EXHIBIT D

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 March 2011 (24.03.2011)

PCT

(10) International Publication Number
WO 2011/033396 A2

(51) International Patent Classification:
A24D 1/18 (2006.01)

(21) International Application Number:
PCT/IB2010/052949

(22) International Filing Date:
29 June 2010 (29.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
200920179316.6
18 September 2009 (18.09.2009) CN

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) Title: ELECTRONIC SMOKE

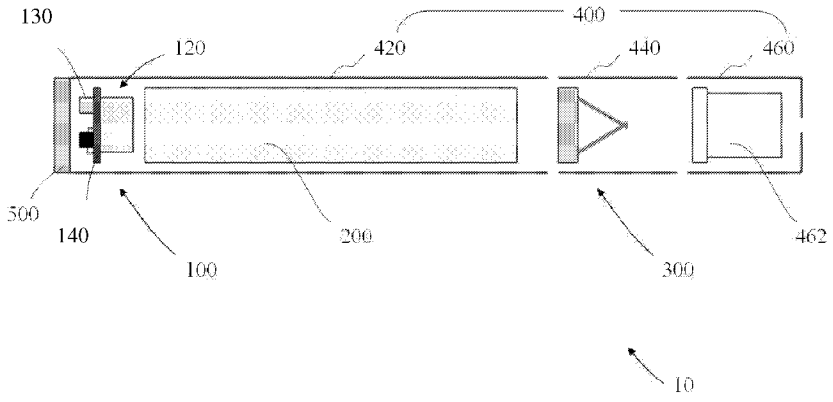

Figure 8

(57) Abstract: An electronic smoke comprising an inhale detector and a smoke effect generating circuitry. The inhale detector comprises an air-flow sensor which is arranged to detect direction and rate of air flow through the smoke apparatus, and the smoke effect generating circuitry is arranged to operate the smoke effect generating circuitry to generate smoking effect when the air flow direction corresponds to inhaling through the apparatus and the air flow rate reaches at predetermined threshold. Such an electronic smoke alleviates the problem of inadvertent triggering due to environmental vibration or noise or children playing by blowing into the device.

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ELECTRONIC SMOKE

Field of the Invention

The present invention relates to electronic smoke apparatus (or electronic smoke in short), and more particularly to electronic cigarettes. The present invention also relates to air-flow rate and direction detector for use in an electronic smoke apparatus.

Background of the Invention

Electronic smoke apparatus such as electronic cigarettes provide a smoking alternative to smokers. An electronic smoke is a non-naked flame smoking apparatus which typically comprises a battery powered heater arranged to vaporize liquid nicotine or nicotine substitutes upon actuation by a user. The heater is usually automatically actuated by a controller when a user inhales through the electronic smoke to simulate a smoking action. Typically, an inhaling detector is provided in an electronic smoke and the controller, such as a digital signal processor (DSP) will actuate the heater when inhaling is detected by the inhaling detector. An exemplary equivalent application circuit of a conventional electronic cigarette is shown in Figure 1.

The inhaling detector of a conventional electronic smoke apparatus typically comprises an air-flow sensor having a structure similar to that of a conventional microphone condenser of Figure 2. A typical air-flow sensor of a conventional electronic smoke comprises a variable capacitor (Cs) comprising a membrane and a

back plate, a pre-charged electret layer (Vs), and a junction field effect transistor (JFET) arranged as schematically shown in Figure 2. The DSP of the smoking circuitry is arranged to actuate the heater automatically when vibration, which is assumed to be due to inhaling, is detected by the air-flow sensor. However, such an arrangement is not very reliable since false actuations are common, especially in a noisy environment. Furthermore, the structure of a conventional air-flow sensor is relatively complicated and more expensive, since a JFET stage is required to amplify signals detected by the vibrating membrane and an electret layer is in combination with a back plate to form a reference capacitive surface.

Therefore, it would be advantageous if an improved air-flow sensor for an electronic smoke could be provided.

In this specification, the terms electronic smoke and electronic smoke apparatus are equivalent and includes electronic smoke apparatus which are commonly known as electronic cigarettes, electronic cigar, e-cigarette, personal vaporizers etc., without loss of generality.

Summary of Invention

According to the present invention, there is provided an electronic smoke comprising an inhale detector and a smoke effect generating circuitry, wherein the inhale detector comprises an air-flow sensor which is arranged to detect direction and rate of air flow through the smoke apparatus, and wherein the smoke effect generating circuitry is arranged to operate the smoke effect generating circuitry to generate smoking effect when the air flow direction corresponds to inhaling through the

apparatus and the air flow rate reaches at predetermined threshold. Such an electronic smoke alleviates the problem of inadvertent triggering due to environmental vibration or noise or children playing by blowing into the device.

In an embodiment, the air-flow sensor may comprise an air-baffle surface which is adapted to deform in response to movement of air through the apparatus, the extent of deformation of the air-baffle surface being measured to determine both the direction and rate of air flow through the apparatus. Measure of deformation within a predetermined period of time further mitigates the risk of inadvertent triggering due to vibrations or environmental noise.

As an example, the capacitance or the change in capacitance of the air-flow sensor may be measured to determine the extent of deformation of the air-baffle surface.

In an embodiment, the smoke effect generating circuitry may comprise a processor which is adapted to measure the capacitance or change in capacitance of the air-flow sensor. As a controller or processor is usually require to operate the heater of the smoke, measuring the capacitance or change in capacitance by the processor means an unexpected cost effective solution.

As a further example, the air-flow sensor may form part of an oscillator circuit, and the processor is arranged to measure the oscillation frequency of the oscillation circuit to determine the air-flow rate and direction. As the oscillation frequency of an oscillator circuit, especially an LC oscillator circuit, is dependent on the capacitance value, this provides a cost effective solution to provide a low cost and compact

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