



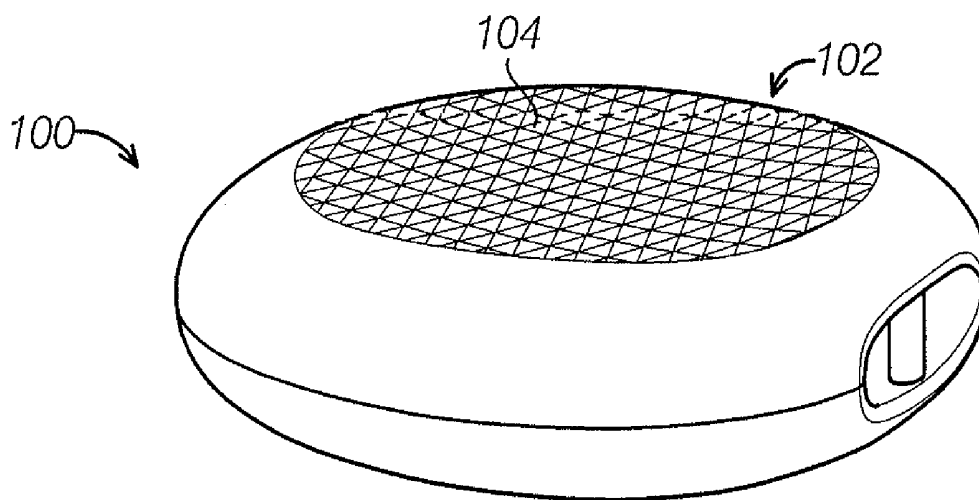
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(19) **United States**(12) **Patent Application Publication**
DARMOUR et al.(10) **Pub. No.: US 2018/0033330 A1**(43) **Pub. Date: Feb. 1, 2018**(54) **CRAVING INPUT AND SUPPORT SYSTEM**(71) Applicant: **CHRONO THERAPEUTICS INC.**,
Hayward, CA (US)(72) Inventors: **Jennifer A. DARMOUR**, Seattle, WA
(US); **Jenny E. HAPGOOD**, Tacoma,
WA (US); **David Evans ROTH**,
Issaquah, WA (US); **Ronald A.**
OVERBECK, Winthrop, WA (US);
Alan Joel LEVY, Bellevue, WA (US)(73) Assignee: **CHRONO THERAPEUTICS INC.**,
Hayward, CA (US)(21) Appl. No.: **15/551,178**(22) PCT Filed: **Mar. 11, 2016**(86) PCT No.: **PCT/US16/22117**

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12, 2015.**Publication Classification**(51) **Int. Cl.****G09B 19/00** (2006.01)**A61B 5/0205** (2006.01)**A61B 5/11** (2006.01)**G06F 19/00** (2006.01)**A61B 5/0488** (2006.01)**A61B 5/16** (2006.01)**A61B 5/00** (2006.01)**G09B 5/02** (2006.01)**A61B 5/0402** (2006.01)(52) **U.S. Cl.**CPC **G09B 19/00** (2013.01); **G09B 5/02**
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5/11 (2013.01); **A61B 5/0402** (2013.01); **A61B**
5/0488 (2013.01); **A61B 5/165** (2013.01);
A61B 5/486 (2013.01); **A61B 5/7455**
(2013.01); **G06F 19/3406** (2013.01); **A61B**
5/082 (2013.01)(57) **ABSTRACT**

A craving control device comprising a housing, a craving input actuator supported by the housing, a wireless communicator supported by the housing, and a controller is provided. The craving input actuator can be configured to obtain information from a user pertaining to a timing, frequency, or intensity of a craving. The controller can be operatively connected to the craving input actuator and the wireless communicator to communicate craving information received by the craving input actuator via the wireless communicator to a device external to the housing. The device external to the housing can be a personal communication device. The housing can be sized and configured to be enclosed in the user's hand and or to be placed in a pocket of the user's clothing. Methods for using the craving control devices are also provided.



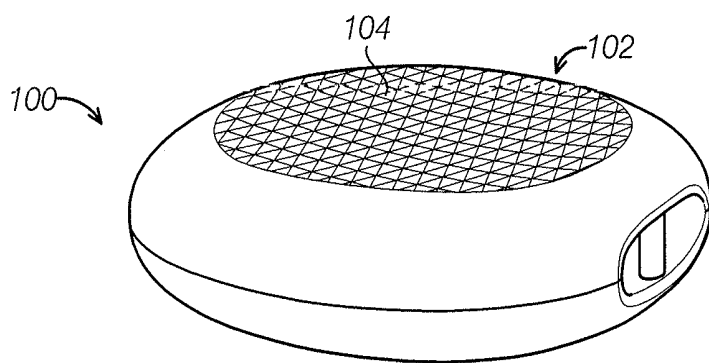


FIG. 1A

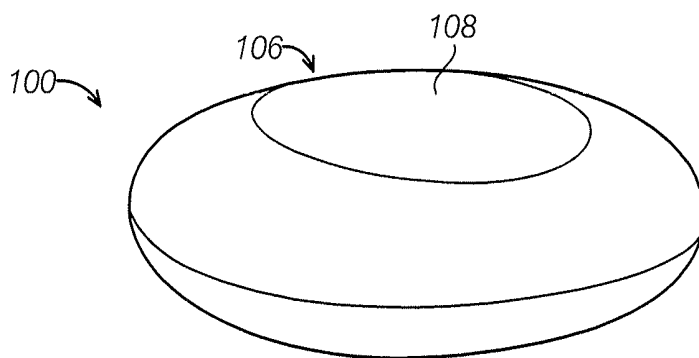


FIG. 1B

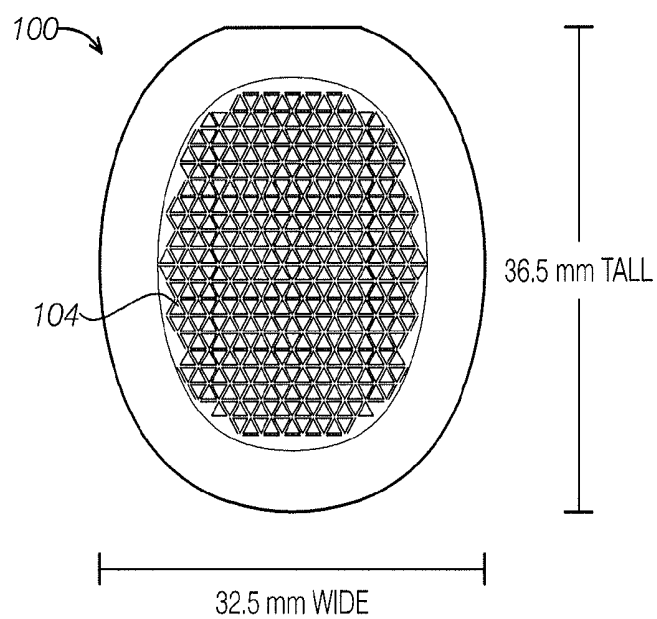


FIG. 2A

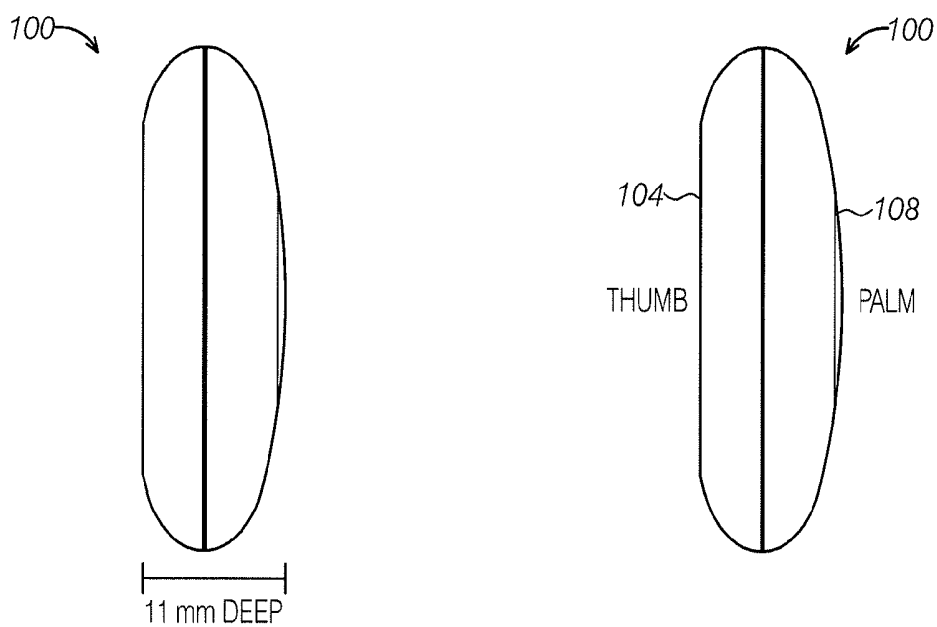


FIG. 2B

FIG. 2C

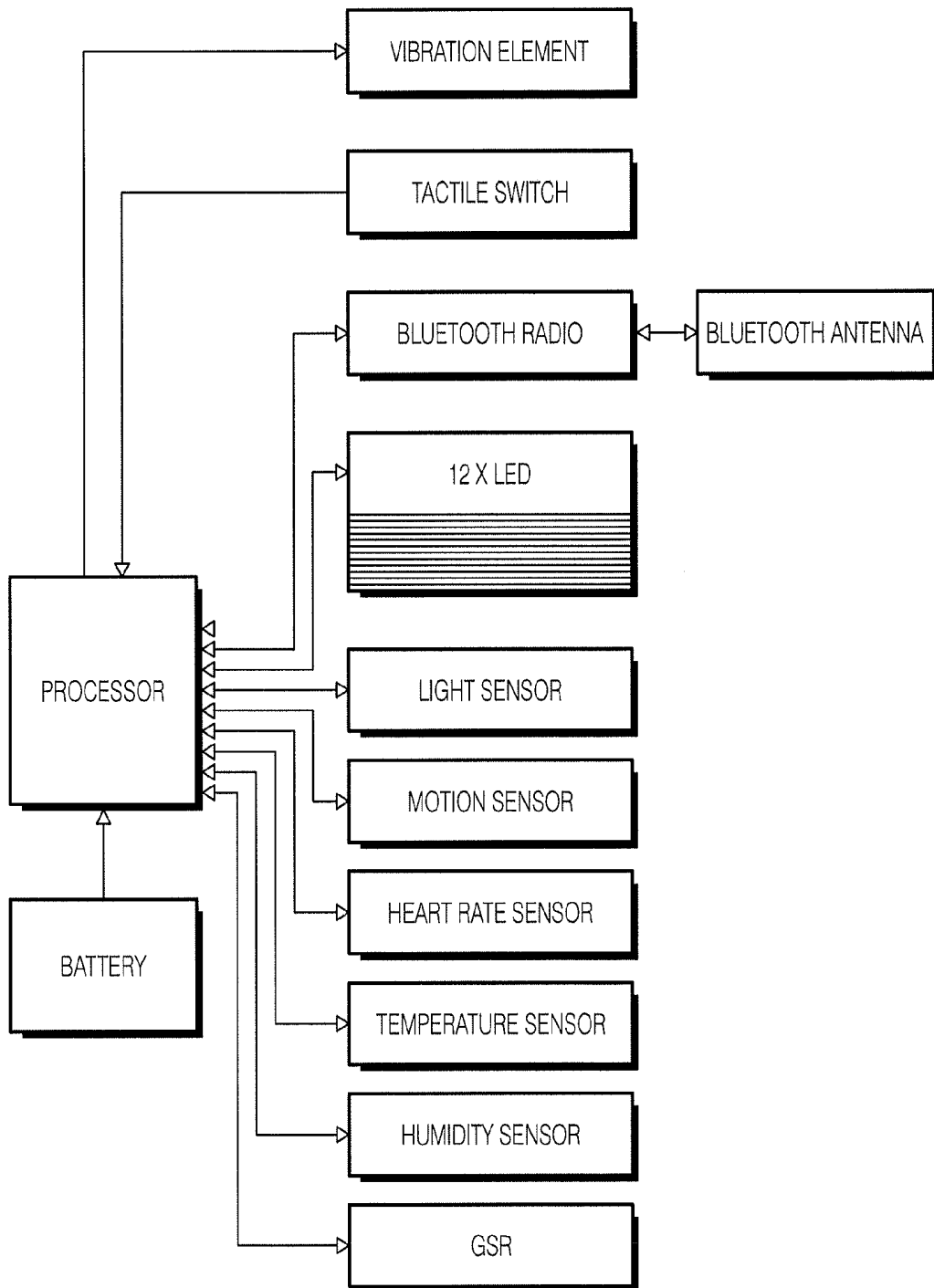


FIG. 3

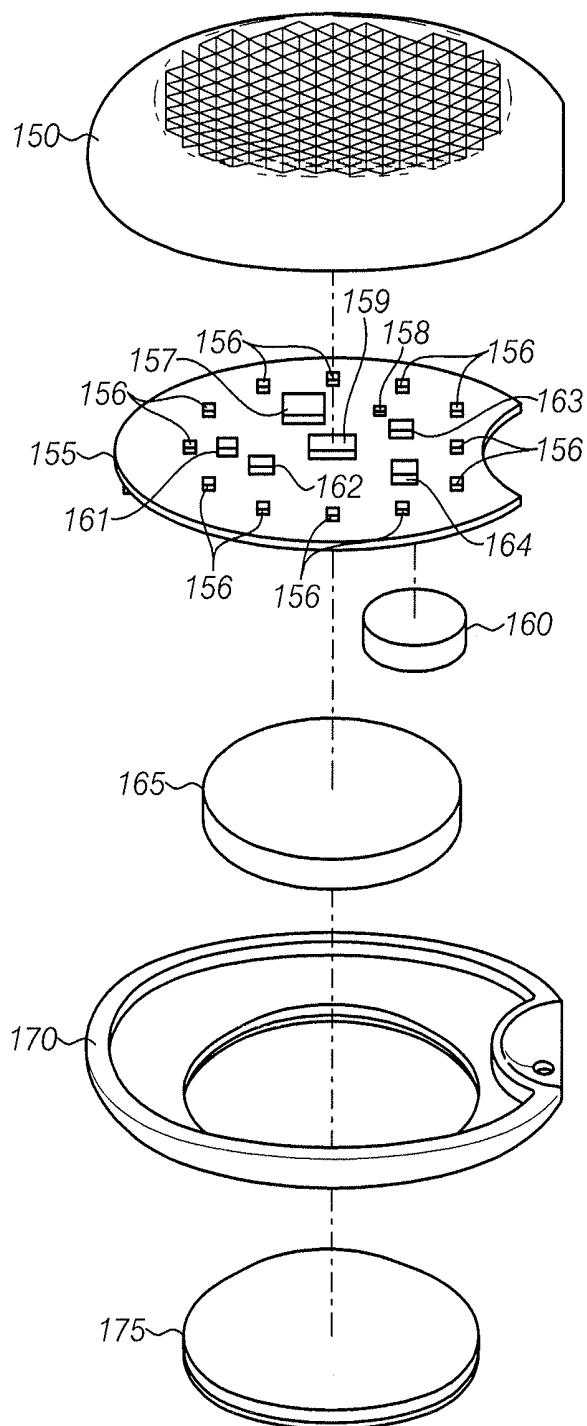


FIG. 4

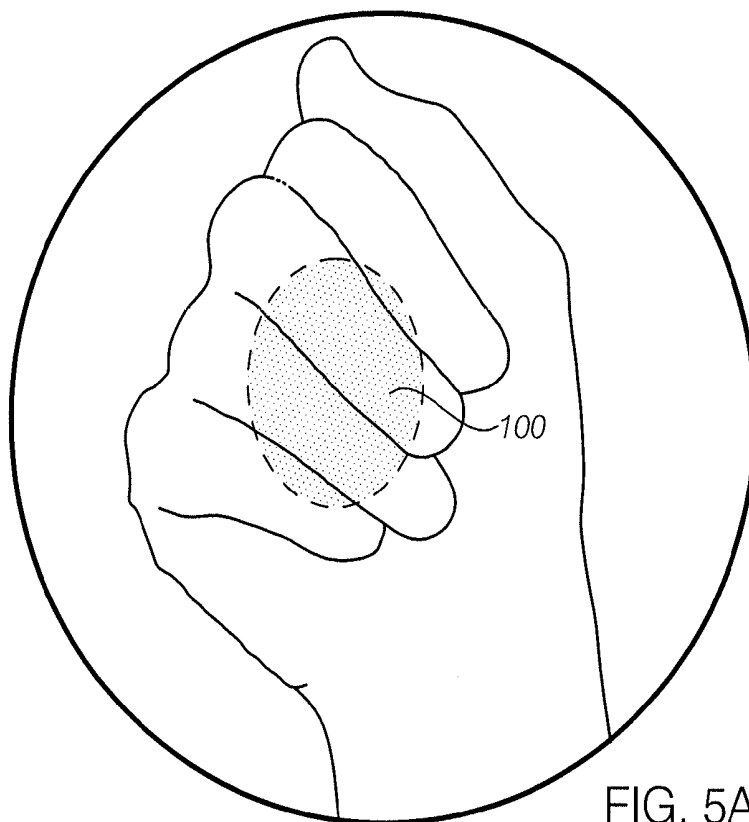


FIG. 5A

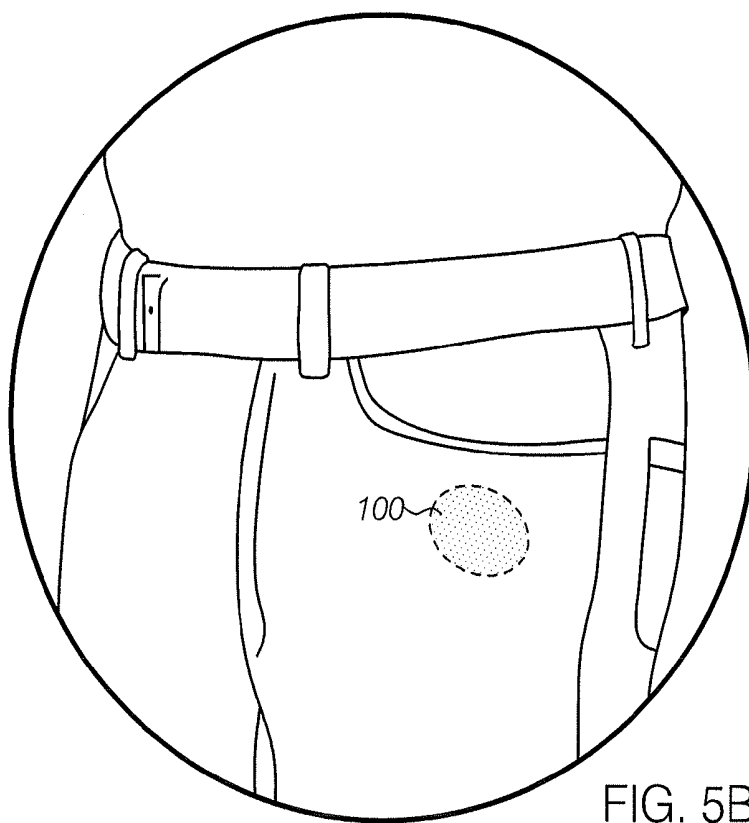


FIG. 5B

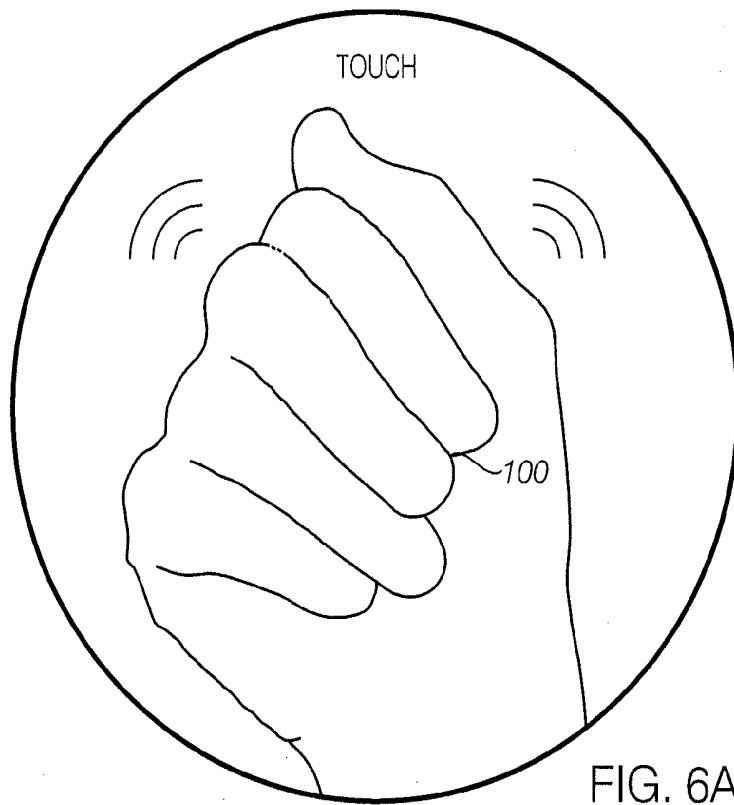


FIG. 6A

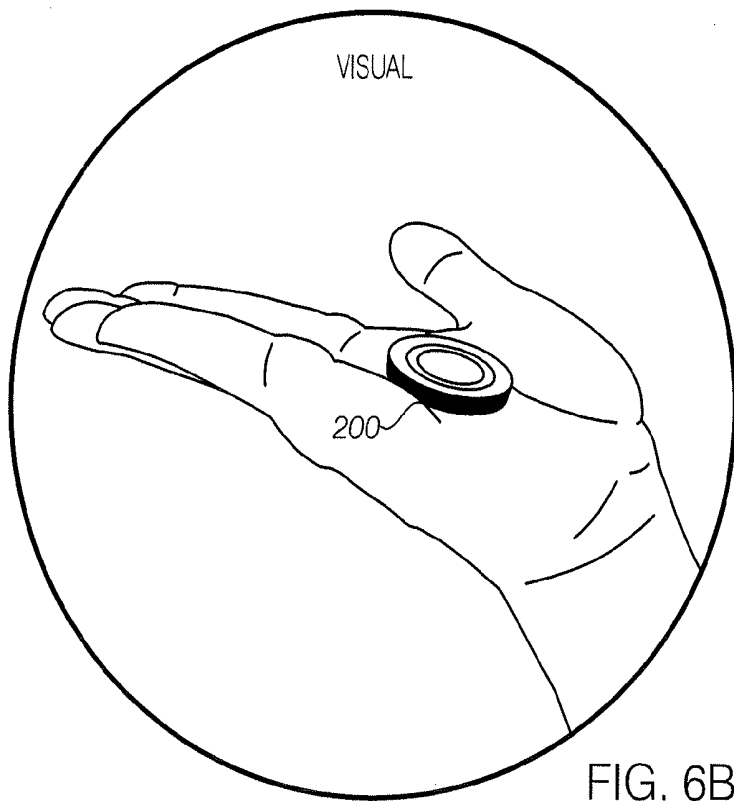


FIG. 6B

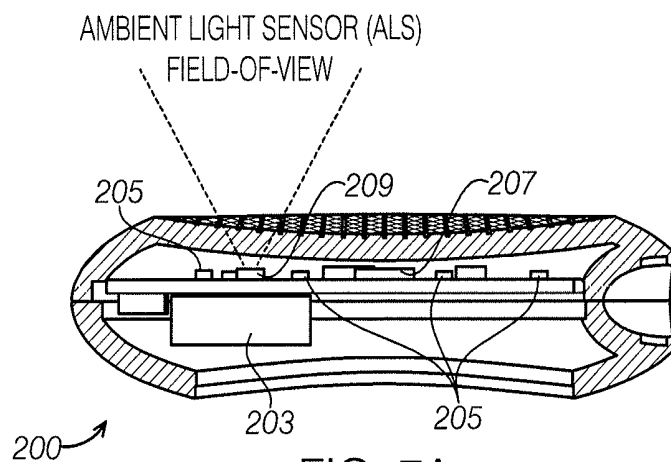


FIG. 7A

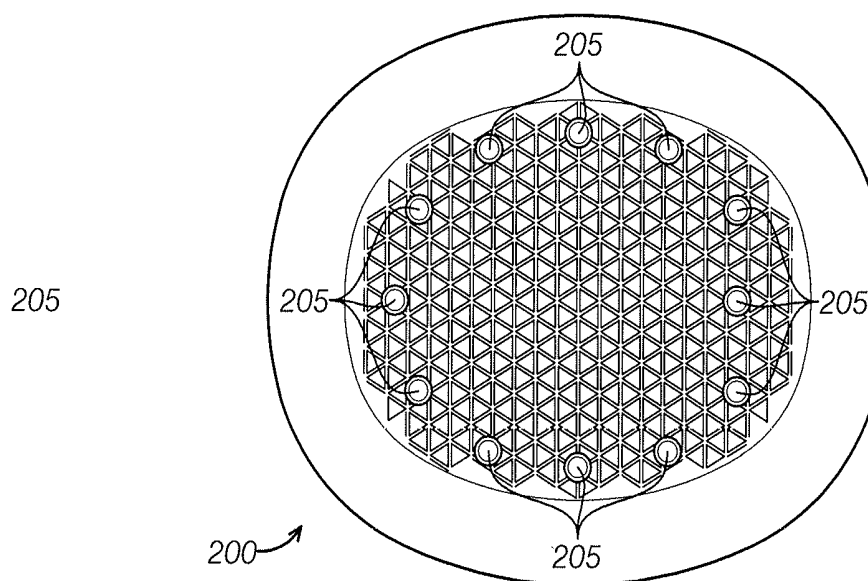


FIG. 7B

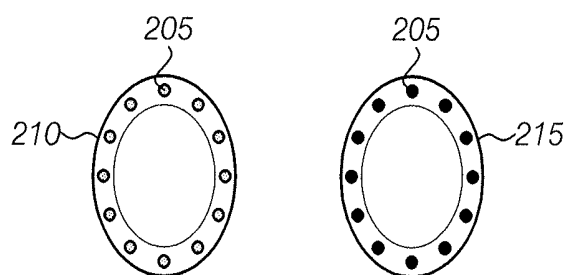


FIG. 7C

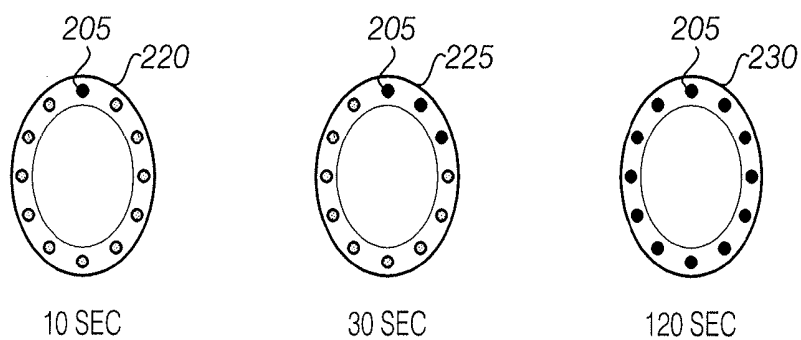


FIG. 8A

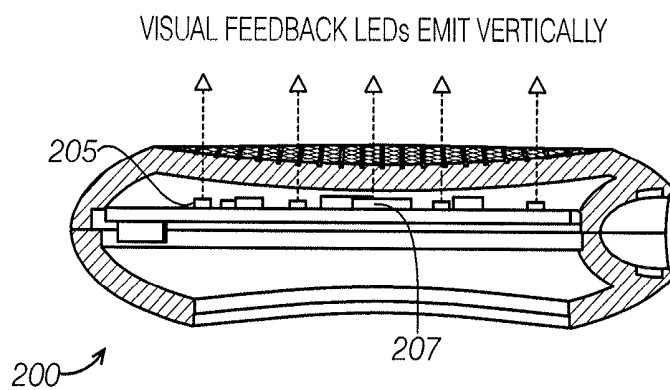


FIG. 8B

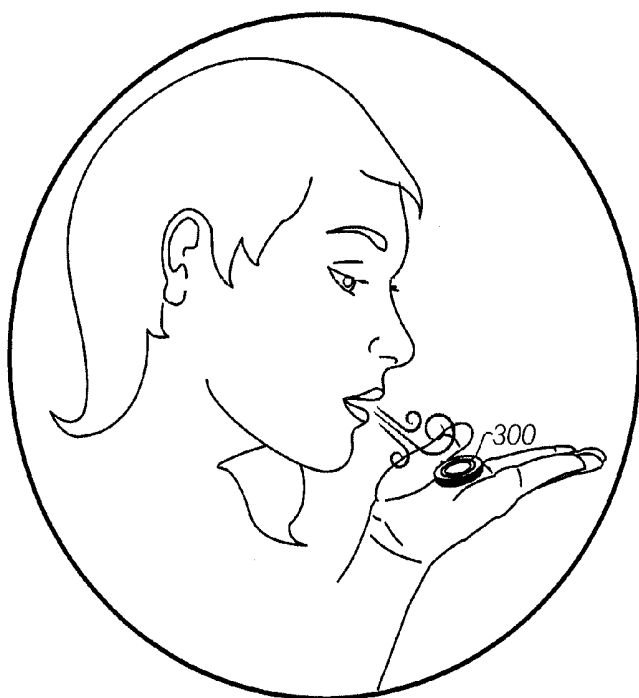


FIG. 9A

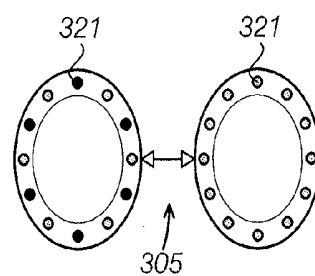


FIG. 9B

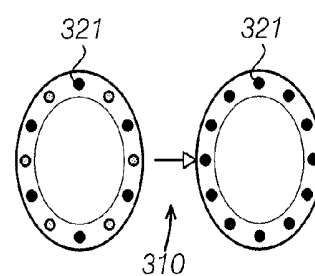


FIG. 9C

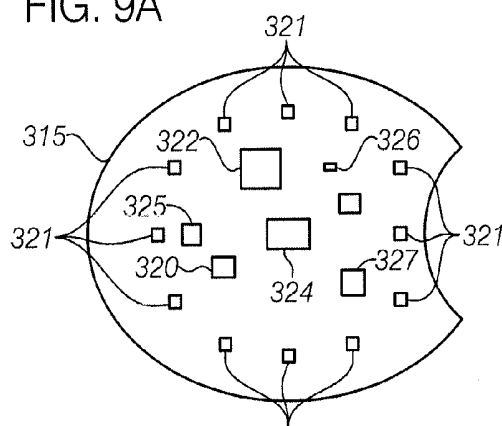


FIG. 9D



FIG. 9E

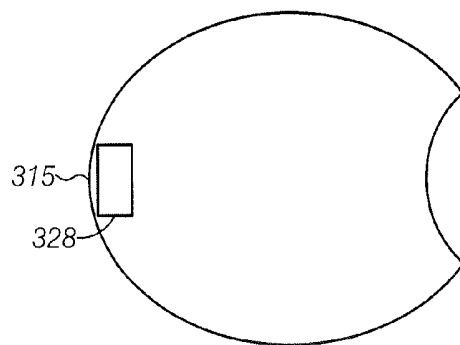


FIG. 9F

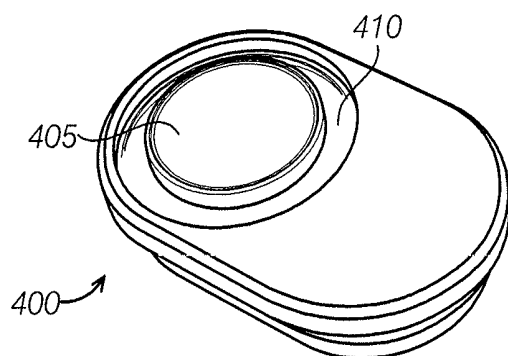


FIG. 10A

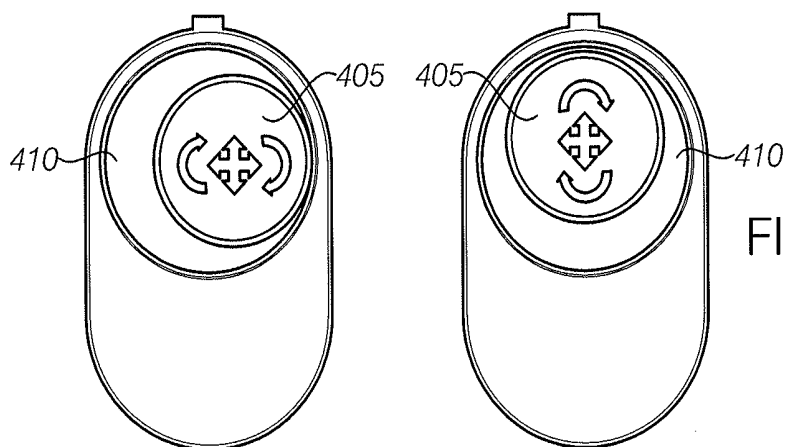


FIG. 10B

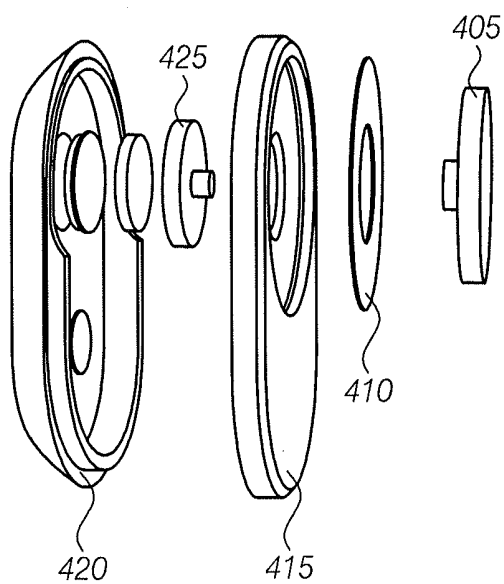


FIG. 10C

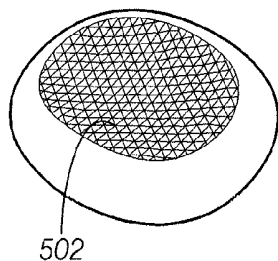


FIG. 11A

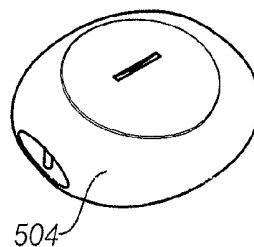


FIG. 11B

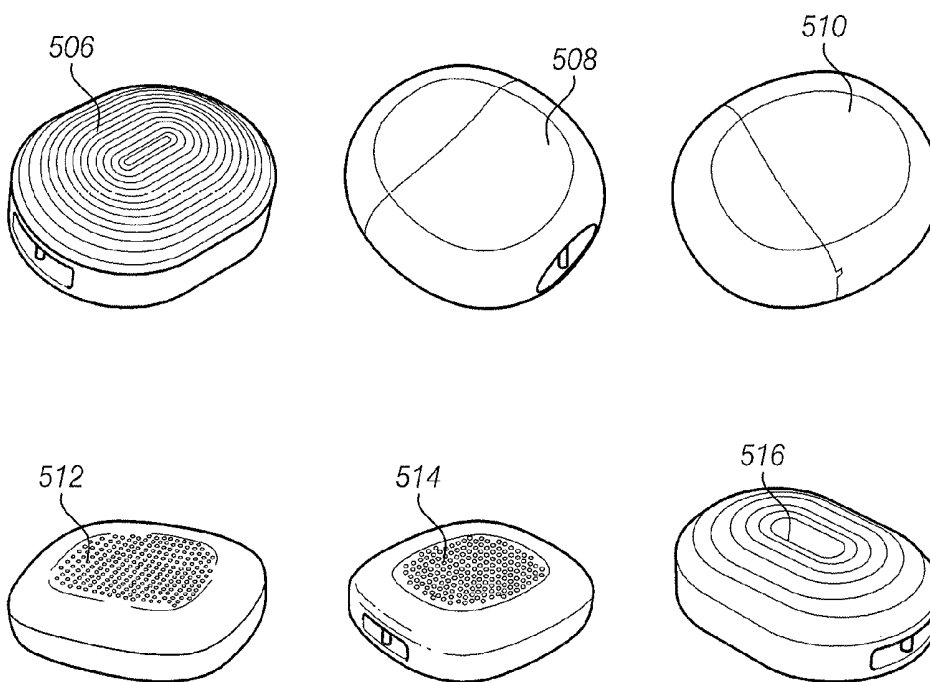


FIG. 11C

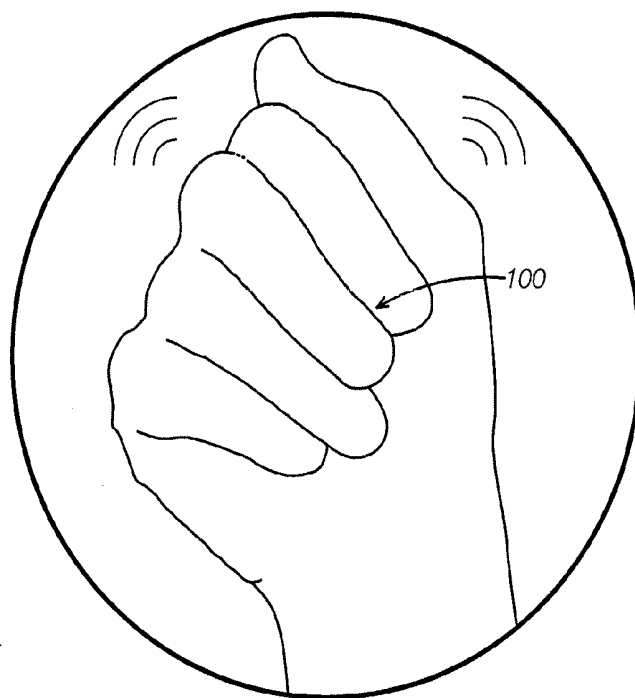


FIG. 12A

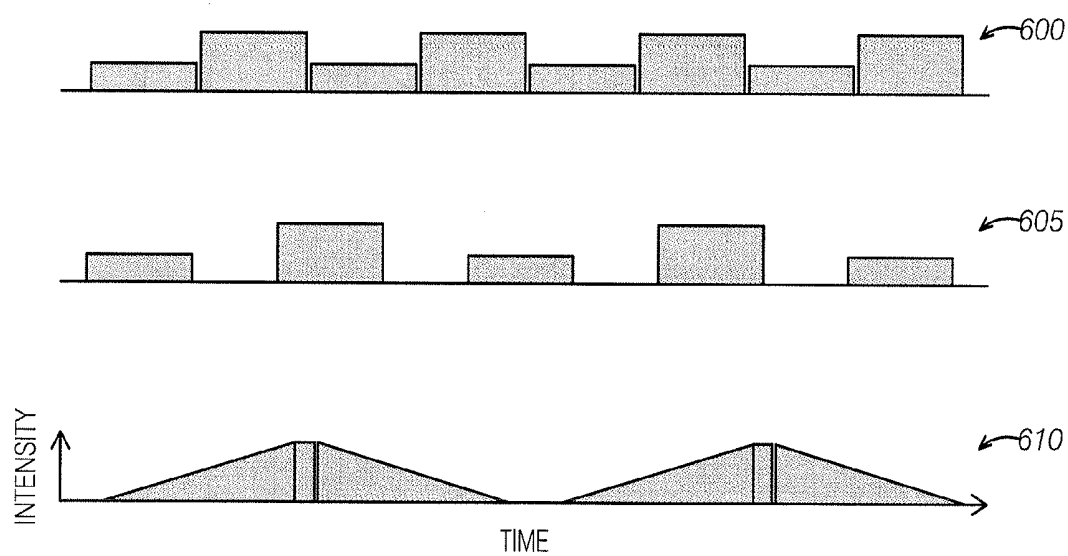


FIG. 12B

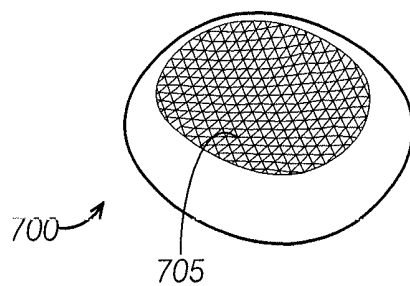


FIG. 13A

NUMBER OF TAPS	DURATION BETWEEN TAPS	INTENSITY OF CRAVING
1	N/A	NEUTRAL / DEFAULT
2-4	LESS THAN 300ms	ELEVATED
4+	LESS THAN 150ms	HIGH

FIG. 13B

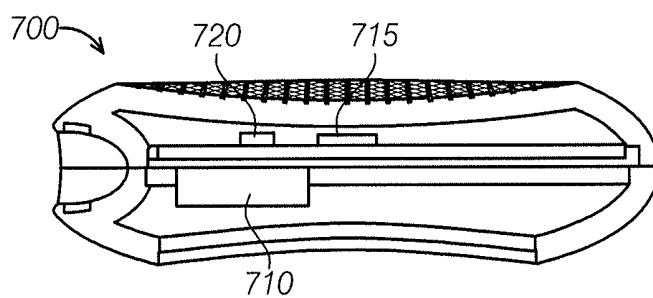


FIG. 13C

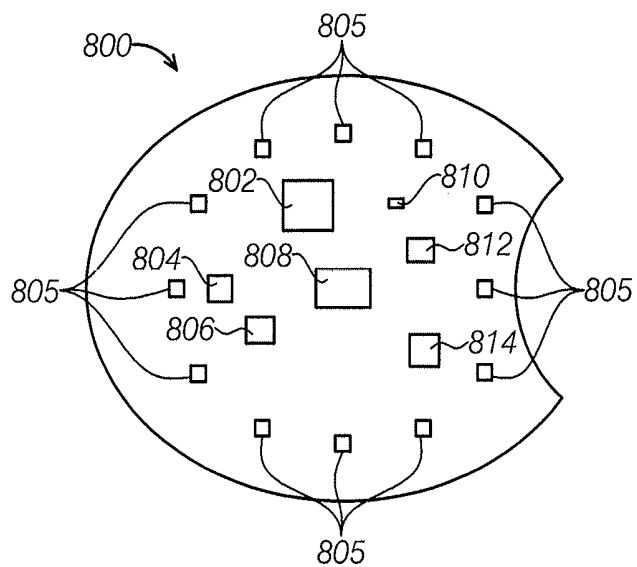


FIG. 14A

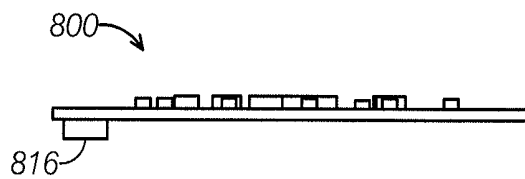


FIG. 14B

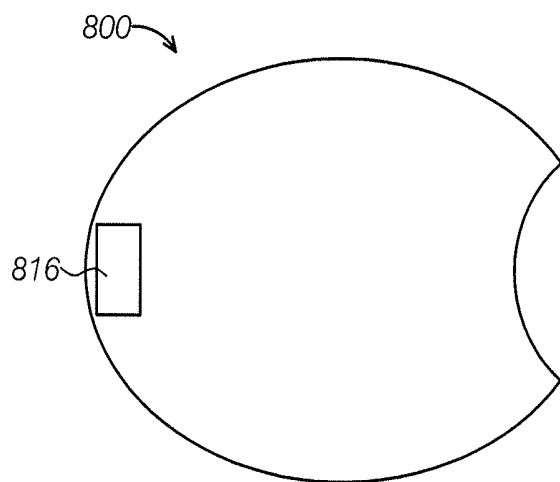


FIG. 14C

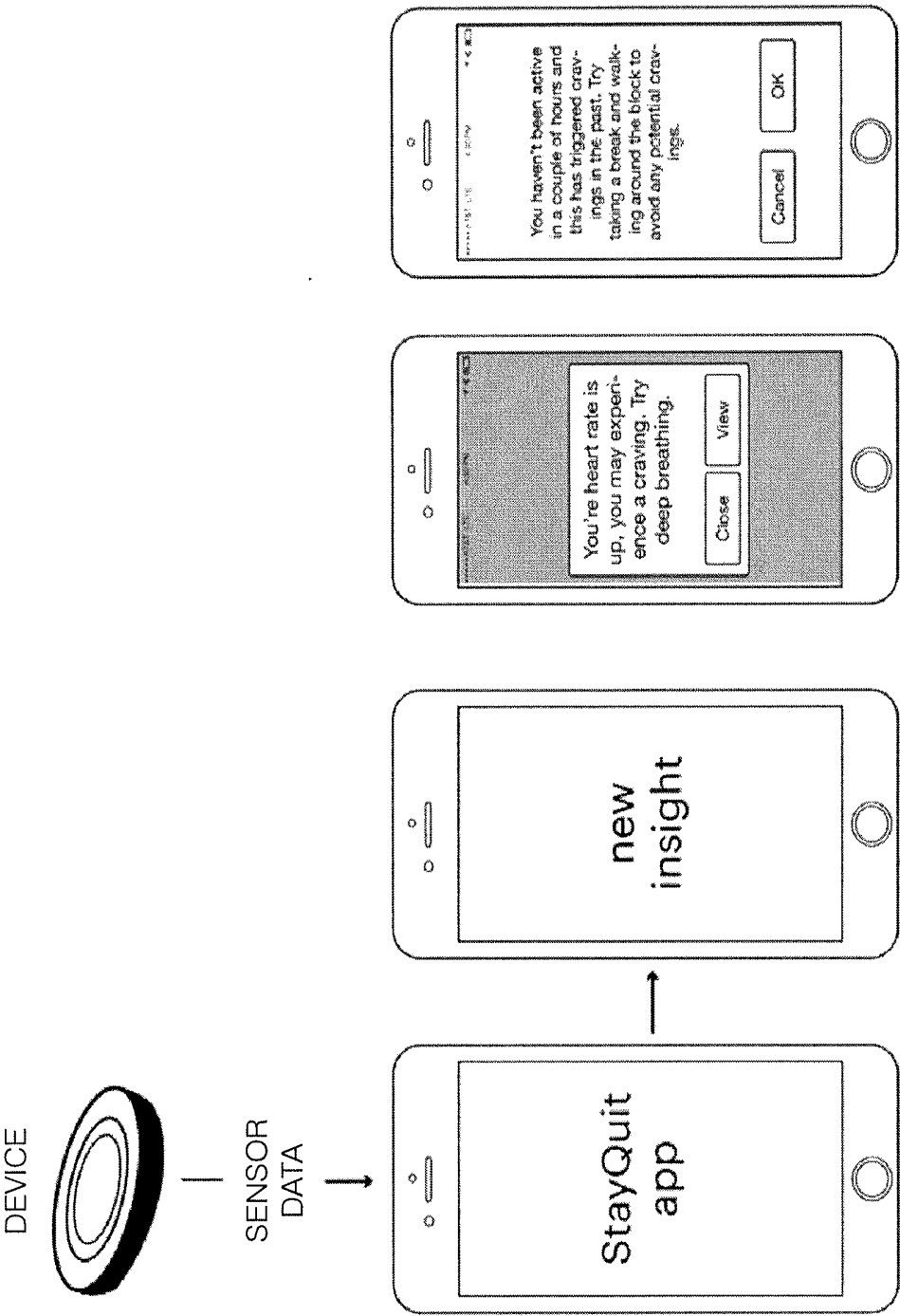


FIG. 15

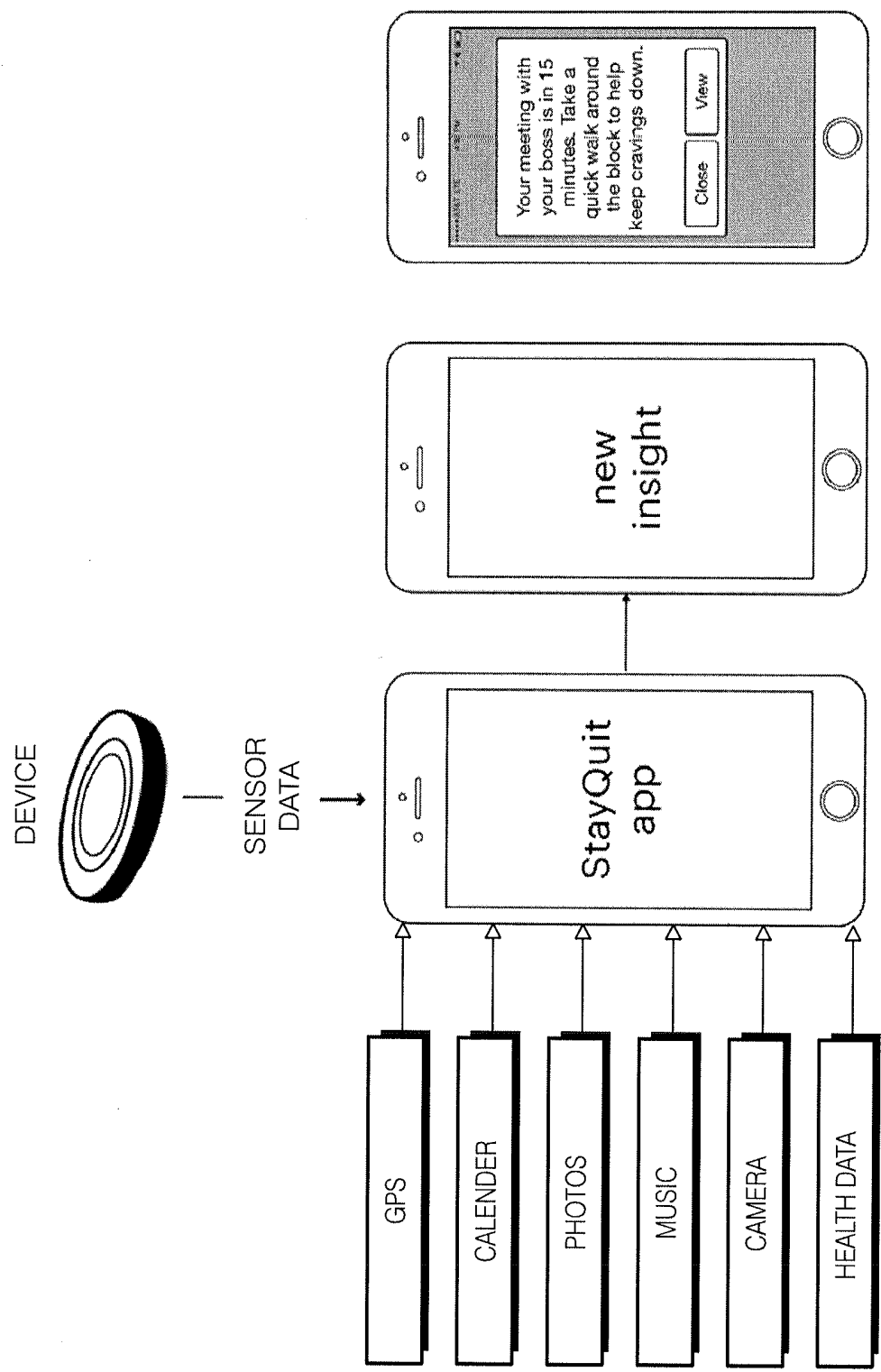


FIG. 16

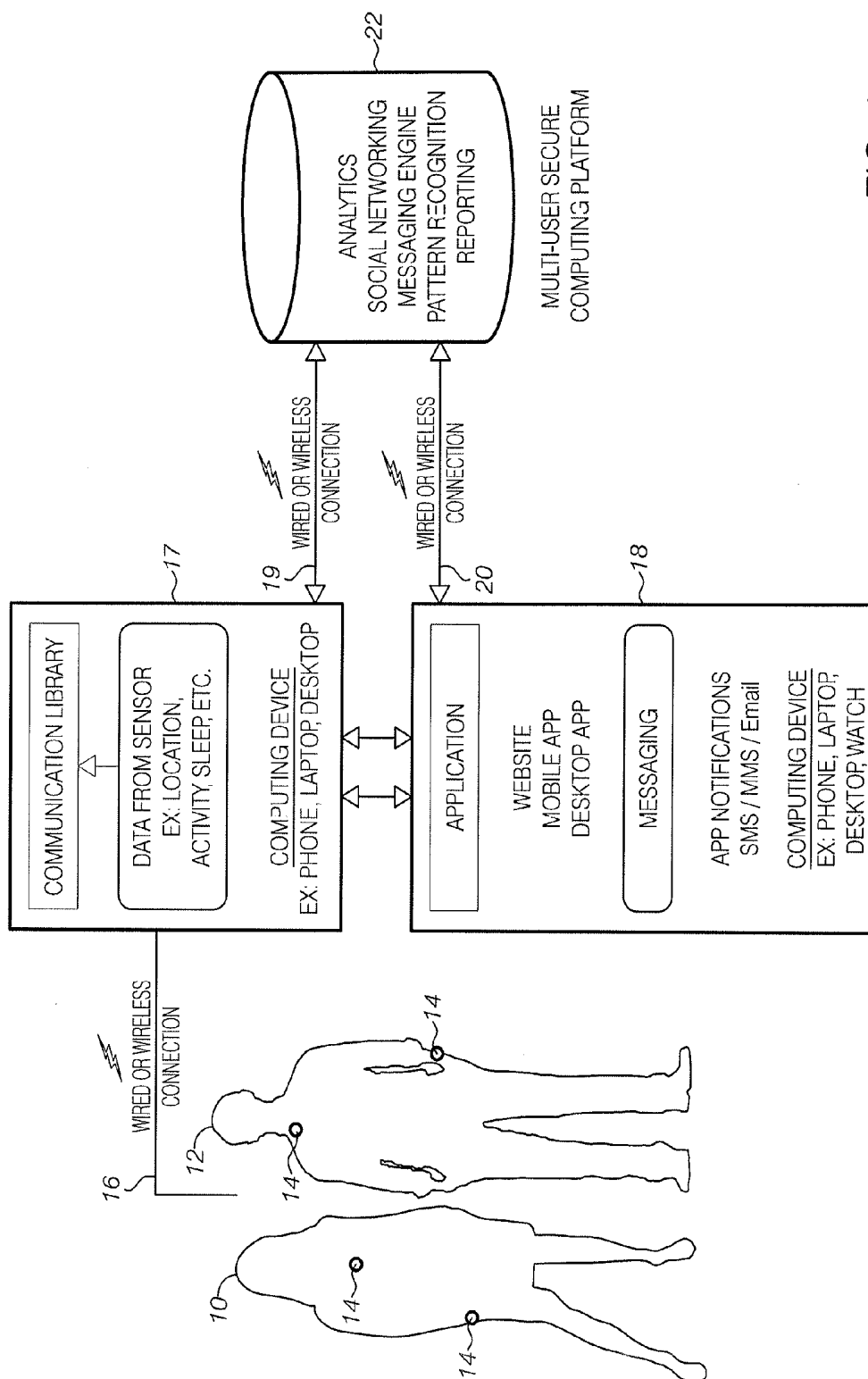


FIG. 17

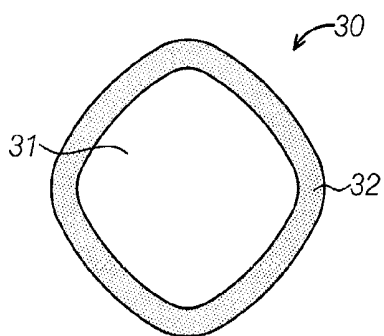


FIG. 18A

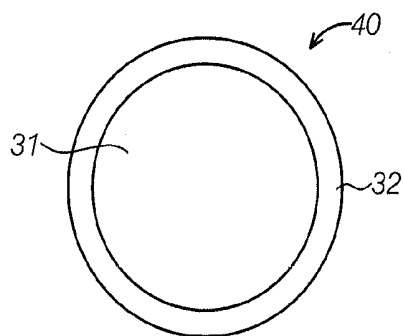


FIG. 19A

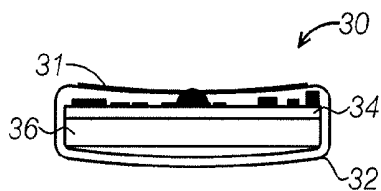


FIG. 18B

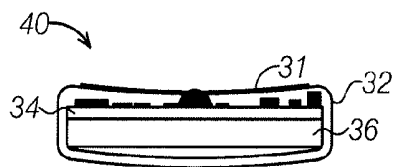


FIG. 19B

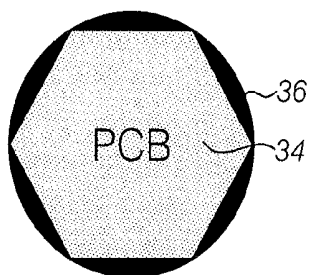


FIG. 20A



FIG. 20B

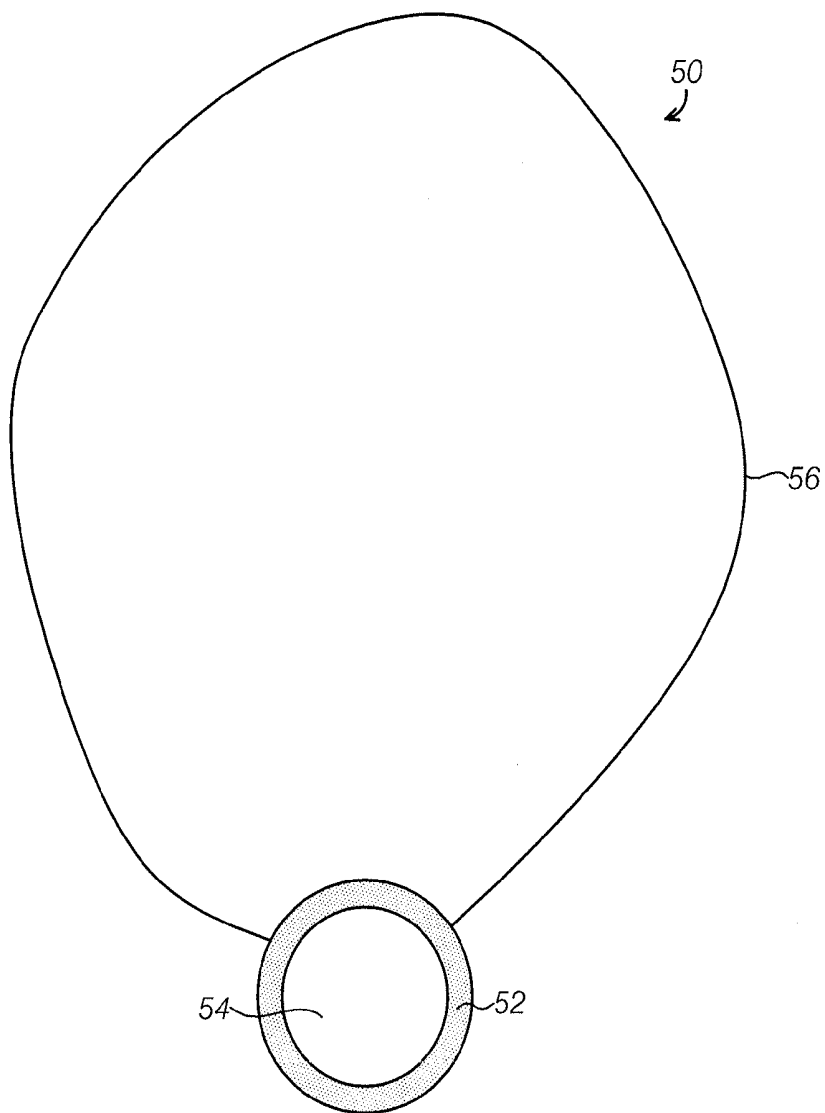


FIG. 21

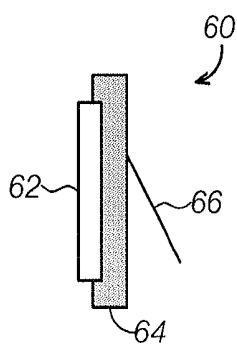


FIG. 22

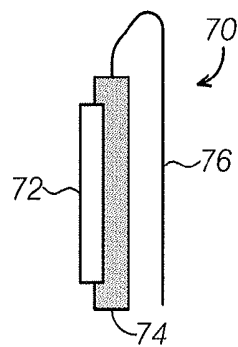


FIG. 23

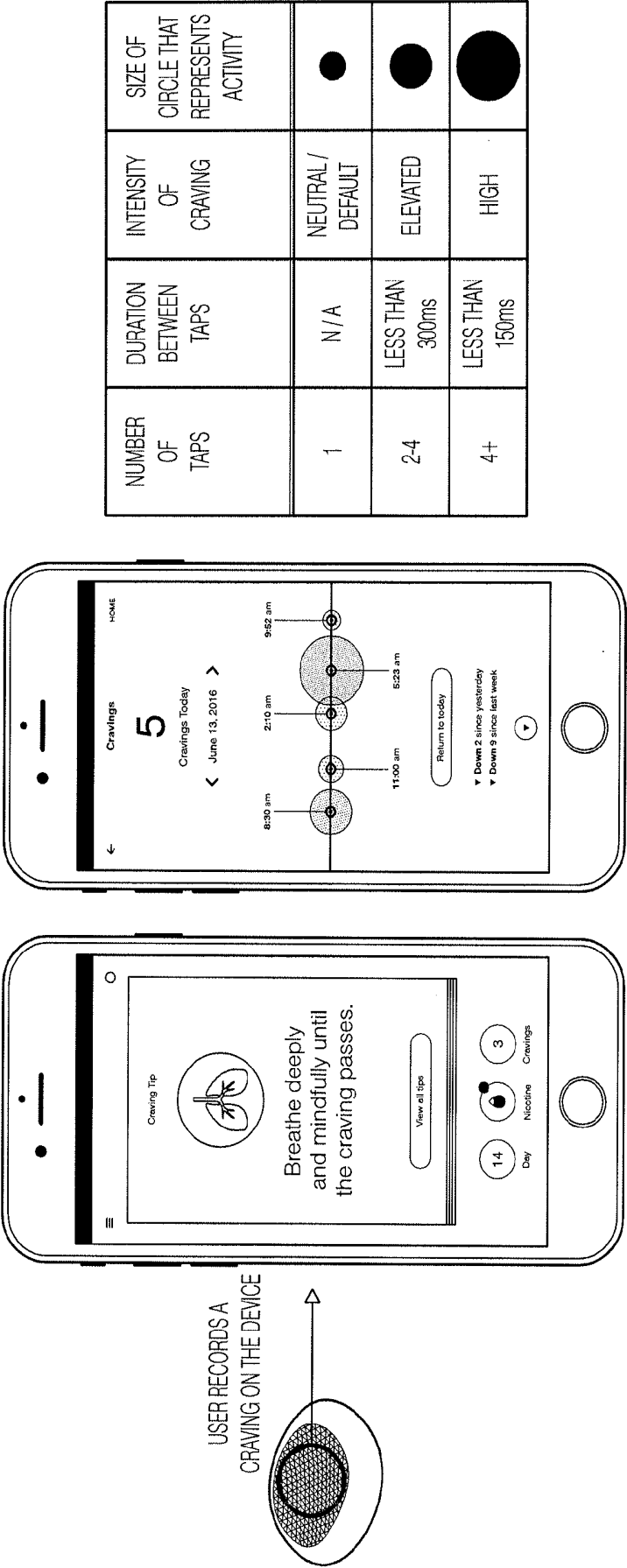


FIG. 24

CRAVING INPUT AND SUPPORT SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Application No. 62/132,436 filed on Mar. 12, 2015, the disclosure of which is herein incorporated by reference in its entirety.

INCORPORATION BY REFERENCE

[0002] All publications and patent applications mentioned in this specification are incorporated herein by reference in their entirety to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

BACKGROUND

[0003] Communication devices to assist users change habitual behavior are known in the prior art. For example, U.S. Pat. No. 5,596,994 describes an interactive behavior modification system that provides motivational messages to a user and obtains information from the user using a computer, personal digital assistant or other personal communication system. In one embodiment, the device asks the user questions, and the user may depress buttons to select answers. Motivational or behavioral information may be sent to the user via the device.

[0004] U.S. Pat. No. 6,567,785 describes a behavior modification device that asks the user whether unwanted behavior has occurred within an earlier time period. The frequency and timing of the prompt signal depends on the response to the previous prompt; future prompts come sooner and more frequently if unwanted behavior has occurred. The system cannot receive unprompted input from the user, such as by indicating when the user has a desire or craving for the undesired behavior, and it therefore has no way to respond to such an unprompted indication from the user.

[0005] There are applications that run on a smartphone that allow users to track cravings and that provide coaching tips for coping with such cravings. Smokers are able to record how often they overcome cravings and see visual renderings of their progress on the mobile application itself. The smartphone application must be used on a smartphone, of course, and therefore lacks an easy and discreet form factor for an input mechanism to identify cravings.

[0006] U.S. Patent Publ. No. 2014/0207048 describes a drug delivery device that includes a data collection application into which the user can input a craving for, e.g., a cigarette. In addition to providing nicotine to help satisfy the craving, the system can respond with a message via text or phone encouraging the user to maintain his or her conviction to the treatment protocol.

FIELD

[0007] The present application relates generally to the field of addiction treatment and craving support. The cravings can be associated with drugs, bioactive agents, other pharmaceutical substances, food, TV, stress, OCD-type behaviors, and other behaviors that can induce cravings.

BACKGROUND

[0008] Successfully quitting an addiction can involve weaning oneself off of the drug and/or modifying psychological and habitual behaviors associated with the addiction or behavior. Cravings associated with a physical drug dependency and/or psychological and habitual behaviors associated with the addiction can result in a relapse. Cravings can occur at set times or can be triggered by external events. Typically the cravings for the specific addictive substance and/or the addictive behavior can last on the order of several minutes and then pass. Improved methods and devices are desired to provide support for the user or patient to handle the periodic cravings with the goal of decreasing instances of relapse and to improve the user's overall success at quitting the addiction.

SUMMARY OF THE DISCLOSURE

[0009] The present invention relates generally to systems and methods for providing support to a user of a device to handle cravings.

[0010] In general, in one embodiment, a craving control device includes a housing, a craving input actuator supported by the housing, the craving input actuator being configured to obtain information from a user pertaining to a timing, frequency, or intensity of a craving, a wireless communicator supported by the housing, a controller operatively connected to the craving input actuator and the wireless communicator to communicate craving timing, frequency, or intensity information received by the craving input actuator via the wireless communicator to a device external to the housing.

[0011] This and other embodiments can include one or more of the following features. The housing can be sized and configured to be enclosed in the user's hand. The housing can be sized and configured to be placed in a pocket of the user's clothing. The housing can be sized and configured to be worn on the user's clothing. The craving control device can further include a distraction feature adapted to distract the user during a craving episode. The distraction feature can be a textured area on an exterior surface of the housing. The distraction feature can be a user-movable element supported by the housing. The distraction feature can be a timer marking an expected duration of the craving episode. The timer can start with actuation of the craving input actuator. The timer can include a visual display configured to change during the expected duration of the craving episode. The visual display can include a plurality of lights. The timer can include a vibration source operable by the controller to vibrate for the expected duration of the craving episode. The controller can be configured to operate the vibration source to vibrate with an intensity that varies during the expected duration of the craving episode. The craving control device can further include a user parameter sensor supported by the housing and adapted to obtain user parameter information relevant to the craving, the controller can be operatively connected to the user parameter sensor to communicate user parameter information sensed by the sensor via the wireless communicator to the device external to the housing. The craving control device can further include an environmental parameter sensor supported by the housing and adapted to obtain environmental information relevant to the craving, the controller can be operatively connected to the environmental parameter sensor to communicate environmental

parameter information sensed by the sensor via the wireless communicator to the device external to the housing. The craving control device can further include a breath sensor and a display supported by the housing, the controller can be operatively connected to the display to provide a target breathing pattern for the user and to the breath sensor to measure a breathing pattern of the user. The craving control device can further include the external device, the external device can include a personal communication device which can have a processor programmed to electronically send a message to a support contact provided by the user. The craving control device can further include the external device, the external device can include a personal communication device which can have a processor programmed to provide craving support to the user in response to craving information from the craving input actuator. The processor of the craving control device can further be programmed to provide the craving support proactively to the user based on a past information from the user pertaining to craving occurrence and craving intensity. The craving control device can further include a user parameter sensor, the personal communication device processor can be further programmed to provide craving support to the user in response to a user parameter sensed by the sensor. The user parameter sensor can include one or more of a: humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor. The craving control device can further include an environmental parameter sensor, the personal communication device processor being further programmed to provide craving support to the user in response to environmental parameter information sensed by the sensor. The environmental parameter sensor can include an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, or a temperature sensor. The controller can further be configured to determine the intensity of the craving based on a pattern received by the input actuator.

[0012] In general, in one embodiment, a method of receiving a craving input from a user including receiving information from the user pertaining to a craving occurrence and an intensity of a craving with a craving control device including a housing and a craving input actuator supported by the housing, the information from the user pertaining to the craving occurrence and craving intensity of the craving received through the craving input actuator; and wirelessly communicating craving occurrence and craving intensity information received by the craving input actuator to a device external to the housing.

[0013] This and other embodiments can include one or more of the following features. The method can further include providing a distraction to the user in response to the craving occurrence and craving intensity information with a distraction feature that is part of the craving control device. The distraction feature can be a textured area on an exterior surface of the housing. The distraction feature can be a user-movable element supported by the housing. The distraction feature can be a timer marking an expected duration of the craving episode, can further include starting the timer after actuation of the craving input actuator. The method can further include providing a visual display with the timer that changes during the expected duration of the craving episode.

Providing the visual display can include providing a plurality of lights. The timer can include a vibration source operable by the controller and further include vibrating the vibration source for the expected duration of the craving episode. The method can further include varying an intensity of the vibration source during the expected duration of the craving episode. The method can further include receiving a user parameter information relevant to the craving with a user parameter sensor supported by the housing and wirelessly transmitting data corresponding to the user parameter information to the device external to the housing. The method can further include receiving an environmental parameter information relevant to the craving with an environmental parameter sensor supported by the housing and wirelessly transmitting data corresponding to the environmental parameter information to the device external to the housing. The method can further include receiving breathing parameter information relevant to the craving from the user with a breath sensor supported by the housing and providing a target breathing pattern for the user with a display supported by the housing. The method can further include providing a craving support to the user in response to craving information from the craving input actuator with the external device. The method can further include receiving information from a user parameter sensor supported by the housing and providing a craving support to the user based on a user parameter sensed by the user parameter sensor. The user parameter sensor can include one or more of a: humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor. The method can further include receiving information from an environmental parameter sensor supported by the housing and providing a craving support to the user based on the environmental parameter sensed by the environmental parameter sensor. The environmental parameter sensor can include an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, or a temperature sensor. The housing can be sized and configured to be enclosed in the user's hand. The housing can be sized and configured to be placed in a pocket of the user's clothing. The external device can include a personal communication device including a display and further including providing instructions to the user to modify a breathing pattern of the user with the display of the personal communication device. The external device can include a personal communication device including a display and further including providing information to the user with the display of the personal communication device relating to the timing and intensity of the cravings. The method can further include determining the intensity of the craving based on a pattern received by the input actuator. The external device can include a personal communication device and further including electronically sending a message to a support contact provided by the user upon receiving information from the user pertaining to the occurrence and intensity of the craving. The method can further include providing a distraction to the user proactively based on a past information from the user pertaining to craving occurrence and craving intensity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The novel features of the invention are set forth with particularity in the claims that follow. A better under-

standing of the features and advantages of the present invention will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the invention are utilized, and the accompanying drawings of which:

[0015] FIGS. 1A and 1B illustrate a top view and a bottom view, respectively, of a craving control device in accordance with some embodiments.

[0016] FIGS. 2A-2C illustrate a top view and two side views, respectively of a craving control device in accordance with some embodiments.

[0017] FIG. 3 is a schematic illustration of a craving control device in accordance with some embodiments.

[0018] FIG. 4 illustrates an exploded view of a craving control device in accordance with some embodiments.

[0019] FIG. 5A illustrates an embodiment of a craving control device held in the hand of a user. FIG. 5B illustrates an embodiment of a craving control device held in the pocket of a user.

[0020] FIG. 6A illustrates an embodiment of a craving control device held in the hand of a user providing touch feedback to the user. FIG. 6B illustrates an embodiment of a craving control device held in the hand of a user providing visual feedback to the user.

[0021] FIG. 7A illustrates a cross-sectional view of an embodiment of a craving control device. FIG. 7B illustrates a top view of an embodiment of a craving control device. FIG. 7C illustrates two schematics of different light patterns displayed by a craving control device.

[0022] FIG. 8A illustrates three schematics of different light patterns displayed by a craving control device. FIG. 8B illustrates a cross-sectional view of an embodiment of a craving control device.

[0023] FIG. 9A illustrates a user breathing onto an embodiment of a craving control device. FIGS. 9B and 9C illustrate schematics of different light patterns displayed by a craving control device. FIG. 9D illustrates a top view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein. FIG. 9E illustrates a side view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein. FIG. 9F illustrates a bottom view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein.

[0024] FIG. 10A illustrates an embodiment of a craving control device with a distraction feature. FIG. 10B illustrates an embodiment of a craving control device with a distraction feature at different positions. FIG. 10C is an exploded view of an embodiment of a craving control device with a distraction feature.

[0025] FIGS. 11A-11C illustrate multiple different surfaces and textures that can be used in embodiments of craving control devices.

[0026] FIG. 12A illustrates an embodiment of a craving control device held in the hand of a user providing a vibrational signal to the user. FIG. 12B illustrates examples of vibrational patterns that can be generated by embodiments of the craving control devices and provided to the user.

[0027] FIG. 13A illustrates a top view of an embodiment of a craving control device. FIG. 13B illustrates a chart showing an embodiment correlating button taps to craving

intensity. FIG. 13C illustrates a cross-sectional view of an embodiment of a craving control device.

[0028] FIG. 14A illustrates a top view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein. FIG. 14B illustrates a side view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein. FIG. 14C illustrates a bottom view of an embodiment of a printed circuit board with sensors that can be used in the craving control devices described herein.

[0029] FIG. 15 illustrates a schematic example of a craving control device interfacing with a personal communication device along with samples for images displayed by the personal communication device in accordance with some embodiments.

[0030] FIG. 16 illustrates a schematic example of a craving control device interfacing with user data and a personal communication device along with samples for images displayed by the personal communication device in accordance with some embodiments.

[0031] FIG. 17 shows one embodiment of a craving input mechanism and a network environment for interfacing with it.

[0032] FIGS. 18A and 18B show top and cross-sectional views of an embodiment of a craving input mechanism.

[0033] FIGS. 19A and 19B show top and cross-sectional views of an embodiment of a craving input mechanism.

[0034] FIGS. 20A and 20B are top and cross-sectional views of the printed circuit board and battery for use with a mechanism in accordance with some embodiments.

[0035] FIG. 21 shows a craving input mechanism with a button in a housing or support structure supported by a necklace chain in accordance with some embodiments.

[0036] FIG. 22 shows a craving input mechanism with a button in a housing or support from which an attachment pin extends in accordance with some embodiments.

[0037] FIG. 23 shows a craving input mechanism with a button in a housing or support from which a clip extends in accordance with some embodiments.

[0038] FIG. 24 illustrates a schematic example of a craving control device interfacing with user data and a personal communication device along with samples for images displayed by the personal communication device in accordance with some embodiments.

DETAILED DESCRIPTION

[0039] Individuals experiencing cravings they wish to resist (e.g., nicotine cravings) would benefit from a discreet and effective way to communicate a craving and receive support to resist the craving. The prior art has not provided a device and system to do so. The craving control device is designed so that the physical device is hidden from others and the way that it is interacted with can be hidden and discreet. The craving control device can provide support to the user during a craving episode or proactively prior to a craving episode to reduce the likelihood of the user relapsing. The craving control devices described herein can increase the overall success for the user to quit the addictive activity.

[0040] Craving control device are described herein. The craving control devices can include a housing and a craving input actuator supported by the housing. The craving input actuator can be configured to obtain information from a user pertaining to a timing, frequency, or intensity of a craving.

The user can press a surface of the housing to actuate the craving input actuator. The craving control device can include a wireless communicator supported by the housing. The craving control device can include a controller operatively connected to the craving input actuator and the wireless communicator to communicate craving timing, frequency, or intensity information received by the craving input actuator via the wireless communicator to a device external to the housing.

[0041] One embodiment of the invention provides a drug delivery system for, e.g., delivering nicotine transdermally and includes a mechanism for activation by a user to identify a craving experienced by the user. The mechanism may be, e.g., a button on a transdermal delivery device such as that disclosed in U.S. Patent Publ. No. 2014/0207048. In some embodiments, the system will record the incidence and duration of the cravings. The system may also give the user tactile, visual and/or auditory feedback related to and during craving episodes to help the user cope with craving-related anxiety and to provide encouragement to the user to overcome the craving. The system may also send data, such as that of a cigarette craving, duration of a craving, and result of the craving (e.g., smoking a cigarette or overcoming the craving), to a companion mobile app in a nearby smartphone for behavioral support and predictive modeling.

[0042] The craving control device can have a discrete size and shape. The housing can be sized and configured to be enclosed in the user's hand. The housing can be sized and configured to be placed in a pocket of the user's clothing. The housing can be sized and configured to be worn on the user's clothing.

[0043] The craving control device can provide craving support and behavioral support. The support can be provided in anticipation of a craving or upon actuation of the craving input actuator on the craving control device.

[0044] The craving control device can include a distraction feature adapted to distract the user during a craving episode. In some embodiments the distraction feature can be a textured area on an exterior surface of the housing. In some embodiments the distraction feature can be a user-movable element supported by the housing. The textured surface and user-movable element can both function as a distraction to the user by redirecting physical habits to reduce cravings. In the example of nicotine dependency the distraction feature can provide the user something to do with their hands to distract them from the hand-to-mouth smoking gesture. The user can rub the textured surface and/or move the user-movable element to distract from the craving episode. The craving input device can also gather user data via the movement of the user-movable element and the use of the textured surface to categorize or quantify the craving episode, such as the craving intensity.

[0045] In some embodiments the distraction feature can be a timer marking an expected duration of the craving episode. The timer can distract the user from the craving episode. The timer can start with actuation of the craving input actuator. In some embodiments the timer can include a visual display configured to change during the expected duration of the craving episode. The visual display can include a plurality of lights. In some embodiments the timer can include a vibration source operable by the controller to vibrate for the expected duration of the craving episode. The controller can be configured to operate the vibration source to vibrate with an intensity that varies during the expected duration of the

craving episode. The timer feedback mode (e.g. visual through the display or tactile through the vibration source) can be automatically selected by the craving control device. For example, an ambient light sensor on the device can determine the ambient light conditions. If a dark environment is detected, such as the device is enclosed in the hand of the user, then tactile feedback can be selected and initiated. If a light environment is detected then the visual feedback can be initiated. The length of the timer can be selected based on a typical craving length of about two minutes. In some embodiments the timer duration can be set by the user or determined by the system based on the user information. The user can let the timer go through the entire 2 minutes or they can stop the timer, which then lets the system know that the craving was overcome earlier than the 2 minutes. The user can also input whether they overcome the craving using the craving control device or the smartphone companion application.

[0046] In some embodiments the vibration source and/or the visual display can be used to convey information to the user. The visual display can be represented as a circle of lights that rotates to indicate time, pulses to indicate intensity, and changes color to indicate type of content. The vibration source can be configured to generate a series of patterns that can represent specific information, such as a timer, intensity, and specific information. The users can also customize the display and vibrational patterns for the timer through the companion smartphone application.

[0047] The craving control device can include a variety of different sensors, such as user parameter sensors and environmental sensors. The sensors can be supported by the housing and a controller in the craving control device can be operatively connected to the sensor to communicate sensor information sensed by the sensor via the wireless communicator to a device external to the housing. The sensors can be supported on a printed circuit board (PCB) within the housing of the craving control device or in electrical communication with a processor on the PCB.

[0048] The user parameter sensor can include one or more of: a humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor. In the example of the ECG lead or EMG lead, sensors can be used that adhere to the skin of the user and that are in electrical communication with the processor to relay signals sensed by the ECG lead/EMG lead.

[0049] The environmental parameter sensor can include one or more of: an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, or a temperature sensor.

[0050] In some embodiments the craving control device can include a breath sensor and a display supported by the housing. The breath sensor can sense the user's breathing pattern and the display of the craving control device can provide a target breathing pattern for the user. Instructions can also, or in the alternative, be provided to the user to modify a breathing pattern of the user with a display of a personal communication device.

[0051] The controller can be configured to determine the intensity of the craving based on a pattern received by the craving input actuator, such as the number of times the craving input actuator is actuated and a time between

actuators of the craving input actuator. The severity and mood of a craving can be assigned based on the pattern of actuating the input actuator. A software algorithm calculates the severity based on frequency and duration of presses over a duration of time. For example, if the button is pressed multiple times in a short amount of time (seconds) or, alternatively, if the button is pressed firmly vs. gently, then the system can register the craving as being more severe. The level of severity of the craving can be visualized in a display.

[0052] The external device can include a personal communication device having a processor. The processor can be programmed to electronically send a message to a support contact provided by the user. The processor can be programmed to provide craving support to the user in response to craving information from the craving input actuator. The processor in the personal communication device can be programmed to provide a craving support proactively to the user based on a user history data or user information like the occurrence and intensity of a craving. The processor of the personal communication device can be configured to provide information to the user with the display of the personal communication device relating to the timing and intensity of the cravings.

[0053] In some embodiments, the craving input mechanism may be in a structure independent of a drug delivery device. In such embodiments, the system may include a craving input mechanism supported on a wearable device such as a bracelet, brooch or pendant. The user may activate the craving input mechanism to identify a craving incident, and the system may record the incidence and duration of the cravings. The system may also give the user tactile (e.g., via haptic feedback in vibrational patterns against the user's body), visual and/or auditory feedback (e.g., LED displays and audible chimes) related to and during craving episodes to help the user cope with craving-related anxiety and to provide encouragement to the user to overcome the craving. The system may also send data, such as the of a cigarette craving, duration of a craving, and result of the craving (e.g., smoking a cigarette), to a companion mobile app in a nearby smartphone for behavioral support and predictive modeling. The system may be used to address cravings and addictive behavior attributed to cigarette smoking, food cravings; sugar cravings; alcohol cravings; marijuana cravings; nicotine cravings; gambling cravings;

[0054] sexual cravings; and other destructive compulsive behaviors. Other form factors of the device include a wristband, an armband, an anklet, a necklace, a ring, an earring, and an adhesive-attached pod. The device may also be a stand-alone system not worn on the body. The device could include multiple sensors and functions that support the system's overall pursuit of improved health and wellbeing. These sensors and functions could include but are not limited to: accelerometers, heart rate monitors, blood pressure monitors, skin temperature monitors, haptic vibration patterns, LED displays, and auditory signals. This functionality may also be combined with a transdermal drug delivery device, such as that disclosed in U.S. Patent Publ. No. 2014/0207048.

[0055] In some embodiments, the system may be used to record the beginning of a craving episode, the end of a craving episode, the duration of a craving episode, and/or the result of a craving episode (i.e., whether or not the user succumbed to the craving). The craving input mechanism may be, e.g., button(s), lever(s), a surface that registers a

gesture such as a swipe, a press, a tap, and/or a pinch, and/or a speaker for an audio recording.

[0056] In some embodiments, the system may include one or more of the following:

[0057] a backend subsystem that stores data in a secure and confidential manner and includes an algorithm-driven predictive modeling engine that analyzes data from the craving input mechanism

[0058] a mobile application to predict cravings, trend historical cravings data, and trigger proactive tailored messages to help users cope with cravings

[0059] a mobile device capable of receiving data about the craving event, whether via a wireless connection, a wired connection or both

[0060] a computer capable of receiving data about the craving event, whether via a wireless connection, a wired connection or both

[0061] a large, multi-user application, which is capable of receiving data about the craving event, whether via a wireless connection or a wired connection, or both.

[0062] These and other features enable the system of this invention to capture and record craving events discretely and easily to aid the user with understanding their unique and individual craving patterns and data related to succumbing and/or overcoming the cravings. Furthermore, the data captured can be transferred to a larger system to harness unique processing capabilities of a larger ecosystem. The data that is captured in each recording includes but is not limited to: time of craving, length of craving from start of episode to end of episode, and result of the craving.

[0063] In some embodiments, each time the user actuates the craving input mechanism to indicate a craving episode, the system initiates a built-in timer, which signals via vibration, sound or visual display, the start and end of the craving episode to the user. As most craving episodes last only a few minutes, the built-in timer will signal to the user when the craving should be ending. After the timer indicates the completion of the craving episode, the user will receive tactile, visual or auditory feedback from the system that the craving episode has passed. Users benefit from knowing that each craving episode lasts a fixed duration with a definitive end.

[0064] In some embodiments, the system includes sensors and built-in functionality to provide feedback to the user regarding each craving episode and series of episodes. The feedback may include: (1) haptic vibrational patterns felt against the body that are designed to soothe the User in the moment of the craving and provide information about the craving; (2) visual displays on the device (lights, animations, text, etc.) to provide the user with data regarding the cravings and encouragement to cope with cravings; and/or (3) auditory signals such as chimes and beeps to signal craving events and provide information about the cravings to the user. The feedback is triggered via algorithms embedded within the system that leverage the user's data collected by the craving input mechanism itself.

[0065] In some embodiments, the system includes a mechanism configured to provide physical vibrational patterns felt against the body to the user during a user-reported craving episode, as entered by the user via the craving input mechanism. The craving therapy could take the form of, e.g., a combination of vibrational/haptic patterns felt against the user's body along with visual and auditory signals. The patterns emitted by the device are intended to provide

therapeutic, calming benefit to the user to help him/her cope with the craving, and associated feelings of anxiety, in the moment the craving is occurring.

[0066] Some embodiments of the invention includes a cravinging calculator, i.e., a robust set of analytics and predictive algorithms that harness data collected through the cravinging input mechanism as well as from other applications, such as a complementary mobile application or third party mobile tools, and then analyze and compute both cravinging data input by the user and data from the user's ecosystem (e.g., data collected by other apps running on a smartphone/desktop system) to educate and inform the user about his/her past and future cravinging episodes. Example of data that can be analyzed includes: the number of cravingings, severity of cravingings, mood, physical activity, location during times of cravingings, etc. This innovation allows a user to view historical patterns of his/her cravingings in context of their lives as well as predictive data for when future cravingings may occur.

[0067] FIGS. 1A and 1B illustrate a top view and a bottom view, respectively, of a cravinging control device 100 in accordance with some embodiments. The cravinging control device 100 includes a housing with a first surface 102 and a second surface 106 on an opposing side of the housing from the first surface 102. The first surface 102 includes a textured area 104 that can serve as a distraction feature. The first surface 102 can be flexibly such that the user can press the surface to actuate one or more actuators or buttons internal to the housing of the crave control device 100. The first surface 102 is illustrated with a concave configuration. The second surface 106 is illustrated with a smooth texture 108.

[0068] FIGS. 2A-2C illustrate a top view and two side views, respectively of a cravinging control device 100 in accordance with some embodiments. The illustrated cravinging control device 100 is designed such that it can be used discreetly. The illustrated cravinging control device 100 is sized such that it can be discreetly held in the user's hand, placed in a pocket, or used such that it others do not know the user is holding or using the device. The cravinging control device 100 is illustrated as 36.5 mm tall, 32.5 mm wide, and 11 mm deep. The illustrated cravinging control device 100 includes matte finish on a portion of the first surface 102 that can provide an easier hand grip to help prevent dropping the device. A smooth finish, such as a high-polish smooth finish can be provided on the second surface 108 to allow for easier insertion into a pocket. The smooth finish of the second surface 108 and illustrated convex curved shape can improve the comfortable engagement with the palm of the user. The first surface 102 and textured area 104 have a concave curved shape that conforms to the thumb to allow the user to push the surface with the thumb to actuate a cravinging input actuator within the device 100 and to rub the first surface 102 and the textured area 104 to receive a distraction when experiencing a cravinging.

[0069] FIG. 3 is a schematic illustration of a cravinging control device in accordance with some embodiments. The cravinging control devices can include any and all of the elements illustrated in FIG. 3 and any of the sensors described herein. FIG. 3 illustrates a battery that powers the device. The processor can receive and send signals to the illustrates sensors including the light sensor, motion sensor, heart rate sensor, temperature sensor, humidity sensor, galvanic skin response, or any of the other sensors described herein. The processor can also receive signals from the tactile switch as well as send instructions to the vibration

element. The processor can also send and receive signals to any LEDs that are part of the cravinging control device, such as the 12 LEDs illustrated in FIG. 3. The processor can send and receive data via the Bluetooth radio and Bluetooth antenna. For example, data can be sent from the processor through the Bluetooth radio and antenna wirelessly to a computer network or a device external to the housing of the cravinging control device. Examples of devices external to the cravinging control device include: a server, a computer network, a tablet computer, desktop computer, laptop computer, a display, a personal communication device like a smartphone or tablet computer, etc. The processor can send data to a back end server for analysis of the user and information received from the user during the use of the device. The back end server can process the data to learn insights specific to the user and send the processed data to the cravinging control device and/or a smartphone application. The processed data can modify the psychological and cravinging support provided by the cravinging control device and/or the smartphone applications. The examples of sensors illustrated in FIG. 3 are non-limiting as any of the sensors described herein can be included in the cravinging control devices described herein.

[0070] FIG. 4 illustrates an exploded view of a cravinging control device 100 in accordance with some embodiments. FIG. 4 illustrates an outer housing surface 150 with the distraction feature (textured area) and the first surface of the housing. A printed circuit board (PCB) 155 is contained within the housing of the cravinging control device. The PCB 155 can contain or support any and all of the structures illustrated in FIGS. 3. The illustrated PCB 155 includes light sources 156, a processor and radio 157, antenna 158, tactile switch or input actuator 159, environmental sensor 161, first user parameter sensor 162, second user parameter sensor 163, and third user parameter sensor 164. Any of the environmental sensors described herein can be used for the environmental sensor 161. Any of the user parameter sensors described herein can be used for the first user parameter sensor 162, second user parameter sensor 163, and third user parameter sensor 164. The cravinging control device can include a vibration element 160 that can provide vibration feedback to the user to distract the user during a cravinging episode. Examples of vibration elements 160 that can be used in the cravinging control devices described herein include a haptic driver, linear resonance actuators (LRA), eccentric rotating mass (ECM) actuators, and other vibration elements used in electronic devices such as smartphones. In one example, the vibration element is the DRV2605 from Texas Instruments®. The cravinging control device includes a battery 165 configured to provide power to the components of the cravinging control device. The cravinging control device also includes an outer housing surface 170 and a battery door 175. The illustrated outer housing surface 170 includes the second surface of the housing.

[0071] FIG. 5A illustrates an embodiment of a cravinging control device 100 held in the hand of a user. The dimensions and discreet design allow the user to hold the cravinging control device 100 within their hand such that other people may not notice that they are holding the device. The shape conforms to the palm of the hand and allows user to close a fist around the cravinging control device.

[0072] FIG. 5B illustrates an embodiment of a cravinging control device 100 held in the pocket of a user. The shape and dimensions of the cravinging control device 100 allow for the user to easily place the cravinging control device 100 in the

pocket and remove it to use it to provide a craving support, such as by holding the craving control device **100** in the hand as shown in FIG. 5A.

[0073] FIG. 6A illustrates an embodiment of a craving control device **100** held in the hand of a user providing touch feedback to the user. Examples of touch feedback that can be provided by the craving control device **100** include haptic feedback that can be provided by a vibration element or other element of the craving control device. The haptic feedback can be provided during part or all of the expected duration of the craving episode. The haptic feedback can be constant, variable, or a repeating pattern.

[0074] FIG. 6B illustrates an embodiment of a craving control device **200** held in the hand of a user providing visual feedback to the user. The craving control device **200** includes a plurality of LEDs. The visual feedback can be provided by a plurality of light sources, such as LEDs or other visual display.

[0075] In some embodiments the craving control device can automatically select the feedback/distraction mode between touch feedback and visual feedback. The sensors on board the craving control device can be used to determine the appropriate feedback modality. For example a light sensor on the craving control device can detect whether the craving control device is in a dark place such as a pocket or a light place such as a hand. When the craving control device detects a dark context, it can use touch feedback (e.g. the haptic-based interface). When the craving control device detects a light environment, it can use visual feedback (e.g. light-based interface). For example, when the craving control device is in a pocket, it can automatically use touch feedback in order to keep the feedback communication discreet. When the craving control device is taken out of a pocket and held in the hand, it can automatically switch to light-based visual feedback so that it can be seen discreetly in the hand. In some embodiments the user can also override the sensor's default behavior via a companion software application, such as software provided on a personal communication device or computer, to select haptic feedback and/or visual feedback when specified conditions are detected by the craving control device.

[0076] FIGS. 7A-7B illustrate an embodiment of a craving control device **200** including a vibration element **203** for touch feedback, light sources **205** for providing visual feedback, a tactile switch or input actuator **207**, and an ambient light sensor **209**. FIG. 7A also shows an example of a field of view that can be detected by the ambient light sensor **209** within the craving control device **200**. The light sources **205** are illustrated as LEDs. FIG. 7B shows the light sources **205** as 12 discrete light sources arranged in a circular pattern. Each of the individual light sources **205** can be separately and individually powered to display a desired pattern to the user. FIG. 7C illustrates a first schematic **210** with the light sources **205** all powered off and a second schematic **215** with all of the light sources **205** powered on.

[0077] FIG. 8A illustrates three schematics (**220**, **225**, **230**) of different light patterns displayed by a craving control device **200**. The illustrated schematics (**220**, **225**, **230**) can function as a timer to provide a countdown to help the individual to allow a craving to pass. The device supports users in allowing cravings to pass by encouraging them to observe the visual or touch feedback and to not give into the craving for a specific amount of time. The timer can be activated upon receiving an input from the user of the

craving input actuator of the craving control device. The length of the timer can be selected such that the timer last for an expected duration of a typical craving for the user. The expected duration can be calculated based on user specific craving input data or an average craving episode for a typical user. The timer is communicated via ambient touch or visual feedback depending on the environment. Users can let the timer go through the entire pre-set timer duration (e.g. the illustrated 2 minutes), or they can stop the timer, which then lets the system know that the craving was overcome earlier than the pre-set timer duration. In the illustrated embodiment in FIG. 8A the timer lasts for 120 seconds. In the example illustrated in FIG. 8A the schematic **220** shows one light element **205** lit up to denote 10 seconds. In the example illustrated in FIG. 8A the schematic **225** shows three light elements **205** lit up to denote 30 seconds. In the example illustrated in FIG. 8A the schematic **230** shows twelve light elements **205** lit up to denote 120 seconds. The timer provides craving support to the user by counting down the expected duration of the craving to provide a distraction to the user throughout the expected duration of the craving. Users can also provide input as to whether they overcame the craving using the device or the phone app. In some embodiments the timer duration can be about 180 seconds or less. In some embodiments the timer duration can be about 120 seconds or less. In some embodiments the timer duration can be from about 5 seconds to about 180 seconds.

[0078] FIG. 8B illustrates a cross-sectional view of an embodiment of a craving control device **200** with an example of the light sources **205** emitting light vertically. The light sources **205** can be configured and mounted to the PCB to emit light vertically through the exterior surface of the housing. This configuration can provide discreet viewing of the light sources to the user while the user holds the device in their hand.

[0079] FIG. 9A illustrates a user breathing onto an embodiment of a craving control device **300** adapted to provide a breathing therapy to the user. The craving control device **300** includes the printed circuit board (PCB) **315** shown in FIGS. 9D-9F. The PCB **315** includes a humidity sensor **320**, light sources **321**, a processor and radio **322**, antenna **323**, tactile switch or input actuator **324**, environmental sensor **325**, first user parameter sensor **326**, second user parameter sensor **327**, and optical heart rate sensor **328**. Any of the environmental sensors described herein can be used for the environment sensor **325**. Any of the user parameter sensors described herein can be used for the first user parameter sensor **326** and second user parameter sensor **327**. The humidity sensor **320** can be used to sense the breathing pattern of the user as shown in FIG. 9A. Other sensors described herein can also be used to sense the breathing pattern of the user, such as the carbon dioxide sensor or a breath sensor. The breathing therapy provided by the craving control device **300** can help calm the user's stress by providing a way to focus on a breathing pattern, which is a common form of stress relief and stress control. Craving support can be provided to reduce stress on the user by focusing the user on the activity of trying to "match" the light patterns displayed on the craving control device **300** to the user's breathing pattern. The breathing therapy can help the user make it through the duration of the craving. The light sources on the craving control device can provide the breathing therapy to the user. FIGS. 9B and 9C illustrate schematics of different light patterns displayed by the craving

ing control device **300**. In one schematic example **305** every-other light source or LED pulses on and off soothingly by cross-fading at the same speed in which the user should breathe into the device to match the desired breathing pattern. The user thus attempts to breathe in at the same time the lights are on in example **305**. Schematic example **310** shows that as the user sufficiently matches the breathing pattern more of the light sources can go on with each breath until all of the lights turn on indicating that the user has achieved the desired breathing pattern.

[0080] Quitting an addiction like smoking can also involve redirecting physical habits as in addition to eliminating the dependency on the nicotine drug. In some embodiments the craving control device includes a mechanical feature that allows users to physically play with it to distract from the hand-to-mouth smoking gesture and to give them something to do with their hands. The “fidget” feature or factor can be used as a distraction feature to help the user avoid cravings. FIGS. **10A-10C** illustrate a movable mechanical fidget factor and FIGS. **11A-11C** illustrate textured mechanical fidget factors in the form of textured surfaces that can be contacted or rubbed by the user.

[0081] In some embodiments the craving control devices described herein can include a distraction features that is a user-movable element supported by the craving control device housing. The user-movable element can be described as a mechanical fidget factor. FIG. **10A** illustrates an embodiment of a craving control device **400** with a distraction feature that is user-movable element **405**. The user-movable element **405** can slide relative to a smooth foil **410**. FIG. **10B** illustrates the user-movable element **405** moved to various positions. FIG. **10C** illustrates an exploded view of the craving control device and movable element **405**. The craving control device **400** includes a top housing **415** and a bottom housing **420**. A disk counter **425** can be engaged with the user-movable element **405** such that it counts or keeps track of the movements of the user-movable element. The disk counter **425** can record user information relating to the craving frequency, craving occurrence, craving intensity, etc. and transfer this information wirelessly to an external device. In some embodiments the user-movable element can also detect a craving based on number of times it is actuated and the frequency. The user-movable element **405** can be incorporated into any of the craving control devices described herein.

[0082] FIGS. **11A-11C** illustrate multiple different surfaces and textures that can be used in any of the embodiments of craving control devices described herein. The textured or smooth surfaces can be used on the outer surface of the craving control device to allow the users to rub and move their hand on it to help soothe the user during the craving. In the case of smoking cessation treatment the surface also satisfies the user’s need to do something with the hands besides hold onto a cigarette. FIG. **11A** shows a device with a textured surface **502** in one embodiment of a fidget factor. FIG. **11B** shows a device with a smooth surface **504** in one embodiment of a fidget factor. The user can rub the smooth surface similar to the use of a worry stone to provide a soothing treatment. FIG. **11C** shows a variety of devices with different surfaces that can be used as a fidget factor such as: raised concentric rings **506**, patterns of smooth/matte surface texture combinations **508**, **510**, a raised surface in a geometric pattern **512**, **514** on a concave housing surface, and recessed concentric rings **516**.

[0083] When the user indicates that they need assistance, the device can provide the user with a soothing pattern that they can use to help manage the brief episode of stress or craving. The pattern can be either pre-defined or programmed by the user. The pattern can be provided by vibrational or haptic feedback. In some embodiments the vibrational feedback can be used to provide a soothing support to the user during the experience of the craving. FIG. **12A** illustrates an embodiment of a craving control device **100** held in the hand of a user. The craving control device **100** is providing a vibrational signal to the hand of the user. FIG. **12B** illustrates examples of vibrational patterns **600**, **605**, and **610** that can be provided to the user with time represented by the x-axis and intensity represented by the y-axis. The vibrational pattern **600** illustrates a pattern that alternates a lower intensity vibrational signal with a higher intensity vibrational signal. The vibrational pattern **605** illustrates a repeating pattern that provides a lower intensity vibrational signal, a pause with no vibrational signal, and a higher intensity vibrational signal. The vibrational pattern can be preselected or tailored to an expected duration of the craving, e.g. 120 seconds. In some embodiments the vibrational pattern can be random. In some embodiments the vibrational pattern can be selected by the user or determined based on user information or user inputs to the craving control device regarding the timing, frequency, and intensity of the cravings.

[0084] The user can record the severity and mood of a craving based on press pattern of the craving input actuator. A software algorithm can be used to calculate the severity of the craving based on frequency and duration of presses over a duration of time. For example, if the button is pressed multiple times in a short amount of time (seconds) or, alternatively, if the button is pressed firmly vs. gently, then the system detects that craving as being more severe. The level of severity of the craving can be visualized in the cravings graphed in a companion app running on a mobile device or pc (see FIG. **24** for an example). FIG. **13A** illustrates a top view of an embodiment of a craving control device **700** with a textured surface **705** that can be pressed or tapped by the user to actuate a craving input actuator. FIG. **13B** illustrates a chart showing an embodiment correlating button taps to craving intensity. In the example shown in FIG. **13B** if a single button press is recorded then the intensity of the craving can be recorded as neutral or a default intensity. In the example shown in FIG. **13B** if multiple taps are recorded, such as 2-4 button presses, and the duration between button presses is greater than a predetermined amount like 300 ms then the intensity of the craving can be recorded as having an elevated intensity. In the example shown in FIG. **13B** if multiple taps above a predetermined number, such as more than 4 button presses, and/or the duration between button presses is less than a predetermined amount like 150 ms then the intensity of the craving can be recorded as having a high intensity. Other thresholds can be used to classify the intensity of the cravings. For example the duration, number of button presses, and intensity correlation can be developed uniquely for the user based on past user information relating to the user’s craving and/or addiction type. FIG. **13C** illustrates a cross-sectional view the craving control device **700** showing the vibration component **710**, tactile switch or craving input actuator **715**, and user parameter sensor or environmental sensor **720**. The button press of the craving input actuator

715 and information sensor can be used in combination with the user parameter sensor or environmental sensor **720** to determine information relating to the craving timing, frequency, and/or intensity. Any of the user parameter sensors or environmental sensors described herein can be used for the user parameter sensor or environmental sensor **720**. Examples of user parameter sensors that can be used include humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor. Examples of environmental sensors that can be used include an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, and a temperature sensor.

[0085] FIGS. **14A**, **14B**, and **14C** illustrate a top view, side view, and bottom view of a printed circuit board (PCB) **800** with hardware and sensors that can be used in the craving control devices described herein. The illustrated PCB **800** includes a processor and radio **802**, ambient light sensor **804**, light sources **805**, temperature and humidity sensor **806**, tactile switch or input actuator **808**, inertial measurement unit (IMU) **814**, galvanic skin response (GSR) sensor **812**, antenna **810**, and optical heart rate sensor **816**. The PCB **800** can also include additional user parameter sensors and environmental sensors. Examples of user parameter sensors that can be used include humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor. Examples of environmental sensors that can be used include an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, and a temperature sensor.

[0086] The craving control devices can send and receive data to a personal communication device running a companion application to the craving control device. The companion application can provide information, insights, craving support, messages, and notices to the user. FIGS. **15**, **16**, and **24** illustrate a schematic example of a craving control device interfacing with a personal communication device along with samples for images displayed by the personal communication device in accordance with some embodiments.

[0087] FIG. **15** illustrates a craving control device sending sensor data to the smartphone and companion application. The sensor data can be from any of the sensors described herein, including the user parameter sensors and environmental parameter sensors. The sensor data/information can then be applied to the real-time coaching on the companion smartphone application that is used to customize the information, guidance and/or suggested actions provided to the user. For example, the device can sense a user's elevated heart rate and then, via the companion app, guide the user through a deep breathing or meditation exercise to lower the heart rate and calm down. In another example, a spike in the reading of the galvanic skin response sensor plus data from the accelerometer can determine if the user has a heightened emotional state without moving (e.g. eliminating sneezing, laughing or exercising) which is applied to the mood and emotional state recorded with the craving. The smartphone application can generate a new insight for the user. The

smartphone application can also provide a notification to the user. FIG. **15** illustrates the smartphone application providing a notification to the user that "You're heart rate is up, you may experience a craving. Try deep breathing." FIG. **15** illustrates the smartphone providing a notification that "You haven't been active in a couple of hours and this has triggered cravings in the past. Try taking a break and walking around the block to avoid any potential cravings."

[0088] In some embodiments the companion smartphone application can receive and analyze data from a source other than the craving control device. For example, the companion smartphone application can use 3rd party data in combination with data from the craving control device. For example, in addition to collecting biometric data via sensors on the craving control device, the companion smartphone application can hook into 3rd party data and services that can be used in combination to create even more personal insights based on new correlations identified between the different sets of data. Examples of 3rd party data and services include GPS to detect location and Calendar to detect context of what users are doing at a given time. The information is used to determine patterns in times of heightened cravings such as stressful meetings at work or at the bar with friends. FIG. **16** illustrates an example of the smartphone companion application receiving sensor data from the craving control device and 3rd party data. The 3rd party data illustrated in FIG. **16** includes GPS, calendar, photos, music, camera, and/or health data. The 3rd party data can be harvested from the user's smartphone, e-mail, other smartphone applications, or other sources. The illustrated smartphone application screens use calendar data to provide the following notice to the user "Your meeting with your boss is in 15 minutes. Take a quick walk around the block to help keep cravings down."

[0089] FIG. **24** illustrates additional examples of information that can be provided by the craving control device and companion smartphone application. The user records a craving by pushing the button on the craving control device to actuate the craving input actuator. The data is sent to the smartphone and companion smartphone application. The left image displayed on the smartphone is a diagram showing real-time coaching that can be displayed as a result of the cravings and severity of cravings that are recorded. The more severe, the more urgent the suggestion. The illustrated image provides a message to the user to breathe deeply until the craving passes. The right image displayed on the smartphone illustrates a diagram representing the number of cravings a user has recorded that day. In the illustrated visualization, the user can see the severity that they recorded based on how many times they pushed the craving control device button and the frequency in which they pressed it. FIG. **24** also illustrates displaying the severity of the craving by assigning a larger circle size for the visualization of the craving to indicate a more intense craving. The visualization illustrated in FIG. **24** represents 1 day; however the user can navigate through the days of the program and also see a weekly view of the timeline or other desired time period.

[0090] FIG. **17** shows one embodiment of a craving input mechanism and a network environment for interfacing with it. To show the many different ways the craving input mechanism can be worn, FIG. **17** shows two users **10** and **12** each wearing a craving input mechanism **14** in two locations. User **10** has a first craving input mechanism **14** in a pocket and second craving input mechanism **14** hanging as a necklace from the user's neck. User **12** is wearing a first

craving input mechanism **14** as a bracelet on the user's wrist and a second craving input mechanism **14** pinned or otherwise support on a shirt collar. (In normal use, each user requires only one craving input mechanism.) Each user can discretely actuate the craving input mechanism **14** to send information about a craving episode (including any information gathered by a sensor in the craving input mechanism **14** providing information about, e.g., location, activity, sleep, etc.) over a wired or wireless connection **16** to a first computing device **17** (e.g., a smartphone) having a communication library. In some embodiments, the first computing device **17** has sensors that collect additional or duplicative data (e.g., activity data, location data, date and/or time, etc.) that can be compared to, and correlated with, data coming from the craving input mechanism **14**. In some embodiments, first computing device **17** may communicate with a second computing device **18** configured to integrate data from other sources to which it has access (e.g., telephone logs, web sites visited, etc.) which can be correlated with data collected elsewhere (such as from first computer **17** or from a remote server). Applications running on second computing device **18** may also be configured to provide additional functionality, such as algorithmic prompts or messaging (SMS/MMS, email, or other notifications). The computing devices **17** and **18** may also communicate over wired or wireless connections **19** and **20** with a secure multi-user computing platform **22** providing analytics, social networking, messaging, pattern recognition and/or reporting.

[0091] FIGS. **18A** and **18B** show top and cross-sectional views of an embodiment of a craving input mechanism **30** having a diamond shape. FIGS. **19A** and **19B** show top and cross-sectional views of an embodiment of a craving input mechanism **40** having a round shape. Both embodiments have a housing **32** enclosing a printed circuit board **34** (with a CPU, Bluetooth LE components, input component (e.g., tactile switch, capacitive touch, accelerometer) and memory and a battery **36**). A port or door for replacing the battery **36** may be provided on the underside of the mechanism **30** or mechanism **40**. Depressing a button **31** on the top of each of mechanism **30** and mechanism **40** actuates the Bluetooth communication components to identify a craving input by the user. FIGS. **20A** and **20B** are top and cross-sectional views of the printed circuit board **34** and battery **36** for use with mechanism **30** or mechanism **40**.

[0092] The basic craving input mechanism shown in FIGS. **18** and **19** may be combined with different housings, support structure and attachment mechanisms to meet a user's needs. For example, FIG. **21** shows a craving input mechanism **50** with a button **52** in a housing or support structure **54** supported by a necklace chain **56**. A user can wear craving input mechanism **50** and discretely activate **52** in the event of a craving episode.

[0093] FIG. **22** shows a craving input mechanism **60** with a button **62** in a housing or support **64** from which an attachment pin **66** extends. Pin **66** may be used to attach craving input mechanism **60** to the user's clothing.

[0094] FIG. **23** shows a craving input mechanism **70** with a button **72** in a housing or support **74** from which a clip **76** extends. Clip **76** may be used to attach craving input mechanism **70** to a user's collar, shoe or other clothing or article surface.

[0095] When a feature or element is herein referred to as being "on" another feature or element, it can be directly on

the other feature or element or intervening features and/or elements may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature may have portions that overlap or underlie the adjacent feature.

[0096] Terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. For example, as used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

[0097] Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal" and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

[0098] Although the terms "first" and "second" may be used herein to describe various features/elements, these features/elements should not be limited by these terms, unless the context indicates otherwise. These terms may be used to distinguish one feature/element from another feature/element. Thus, a first feature/element discussed below could be termed a second feature/element, and similarly, a second feature/element discussed below could be termed a first feature/element without departing from the teachings of the present invention.

[0099] As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced

by the word “about” or “approximately,” even if the term does not expressly appear. The phrase “about” or “approximately” may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions. For example, a numeric value may have a value that is $\pm 0.1\%$ of the stated value (or range of values), $\pm 1\%$ of the stated value (or range of values), $\pm 2\%$ of the stated value (or range of values), $\pm 5\%$ of the stated value (or range of values), $\pm 10\%$ of the stated value (or range of values), etc. Any numerical range recited herein is intended to include all sub-ranges subsumed therein.

[0100] Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others. Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

[0101] The examples and illustrations included herein show, by way of illustration and not of limitation, specific embodiments in which the subject matter may be practiced. As mentioned, other embodiments may be utilized and derived there from, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. Such embodiments of the inventive subject matter may be referred to herein individually or collectively by the term “invention” merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept, if more than one is, in fact, disclosed. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

What is claimed is:

1. A craving control device comprising: a housing, a craving input actuator supported by the housing, the craving input actuator being configured to obtain information from a user pertaining to a timing, frequency, or intensity of a craving, a wireless communicator supported by the housing, a controller operatively connected to the craving input actuator and the wireless communicator to communicate craving timing, frequency, or intensity information received by the craving input actuator via the wireless communicator to a device external to the housing.

2. The craving control device of claim 1, wherein the housing is sized and configured to be enclosed in the user's hand.

3. The craving control device of claim 1, wherein the housing is sized and configured to be placed in a pocket of the user's clothing.

4. The craving control device of claim 1, wherein the housing is sized and configured to be worn on the user's clothing.

5. The craving control device of claim 1, further comprising a distraction feature adapted to distract the user during a craving episode.

6. The craving control device of claim 5, wherein the distraction feature is a textured area on an exterior surface of the housing.

7. The craving control device of claim 5, wherein the distraction feature is a user-movable element supported by the housing.

8. The craving control device of claim 5, wherein the distraction feature is a timer marking an expected duration of the craving episode.

9. The craving control device of claim 8, wherein the timer starts with actuation of the craving input actuator.

10. The craving control device of claim 8, wherein the timer comprises a visual display configured to change during the expected duration of the craving episode.

11. The craving control device of claim 10, wherein the visual display comprises a plurality of lights.

12. The craving control device of claim 8, wherein the timer comprises a vibration source operable by the controller to vibrate for the expected duration of the craving episode.

13. The craving control device of claim 12, wherein the controller is configured to operate the vibration source to vibrate with an intensity that varies during the expected duration of the craving episode.

14. The craving control device of claim 1, further comprising a user parameter sensor supported by the housing and adapted to obtain user parameter information relevant to the craving, the controller being operatively connected to the user parameter sensor to communicate user parameter information sensed by the sensor via the wireless communicator to the device external to the housing.

15. The craving control device of claim 1, further comprising an environmental parameter sensor supported by the housing and adapted to obtain environmental information relevant to the craving, the controller being operatively connected to the environmental parameter sensor to communicate environmental parameter information sensed by the sensor via the wireless communicator to the device external to the housing.

16. The craving control device of claim 1, further comprising a breath sensor and a display supported by the housing, the controller being operatively connected to the display to provide a target breathing pattern for the user and to the breath sensor to measure a breathing pattern of the user.

17. The craving control device of claim 1, further comprising the external device, wherein the external device comprises a personal communication device having a processor programmed to electronically send a message to a support contact provided by the user.

18. The craving control device of claim 1, further comprising the external device, wherein the external device comprises a personal communication device having a processor programmed to provide craving support to the user in response to craving information from the craving input actuator.

19. The craving control device of claim 18, the processor further programmed to provide the craving support proac-

tively to the user based on a past information from the user pertaining to craving occurrence and craving intensity.

20. The craving control device of claim 18, wherein the craving control device further comprises a user parameter sensor, the personal communication device processor being further programmed to provide craving support to the user in response to a user parameter sensed by the sensor.

21. The craving control device of claim 14, wherein the user parameter sensor comprises one or more of a: humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor.

22. The craving control device of claim 19, wherein the craving control device further comprises an environmental parameter sensor, the personal communication device processor being further programmed to provide craving support to the user in response to environmental parameter information sensed by the sensor.

23. The craving control device of claim 15, wherein the environmental parameter sensor comprises an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, or a temperature sensor.

24. The craving control device of claim 1, wherein the controller is further configured to determine the intensity of the craving based on a pattern received by the input actuator.

25. A method of receiving a craving input from a user comprising:

receiving information from the user pertaining to a craving occurrence and an intensity of a craving with a craving control device comprising a housing and a craving input actuator supported by the housing, the information from the user pertaining to the craving occurrence and craving intensity of the craving received through the craving input actuator; and wirelessly communicating craving occurrence and craving intensity information received by the craving input actuator to a device external to the housing.

26. The method of claim 25, further comprising providing a distraction to the user in response to the craving occurrence and craving intensity information with a distraction feature that is part of the craving control device.

27. The method of claim 25, wherein the distraction feature is a textured area on an exterior surface of the housing.

28. The method of claim 25, wherein the distraction feature is a user-movable element supported by the housing.

29. The method of claim 26, wherein the distraction feature is a timer marking an expected duration of the craving episode, further comprising starting the timer after actuation of the craving input actuator.

30. The method of claim 29, further comprising providing a visual display with the timer that changes during the expected duration of the craving episode.

31. The method of claim 30, wherein providing the visual display comprises providing a plurality of lights.

32. The method of claim 29, wherein the timer comprises a vibration source operable by the controller and further comprising vibrating the vibration source for the expected duration of the craving episode.

33. The method of claim 32, further comprising varying an intensity of the vibration source during the expected duration of the craving episode.

34. The method of claim 25, further comprising receiving a user parameter information relevant to the craving with a user parameter sensor supported by the housing and wirelessly transmitting data corresponding to the user parameter information to the device external to the housing.

35. The method of claim 25, further comprising receiving an environmental parameter information relevant to the craving with an environmental parameter sensor supported by the housing and wirelessly transmitting data corresponding to the environmental parameter information to the device external to the housing.

36. The method of claim 25, further comprising receiving breathing parameter information relevant to the craving from the user with a breath sensor supported by the housing and providing a target breathing pattern for the user with a display supported by the housing.

37. The method of claim 25, further comprising providing a craving support to the user in response to craving information from the craving input actuator with the external device.

38. The method of claim 37, further comprising receiving information from a user parameter sensor supported by the housing and providing a craving support to the user based on a user parameter sensed by the user parameter sensor.

39. The method of claim 38, wherein the user parameter sensor comprises one or more of a: humidity sensor, breath sensor, nicotine sensor, carbon monoxide sensor, carbon dioxide sensor, oxygen sensor, inertia sensor, electrocardiogram (ECG) lead, electromyography (EMG) lead, accelerometer, blood pressure sensor, galvanic skin response sensor, temperature sensor, and heart rate sensor.

40. The method of claim 37, further comprising receiving information from an environmental parameter sensor supported by the housing and providing a craving support to the user based on the environmental parameter sensed by the environmental parameter sensor.

41. The method of claim 40, wherein the environmental parameter sensor comprises an ambient light sensor, ultraviolet light sensor, air pressure sensor, environmental pollutant sensor, or a temperature sensor.

42. The method of claim 25, wherein the housing is sized and configured to be enclosed in the user's hand.

43. The method of claim 25, wherein the housing is sized and configured to be placed in a pocket of the user's clothing.

44. The method of claim 25, wherein the external device comprises a personal communication device comprising a display and further comprising providing instructions to the user to modify a breathing pattern of the user with the display of the personal communication device.

45. The method of claim 25, wherein the external device comprises a personal communication device comprising a display and further comprising providing information to the user with the display of the personal communication device relating to the timing and intensity of the cravings.

46. The method of claim 25, further comprising determining the intensity of the craving based on a pattern received by the input actuator.

47. The method of claim 25, wherein the external device comprises a personal communication device and further comprising electronically sending a message to a support contact provided by the user upon receiving information from the user pertaining to the occurrence and intensity of the craving.

48. The method of claim **25**, further comprising providing a distraction to the user proactively based on a past information from the user pertaining to craving occurrence and craving intensity.

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[标]申请(专利权)人(译)	CHRONO THERAPEUTICS		
申请(专利权)人(译)	CHRONO Therapeutics公司.		
当前申请(专利权)人(译)	CHRONO Therapeutics公司.		
[标]发明人	DARMOUR JENNIFER A HAPGOOD JENNY E ROTH DAVID EVANS OVERBECK RONALD A LEVY ALAN JOEL		
发明人	DARMOUR, JENNIFER A. HAPGOOD, JENNY E. ROTH, DAVID EVANS OVERBECK, RONALD A. LEVY, ALAN JOEL		
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摘要(译)

本发明提供一种吸气控制装置，包括壳体，由壳体支撑的吸气输入致动器，由壳体支撑的无线通信装置，以及控制器。渴望输入致动器可以被配置为从用户获得关于渴望的时间，频率或强度的信息。控制器可操作地连接到渴望输入致动器和无线通信器，以将由渴望输入致动器经由无线通信器接收的渴望信息传送到外壳外部的设备。外壳外部的设备可以是个人通信设备。壳体的尺寸和构造可以封闭在使用者的手中，或者放置在使用者的衣服口袋中。还提供了使用摇摄控制装置的方法。

