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## MERCHANDISE SECURITY SYSTEM

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# MERCHANDISE SECURITY SYSTEM

## FIELD OF THE INVENTION

[0001] Embodiments of the present invention relate generally to security systems and methods for displaying articles of merchandise in a retail environment.

## BACKGROUND OF THE INVENTION

[0002] Retailers routinely display articles of merchandise, such as telephones, portable computers (e.g. notebooks, laptops, tablets, etc.), e-readers, media players, and the like for customers to evaluate before making a purchase. These articles of merchandise are continually being made smaller and lighter in weight due to advances in technology and materials. As a result, such merchandise is increasingly vulnerable and susceptible to theft. At the same time, the retail price, and hence the profit margin, for such merchandise continues to decline. Accordingly, these articles of merchandise need to be secured by a security device that effectively and cost efficiently protects the merchandise from theft.

## BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0003] The detailed description of the invention provided hereafter may be better understood with reference to the accompanying drawing figures, in which embodiments of a merchandise security system for displaying an item of merchandise are disclosed, and in which like reference characters indicate the same or similar parts.

[0004] FIG. 1 is a perspective view of a merchandise security system for displaying and protecting an item of merchandise according to an embodiment of the invention.

[0005] FIG. 2 is a perspective of the base shown in FIG. 1 with the sensor removed.

[0006] FIG. 3 is an enlarged perspective view of the base shown in FIG. 1 with the sensor removed.

[0007] FIG. 4 is a side perspective view of a base according to one embodiment of the invention.

[0008] FIG. 5 is a perspective view of a sensor according to one embodiment of the invention.

[0009] FIG. 6 is an enlarged plan view of the sensor shown in FIG. 5

[0010] FIG. 7 is an exploded view of the sensor shown in FIG. 5.

[0011] FIG. 8 is another exploded view of the sensor shown in FIG. 5.

#### DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0012] One or more embodiments of a merchandise security system for displaying an item of merchandise are shown in the accompanying drawing figures and described below. The item of merchandise is typically a display model or an operational sample of electronic merchandise, such as portable telephones, smart phones, computers (e.g. notebooks, laptops, tablets, etc.), e-readers, media players, and the like, for a customer to examine before making a decision whether to purchase the article. The item of merchandise is typically displayed in a manner that permits a prospective purchaser to evaluate the operation and features of the merchandise, while protecting the merchandise from theft. In one embodiment, a sensor may be attached to the item of merchandise for detecting various alarming conditions, such as the article being removed from the sensor. A cable may be operably engaged with the sensor at one end, while the opposite end may be secured to a base. As explained in further detail below, the sensor may also be configured to detect an alarming condition of the cable, such as a cutting, severing, removing or detaching of the cable.

[0013] According to one embodiment shown in FIG. 1, the security system 10 generally comprises a sensor 12 configured to be secured to an item of merchandise. The sensor 12 may be electrically connected to a connector 17 that is configured to electrically connect to an input jack of the item of merchandise. The security system 10 may also include a base 18 that is configured to removably support the sensor 12 and the item of merchandise thereon. In some embodiments, the base 18 and the sensor 12 include one or more contacts 28, 40 for facilitating contact charging when the sensor is supported on the base (see, e.g., FIGS. 1). In addition, the security system 10 also includes a cable 20 that is coupled to the sensor 12 at one end and the base 18 at an opposite end. As explained in further detail below, a sense circuit or loop may be defined through the cable 20 and the sensor 12 which may be used to detect various security events associated with the cable and/or the sensor, such as the cable being cut, shorted, and/or disconnected. The sensor 12 may also be used to detect security events associated with the sensor and/or the item of merchandise, such as the item of merchandise being removed from the

sensor.

[0014] The sensor 12 may be secured to the item of merchandise using any desired technique, such as an adhesive and/or mechanical brackets. The sensor 12 may have a variety of shapes and sizes for being secured to the item of merchandise. In one embodiment shown in FIG. 1, the sensor 12 may include a sensing device 15, such as a pressure or plunger switch, for detecting removal of the item of merchandise. In addition, the connector 17 may be configured to be removably inserted into the input jack of the item of merchandise. The connector 17 may be electrically connected to the sensor 12 with a cable 25. Thus, the sensor 12 and the item of merchandise may be electrically connected via the connector 17. The sensor 12 may include a printed circuit board 42 (PCB), circuitry, or the like (see, e.g., FIGS. 7-8). For example, the sensor 12 may include charging circuitry for facilitating power transfer between the base 18 and the item of merchandise. The connector 17 may be electrically connected to the PCB 42 using various techniques, such as via one or more conductors in cable 25. In the illustrated embodiment, the connector 17 is mounted to and extends from the sensor 12 via a cable 25 but could be positioned at other locations depending on the location of the input port of the item of merchandise. Moreover, the cable 25 may be hardwired to the sensor 12 in some embodiments or could be releasably connected via a connector in other embodiments.

[0015] As noted above, the sensor 12 may include one or more electrical contacts 28. In some embodiments, the sensor 12 includes a plurality of electrical contacts 28. The electrical contacts 28 may be in electrical communication with the PCB 42 in the sensor 12 and the connector 17. Alternatively, the electrical contacts 28 may be electrically connected to only the connector 17. In some embodiments, the sensor 12 may not supply power to the item of merchandise when the item is lifted from the base 18. Rather, the item of merchandise may operate using its own power source when lifted from the base 18.

[0016] The base 18 may be configured to be supported by a fixed support or display surface, such as a counter, shelf, fixture, or the like. The base 18 may be secured to the support surface using any desired technique such as an adhesive, brackets, and/or fasteners. The base 18 may include one or more magnets and/or engagement features 34, and the sensor 12 may include or more magnets and/or engagement features 36 for releasably holding the sensor on the base and/or aligning the item of merchandise in a desired display orientation. The base 18 may

include a similar sensing device 15 as the sensor 12 for detecting removal of the base from the support surface.

[0017] It is understood that the cable 20 may be any suitable cord, tether, or the like. In addition, the cable 20 may include one or more electrical conductors 22 for transmitting electrical, security, and/or communication signals (see, e.g., FIGS. 7-8). In addition, the cable 20 may be a single strand, multi-strand, or braided. The cable 20 may be flexible to facilitate extension and retraction relative to the base 18, and in some embodiments, may be formed of a cut-resistant material. Furthermore, the cable 20 may have various cross sections, such as round or flat. In one embodiment, the cable 20 is a flexible helical cable as shown in FIGS. 1, 2, and 5. In some cases, the cable 20 may include a pair of conductors for defining a sense loop or circuit and conducting an electrical signal. In one exemplary embodiment, the cable 20 may also include a power conductor for delivering power and a pair of conductors for defining a sense loop. In other cases, the cable 20 may include a single conductor, such as an optical conductor for conducting an optical signal (e.g., a fiber optic cable). As explained in further detail below, the cable 20 may not include a ground conductor in some embodiments.

[0018] An end of cable 20 may be connected to the sensor 12 as shown in FIG. 5. In some embodiments, the cable 20 is electrically connected to the sensor 12. The cable 20 could be hardwired to the sensor in one embodiment, although the end of the cable may include a releasable connector for engaging the sensor. An opposite end of the cable 20 may include a releasable connector 26 for engaging an input port 30 on the base 18 (see, e.g., FIGS. 1-2). When engaged with the base 18, the cable 20 may facilitate electrical communication between the sensor 12 and the base.

[0019] As discussed above, the base 18 may include one or more electrical contacts 40. The contacts 28, 40 of the base 18 and the sensor 12 are configured to align with one another and contact one another when the sensor is supported on the base. Thus, the base 18 and the sensor 12 are in electrical communication with one another when the sensor is supported on the base. The base 18 may be electrically connected to a power cord 38 which is configured to provide power to the base and/or the one or more electrical contacts 40 in the base. The base 18 may include a printed circuit board 46 (PCB), circuitry, or the like (see, e.g., FIGS. 7-8). In one embodiment, the base 18 includes charging circuitry that is configured to facilitate power

transfer from the external power cord 38. Thus, when the sensor 12 is supported on the base 18, power is able to be transferred from the base 18 to the sensor 12. The connector 17 is electrically connected to the sensor contacts 28 as power is delivered such that power is provided to the item of merchandise. Therefore, the item of merchandise may be powered by power transferred thereto and may be used to charge a battery associated with the item of merchandise. In some embodiments, any voltage adaption occurs prior to being delivered to the sensor 12. Voltage adaption may be needed in order to accommodate different items of merchandise that require different operating voltages. Any voltage adaption may occur prior to power being provided to the sensor 12. Thus, the sensor 12 and connector 17 do not provide any voltage adaption. However, in other embodiments, the sensor 12 may include a resistor or other identifier that detects the voltage requirements of the item of merchandise which provides a signal to the base 18 for adjusting the voltage as necessary before providing power to the sensor.

[0020] In one embodiment, the base 18 include a single conductor 40 (see, e.g., FIG. 3). The single conductor 40 may be a pogo pin type of conductor in some examples. The single conductor 40 may be configured to electrically engage any one of the conductors 28 of the sensor 12. In particular, the sensor 12 may include a plurality of conductors 28 (see, e.g., FIG. 6), and the sensor may be configured to be positioned in a plurality of different display orientations on the base 18. For instance, the sensor 12 may be configured to rotate or index to different orientations while the sensor is supported on the base 18 (e.g., between landscape and portrait orientations). In one non-limiting example, the sensor 12 may include four conductors 28 such that the sensor may be positioned in four different orientations on the base 18 while being electrically connected thereto. In any orientation on the base 18, any one of the conductors 28 is configured to engage with the conductor 40. Thus, only a single conductor 40 is needed on the base 18 to facilitate electrical communication with the sensor 12. In some instances, the single conductor 40 acts as a ground conductor when the conductor of the sensor 28 receives power from the base 18. In one embodiment, the cable 20 may include a single conductor for delivering power to the sensor 12 and/or the item of merchandise. As such, the cable 20 does not require a ground conductor for delivering power since the conductor 40 provides the suitable ground conductor for facilitating power transfer. Therefore, the number of conductors in the cable 20 and the diameter of the cable 20 may be reduced.

[0021] In some cases, the conductors 28 and single conductor 40 may be configured to

cooperate to detect that the sensor 12 is lifted off of the base 18. As discussed above, the sensor 12 and base 18 may each include a conductor 28, 40 that is configured to engage one another when the sensor is supported on the base. The conductor 40 on the base 18 may communicate with the PCB 46 to indicate when the sensor 12 has been lifted off of the base and to cease transferring power to the conductor.

[0022] In one embodiment, the sensor 12 may include one or more resistors for detecting that the sensor has been lifted off the base 18 or whether a security event has occurred. For example, the cable 20 may be electrically connected to the sensor 12 when the sensor is supported on the base 18 such that the resistor and the cable are electrically connected. The base 18 may be configured to send a signal through the cable 20 that is configured to return via a conductor in the cable or the conductor 40. When the signal is transmitted across a single resistor returns via the conductor in the cable 20, the base 18 may determine that the sensor 12 has been lifted based on the detected voltage. Alternatively, the base 18 may determine that the sensor 12 is seated on the base 18 if the signal returns via the conductor 40 based on a different lower voltage where the signal is transmitted across a plurality of resistors. In the sense loop has been interrupted, the base may be configured to detect a high voltage (i.e., no signal is transmitted across any resistor) in comparison to the sense loop being intact thereby indicating that a security event has occurred. Thus, in some cases, the system 10 does not include an optical sensor for detecting that the sensor 12 has been lifted from the base 18, which may be less reliable than the techniques disclosed herein.

[0023] The base 18 may include an alarm 48 for generating a security signal (e.g., an audible and/or a visible signal) in response to a security event (e.g., the cable 20 being cut or disconnected, the base being removed from the support surface, or the sensor 12 being removed from the item of merchandise). The base 18 may include one or more openings 32 defined about its perimeter for facilitating sound transfer from within the base. Thus, where the base 18 includes an alarm 48, the openings 32 may allow for sound to be more readily transmitted from the base. In this embodiment, one opening 32 is defined in a front surface of the base 18, although any number of openings may be used if desire.

[0024] In one embodiment, the sensor 12 and/or base 18 may be configured to communicate with a key for controlling the sensor and/or the base. For example, the base 18 may include a

port 50 configured to facilitate communication between a key and the base. In some cases, the key may communicate a security code that is used to disarm the alarm 48. Means of communication between the key and the sensor 12 and/or base 18 may be wired or wireless. In one embodiment, the base 18 is configured to be selectively configured to generate a security signal or a silent alarm. For instance, the base 18 may follow a particular communication sequence with a key (e.g., a predetermined number of button activations on the key) to allow the base to be programmed with a desired alarming protocol (e.g., no alarm or alarms having a different intensity and/or frequency). The retailer may communicate with the base 18 using a key and then actuate an actuator on the base (e.g., a plunger switch) to select a desired alarming protocol. Different numbers of activations of the key and/or the base 18 may facilitate selection of a desired communication protocol. In the instance where a silent alarm is selected, the base 18 may be configured to communicate with one or more remote devices (e.g., via wired or wireless means) to initiate various security measures (e.g., generating a security signal, directing a camera to record, and/or messaging a retailer or associate).

[0025] Furthermore, the base 18 may include one or more auxiliary ports 35 for connecting to corresponding auxiliary devices for the item of merchandise. Thus, in addition to securing an item of merchandise and electrically connecting to a power cord and associated input power cord 38, the base 18 may be configured to electrically connect to an auxiliary device, such as, for example, an auxiliary device for the item of merchandise on display (e.g., a stylus, a speaker, keyboard, Bluetooth device, etc.). The auxiliary port 35 may be an input port (e.g., a micro-USB port) that is configured to receive a corresponding input connector 37 on the auxiliary device. When the auxiliary device is connected to the auxiliary port, the auxiliary port may be configured to receive power, if necessary, and/or define a sense loop that may be used to detect various security events associated with the auxiliary device, such as the auxiliary device being removed from the base 18 in an unauthorized manner. The auxiliary port 35 may be part of the same sense loop defined with the sensor 12 and the cable 20, or may define a separate sense loop. In the instance where the auxiliary port 35 is configured to provide power, the charging circuit may be configured to determine the power requirements of the auxiliary device and provide the necessary power level to effectuate charging. In some cases, the charging circuit may be configured to reduce the amount of power being provided to the sensor 12 and/or the item of merchandise so that power may be provided to the auxiliary device while still facilitating

charging of the sensor and/or the item of merchandise. Therefore, the auxiliary port 35 allows an auxiliary device to be displayed and used by a prospective consumer in connection with an item of merchandise, while the retailer is able to also power and protect both the item of merchandise and the auxiliary device from theft with a single security device rather than requiring two separate security devices.

[0026] The foregoing has described one or more embodiments of merchandise security systems and methods for displaying and protecting an item of merchandise from theft. Those of ordinary skill in the art will understand and appreciate that numerous variations and modifications of the invention may be made without departing from the spirit and broad scope of the invention. Accordingly, all such variations and modifications are intended to be encompassed by the appended claims.

That which is claimed is:

1. A merchandise security system for displaying and protecting an item of merchandise from theft, comprising:

a sensor configured to be secured to the item of merchandise, the sensor comprising a plurality of electrical contacts;

a base configured to removably support the sensor and the item of merchandise thereon, the base comprising a single electrical contact; and

a cable configured to connect the sensor to the base and further configured to define a sense loop therethrough for detecting a security event,

wherein one of the plurality of electrical contacts of the sensor is configured to engage the single electrical contact of the base when the sensor is supported on the base to establish electrical communication with one another for transferring power to the item of merchandise.

2. The merchandise security system of Claim 1, wherein the sensor is configured to be positioned on the base in a plurality of different display orientations.

3. The merchandise security system of Claim 2, wherein one of the plurality of electrical contacts of the sensor is configured to engage the single electrical contact of the base in each of the plurality of display orientations.

4. The merchandise security system of Claim 1, wherein the cable comprises at least one electrical conductor for defining the sense loop.

5. The merchandise security system of Claim 4, wherein the cable comprises at least one conductor for transferring power to the sensor.

6. The merchandise security system of Claim 1, wherein the single electrical contact of the base is a ground conductor.

7. The merchandise security system of Claim 6, wherein the cable does not include a ground conductor for transferring power to the sensor.

8. The merchandise security system of Claim 1, wherein the single electrical contact

of the base is a pogo pin conductor.

9. The merchandise security system of Claim 1, wherein the sensor comprises at least one resistor for detecting that the sensor has been lifted from the base.

10. The merchandise security system of Claim 1, wherein the base comprises an alarm for generating a security signal in response to a security event.

11. The merchandise security system of Claim 10, wherein the base is selectively configured to generate no security signal or an audible security signal.

12. A method for displaying and protecting an item of merchandise from theft, comprising:

securing a sensor to the item of merchandise, the sensor comprising a plurality of electrical contacts;

attaching a base to a support surface for removably supporting the sensor and the item of merchandise thereon, the base comprising a single electrical contact;

connecting the sensor to the base with a cable; and

placing the sensor on the base such that one of the plurality of electrical contacts of the sensor engages the single electrical contact of the base to establish electrical communication with one another for transferring power to the item of merchandise when the sensor is supported on the base.

13. The method of Claim 12, further comprising lifting the sensor and the item of merchandise from the base.

14. The method of Claim 12, wherein connecting comprises connecting the cable to the base with a releasable connector.

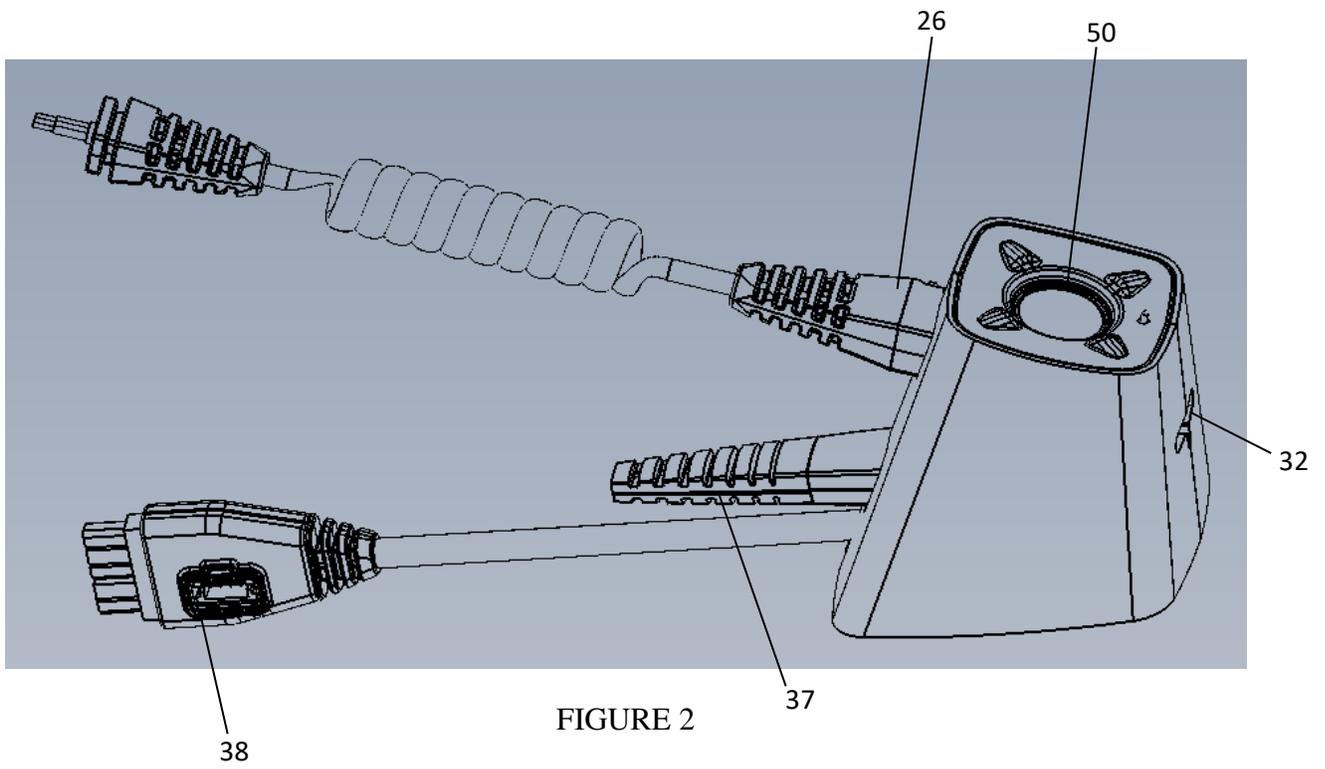
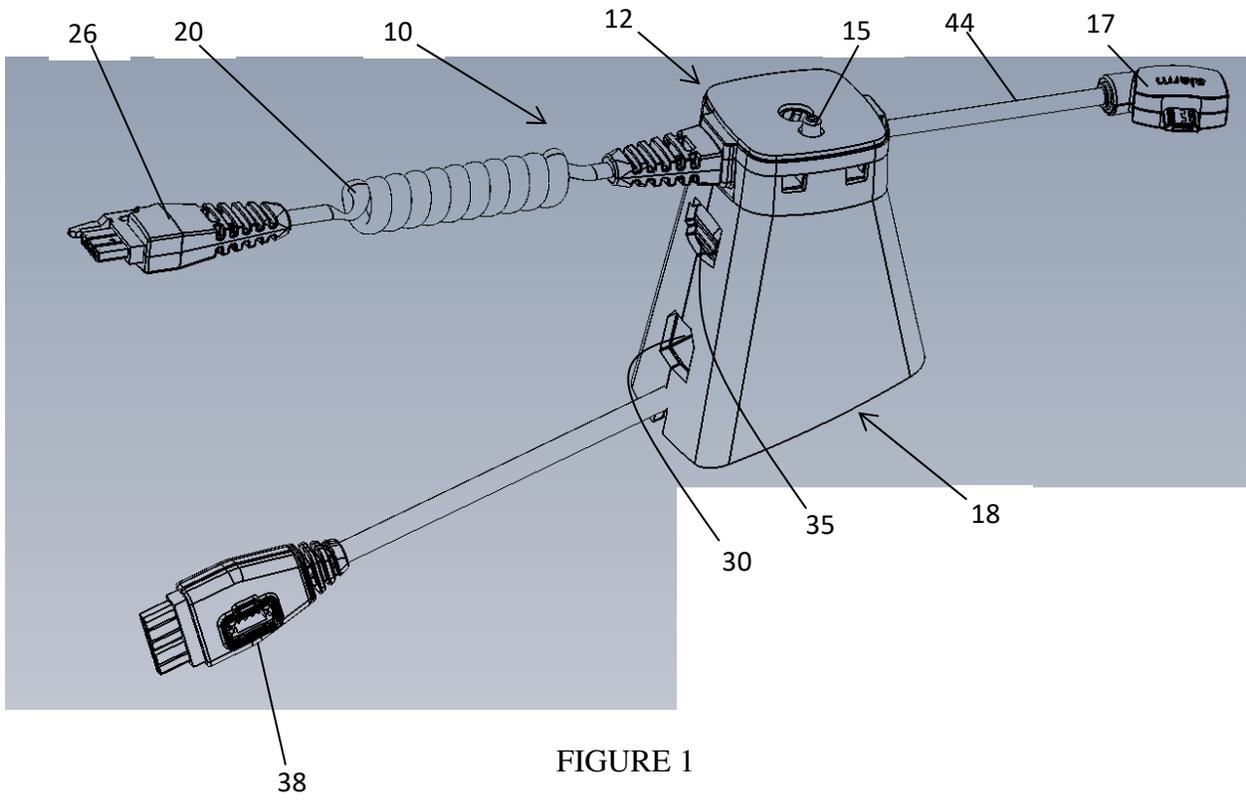
15. The method of Claim 12, further comprising electrically connecting the sensor to the item of merchandise.

16. The method of Claim 12, further comprising connecting an auxiliary device to an auxiliary port in the base.

17. The method of Claim 12, further comprising selecting an alarming protocol for the base.

## ABSTRACT

Embodiments of the present invention are directed to merchandise security systems and methods for displaying and protecting an item of merchandise from theft. In one example, the merchandise security system includes a sensor configured to be secured to the item of merchandise. The merchandise security system includes a base configured to removably support the sensor and the item of merchandise thereon, a cable configured to connect the sensor to the base and further configured to define a sense loop therethrough for detecting a security event. One of a plurality of electrical contacts of the sensor is configured to engage a single electrical contact of the base when the sensor is supported on the base to establish electrical communication with one another for transferring power to the item of merchandise.



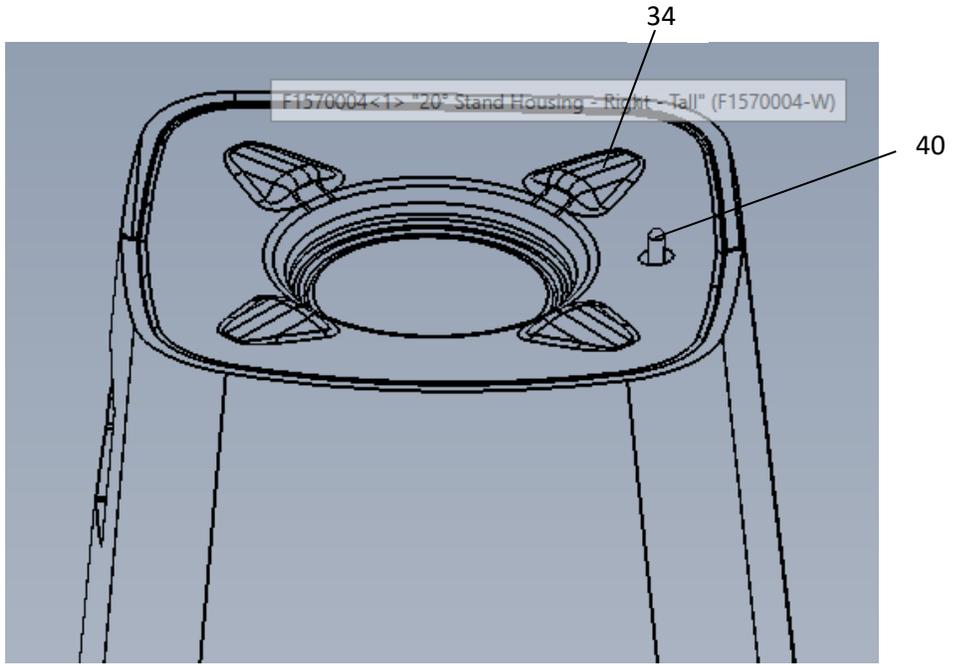


FIGURE 3

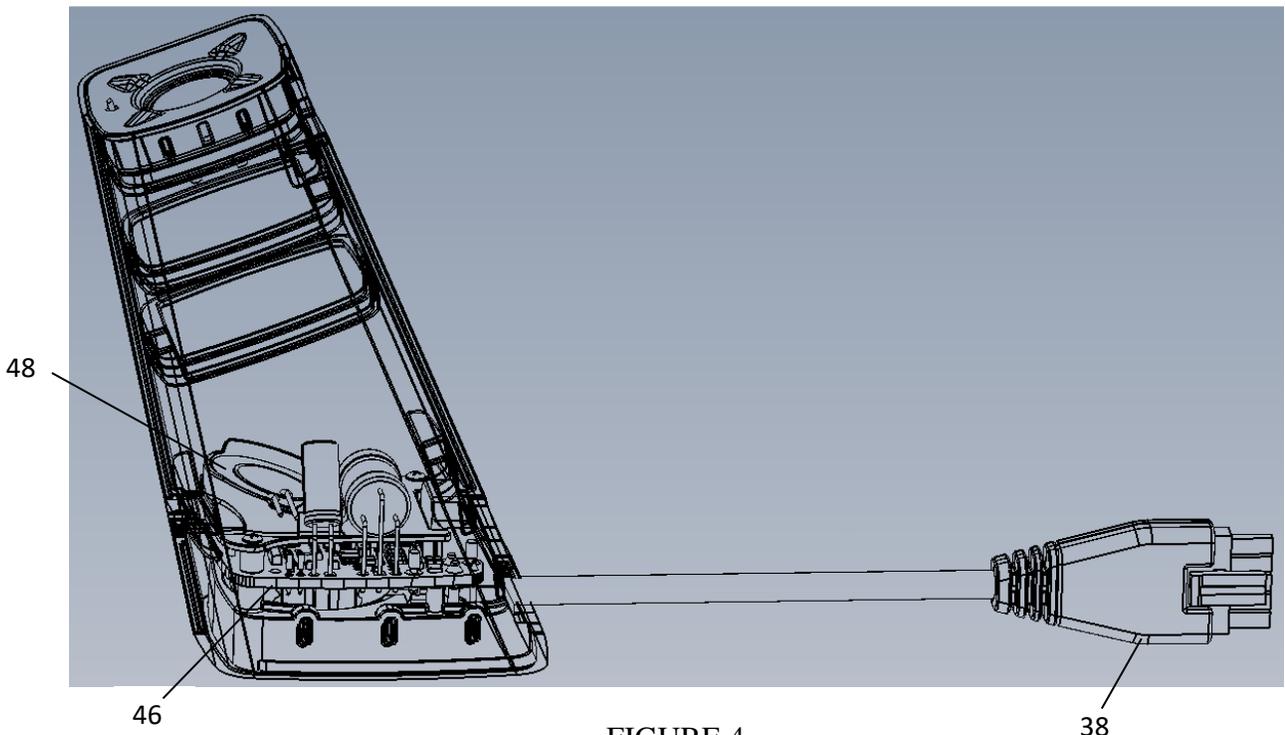
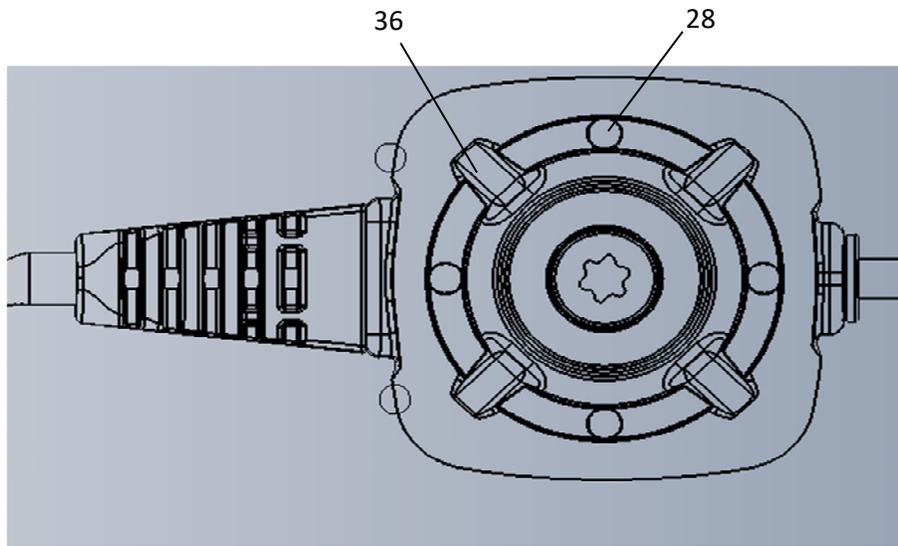
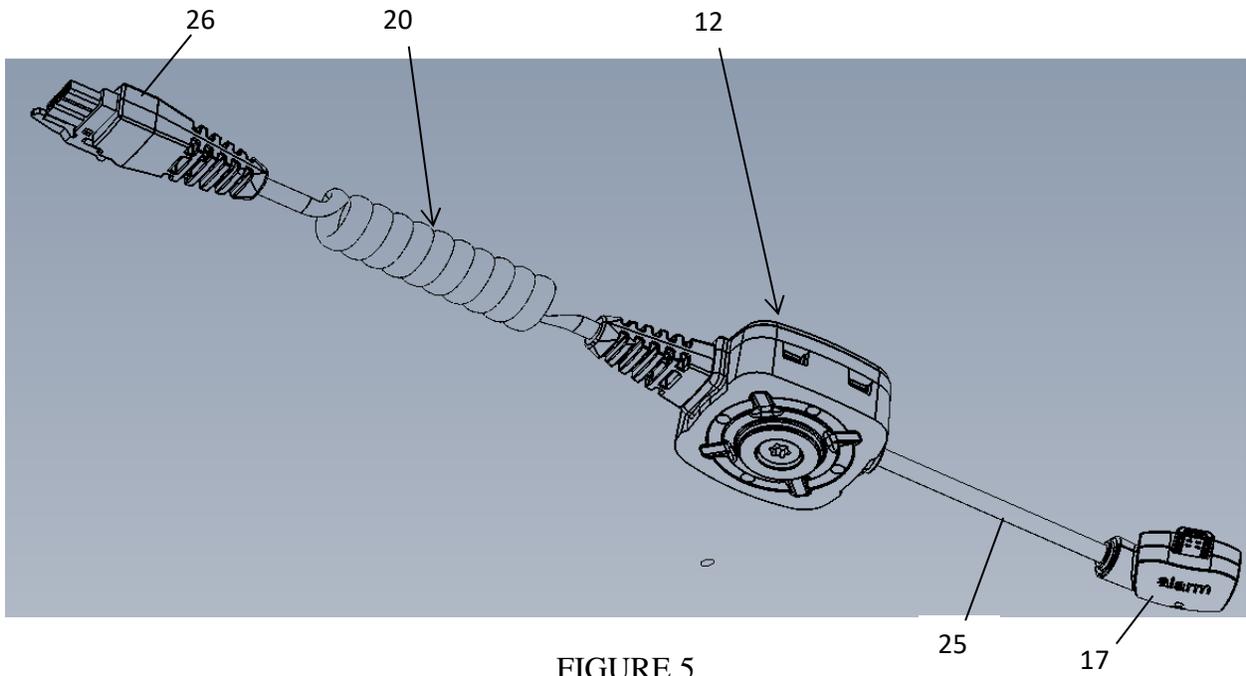


FIGURE 4



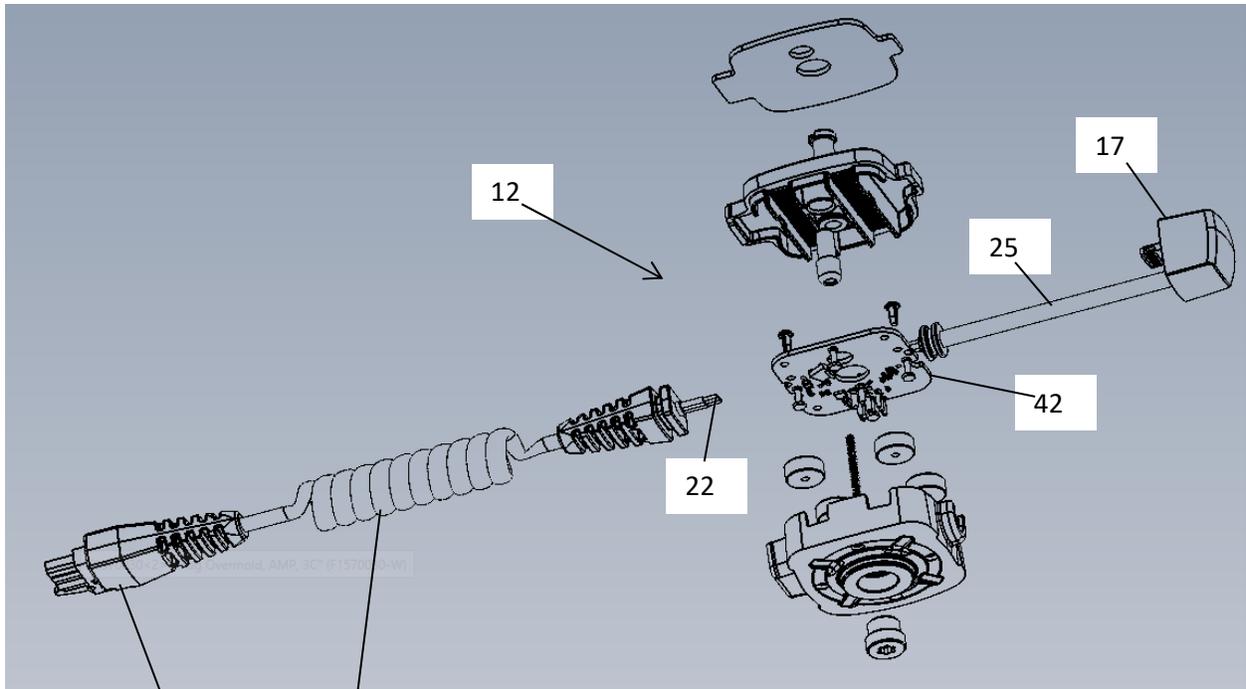


FIGURE 7

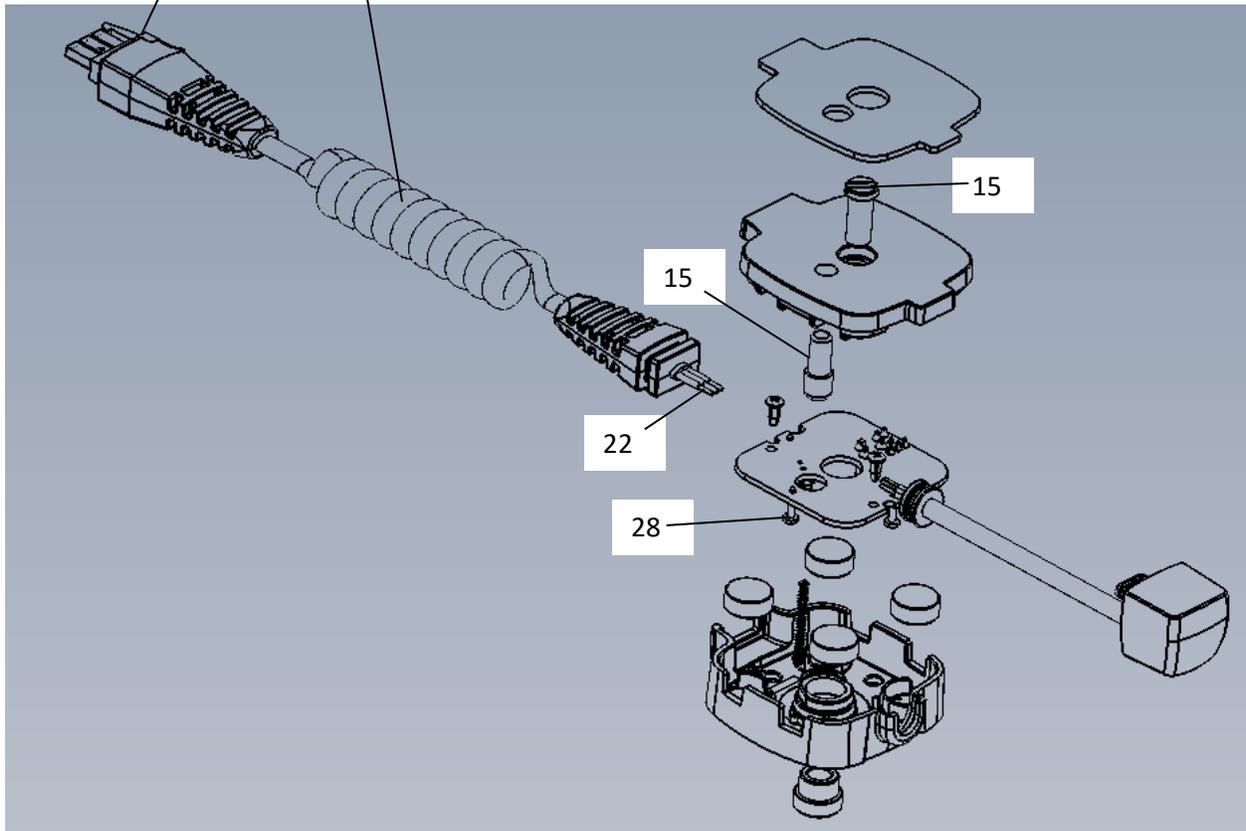


FIGURE 8