a closed circuit. Current passes through capacitor 210 to the base of the transistor 212. This causes the transistor to enter a saturated state, providing a low voltage signal (referred to as a reset signal) to the reset pin 208. This causes the processor 202 to reset in the reset step 308 as described above.

Once the capacitor 210 is fully charged, with the voltage across the capacitor 210 equal to the voltage of the power supply, no current flows through the capacitor 210. This means that no current flows to the base of the transistor 212, which enters a cut-off state. The voltage at the reset pin 208 changes from low to high and the processor 202 restarts. In the present example, this is a hard reset. After the processor 202 has restarted the aerosol provision device 100 returns to the device running step 302.

The charging time of the capacitor 210 therefore determines the reset time of the processor 202 (i.e. the time between shut down and restart of the processor 202), and the reset circuitry 206 may be configured to provide a desired reset time.

When the aerosol provision device 100 is in the device running step 302, a user input via the switch 214 causes the aerosol provision device 100 to enter the command receipt step 306. In the command receipt step 306, the switch 214 closes, which causes a low

voltage signal (i.e. the additional reset signal) to be provided to the additional reset pin 209. This causes the processor 202 to perform the command reset step 310.

In the command reset step 310, in response to receiving the additional reset signal at the additional reset pin 209, the processor 202 restarts. In the present example, in the
5 command reset step 310 the processor 202 performs a software reset. In the software reset (also referred to as a soft reset), the memory may not be cleared to the same extent as in the hard reset, e.g. with error state not cleared. After the command reset step 310, the aerosol provision device 100 returns to the device running step 302.

In other examples, the switch 214 may be omitted, and the command receipt step
10 306 may instead be triggered by a demand inside the processor 202 (e.g. due to a reset command being provided to the aerosol provision device 100 wirelessly).

In other examples, in the command reset step 310, the processor 202 may perform the hard reset. In order for this to occur, the processor 202 may output a high voltage signal from output pin 214. This may result in the transistor 212 entering a saturation state, with a
15 low voltage signal being transmitted to the reset pin 208 causing a reset as described above with respect to the power module reset step 308.

In the above described embodiments, the aerosol provision device comprises a heating arrangement that is an inductive heating arrangement. In embodiments, other types of heating arrangement are used, such as resistive heating. The configuration of the device
20 is generally as described above and so a detailed description will be omitted. In such arrangements the aerosol generating assembly comprises a resistive heating generator including components to heat the heating element via a resistive heating process. In this case, an electrical current is directly applied to a resistive heating component, and the resulting flow of current in the heating component causes the heating component to be
25 heated by Joule heating. The resistive heating component comprises resistive material configured to generate heat when a suitable electrical current passes through it, and the heating assembly comprises electrical contacts for supplying electrical current to the resistive material.

In embodiments, the heating element forms the resistive heating component itself. In
30 embodiments the resistive heating component transfers heat to the heating element, for example by conduction.

The various embodiments described herein are presented only to assist in understanding and teaching the claimed features. These embodiments are provided as a representative sample of embodiments only, and are not exhaustive and/or exclusive. It is to
35 be understood that advantages, embodiments, examples, functions, features, structures,

and/or other aspects described herein are not to be considered limitations on the scope of the invention as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope of the claimed invention. Various embodiments of the invention may suitably

5 comprise, consist of, or consist essentially of, appropriate combinations of the disclosed elements, components, features, parts, steps, means, etc, other than those specifically described herein. In addition, this disclosure may include other inventions not presently claimed, but which may be claimed in future.

CLAIMS

1. An aerosol provision device comprising:
5 an aerosol generator;
a processor for controlling the aerosol generator to generate aerosol;
a power module connectable to a power supply; and
reset circuitry configured to reset the processor in response to the power module
being connected to the power supply.
10
2. An aerosol provision device according to claim 1, wherein the reset circuitry
comprises a capacitor, the capacitor configured to charge on connection of the power
module to the power supply to reset the processor.
- 15 3. An aerosol provision device according to claim 2, wherein the reset circuitry
comprises a transistor, wherein current flowing from the capacitor during the charging of the
capacitor causes the transistor to change state to reset the processor.
4. An aerosol provision device according to claim 3, wherein the current flowing from
20 the capacitor during the charging of the capacitor causes the transistor to change to a
saturated state to reset the processor.
5. An aerosol provision device according to any of claims 1 to 4, wherein the reset
circuitry is configured to provide a reset signal to a reset pin of processor to reset the
25 processor.
6. An aerosol provision device according to claim 5, wherein the reset signal is a low
signal.
- 30 7. An aerosol provision device according to any of claims 1 to 6, wherein the reset
circuitry is further configured to reset the processor in response to a further user input.
8. An aerosol provision device according to claim 7 and comprising a device
communicator, the device communicator configured to receive the further user input from an
35 external device.

9. An aerosol provision device according to claim 7 or 8 and comprising a user input element configured to receive the further user input.

10. An aerosol provision device according to any of claims 7 to 9, wherein the reset circuitry is configured to receive a reset input from the processor in response to the further user input.

11. An aerosol provision device according to claim 10 when dependent on claim 3, wherein the reset input causes the transistor to change state to reset the processor.

12. An aerosol provision device according to any of claims 1 to 11 and comprising a haptic motor, wherein the processor is configured to control the haptic motor.

13. An aerosol provision device according to any of claims 1 to 12 and comprising a temperature sensor configured to sense a temperature of a heater of the aerosol generator, wherein the processor is configured to control the aerosol generator based on the temperature of the heater sensed by the temperature sensor.

14. An aerosol provision device according to any of claims 1 to 13, wherein the reset circuitry does not comprise an integrated circuit.

15. An aerosol provision system comprising an aerosol provision device according to any of claims 1 to 14 and an article comprising aerosol generating material.

16. A method comprising:
connecting a power module of an aerosol provision device to a power supply; and
using reset circuitry to reset the processor in response to the power module being connected to the power supply.

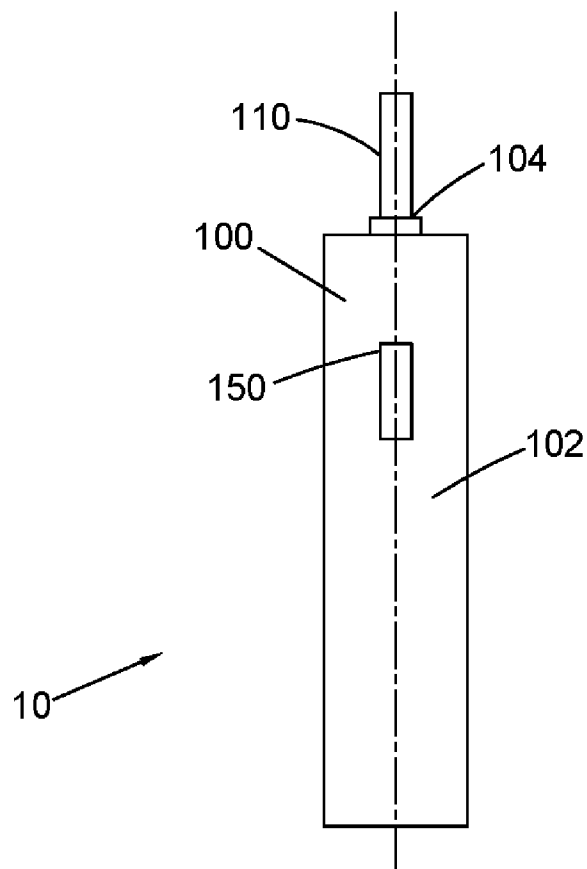


FIG. 1

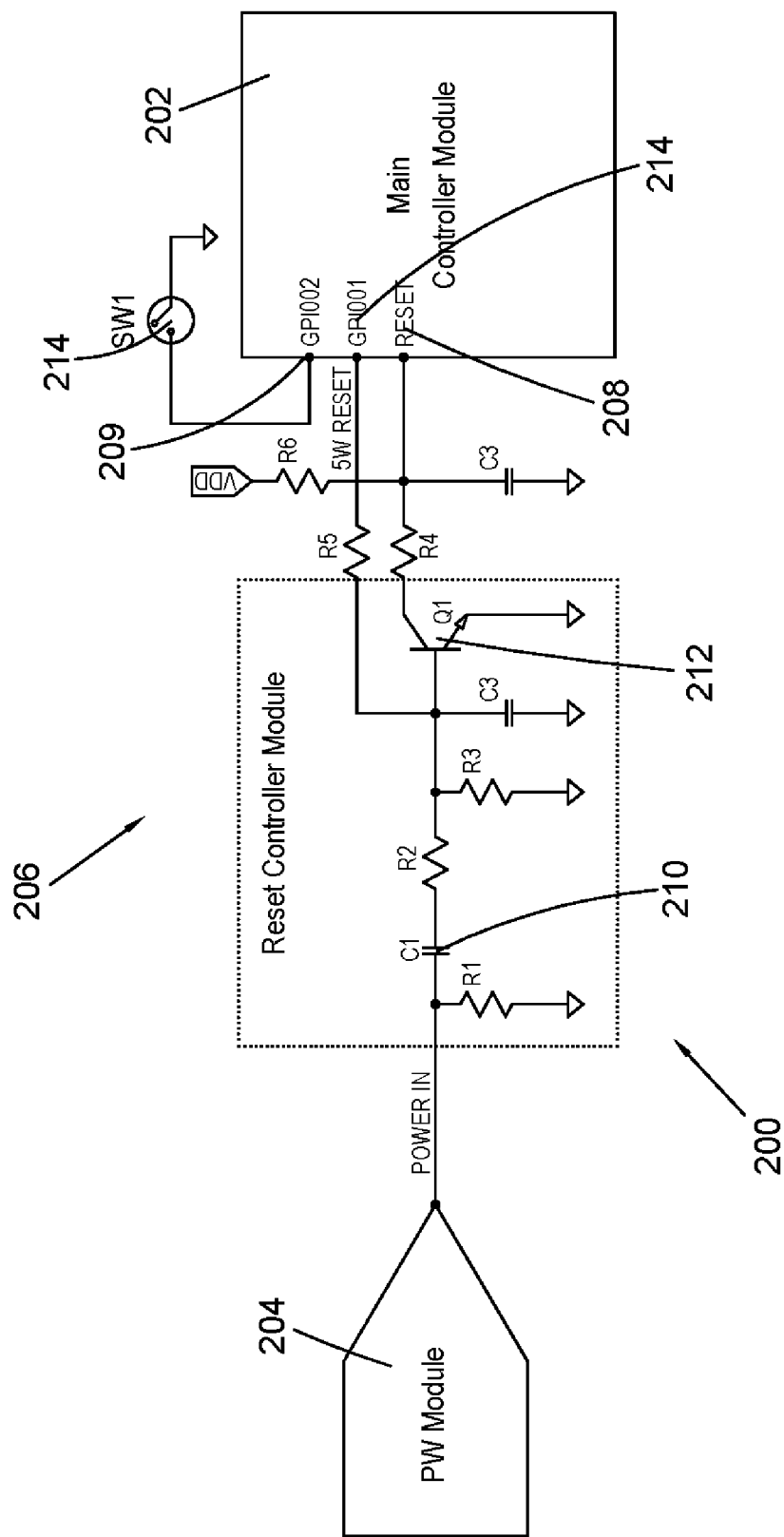


FIG. 2

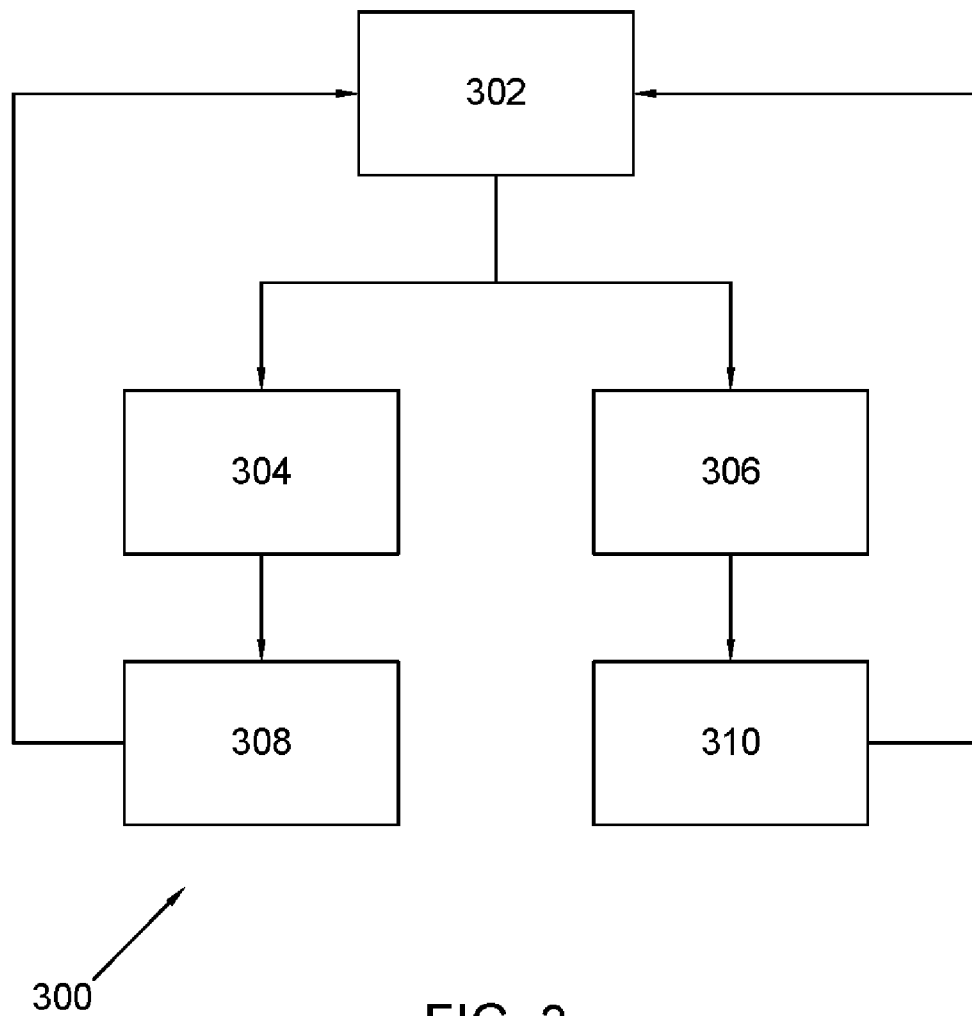


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/065588

A. CLASSIFICATION OF SUBJECT MATTER INV. A24F40/50 A24F40/90 ADD. A24F40/20		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A24F Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 4 September 2024		Date of mailing of the international search report 01/10/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Espla, Alexandre

INTERNATIONAL SEARCH REPORT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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