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(54) ELECTRONIC VAPING DEVICE WITH AN ANTI-ASSAULT FUNCTIONALITY

(57) An electronic vaping device (10) comprises a speaker (30) adapted to emit an alarm sound of at least 80 dB, when triggered through a user input.

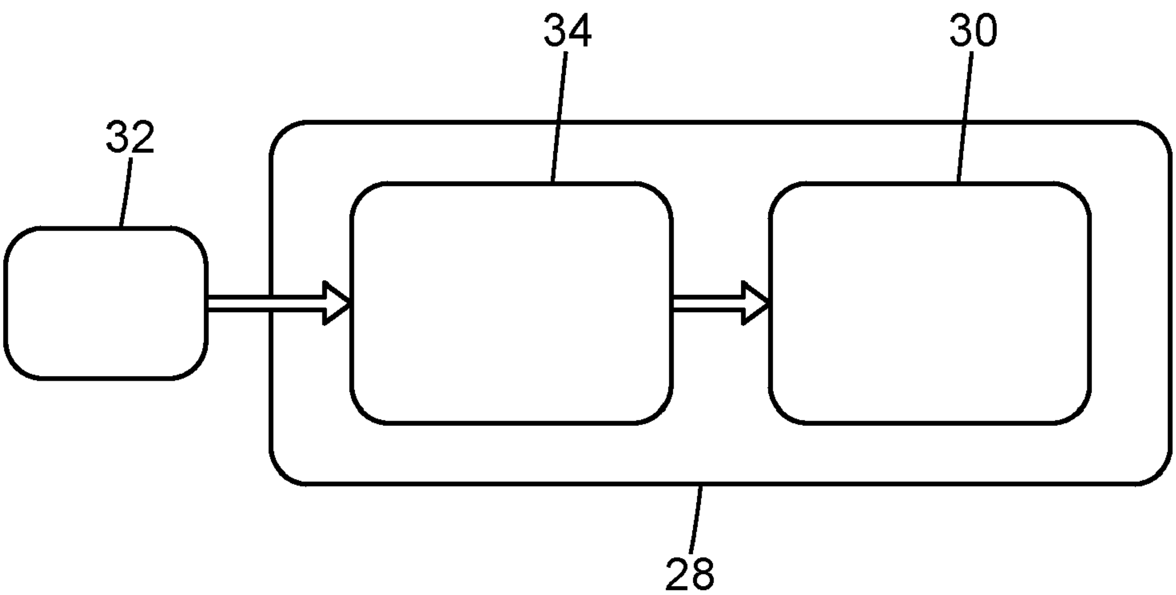

FIG. 2

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Description

Technical Field

[0001] This disclosure pertains to the field of electronic vaping devices.

Background Art

[0002] Safe sound personal security alarm devices are known, which include a buzzer adapted to emit a loud alarm sound when triggered. These devices are stand-alone devices, which usually comprise a button to trigger the alarm sound. Thus, one being assaulted can trigger the alarm sound by pushing the button.

[0003] A disadvantage of such a device is the accessibility of the button to be pressed in case of assault. Indeed, the device is often kept in a handbag, when the user does think to take the device with him/her when going out.

[0004] Moreover, an assaulter may recognize these devices and take corresponding precautions to avoid that the user triggers the alarm.

[0005] On another hand, electronic vaping devices - or heated substrate aerosol generating devices - are known. In such an electronic vaping device, a substrate containing tobacco or other suitable material is heated to a temperature that is sufficiently high to generate an aerosol from the material but not so high as to cause combustion of the material. This aerosol contains the components of the material sought by the user but not the undesired by-products of combustion that are generated when the material combusts.

[0006] Users generally have these devices on them most of the time and hold them in their hands, especially when they are outside, where vaping is authorized.

[0007] Moreover, WO-A-2019/16468 describes an aerosol generating device comprising at least one accelerometer and a controller comprising a processor configured to determine a fall of the device based on at least one acceleration value measured by the at least one accelerometer. According to this document, the controller is further configured to initiate at least one response procedure in case a fall is detected. The response procedure may include generating an audible beacon, such as the sound of a buzzer from the speaker. The sound of the buzzer may be louder the closer the user is to the aerosol generating device.

[0008] WO-A-2020/099822 also discloses a diagnostic system for an electronic vapour provision system, comprising a detection processor adapted to detect any misuse events, such as dropping of system. A diagnostic processor is adapted to perform, in response to detection of a predetermined misuse event, a corresponding system diagnostic, such as signaling a user via a speaker.

[0009] However, in these documents, the level of the sound generated by the buzzer can be kept relatively low, since its function is essentially to warn the user that the aerosol generating device fell and to let the user know where the aerosol generating device lays, not to repulse the user.

Summary

[0010] It is proposed an electronic vaping device, comprising a speaker adapted to emit an alarm sound of at least 80 dB, preferably at least 90 dB, more preferably at least 100 dB, when triggered through a user input.

[0011] Thus, the electronic vaping device may comprise an anti-assault functionality consisting in emitting an alarm sound. The alarm sound may be triggered by the user, when needed, through a user input. Usefully, the electronic vaping device is generally easy to access for a user, since the user may be holding the electronic vaping device, e.g. when using it, or keep it in an easy to access place, as a pocket for example.

[0012] The following features can be optionally implemented, separately or in combination one with the others:

- the electronic vaping device comprises a button, the user input comprising pressing the button. Thus the user may easily know how to trigger the alarm sound;
- the electronic vaping device further comprises an electronic command unit to trigger the speaker to emit the alarm sound in response to the user input;
- the electronic vaping device further comprises at least one accelerometer, the electronic command unit being adapted to receive at least one signal from the accelerometer, to run an algorithm to determine whether the electronic vaping device is subject to a specific movement based on the signal from the accelerometer and to trigger the speaker to emit the alarm sound if the specific movement of the electronic vaping device is recognized by the algorithm. Thus a specific movement of the electronic vaping device may be used as user input to trigger the alarm sound. It is deemed that subjecting the electronic vaping device to a specific movement may be an easy user input to trigger the alarm sound, especially an easier user input than pressing a specific button;
- the electronic vaping device comprises one three-axis accelerometer, the electronic vaping device preferably comprising one single accelerometer, which is a three-axis accelerometer. Recognizing a movement underwent by the electronic vaping device is more accurate when accelerations according to three different axis which are perpendicular to each other, are analyzed;
- the algorithm comprises a first criterion consisting in detecting a first time interval during which at least one acceleration of the electronic vaping device is lower, respectively higher, than a first threshold. It is deemed that this simple criterion to check may be representative of a particular movement of the electronic vaping device, for example a fall of the electronic vaping device, which is consequently a user

input which may be easily recognized by an algorithm analyzing at least one acceleration of the electronic vaping device;

- the algorithm comprises a second criterion consisting in detecting a second time interval, preferably immediate after the first time interval, during which at least one acceleration varies of an amount above a second threshold, the second time interval being preferably shorter than a third threshold. It is deemed that recognition of a specific movement of the electronic vaping device, e.g. a fall of the electronic vaping device, is more accurate when it is based on more criterions;
- the electronic vaping device comprises a three-axis accelerometer or three one-axis accelerometers adapted to measure an acceleration along three axes perpendicular to each other, wherein the algorithm comprises a first criterion consisting in detecting a first time interval during which a resultant acceleration of the electronic vaping device is lower, respectively higher, than a first threshold, the resultant acceleration being defined as the square root of the sum of the square of the three accelerations. It is deemed that analyzing a resultant acceleration may be a convenient way to take into consideration the three components of the acceleration of the electronic vaping device, handling only one signal;
- the algorithm comprises a second criterion consisting in detecting a second time interval, preferably immediate after the first time interval, during which the resultant acceleration varies of an amount above a second threshold, the second time interval being preferably shorter than a third threshold;
- the electronic vaping device further comprises a GPS module adapted to determine a position of the electronic vaping device when the speaker is triggered to emit the alarm sound, and a communication module, especially a GSM module, adapted to send an alert message comprising the position of the electronic vaping device when the speaker is triggered to emit the alarm sound;
- the electronic vaping device further comprises a microphone adapted to sense sound from outside the electronic vaping device;
- the microphone is connected to the electronic command unit and the electronic command unit is adapted to detect a specific sentence pronounced by a user of the electronic vaping device in the signal received from the microphone and to trigger the speaker to emit the alarm sound, when the specific sentence is detected. Accordingly, the alarm sound may be triggered without contact of the user with the electronic vaping device;
- the microphone is connected to the electronic command unit and the electronic command unit is adapted to detect a sound level of the sound sensed by the microphone, which is above a predetermined threshold, preferably during a predetermined threshold of time, and to trigger the speaker to emit the alarm sound consequently. Here again, the alarm sound may be triggered without contact of the user with the electronic vaping device;
- the electronic vaping device further comprises means for recording the signal from the microphone after the speaker was triggered to emit the alarm sound. This recording may be used later by a user to prove that he/she was assaulted;
- the electronic vaping device further comprises a user input device to stop the emission of the alarm sound after the speaker was triggered. Hence the user may stop the alarm sound, e.g. when the alarm was triggered by mistake.

Brief Description of Drawings

[0013] Other features, details and advantages will be shown in the following detailed description and on the figures, on which:

Fig. 1 is a schematic view of an electronic vaping device.

Fig. 2 illustrates a schematic view of a first example of a PCB of the electronic vaping device of Fig. 1.

Fig. 3 shows a schematic view of a second example of a PCB of the electronic vaping device of Fig. 1.

Fig. 4 is a graphic showing examples of accelerations measured by the accelerometer of the PCB shown on Fig. 3, illustrating different use conditions of the corresponding electronic vaping device.

Fig. 5 is a flowchart illustrating an algorithm to determine whether the electronic vaping device of Fig. 1 is subject to a fall movement.

Fig. 6 is a graphic showing examples of accelerations of the electronic vaping device of Fig. 1 falling from different heights.

Fig. 7 illustrates a schematic view of a third example of a PCB of the electronic vaping device of Fig. 1.

Fig. 8 shows a schematic view of a fourth example of a PCB of the electronic vaping device of Fig. 1.

Description of Embodiments

[0014] Fig. 1 schematically shows an example of an electronic vaping device **10** - also known as electronic cigarette.

[0015] Such an electronic vaping device **10** has become a popular alternative to traditional tobacco products such as cigarettes, cigars or pipes. By contrast to these traditional products, which rely on combustion of tobacco, an electronic vaping device 10 typically produces a vapor or aerosol for inhalation by a user.

[0016] In this kind of device, a substrate containing tobacco or other suitable material is heated to a temperature that is sufficiently high to generate an aerosol from the material but not so high as to cause combustion of the material. This aerosol contains the components of the material sought by the user but not the undesired by-products of combustion that are generated when the material combusts. Accordingly, this kind of device may be regarded as a reduced-risk device.

[0017] As illustrated on Fig. 1, an electronic vaping device **10** usually comprises a vaporizer **12,** a power unit **14** for powering the vaporizer **12,** and a controller **16.** The vaporizer **12,** the power unit **14** and the controller **16** may be comprised in a casing **18.** The casing **18** may be elongated along a longitudinal axis **A.** A mouthpiece **20** may be fixed on one end of the casing **18.** The casing **18** may be provided with an ON/OFF button **22** for selectively switching on/off the power unit **14.**

[0018] The vaporizer **12** may comprise a cartridge **24** or reservoir or pod, which holds a liquid solution containing varying amounts of nicotine, flavorings, and other chemicals.

[0019] The vaporizer **12** may further comprise a heating device **26,** e.g. a resistor, for heating the product comprised in the cartridge **24.** The heating device **26** is powered by the power unit **14.**

[0020] The power unit **14** may comprise a battery. The power unit **14** may further comprise a charging interface for the battery. The charging interface may take the form of a mini-USB port or any other format apparent to those skilled in the art.

[0021] The controller **16** may comprise one printed circuit board (PCB) **28** or more than one printed circuit board (PCB) **28.** In this latter case, the PCB may be connected together.

[0022] Puffing may activate the battery-powered heating device **26,** which vaporizes the liquid in the cartridge **24.** The person then inhales the resulting aerosol or vapor through the mouthpiece **20.**

[0023] In the following, reference is made to one single PCB **28** keeping in mind that the different elements on this single PCB **28** can actually be on different PCB connected together.

[0024] According to the example of Fig. 2, PCB **28** comprises a speaker **30** capable of generating an alarm sound.

[0025] As used herein, an alarm sound means at least one sound whose sound level is so unpleasant that people subject to this sound, especially in the neighborhood of the electronic vaping device **10,** are incited to go away from the electronic vaping device **10.** In the present application, a sound level of at least 80 dB, preferably at least 90 dB, more preferably at least 100 dB, is regarded as an unpleasant sound level. Indeed, a sound level of 80 dB is usually considered as harmful, whereas a sound level of 90 to 100 dB is generally deemed dangerous. Preferably, the sound level of the alarm sound is so high that a person subject to the alarm sound, especially in the neighborhood of the electronic vaping device **10,** is incited to cover his/her hears.

[0026] Moreover, the alarm sound may consist in one single tone, played continuously. However, the alarm sound may comprise more than one tone. The alarm sound may for example comprise two or three tones played one after the other, e.g. in repeating cycles.

[0027] According to the first example of PCB **28** as shown on Fig. 2, the speaker **30** is triggered to generate the alarm sound in response to a user input. In the present case, the user input may consist in activating or using a user input device **32.** The user input device **32** may be connected to an electronic command unit (ECU) **34** - or microcontroller - on the PCB **28** which receives information from the user input device **32** and command the speaker **30** according to this information. Alternatively, the user input device **32** is directly connected to the speaker **30** to trigger the emission of the alarm sound when activated/used.

[0028] User input device **32** may be a specific button on the casing **18** of the electronic vaping device **10.** In this case, a user pushing this specific button trigger the speaker **30** to emit the alarm sound.

[0029] Alternatively, the user input device **32** may be the ON/OFF button **22** of the electronic vaping device **10.** For example, the ECU **34** may recognize a combination of press(es) on the ON/OFF button **22** like a long press on the ON/OFF button **22** longer than a predetermined time interval, or a combination of a plurality of presses on the ON/OFF button **22,** e. g. more than five, preferably more than ten presses during a predetermined time interval.

[0030] Other user input devices **32** may be apparent to those skilled in the art, for example a button that is pressed by a deformation of the casing, a strain gauge on the casing or a capacitive sensor.

[0031] Fig. 3 shows a second example of PCB **28** that can be used in the electronic vaping device **10** of Fig. 1.

[0032] According to this second example, at least one accelerometer **36** is provided in the electronic vaping device **10,** e.g. on the PCB **28.** Preferably, the electronic vaping device **10** comprises means for measuring acceleration along three directions perpendicular to each other. Thus, the electronic vaping device **10** may for example comprise three accelerometers **36,** each accelerometer **36** being able to measure acceleration along one single direction, the directions of the accelerometers being perpendicular to each other. Alternatively, the electronic vaping device **10** may comprise one single three-way accelerometer **36** (or three-axis accelerometer) capable of measuring accelerations along three directions, which are perpendicular to each other.

[0033] It must be noticed here that an accelerometer may measure a proper acceleration. Proper acceleration is the acceleration of a body in its own instantaneous rest frame. This is different from coordinate acceleration, which is acceleration in a fixed coordinate system. For example, an accelerometer at rest on the surface of the Earth will measure a proper acceleration due to Earth's gravity, straight upwards of g ≈ 9.81 m/s^2. By contrast, an accelerometer in free fall - i. e. falling toward the center of the Earth at a rate of about 9.81 m/s^2 - measures a proper acceleration equal to zero. In the following, the word "acceleration" refers to the "proper acceleration" as well as to the "coordinate acceleration".

[0034] Fig. 4 shows examples of signals measured by a three-axis accelerometer **36** in an electronic vaping device **10,** representative of proper accelerations of the electronic vaping device **10** according to three different axes, which are perpendicular to each other.

[0035] During a first timeslot **T1,** the electronic vaping device **10** is held by a user in movement. Accordingly, during this first timeslot **T1,** the vertical proper acceleration - along z axis - is substantially equal to 9,81 m/s^2. The longitudinal acceleration - along x axis - is low but not equal to zero, since the x axis corresponds to the direction of the movement of the user. On the contrary, since there is no movement of the user along the y axis, the acceleration measured along this y axis is equal to zero.

[0036] During a second timeslot **T2,** the user let the electronic vaping device **10** fall. Then, the electronic vaping device **10** is subject to a free fall - the only substantial force applied to the electronic vaping device **10** is Earth's gravity - during a first time interval. The accelerometer **36** measures proper accelerations substantially equal to zero, along its three axes, during this first time interval.

[0037] Then, during a third timeslot **T3,** the electronic vaping device **10** hit the ground. Accordingly, proper acceleration measured by the accelerometer **36** along the vertical z axis becomes higher than 10 - the electronic vaping device **10** rebounds on the floor - during a short time interval, especially shorter than the first time interval.

[0038] During a fourth timeslot **T4,** the electronic vaping device **10** lies on the ground. Then the proper accelerations measured along the longitudinal x axis and the transversal y axis are substantially equal to zero. On the contrary, the acceleration measured along the vertical z axis is substantially equal to Earth's gravity.

[0039] Fifth timeslot **T5** is representative of a normal use of the electronic vaping device **10.** Measured accelerations along the longitudinal x axis and the transversal y axis are kept relatively low during this fifth timeslot **T5,** whereas the proper acceleration measured along the vertical z axis is substantially equal to Earth's gravity. Low variations of the measured proper accelerations along the three axes may still be observed during this fifth timeslot **T5.**

[0040] Sixth timeslot **T6** is representative of a further movement of the electronic vaping device **10** thrown towards the ground. As can be seen, the proper accelerations measured during timeslot **T6** are relatively closed to the accelerations measured during the second timeslot **T2,** i. e. during free fall of the electronic vaping device. However, in this sixth timeslot **T6** the rebound of the electronic vaping device **10** hitting the ground also induce proper accelerations measured along the longitudinal x axis and the transversal y axis which are not equal to zero. This may be the result of a rebound on a ground which is not flat and/or to a particular position/orientation of the electronic vaping device **10** when hitting the ground.

[0041] Finally, seventh timeslot **T7** corresponds to a situation similar to the first timeslot **T1,** with similar measured proper accelerations.

[0042] As it can be seen from Fig. 4, specific movements of the electronic vaping device **10** may be determined by analyzing acceleration/s of the electronic vaping device **10,** especially proper acceleration/s measured by at least one accelerometer **34** provided in the electronic vaping device **10.** According to a specific embodiment of the electronic vaping device **10** such a specific movement recognition based on analysis of acceleration is used as user input to trigger the speaker **30** to emit the alarm sound. Indeed, it is considered that it would be easier and faster for an assaulted user of the electronic vaping device **10,** to move the electronic vaping device **10** according to a specific movement rather than using a user input device, especially a specific button and/or a specific combination of press(es) on a button.

[0043] For example, Fig. 5 shows a flowchart of the different steps carried out in the PCB 28 of Fig. 3 to trigger to speaker **30** to emit the alarm sound.

[0044] In the following reference is made only to one acceleration of the electronic vaping device. It must be understood of course that each of the following steps can be carried out for each acceleration along a specific axis or for a resultant acceleration. The resultant acceleration may be equal to the square root of the sum of the square of each of the accelerations along three axes:

$$A_R = \sqrt{A_x^2 + A_y^2 + A_z^2}$$

where A_R is the resultant acceleration, A_x is the acceleration along a longitudinal x axis, Ay is the acceleration along a transversal y axis, and Az is the acceleration along a vertical z axis of the accelerometer **36.**

[0045] Acceleration along only one single axis may be analyzed to determine a specific movement especially for movement according to one degree of freedom. However, it is preferred to analyze accelerations along three different axes which are perpendicular to each other. Indeed, the analysis of these accelerations may not be subject to biased due to a particular orientation of the electronic vaping device **10** in this latter case. Moreover, a simple way to analyze three accelerations along directions which are perpendicular to each other, is to consider a resultant acceleration. Indeed, then only one signal is handled, which is representative of the three accelerations.

[0046] According to the flowchart shown of Fig. 5 representative of the algorithm carried out in the electronic vaping device **10,** during a first step **S1,** an activity detection is performed, e.g. by the ECU **34.** The activity detection may consist in determining whether the acceleration variations are above a predetermined threshold, considered as representative of noise only. To do so, the signal energy of the measured acceleration(s) may be analyzed.

[0047] Then, during a second step **S2,** the acceleration signal is conditioned, e.g. cleaned. Especially, high frequencies components - which may be considered as noise - of the acceleration signal may be subtracted from the measured acceleration signal. To do so, the acceleration signal may be processed through a low pass filter **38.** The low pass filter **38** may be provided on the PCB **28.** The low pass filter **38** may be distinct from the ECU **34.** Alternatively, the low pass filter **38** is comprised in the ECU **34.**

[0048] It may be noticed here that such a cleaning of the acceleration signal may not be necessary, for example if the output of the accelerometer/s **34** is/are digital.

[0049] Then, during a third step **S3,** the filtered acceleration signal is compared with a predetermined threshold value. Especially, during a drop of the electronic vaping device **10,** it is expected that the proper acceleration of the electronic vaping device **10** becomes lower than a first threshold. It is also expected that the proper acceleration stays below the first threshold during a first time interval which is higher than a second threshold.

[0050] On the contrary, it is expected that the coordinate acceleration becomes higher than a corresponding first threshold during free fall and stay above the corresponding first threshold during a second time interval.

[0051] This can be seen on Fig. 6 showing coordinate accelerations of the electronic vaping device **10** dropped from different heights. Thus, curves **C1** to **C5** respectively illustrate the coordinate acceleration of the electronic vaping device **10** dropped respectively from the Vertex **V,** the forehead **FH,** the occiput **O,** the right parietal **RP** and the left parietal **LP.** Based on these curves **C1-C5,** the first threshold $\mathbf{A_T}$ may be defined as a percentage of the maximum acceleration value reached by curves **C1-C5** - e.g. half of the maximum acceleration value reached by curves **C1-C5** - or a percentage of the maximum acceleration value reach by the lowest of curves **C1-C5** - e.g. 80% of the maximum acceleration value reached by the lowest curve. The first threshold $\mathbf{A_T}$ is preferably chosen high enough not to be confused with an acceleration underwent by the vaping device **10** in normal use, but not to high so as to be reachable by the lowest of curves **C1-C5.** The second threshold $\mathbf{T_T}$ may then be defined as the minimum time interval each of the curves **C1-C5** stay above the first threshold $\mathbf{A_T}$ or a percentage thereof. It may be noticed here that, in case the vaping device **10** is provided with a three-axis accelerometer, then the ECU **32** may be capable of detecting in which position or orientation the vaping device **10** is falling. The ECU **32** may then adapt the thresholds $\mathbf{A_T}$, $\mathbf{T_T}$ according to the orientation of the falling vaping device **10.** According to another embodiment, the ECU **32** may be capable of using different curves **C1-C5** and thus different threshold $\mathbf{A_T}$, $\mathbf{T_T}$, according to the orientation of the falling vaping device **10,** which orientation may be detected by the ECU **32** based on accelerations measured by a three-axis accelerometer or three single-axis accelerometers.

[0052] Other ways to define the first and second thresholds $\mathbf{A_T}$, $\mathbf{T_T}$ are apparent to those skilled in the art.

[0053] For a better detection of a drop of the electronic caping device **10,** a longer time interval or a larger portion of the filtered signal including the free-fall time can be analyzed in step **S3.** In this case, the scheme of accelerations shown in Fig. 4 may be searched and recognized by the algorithm carried out. In other words, a second time interval may have to be detected, which may be immediate after the first time interval, during which at least one proper acceleration varies of an amount above a predetermined threshold, the second time interval being preferably shorter than a third threshold, to recognize a drop movement of the electronic vaping device.

[0054] On the contrary, it may be searched for a second time interval, which may be immediate after the first time interval, during which at least one coordinate acceleration varies of an amount above a predetermined threshold, the second time interval being preferably shorter than a third threshold, to recognize a drop movement of the electronic vaping device **10.**

[0055] In case the criterions described above are met, then a fall movement of the electronic vaping device **10** is recognized. Accordingly, in step **S4,** the ECU **34** triggers the speaker **30** to emit the alarm sound.

[0056] Other ways to recognize specific movements of the electronic vaping device **10** may be apparent to those skilled in the art. Especially, signal cross-correlations or neural networks may be considered to recognize specific movements of the electronic vaping device **10.**

[0057] Also, other specific movements than a fall can be determined thanks to acceleration measurement/s and analyze/s. A specific movement that can be determined thank to acceleration/s may be e.g. one of:

- a shaking of the electronic vaping device **10** by the user;
- a rotation of the electronic vaping device **10,** e.g. along a rotation axis which is perpendicular the longitudinal axis **A** of the casing **18** of the electronic vaping devices.

[0058] Fig. 7 shows a third example of the PCB **28** which can be used in the electronic vaping device **10** of Fig. 1.

[0059] According to this third example, the electronic vaping device **10** is provided with a microphone **40** adapted to sense sound from outside the electronic vaping device **10.** The microphone **40** may be on the PCB **28.** Alternatively, the microphone **40** may be on the casing

18 of the electronic vaping device **10.**

[0060] Thanks to the microphone **40** which is connected to the ECU **34,** the ECU **34** may be configured to detect a specific sentence pronounced by the user of the electronic vaping device **10,** by analyzing the signal provided by the microphone **40.** The recognition of the specific sentence may be the user input based on which the alarm sound is triggered. Accordingly, when the ECU **34** determines that the specific sentence is pronounced by the user, the ECU **34** may trigger the speaker **30** to emit the alarm sound.

[0061] It is deemed that recognition of a sentence pronounced by the user of the electronic vaping device **10** is an easy and effective way to determined that the user is subject to an assault and that the alarm sound must be emitted.

[0062] Alternatively, the ECU **34** may be adapted to measure a sound level of the sound sensed by the microphone **40.** In this case, the ECU **34** may be configured to trigger the speaker to emit the alarm sound in case the level of sound determined by the ECU **34** is above a predetermined threshold, preferably during a time interval longer than another threshold. Indeed, the sound level may be above a predetermined threshold because of the user of the electronic vaping device **10** is shouting in response to the assault - e.g. calling for help. Thus, the sound level sensed by the microphone **40** is also a user input that can be used to trigger the speaker **30** to emit the alarm sound.

[0063] As illustrated in Fig. 7, the electronic vaping device **14** may further comprise means for recording the signal from the microphone **40,** after the alarm sound was emitted. For example, the electronic vaping device **14** may comprise a memory **42,** e.g. RAM or, preferably ROM, for recording the signal from the microphone **40.** The signal from the microphone **40** may be pre-treated before to be recorded on the memory **42.** For example, a noise reduction algorithm can be applied to the signal from the microphone **40** before it is recorded.

[0064] The signal recorded on the memory **42** may then be accessible to the user of the electronic vaping device **10.** Alternatively, the signal recorded on the memory **42** may then be accessible to a restricted number of people only, e.g. police officers or judges. To do so, the signal recorded on the memory **42** may for example be encoded.

[0065] Finally, Fig. 8 shows a fourth example of PCB **28** which can be used in the electronic vaping device **10.**

[0066] According to this fourth example, the electronic vaping device **10** comprises a GPS module **44.** In the present case, the GPS module **44** is on the PCB **28.** The GPS module **44** allows to determine the location of the electronic vaping device **10** when the ECU **34** triggers the speaker **30** to emit the alarm sound in response to a user input. The location of the electronic vaping device **10** can be stored in a memory **42.** However, as illustrated, the electronic vaping device **10** may further include a communication module **46,** especially a wireless communication module **46,** e.g. a GSM module. Accordingly, it is deemed advantageous that the ECU **34** is configured to command the communication module **46** so that this communication module **46** send an alert message. The alert message can be sent immediately after the speaker **10** emitted the alarm sound. The alert message may comprise the location of the electronic vaping device **10** when the alarm sound was emitted, the location being provided by the GPS module **44.** The alert message may be sent to the police or to contacts specified by the user of the electronic vaping device.

[0067] According to an alternative, the communication module **46** is a Wi-Fi or Bluetooth communication module. In this case, the electronic vaping device **10** may contact a smartphone of the user of the electronic vaping device **10** through the communication module **46,** so that the smartphone is used to send the alert message, using one of the communication modules of the smartphone, e.g. the GSM communication module of the smartphone.

[0068] It is to be understood that the invention is not limited to the details of construction set forth above. On the contrary, it is apparent to those skilled in the art having the benefit of the present disclosure that the invention is capable of other embodiments and of being practiced or carried out in various way.

[0069] For example, the different embodiments described above may be combined when they are not inconsistent.

[0070] Moreover, the electronic vaping may further comprise a user input device, as a button, to stop the emission of the alarm sound after the speaker was triggered to emit the alarm sound.

Claims

1. An electronic vaping device (10), comprising a speaker (30) adapted to emit an alarm sound of at least 80 dB, when triggered through a user input.

2. The electronic vaping device of claim 1, wherein the electronic vaping device comprises a button (22), the user input comprising pressing the button (22).

3. The electronic vaping device of claim 1 or 2, further comprising an electronic command unit (34) to trigger the speaker (30) to emit the alarm sound in response to the user input.

4. The electronic vaping device of claim 3, further comprising at least one accelerometer (36), the electronic command unit (32) being adapted to receive at least one signal from the accelerometer (36), to run an algorithm to determine whether the electronic vaping device (10) is subject to a specific movement based on the signal from the accelerometer (36) and to trigger the speaker (30) to emit the alarm sound if the specific movement of the electronic vaping de-

vice (10) is recognized by the algorithm.

5. The electronic vaping device of claim 4, comprising one three-axis accelerometer (36), the electronic vaping device (10) preferably comprising one single accelerometer (36), which is a three-axis accelerometer.

6. The electronic vaping device of claim 4 or 5, wherein the algorithm comprises a first criterion consisting in detecting a first time interval during which at least one acceleration of the electronic vaping device is lower, respectively higher, than a first threshold.

7. The electronic vaping device of claim 6, wherein the algorithm comprises a second criterion consisting in detecting a second time interval, preferably immediate after the first time interval, during which at least one acceleration varies of an amount above a second threshold, the second time interval being preferably shorter than a third threshold.

8. The electronic vaping device of claim 4 of 5, comprising a three-axis accelerometer (36) or three one-axis accelerometers (36) adapted to measure an acceleration along three axes perpendicular to each other, wherein the algorithm comprises a first criterion consisting in detecting a first time interval during which a resultant acceleration of the electronic vaping device is lower, respectively higher, than a first threshold, the resultant acceleration being defined as the square root of the sum of the square of the three accelerations.

9. The electronic vaping device of claim 8, wherein the algorithm comprises a second criterion consisting in detecting a second time interval, preferably immediate after the first time interval, during which the resultant acceleration varies of an amount above a second threshold, the second time interval being preferably shorter than a third threshold.

10. The electronic vaping device of any one of the preceding claims, further comprising a GPS module (44) adapted to determine a position of the electronic vaping device (10) when the speaker (30) is triggered to emit the alarm sound, and a communication module (46), especially a GSM module, adapted to send an alert message comprising the position of the electronic vaping device (10) when the speaker (30) is triggered to emit the alarm sound.

11. The electronic vaping device of any one of the preceding claims, further comprising a microphone (40) adapted to sense sound from outside the electronic vaping device (10).

12. The electronic vaping device of claims 3 and 11, wherein the microphone (40) is connected to the electronic command unit (34) and wherein the electronic command unit (34) is adapted to detect a specific sentence pronounced by a user of the electronic vaping device (10) in the signal received from the microphone (40) and to trigger the speaker (30) to emit the alarm sound, when the specific sentence is detected.

13. The electronic vaping device of claim 11 or 12, wherein the microphone (40) is connected to the electronic command unit (34) and wherein the electronic command unit (34) is adapted to detect a sound level of the sound sensed by the microphone (40), which is above a predetermined threshold, preferably during a predetermined threshold of time, and to trigger the speaker (30) to emit the alarm sound consequently.

14. The electronic vaping device of one of claims 11 to 13, further comprising means (42) for recording the signal from the microphone (40) after the speaker (30) was triggered to emit the alarm sound.

15. The electronic vaping device of any one of the preceding claims, further comprising a user input device to stop the emission of the alarm sound after the speaker (30) was triggered.

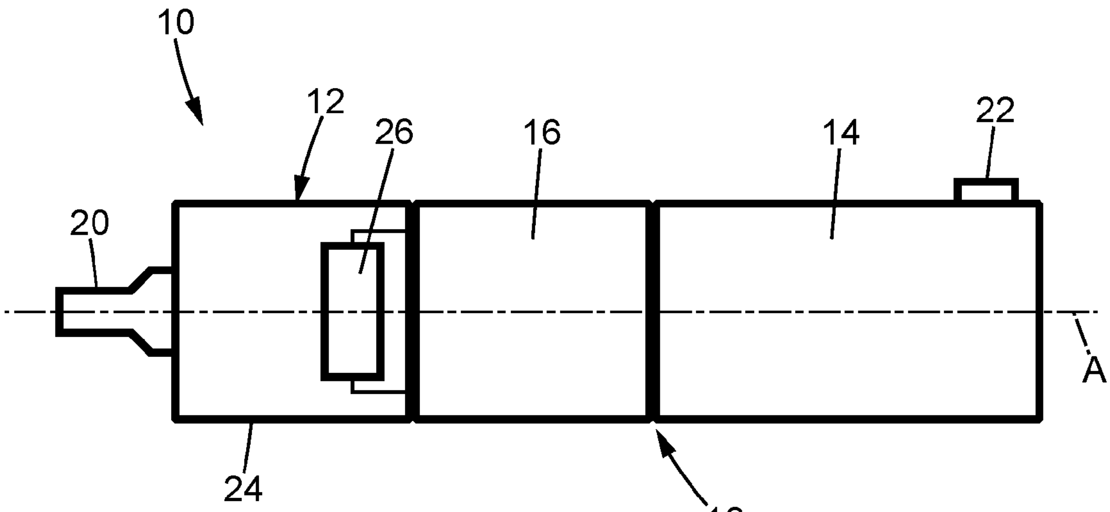


FIG. 1

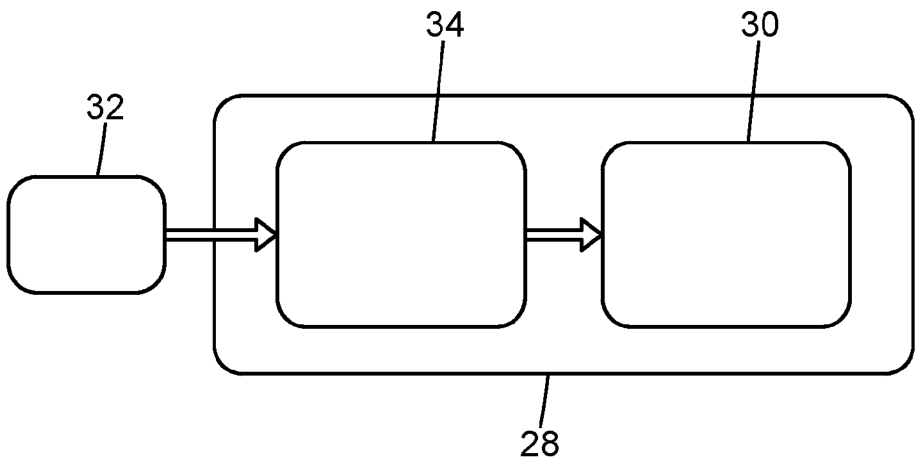


FIG. 2

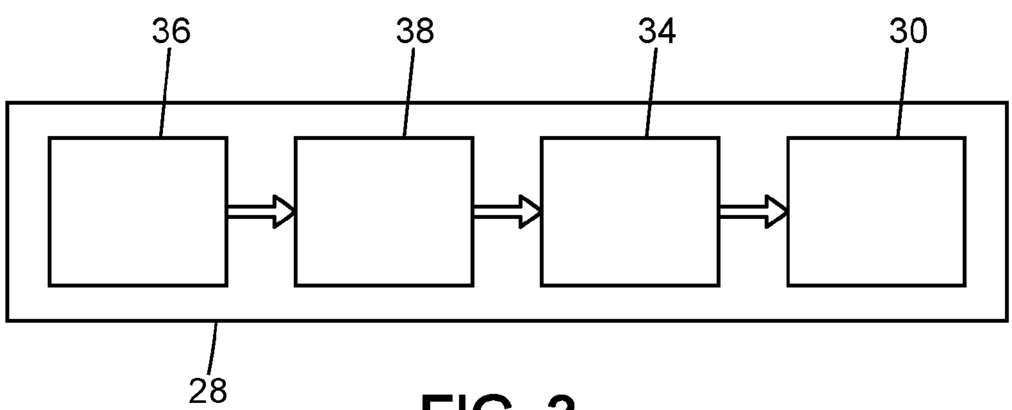


FIG. 3

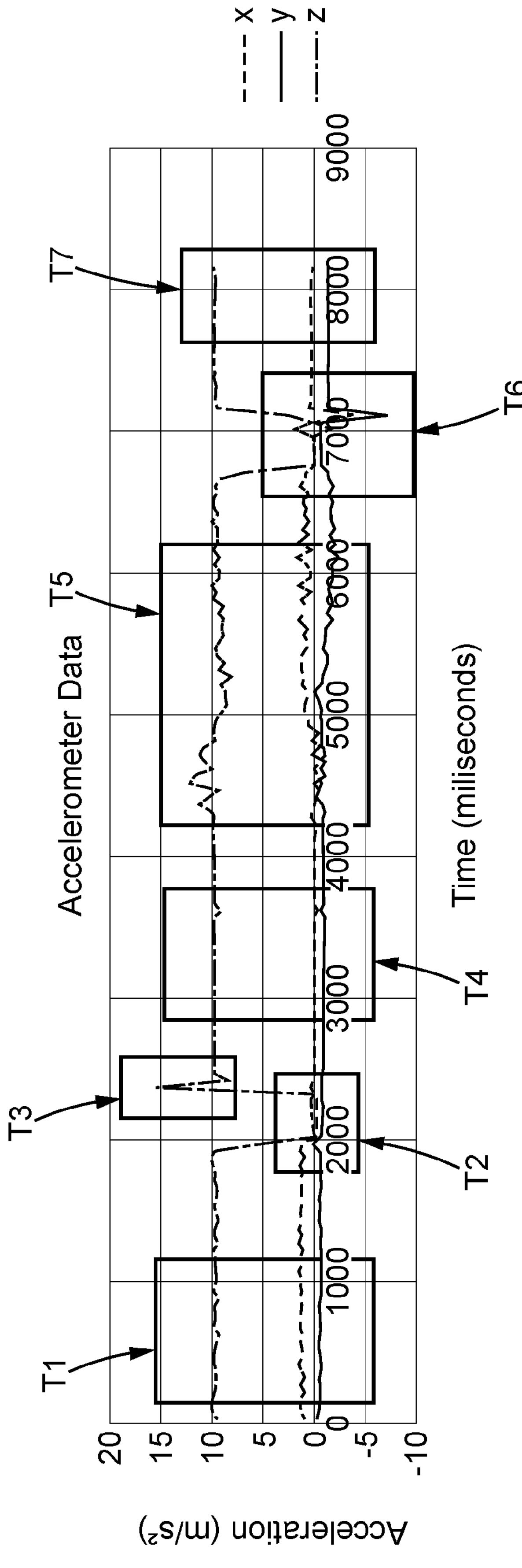

Accelerometer Data
x
y
z
T1
T2
T3
T4
T5
T6
T7
Acceleration (m/s²)
20
15
10
5
0
-5
-10
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
Time (miliseconds)

FIG. 4

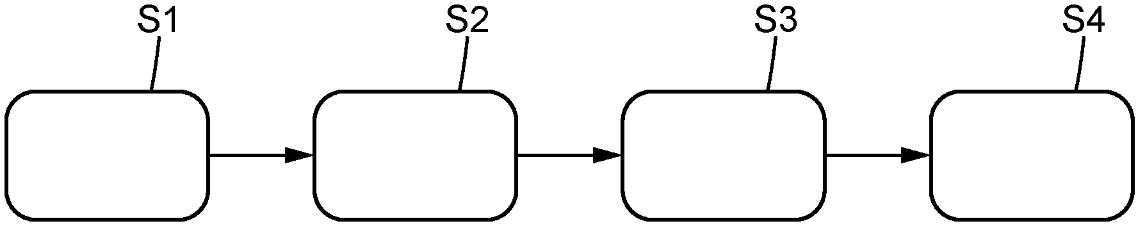
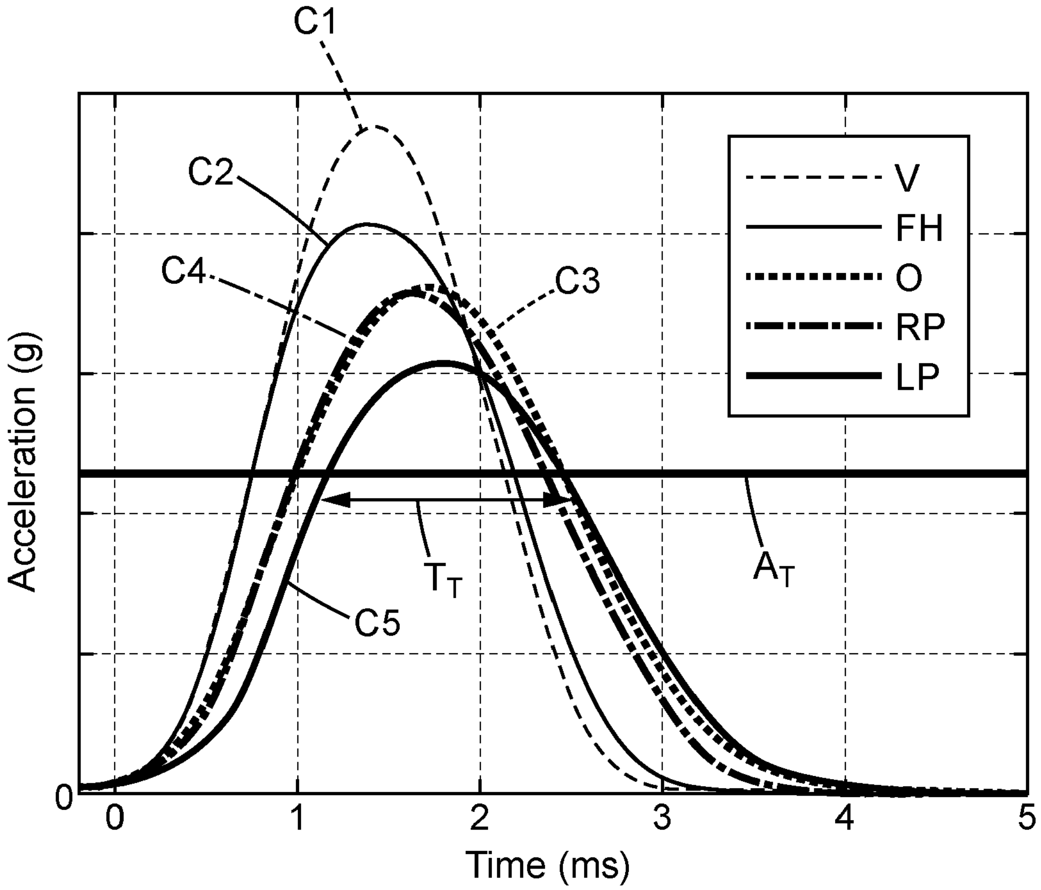

S1
S2
S3
S4

FIG. 5


C1
C2
C4
C3
C5
V
FH
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RP
LP
T_T
A_T
Acceleration (g)
Time (ms)
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0
1
2
3
4
5

FIG. 6

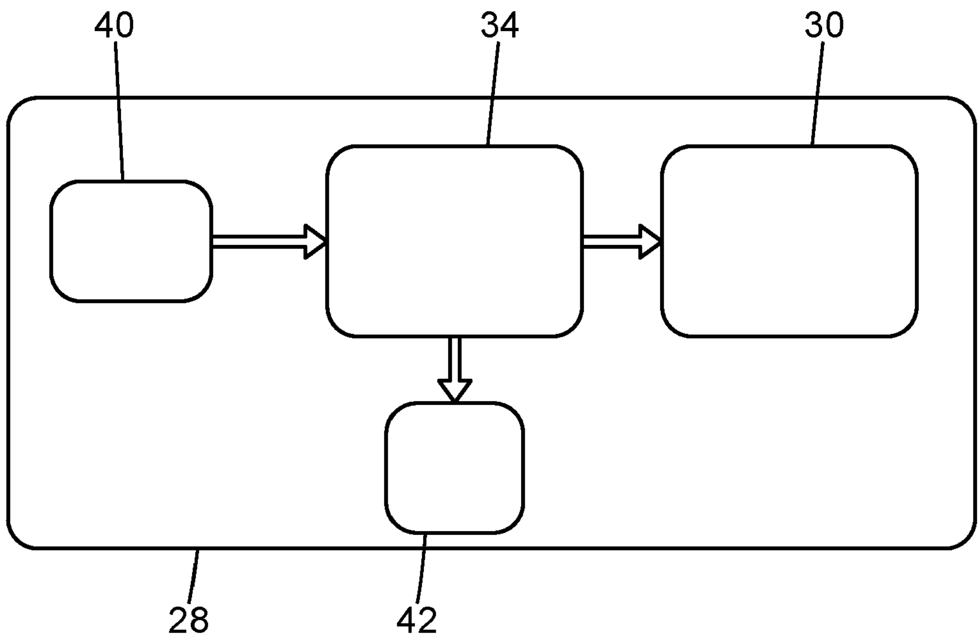

FIG. 7

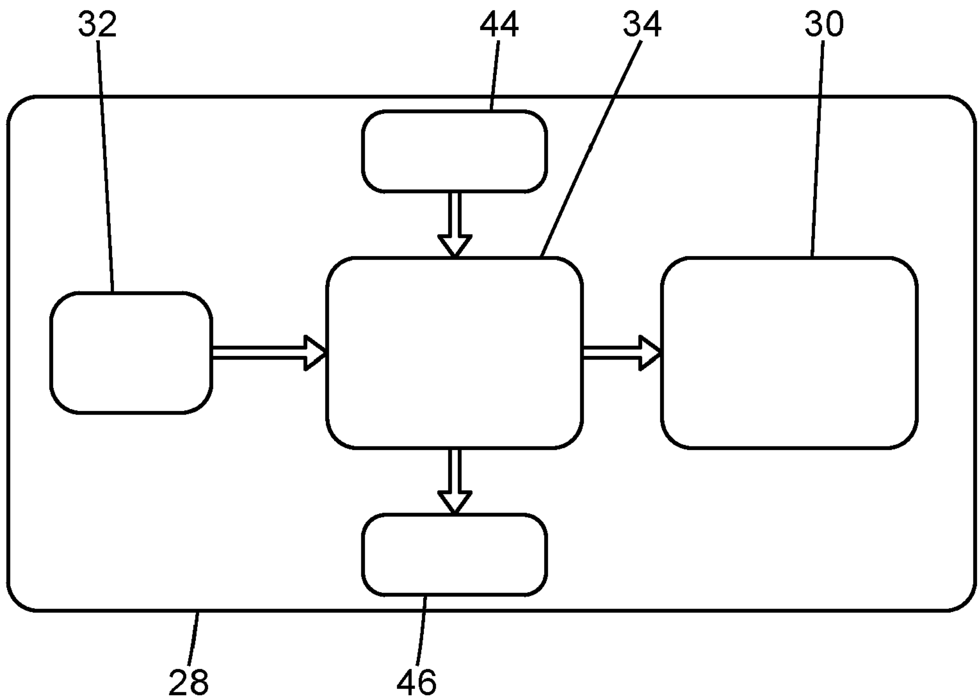

FIG. 8

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Application Number
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The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	14 December 2022	Meister, Mark

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