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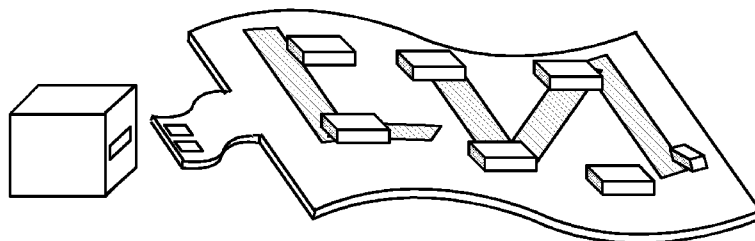
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(54) **Title:** SYSTEMS AND METHODS FOR SELF EXPRESSION USING A READILY ALTERABLE DEVICE

FIG. 1



(57) **Abstract:** A body art device enables a user, who typically wears the device, to non-permanently display or emit one or more elements of personal self-expression. The body art device is attached to the user's skin or clothing or other object of the user's choosing, and is temporarily, indefinitely or permanently attached. The body art device incorporates one or more multimedia elements including, but not limited to: light-emitting elements, sound-emitting elements, odor-emitting elements, surface-distorting elements and/or other sensible-signal-generating elements. The light-emitting elements can display static images, moving images and the like. The body art device can control the sensible signal in response to motion, sound, touch, proximity to other similar devices, temperature and other sensible environmental parameters. The body art device includes a flexible and transparent substrate. The body art device can provide a wearable, physical and visible way to promote self-expression that can change moment to moment as a user chooses.

**SYSTEMS AND METHODS FOR SELF EXPRESSION USING A READILY ALTERABLE DEVICE****BACKGROUND OF THE INVENTION****1. Field of the Invention**

[0001] This invention relates to systems and methods that enable self-expression by using one or more readily alterable devices that allow the user to display and/or emit a sensible signal.

**2. Related Art**

[0002] Most people have a need to visibly express their moods, emotions, group affiliations and/or identity on their bodies and/or possessions. This need for self-expression has always been an important driver of human behavior. In the past few decades, self-expression has assumed a larger role for people, particularly in younger generations.

[0003] Thus far, there have been limited options for visible self-expression located on or near a person's body. Such on- or near-body self-expression has heretofore been restricted to wearing clothing, accessories or the like, or to making permanent or semi-permanent physical alterations to the person's body. For example, tattoos, piercings, body paint, hair styling, and fingernail decoration represent some techniques people can use to permanently or semi-permanently modify their bodies to demonstrate their self-expression.

[0004] Those options, however, typically have one or more disadvantages. One significant disadvantage is permanence. For example, techniques such as tattoos are applied and remain on the wearer's body forever, unless difficult, costly and painful remedies are used to remove some or all of the tattoo. Other disadvantages are that the image is static and unchanging. The tattoo contains a single design, without motion or other dynamic aspects. Furthermore, the design is unchanging. It remains the same design forever, or at least until it is removed or revised by undergoing another expensive, time-consuming and painful tattooing.

[0005] Because of the time and expense to make a change, typical body modifications are not interactive. Options do not exist that allow a given body modification to interact with a person or the environment. Another disadvantage is that conventional body modifications, even when temporary, are time consuming. Techniques such as tattoos and other body modifications are time-consuming to obtain or create. For example, adding a tattoo, changing hair styles, clothes or nail designs, all take time.

[0006] Many body modifications, such as tattoos and piercings, are painful. Moreover, many body modifications raise significant safety concerns. Tattoos and piercing are prone to infection, are able to transmit needle-borne disease, and tattoo inks can have long term health concerns.

[0007] Because of the time and expense to change such body modifications, they do not allow a person to be spontaneous. A person feeling creative and desiring to be self-expressive cannot use tattoos or other body modifications to immediately express themselves.

[0008] Because of many of these disadvantages, many of the conventional body modification techniques are not accessible to all people. For example, minors are typically not allowed to get tattoos. Similarly, piercing artists are limited and piercing often requires adult consent. Many techniques, such as tattoos can be expensive, restricting access to some users. Techniques such as tattoos and piercings require a person to go to a specific location to receive a service. Furthermore, many body modification techniques, such as tattoos and piercings, are not acceptable in some religions.

[0009] One known method used to enable changeable tattoos is to use electrically modifiable ink, thus enabling a design to change to a new, pre-configured design by imposing different electromagnetic fields. Such methods, however, typically does not address several other key concerns such as static-ness, lack of interactivity, pain and health concerns, etc. Another known method used to display information on a body is to use a subcutaneous implant for displaying various re-programmable information or decorative patterns beneath the surface of the skin. This known method provides a permanent method for displaying information that can change over time. Such a known method, however, requires a person to have a surgical procedure to implant the device, thus raising substantial safety and health concerns.

## **SUMMARY OF THE INVENTION**

[0010] This invention provides systems and methods for a non-permanent display of self-expression on a person's body, clothing or possession.

[0011] This invention separately provides systems and methods for a readily alterable display of self-expression on a person's body, clothing or possession.

[0012] This invention separately provides systems and methods for an interactive display of self-expression on a person's body, clothing or possession.

[0013] This invention separately provides systems and methods for a display of self-expression on a person's body that reduces, and ideally eliminates, health and/or safety concerns of known body modification techniques.

[0014] This invention separately provides systems and methods for a cost-effective display of self-expression on a person's body, clothing or possessions.

[0015] In various exemplary embodiments according to this invention, a body art device enables a user, who typically wears the device, to non-permanently display or emit one or more elements of personal self-expression. In various exemplary embodiments according to this invention, the body art device is attached to the user's skin, clothing or other object of the user's choosing, and is temporarily, indefinitely or permanently attached. In various exemplary embodiments according to this invention, the body art device incorporates one or more multimedia elements including, but not limited to: light-emitting elements, sound-emitting elements, odor-emitting elements, surface-distorting elements and/or other sensible-signal-generating elements. In various exemplary embodiments according to this invention, the light-emitting elements can display static images, moving images and the like. In various exemplary embodiments according to this invention, the body art device can control the sensible signal in response to motion, sound, touch, proximity to other similar devices, temperature and other sensible environmental parameters. In various exemplary embodiments according to this invention, the body art device includes a flexible and transparent substrate. The body art device can provide a wearable, physical and visible way to promote self-expression that can change moment to moment as a user chooses.

[0016] In various exemplary embodiments according to this invention, a temporary light-up electric body art device can incorporate one or more multimedia elements including, but not limited to: lights, motion, reaction to sound or touch, proximity to other similar devices, and/or temperature. In various exemplary embodiments according to this invention, the body art device can display one or more designs, lit in appropriate sequences to create motion and/or animation. In various exemplary embodiments

according to this invention, the body art device includes a flexible and transparent substrate. The body art device can provide a wearable, physical and visible way to promote self-expression that can change moment to moment as a user chooses.

[0017] Therefore, systems and methods according to this invention can provide, for example, a non-permanent body art device that enables visual body art; an apparatus that can change a displayed design based on the short-term and/or immediate needs of a user; a more visually engaging and dynamic set of display images that reflects a user's visual embodiment of what the user is trying to express; light-up body art that interacts with its environment; a light-up body art device that is usable at any time and any place; a body art device for sensible self-expression that is relatively painless for the wearer to implement; a safe apparatus for displaying sensible body art that does not require foreign objects to enter or to be inserted into, the user's body; an apparatus capable of displaying a user's choice of visual imagery or other sensible body art; a more user-friendly way to control visual and/or other sensible self-expression; and/or the like.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0018] FIG. 1 illustrates a first exemplary embodiment of a body art device according to this invention, showing a substrate with light emitting diodes (LEDs) connected to an electronics module;

[0019] FIG. 2 is a side view of the first exemplary embodiment of the body art device shown in FIG. 1 in a non-flexed position, showing LEDs connected to a flexible substrate, backed with rigid plastic nubs attached to adhesive that form a raised matrix that attaches to skin;

[0020] FIG. 3 is a side view of the first exemplary embodiment of the body art device shown in FIG. 1 in a flexed position, showing LEDs connected to a flexible substrate, backed with rigid plastic nubs attached to adhesive that form a raised matrix that attaches to skin;

[0021] FIG. 4 is a close up side view of the first exemplary embodiment of the body art device shown in FIG. 1 that shows a more detailed, cross-sectioned view;

[0022] FIG. 5 illustrates a first exemplary embodiment of an LED circuit and related components usable with a body art device according to this invention;

[0023] FIG. 6 illustrates a first exemplary embodiment of a control board and associated components usable with a body art device according to this invention;

[0024] FIG. 7 illustrates a first exemplary embodiment of a multi-layered flexible substrate usable with a body art device according to this invention;

[0025] FIG. 8 is a block diagram of a second exemplary embodiment of a body art device according to this invention;

[0026] FIG. 9 shows a third exemplary embodiment of a body art device according to this invention;

[0027] FIG. 10 is a second view of the third exemplary embodiment of the body art device at a later moment in time;

[0028] FIG. 11 is a third view of the third exemplary embodiment of the body art device at a further moment in time;

[0029] FIG. is a fourth view of the third exemplary embodiment of the body art device at a still further moment in time;

[0030] FIG. 13 is a side view of the third exemplary embodiment of the body art device shown in FIG. 9;

[0031] FIG. 14 is a front side view of the third exemplary embodiment of the body art device shown in FIG. 9;

[0032] FIG. 15 shows the third exemplary embodiment of the body art device shown in FIG. 9 with all of the LEDs energized;

[0033] FIG. 16 shows a first step in a progression of a colored design animating across the entire length of the third exemplary body art device shown in FIG. 9;

[0034] FIG. 17 shows a second step in a progression of a colored design animating across the entire length of the third exemplary body art device shown in FIG. 9;

[0035] FIG. 18 shows a third step in a progression of a colored design animating across the entire length of the third exemplary body art device shown in FIG. 9;

[0036] FIG. 19 shows the third exemplary body art device shown in FIG. 9 in greater detail;

[0037] FIG. 20 is an outline storyboard view of one exemplary embodiment of a smart phone application usable to control and interact with a body art device according to

this invention;

[0038] FIG. 21 illustrates one exemplary embodiment of a home screen of the smart phone application shown in FIG. 21;

[0039] FIG. 22 illustrates one exemplary embodiment of a displayed design selection screen usable to select one or more of a set of available displayable designs of the smart phone application shown in FIG. 21;

[0040] FIG. 23 illustrates one exemplary embodiment of a sharing screen of the smart phone application shown in FIG. 21 that allows a user to share a user-generated design with others;

[0041] FIG. 24 illustrates one exemplary embodiment of an option selection screen of the smart phone application shown in FIG. 21 usable to select a mood and a corresponding set of design options based on the selected mood;

[0042] Figure 25 illustrates one exemplary embodiment of a control screen of the smart phone application shown in FIG. 21 usable to control one or more display parameters;

[0043] FIG. 26 illustrates one exemplary embodiment of an event screen of the smart phone application shown in FIG. 21 usable to set up, activate and deactivate one or more events that trigger one or more display designs;

[0044] FIG. 27 illustrates one exemplary embodiment of an access screen of the smart phone application shown in FIG. 21 usable to control access and/or sync modes;

[0045] FIG. 28 illustrates one exemplary embodiment of a design screen of the smart phone application shown in FIG. 21 usable to create and/or save new display designs;

[0046] FIG. 29 illustrates one exemplary embodiment of a playlist selection screen of the smart phone application shown in FIG. 21 usable to set up and/or control a playlist of designs to be displayed;

[0047] FIG. 30 illustrates one exemplary embodiment of a setting selection screen of the smart phone application shown in FIG. 21 usable to control one or more setting parameters and/or security parameters;

[0048] FIG. 31 shows a fourth exemplary embodiment of a body art device according to this invention;

[0049] FIG. 32 shows a fifth exemplary embodiment of a body art device according to this invention;

[0050] FIG. 33 shows a sixth exemplary embodiment of a body art device according to this invention;

[0051] FIG. 34 shows a seventh exemplary embodiment of a body art device according to this invention; and

[0052] FIG. 35 shows an eighth exemplary embodiment of a body art device according to this invention.

#### **DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS**

[0053] The following detailed description of various exemplary embodiments of sensible-signal-emitting devices that enable a user to readily alter the self-expression implemented by the user using this device refers to a body art device that visibly displays one or more images using one or more display modes and/or techniques, and thus is usable in place of tattoos and other visible body modifications. This is done primarily for ease of description and understanding by those unfamiliar with this technical subject. It should be appreciated that the term body art device is not intended to limit the scope and breadth of systems and methods according to this invention.

[0054] In various exemplary embodiments according to this invention, a temporary light emitting body art device can incorporate one or more multimedia elements including, but not limited to: lights, motion, reactive to sound or touch, proximity to other similar devices, and temperature. Such a body art device can display one or more images, which can be displayed in various sequences and/or display modes, such as, for example, to create motion and animation, on a flexible and transparent substrate. The body art device can provide a wearable, physical and visible way to promote self-expression that can change moment to moment as a user chooses.

[0055] FIG. 1 is a systemic illustration of a first exemplary embodiment of a body art device according to this invention. In particular, FIG. 1 shows a substrate with LEDs connected to an electronics module, according to an embodiment.

[0056] It should be appreciated that, in some exemplary embodiments, Surface Mounted Device (SMD) diodes, such as LEDs, are cold soldered to an etched substrate of the body art device. In these exemplary embodiments, cold soldering is used when attaching the SMD diodes to the flexible substrate, as the flexible substrate tends to be damaged by traditional hot soldering techniques. In some exemplary embodiments, soldering can be used to ensure that the SMD diodes remain attached to the substrate while the body art device is being used.

[0057] In various exemplary embodiments, the body art device may use one or more touch contact switches or the like. In some of these exemplary embodiments, one or more of the switches may be used to control the flow of electrical current from a battery or other on-board power supply device or element to turn the body art device on or off. If desired, the switches may also be used when configuring the body art device. In various exemplary embodiments, the body art device can be configured to display a selected set of one or more specific images, to set a display period, rate or the like, to set or control various display and/or lighting effects or behaviors, and/or any other desired attributes of the body art device.

[0058] It should also be appreciated that other, static graphics, shells and the like can be incorporated into, or attached to, the body art device to personalize it, similarly to what is currently done with many mobile phones. Such static graphics may be printed on the reverse (non-display or non-emitting) side of the substrate. This allows the components of the body art device to be located on a top or outermost level, placing them away from the user's skin or other device contact points. This tends to provide the body art device with a more comfortable feeling when worn, and makes using the body art device more secure and functional. For example, heat generated by the body art device tends to more readily dissipate when the functional components are located farther away from the object the body art device is attached to, and farther away from any adhesive surface that is provided on the body art device to make the body art device more readily attachable. Similarly, should the various SMDs, such as the SMD diodes, create any variance in the thickness of the body art device, this varying surface is moved to the non-adhesive side of

the body art device. As a result, the adhesive surface of the body art device is smooth and consistent, making it generally more comfortable when the body art device is adhesively attached to a user's body.

[0059] It should further be appreciated that, in various exemplary embodiments, the substrate of the body art device is flexible. Using a flexible substrate allows the body art device to more readily conform to many different surface shapes. The flexible substrate also allows the body art device to adjust to changing surface conditions such that typically occur with deformable soft-tissue surface changes occurring during body movement. Because the flexible substrate allows the body art device to better conform to variable and varying surfaces, more of the adhesive contacts the surface, such as the body of the user, making the body art device more securely attached to that surface.

[0060] It should additionally be appreciated that tracking can be two dimensional, similar to a single layer Printed Circuit Board (PCB). It should also be appreciated that tracking can be transparent or translucent. In various exemplary embodiments, the various electronic modules used to implement the various functions of the body art device can be mechanically and/or electrically connected using push in connectors. This allows for rapidly changing the substrate, the battery and/or other device elements during manufacture or repair operations.

[0061] FIG. 2 is a side-view illustration of the exemplary body art device shown in FIG. 1. In particular, FIG. 2 shows this exemplary body art device in a non-flexed position, as well as an array of LEDs connected to a flexible substrate. As shown in FIG. 2, in this exemplary embodiment, the LEDs are backed with rigid plastic nubs attached to adhesive that form a raised matrix that attaches to the user's skin when worn on the user's body.

[0062] It should be appreciated that, in this exemplary embodiment, the flexible substrate provides the conductive medium and primary surface of the device. Accordingly, the various surface mounted device diodes, such as the LEDs, are electrically and mechanically connected to the flexible substrate. The rigid plastic nubs provide a set of surfaces that the adhesive is applied to. The adhesive allows the body art device to attach to and remain attached to, the chosen surface, such as the user's skin. The rigid plastic nubs also enable the body art device, and specifically the flexible substrate to retain some degree of flexibility. This

remaining flexibility allows the body art device to accommodate deformation requirements of its working environment.

[0063] It should further be appreciated that the plastic nubs elevate the body art device above the surface it is attached to, creating a plurality of air gaps. These air gaps allow air to circulate between the body art device and the surface it is attached to. This air flow enables heat and moisture to dissipate. This is especially useful in some working environments, such as when the body art device is adhesively attached to the user's body, where body heat and perspiration could make wearing the body art device uncomfortable at the least, and liable to lose adhesion at the worst.

[0064] FIG. 3 is a side-view illustration this exemplary body art device in a flexed position. Like FIG. 2, FIG.3 shows the array of LEDs connected to the flexible substrate and backed with the rigid plastic nubs that form a raised matrix. Similarly, an adhesive layer is provided over the rigid plastic nubs and attaches to, for example, the user's skin. It should be appreciated that FIG.3 shows the same elements as shown in FIG. 2, but in a flexed position, as may be encountered while the body art device is used. However, FIG. 3 further demonstrates two purposes of the rigid plastic nubs, as the nubs allow the body art device to flex and adjust to deformation conditions. Unlike a solid, rigid layer, the rigid nubs allow the body art device to maintain the air gaps that air can flow through to dissipate heat and/or moisture.

[0065] FIG. 4 is a close-up side-view illustration of the body art device shown in FIG. 1 that provides a more detailed, cross-sectional view of this exemplary embodiment of a body art device according to this invention. In particular, FIG. 4 shows a more detailed cross-sectional view of a portion of the device

[0066] As shown in FIG.4, the flexible substrate is layered with a conductive material, such as, for example, indium tin oxide (ITO), printed wire or graphene, that can be applied directly to the flexible substrate. The flexible substrate provides a solid surface on that the conductive material can adhere to. In various exemplary embodiments, each LED is connected to the conductive material and the flexible substrate. In some such exemplary embodiments, each LED connection to the substrate can be accomplished using, for example, an adhesive for durability. In various exemplary embodiments, a cold, metallic solder, such as, for example, silver, is used to provide conductivity to the conductive material.

[0067] In various exemplary embodiments, the rigid plastic nubs are attached to the substrate using an adhesive. In some such exemplary embodiments, additional adhesive is applied to the exposed plastic surface to provide adhesion to the target object surface. In various exemplary embodiments, graphic designs are placed directly on the substrate.

[0068] FIG. 5 is an illustration of a first exemplary embodiment of an LED circuit and related components according to this invention that is usable in a body art device, such as the exemplary body art device shown in FIGS. 1-4. This exemplary LED circuit includes a plurality of LEDs arranged in an array, one or more touch switches, and a resistive layer that provides protection against electrostatic discharges (ESD).

[0069] In particular, the exemplary LED circuit shown in FIG. 5 uses bi-LEDs to increase design flexibility and add additional tracking. However, it should be appreciated that these bi-LEDs are optional, and standard LEDs are used in various other exemplary embodiments. The one or more touch switches allow the user to input control signals and tracking. Resistive measurement for touch switch provides ESD protection. It should be appreciated that, in various exemplary embodiments, the LEDs are bin matched per product batch to provide output consistency. It should further be appreciated that differently-colored LEDs can be used, including, but not limited to red, blue, green and amber colored LEDs. . It should further be appreciated that different types of LEDs may be used, including, but not limited to 0603 and 0805 LEDs.

[0070] FIG. 6 is an illustration of a first exemplary embodiment of a control board and associated components according to this invention that are usable in a body art device, such as the exemplary body art device shown in FIGS. 1-4. In the exemplary embodiment shown in FIG.6, the control board contains a battery, a program header, a standby power circuit, and a current mirror.

[0071] In various exemplary embodiments, the battery is embedded in the Printed Circuit Board (PCB). Embedding the battery tends to reduce the board profile. The program header can be implemented by any known or later developed device or system, such as, for example, a Programmable Integrated Circuit (PIC), an ARM program, or the like. In various exemplary embodiments, the ARM program is implemented as a PCB. Implementing the ARM program in this way tends to reduce its size and cost. The standby power circuit is implemented using CMOS circuit elements. Such CMOS circuit elements have nA current requirements, which yields up to an 18 month shelf half life. In various exemplary

embodiments, the battery is a rechargeable lithium-based battery, which yields about 12 hours of operation before the battery will need to be recharged. The current mirror provides for LED current control.

[0072] It should be appreciated that pre-programmed light sequences are controlled using the PIC or ARM. In various exemplary embodiments, driver pulse width modulation (PWM) is used so that the various LEDs have generally equal luminosity values when energized. Various different types, styles and/or technology PCBs can be used, depending on the desired aesthetic requirements of the body art device. In various exemplary embodiments, the PCB is a double side PCB component that is populated to reduce the overall footprint size of the body art device. In various exemplary embodiments, SMD components can be the smallest available size. It should also be appreciated that PCB legends can also be omitted to reduce the size or footprint of the PCB. In various exemplary embodiments, the PCB's tracking range can be 0.10 to 0.25mm. In various exemplary embodiments, the substrate socket is PCB pressure fit.

[0073] FIG. 7 is an illustration of a first exemplary embodiment of a multi-layered flexible substrate according to this invention that are usable in a body art device, such as the exemplary body art device shown in FIGS. 1-4. In particular, FIG. 7 shows a two-layer flexible substrate. As shown in FIG. 7, this exemplary two-layer substrate provides cross tracking over two single layer PCBs. In particular, a hole in a first layer 1 allows an LED provided on and electrically connected to a second layer 2 to extend through the first layer 1. A capacitive touch switch provided on and electrically connected to the second layer 2 uses the first layer 1 as a protective layer. In various exemplary embodiments, one or more graphic images are provided on one or both of the underside surfaces of the first layer 1 and/or the second layer 2. It should also be appreciated that, additional tracking is needed in a given implementation of the PCB, additional layers may be provided or implemented.

[0074] FIG. 8 is a block diagram of one exemplary embodiment of a body art device 800, according to this invention. In particular, as shown in FIG. 8, the body art device 800 includes a screen 810, a processor 820, a memory 830, a first button 862 and a second button

864. Although not shown in FIG. 8, the body art device 800 can include other components such as, for example, a battery and a control module.

[0075] It should be appreciated that the body art device 800 shown in FIG. 8 can be structurally and/or functionally similar to the exemplary body art device and exemplary components shown and described above with respect to FIGS. 1-7. It should also be appreciated that the body art device 800 can be configured to attach to a skin of a person's body, the person's clothing, and/or any other suitable possession of the person, and/or to display an image accordingly as described in detail herein.

[0076] Specifically, the screen 810 can be configured to display an image. The image can be a static image or a motion image. As discussed above, the screen 810 can be, for example, a LED screen (i.e., formed by a set or array of LEDs). The processor 820 can be any known or later developed processing device, chip or component that can be configured to execute instructions stored in the memory 830. The memory 830 can be any known or later developed memory circuit, structure or device. For example, the memory 830 can be one or more of a random-access memory (RAM) (e.g., dynamic RAM, static RAM, or any other known or later developed RAM), a flash memory, a removable memory, and/or so forth. In various exemplary embodiments, instructions associated with controlling operations of the body art device 800, such as displaying images on the screen 810, can be stored in the memory 830 and can be executed by the processor 820. In various exemplary embodiments, the body art device 800 can include a combination of hardware modules and software modules, which themselves can be stored and/or implemented as hardware circuits. In various exemplary embodiments, for example, the body art device 800 can include a field-programmable gate array (FPGA), an application specific integrated circuit (ASIC), a digital signal processor (DSP) and/or the like.

[0077] In various exemplary embodiments, the memory 830 is and/or includes a non-transitory processor-readable medium that stores code representing instructions to be executed by the processor 820. Some of the instructions executed by the processor 820 can cause the body art device 800 to execute a series of operations with respect to displaying images on the screen 810 such as, for example, downloading a new image into the memory 830, removing an existing image from the memory 830, changing from a first image to a second image on the screen 810, modifying parameters (e.g., frequency, resolution) associated with displaying a static or motion image, changing configuration

setting of the body art device, and/or the like.

[0078] The first button 862 and the second button 864 can be any type of components that enable interactions with a user of the body art device 800. In various exemplary embodiments, the first button 862 or the second button 864 can be, for example, a switch, a keypad, a touchscreen, and/or the like that can receive a command or instruction from the user. Thus, the user can send a signal by operating the first button 862 or the second button 864 in an appropriate manner such as, for example, pressing a button, turning on or turning off a switch, striking a keypad, etc. The first button 862 and the second button 864 can be associated with controlling operations of the body art device 800, especially with displaying images on the screen 810. For example, the body art device 800 can be turned on or turned off by pressing the first button 862. For another example, the image displayed on the screen 810 can be changed by pressing the second button 864. In other exemplary embodiments, the body art device omits one or both of the first button 862 and/or the second button 864.

[0079] FIG. 9 shows a third exemplary embodiment of a body art device according to this invention. As shown in FIG. 9, in this third exemplary embodiment, the body art device is embedded in a wristband. In particular, this body art device is able to display a design using 2 or more, or a range of, different colors simultaneously. The array of LEDs are lit up based on the design to be displayed, and can be controlled to move the design in a desired pattern around the wristband.

[0080] FIG. 10 is a second view of the third exemplary embodiment of the body art device at a later moment in time. In particular, FIG. 10 shows how the colors and pattern have progressed around the wristband and now appear to be reversed. It should be appreciated that, as can now be seen in FIG. 10, there are, in fact, two different display designs that are displayed on the wristband and that are moving in opposite directions.

[0081] FIG. 11 is a third view of the third exemplary embodiment of the body art device at a further moment in time. In particular, FIG. 11 shows the body art device embedded in the wristband is now displaying the animated design using a lower brightness level, different colors and a more discreet light sequence. Accordingly, each individual LED is now discernible

to the user. This is in contrast to the display mode illustrated in FIGS. 9 and 10, where groups of the LEDs are energized simultaneously to create a streaking, comet-like appearance.

[0082] FIG. 12 is a fourth view of the third exemplary embodiment of the body art device at a still further moment in time. In particular, FIG. 12 shows the displayed design or pattern has again changed, demonstrating how the LED array can be controlled to display a dynamic and controllable image or design sequence. It should be appreciated that, in various exemplary embodiments, the displayed design can be replayed and controlled from the user's smart phone, or via control inputs provided on a standalone wristband. FIG. 13 is a side view showing the continuing design displayed using the body art device shown in FIG. 12

[0083] FIG. 14 is a front side view of the third exemplary embodiment of the body art device shown in FIG. 9. In particular, FIG. 14 shows a multitude of the LEDs being simultaneously energized to display a spectrum of colors.

[0084] FIG. 15 shows the third exemplary embodiment of the body art device shown in FIG. 9 with all of the LEDs energized. In particular, FIG. 15 shows an example of a total wristband light flash, across all of the LEDs of the array, creating a brilliant light effect. This demonstrates that this third exemplary body art device has the capability to power all of the light sources in simultaneously. It should be appreciated that this requires the third exemplary body art device to have large and immediate power dissipation capabilities.

[0085] FIG. 16 shows a first step in a progression of a colored design animating across the entire length of the third exemplary body art device shown in FIG. 9. FIG. 17 shows a second step of this progression, while FIG. 18 shows a third step of this progression.

[0086] FIG. 19 shows the third exemplary body art device shown in FIG. 9 in greater detail. In particular, FIG. 19 shows a up close view of the wristband allowing visual details to be seen while the LED array of the body art device embedded in the wristband are energized to display a selected design in a normally lit environment.

[0087] FIG. 20 is an outline storyboard view of one exemplary embodiment of a smart phone application usable to control and interact with a body art device according to this invention. FIG. 21 illustrates one exemplary embodiment of a home screen of the smart phone application shown in FIG. 20. In particular, FIG. 21 shows the various

functions, capabilities or secondary screens of the smart phone application that a user can access from the home screen. In particular, in the exemplary embodiment shown in Fig. 21, the user can use the home screen to access a "Choose" screen, a "Share" screen, a "Mood" screen, a "Sound & Light" screen, an "Alert" screen, a "Sync" screen, a "Create" screen, a "Playlist" screen and a "Settings" screen, as well as an other useful screen, function or capability.

[0088] FIG. 22 illustrates one exemplary embodiment of a displayed design selection screen usable to select one or more of a set of available displayable designs of the smart phone application shown in FIG. 20. In particular, FIG. 22 shows a screen that allows the user to select designs from a personal design library and/or a public design library that is available via the Internet.

[0089] FIG. 23 illustrates one exemplary embodiment of a sharing screen of the smart phone application shown in FIG. 20 that allows a user to share a user-generated design with other users. FIG. 24 illustrates one exemplary embodiment of an option selection screen of the smart phone application shown in FIG. 20 usable to select a mood and a corresponding set of design options based on the selected mood. Figure 25 illustrates one exemplary embodiment of a control screen of the smart phone application shown in FIG. 20 usable to control one or more display parameters. In particular, FIG. 25 shows an application screen that allows the user to control display parameters such as sound, motion responsiveness, brightness, display period and/or display rate.

[0090] FIG. 26 illustrates one exemplary embodiment of an event screen of the smart phone application shown in FIG. 20 usable to set up, activate and deactivate one or more events that trigger one or more display designs. In particular, FIG. 26 shows an application screen that allows the user to set up and activate or turn off alerts tied to triggering events such as a social media update or a weather event.

[0091] FIG. 27 illustrates one exemplary embodiment of an access screen of the smart phone application shown in FIG. 20 usable to control access and/or sync modes. FIG. 28 illustrates one exemplary embodiment of a design screen of the smart phone application shown in FIG. 20 usable to create and/or save new display designs. FIG. 29 illustrates one exemplary embodiment of a playlist selection screen of the smart phone application shown in FIG. 20 usable to set up and/or control a playlist of designs to be displayed. FIG. 30 illustrates

one exemplary embodiment of a setting selection screen of the smart phone application shown in FIG. 20 usable to control one or more setting parameters and/or security parameters.

[0092] FIG. 31 shows a fourth exemplary embodiment of a body art device according to this invention. In particular, FIG. 31 shows a digital baseball cap having an embedded body art device according to this invention. This embedded body art device displays animated designs and messages on the LED array. The particular designs, messages and the like displayed using the LED array are controlled by the user using the user's smart phone. The user uses their smart phone to communicate wirelessly with the embedded body art device, to select the particular design, message and/or the like to be displayed, and the various display parameters for displaying the selected content, such as brightness, display rate, color, ambient factors to be reactive to, and the like. This allows the user to select how to display a given message and how to change the message and/or the display parameters in real time. Consequently, this embedded body art device allows the wearer to communicate with other people in the wearer's vicinity, such as when the wearer is attending a sporting event or the like. For example, the wearer can use the embedded body art device to show support for the wearer's favorite team, to message to those around the wearer the wearer's thoughts about the game, a particular play, the refereeing, the strategy used by one or either team, and/or any other thing that catches the wearer's interest and/or attention.

[0093] FIG. 32 shows a fifth exemplary embodiment of a body art device according to this invention. In particular, FIG. 32 shows a set of headphones having an embedded body art device according to this invention. This body art device displays on the LED array a design that is modified based on the music being output through the headphones.

[0094] FIG. 33 shows a sixth exemplary embodiment of a body art device according to this invention. In particular, FIG. 33 shows an alternative version of the wristband shown in FIGS. 9-20.

[0095] FIG. 34 shows a seventh exemplary embodiment of a body art device according to this invention. In particular, FIG. 34 shows a digital bumper sticker having an embedded body art device according to this invention. In various exemplary embodiments, the digital bumper sticker is attached to an interior surface of a window of a vehicle, such as a car, pickup truck or the like. In various exemplary embodiments, this body art device is

permanently connected to a power source of the vehicle that the digital bumper sticker is attached to. This body art device displays on the LED array animated designs and messages visible through the vehicle's window. In various exemplary embodiments, this body art device can be controlled by a passenger in the vehicle, such as child, while the vehicle is being driven. In various exemplary embodiments, this body art device can be used to show a series of affiliations such as logos, team names, schools, or messages. In various exemplary embodiments, this body art device can display real time updates about alerts, information or information from friends.

[0096] FIG. 35 shows an eighth exemplary embodiment of a body art device according to this invention. In particular, FIG. 35 shows a digital badge having an embedded body art device according to this invention. In various exemplary embodiments, the digital badge can be worn around the user's neck, wrist, ankle or the like, and/or can be attached to an article of clothing, a backpack, a belt, a briefcase or any other place of attachment on the user's body or possessions. In various exemplary embodiments, this eighth exemplary body art device has the same messaging and design capabilities as the seventh exemplary body art device. Likewise, this eighth exemplary body art device can be control similarly to the seventh exemplary body art device. For example, this eighth exemplary body art device can be controlled by others to deliver information to the wearer, to deliver proximity-based, and/or timed information, and/or can be controlled to deliver advertising and/or promotional information.

[0097] In operation, for example, a user removes a protective covering of the adhesive of a body art device according to this invention and places the body art device against his skin in a location of his choosing, as seen in FIG. 2. A touch sensor, shown in FIG. 1, is touched to connect a circuit supplying power to the body art device, turning the body art on. The lights, such as LEDs, begin turning on and off in a pattern to produce a desired design. The design may contain a single image or multiple images, enabling a range of light sequences to create the appearance of movement or motion. The light sequence is controlled by a processor, as seen in FIG. 6 and FIG. 8, which issues instructions to the associated gates of each light element, as seen in FIG. 5, controlling the on/off state, color, brightness, and other attributes of the light element. The user can turn off the body art at any point by touching the

touch sensor shown in FIG. 1. When a user is done using the body art, the body art can be removed by peeling the device off of the skin.

[0098] In various exemplary embodiments, a user can re-use the body art by reapplying the device at another time, either as is, or with an additional application of adhesive. In various exemplary embodiments, a user can change the design of the body art device one of several ways. For example, a user can select a different pre-programmed body art design by using the touch switch to toggle through designs. Alternatively, for example, a user can use a mobile phone or computer to select a design from a design library, convert a picture into a device-ready design, or access a design from one of several locations on the Internet, and download the design using wireless communication, such as Bluetooth, to the body art device. For another example, a user may also select a new body art device containing different designs and use that device when a new design is desired.

[0099] In various exemplary embodiments, users may also opt for a version of the body art device that adheres to another surface, such as a backpack or car window. In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can be a portable, flexible device that adheres to the skin in a non-permanent manner and displays a light up design using a pattern of light emitting elements, such as but not limited to LEDs, OLEDs, e-Ink, or other sources that emit light. The lights can be powered by a battery embedded in the device, a battery external to the body art device or any other external power source.

[0100] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include, for example, a control chip (e.g., the processor 820 in FIG. 8) configured to send instructions to individual LEDs allowing control of the light on/off state, timing, sequence, and color, resulting in an image that can be stationary or animates through a set of designs to appear as in motion.

[0101] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include a screen formed by, for example, a LED array. Such a LED array can be programmed to display any set of designs. In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include a rechargeable battery made of,

for example, a solar film or any other suitable material. Such a rechargeable battery enables continuous operation of the body art device.

[0102] As shown and described with respect to FIGS. 2-4, a body art device can include multiple layers including an adhesive layer that is used to attach to a skin of a person's body or any other suitable object (e.g., a car, a backpack, a bracelet, etc.). In various exemplary embodiments, such an adhesive layer can be replaceable when the adhesive material is worn out. Furthermore, in various exemplary embodiments, the adhesive layer of the body art device can be made of appropriate adhesive materials such that the adhesive layer can be adhesive to various materials and surfaces including, for example, leather, plastic, Plexiglas, natural and synthetic cloth, metal, wood, glass and/or the like. Such materials could be encountered when the apparatus is used on clothes, windows, walls, purses, electronics, protective cases (cell phone case, helmets), and other objects.

[0103] In various exemplary embodiments, although not shown in FIGS. 1-8, a body art device can include one or more sensors (e.g., an audio sensor, a temperature sensor, a light sensor, a touch sensor) that can detect environmental factors (e.g., sound, temperature, light) or factors associated with a person (e.g., skin temperature, a touch on the body art device). The body art device can also include a control chip or circuit (e.g., the processor 820 in FIG. 8) with signal processing capabilities, such that displaying images at the body art device can be interactive with those environmental factors or other inputs. In such embodiments, changing of the images can include, for example, light patterns, designs, lighting sequence, sequence speed and/or any other attributes of the images. Thus, for example, an image displayed on the body art device can move to a beat and/or tempo of music played in the surrounding environment.

[0104] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include an audio speaker to allow the body art device to communicate through sound with its surrounding environment. For example, the body art device can generate, and play via the audio speaker, a sound or music (e.g., a song) specific for a displayed image when triggered by a person (e.g., pressing a button) or an environmental factor (e.g., detected by a temperature sensor).

[0105] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include a component or module with wireless communication capabilities (e.g., Bluetooth, ZigBee, WiFi, etc.) to send and receive commands with external devices operated by a user such as, for example, computers, cellular phones, smart phones, tablets, and personal electronic music and game devices.

[0106] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include a component or module with geographic locating capabilities (e.g., a GPS module) such that the body art device can be configured to dynamically adjust its behavior (e.g., displaying images) based on location.

[0107] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can include a programmable component or chip (e.g., a microprocessor, an FPGA) that can be programmed to enable the body art device to change behavior dynamically based on one or more sensory inputs, thus enabling the device to display an ever changing set of display attributes, imparting a unique personality to each device.

[0108] In various exemplary embodiments, the body art device described with respect to FIGS. 1-8 can interact with a software application to convert photos or other images into designs that can be downloaded into the body art device for display. For example, a software application executing on a computing device (e.g., personal computer, tablet, smart phone, etc.) can be configured to convert images into a format compatible with the body art device. Such images can then be downloaded to the device by, for example, a wireless connection (e.g., Bluetooth) and/or a wired connection (e.g., a Universal Serial Bus (USB) connection). Furthermore, in various exemplary embodiments, device described with respect to FIGS. 1-8 can implement software application (e.g., executing on a computing device) that allows users to create personal designs using a non-technical design tool. Such personal designs can be similarly downloaded to the body art device.

[0109] Various exemplary embodiments described herein relate to a computer storage product with a non-transitory computer-readable medium (also can be referred to as a non-transitory processor-readable medium) having instructions or computer code thereon for performing various computer-implemented operations. The computer-readable medium (or processor-readable medium) is non-transitory in the sense that it does not include transitory propagating signals per se (e.g., a propagating electromagnetic

wave carrying information on a transmission medium such as space or a cable). The media and computer code (also can be referred to as code) may be those designed and constructed for the specific purpose or purposes. Examples of non-transitory computer-readable media include, but are not limited to: magnetic storage media such as hard disks, floppy disks, and magnetic tape; optical storage media such as Compact Disc/Digital Video Discs (CD/DVDs), Compact Disc-Read Only Memories (CD-ROMs), and holographic devices; magneto-optical storage media such as optical disks; carrier wave signal processing modules; and hardware devices that are specially configured to store and execute program code, such as Application-Specific Integrated Circuits (ASICs), Programmable Logic Devices (PLDs), Read-Only Memory (ROM) and Random-Access Memory (RAM) devices. Other exemplary embodiments described herein relate to a computer program product, which can include, for example, the instructions and/or computer code discussed herein.

[0110] Examples of computer code include, but are not limited to, micro-code or micro-instructions, machine instructions, such as produced by a compiler, code used to produce a web service, and files containing higher-level instructions that are executed by a computer using an interpreter. For example, various ones of such exemplary embodiments may be implemented using Java, C++, or other programming languages (e.g., object-oriented programming languages) and development tools. Additional examples of computer code include, but are not limited to, control signals, encrypted code, and compressed code. Such computer code can also be referred to as a computer program and various exemplary embodiments can be in the form of a computer program.

[0111] While various exemplary embodiments have been described above, it should be understood that they have been presented by way of example only, not limitation, and various changes in form and details may be made. Any portion of the apparatus and/or methods described herein may be combined in any combination, except mutually exclusive combinations. The various exemplary embodiments described herein can include various combinations and/or sub-combinations of the functions, components and/or features of the various exemplary embodiments described above.

What is claimed is:

1. A sensible-signal-emitting device that emits at least one signal that is sensible by at least one person who is located in proximity to the sensible-signal-emitting device, the sensible-signal-emitting device comprising:
  - a substrate;
  - at least one sensible-signal emitting element, each at least one sensible-signal-emitting element at least indirectly attached to the substrate;
  - a controller, the controller at least indirectly attached to the substrate and electrically connected to at least one sensible-signal-emitting element;
  - a storage device, the storage device at least indirectly attachable to the substrate and electrically connected to at least the controller, the storage device operable to store information usable by the controller to control at least one sensible-signal-emitting element to emit a sensible signal representing an element of self-expression of a user of the sensible-signal-emitting device;
  - an input device, the input device at least indirectly attached to the substrate and electrically connected to at least the controller; and
  - a power source, the power source at least indirectly attached to the substrate and electrically connected to at least the controller, the storage device, the input device and the at least one sensible-signal-emitting element.
2. The sensible-signal-emitting device of claim 1, further comprising at least one attachment element provided on the substrate.
3. The sensible-signal-emitting device of claim 2, wherein the at least one attachment element provided on the substrate is at least one region of adhesive.
4. The sensible-signal-emitting device of claim 1, wherein the substrate is flexible.
5. The sensible-signal-emitting device of claim 4, wherein the flexible substrate is non-permanently attachable to a user's body.
6. The sensible-signal-emitting device of claim 5, wherein the flexible substrate is adhesively attachable to a user's body.
7. The sensible-signal-emitting device of claim 1, wherein the sensible-signal-emitting device is operable by a user to controllably operate at least one of the at least one sensible-signal-emitting element to selectively emit at least one sensible signal into an

ambient environment of the user.

8. The sensible-signal-emitting device of claim 1, wherein the at least one sensible-signal-emitting element includes at least one of:

- a light-reflecting display device;
- a light-emitting display device;
- a sound generating device;
- an odor emitting device; and
- a surface distorting device.

9. The sensible-signal-emitting device of claim 1, wherein the surface distorting device comprises a distortable surface and generates touch-sensible distortions in the distortable surface.

FIG. 1

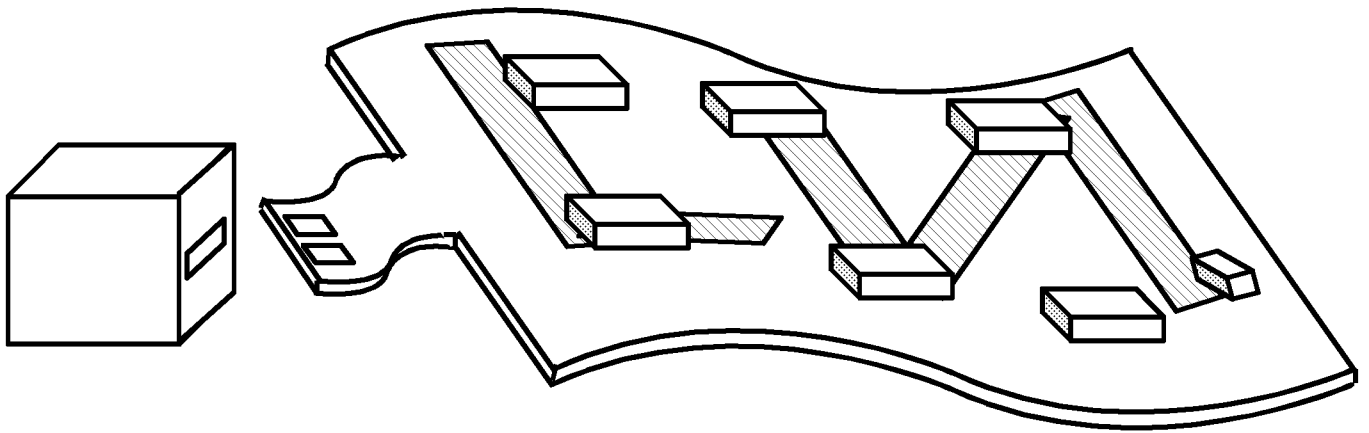
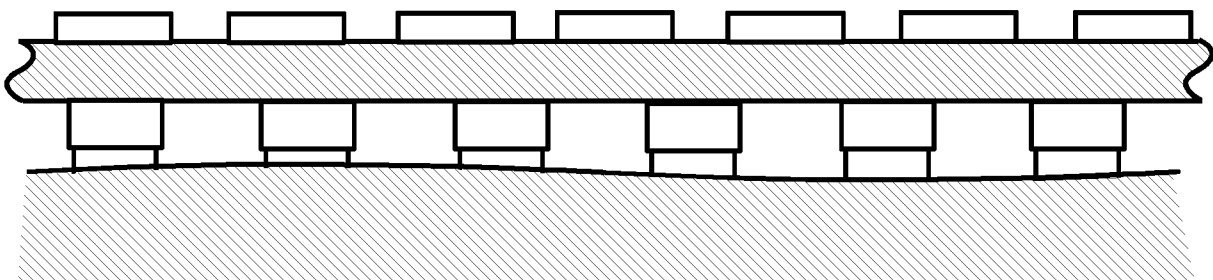


FIG. 2



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FIG. 3

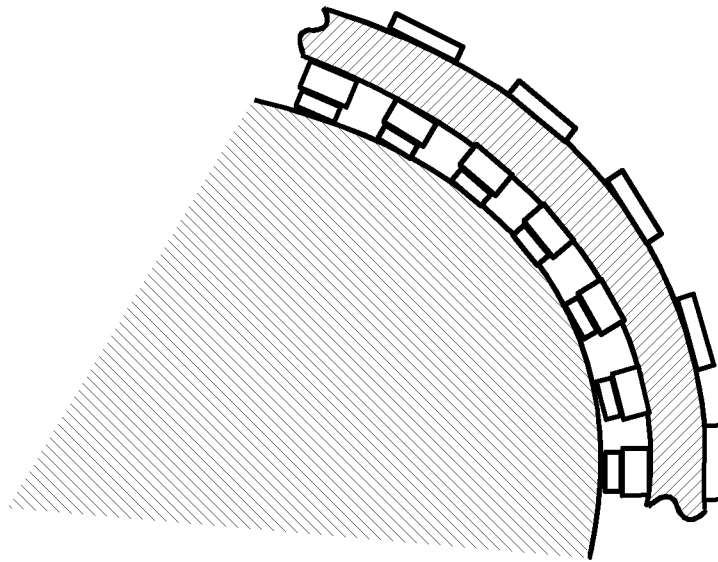
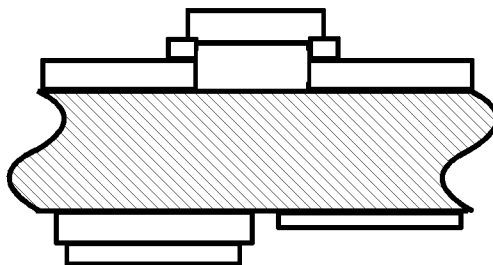


FIG. 4



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FIG. 5

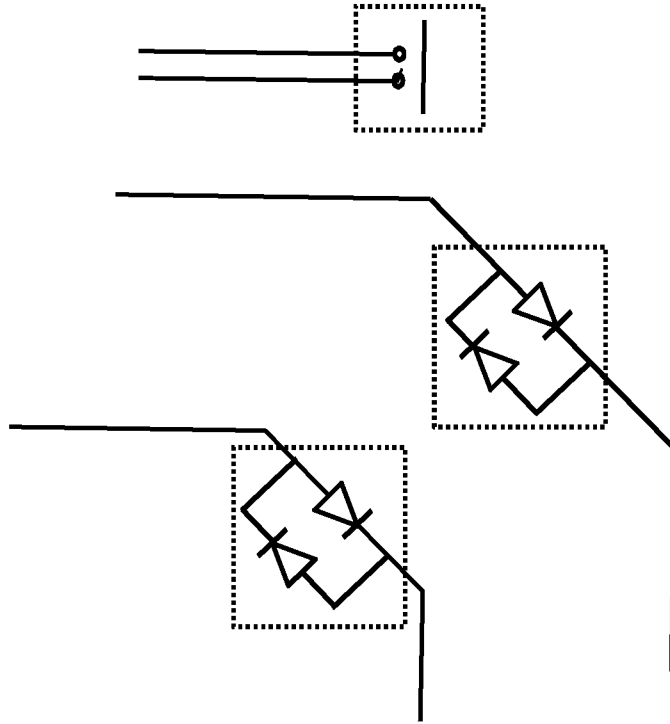
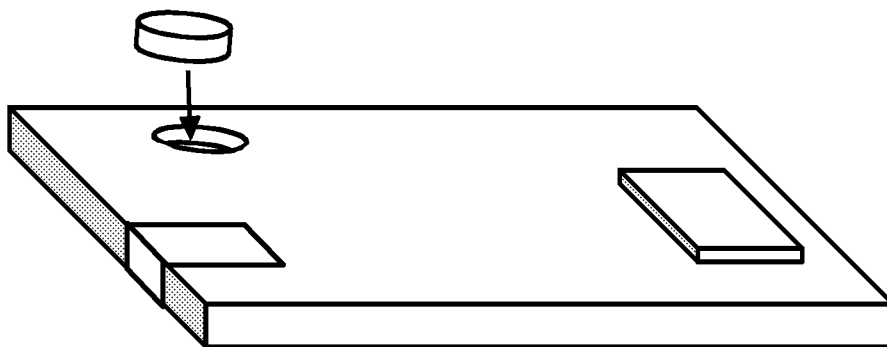


FIG. 6



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FIG. 7

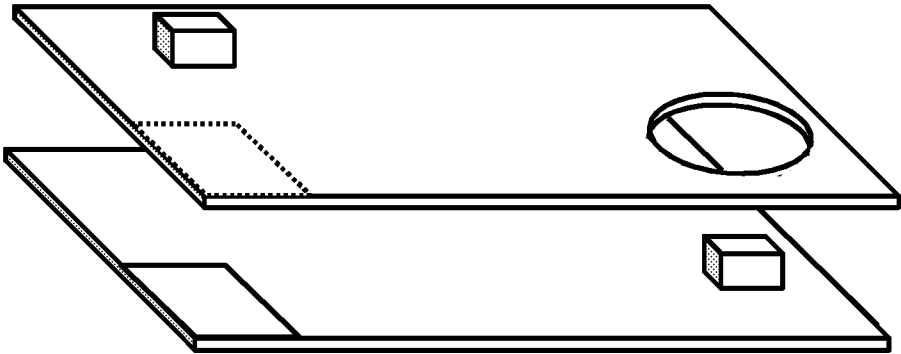


FIG. 8

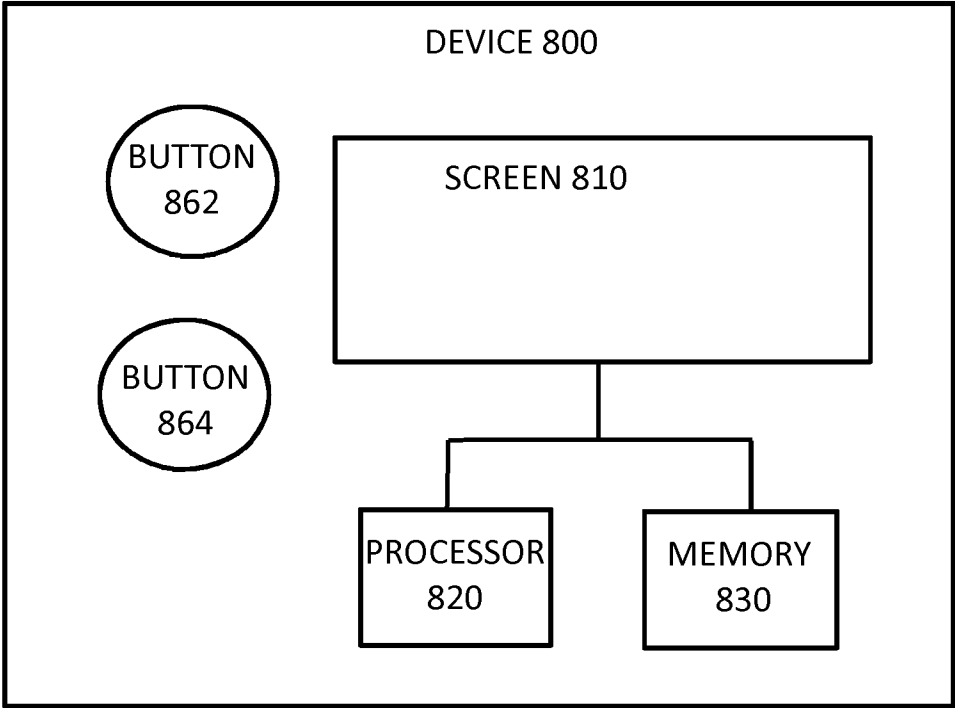




FIG. 9



FIG. 10

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FIG.11

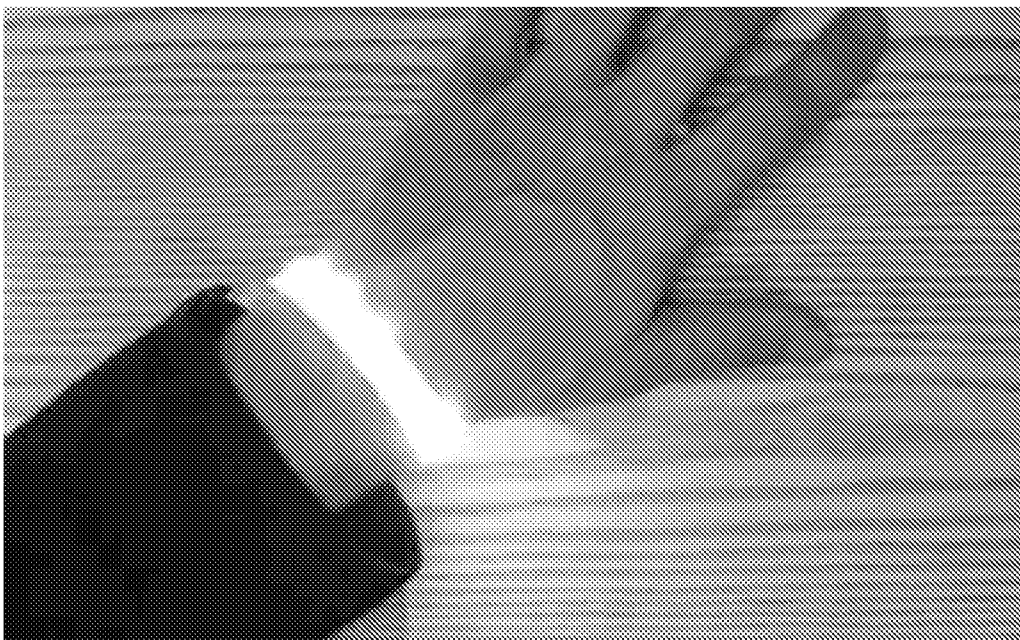


FIG.12

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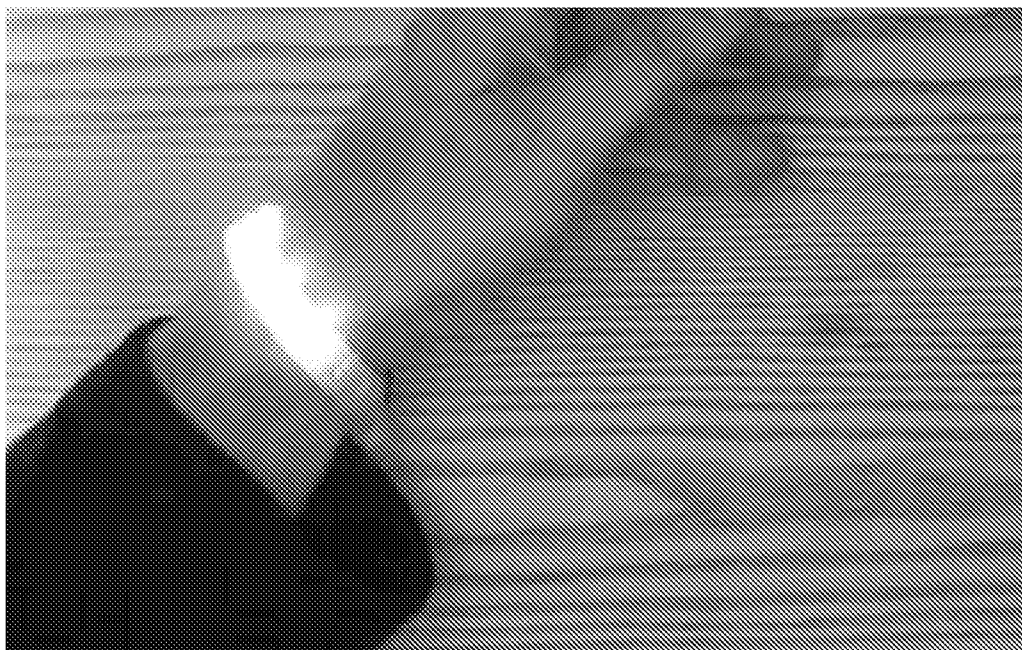


FIG.13

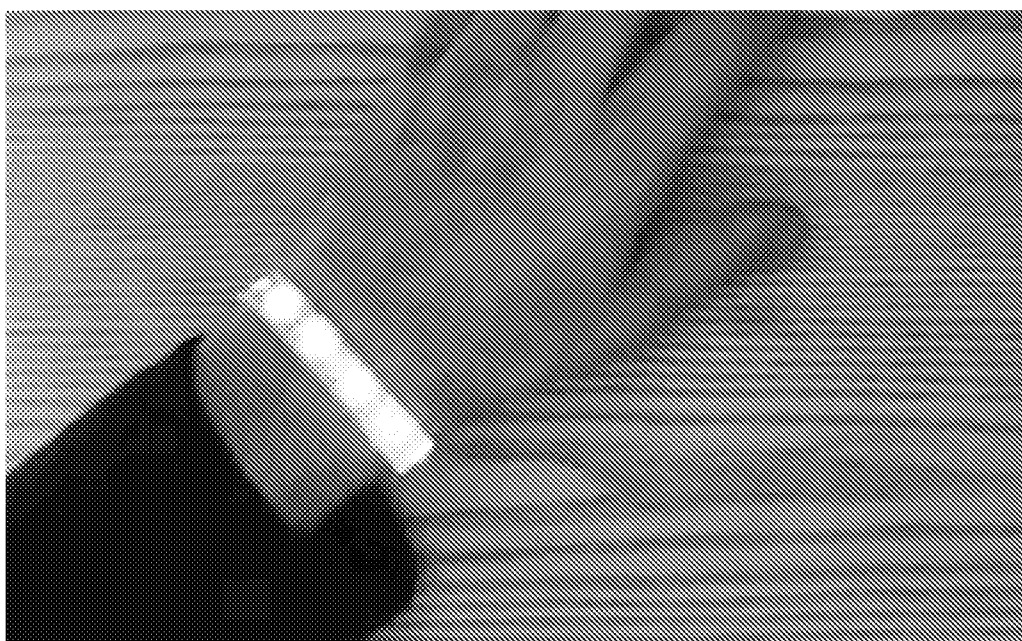


FIG. 14

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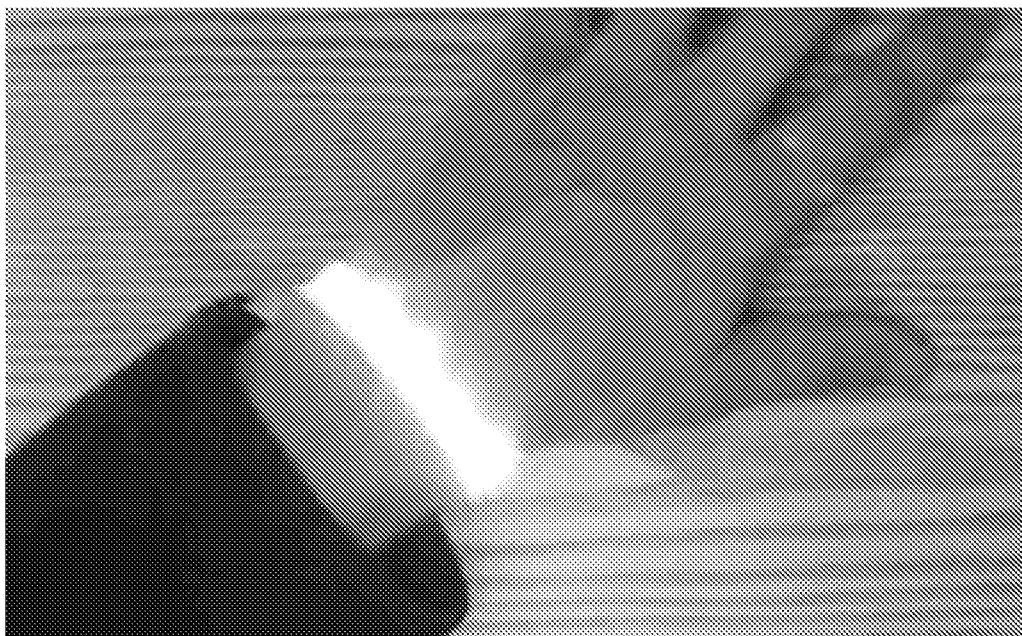


FIG.15

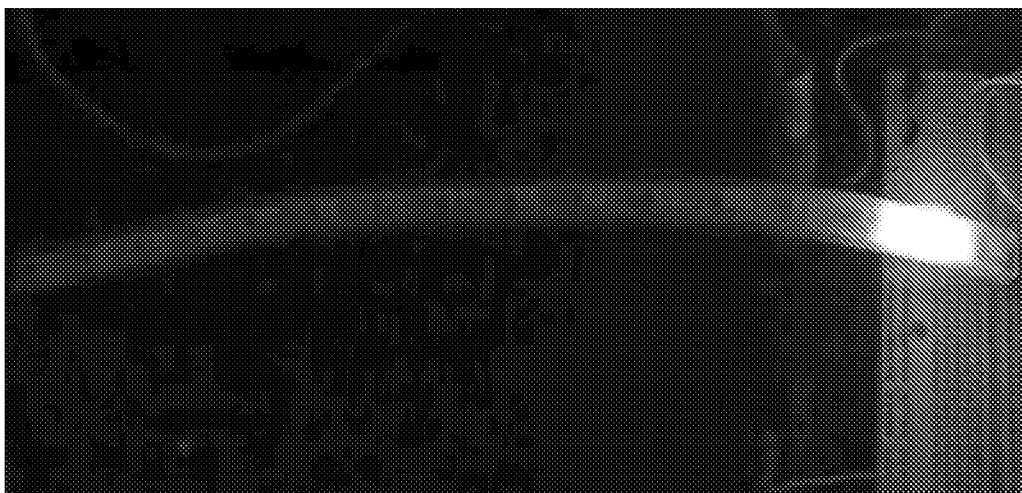


FIG.16

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FIG.17



FIG.18



FIG.19

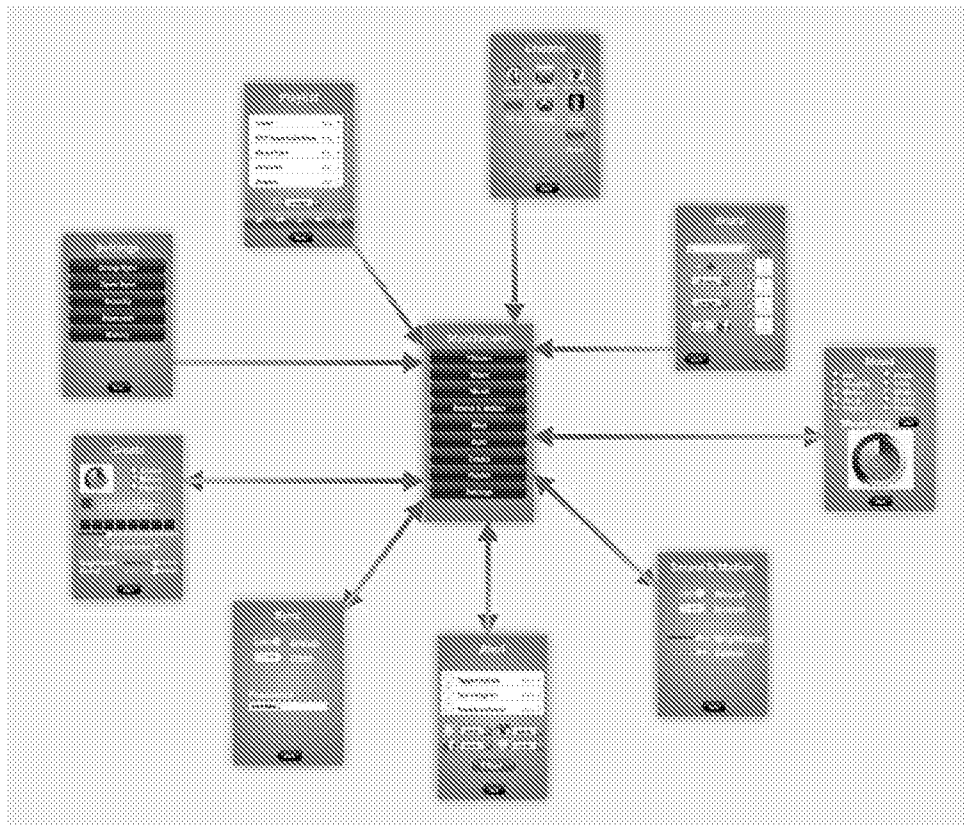


FIG.20

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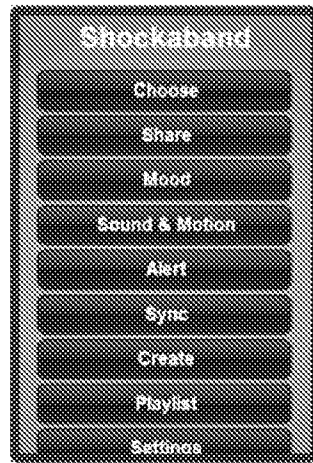


FIG. 21

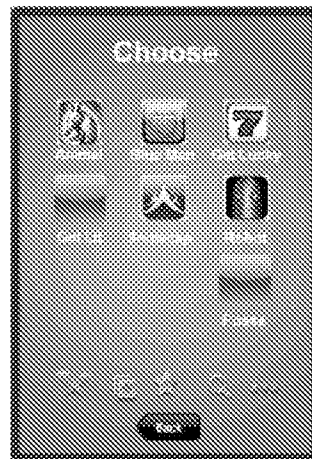


FIG. 22

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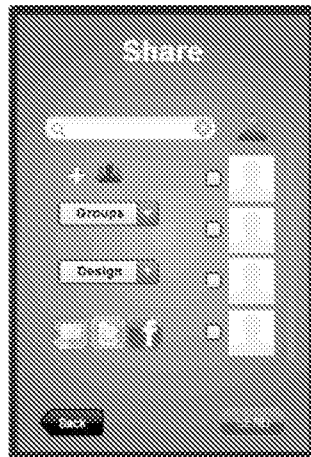


FIG. 23



FIG. 24

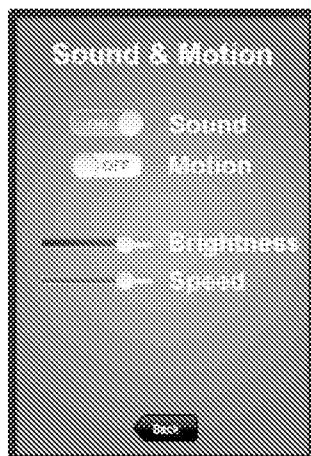


FIG. 25



FIG. 26

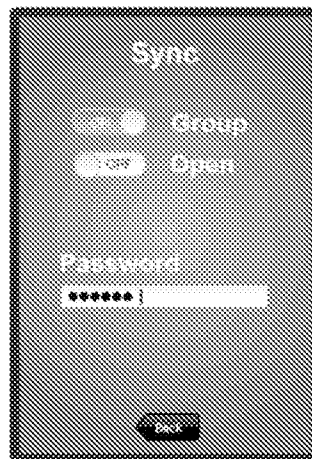


FIG. 27

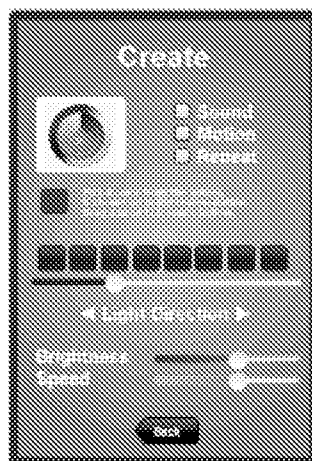


FIG. 28

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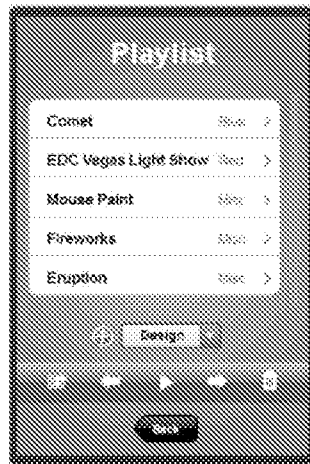


FIG.29

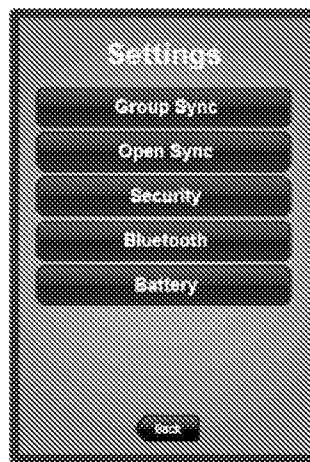


FIG.30

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FIG.31



FIG.32

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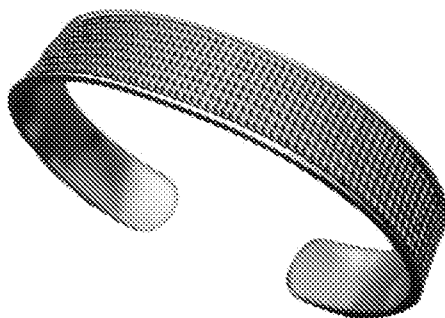


FIG.33

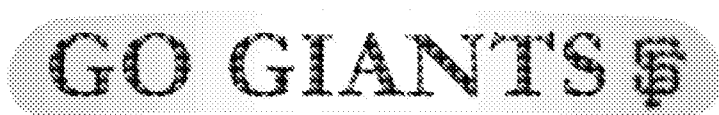


FIG.34

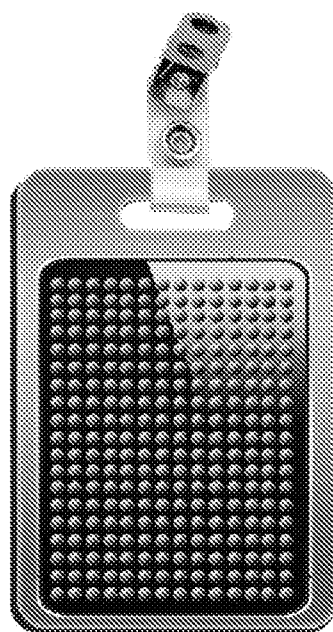


FIG.35