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(71) Applicant: **LEVIN, Orna** [IL/IL]; Haharuv 8, 40593 Kfar Netter (IL).

(72) Inventor: **WALLACH, Adi**; Hashita 5, 40593 Kfar Netter (IL).

(74) Agent: **GUR, Erez**; POB 1372, Weizman Street, 44113 Kfar Saba (IL).

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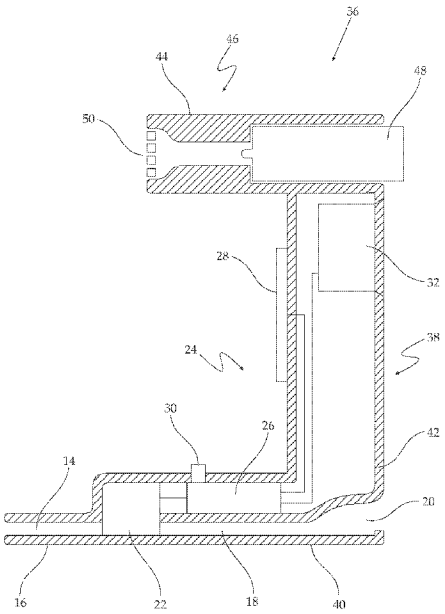

FIGURE 2

(57) Abstract: Disclosed are biofeedback methods and devices suitable for providing biofeedback useful for helping a user control an own breathing, for example, to help in inducing deep breathing, and such biofeedback devices further comprising a dispenser for dispensing an inhalable substance.

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BREATHING BIOFEEDBACK DEVICE

RELATED APPLICATION

The present application gains priority from UK Patent Application No. GB1120060.7 filed 21 November 2011, which is incorporated by reference as if fully set-forth herein.

FIELD AND BACKGROUND OF THE INVENTION

The invention, in some embodiments, relates to the field of biofeedback, and more particularly, but not exclusively, to methods and devices suitable for providing biofeedback useful for helping a user control an own breathing, for example, to help in inducing deep breathing.

Breathing is the process by which animals take in oxygen necessary for cellular metabolism and release the carbon dioxide that accumulates in the body as a result of the expenditure of energy.

Breathing can be affected by conditions such as emotional state (such as stress, excitement, fear, etc.), physical exercise, temperature, ingested or inhaled substances weather and environmental conditions, various diseases, and obesity.

The breathing pattern of an individual changes under stress. Typically, a stressed individual takes small, shallow breaths, using the shoulders rather than the diaphragm to move air in and out of the lungs. This style of breathing removes too much carbon dioxide from the blood, leading to hyperventilation, which can prolong feelings of anxiety by exacerbating physical symptoms of stress, including chest tightness, constant fatigue, faintness and lightheadedness, feelings of panic, headaches, heart palpitations, insomnia, muscular aches, twitches or stiffness.

Breathing is one of the few bodily functions that can be controlled, within limits, both consciously and unconsciously. Conscious control of breathing is provided by the autonomic nervous system via the cerebral cortex. Conscious control of breathing is common in many forms of meditation, such as forms of yoga, and controlled, deep, breathing from the abdomen rather than from the upper chest, has been found to induce relaxation, leading to lowered blood pressure and heart rate, reduced amounts of stress hormones, reduced lactic acid build-up in muscle tissue, balanced levels of oxygen and carbon dioxide in the blood, improved immune system functioning, increased physical energy and feelings of calm and well-being. The use of slow, deep breathing, particularly deep abdominal breathing as a means of promoting relaxation is considered to be of help in managing stress, as well as a

range of disorders which are related to, or affected by stress including anxiety, asthma, chronic fatigue syndrome, chronic pain, high blood pressure, insomnia, panic attacks, labor pain, and some skin conditions such as eczema, and as well as various psychosomatic and psychoneurotic disorders.

In relaxed, deep breathing, the respiration rate is preferably slow (less than 8 breaths per minute), with large tidal volume (at least 2000 ml) and smooth flow rates, predominant abdominal expansion during inhalation and abdominal contraction during exhalation. The exhalation duration is significantly longer than the inhalation time and the end-tidal CO_2 is around 5%. Preferably for relaxation inhalation is through the nose and exhalation is prolonged, slow and through the mouth.

Various biofeedback techniques and systems have been proposed to assist a user in achieving controlled breathing.

The Respiratory Biofeedback Device produced by BioMental mBh (Vierlinden, Germany) detects respiratory movement by means of a sensor worn by the user and converts the detected movement to an optical and/or acoustic signal that makes the user aware of the own breathing rhythm and respiratory rate. The device includes a feedback mask and breath sensor.

US Patent Publication US2010/0240945 discloses respiratory biofeedback devices and methods which include producing a signal in response to a user's respiratory activity by acquiring sounds of a user's breathing.

Publications that provide background for understanding the field of the invention include US Patent Publications US2007/167855, US2011/021940; US2012/029376; US Patents US 4,984,158; US5,357,975; US6,165,105; PCT publication WO2007/012818; UK Patent application GB2480605; and Japan patent application JP201004457. It is important to note that at least some of the references were published after the priority date of the instant application.

SUMMARY OF THE INVENTION

Some embodiments of the invention relate to methods and biofeedback devices useful for helping a user control an own breathing. In some embodiments, a signal related to a determined exhalation duration is reported to the user as biofeedback. The biofeedback makes the user aware if breathing is too shallow and helps the user increase exhalation duration, in some embodiments helping to induce deep breathing.

According to some embodiments of the invention, there is provided a biofeedback device for providing biofeedback useful for helping a user control breathing, the device comprising a housing configured to be hand-held by the user; an exhalation inlet for receiving exhaled breath of the user; physically associated with the housing, an exhalation determiner functionally associated with the exhalation inlet, configured to determine when exhaled breath is received by the exhalation inlet; and a reporter associated with the exhalation determiner, the reporter configured to provide a signal related to an exhalation duration of the exhaled breath received from the exhalation determiner to the user.

According to some embodiments of the invention, there is also provided a biofeedback device for providing biofeedback useful for helping a user control breathing, the device comprising:

a housing configured to be hand-held by the user;

an exhalation inlet for receiving exhaled breath from the mouth of the user;

physically associated with the housing, an inhalable substance outlet and a functionally-associated dispenser configured for dispensing an inhalable substance to the user through the inhalable substance outlet, wherein the housing is configured so that when the exhalation inlet is positioned for the receiving the exhaled breath from the mouth, the inhalable substance outlet is located in proximity of the nostrils of the user;

physically associated with the housing, an exhalation determiner functionally associated with the exhalation inlet, configured to determine when exhaled breath is received by the exhalation inlet; and

a reporter associated with the exhalation determiner, the reporter configured to provide a signal related to an exhalation duration of the exhaled breath received from the exhalation determiner to the user.

According to some embodiments of the invention, there is also provided a biofeedback device for providing biofeedback useful for helping a user control breathing, the device comprising:

a housing configured to be hand-held by the user;

an exhalation inlet for receiving exhaled breath from the mouth of the user, wherein the exhalation inlet is functionally associated with an exhalation conduit including an exhalation outlet, configured so that exhaled breath received by the exhalation inlet passes through the exhalation conduit and exits through the exhalation outlet, and a

flow-restrictor functionally associated with the exhalation conduit, configured for limiting the rate of flow of the exhaled breath through the conduit;

physically associated with the housing, an exhalation determiner functionally associated with the exhalation inlet, configured to determine when exhaled breath is received by the exhalation inlet; and

a reporter associated with the exhalation determiner, the reporter configured to provide a signal related to an exhalation duration of the exhaled breath received from the exhalation determiner to the user.

In some embodiments, the signal is selected from the group consisting of a visual signal (such as one or more of a symbol, a color, a light, an animation and a numerical display), an audible signal (such as one or more of a bell, a buzzer, a beep, a musical fragment, and a voice recording, and combinations thereof), a tactile signal (such as one or more of a vibration of a component, a change in temperature of a component and a change in shape of a component), and combinations thereof.

In some embodiments, the visual display is a dynamic visual display, such as a blinking visual display, an animated visual display, or a color-changing visual display, or combinations thereof.

In some embodiments, the device of the invention further comprises, physically associated with the housing, an inhalable substance outlet and a functionally-associated dispenser configured for dispensing an inhalable substance to the user through the inhalable substance outlet.

In some embodiments, the housing is configured so that when the exhalation inlet is positioned by the user for receiving exhaled breath, the inhalable substance outlet is located in proximity of the nostrils of the user.

In some embodiments, at least one of the inhalable substance outlet and the dispenser is contained within a reversibly detachable section of the housing.

In some embodiments, at least one of the inhalable substance outlet and the dispenser is contained within an integrally formed part of the housing.

In some embodiments, the device further comprises an inhalable substance reservoir functionally associated with the inhalable substance outlet, the reservoir configured to store the inhalable substance and to release the inhalable substance to the dispenser.

In some embodiments, the dispenser is a passive dispenser, comprising a reservoir configured to passively release the inhalable substance via the inhalable substance outlet.

In some embodiments, the device of the invention further comprises a cover couplable to the housing, configured to substantially prevent entry of air into the exhalation inlet when the cover is coupled to the housing.

In some embodiments, the device of the invention further comprises a cover couplable (in some embodiments, reversibly couplable) to the housing, configured to substantially prevent at least one of entry of air into the exhalation inlet, diffusion of inhalable substance out of the device prior to use, and soiling of the exhalation inlet, when the cover is coupled to the housing. In some embodiments, the device is configured so that removal of the cover activates the reporter and/or exhalation determiner. In some embodiments, the device further comprises a tether attached to at least one of the cover and the housing.

In some embodiments of the device of the invention, the exhalation inlet is functionally associated with an exhalation conduit including an exhalation outlet, configured so that exhaled breath received by the exhalation inlet passes through the exhalation conduit and exits through the exhalation outlet. In some embodiments, the exhalation conduit is contained within the housing. In some embodiments, the device further comprises a flow-restrictor functionally associated with the exhalation conduit, configured for limiting the rate of flow of exhaled breath through the conduit. In some embodiments, the exhalation determiner is configured to function as the flow-restrictor.

According to some embodiments of the invention, there is provided a biofeedback method useful for helping a user control breathing, the method comprising determining when a user is exhaling; and providing a signal related to an exhalation duration of exhaling to the user.

In some embodiments of the method of the invention, the signal comprises a comparison to a preferred exhalation duration. In some embodiments, the preferred exhalation duration is fixed. In some embodiments, the preferred exhalation duration is variable. In some embodiments, the signal further comprises a comparison to a preferred pattern of at least two exhalations.

In some embodiments of the method of the invention, the signal is selected from the group consisting of a visual signal (such as at least one of a symbol, a color, a light, an animation and a numerical display, or combinations thereof), audible signal (such as at least one of a bell, a buzzer, a beep, a musical fragment, and a voice recording), a tactile signal (such as at least one of a vibration of a component, a change in temperature of a component and a change in shape of a component), and combinations thereof.

In some embodiments, the visual display is a dynamic visual display, such as a blinking visual display, an animated visual display, a color-changing visual display.

According to an aspect of some embodiments of the invention, there is also provided a biofeedback method useful for helping a user control breathing, the method comprising:

a) providing a device for measuring exhalation duration of a user , the device having:

a variable preferred exhalation duration,

a target exhalation duration, and

a update threshold difference value;

b) for a given use-event of the device by a user, setting the preferred exhalation duration to the target exhalation duration; and

c) during at least part of the given use-event of the device by the user, repeatedly

determining an actual exhalation duration of the user, and

if the actual exhalation duration is less than the preferred exhalation duration by at least the update threshold difference value, reducing the preferred exhalation duration, or

if the actual exhalation duration is substantially equal to or greater than the preferred exhalation duration, providing a signal indicating such to the user.

In some embodiments, a signal is selected from the group consisting of a visual signal, audible signal, a tactile signal, and combinations thereof.

In some embodiments, the target exhalation duration is set through a user interface. In some embodiments, the target exhalation duration is set by the results of a previous use of the device.

In some embodiments, the method further comprises, subsequent to the determining an actual exhalation duration of the user, if the actual exhalation duration is substantially equal to the preferred exhalation duration, increasing the preferred exhalation duration.

In some embodiments, the method further comprises, subsequent to the determining an actual exhalation duration of the user, if the actual exhalation duration is greater than the preferred exhalation duration, increasing the preferred exhalation duration.

In some embodiments, the method further comprises, subsequent to the determining an actual exhalation duration of the user, if the actual exhalation duration is less than the preferred exhalation duration by less than the update threshold difference value, increasing the preferred exhalation duration.

In some embodiments, the method further comprises administering an inhalable substance to the subject, so that the subject inhales the inhalable substance between exhalations.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. In case of conflict, the specification, including definitions, takes precedence.

As used herein, the terms “comprising”, “including”, "having" and grammatical variants thereof are to be taken as specifying the stated features, integers, steps or components but do not preclude the addition of one or more additional features, integers, steps, components or groups thereof. The phrase "consisting essentially of" or grammatical variants thereof when used herein are to be taken as specifying the stated features, integers, steps or components but do not preclude the addition of one or more additional features, integers, steps, components or groups thereof but only if the additional features, integers, steps, components or groups thereof do not materially alter the basic and novel characteristics of the claimed device or method.

As used herein, the indefinite articles "a" and "an" mean "at least one" or "one or more" unless the context clearly dictates otherwise.

As used herein, when a numerical value is preceded by the term "about", the term "about" is intended to indicate +/-10%.

Embodiments of methods and/or devices of the invention may involve performing or completing selected tasks manually, automatically, or a combination thereof. Some embodiments of the invention are implemented with the use of components that comprise hardware, software, firmware or combinations thereof. In some embodiments, some components are general-purpose components such as general purpose computers or oscilloscopes. In some embodiments, some components are dedicated or custom components such as circuits, integrated circuits or software.

For example, in some embodiments, some of an embodiment is implemented as a plurality of software instructions executed by a data processor, for example which is part of a general-purpose or custom computer. In some embodiments, the data processor or computer comprises volatile memory for storing instructions and/or data and/or a non-volatile storage, for example, a magnetic hard-disk and/or removable media, for storing instructions and/or data. In some embodiments, implementation includes a network connection. In some embodiments, implementation includes a user interface, generally comprising one or more of

input devices (e.g., allowing input of commands and/or parameters) and output devices (e.g., allowing reporting parameters of operation and results.

BRIEF DESCRIPTION OF THE FIGURES

Some embodiments of the invention are described herein with reference to the accompanying figures. The description, together with the figures, makes apparent to a person having ordinary skill in the art how some embodiments of the invention may be practiced. The figures are for the purpose of illustrative discussion and no attempt is made to show structural details of an embodiment in more detail than is necessary for a fundamental understanding of the invention. For the sake of clarity, some objects depicted in the figures are not to scale.

In the Figures:

FIG. 1 depicts a cross-sectional representation of an embodiment of a device as taught herein, for determining exhalation duration and providing biofeedback;

FIG. 2 depicts a cross-sectional representation of an embodiment of a device as taught herein, for determining exhalation duration, providing biofeedback and for dispensing an inhalable substance;

FIGs. 3A and 3B are schematic depictions of the device of Figure 2, with a cover couplable to a housing of the device, with the cover coupled (Figure 3A) and not-coupled (Figure 3B);

FIGs. 4A and 4B schematically depict, in cross section, an embodiment of an exhalation determiner useful in implementing some embodiments of the teachings herein, during exhalation (Figure 4A) and during no exhalation (Figure 4B);

FIGs. 5A and 5B schematically depict, in cross section, an additional embodiment of an exhalation determiner useful in implementing some embodiments of the teachings herein, during exhalation (Figure 5A) and during no exhalation (Figure 5B);

FIGs. 6A and 6B schematically depict, in cross section, an embodiment of a device as taught herein, including an additional embodiment of an exhalation determiner, during exhalation (Figure 6A) and during no exhalation (Figure 6B);

FIGs. 7A, 7B, 7C and 7D depict an embodiment of a device as taught herein in front view (Figure 7A), side view (Figure 7B) back view (Figure 7C) and schematic side cross section (Figure 7D;

FIGs. 8A, 8B and 8C depict an embodiment of a device as taught herein in front view (Figure 8A and 8B) and perspective view (Figure 8C);

FIGs. 9A and 9B depict an embodiment of a device as taught herein in perspective view from the front somewhat angled to the right side (Figure 9A) and from the left side somewhat angled to the back (Figure 9B); and

FIGs. 10A, 10B, 10C and 10D depict an embodiment of a device as taught herein in a closed configuration (Figure 10A), in a partially-open configuration (Figure 10B), in a fully-open configuration (Figure 10C) and schematically (Figure 10D).

DESCRIPTION OF SOME EMBODIMENTS OF THE INVENTION

The invention, in some embodiments, relates to the field of biofeedback, and more particularly, but not exclusively, to a device providing biofeedback for helping a user control breathing. Some embodiments of the invention relate to methods and devices that report a signal related to a preferred exhalation duration. The reported signal makes the user aware if breathing is too shallow and helps the user increase exhalation duration, in some embodiments helping to induce deep breathing.

The principles, uses and implementations of the teachings herein may be better understood with reference to the accompanying description and figures. Upon perusal of the description and figures present herein, one skilled in the art is able to implement the invention without undue effort or experimentation. In the figures, like reference numerals refer to like parts throughout.

Before explaining at least one embodiment in detail, it is to be understood that the invention is not necessarily limited in its application to the details of construction and the arrangement of the components and/or methods set forth herein. The invention is capable of other embodiments or of being practiced or carried out in various ways. The phraseology and terminology employed herein are for descriptive purpose and should not be regarded as limiting.

Method for helping a user control breathing

According to an aspect of some embodiments of the invention there is provided a biofeedback method useful for helping a user control breathing, in some embodiments helping inducing deep breathing, the method comprising:

determining when a user is exhaling; and

providing a signal (as biofeedback) related to an exhalation duration of the exhaling to the user. In some embodiments, an additional feedback is provided that relates to the breathing pattern.

The user monitors the signal. If the exhalation duration is too short (that is to say, the breathing is too fast) the user knows to make an effort to exhale for a longer time, increasing the exhalation duration, and thereby breathing more slowly. In some embodiments, deep breathing is induced.

In some embodiments, the signal comprises a comparison to a preferred exhalation duration, making it easier for the user to know when the exhalation duration is sufficiently long. A typical preferred exhalation duration is at least about 3 seconds, typically between about 3 and about 7 seconds.

As discussed above, correct breathing is known to provide relief for various conditions. Conditions which may be treated or relieved by the method of the invention are discussed below.

Any suitable signal may be provided for the user. For example, a visual signal, an audible signal, a tactile signal or combinations thereof.

For example, in some embodiments, the signal includes or is a visual signal such as a signal selected from the group consisting of a symbol, a color, a light, a numerical display, an animation, or a combination thereof.

For example, in some embodiments the signal includes or is an audible signal such as a signal selected from the group consisting of a bell, a buzzer, a beep, a musical fragment, a voice recording, or a combination thereof.

For example, in some embodiments the signal includes or is a tactile signal such as a signal selected from the group consisting of a vibration, a change in temperature of a component, a change in the shape of a component, or a combination thereof.

Adaptive Biofeedback

In some embodiments, the method comprises adaptive biofeedback, that is to say, biofeedback that is dependent on the actual exhalation pattern of a user, for example actual determined exhalation duration. In some embodiments, adaptive biofeedback is implemented by an electrical controller by closed loop method implementation. In some embodiments, biofeedback comprises a feedback signal provided only when the exhalation time reaches at least a predetermined target threshold. In some such embodiments, no signal is provided when the user fails to reach the target threshold. In some such embodiments, a second, different signal is provided when the user fails to reach the target threshold. In some embodiments, the threshold for determining when feedback for the required exhalation time is provided is changed according to the performance of the user. In some embodiments, the

threshold is set at a constant number (such as, for example, 5 seconds). In some embodiments, a constant number threshold is used only for a first-time use of the device. In some embodiments, the constant number threshold is used for subsequent uses of the device. In some embodiments, the exhalation time achieved by the user in the first exhalation is measured) and the threshold for feedback is changed accordingly. In some embodiments, if the first measured exhalation time is less than the threshold level, the threshold is decreased. In some embodiments, if the first measured exhalation time is longer than the threshold, the threshold is increased.

Some such embodiments are useful for helping a person not-necessarily suffering from an acute problem train for more effective breathing, for example, people who decide to increase lung capacity, singers, musicians, divers, and practitioners of yoga and martial arts.

Some such embodiments are useful for treating stress-related conditions especially acute stress-related conditions as discussed herein, by reducing the performance anxiety potentially arising from the need to attain a fixed preferred exhalation duration. Instead, a user gains confidence (and is calmed) by being presented with a series of attainable but increasingly difficult challenges (an increasing preferred exhalation duration).

Thus, accordingly to an aspect of some embodiments of the teachings herein, there is provided a biofeedback method useful for helping a user control breathing, the method comprising:

a) providing a device for measuring the exhalation duration of a user, the device having: a variable preferred exhalation duration, a target exhalation duration, and a update threshold difference value;

b) for a given use-event of the device by a user (e.g., a continuous session when the user is using the device), setting the preferred exhalation duration to the target exhalation duration; and

c) during at least part of the given use-event of the device by the user, repeatedly

determining an actual exhalation duration of the user, and

if the actual exhalation duration is less than the preferred exhalation duration by at least the update threshold difference value, reducing the preferred exhalation duration, or

if the actual exhalation duration is substantially equal to or greater than the preferred exhalation duration, providing a signal indicating such to the user, as the biofeedback.

In a descriptive non-limiting embodiment, when a user first activates such a device for a use-event, the preferred exhalation duration is set to the value of the target exhalation duration (e.g., 5 seconds).

The user exhales, and the device determines (registers) the actual exhalation duration (e.g., 1 seconds) that is less than the preferred exhalation duration (5 seconds) by more than the update threshold difference value (e.g., 0.5 seconds). Depending on the exact embodiment, the user may or may not receive biofeedback, as described above. Since the actual exhalation duration (1 second) is less than the preferred exhalation duration (5 seconds) by at least the update threshold difference value (0.5 seconds), the preferred exhalation duration is reduced, e.g., by 1 second to 4 seconds.

The user exhales a second time, and the device determines the actual exhalation duration (e.g., 1.3 seconds) that is less than the preferred exhalation duration (4 seconds) by more than the update threshold difference value (0.5 seconds). Depending on the exact embodiment, the user may or may not receive biofeedback, as described above. Since the actual exhalation duration (1.5 seconds) is less than the preferred exhalation duration (4 seconds) by at least the update threshold difference value (0.5 seconds), the preferred exhalation duration is reduced, e.g., by 1 second to 3 seconds.

The user exhales a third time, and the device determines the actual exhalation duration (e.g., 1.5 seconds) that is less than the preferred exhalation duration (3 seconds) by more than the update threshold difference value (0.5 seconds). Depending on the exact embodiment, the user may or may not receive feedback, as described above. Since the actual exhalation duration (1.5 seconds) is less than the preferred exhalation duration (3 seconds) by at least the update threshold difference value (0.5 seconds), the preferred exhalation duration is reduced, e.g., by 1 second to 2 seconds.

The user exhales a fourth time, and the device determines the exhalation duration (e.g., 1.6 seconds) that is less than the preferred exhalation duration (2 seconds) but by more update threshold difference value (0.5 seconds). Depending on the exact embodiment, the user may or may not receive feedback, as described above. Since the actual exhalation duration (1.5 seconds) is less than the preferred exhalation duration (3 seconds) by at least the update threshold difference value (0.5 seconds), the preferred exhalation duration is reduced, e.g., by 1 second to 2 seconds.

Device

The device provided to implement such an embodiment having a variable preferred exhalation duration is any suitable device, for example, devices such as described herein, that is suitably modified. Typically, a suitable device includes a digital processor and can be suitably modified without undue effort or experimentation by a person having ordinary skill in the art of programming using software and/or hardware configured to implement the teachings herein.

In some typical embodiments, the variable preferred exhalation duration, the target exhalation duration, and the update threshold difference value are implemented as variables (software or hardware) in a computer program.

Target exhalation duration

In some embodiments, the target exhalation duration is the ultimately-desired exhalation duration for a use-event of the device. The exact value of a target exhalation duration is embodiment-dependent.

In some embodiments, the target exhalation duration is "factory preset", that is to say, there is no simple manner to change the value thereof. In such embodiments, the value of the target exhalation duration is embodiment-dependent. For example, for embodiments suitable for treatment of stress and the like, the target exhalation duration is typically, as discussed above, at least about 3 second, typically between about 3 and about 7 seconds.

In some embodiments, the target exhalation duration is set through a user interface (e.g., entered through a user-interface of the device by the user, a parent of the user, a health care professional). Some such embodiments are exceptionally useful for training, as opposed to treatment, embodiments. In some such embodiments, there is typically no upper limit to the target exhalation duration. In some such embodiments there is an arbitrarily high upper limit (e.g., 30 seconds, 60 seconds) is integrated in the device. In some such embodiments there is a lower limit to the target exhalation duration, for example 1 second.

In some embodiments, the target exhalation duration is set by the results of a previous use of the device.

Variable preferred exhalation duration

The variable preferred exhalation duration is the exhalation duration desired for a single exhalation event which purpose, in some embodiments, is constituting an attainable goal. As noted above, in some instances a following variable preferred exhalation duration is updated as a result of a previously-achieved exhalation duration.

In some embodiments, there is a minimal value below which the variable preferred exhalation duration is not set, for example, in some embodiments 1 second or 2 seconds.

Threshold difference value

As discussed above, the difference between an actual exhalation duration and a current preferred exhalation duration is compared to the update threshold difference value. If the actual exhalation duration is less than the preferred exhalation duration by at least the update threshold difference value, that is to say a relatively large difference, the current preferred exhalation duration is considered too long and difficult to attain, so that the preferred exhalation duration is reduced to become a more easily attainable goal. If the actual exhalation duration is less than the preferred exhalation duration by less than the update threshold difference value, that is to say a relatively small difference, the current variable preferred exhalation duration is considered an attainable goal and is therefore the preferred exhalation duration is not reduced.

The exact value of the threshold difference value is embodiment-dependent. That said, the threshold difference value in some typically embodiments, the threshold difference value is not less than 0.1 seconds and not more than 3 seconds, more typically not less than 0.2 seconds and nor more than 2 seconds.

Reducing the preferred exhalation duration

The amount by which the preferred exhalation duration is reduced when needed is embodiment-dependent. In some embodiments, the amount if fixed. In some embodiments, the amount is varied, for example, as a function of the absolute value of the current value of the preferred exhalation duration and/or the value of the target exhalation duration and/or the number of exhalations and/or the purpose for which the embodiment is implemented. That said, the amount by which the preferred exhalation duration is reduced when needed is typically between about 0.1 and 1 second, more typically between 0.2 and 0.5 seconds.

Rewarding the user and increasing the preferred exhalation duration

In some embodiments, it is desirable to reward a user for an achievement with a signal as a biofeedback.

In some embodiments, certain events lead to an increase of the value of the preferred exhalation duration.

In some embodiments, the method further comprises during at least part of given use-event of the device by a user, subsequent to determining an actual exhalation duration of the user, if the actual exhalation duration is substantially equal to the preferred exhalation duration, at least one of: increasing the preferred exhalation duration and/or providing a signal thereof as a biofeedback. It is important to note that in some such embodiments the preferred exhalation duration remains unchanged.

In some embodiments, the method further comprises during at least part of given use-event of the device by a user, subsequent to determining an actual exhalation duration of the user, if the actual exhalation duration is greater the preferred exhalation duration, at least one of: increasing the preferred exhalation duration and/or providing a signal thereof as a biofeedback. It is important to note that in some such embodiments, the preferred exhalation duration remains unchanged.

In some embodiments, the method further comprises during at least part of given use-event of the device by a user, subsequent to determining an actual exhalation duration of the user, if the actual exhalation duration is less than the preferred exhalation duration by less than the update threshold difference value, at least one of: increasing the preferred exhalation duration and/or providing a signal thereof as a biofeedback. It is important to note that in some such embodiments, the preferred exhalation duration remains unchanged.

The amount by which the preferred exhalation duration is increased when needed is embodiment-dependent. In some embodiments, the amount if fixed. In some embodiments, the amount is varied, for example, as a function on the absolute value of the current value of the preferred exhalation duration and/or the value of the target exhalation duration and/or the number of exhalations and/or the purpose for which the embodiment is implemented. That said, the amount by which the preferred exhalation duration is increased when needed is typically between about 0.1 and 1 second, more typically between 0.2 and 0.5 seconds.

In some embodiments, there is no practical limit as to the upper value to which the preferred exhalation duration can be increased. In some embodiments, the upper value to which the preferred exhalation duration can be increased is the target exhalation duration. In some embodiments, some function of the last (one or few) values of the preferred exhalation durations achieved in a given use-event are used to determine a future target exhalation duration.

A provided signal is any suitable as discussed herein, and in some embodiments is a signal selected from the group consisting of a visual signal, audible signal, a tactile signal, and combinations thereof.

Inhalable Substance

In some embodiments, any of the methods further comprise administering an inhalable substance, such as an aromatherapy oil, to the subject, so that the subject inhales the inhalable substance between exhalations. Preferably, the inhalable substance is pleasant to the user or has a pharmacological effect, especially a pharmacological effect that provides relief to a condition for which the method is implemented.

In some embodiments, the inhalable substance is an active pharmaceutical ingredient.

In some embodiments, the inhalable substance is an essential oil, especially an essential oil useful for aromatherapy.

Aromatherapy is the practice of using essential oils, particularly natural essential oils extracted from aromatic plants and herbs, for the treatment of a condition or to enhance well-being. The essential oil for use in implementing the teachings herein is preferably selected according to the required use.

For example, oils or combinations thereof may be selected from any of the following: basil oil for relief of migraine, mental fatigue or nervous tension; bergamot oil as analgesic, antidepressant, antiseptic, antibiotic, anti-spasmodic, stomachic, calmative, digestive, febrifuge; black pepper oil for relief of conditions related to nicotine addiction and stress; carrot seed oil as an analgesic and anti-asthmatic, or for treatment of hypertension; chamomile oil as an analgesic, or for treatment of depression, headaches, digestive problems, eczema, irritable bowel syndrome, anxiety or fear; cedarwood oil for treatment of eczema; cinnamon oil for relief of conditions related to nicotine addiction and stress; citrodora oil for relief of conditions related to nicotine addiction and stress; citronella oil for relief of conditions related to nicotine addiction and stress; clary sage oil for relief of asthma, depression, digestive problems, exhaustion, or respiratory problems; cypress oil for treatment of asthma, relief of muscle or nerve tension; elemi oil for relief of conditions related to alcohol addiction and stress; eucalyptus oil for relief of asthma, bronchitis, headaches or muscle aches; fennel oil for relief of digestive disorders or nervous tension; frankincense oil for relief of asthma, bronchitis, nervous tension or respiratory conditions; geranium oil for relief of eczema; ginger oil for relief of bronchitis, exhaustion, or indigestion; grapefruit oil for relief of conditions related to nicotine addiction and stress, and for treatment of anxiety, depression or digestive problems; hyssop oil for relief of asthma, bronchitis or mental tension; jasmine oil for anxiety, headache, mental tension or lack of confidence; lavender oil for relief or treatment of acne, anxiety, bronchitis, eczema, headaches, insomnia, muscle aches and pains, psoriasis, or tension; lemon oil for treatment of headaches and migraine;

lemongrass oil for relief of fatigue, indigestion, muscle aches and pains, appetite loss, and stress; lime oil for relief of conditions related to nicotine addiction; mandarin oil for stress relief, marjoram oil for relief of arthritis, bronchitis, digestive problems, insomnia, muscle aches and pains; lemon balm oil for stress or menstrual symptoms; marjoram oil for relief of conditions related to nicotine addiction and stress; nutmeg oil for relief of conditions related to nicotine addiction and stress; palmarosa oil for relief of conditions related to nicotine addiction and stress; neroli oil for relief of depression, digestive problems, headaches, insomnia, irritable bowel syndrome, nervous tension, panic attacks or stress; orange oil for relief of anxiety, depression, digestive problems, insomnia, muscle aches and pains, nervous tension, respiratory conditions or stress; patchouli oil for relief of anxiety, depression or eczema; peppermint oil for relief of asthma, bronchitis, headaches, indigestion, migraine, muscle and joint pain; petitgrain oil for relief of anxiety, digestive problems, exhaustion, insomnia, respiratory problems or stress; pine oil for treatment of respiratory disorders; rose oil for relief of depression, headache, insomnia or stress; rosemary oil for relief of conditions related to nicotine addiction, to boost memory recall and concentration, for mild depression and for fatigue; sandalwood oil for relief of anxiety, bronchitis, fatigue, nervous tension, eczema, nicotine addiction or stress; spearmint oil for relief of conditions related to nicotine addiction and stress; thyme oil for relief of conditions related to nicotine addiction and for relief of depression, fatigue, or stress; vanilla oil for treatment of sexual dysfunction, depression, insomnia, or stress; vetiver oil for relief of conditions related to nicotine addiction and for relief of exhaustion, insomnia, nervousness, or stress; ylang ylang oil for relief of anxiety, high blood pressure, intestinal problems, sexual dysfunction or stress; and wintergreen oil for relief of headaches, hypertension, eczema, psoriasis or ulcers.

The methods described herein can be implemented using any suitable device. That said, in some embodiments it is preferred to implement the method using a device as described herein.

Device for helping a user control breathing

According to an aspect of some embodiments of the invention there is provided a biofeedback device for providing biofeedback useful for helping a user control breathing, in some embodiments helping inducing deep breathing, the device comprising:

a housing configured to be hand-held by the user;

an exhalation inlet for receiving exhaled breath of the user;

physically associated with the housing, an exhalation determiner functionally associated with the exhalation inlet, configured to determine when exhaled breath is received by the exhalation inlet; and

a reporter associated with the exhalation determiner, the reporter configured to provide a signal related to an exhalation duration of the exhaled breath received from the exhalation determiner to the user.

In some embodiments, the reporter is further configured to provide a signal related to an exhalation pattern.

In some embodiments, a device is a small, discrete, portable device which can be carried by a user, for example in a bag or pocket, to use as needed, for example in stress-related situations, to prevent the onset or reduce the severity of conditions caused or exacerbated by stress. In some embodiments, the device may be used on a regular basis, such as according to a defined schedule, for treatment or relief of stress-induced disorders. In some embodiments, the device may be used on a regular basis, such as according to a defined schedule, for treatment or relief of disorders that are not related to stress. In some embodiments, the device may be used as-needed on an ad hoc basis for treatment or relief of a disorder, including stress-related disorders and disorders that are not related to stress. In some embodiments, the device may be used under non-stress conditions as a training device to help a user practice deep breathing techniques e.g. for yoga exercises, martial arts or voice training.

In some embodiments, the housing of a device is as small and lightweight. The housing is preferably formed from any suitable non-allergenic, non-corroding material of sufficient strength to resist deformation or damage when carried, for example, in a handbag or pocket, and to provide protection to the assemblies and components contained therein.

Suitable materials for construction of the housing include materials known in the field of portable telephony such as rigid polymers, for example, polycarbonates, copolyesters, acrylics, ABS, nylon, polystyrene, polypropylene, polyethylene, polysulfone, and polyimide as well as light-weight metals such as magnesium. Preferably, the housing is sufficiently small to enable the device to be concealed within the hand of the user during use (e.g., in some embodiments not more than about 200 g and even not more than 100 g; having dimensions typically similar or smaller than of a box of cigarettes, e.g., in some embodiments having a greatest dimension not greater than about 150 mm, and even not greater than about 120 mm). In some embodiments, the housing has a height (i.e., when properly held for use, in the mouth-to-nose direction) in the range of about 55 to 80 mm. In some embodiments, the

housing has a width (i.e., when properly held for use in the ear-to-ear direction) in the range of from about 30 to about 120 mm. In some embodiments, the width is in the range of from about 35 to about 50 mm. In some embodiments, the housing has a length of from about 10 to about 75 mm.

In some embodiments, the outside of the housing is provided in a color considered to exert a calming effect, such as, for example, pink, blue, white, purple, gray or green. In some embodiments, the color of the housing is selected to be similar to the skin color of the user so that the device is unobtrusive during use.

A housing of any suitable shape may be used in implementing the teachings herein.

In some embodiments, the signal comprises a comparison to a preferred exhalation duration, making it easier for the user to know when the exhalation duration is sufficiently long. In such embodiments, a reporter typically includes a timer, clock or similar component. In some embodiments, a reporter includes a controller. A typical preferred exhalation duration is at least about 3 seconds, typically between about 3 and about 7 seconds.

The reporter is configured to provide any suitable signal. For example, a visual signal, an audible signal, a tactile signal or combinations thereof.

For example, in some embodiments, the signal includes or is a visual signal. Any suitable visual signal may be used. Non-limiting examples of visual signals include an animation, a symbol, such as a tick, a check, a heart, or a 'smiley', 'thumbs up' or 'kiss' icon which is displayed only when the exhalation duration is within the desired range. In some embodiments, a light of a specific color is displayed when the exhalation duration is within the desired range, or a change of color is displayed during exhalation. In some embodiments, the visual signal comprises a numerical display of the exhalation duration or of time elapsed during exhalation. In some embodiments, a series of different colored lights are sequentially activated to indicate the duration of exhalation. In some embodiments, the visual signal may be preselected by the user from a number of options.

In some such embodiments, a visual signal is an image (e.g., a photograph) that the user enjoys seeing (e.g., a photograph of a beloved animal). For example the image is at least partially, preferably completely, obscured when exhalation begins and is entirely unobscured and apparent if the exhalation duration is sufficiently long.

In some embodiments, the device further comprises a screen for display of the visual signal. Preferably, the location of such a screen is selected such that the visual signal is visible to the viewer during use of the device without requiring the device to be removed from proximity with the mouth. For example, in some embodiments of devices having a tube-

shaped housing, the screen is located on a surface of the housing facing the user's face when the tube is inserted into the mouth. In some embodiments, the device housing comprises a raised section on which a display screen is located.

For example, in some embodiments the signal includes or is an audible signal. Any suitable audible signal may be used. Non-limiting examples include a bell, a buzzer, a beep, a musical fragment, or a voice recording (for example, stating the value of the measured exhalation duration). In some embodiments, the audible signal is sounded only when the exhalation duration is within the desired range. In some embodiments, the same or different audible signals are sounded intermittently, for example, each second that the user exhales. In some embodiments, the audible signal may be preselected by the user from a number of options. In some embodiments, the audible signal is recorded and/or stored by a user in a device.

In some embodiments, a visual and/or audible signal are defined by the user, for example, an audible signal chosen, acquired, generated, recorded and/or composed by the user, or a visual signal chosen, acquired, generated, recorded and/or captured by the user. In some such embodiments, a device used in implementing the method is configured to allow uploading and storage of such visual and/or audible signal, for example, includes a USB or Bluetooth® port functionally associated with a device memory (e.g., flash memory), allowing upload and storage of visual and/or audible signals.

For example, in some embodiments the signal includes or is a tactile signal such as a vibration, a change in temperature of a component of the device, for example of at least part of the casing, or a change in the shape of a component of the device, for example a progressively protruding knob or figure, for example, a figurine.

According to some embodiments, the signal may be communicated to a component or device remote from the housing. For example, a visual signal may be displayed on spectacles adapted for wired or wireless communication with the device; on a remote screen; on a mobile phone or the like. An audible or tactile signal may be communicated to a mobile phone, a wireless earpiece, a waistband, a bracelet, a ring or a hand-held ball.

In some embodiments, the device further comprises, physically associated with the housing, an inhalable substance outlet and a functionally-associated dispenser configured for dispensing an inhalable substance to the user through the inhalable substance outlet.

In some embodiments, the dispenser is a passive dispenser, such as a reservoir containing an inhalable substance, such that the inhalable substance is passively released from the reservoir and wafts from the inhalable substance outlet. In some embodiments, the

dispenser is an active dispenser including components that increase the amount of inhalable substance dispensed when activated, for example, by the flow of air and/or by heating of a component (e.g., a vaporizer) and/or by vibrating a component (e.g., a piezoelectric nebulizer).

In some embodiments, the inhalable substance outlet and the dispenser are contained within a reversibly detachable section of the housing. In some embodiments, the inhalable substance outlet and the dispenser are contained within a section of the housing that is permanently affixed or integrally-formed with other parts of the housing.

The housing of a device as described herein may be of any suitable and useful shape, including straight, curved, C-shaped, J-shaped, K-Shaped, L-shaped, U-shaped and V-shaped In some embodiments, the housing is configured to change in shape.

In some embodiments, the housing is configured so that when the exhalation inlet is positioned by the user for receiving the exhaled breath, the inhalable substance outlet is located in proximity of the nostrils of the nose of the user.

In some such embodiments, the device comprises a substantially 'U' shaped housing, having a rounded or squared (flat) base portion, such that the end of a first arm of the 'U' comprises the exhalation inlet and the end of a second arm of the 'U' comprises the inhalable substance outlet, with the dispenser contained within the body of the 'U'. The proximal ends of the two arms of the 'U' are preferably spaced apart such that inhalable substance outlet is proximal to the nose of the user when the exhalation inlet is positioned in or adjacent to the mouth of the user. In some such embodiments, the distance between the proximal ends is adjustable by the user. In some such embodiments, the arm comprising the inhalable substance outlet is preferably slightly shorter than the arm comprising the exhalation inlet, in order to accommodate the nose of the user.

In some embodiments, the device further comprises an inhalable substance reservoir functionally associated with the inhalable substance dispenser, the reservoir configured to store the inhalable substance and to release the inhalable substance to the dispenser.

The reservoir is constructed of any suitable material and may have any suitable shape. Typical but non-limiting examples of reservoirs suitable for storing and dispensing essential oils include a sealed reservoir containing the oil, wherein the seal is broken prior to use; a diffuser, such as a steam diffuser; a solid material such as a pad or cloth or plastic article impregnated with the oil; a slow release polymeric film comprising the oil (such as described in US 3,994,439); a composition comprising a water-soluble gel which releases the essential oil with gradual evaporation of water; a slow-release composition comprising an ethylene-

vinyl acetate polymer, such as disclosed in US 4,492,644; or any other suitable reservoir. In some embodiments, the essential oil is contained in a solid material and exposure to air (for example, exhaled air passing through the device or air entering the device upon opening thereof) causes release of the inhalable substance.

In some embodiments, the inhalable substance is an active pharmaceutical ingredient.

In some embodiments, the inhalable substance is an essential oil, especially an essential oil useful for aromatherapy. Typical essential oils include allspice oil; ambrette oil; anise oil; basil oil; bergamot oil; black pepper oil; borneol oil; cajeput oil; calamintha oil; camphor white oil; carrot seed oil; cedarwood oil; chamomile oil; cinnamon oil; citrodora oil; citronella oil; clary sage oil; coriander oil; cypress oil; elemi oil; eucalyptus oil; fennel oil; frankincense oil; galbenum oil; geranium oil; ginger oil; grapefruit oil; helichrysum oil; hemlock oil; hyssop oil; jasmine oil; lavender oil; lavendin oil; lemon oil; lemon balm oil; lemongrass oil; lime oil; mandarin oil; marjoram oil; mastic oil; mint oil; myrrh oil; niaouli oil; neroli oil; nutmeg oil; orange oil; palmarosa oil; patchouli oil; peppermint oil; petitgrain oil; pine oil; rose oil; rosemary oil; sage oil; sandalwood oil; silver fir oil; spearmint oil; spruce oil; star anise oil; thyme oil; turmeric oil; turpentine oil; vanilla oil; vetiver oil; wintergreen oil; and ylang ylang oil; or combinations thereof.

In some embodiments, the inhalable substance is selected as having an effect for the relief or treatment of a stress-related condition, for example, in some embodiments a stress-related condition is selected from the group consisting of abdominal pain, acne, addiction, agitation, allergy, anxiety, appetite loss, arthritis, asthma, attention deficit syndrome, blepharospasm, bowel disorders, bronchitis, cardiovascular disorders, chronic fatigue syndrome, chronic pain, dermatitis, cold extremities, digestive disorders, dysmenorrhea, eczema, endocrine disorders, fatigue, headaches, hyperhidrosis, hypertension, fear of flying, insomnia, irritable bowel syndrome, labor pain, mental fatigue, mental stress, migraine, muscle aches, neck pain, nervous tension, panic attacks, phobia, poor concentration, post traumatic disorders, psoriasis, psychosomatic conditions, rashes, respiratory disorders, sexual dysfunction, sleep disorders, sinus congestion, test anxiety, and ulcers.

In some embodiments, an inhalable substance for treatment of a stress-related condition is selected from the group consisting of basil oil, bergamot oil, black pepper, cedarwood oil, chamomile oil, cinnamon oil, citrodora oil, clary sage oil, cypress oil, elemi oil, eucalyptus oil, fennel oil, frankincense oil, geranium oil, ginger oil, grapefruit oil, hyssop oil, jasmine oil, lavender oil, lemon oil, lemon balm oil, lemongrass oil, lime oil, mandarin oil, marjoram oil, neroli oil, nutmeg oil, orange oil; palmarosa oil; patchouli oil, peppermint

oil; petitgrain oil, rose oil; rosemary oil, sandalwood oil, spearmint oil; thyme oil; vanilla oil; vetiver oil; wintergreen oil; and ylang ylang oil; and combinations thereof.

In some embodiments, the stress related condition is a psychosomatic disorder. In some embodiments, the psychosomatic disorder is selected from the group consisting of abdominal pain, allergy, asthma, blepharospasm, dysmenorrhea, essential hypertension, lower back pain, migraine and tension headaches, hyperhidrosis, irritable bowel syndrome, myofascial pain, pain, psychogenic emesis, raynaud's disease, tinnitus, writer's cramp, and performance anxiety.

In some embodiments, an inhalable substance for treatment of a psychosomatic disorder is selected from the group consisting of basil oil; carrot seed oil; chamomile oil; cedarwood oil; clary sage oil; cypress oil; eucalyptus oil; fennel oil; frankincense oil; geranium oil; ginger oil ; grapefruit oil; hyssop oil; jasmine oil; lavender oil; lemon oil; lemongrass oil; lime oil; marjoram oil; lemon balm oil; neroli oil; orange oil; patchouli oil; peppermint oil; petitgrain oil; pine oil; rose oil; rosemary oil; sandalwood oil; thyme oil; vetiver oil; ylang ylang oil; wintergreen oil; and vanilla oil.

In some embodiments, the method or device is useful in rehabilitation therapy. In some embodiments, the rehabilitation therapy comprises rehabilitation of a subject suffering from a condition selected from the group consisting of causalgia, cerebral palsy, esophageal motility disorders, dysphagia, guillian barre syndrome, hemiplegia, multiple sclerosis, neuromuscular reeducation, orthopedic recovery enhancement, paretic muscles, Parkinson's disease, post-cva rehabilitation, reduction of spasticity and hypertonicity, respiratory disorders, spinal cord injuries, stress management, stroke, tendon transfer, tic, and torticollis.

In some embodiments, a method or device useful in rehabilitation therapy comprises an inhalable substance selected from the group consisting of allspice oil, ambrette oil, aniseed oil, basil oil (including French basil oil),bay oil (including West Indian bay oil), bergamot oil, borneol oil, black pepper, cajeput oil, calamintha oil, camphor-white oil, chamomile oil, cedarwood oil, cinnamon oil, citrodora oil, clary sage oil, coriander oil, cypress oil, elemi oil, eucalyptus oil (including blue gum and peppermint), fennel oil, frankincense oil, galbanum oil, geranium oil, ginger oil, grapefruit oil, helichrysum oil, hemlock oil, hyssop oil, jasmine oil, lavender oil (including spike and true lavender oil), lavendin oil, lemon oil, lemongrass oil, lime oil, mandarin oil, marjoram oil, lemon balm oil, marjoram oil, mastic oil, mint oil (including peppermint and spearmint oil), nutmeg oil, palmarosa oil; neroli oil, niaouli oil, nutmeg oil, orange oil; patchouli oil, peppermint oil; petitgrain oil, pine oil (including longleaf and Scotch pine oil); rose oil; rosemary oil, sage oil (including clary and Spanish

sage oil), sandalwood oil, silver fir oil; spearmint oil; spruce oil; star anise oil; thyme oil; turmeric oil; turpentine oil; vetiver oil; ylang ylang oil; wintergreen oil; and vanilla oil; or combinations thereof.

In some embodiments, a method or device useful in muscle pain and rehabilitation comprises an inhalable substance selected from the group consisting of allspice, ambrette, star anise, aniseed, French basil, west Indian bay, borneol, cajeput, calamintha, camphor-white, chamomile, coriander, cypress, eucalyptus (blue gum and peppermint), Silver fir, galbanum, ginger, grapefruit, helichrysum, jasmine, lavandin, lavender (spike and true), lemongrass, sweet marjoram, mastic, mint (peppermint and spearmint), niaouli, nutmeg, blackpepper, pine (longleaf and Scotch), rosemary, sage (clary and Spanish), hemlock spruce, thyme, turmeric, turpentine, and vetiver.

In some embodiments, the method or device is useful in the treatment of a condition which is at least partially unrelated to stress, the condition selected from the group consisting of acne, anger states, arthritis, attention deficit disorder, backache/neck pain, balance disorders, behavioral control (including addictions, such as alcohol addiction, drug addiction, nicotine addiction), bronchitis, bruxism, cardiac arrhythmia, cardiovascular disorders, carpal tunnel syndrome, chronic fatigue syndrome, chronic pain, concentration disorders, diabetes, dermatitis, cold extremities, digestive disorders, dysmenorrhea, eczema, endocrine disorders, epilepsy, fatigue, headaches, hyperhidrosis, hypertension, insomnia, impotence, incontinence, irritable bowel syndrome, labor pain, learning disabilities, mental fatigue, migraine, muscle aches, neck pain, poor concentration, postural dysfunction, rashes, respiratory disorders, sexual dysfunction, sleep disorders, sinus congestion, and ulcers.

In some embodiments, a method or device for treatment of a condition at least partially unrelated to stress comprises an inhalable substance selected from the group consisting of basil oil; bergamot oil; black pepper oil; carrot seed oil; cedarwood oil; chamomile oil; cinnamon oil; citrodora oil; citronella oil; clary sage oil; cypress oil; elemi oil; eucalyptus oil; fennel oil; frankincense oil; geranium oil; ginger oil; grapefruit oil; hyssop oil; jasmine oil; lavender oil; lemon oil; lemon balm oil; lemongrass oil; lime oil; marjoram oil; neroli oil; nutmeg oil; orange oil; palmarosa oil; patchouli oil; peppermint oil; petitgrain oil; pine oil; rose oil; rosemary oil; sandalwood oil; spearmint oil; thyme oil; vetiver oil; ylang ylang oil; wintergreen oil; and vanilla oil; and combinations thereof.

In some embodiments, the method or device of the invention is useful in the treatment of addiction, such as substance addiction (for example, at least one of alcohol addiction, drug addiction, and smoking or nicotine addiction).

In some embodiments, a method or device for treatment of a condition comprising smoking or nicotine addiction comprises an inhalable substance selected from the group consisting of anise, bergamot, black pepper, cedarwood, chamomile, cinnamon, citrodora, citronella, clary sage, eucalyptus, fennel, frankincense, geranium, grapefruit, lavender, lemon, lemongrass, lime, marjoram, nutmeg, orange, palmarosa, peppermint, pine, rosemary, sandalwood, spearmint, thyme, vetiver, and ylang ylang, or combinations thereof.

In some embodiments, a method or device for treatment of a condition comprising alcohol addiction comprises an inhalable substance for the relief of difficulties associated with withdrawing from alcohol addiction, wherein the inhalable substance is selected from the group consisting of fennel oil; clary sage oil; bergamot oil; elemi oil; frankincense oil; lavender oil; neroli oil; thyme oil; and ylang ylang oil, or combinations thereof.

In some embodiments, the method or device is useful in the treatment of difficulties associated with dieting.

In some embodiments, a method or device useful in the treatment of difficulties associated with dieting comprises an inhalable substance for relief of difficulties associated with dieting, wherein the inhalable substance comprises an essential oil selected from the group consisting of orange oil; lemon oil; grapefruit oil; rosemary oil; peppermint oil; ginger oil; and basil oil, or combinations thereof.

In some embodiments, the method or device of the invention is useful in performance and lifestyle applications, such as, for example, sports applications (improvement of performance in a sport), stress management, and voice-coaching.

In some embodiments, a method or device useful in performance and lifestyle applications comprises an inhalable substance selected from the group consisting of basil oil, bergamot oil, black pepper, chamomile oil, cedarwood oil, cinnamon oil, citrodora oil, clary sage oil, cypress oil, elemi oil, eucalyptus oil, fennel oil, frankincense oil, geranium oil, ginger oil, grapefruit oil, hyssop oil, jasmine oil, lavender oil, lemon oil, lemongrass oil, lime oil, mandarin oil, marjoram oil; lemon balm oil; marjoram oil, nutmeg oil,; palmarosa oil; neroli oil, orange oil; patchouli oil, peppermint oil; petitgrain oil, rose oil; rosemary oil, sandalwood oil, spearmint oil; thyme oil; vetiver oil; ylang ylang oil; wintergreen oil; and vanilla oil.

In some embodiments wherein the performance and lifestyle application comprises voice-coaching, the inhalable substance is selected from the group consisting of Tolu balsam, benzoin, caraway, cubeb, lemon, eucalyptus, frankincense, jasmine, lavandin, lavender, myrrh, sage, sandalwood, and thyme.

In some embodiments, the device further comprises a cover couplable to the housing, configured to substantially prevent entry of air into the exhalation inlet and/or to cover the inhalable substance outlet and/or to conceal the nature of the device when the cover is coupled to the housing and/or to maintain the various inlets and outlets clean and/or to prevent evaporation of an essential oil. In some embodiments, the cover is reversibly couplable to the housing. In some embodiments the cover comprises a cap configured to fit over the mouthpiece or over the inhalable substance outlet. In some embodiments, the device is configured so that removal of the cover activates the reporter and/or the exhalation determiner. In some embodiments, the device further comprises a tether (e.g., key-chain) attached to at least one of the cover and the housing, allowing the device to be easily connected (tied) to something, for example, a bag. In some embodiments, the device comprises a cover connector for maintaining association of the cover and the housing, preventing the cover from being lost when the device is in use. The connector may comprise, for example, a plastic or metal wire, or a thin chain.

In some embodiments, a device is devoid of a cover. In some embodiments, a device is devoid of a cover and includes a tether. In some embodiments, a device is devoid of both a cover and a tether.

In some embodiments, the exhalation inlet is functionally associated with an exhalation conduit including an exhalation outlet, and the device is configured so that exhaled breath received by the exhalation inlet passes through the exhalation conduit and exits (to the surroundings) through the exhalation outlet. In some embodiments, the exhalation conduit is contained within the housing.

In some embodiments, the device further comprises a flow-restrictor functionally associated with the exhalation conduit configured for limiting the rate of flow of the exhaled breath through the conduit. Specifically, in some embodiments a flow-restrictor allows a certain exhalation flow rate to be exhaled substantially unimpeded, but higher flow rates are impeded. Such a flow-restrictor allows free flow of breath through the exhalation conduit at a relatively low (thus desirable) rate, but generates resistance to a too forceful flow of breath through the exhalation conduit. The generated resistance acts as a reminder to the user to slow down the rate of exhalation. A flow-restrictor is typically defined by dimensions and/or shape of some or all of the exhalation conduit, for example, width, length and shape (curved, angled) of the exhalation conduit. In some embodiments, a flow-restrictor, is defined by the cross-sectional area of some or all of the exhalation conduit, for example being between 0.13 cm^2 (equivalent to a circle with a 0.2 cm radius) and 3.8 cm^2 (equivalent to a circle with a 1.1

cm radius). In some embodiments, the exhalation determiner is configured to function as the flow-restrictor.

In some embodiments, the device is devoid of a flow-restrictor and exhalation, even at high flow rates and/or pressure, does not encounter substantial resistance.

In some embodiments, the device further comprises a one-way valve functionally associated with the exhalation conduit, configured for allowing passage of exhaled breath from the exhalation inlet through the exhalation conduit and out through the exhalation outlet but for preventing inhalation of air from the exhalation outlet, through the exhalation conduit and out through exhalation inlet. If a user mistakenly tries to inhale through the mouth and not through the nose, not in keeping with the desired breathing pattern, the one-way valve prevents air from being inhaled through the mouth. The user senses that inhalation through the mouth is not possible and instead resumes inhaling through the nose. It is important to note that the one-way valve acts as a reminder to the user and is not dangerous. If, for any reason, the user does not want to, or cannot, inhale through the nose, the user can simply release the mouthpiece and inhale through the mouth. Furthermore, in embodiments comprising an inhalable substance, the valve prevents the user from swallowing the substance.

In some embodiments, the device is devoid of a one-way valve and a user can inhale air through the exhalation inlet, drawing air into the mouth.

In some embodiments, a device includes both a one-way valve as described above and a flow-restrictor as described above. In some such embodiments, an exhalation determiner is configured to function as the one-way valve. In some embodiments, a device includes separate components, some function as a one-way valve and some as a flow-restrictor.

In some embodiments, a device includes a one-way valve as described above but is devoid of a flow-restrictor as described above.

In some embodiments, a device is devoid of a one-way valve as described above but includes a flow-restrictor as described above.

In some embodiments, a device is devoid of both a one-way valve as described above and a flow-restrictor as described above.

In some embodiments, the device includes an ‘on/off’ button or switch for activation/deactivation of the device. In some embodiments, the button is pressed or the switch position moved to the ‘on’ position manually by the user in order to activate the device. In some embodiments, the device is provided with a protruding button, wherein the device is inactive when the switch is depressed, and activated when the button is released. In

some such embodiments, the device is inactive when a couplable cover as described above is coupled with the housing, for example depresses a button, and the device is activated automatically upon removal of the cover such that the button is released. In some embodiments comprising a dispenser for an inhalable substance, activation of the dispenser may be effected independently from activation of the assembly for measurement of exhalation duration. Alternatively, the dispenser may be activated manually or automatically following completion of measurement of exhalation duration, e.g. after a preset number of exhalations are made, or preset number of exhalations within the desired range are made, or after a preset time. According to some embodiments, a device as described herein is battery-operated. In some embodiments, electrical power is provided by other components (in addition to or instead of a battery), for example, one or more capacitors to store electricity, cells to convert light to electricity, fuel-cells and motion-powered generators to generate electricity from motion, e.g., shaking, rotation.

In some embodiments, upon activation of the device a signal is given to a user to commence exhalation after a predetermined time period. The signal to commence exhalation may be a visual and/or an audible and/or tactile signal, and may be the same as or different to the signal related to exhalation duration described above. For example, both signals may be visual / audible / tactile signals, or one of the signals may be one of visual / audible / tactile and the other signal may be another of visual / audible / tactile. In embodiments comprising a screen for display of a signal related to exhalation duration, a visual signal to commence exhalation may be displayed upon the same screen, or upon a second screen, and may comprise a different or the same visual signal as that related to exhalation duration.

In some embodiments, for use a user activates the device. In embodiments wherein the device is activated by removal of the cover, the cover is removed to activate the device. In embodiments wherein the device is activated by a button or switch, the user presses or moves the button or switch. In some embodiments comprising a cover and an activation switch, the user first removes the cover, then activates the device by use of the switch. In some embodiments comprising a cover and an activation switch, the user first activates the switch and then removes the cover. In some embodiments, a device requires no particular user-action to be activated.

The user then places the exhalation inlet in proximity of the mouth (in some embodiments at least partially held in the mouth, but in some embodiments not contacting any part of the mouth) and exhales thereinto. In some embodiments a signal is provided to commence exhalation. In some such embodiments, the user first waits for the signal before

commencing exhalation. In some embodiments, the user may choose to commence exhalation prior to receiving the signal. In some embodiments no signal is provided and the user simply commences exhalation when desired.

For a period of time, the user continues breathing with the exhalation inlet in proximity of the mouth, exhaling through the mouth and into the exhalation inlet.

At any given exhalation, the user tries to exhale until the reporter provides a signal indicating that the exhalation duration is sufficient. If this is achieved, the user continues breathing with substantially the same exhalation duration, for example until a required degree of relaxation is achieved, assured that breathing is correct and, in some embodiments, inhaling an inhalable substance.

If at a given exhalation the reporter does not provide a signal indicating that the exhalation duration is sufficient, the user knows to exhale for a longer duration until a sufficient exhalation duration is achieved and, in some embodiments, inhaling an inhalable substance.

In some embodiments, the device measures a more complex breathing pattern, such as, for example, a breathing pattern that includes at least two breathing cycles (inhalation / exhalation) with a variable exhalation duration or time between two exhalations. In some embodiments the user is able to select or input a desired complex breathing pattern and the device then provides relevant feedback to actualize the desired complex breathing pattern. For example, in some embodiments, a device provides a first feedback when the user achieves a required exhalation duration and the device provides a second feedback when the user completes the desired complex breathing pattern (e.g., 5 cycles of 2 seconds exhalation duration with time difference of less than 1 second between subsequent exhalations as preferred during childbirth). Some such embodiments are exceptionally useful, for example, for use during labor: a suitably configured device can be used by a woman in labor to assist in maintaining a proper breathing pattern.

Exhalation duration can be measured using any suitable method or device, for example, by determining the presence of flow through an exhalation conduit.

In some embodiments, a device comprises at least one pressure sensor (e.g., piezoelectric pressure sensor, metal/ceramic/silicone diaphragm pressure sensor) configured to measure exhalation duration. For example, in some such embodiments the device is configured so that a user exhales directly at a pressure sensor, and the pressure applied by the exhalation is an indication of exhalation. In some embodiments, a device comprises at least one temperature sensor (e.g., thermistor, for example an MCP9700 or MCP 9701series low-

power linear active thermistor integrated circuit available from Microchip Technology Inc, Chandler, Arizona, USA) configured to measure exhalation duration. For example, in some such embodiments the device is configured so that a user exhales directly at a temperature sensor, and the difference between the temperature of the exhaled breath and ambient temperature is taken as an indication of exhalation. In some such embodiments, the device includes at least one temperature sensor to measure ambient temperature.

When desired, the user stops using the device. If applicable, the device is deactivated, for example, by replacing the cover or by pressing a button or changing the position of a switch. If applicable and/or desired, the device is cleaned, especially the exhalation inlet. In some embodiments, the device is discarded.

Conditions treatable by controlled breathing

In some embodiments, the method or device of the invention is useful for the relief or treatment of a condition responsive to controlled breathing.

In some embodiments, the condition is stress-related condition, for example, in some embodiments a stress-related condition is selected from the group consisting of abdominal pain, acne, addiction, agitation, allergy, anxiety, appetite loss, arthritis, asthma, attention deficit syndrome, blepharospasm, bowel disorders, bronchitis, cardiovascular disorders, chronic fatigue syndrome, chronic pain, dermatitis, cold extremities, digestive disorders, dysmenorrhea, eczema, endocrine disorders, fatigue, headaches, hyperhidrosis, hypertension, fear of flying, insomnia, irritable bowel syndrome, labor pain, mental fatigue, mental stress, migraine, muscle aches, neck pain, nervous tension, panic attacks, phobia, poor concentration, post traumatic disorders, psoriasis, psychosomatic conditions, rashes, respiratory disorders, sexual dysfunction, sleep disorders, sinus congestion, test anxiety, and ulcers.

In some embodiments, the stress related condition is a psychosomatic disorder. In some embodiments, the psychosomatic disorder is selected from the group consisting of abdominal pain, allergy, asthma, blepharospasm, dysmenorrhea, essential hypertension, lower back pain, migraine and tension headaches, hyperhidrosis, irritable bowel syndrome, myofascial pain, pain, psychogenic emesis, raynaud's disease, tinnitus, writer's cramp, and performance anxiety.

In some embodiments, the method or device is useful in rehabilitation therapy. In some embodiments, the rehabilitation therapy comprises rehabilitation of a subject suffering from a condition selected from the group consisting of causalgia, cerebral palsy, esophageal

motility disorders, dysphagia, guillian barre syndrome, hemiplegia, multiple sclerosis, neuromuscular reeducation, orthopedic recovery enhancement, paretic muscles, Parkinson's disease, post-cva rehabilitation, reduction of spasticity and hypertonicity, respiratory disorders, spinal cord injuries, stress management, stroke, tendon transfer, tic, and torticollis.

In some embodiments, the method or device is useful in the treatment of a condition which is at least partially unrelated to stress, the condition selected from the group consisting of acne, anger states, arthritis, attention deficit disorder, backache/neck pain, balance disorders, behavioral control (including addictions, such as alcohol addiction, drug addiction, nicotine addiction),bronchitis, bruxism, cardiac arrhythmia, cardiovascular disorders, carpal tunnel syndrome, chronic fatigue syndrome, chronic pain, concentration disorders, diabetes, dermatitis, cold extremities, digestive disorders, dysmenorrhea, eczema, endocrine disorders, epilepsy, fatigue, headaches, hyperhidrosis, hypertension, insomnia, impotence, incontinence, irritable bowel syndrome, labor pain, learning disabilities, mental fatigue, migraine, muscle aches, neck pain, poor concentration, postural dysfunction, rashes, respiratory disorders, sexual dysfunction, sleep disorders, sinus congestion, and ulcers.

In some embodiments, the method or device of the invention is useful in the treatment of addiction, such as substance addiction (for example, at least one of alcohol addiction, drug addiction, and nicotine addiction).

In some embodiments, the method or device is useful in the treatment of difficulties associated with dieting.

In some embodiments, the method or device of the invention is useful in performance and lifestyle applications, such as, for example, sports applications (improvement of performance in a sport), stress management, and voice-coaching.

Referring now to Figure 1, a first embodiment of a device of the invention is schematically depicted, a device **10** comprising an elongated housing **12** configured (in terms of size, weight and shape) to be hand-held by a user, an exhalation inlet **14** for receiving exhaled breath of the user comprising a shaped mouthpiece **16** at the proximal end of housing **12** into which the user exhales, and an exhalation conduit **18** including an exhalation outlet **20** at the distal end of housing **12**, configured so that exhaled breath received by exhalation inlet **14** passes through exhalation conduit **18** and exits to the surroundings through exhalation outlet **20**.

Inside housing **12** are exhalation determiner **22** and components of a reporter **24** of device **10**, including controller **26** (e.g., an integrated circuit or populated circuit board as

known in the art), a display screen **28** (e.g., an LED or LCD screen), an on/off switch **30** and a power source **32** (e.g., a battery such as a Li-ion battery).

Exhalation determiner **22**, is functionally associated with exhalation inlet **14** and is configured to determine when exhaled breath is received by exhalation inlet **14**, and is configured to send one of two indications to controller **26** of reporter **24** associated with exhalation determiner **22**: that exhaled breath is being received by exhalation inlet **14** or that exhaled breath is not being received by exhalation inlet **14**. Specifically, in device **10**, exhalation determiner **22** comprises a propeller. When exhaled breath is being received by exhalation inlet **14**, the propeller rotates and an alternatingly on/off current is received by controller **26**, corresponding to "exhalation". When exhaled breath is not being received by exhalation inlet **14**, the propeller does not rotate and controller **26** receives either a continuous "on" signal or a continuous "off" signal, corresponding to "no exhalation".

Reporter **24** is associated with exhalation determiner **22** as noted above, and is configured to provide a visual signal related to an exhalation duration of exhaled breath received from exhalation determiner **22** to a user. The signal provided is provided as a comparison to a preferred "exhalation duration", for example five seconds. Specifically, when reporter **24** is activated, controller **26** generates instructions to display screen **28** showing a first column of ten illuminated blocks. When reporter **24** receives an "exhalation" signal from exhalation determiner **22**, controller **26** generates instructions to display screen **28** to serially illuminate blocks of a second column parallel to the first column, from the bottom of the second column moving upwards, where a new block is illuminated every 0.5 seconds. Display screen **28** is located on an outer surface of housing **12** at a location which allows screen **28** to be clearly visible to the user during exhalation, with mouthpiece **16** in the mouth of the user.

A user who wants to use device **10** (for example, a person practicing meditation, or a person feeling the onset of a panic attack) places mouthpiece **16** in the mouth, activates device **10** by toggling switch **30** to the "on" position to activate exhalation determiner **22** and reporter **24** (including both controller **26** and display screen **28**), and looks at display screen **28**.

As long as switch **30** is at the "on" position, the first column of ten illuminated blocks is displayed on screen **28.** When switch **30** is at the "off" position, screen **28** is turned off and the blocks of the first column are not displayed.

When the user exhales into exhalation inlet **14**, the exhaled breath causes rotation of the propeller of exhalation determiner **22**, producing an "exhalation" signal. Reporter **24**

illuminates a new block in the second column of blocks every 0.5 seconds that an exhalation signal is continuously received from exhalation determiner **22**. When ten blocks in the second column of blocks are illuminated on screen **28** (easily seen by the user looking at screen **28** with reference to the first column of ten illuminated blocks) the user knows that the exhalation duration has been 5 seconds that is sufficiently long and so inhales, preferably through the nose.

Whenever the user stops exhaling into exhalation inlet **14**, the propeller of exhalation determiner **22**, produces a "no exhalation" signal. Reporter **24** turns off illumination of all illuminated blocks in the second column. If exhalation is stopped prior to illumination of all the ten blocks in the second column of blocks, the user realizes that the exhalation duration in that breathing cycle was insufficiently long, and knows to make an effort to exhale for a longer duration in the following breathing cycle.

For a period of time, the user repeatedly exhales into exhalation inlet **14** while observing display screen **28** until a desired effect is achieved, e.g., inducing deep breathing, calming, overcoming panic.

In Figure 2, a second embodiment of a device of the invention is schematically depicted, a device **36** comprising a U-shaped housing **38** including a lower arm **40**, a base portion **42** and an upper arm **44** configured (in terms of size, weight and shape) to be hand-held by a user, an exhalation inlet **14** for receiving exhaled breath of the user comprising a shaped mouthpiece **16** at the proximal end of lower arm **40** of housing **38** into which the user exhales, and an exhalation conduit **18** including an exhalation outlet **20** opening out in the middle of a base portion **42** of housing **38**, configured so that exhaled breath received by exhalation inlet **14** passes through exhalation conduit **18** and exits to the surroundings through exhalation outlet **20**.

As in device **10**, physically associated with housing **38** are exhalation determiner **22** and components of a reporter **24** of device **10**, including controller **26**, a display screen **28**, an on/off switch **30** and a power source **32**, that are all mutually associated and function substantially as described above with reference to device **10**.

Physically associated with upper arm **44** of device **36** is an inhalable substance dispenser **46** configured to dispense an inhalable substance such as an essential oil from an inhalable substance reservoir **48** through an inhalable substance outlet **50**. In device **36**, inhalable substance reservoir **48** is a plastic container in which is found cloth impregnated with neroli oil useful for relief of panic attacks.

Housing **38** is configured so that when exhalation inlet **14** is positioned by the user for receiving exhaled breath from the mouth of the user, inhalable substance outlet **50** is located in proximity of the nostrils of the nose of the user.

Inhalable substance reservoir **48** is configured to be reversibly functionally associated with inhalable substance dispenser **46**. Such reversible functional association allows a user to use the same device but to select a suitable essential oil for a desired use.

Specifically, from the state depicted in Figure 2 where inhalable substance reservoir **48** is functionally associated with inhalable substance dispenser **46**, when desired, a user grasps a distal end of inhalable substance reservoir **48** and disconnects reservoir **48** from device **36** by pulling outwards so that there is no longer an inhalable substance reservoir **48** functionally associated with inhalable substance dispenser **46**

From a state (not depicted) where no inhalable substance reservoir **48** is functionally associated with inhalable substance dispenser **46**, a user can functionally associate a suitable inhalable substance reservoir **48**. Specifically, a user functionally associates an inhalable substance reservoir **48** with inhalable substance dispenser **46** by pushing a suitable reservoir **48** into the opening in the distal end of upper arm **44** of housing **38** so that the reservoir is held in position, functionally associated with inhalable substance dispenser **46** by friction. The act of pushing the suitable reservoir into the distal opening opens a valve (e.g., a spring-loaded valve similar to a Schrader valve) at the terminal end of reservoir **48** allowing release of an inhalable substance contained therein.

Figures 3A and 3B depict an embodiment of a device **36** of Figure 2, further comprising a reversibly couplable cover **54** configured to reversibly couple to housing **38** of device **36.** Cover **54** further comprises a tether **56** in the form of a keychain attached to an outer surface. When coupled to housing **38**, Figure 3A, cover **54** protects components of device **36** (e.g., display screen **28**) from damage, substantially prevents entry of air into exhalation inlet **14**, prevents escape of inhalable substance from inhalable substance outlet **50**, assists in maintaining inlet **14**, mouthpiece **16** and outlet **50** clean and keeps on/off switch **30** in an "off" state. When uncoupled from housing **38**, Figure 3B, device **36** is ready for use, including switch **30** toggling to an "on" state.

Device **36** discussed with reference to Figures 2 and 3 includes a U-shaped housing **38** having a lower arm **40** containing exhalation conduit **18** and an upper arm **44** containing inhalable substance dispenser **46** so that inhalable substance dispenser **46** is fixed to the rest of device **36**. In some related embodiments, an upper arm **44** (in some embodiments, together with base portion **42** connecting upper arm **44** to lower arm **40**) is reversibly detachable from

lower arm **40**. Such embodiments allow a user to optionally use the device with an inhalable substance dispenser or without an inhalable substance dispenser, in analogy to device **10**.

Device **36** discussed with reference to Figures 2 and 3 includes an inhalable substance reservoir **48** that is configured to be reversibly functionally associated with an inhalable substance dispenser **46**, allowing a user to change the nature of the inhalable substance dispensed by device **36**. In some embodiments, an inhalable substance reservoir such as **48** is functionally associated, but not reversibly, with an inhalable substance dispenser such as **46** of a device. In some such embodiments, the device is provided with a specific inhalable substance and a user desiring a different inhalable substance must acquire a different device.

Device **36** discussed with reference to Figures 3 includes a reversibly couplable cover **54**: coupling cover **54** with housing **38** deactivating device **36** and uncoupling cover **54** from housing **38** activating device **36**. In some embodiments, a device includes a cover that is not reversibly couplable. The cover is removed one-time, activating the device and thereafter the device is preferably discarded.

In Figures 4A and 4B is schematically depicted an additional embodiment of an exhalation determiner, exhalation determiner **60**. Exhalation determiner **60** comprises a chamber **62** that constitutes a portion of an exhalation conduit **18** that is functionally associated with an exhalation inlet **14**. Specifically, chamber **62** is in fluid communication with exhalation inlet **14** through lower opening **64** and is in fluid communication with exhalation outlet **20** through a side opening **66**.

Flanking the sides of lower opening **64** are contacts **68a** and **68b** that are part of an electrical circuit **70** that is interrogatable by reporter **24**.

Contained inside chamber **62** is a conductive ball **72**, e.g., a polyethylene or celluloid ball on which outer surface a conductive layer of aluminum is deposited.

Exhalation determiner **60** is configured to determine when exhaled breath is received by exhalation inlet **14**, and is configured to send one of two indications to reporter **24** associated with exhalation determiner **60**: that exhaled breath is being received by exhalation inlet **14** or that exhaled breath is not being received by exhalation inlet **14**. Specifically, when exhaled breath is being received by exhalation inlet **14**, Figure 4A, the exhaled breath enters chamber **62** through lower opening **64**, lifting ball **72**, and escaping chamber **62** through side opening **66**. Electrical circuit **70** is broken, corresponding to an "exhalation" signal. When exhaled breath is not being received by exhalation inlet **14**, Figure 4B, ball **72** settles on contacts **68**, closing electrical circuit **70**, corresponding to a "no exhalation" signal.

In Figures 5A and 5B is schematically depicted an additional embodiment of an exhalation determiner, exhalation determiner **76**. Exhalation determiner **76** constitutes a portion of an exhalation conduit **18** and is thereby functionally associated with an exhalation inlet **14**. Specifically, exhalation determiner **76** comprises a silicone rubber diaphragm **78** located inside exhalation conduit **18**, configured to be biased in a "closed" position, blocking upstream fluid flow from exhalation outlet **20** towards exhalation inlet **14** through exhalation conduit **18**. Located upstream from diaphragm **78**, are a LED (Class I) laser **80** and a light detector **82**. Laser **80** is configured, when activated, to produce a beam of light **84** that is projected just above and parallel to diaphragm **78** to be detected by detector **82**. Detector **82** is functionally associated with reporter **24** and is configured to provide a signal to reporter **24** when a beam of light **84** is detected.

Exhalation determiner **76** is configured to determine when exhaled breath is received by exhalation inlet **14**, and is configured to send one of two indications to reporter **24** associated with exhalation determiner **76**: that exhaled breath is being received by exhalation inlet **14** or that exhaled breath is not being received by exhalation inlet **14**. Specifically, when exhaled breath is being received by exhalation inlet **14**, Figure 5A, the exhaled breath passes downstream from exhalation inlet **14** towards exhalation outlet **20** through exhalation conduit **18**, lifting diaphragm **78**, blocking beam of light **84** from reaching detector **82**, corresponding to an "exhalation" signal. When exhaled breath is not being received by exhalation inlet **14**, Figure 5B, diaphragm **78** closes, allowing beam of light **84** to reach detector **82**, corresponding to a "no exhalation" signal.

In Figures 6A and 6B is schematically depicted an additional embodiment of an exhalation determiner, exhalation determiner **88**. Exhalation determiner **88** constitutes a portion of an exhalation conduit **18** (having a square cross section) and is thereby functionally associated with an exhalation inlet **14**. Specifically, exhalation determiner **88** comprises two rigid reeds **90a** and **90b** rotatably mounted on respective axes **92a** and **92b**. Axes **92a** and **92b** are spring-loaded to be biased in a "closed" position where respective distal edges **94a** and **94b** are in mutual contact, blocking upstream fluid flow from exhalation outlet **20** towards exhalation inlet **14** through exhalation conduit **18**. Downstream fluid flow of breath from exhalation inlet **14** to exhalation outlet **20** through exhalation conduit **18** applies a force that pivots reed **90b** around axis **92b** in a clockwise direction to contact a stop **96b** and pivots reed **90a** around axis **92a** in a counterclockwise direction to contact a stop **96a**. Stop **96a** includes a microswitch that is part of an electrical circuit **70** that is interrogatable by reporter **24**.

Exhalation determiner **88** is configured to determine when exhaled breath is received by exhalation inlet **14**, and is configured to send one of two indications to reporter **24** associated with exhalation determiner **88**: that exhaled breath is being received by exhalation inlet **14** or that exhaled breath is not being received by exhalation inlet **14**. Specifically, when exhaled breath is being received by exhalation inlet **14**, Figure 6A, the exhaled breath passes through exhalation conduit **18**, pivoting reed **90a** to contact stop **96a**, activating the microswitch that closes electrical circuit **70**, corresponding to an "exhalation" signal. When exhaled breath is not being received by exhalation inlet **14**, Figure 6B, reed **90a** rotates away from stop **96a**, breaking electrical circuit **70**, corresponding to a "no exhalation" signal.

As discussed above, in some embodiments a device as described herein comprises a flow-restrictor functionally associated with the exhalation conduit, configured for limiting the rate of flow of exhaled breath through the exhalation conduit. Such a flow-restrictor, typically defined by the cross-sectional area of some or all of the exhalation conduit, allows free flow of breath through the exhalation conduit at a relatively low (thus desirable) rate, but generates resistance to a too strong flow of breath through the exhalation conduit.

Exhalation determiner **60** depicted in Figures 4 constitutes a flow-restrictor, specifically, the relatively small cross-sectional size of lower opening **64** and side opening **66** preventing a too strong flow of breath through exhalation conduit **18**.

Exhalation determiner **76** depicted in Figures 5 constitutes a flow-restrictor, specifically, the relatively small cross-sectional size of exhalation conduit **18** past diaphragm **78** preventing a too strong flow of breath through exhalation conduit **18**.

Exhalation determiner **88** depicted in Figures 6 constitutes a flow-restrictor, specifically, the relatively small cross-sectional size of exhalation conduit **18** past distal edges **94a** and **94b** of reeds **90a** and **90b** preventing a too strong flow of breath through exhalation conduit **18**.

In some embodiments, the degree of flow-restriction of a flow-restrictor is adjustable. For example, in some embodiments related to exhalation determiner **88** depicted in Figures 6, one or both of stops **96a** and **96b** are configured to be translated inwards and outwards of exhalation conduit **18**, for example, in the manner of screws, thereby defining the distance between distal edges **94a** and **94b** of reeds **90a** and **90b**, and thereby the cross-sectional size of exhalation conduit **18**.

As discussed above, in some embodiments a device as described herein comprises a one-way valve functionally associated with the exhalation conduit, configured for allowing downstream passage of exhaled breath from the exhalation inlet through the exhalation

conduit and out through the exhalation outlet but for preventing upstream inhalation of air from the exhalation outlet, through the exhalation conduit and out through exhalation inlet to a user. Such a one-way valve assists a user in remembering to inhale through the nose, in some embodiments considered to be a "more correct" style of breathing.

Exhalation determiner **60** depicted in Figures 4 constitutes such a one-way valve, specifically, ball **72** sealing lower opening **64** during potential upstream flow.

Exhalation determiner **76** depicted in Figures 5 constitutes such a one-way valve, specifically, diaphragm **78** blocking exhalation conduit **18** during potential upstream flow.

Exhalation determiner **88** depicted in Figures 6 constitutes such a one-way valve, specifically, reeds **90** blocking exhalation conduit **18** during potential upstream flow.

In Figures 7A to 7D an additional embodiment of a device as described herein is depicted, device **100**, in front view (Figure 7A), side view (Figure 7B), back view (Figure 7C) and schematic cross section (Figure 7D). Device **100** includes a flattened housing **12** that is 50 mm wide (a), 15 mm thick (b) and 75 mm high (c) with a front face **102** including an exhalation inlet **14**, a back face **104** with an exhalation outlet **20** and an exhalation conduit **18** therebetween. Device **100** includes an inhalable substance dispenser **46**, including an inhalable substance reservoir **48** (a container) holding an essential oil. Inhalable substance outlet **50** (the neck of reservoir **48**) is reversibly sealable with cover **54**.

An exhalation determiner **105** of device **100** comprises a propeller **106** functionally associated with an electrical generator **108**. A reporter **24** of device **100** comprises a processor **26** (an integrated circuit) and five light-emitting diodes **110** arranged in a vertical column and visible through front face **102** of housing **12**. Device **100** is devoid of an on/off switch and of a power source.

For use, a user holds device **100** with exhalation inlet **14** in proximity of the mouth. The user exhales into exhalation inlet **14**, so that the exhaled breath passes through exhalation conduit **18** and out through exhalation outlet **20**. The exhaled breath passing through exhalation conduit **18** causes propeller **106** to rotate, causing generator **108** to generate electricity. The generated electricity powers processor **26**. With detection of generated electricity (and power up), processor **26** times the duration of exhalation and successively lights light-emitting diodes **110** from the lowest to the highest, one a second. The user knows that to achieve the desired five-second exhalation duration, it is necessary to exhale long enough so that all five light-emitting diodes **110** are lit.

If desired, during use the user can remove cover **54** so that inhalable substance outlet **50** is located in the proximity of the nostrils. In such a way, the user can inhale the inhalable

substance that volatilizes and escapes inhalable substance reservoir **48**. When desired, the user can reseal inhalable substance outlet **50** with cover **54**.

In Figures 8A to 8C an additional embodiment of a device as described herein is depicted, device **112** in front view (Figure 8A and 8B), and perspective view during use (Figure 8C). Device **112** includes a flattened housing **12** 50 mm wide (a), 10 mm thick and 80 mm high (c) with a proximal end **102** including an exhalation inlet **14**, a distal end **116** with an exhalation outlet **20** and an exhalation conduit **18** therebetween.

Housing **12** is articulated, including two rigid sections of polycarbonate, proximal section **12a** and distal section **12b**, mutually connected by articulated middle section **12c** of silicone rubber.

Contained inside distal section **12b** is an exhalation determiner similar to exhalation determiner **60** depicted in Figures 4A and 4B, including a conductive ball **72** that is raised when exhaled air passes through a exhalation conduit. The reporter of device **112** includes ball **72** that is visible through a window **118** in housing **12**. Additionally, there is a lamp that is lit by a controller of device **112** when a desired exhalation duration is attained.

Device **112** includes an inhalable substance dispenser **46**, including an inhalable substance reservoir (a fibrous pad impregnated with an essential oil). Inhalable substance dispenser **46** is a component separate from housing **12** that is provided in a sealed aluminized sachet and is configured to reversibly engage the rim of exhalation outlet **20**.

For use, a user holds device **112** with exhalation inlet **14** in proximity of the mouth and bends housing **12** upwards around articulated middle section **12c** so that window **118** is visible and exhalation outlet **20** is close to the nostrils. As the user exhales, the exhalation duration is determined as described hereinabove with reference to exhalation determiner **60**. If desired, the user removes an inhalable substance dispenser **46** from a sachet and places in exhalation outlet **20** and can inhale released inhalable substance. Exhaled air passes through the exhalation reservoir, helping volatilize the inhalable substance in the inhalable substance reservoir.

In Figures 9A to 9B an additional embodiment of a device as described herein is depicted, device **120**, in perspective view from the front somewhat angled to the right side (Figure 9A) and from the left side somewhat angled to the back (Figure 9B). Device **120** includes an elongated rounded housing **12**, 36 mm wide (a), 73 mm long (b) and 55 mm high (c) with a proximal end **102** including an exhalation inlet **14**, a distal end **116** with an exhalation outlet **20** and an exhalation conduit **18** therebetween. Housing **12** is rigid but includes two pads **122** of silicone rubber.

Contained inside housing **12** is an exhalation determiner similar to exhalation determiner **22** of device **10** depicted in Figure 1, comprising a propeller (not depicted) that rotates when exhaled breath passes through the exhalation conduit. In device **120**, the axis of rotation of the propeller is parallel to the width (dimension a), in the manner of a waterwheel. The propeller is visible through a window **118**. The processor of device **120** is configured to determine when the propeller rotates and when not, and is thereby configured to determine an exhalation duration. When exhalation duration is sufficiently long, the processor triggers vibrating elements functionally associated with pads **122** so that a user knows when a desired exhalation duration is attained.

Device **120** includes an inhalable substance dispenser **46**, including an inhalable substance reservoir **48** (a fibrous pad impregnated with an essential oil). Inhalable substance dispenser **46** is a component separate from housing **12** that is provided in a sealed aluminized sachet and is configured to reversibly engage a cavity in the top portion of housing **12**.

For use, a user holds device **120** with exhalation inlet **14** in proximity of the mouth so that window **118** is visible and a substance dispenser **46** is close to the nostrils. As the user exhales, the exhalation duration is determined as described hereinabove with reference to exhalation determiner **22**. Through window **118**, the user sees that the propeller rotates and feels the vibration of pads **122** when a desired exhalation duration is attained.

In Figures 10A to 10D an additional embodiment of a device as described herein is depicted, device **124**, in a closed configuration (Figure 10A), in a partially-open configuration (Figure 10B), in a fully-open configuration (Figure 10C) and schematically (Figure 10D). Device **124** comprises a housing **12** made of two rigid housing parts **12a** and **12b** mutually joined, in the manner of a codex, with a hinge **126**, a portion of an inner cover **128** (a sheet of elastomer such as silicone rubber).

When housing **12** is in a closed configuration (Figure 10A), housing parts **12a** and **12b** are close together, folding inner cover **128** in half so that inner cover **128** is contained between housing parts **12a** and **12b**. A microswitch **30** functionally associated with a controller **26** of device **124** is depressed, maintaining controller **26** and device **124** in an inactive "OFF" state, suitable for storage and transport

When housing **12** is in an open configuration (Figures 10B and 10C), housing parts **12a** and **12b** are spaced apart and inner cover **128** is exposed. Microswitch **30** is not depressed, so that controller **26** and device **124** are in an active "ON" state in a state ready to provide biofeedback to a user.

The exhalation inlet of device **124** is an area **130** of inner cover **128** visibly marked with both a symbol and letters. Underneath area **130** of inner cover **128** are located components of an exhalation determiner **132** comprising two temperature sensors **134** (e.g., thermistors) and two pressure sensors **136** (e.g., piezoelectric elements) functionally associated with controller **26**. A reference temperature sensor **138** is positioned underneath inner cover **128** remote from area **130**.

A reporter **24** of device **124** comprises two substantially identical groups **24a** and **24b**, each of six light-emitting diodes **110** arranged in columns underneath inner cover **128**, light-emitting diodes functionally associated with controller **26**.

Device **124** also includes an inhalable substance dispenser **46**, a slot-shaped volume inside inner cover **128** configured to removably hold a suitable inhalable substance reservoir **48**, a flexible flat component of cardboard or paper impregnated with an inhalable substance such as an essential oil. Inhalable substance dispenser **46** is in fluid communication with the surroundings through inhalable substance outlets, openings in inner cover **128**. Device **124** is configured so that when area **130** of inner cover **128** is positioned close to the mouth of a human user, the inhalable substance outlets are located in proximity of nostrils of the user.

Before use (immediately before or a significant time before, e.g. a few hours before), a user places a fresh inhalable substance reservoir **48** in inhalable substance dispenser **46**. As long as device **124** is in a closed configuration (Figure 10A), device **124** is inactive and inhalable substance does not substantially volatilize from inhalable substance reservoir **48**.

For use, a user moves housing parts **12a** and **12b** apart (Figure 10B and Figure 10C). As microswitch **30** is no longer depressed, device **124** is in an active state. Inhalable substance from inhalable substance reservoir **48** volatilizes and is released into the surroundings. The user holds device **124** so that area **130** of inner cover **128** is positioned close to the mouth, bringing the inhalable substance outlets in proximity of the nostrils and enjoying the advantages of inhaling the substance.

The user exhales through the mouth. During an exhalation, temperature sensors **134** report the warmth of detected exhaled breath and pressure sensors **136** report the pressure of detected exhaled breath to controller **26**. Controller **26** identifies an exhalation by identifying a transient temperature difference between the ambient temperature reported by reference temperature sensor **138** and temperature sensors **134** that temporally correlates with an increased pressure reported by pressure sensors **136**.

As long as the user exhales, controller **26** serially activates light-emitting diodes of columns **24a** and **24b**, a new diode each 0.8 seconds, as a visual biofeedback related to the

exhalation duration. When the person stops exhaling, the concomitant lower temperature reported by temperature sensors **134** and the concomitant decreased pressure reported by pressure sensors **136** is considered to be non-exhalation, so controller **26** extinguishes all the activated light-emitting diodes of columns **24a** and **24b**. The user is able to take advantage of the biofeedback to control the duration, and consequently rate, of breathing in accordance with the teachings herein.

In some non-depicted embodiments related to device **124**, a device includes only temperature sensors **134** and no pressure sensors **136**. In some non-depicted embodiments related to device **124**, a device includes only pressure sensors **136** and no temperature sensors **134**. In some non-depicted embodiments related to device **124**, a device including temperature sensors **134** is devoid of a reference temperature sensor **138**.

It is important to note that in some embodiments, an inhalable substance reservoir is replaceable. In some embodiments, an inhalable substance reservoir is not replaceable: when such an inhalable substance reservoir is spent, the device is either discarded or used without the advantageous effects of an inhalable substance. In some embodiments, an inhalable substance reservoir of a device as described herein is for a single use: after one use, the reservoir is spent. In some embodiments, an inhalable substance reservoir of a device as described herein is for multiple uses: the reservoir is spent after a number of uses. In some embodiments, a reservoir is configured to be spent after between a week and a few months of being used for the first time.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the scope of the appended claims.

Citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the invention.

CLAIMS:

1. A biofeedback device for providing biofeedback useful for helping a user control breathing, the device comprising:

a housing configured to be hand-held by the user;

an exhalation inlet for receiving exhaled breath from the mouth of the user;

physically associated with said housing, an inhalable substance outlet and a functionally-associated dispenser configured for dispensing an inhalable substance to the user through said inhalable substance outlet, wherein said housing is configured so that when said exhalation inlet is positioned for said receiving said exhaled breath from the mouth, said inhalable substance outlet is located in proximity of the nostrils of the user;

physically associated with said housing, an exhalation determiner functionally associated with said exhalation inlet, configured to determine when exhaled breath is received by said exhalation inlet; and

a reporter associated with said exhalation determiner, said reporter configured to provide a signal related to an exhalation duration of said exhaled breath received from said exhalation determiner to the user.

2. The device of claim 1, wherein said exhalation inlet is functionally associated with an exhalation conduit including an exhalation outlet, configured so that exhaled breath received by said exhalation inlet passes through said exhalation conduit and exits through said exhalation outlet.

3. The device of claim 2, further comprising a flow-restrictor functionally associated with said exhalation conduit, configured for limiting the rate of flow of said exhaled breath through said conduit.

4. A biofeedback device for providing biofeedback useful for helping a user control breathing, the device comprising:

a housing configured to be hand-held by the user;

an exhalation inlet for receiving exhaled breath from the mouth of the user, wherein said exhalation inlet is functionally associated with an exhalation conduit including an exhalation outlet, configured so that exhaled breath received by said exhalation inlet passes through said exhalation conduit and exits through said exhalation outlet, and a

flow-restrictor functionally associated with said exhalation conduit, configured for limiting the rate of flow of said exhaled breath through said conduit;

physically associated with said housing, an exhalation determiner functionally associated with said exhalation inlet, configured to determine when exhaled breath is received by said exhalation inlet; and

a reporter associated with said exhalation determiner, said reporter configured to provide a signal related to an exhalation duration of said exhaled breath received from said exhalation determiner to the user.

5. The device of any one of claims 1 to 4, wherein said signal is selected from the group consisting of a visual signal, audible signal, a tactile signal, and combinations thereof.

6. The device of any one of claims 1 to 5, for use in the relief or treatment of a condition responsive to controlled breathing.

7. The device of claim 6, wherein said condition is a stress-related condition.

8. The device of any one of claims 1 to 7, wherein at least one of said inhalable substance outlet and said dispenser is contained within an integrally formed part of said housing.

9. The device of any one of claims 1 to 8, further comprising an inhalable substance reservoir functionally associated with said inhalable substance outlet, said reservoir configured to store said inhalable substance and to release said inhalable substance to said dispenser.

10. The device of any one of claims 1 to 9, wherein said dispenser is a passive dispenser, comprising a reservoir configured to passively release said inhalable substance via said inhalable substance outlet.

11. The device of any one of claims 1 to 9, wherein said inhalable substance is an essential oil or an essential oil combination.

12. The device of any one of claims, said inhalable substance for the relief or treatment of a stress-related condition.

13. The device of claim 12, wherein said inhalable substance is selected from the group consisting of basil oil, bergamot oil, black pepper, cedarwood oil, chamomile oil, cinnamon oil, citrodora oil, clary sage oil, cypress oil, elemi oil, eucalyptus oil, fennel oil, frankincense oil, geranium oil, ginger oil, grapefruit oil, hyssop oil, jasmine oil, lavender oil, lemon oil, lemon balm oil, lemongrass oil, lime oil, mandarin oil, marjoram oil, neroli oil, nutmeg oil, orange oil; palmarosa oil; patchouli oil, peppermint oil; petitgrain oil, rose oil; rosemary oil, sandalwood oil, spearmint oil; thyme oil; vanilla oil; vetiver oil; wintergreen oil; and ylang ylang oil; and combinations thereof.

14. The device of any one of claims 1 to 13, further comprising a cover couplable to said housing, configured to substantially prevent at least one of entry of air into said exhalation inlet, diffusion of said inhalable substance out of said device prior to use, and soiling of said exhalation inlet, when said cover is coupled to said housing.

15. The device of claim 14, wherein the device is configured so that removal of said cover activates said reporter and/or said exhalation determiner.

16. The device of any one of claims 2 to 15, wherein said exhalation conduit is contained within said housing.

17. The device of any one of claims 3 to 16, wherein said exhalation determiner is configured to function as said flow-restrictor.

18. The device of any one of claims 2 to 14, further comprising a one-way valve functionally associated with said exhalation conduit, configured for allowing passage of exhaled breath from said exhalation inlet through said exhalation conduit and out through said exhalation outlet but for preventing inhalation of air from said exhalation outlet, through said exhalation conduit and out through exhalation inlet.

19. The device of claim 18, wherein said exhalation determiner is configured to function as said one-way valve.

20. A biofeedback method useful for helping a user control breathing, the method comprising:

determining when a user is exhaling; and

providing a signal related to an exhalation duration of said exhaling to said user.

21. The method of claim 20, for the relief or treatment of a condition responsive to controlled breathing.

22. The method of claim 21, wherein said condition is a stress-related condition.

23. The method of claim 20 or 22, wherein said signal comprises a comparison to a preferred exhalation duration.

24. The method of claim 23, wherein said preferred exhalation duration is fixed.

25 The method of claim 23, wherein said preferred exhalation duration is variable.

26. The method of any one of claims 23 to 25, wherein said signal further comprises a comparison to a preferred pattern of at least two exhalations.

27. The method of any one of claims 20 to 26, wherein said signal is selected from the group consisting of a visual signal, audible signal, a tactile signal, and combinations thereof.

28. The method of any one of claims 20 to 27, further comprising administering an inhalable substance to the subject, so that the subject inhales the inhalable substance between said exhalations.

29. The method of claim 28, wherein said inhalable substance is an essential oil or combination of essential oils.

30. A biofeedback method useful for helping a user control breathing, the method comprising:

a) providing a device for measuring exhalation duration of a user , said device having:

a variable preferred exhalation duration,

a target exhalation duration, and

a update threshold difference value;

b) for a given use-event of said device by a user, setting said preferred exhalation duration to said target exhalation duration; and

c) during at least part of said given use-event of said device by said user, repeatedly determining an actual exhalation duration of said user, and

if said actual exhalation duration is less than said preferred exhalation duration by at least said update threshold difference value, reducing said preferred exhalation duration, or

if said actual exhalation duration is substantially equal to or greater than said preferred exhalation duration, providing a signal indicating such to said user.

31. The method of claim 30, wherein said target exhalation duration is set through a user interface.

32. The method of claim 30, wherein said target exhalation duration is set by the results of a previous use of said device.

33. The method of any one of claims 30 to 32, wherein:

subsequent to said determining an actual exhalation duration of said user,

if said actual exhalation duration is substantially equal to said preferred exhalation duration, increasing said preferred exhalation duration.

34. The method of any one of claims 30 to 33, wherein:

subsequent to said determining an actual exhalation duration of said user,

if said actual exhalation duration is greater than said preferred exhalation duration, increasing said preferred exhalation duration.

35. The method of any one of claims 30 to 34, wherein:

subsequent to said determining an actual exhalation duration of said user,

if said actual exhalation duration is less than said preferred exhalation duration by less than said update threshold difference value, increasing said preferred exhalation duration.

36. The method of any one of claims 30 to 35, wherein a said signal is selected from the group consisting of a visual signal, audible signal, a tactile signal, and combinations thereof.

37. The method of any one of claims 30 to 36, further comprising administering an inhalable substance to the subject, so that the subject inhales the inhalable substance between said exhalations.

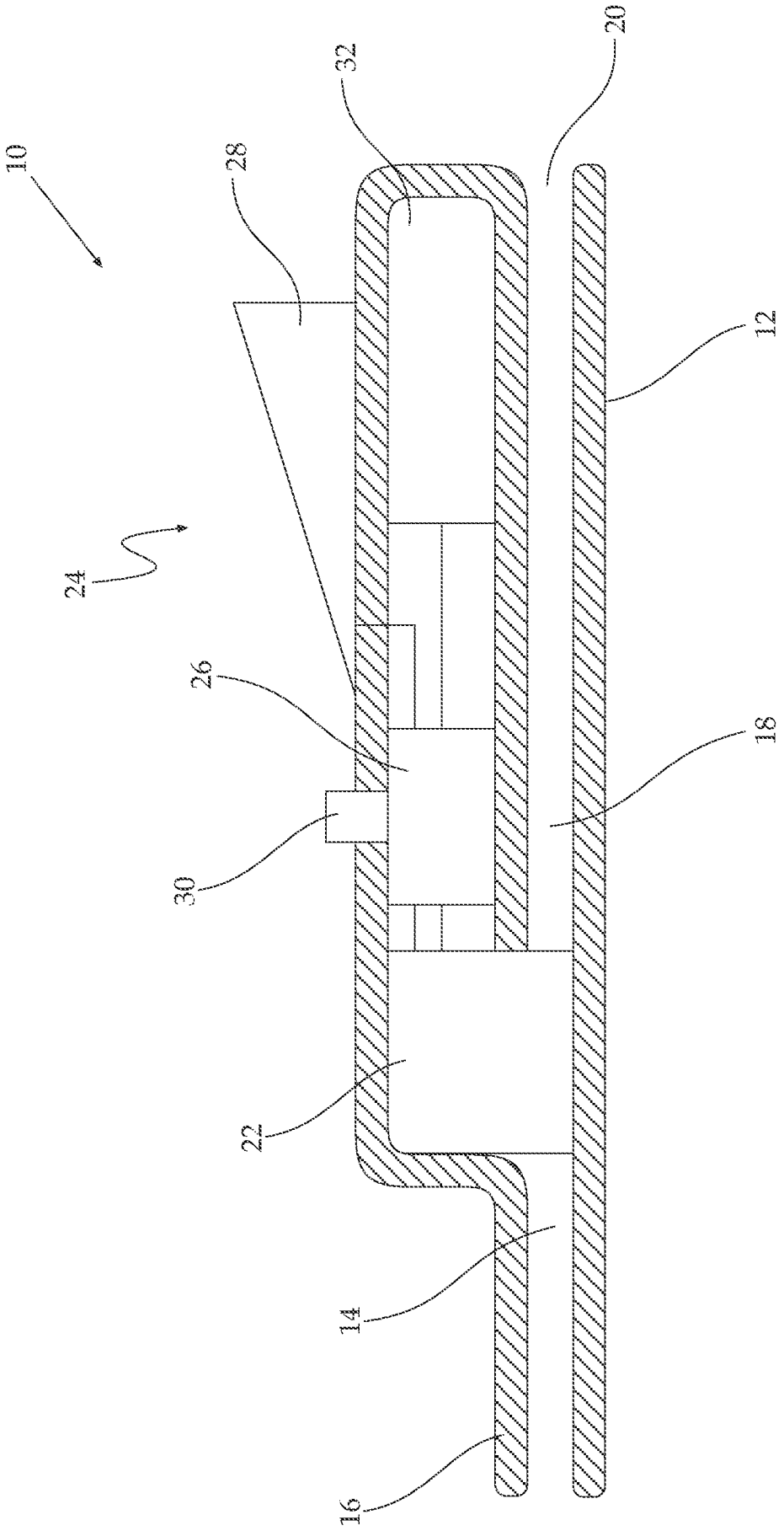

FIGURE 1

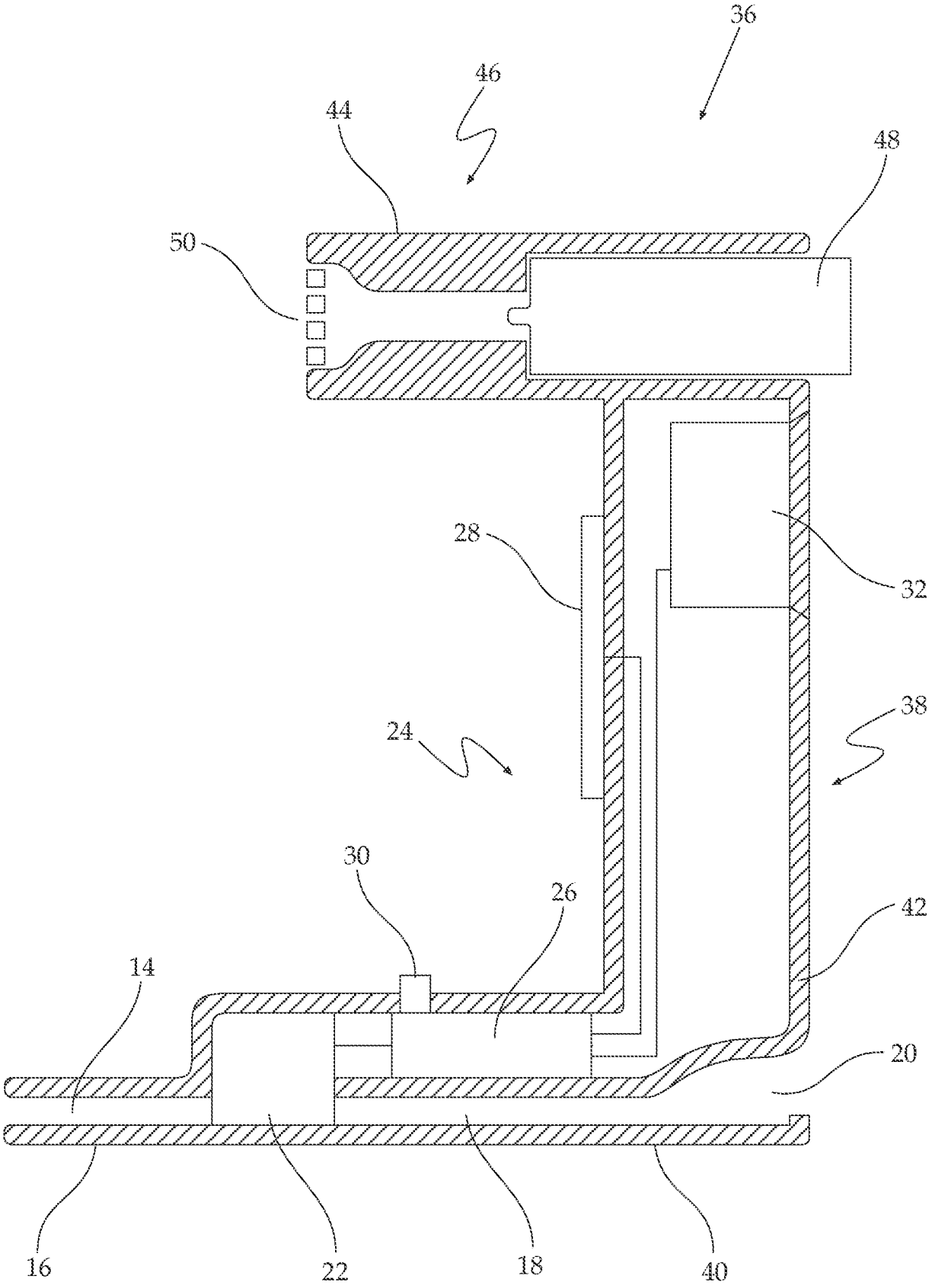

FIGURE 2

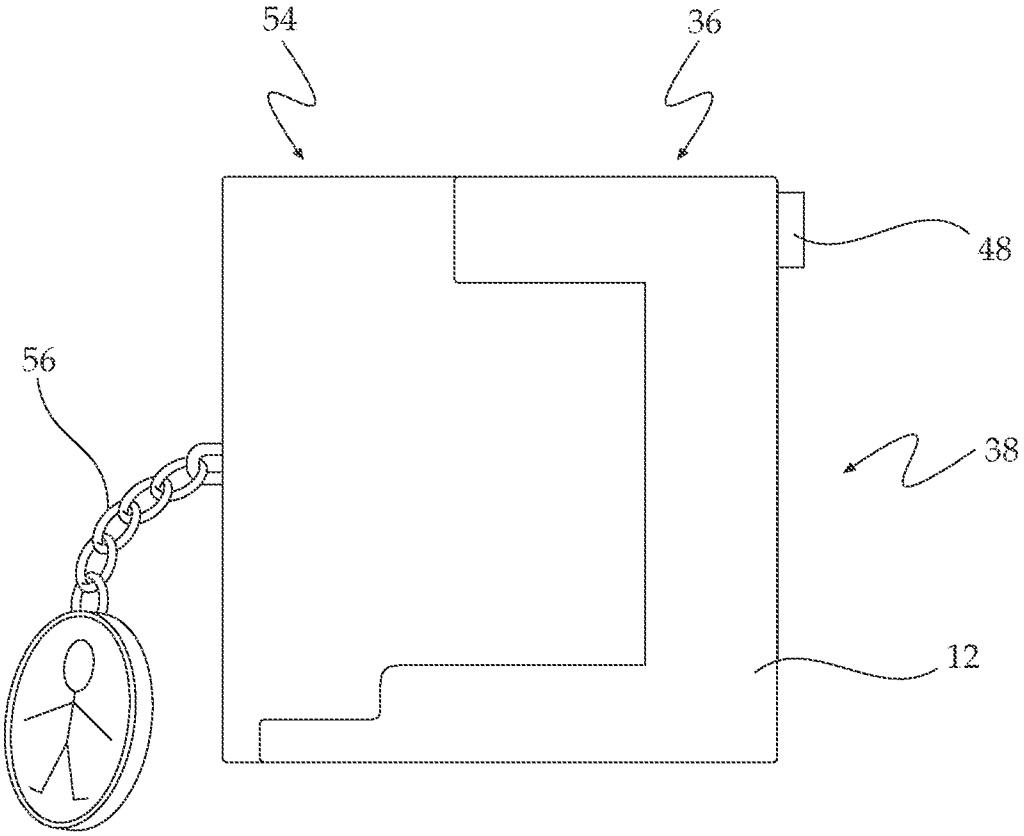

FIGURE 3A

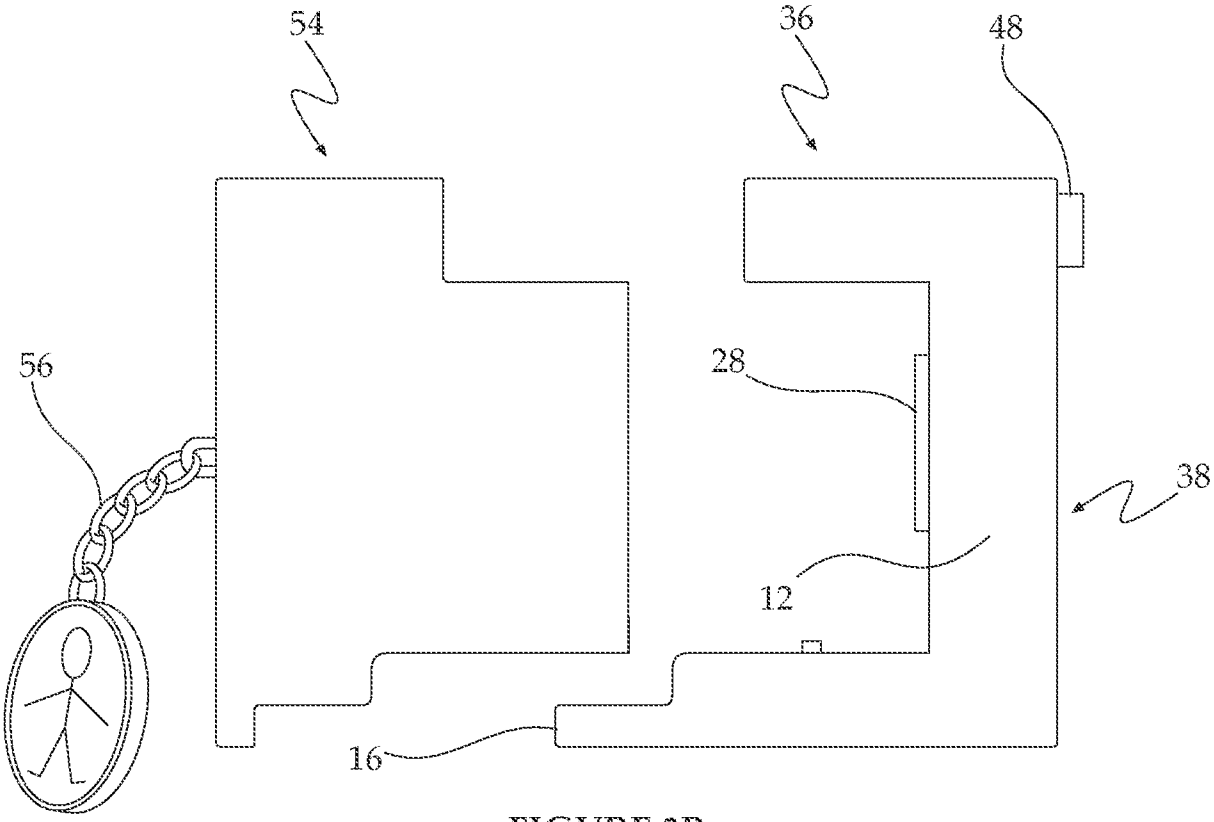

FIGURE 3B

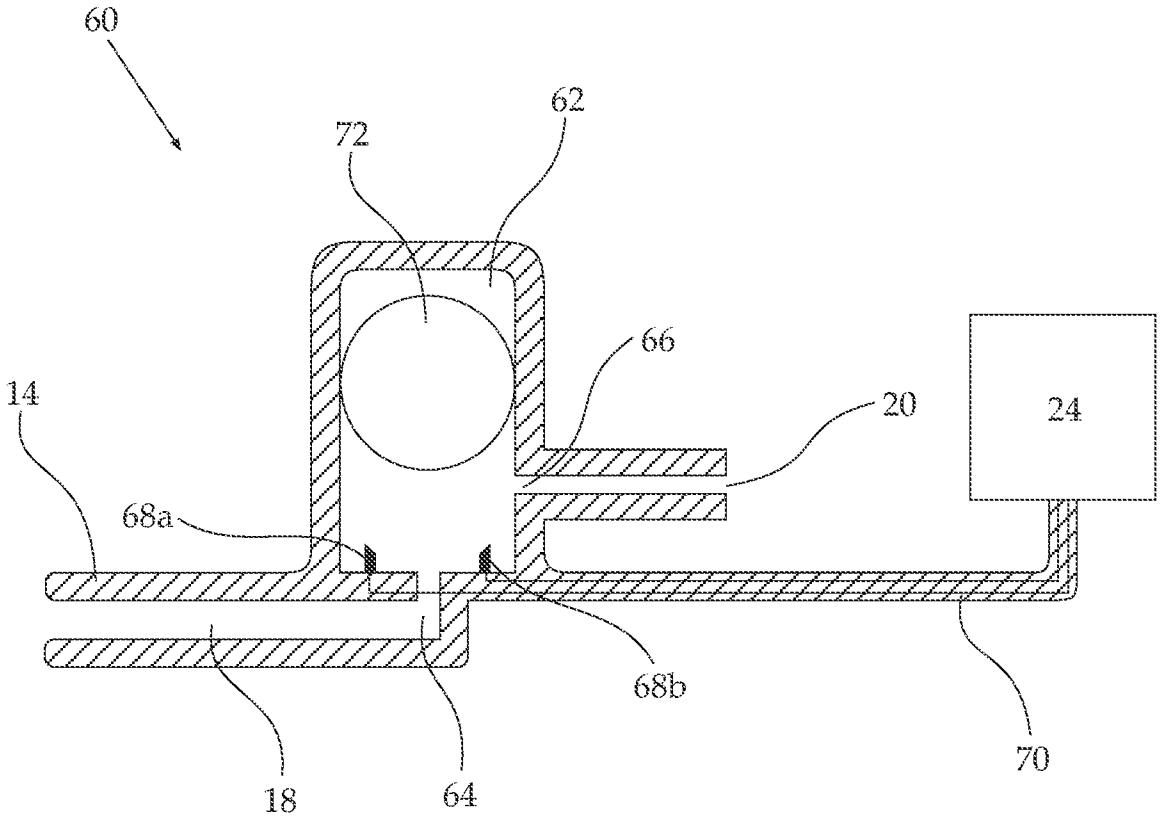

FIGURE 4A

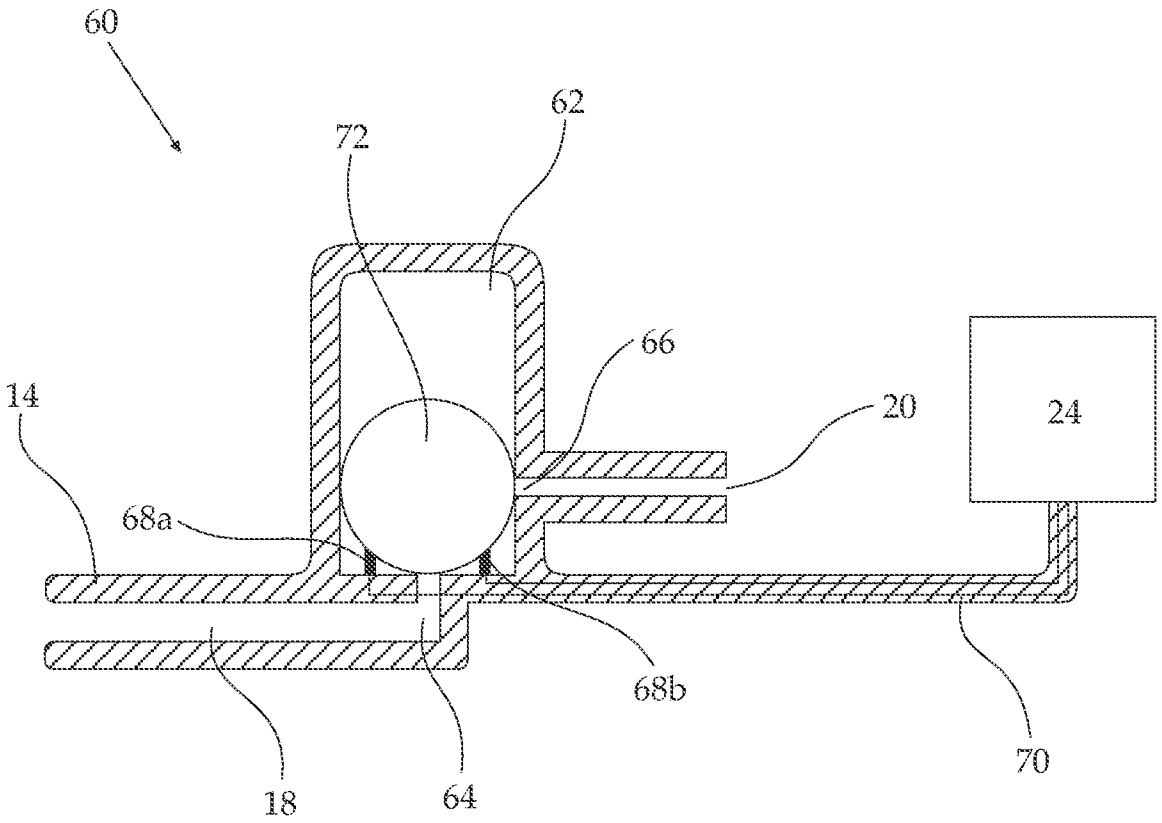

FIGURE 4B

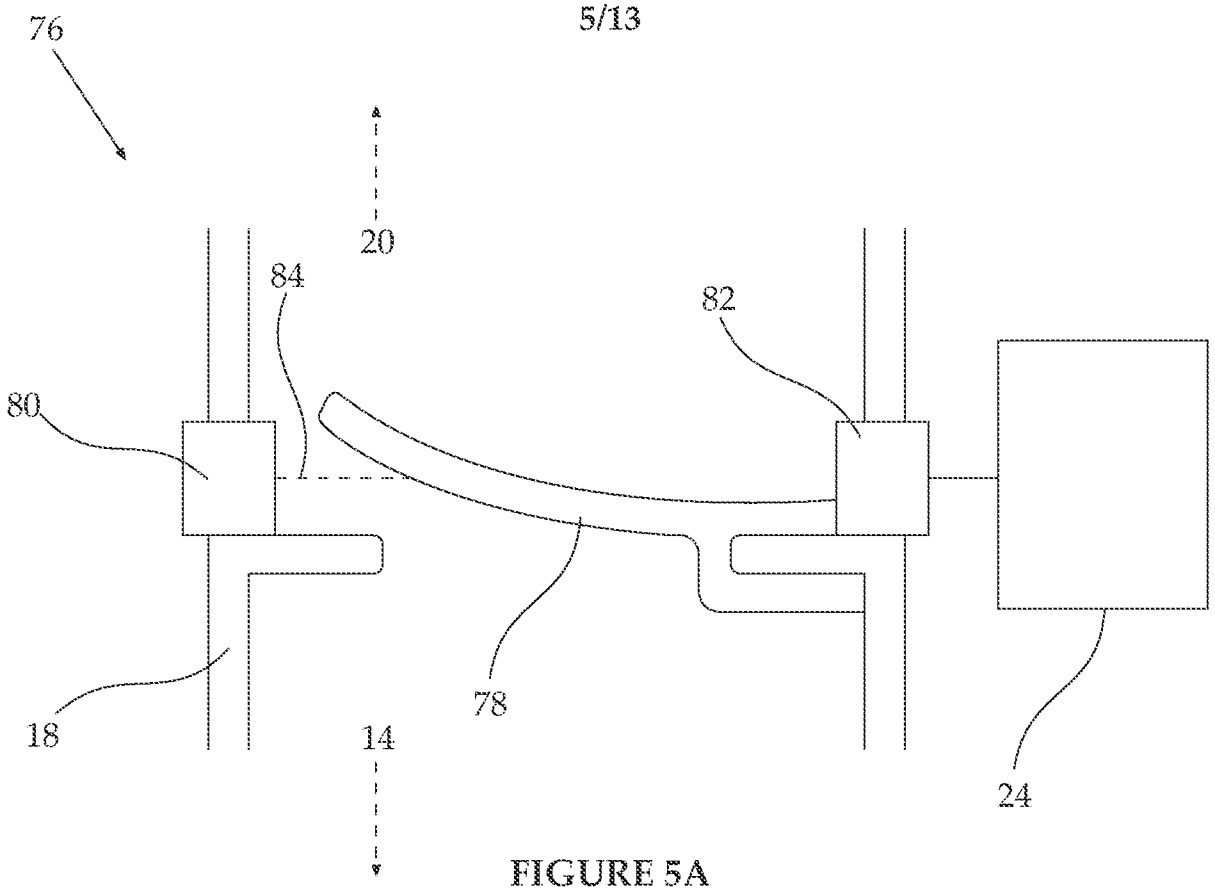

FIGURE 5A

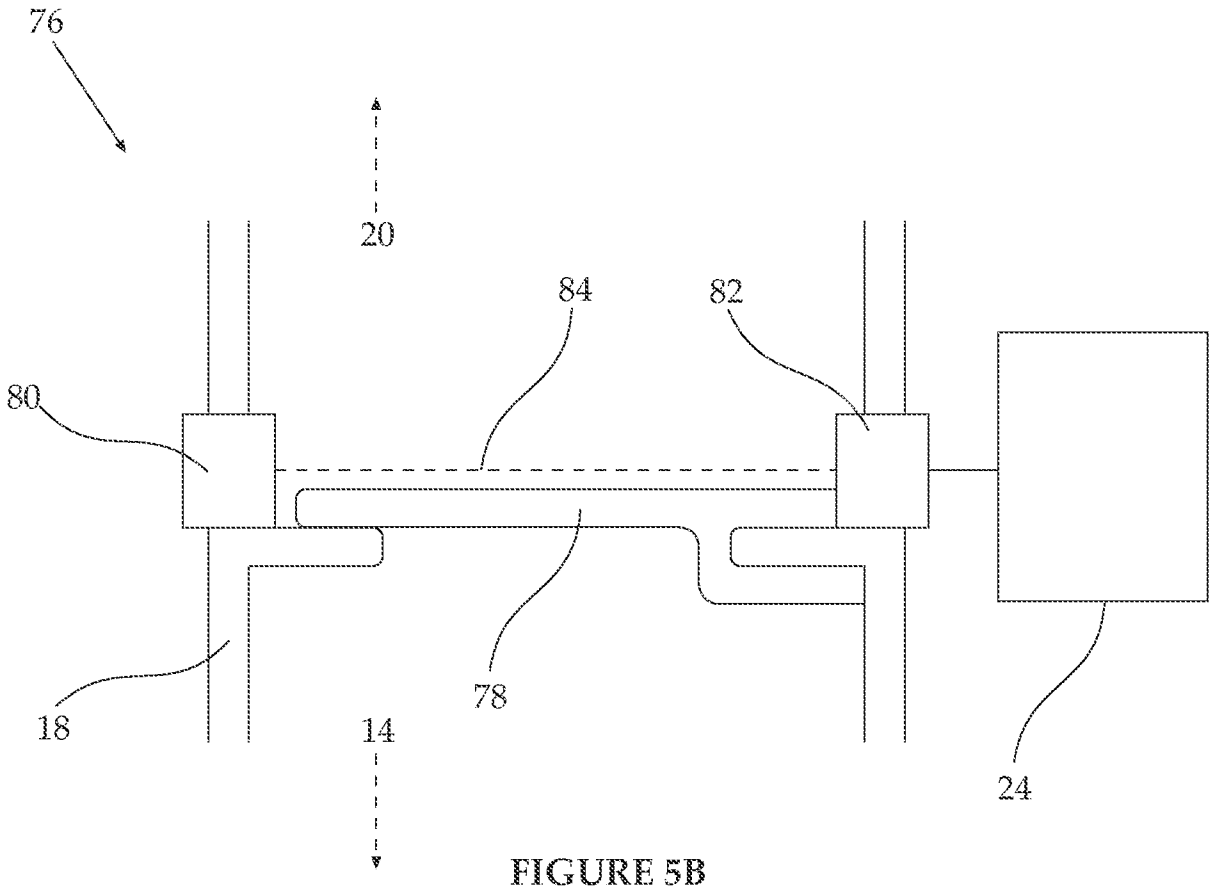

FIGURE 5B

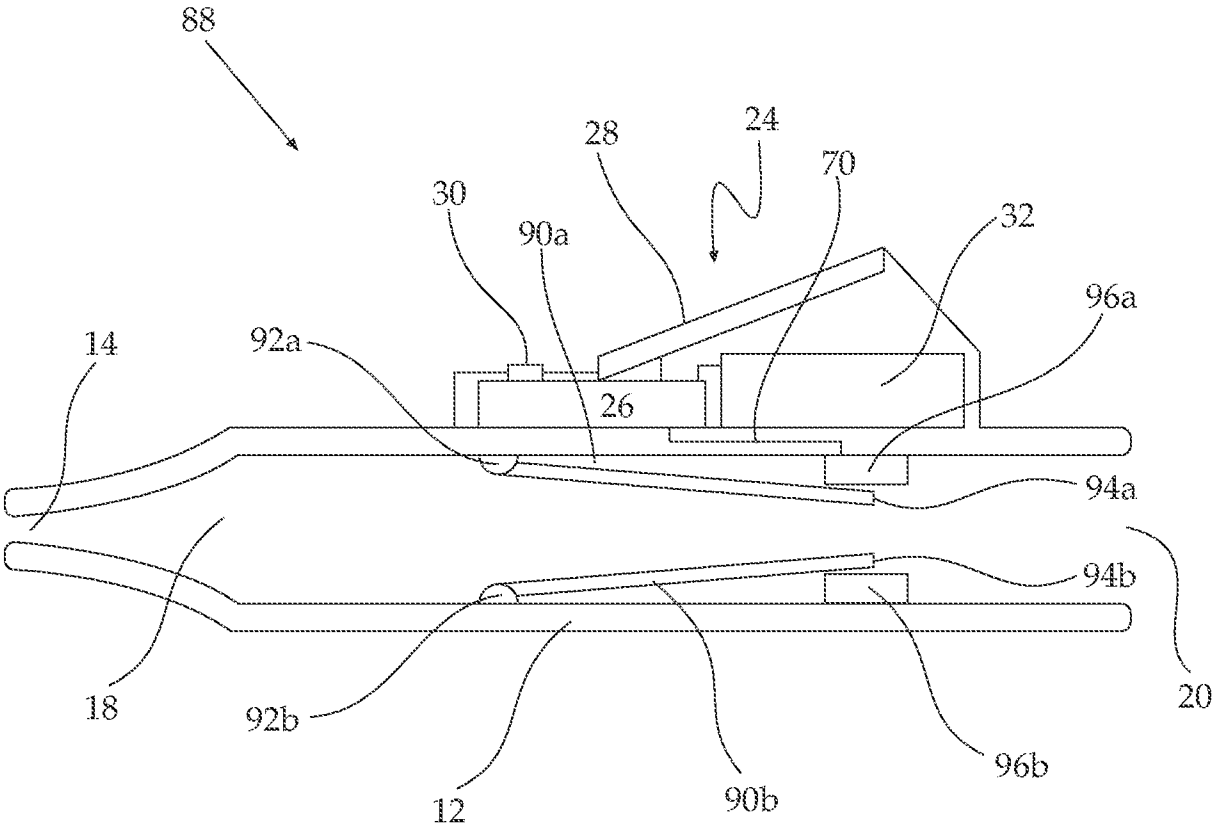

FIGURE 6A

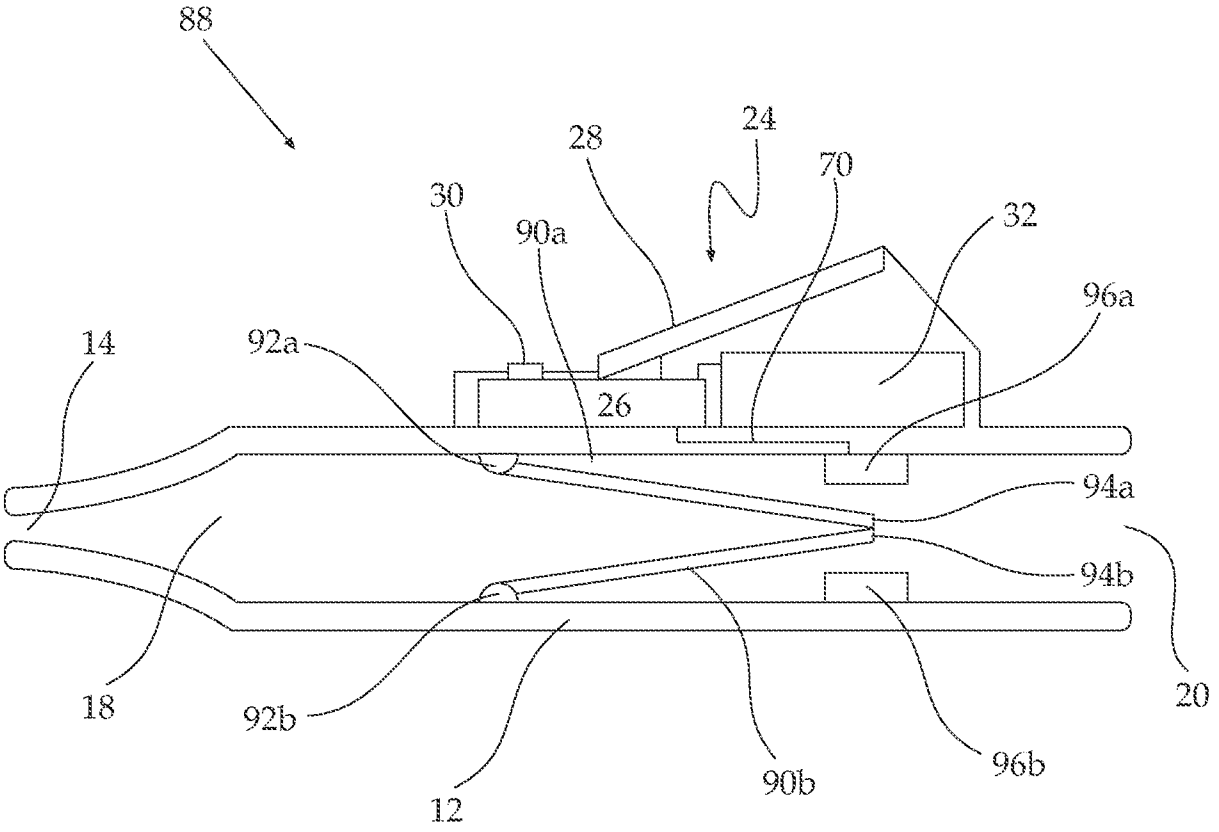

FIGURE 6B

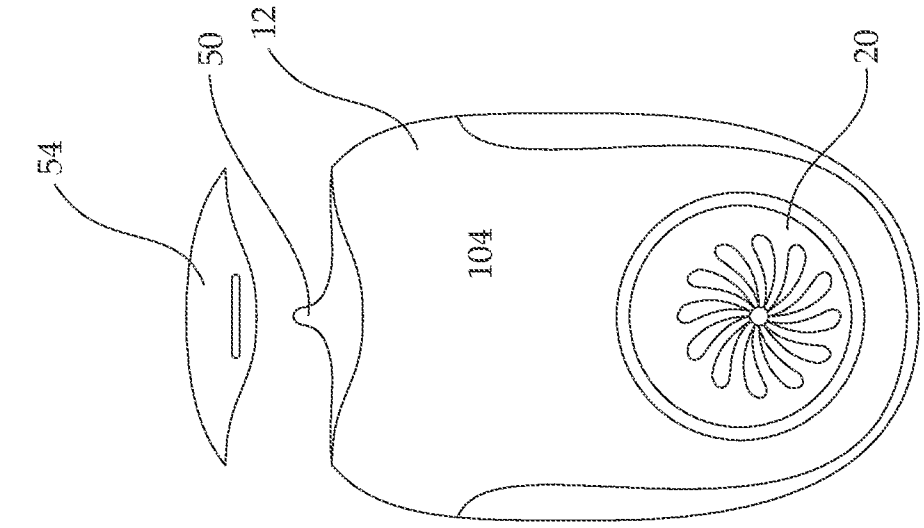

FIGURE 7C

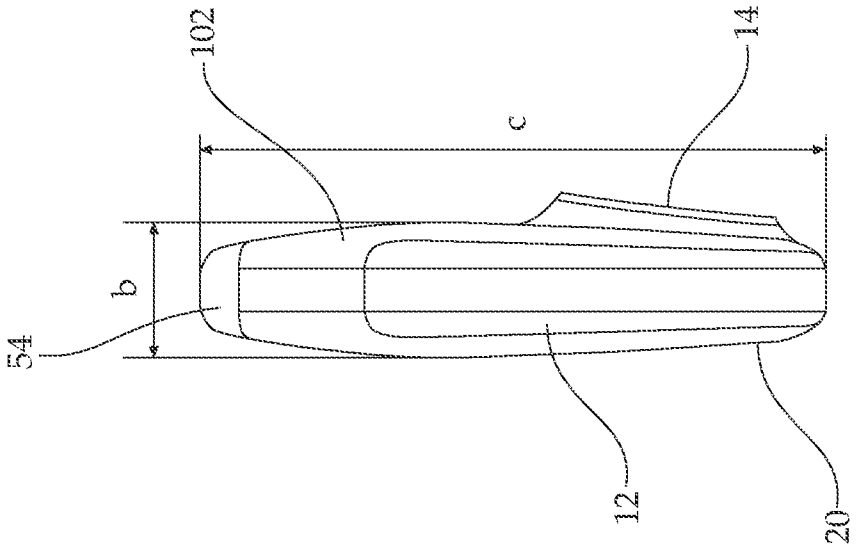

FIGURE 7B

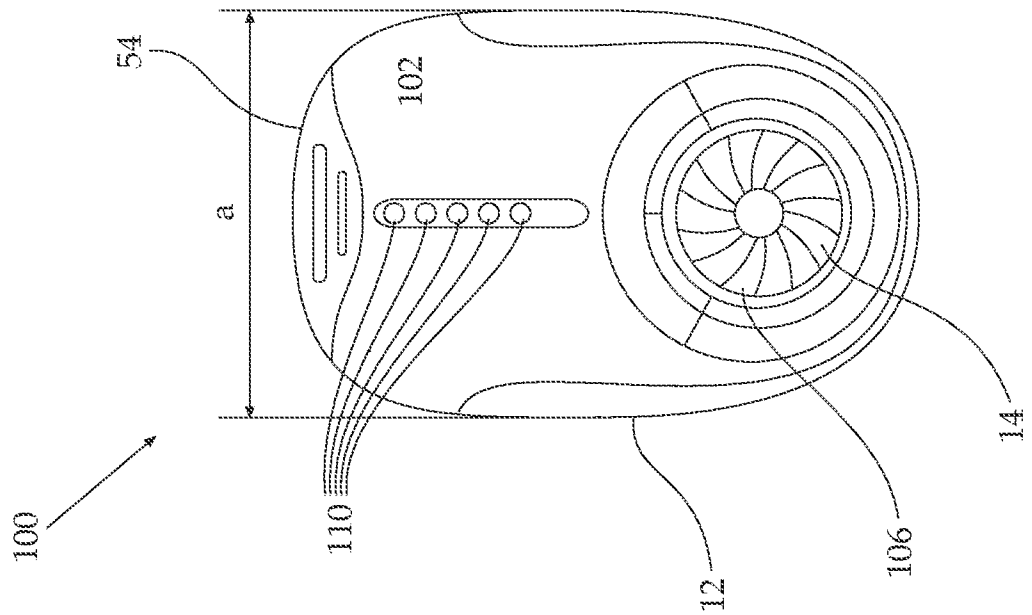

FIGURE 7A

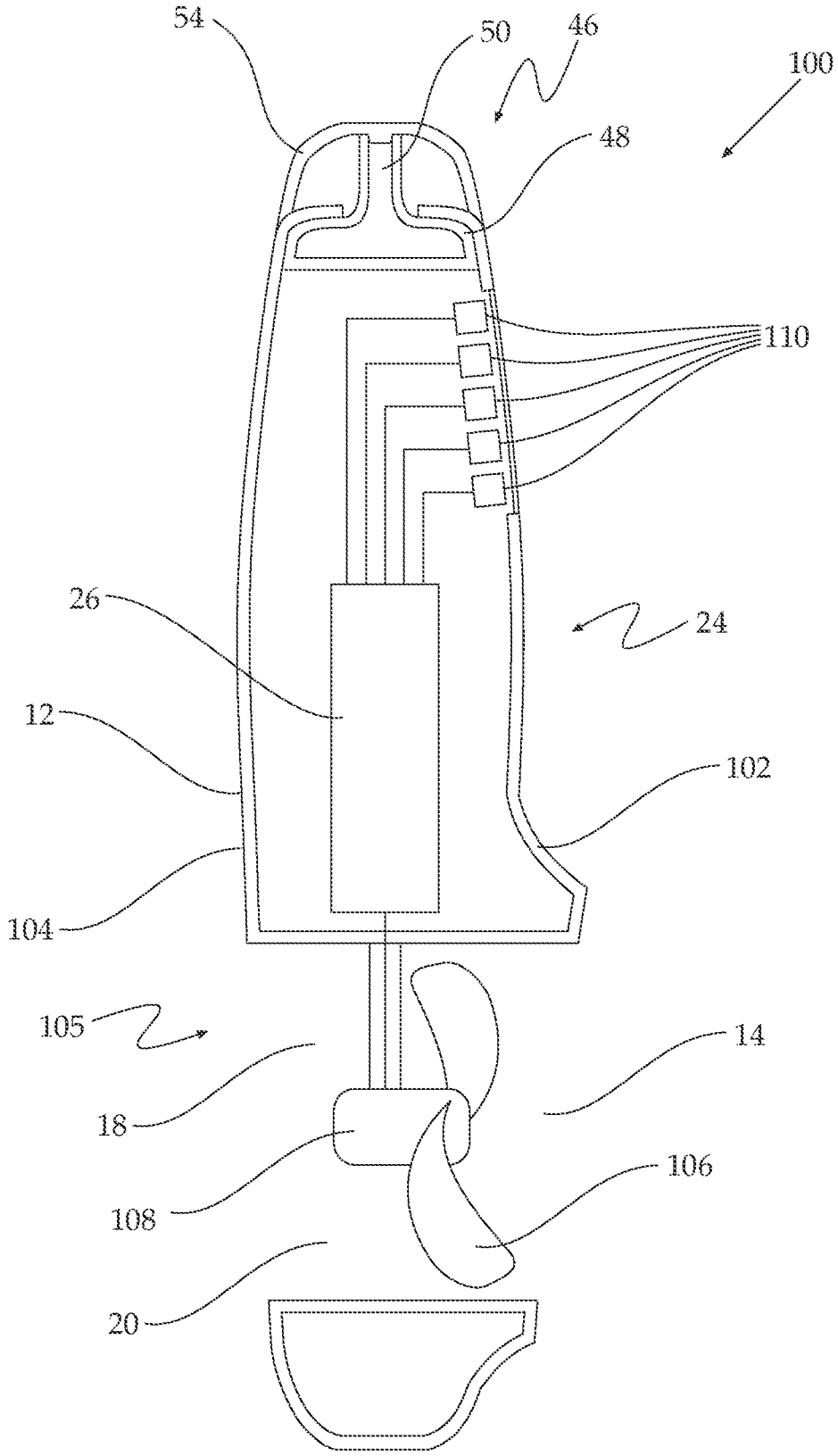

FIGURE 7D

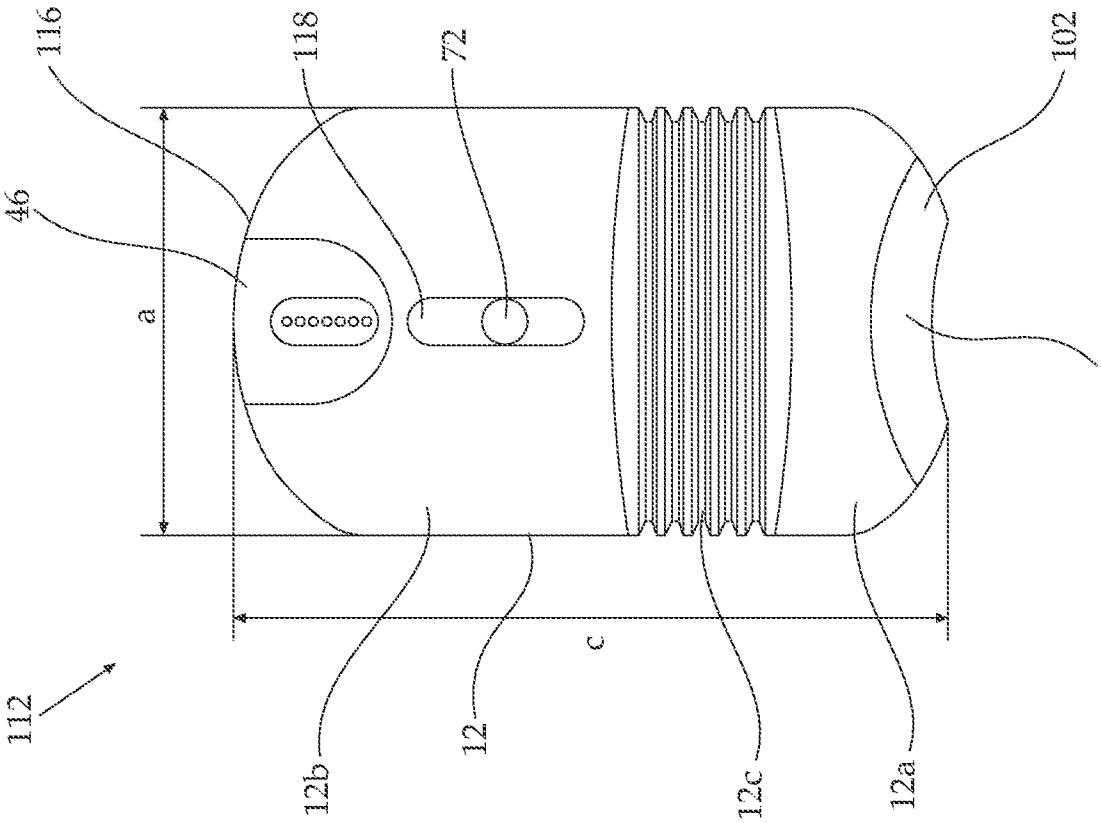

FIGURE 8B

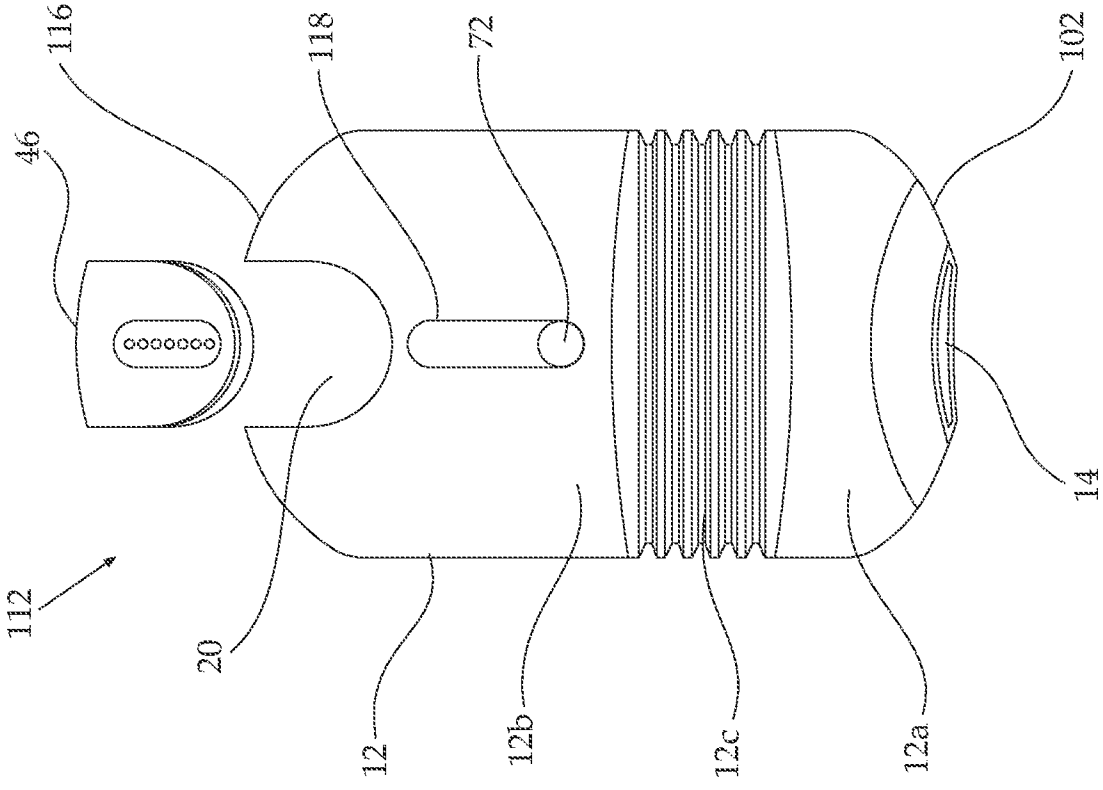

FIGURE 8A

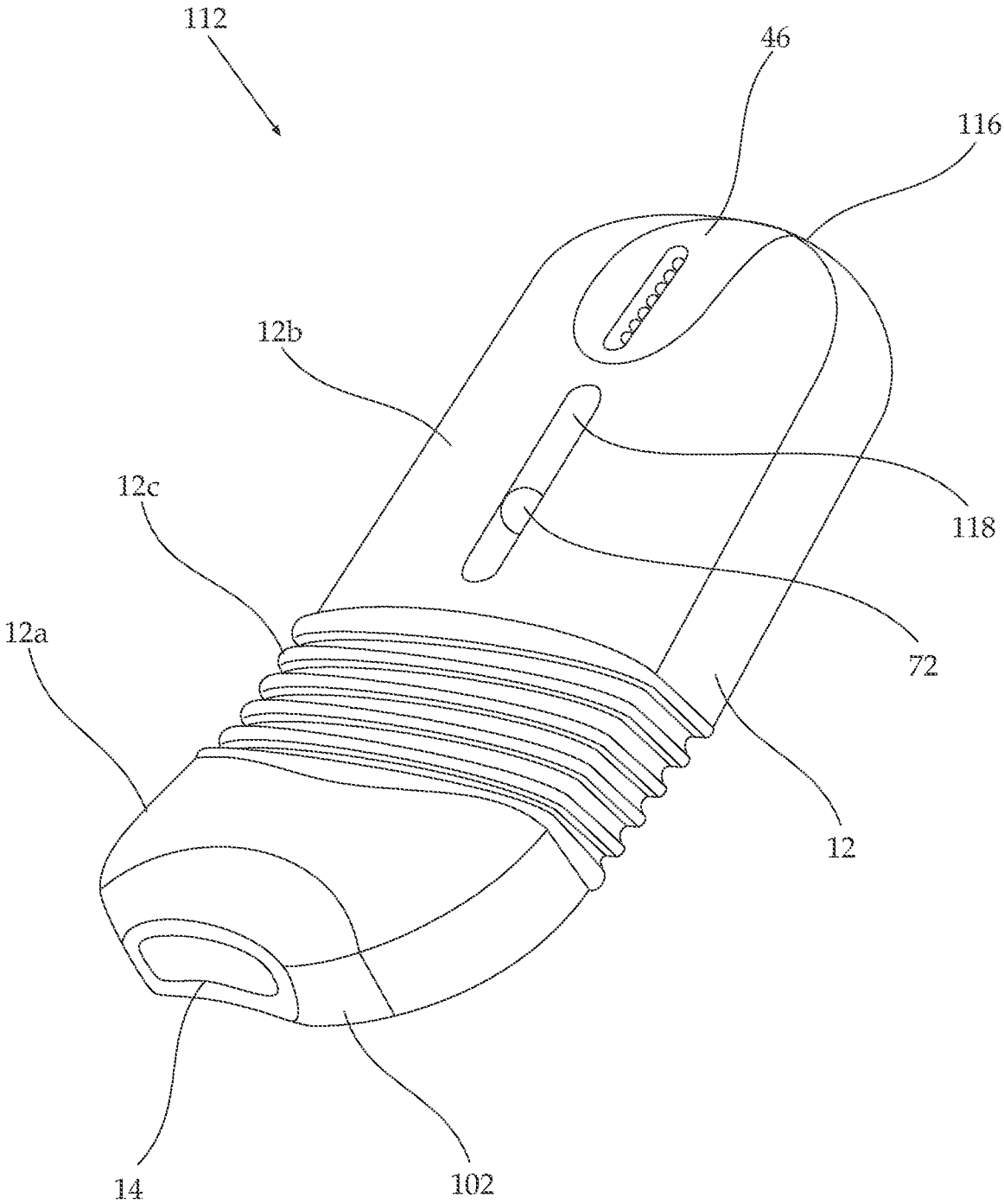

FIGURE 8C

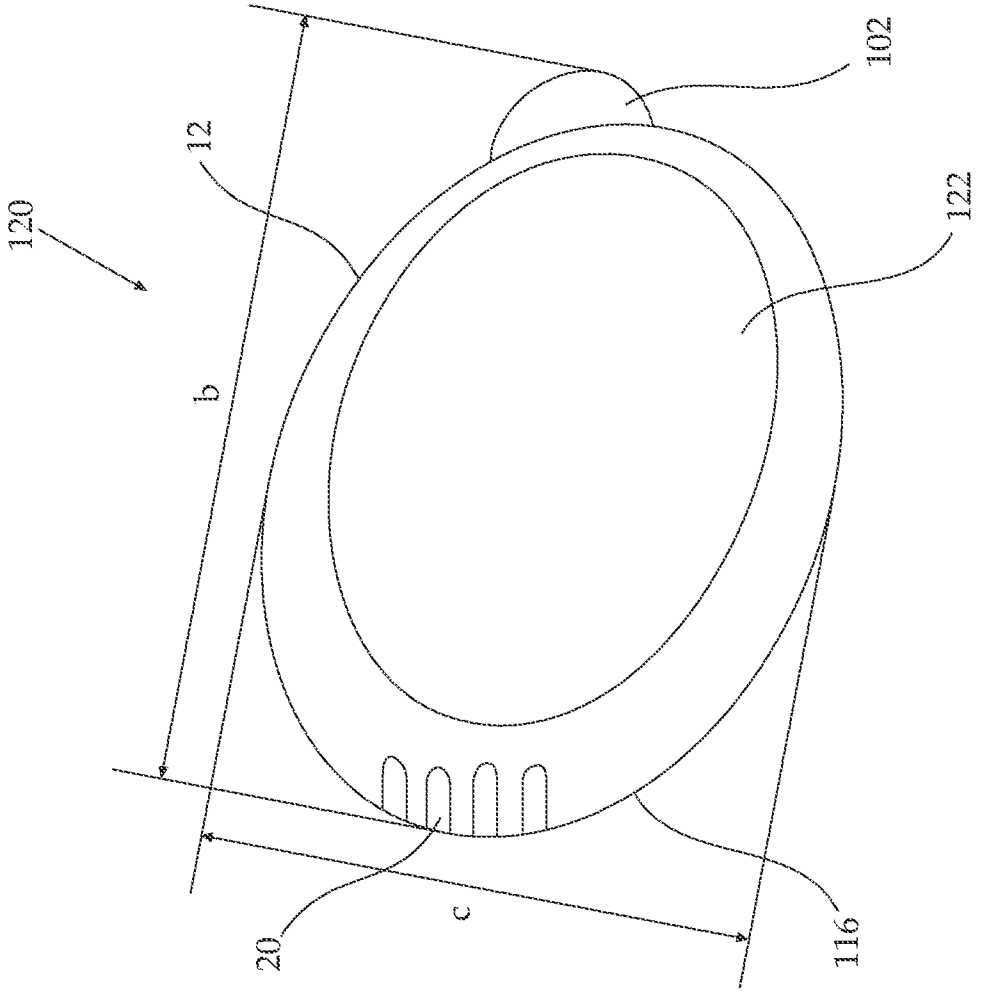

FIGURE 9B

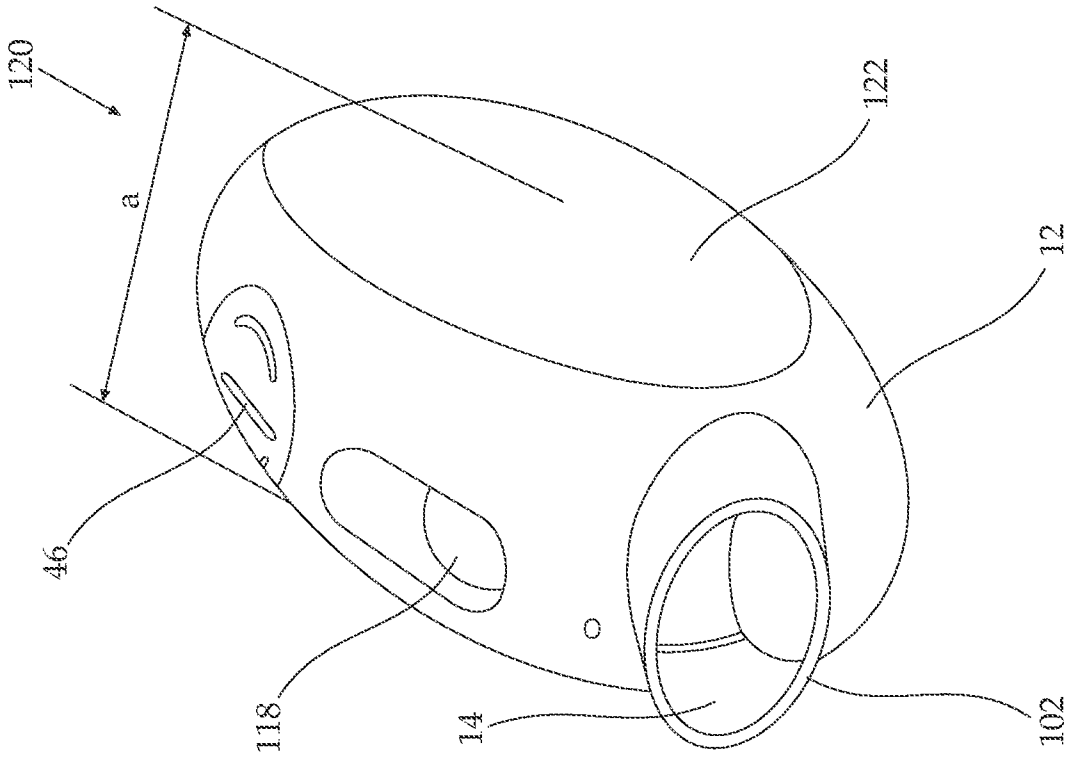

FIGURE 9A

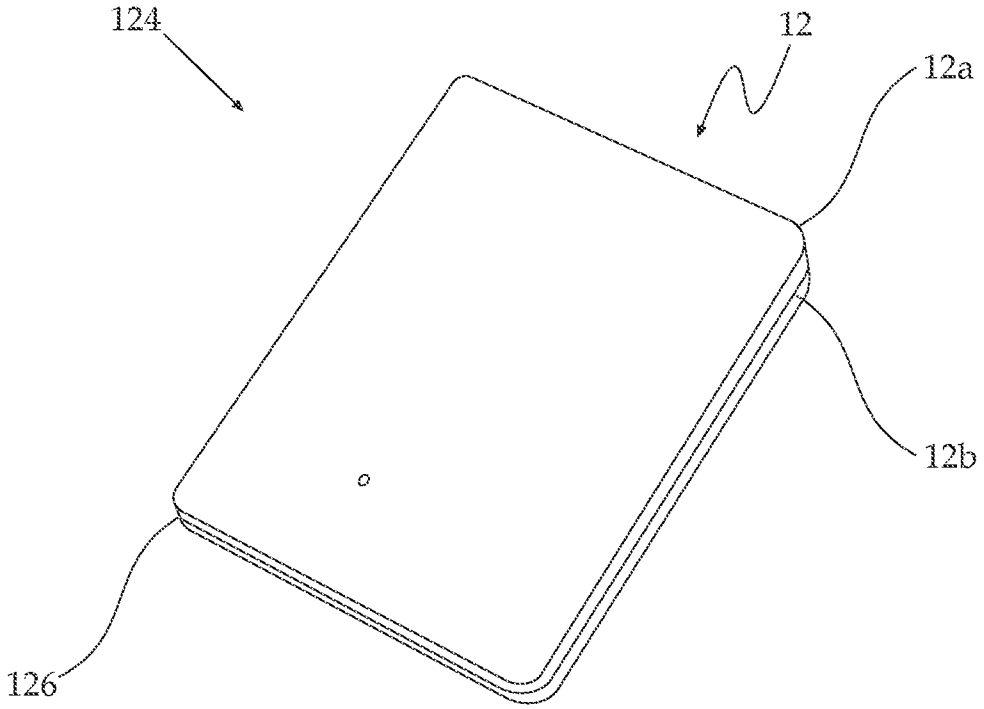

FIGURE 10A

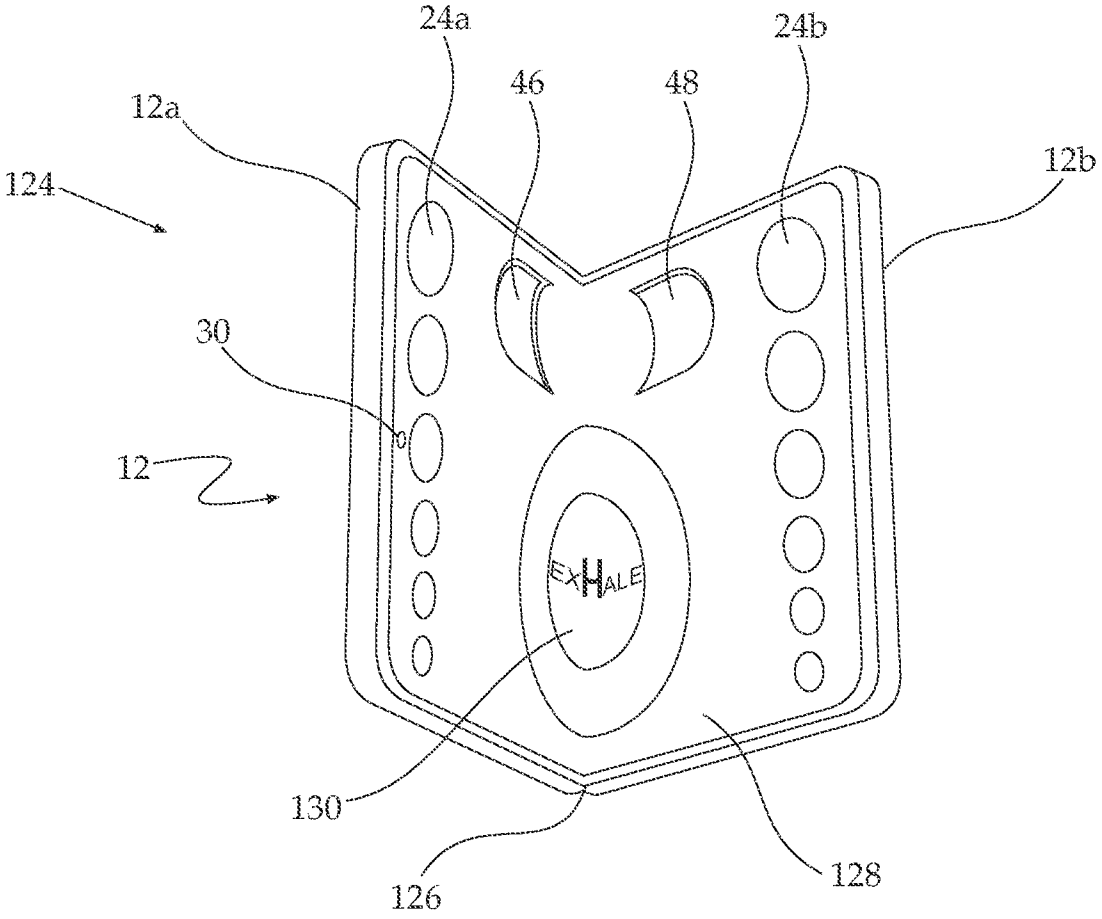

FIGURE 10B

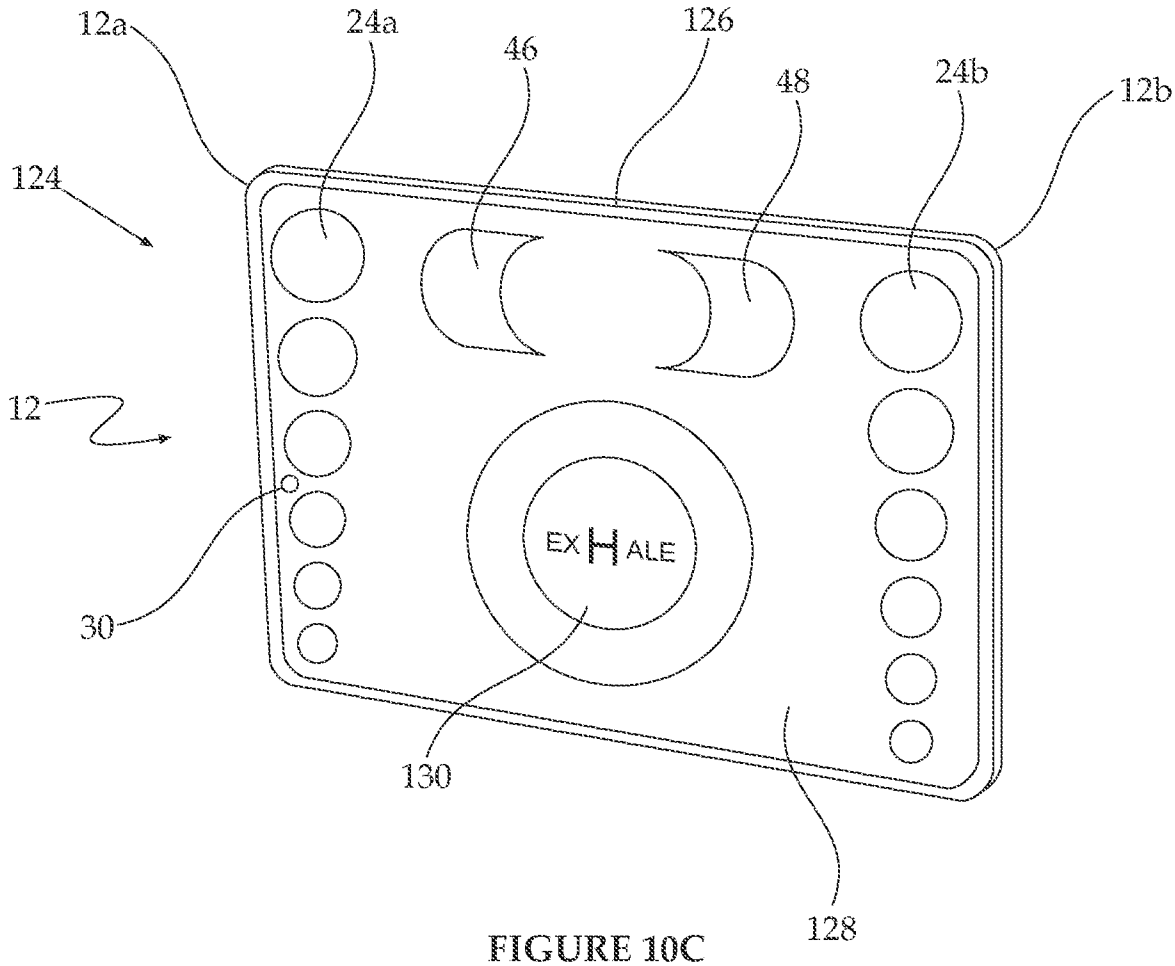

FIGURE 10C

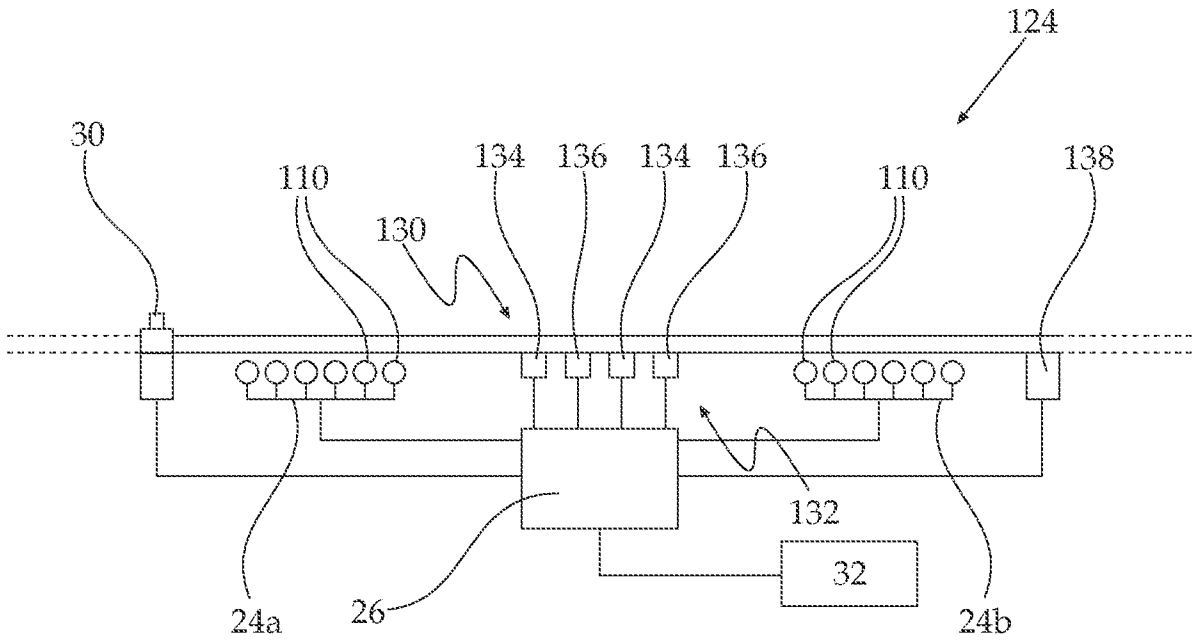

FIGURE 10D

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/056574

A. CLASSIFICATION OF SUBJECT MATTER
IPC (2013.01) A61M 11/00, A61M 15/00, A61M 16/00

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)
IPC (2013.01) A61M 11/00, A61M 15/00, A61M 16/00

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)
Databases consulted: THOMSON INNOVATION, Esp@cenet, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006231094 A1 Djupesland 19 Oct 2006 (2006/10/19) (Figs. 2-9, paragraphs 86-132)	1-13,20-22
Y	US 2009229604 A1 Pearson et al. 17 Sep 2009 (2009/09/17) (abstract, Figs. 3-6, closure 5)	14
Y	US 2003205229 A1 Crockford et al. 06 Nov 2003 (2003/11/06) (Abstract)	15-17
X	(D3: abstract, Figs. 4, 5, Fig. 8, especially blocks: 132, 131, 134, 135, 139)	20-29
X	US 5709202 A Lloyd et al. 20 Jan 1998 (1998/01/20) (col. 4 lines 29-34, col. 5 lines 14-20, lines 35-41, col. 8 lines 30-31, col. 10 lines 30-36, line 39-40 "method of drug delivery", col. 11 lines 1-15, col. 22 lines 24-65, col. 24 lines 6-16, col. 24 line 59 to col. 25 line 3, col. 26 lines 25-27, lines 45-63, col. 26 line 64-col.27 line 19, col. 27 lines 13-16 ,col. 28 lines 36-37, col. 29 lines 29-37).	20-37

[X] Further documents are listed in the continuation of Box C. [X] 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
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Date of the actual completion of the international search	Date of mailing of the international search report
23 Apr 2013	25 Apr 2013
Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	Authorized officer NIMER Emad Telephone No. 972-2-5657801

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Y	US 2005279349 A1 Patton et al. 22 Dec 2005 (2005/12/22) (Abstract, paragraphs 12, 14, 16-19)	1-13,20-22

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[标]发明人	WALLACH ADI		
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摘要(译)

公开了适用于提供生物反馈的生物反馈方法和装置，其可用于帮助用户控制自己的呼吸，例如，帮助引发深呼吸，并且这种生物反馈装置还包括用于分配可吸入物质的分配器。