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THEFT DETERRENT SYSTEMS AND METHODS

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THEFT DETERRENT SYSTEMS AND METHODS

BACKGROUND OF THE INVENTION

[0001] Retailers often display samples of merchandise items to allow customers to see the items that they may wish to buy. Given the opportunity to observe and touch the items of merchandise, a customer may be more likely to make a purchase. Some items of merchandise, such as electronic devices, may be attached to a display stand or other security device, while still allowing potential customers to see and handle the items. The relative expense of some items, however, makes these items an attractive target for shoplifters.

[0002] Also, thieves have been getting bolder in recent years in their attempts to steal expensive merchandise, whereas thieves in the past resorted to more secretive attempts. Some thieves now may go into a store and forcefully "attack" a security device to dislodge the security device from its connection to a fixed structure. Due to "do not confront" policies at some stores, a thief may get away with this type of behavior, which can create a frightful and dangerous experience for both store personnel and customers.

[0003] Therefore, there is a need to deter attempted theft in a way that prevents a perpetrator from continuously attacking a security device. Although strides have been made to securely mount merchandise using various security devices, theft attempts have continued. Therefore, a need exists for more than simply preventing a perpetrator from using excessive force to dislodge merchandise and security devices from a fixed structure.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0004] Referring now to the accompanying drawing figures wherein like reference numerals denote like elements throughout the various views, one or more embodiments of an inventory tracking system are shown. In the embodiments shown and described herein, the theft deterrent system may be included with security systems for preventing theft.

[0005] FIG. 1 is a diagram illustrating a theft deterrent system 10 according to one embodiment. In this embodiment, the theft deterrent system 10 is installed in conjunction with a security device 12 that is mounted on a fixed support structure, such as a counter 14, table, or

countertop, having a support surface. The counter 14 or table may be firmly attached to a floor 16 and/or wall 18 in a store or other retail location where customers may browse and purchase a product 20 (e.g., mobile phone, personal computer, tablet, etc.) that is on display. The security device 12 in this case may be used not only to securely hold the product 20, but also may be configured to allow customers to handle the product 20. In some embodiments, the security device is similar to that disclosed in U.S. Patent No. 9,761,101, entitled Recoiler for Merchandise Security System, the contents of which are hereby incorporated by reference in its entirety.

[0006] In some situations, a perpetrator may attempt to steal the product 20. Since the product 20 is securely connected to the security device 12, the perpetrator may try to break the security device 12 away from the counter 14. To deter the perpetrator, the theft deterrent system 10 according to one embodiment provides intense output stimuli to cause the perpetrator to experience an involuntary reflex response, startle response, a fight or flight response, or other response that might invoke fear or a heightened sense of awareness in a normal human. For example, the theft deterrent system 10 may invoke a "fear-potentiated startle" (FPS), which is a reflexive physiological reaction to intense stimuli that may be indicated by one or more of increased heart rate and blood pressure, increased blinking, an adverse affect on the immune system, etc.

[0007] In one embodiment, the theft deterrent system 10 includes two primary systems, although it is understood that either system may be employed independently in some cases. A first system is configured to detect excessive forces (e.g., forces greater than a predetermined threshold) on the security device 12 (such as those that may be exerted on the security device 12 by a perpetrator attempting to break the security device 12 off the counter 14). A second system is configured to provide the intense stimuli in response to the detection of the excessive force by the first system.

[0008] The first system for detecting force includes a strain monitoring device 22, which, according to some embodiments, may include a strain gauge 24. The strain gauge 24 may be connected to mounting components that are used for mounting the security device 12 to the counter 14. The strain monitoring device 22 may be configured to receive measurements of strain or other forces acting on the strain gauge 24 and compare these forces with threshold values to determine if a perpetrator is placing an excessive amount of force on the security device 12.

[0009] If an excessive force is measured by the strain monitoring device 22, the strain monitoring device 22 produces a trigger signal that is sent to a controller 26. In response to receiving the trigger signal, the controller 26 is configured to control one or more deterrent devices in an attempt to thwart the nefarious actions of the perpetrator. The deterrent devices, described in more detail below, may be divided into two categories, a first category consisting of devices that are configured to produce an intensive sensory stimulus and a second category consisting of devices that are configured to produce a less intense output that is nonetheless intended to deter a theft attempt. According to various embodiments, the theft deterrent system 10 may include any one or more of the theft deterrent devices described below and include in either one or both of the first and second categories. FIG. 1 illustrates an embodiment in which many deterrent devices are included in the theft deterrent system 10. Other embodiments may include fewer or more deterrent devices.

[0010] An example of some of the first category of deterrent devices for providing intensive sensory stimulus includes one or more lights 28 (e.g., strobe lights, rotating "police-siren" lights, etc.) and one or more alarms 30 (e.g., horns, speakers, etc.). Other first category devices may include a first vibration device 34 configured to vibrate the security device 12, a second vibration device 36 configured to vibrate a floor mat where the perpetrator may be standing, an electric shock device 38 (e.g., taser), and an air cannon 40 or other device for pushing bursts of air toward the perpetrator. These intense output devices are configured to startle the perpetrator, such as a FPS or fight-or-flight reflex. The levels of intensity of the outputs of these devices are sufficiently high to create such involuntary or startle reflexes in a normal human.

[0011] An example of some of the second category of deterrent devices for providing less intense responses to a potential theft attempt include a light control device 42 configured to control the lights 44 of the store in which the theft deterrent system 10 is installed. Another example of a second category device may include an audio output device 32 (e.g., speaker) configured to play a recorded message. For example, the audio output device 32 may be configured to play a recording such as "A theft has been detected. The authorities have been notified and are *en route*." Other recordings may also be played.

[0012] Other less intense second-category deterrent devices may include one or more surveillance cameras 46 for capturing still images, one or more video cameras 48, and one or more marking devices 50. For example, the marking devices 50 may include devices for projecting or shooting ink or other substance that visually marks its target, devices for projecting or shooting chemicals that can be traced, devices for projecting or shooting pungent odors, etc. Still other second category devices may include an airbag system 52 configured to deploy an airbag 54 that covers the security device 12 and product 20. Another second category theft deterrent device may be a video monitor 56, which, for example, may be configured to display a video message to the perpetrator.

[0013] In some embodiments, the theft deterrent system 10 may further include a communication device 58 configured to receive an indication from the controller 26 that a potential theft has been detected. The communication device 58 may be configured to send an automated message to one or more people authorized to oversee security in the store, such as store managers, security guards, police officers, etc. The message sent to the authorized people may be transmitted via a wired or wireless connection to one or more nearby or remote locations. The message may be sent by a landline telephone system, a cellular telephone system, a text message system, an email message system, etc.

[0014] FIG. 2 is a block diagram illustrating a control device 64, which includes portions of the theft deterrent system 10. In this embodiment, the control device 64 includes the strain monitoring device 22 shown in FIG. 1 and the controller 26 also shown in FIG. 1. When the strain monitoring device 22 detects an excessive force, the strain monitoring device 22 may provide a trigger signal to the controller 26. In response to receiving the trigger signal, the controller 26 may control the theft deterrent devices, such as those described above with respect to FIG. 1. For example, the theft deterrent devices may include lights 28, alarms 30, speakers 32, vibrating devices 34, 36, taser 38, air cannon 40, and/or other devices.

[0015] As illustrated in the embodiment of FIG. 2, the strain monitoring device 22 includes the strain gauge 24 (also shown in FIG. 1), a strain measurement circuit 66, a memory 68, and a trigger device 70. When the strain gauge 24 is initially connected to the mounting hardware for securely fixing the security device 12 to the counter 14, the strain measurement circuit 66 may be

configured to take an initial tare reading of the strain. This initial tare reading may stored in the memory 66 as a baseline value to which future strain measurements can be compared. The tare/baseline value represents the strain that is applied to the strain gauge 24 by only the mounting hardware in a steady state without other external forces being applied. In other embodiments, tare readings may be taken and stored at a later time after installation, such as after a customer interacts with a security device 12 in a normal use case. Such tare readings may be automatically recalibrated after predetermined periods of time or after customer interaction is detected.

[0016] However, when other forces are applied to the strain gauge 24, the strain measurement circuit 66 will detect changes from the tare baseline value stored in memory 68. The changes in strain may be the result of normal handling by customers, which, in this case, may be only a small percentage change in the strain from the tare. However, when an excessive force is applied to the strain gauge 24, such as a force resulting from an intentional forceful attempt to break the security device 12 free from the counter 14, this excessive force can be detected as a significant percentage change from the tare that may result from the improper handling of the security device 12.

[0017] The strain measurement circuit 66 may include a processing device (e.g., processor, microprocessor, etc.) configured to utilize logic for making a comparison between the tare baseline value stored in the memory 68 and new strain measurements from the forces ascertained from the strain gauge 24. The comparison detected by the strain measurement circuit 66 may be a percentage change from the tare or an extra force beyond the tare to thereby determine if the strain deviates significantly from the tare beyond a certain threshold. For example, the strain measurement circuit 66 may determine if the newly measured strain is “excessive”, which may correspond to a strain that exceeds a threshold that is a certain percentage, such as 5%, 10%, 20%, or any other preset percentage beyond the tare. In other embodiments, the strain measurement circuit 66 may determine if the newly measured strain exceeds a threshold that is a certain value, such as 20 lb., 30 lb., 40 lb., or any other preset force value beyond the tare. When it is determined that a strain has exceeded the predetermined threshold, the strain measurement circuit 66 may send a signal to the trigger device 70, which in turn sends a trigger signal to the controller 26 triggering the activation of one or more theft deterrent devices.

[0018] FIG. 3 is a cross-sectional side view of mounting hardware 76 for mounting the security device 12 to the counter 14 according to one embodiment. In this embodiment, the mounting hardware 76 may include a bolt 78 connected to the security device 12 in any suitable manner, whereby the bolt 78 is inserted through an opening 80 in the counter 14. A nut 82 or like fastening device may be tightened onto or otherwise secured to the bolt 78 to secure the security device 12 against a top surface 84 of the counter 14. It is understood that a variety of types of mounting hardware 76 may be employed to secure the security device 12 to the counter 14, including any number of types of fasteners, brackets, and/or adhesives.

[0019] In addition to the mounting hardware 76, one or more strain gauges 24 are installed between the nut 82 and an underside 86 or bottom surface of the counter 14 according to one embodiment. For example, the strain gauges 24 may be installed between an anchor 88 and the bottom surface 86 of the counter 14. The anchor 88 may include one or more washers and/or disk-shaped platforms such that when the nut 82 is tightened, the anchor 88 securely presses the strain gauge 24 against the bottom surface 86. Thus, with the mounting hardware 76 tightened to a certain force for securely mounting the security device 12, a tare baseline strain value can be obtained from the strain gauge(s) 24. After installation and the theft deterrent system 10 is put into action, strain measurements are then compared with the baseline value to determine if excessive forces are being applied to the security device 12. In some cases, the anchor 88 may be omitted such that the strain gauge 24 may be installed directly between the counter 14 and the nut 82 or similar fastening device. In other embodiments, the strain gauge 24 may be integrated into the counter 14 and/or mounting hardware, or could be mounted to an upper surface of the counter, between the security device and the counter, if desired.

[0020] FIG. 4 is a diagram illustrating one embodiment of the strain gauge 24. It should be understood that other embodiments of strain gauges may be used in place of the exemplary strain gauge 24 shown in FIG. 4.

[0021] According to the embodiment of FIG. 4, the strain gauge 24 may include a base material 94 (e.g., wood) formed as a block or other suitable shape. The base material 94 may be formed to fit in the space between the anchor 88 and the underside 86 of the counter 14. Also, the base material 94 may be formed of a material that has sufficient strength to firmly secure the security

device 12, yet can be compressed in the vertical direction (as shown by the arrows) by a measurable amount. The strain gauge 24 in this embodiment may also include a foil attachment 96 that is affixed to the block of the base material 94. The foil attachment 96 may include an insulative material 98 with a conductive pattern 100 formed thereon. The conductive pattern 100 may be a serpentine conductor having long segments oriented in the vertical direction. Thus, when a strain force is applied that compresses the base material 94 vertically, the conductive pattern 100 may be deformed in such a way that the resistive characteristics of the strain gauge 24 are changed. It is understood that the strain gauge 24 may be configured to detect any desired variable, such as tensile forces, compressive forces, torque, etc. Furthermore, it is understood that any desired sensor (e.g., strain gauges, load cells, pressure sensors, torque transducers, etc.) may be utilized to determine whether excessive forces are present that are indicative of a theft attempt such that the discussion of a strain monitoring device and strain gauge should not be considered limiting.

[0022] In operation, the strain measurement circuit 66 shown in FIG. 2 may be configured to apply an excitation voltage across terminals 102 of the strain gauge 24. Then, the strain measurement circuit 66 may read the voltage across the terminals 102 when the strain gauge 24 is experiencing strain. The change in resistance of the conductive pattern 100 is a factor of a measured change in the voltage. This resistance changes is indicative of the strain.

[0023] FIG. 5 is a flow diagram illustrating an embodiment of a method 110 regarding the activities of a strain monitoring device (e.g., strain monitoring device 22 shown in FIG. 2). The steps of the method 110 may involve, for example, steps regarding the installation and set-up of a strain gauge (e.g., strain gauge 24) and then steps regarding the measuring of strain after this installation.

[0024] According to FIG. 5, the method 110 includes a block 112 that indicates the execution of a step of incorporating a strain gauge into a support structure. For example, incorporating the strain gauge may include the installation of a strain gauge in a manner described with respect to FIG. 3, where the strain gauge 24 is sandwiched between the anchor 88 and the counter 14 and held in place by the nut 82 and bolt 78. Block 114 indicates that the method 110 includes a step of measuring a baseline or tare reading of strain. The blocks 112 and 114 of the method 110 are

therefore performed initially during a set-up process before the theft deterrent system 10 is put into operation.

[0025] When the strain monitoring device is in place and the theft deterrent system 10 is ready for responding to customer interaction, the method 110 includes a step as indicated in block 116 of measuring strain, which may be performed in a continuous manner. Block 118 indicates that the measured strain is compared with the tare reading obtained in block 114. According to decision diamond 120, it is determined whether the measured strain exceeds a predetermined threshold related to the baseline tare reading. The threshold may be a percentage above the tare or a certain amount of force above the tare.

[0026] If it is determined in step 120 that the measured strain does not exceed the threshold, then the method 110 returns back to block 116 to measure the strain on the strain gauge again. However, if the measured strain does indeed exceed the threshold, the method 110 proceeds from diamond 120 to block 122, which indicates that a step of sending a trigger signal is executed. The trigger signal may be sent to any number of theft deterrent devices. In particular, the trigger signal may be sent to a controller (e.g., controller 26) that is configured to control the theft deterrent devices to provide sensory overload outputs to the devices.

[0027] FIG. 6 is a flow diagram illustrating a method 130 that defines an embodiment of the operation of a theft deterrent system. Steps defined in blocks 132, 134, and 136 may represent actions that are performed during an installation or set-up stage when the theft deterrent system is initially installed in a store or other retail setting. After set-up, the method 130 further includes operational steps 138 and 140 that are performed when customers are present in the store and may handle the products that are secured by the security devices.

[0028] In particular, the method 130 includes a step of installing one or more theft deterrent devices in a security system, as indicated in block 132. Block 134 indicates that the theft deterrent devices are connected to a controller (e.g., controller 26) that is configured to activate the theft deterrent devices in the event of a detected theft attempt. According to block 136, the method 130 includes the step of setting output levels for controlling each one of the theft deterrent devices. The output levels are set to cause a perpetrator to experience a fear-potentiated startle, such as an involuntary response, a fight or flight response, or other response that might invoke fear or a

heightened sense of awareness in a normal human. Once the theft deterrent devices are installed and the controller is configured with proper output levels for controlling each of the theft deterrent devices properly, the method 130 proceeds to step 138, which represents the start of the theft deterrent system being put into action in an environment where the customers can handle the security device 12 and products 20.

[0029] Decision diamond 138 indicates a step of the method 130 in which it is determined whether a trigger signal has been received. The trigger signal corresponds, for example, to the signal sent as described in block 122 of the method 110 of FIG. 5. If no trigger signal is received, indicative of no one applying excessive forces on the security device 12, the method 130 loops back to the decision diamond 138 to repeat until a trigger signal is received, if one is ever received. When a trigger signal is received, the method 130 proceeds to block 140, which indicates that the controller provides the output levels, which were set in block 136, to the appropriate theft deterrent devices to thereby activate each of the theft deterrent devices according to set-up parameters.

[0030] For example, at least one of the theft deterrent devices may receive an output level that would cause the device to invoke a startle response, reflex action, or other physiological stress in the perpetrator. In some embodiments, the controlling of output levels of various theft deterrent devices may include the operation of multiple theft deterrent devices having less intense outputs, such as those that do not necessarily invoke a reflex response. The method 130 may include providing multi-sensory stimuli for causing startle responses to more than one sense, such as flashing lights to cause a reflex response based on the perpetrator's sense of vision and a loud alarm to cause a reflex response based on the perpetrator's sense of hearing. Other combinations of multi-sensory theft deterrent devices may be utilized, which may be used to invoke optical, auditory, tactile, and/or olfactory sensations in the perpetrator.

[0031] The foregoing has described one or more exemplary embodiments of a merchandise display security system. Embodiments of a merchandise display security system have been shown and described herein for purposes of illustrating and enabling one of ordinary skill in the art to make, use and practice the invention. Those of ordinary skill in the art, however, will readily understand and appreciate that numerous variations and modifications of the invention may be

made without departing from the spirit and scope thereof. Accordingly, all such variations and modifications are intended to be encompassed by the appended claims.

CLAIMS

What is claimed is:

1. A system for deterring theft comprising:

at least one security device configured to be mounted to a support surface, the security device configured to secure a product from theft;

a strain gauge configured to measure a strain on the mounted security device to obtain a strain measurement;

a strain monitoring circuit configured to compare the strain measurement to a predetermined threshold to determine if the strain measurement exceeds the predetermined threshold, the predetermined threshold indicative of an attempted theft by a perpetrator, the strain monitoring circuit further configured to output a trigger signal if the strain measurement exceeds the predetermined threshold; and

a controller configured to provide at least one output control signal to one or more theft deterrent devices in response to receiving the trigger signal;

wherein the at least one output control signal is configured to cause the one or more theft deterrent devices to output a signal for deterring theft of the product.

2. The system of claim 1, further comprising a plurality of theft deterrent devices.

3. The system of claim 2, wherein the theft deterrent devices are configured to produce multi-sensory stimuli.

4. The system of claim 1, wherein the signal output by the one or more theft deterrent devices comprises an optical, an auditory, a tactile, and/or olfactory signal.

5. The system of claim 1, wherein the theft deterrent devices include at least one sensory overload device selected from strobe lights, rotating lights, audible alarms, horns, speakers, vibration devices that vibrate the security fixture, vibration devices that vibrate a floor mat, tasers, electric shock mechanisms, and air cannons.

6. The system of claim 5, wherein the theft deterrent devices include at least one low-intensity device selected from an auditory system for providing a recorded message, a system for controlling lights of a store in which the security fixture resides, a camera, a video camera, a marking device, an air bag system, a video monitor for displaying a message to the perpetrator, and a communication device configured to send a message to a person authorized to oversee security in the store.

7. The system of claim 6, wherein the marking device includes one of an ink shooter, a chemical shooter, and a pungent scent shooter.

8. The system of claim 1, wherein the strain gauge is mounted between the support surface and hardware used for mounting the security fixture to the support surface.

9. The system of claim 8, wherein the hardware includes at least one bolt, at least one nut, and an anchor positioned between the nut and an underside of the support surface.

10. The system of claim 8, wherein the predetermined threshold is at least 5% greater than a tare baseline value of a strain measurement caused by a strain force exerted by the hardware in a steady state.

11. The system of claim 8, wherein the predetermined threshold is at least 10% greater than a tare baseline value of a strain measurement caused by a strain force exerted by the hardware in a steady state.

12. The system of claim 8, wherein the predetermined threshold is at least 20% greater than a tare baseline value of a strain measurement caused by a strain force exerted by the hardware in a steady state.

13. The system of claim 1, wherein at least one of the one or more theft deterrent devices is configured to provide a sensory overload sensation to the perpetrator.

14. The system of claim 1, wherein at least one of the one or more theft deterrent devices is configured to provide an output that initially invokes a fight-or-flight response in the perpetrator.

15. The system of claim 1, wherein at least one of the one or more theft deterrent devices is configured to cause an involuntary reaction or reflex action in the perpetrator.

16. The system of claim 1, wherein the predetermined threshold is established during installation of the strain gauge to sufficiently allow detection of an occurrence of an attempted theft.

17. The system of claim 1, wherein the at least one output control signal is configured to cause the one or more theft deterrent devices to invoke at least one fear-potentiated startle (FPS) response in the perpetrator.

18. A method comprising the steps of:

measuring strain on a mounted security device, the security device configured to secure a product from theft;

comparing the measured strain to a predetermined threshold, the predetermined threshold indicative of an attempted theft of the product by a perpetrator; and

when the measured strain exceeds the predetermined threshold, transmitting a trigger signal to a controller for controlling one or more theft deterrent devices.

19. A method comprising the steps of:

determining if a trigger signal is received, the trigger signal being indicative of a strain on a security device mounted to a support surface that exceeds a predetermined threshold, the

predetermined threshold indicative of an attempted removal of the security device from the support surface by a perpetrator; and

in response to determining that the trigger signal is received, providing predetermined outputs to one or more theft deterrent devices to invoke a fear-potentiated startle (FPS) in the perpetrator.

20. A system for deterring theft comprising:

at least one security device configured to be mounted to a support surface, the security device configured to secure a product from theft;

a sensor configured to measure a force applied to the mounted security device to obtain a measurement;

a monitoring circuit configured to compare the measurement to a predetermined threshold to determine if the measurement exceeds the predetermined threshold, the predetermined threshold indicative of an attempted removal of the security device from the support surface, the monitoring circuit further configured to output a trigger signal if the measurement exceeds the predetermined threshold; and

a controller configured to provide at least one output control signal to one or more theft deterrent devices in response to receiving the trigger signal.

ABSTRACT

Systems and methods for deterring theft are provided. In one embodiment, a system for deterring theft comprises a strain gauge configured to measure the strain on a mounted security device to obtain a strain measurement. A strain monitoring circuit is configured to compare the strain measurement to a predetermined threshold to determine if the strain measurement exceeds the predetermined threshold. The predetermined threshold may be indicative of an attempted theft by a perpetrator. The strain monitoring circuit is further configured to output a trigger signal if the strain measurement exceeds the predetermined threshold. The system further includes a controller configured to provide preset output control signals to one or more theft deterrent devices in response to receiving the trigger signal. The preset output control signals may be configured to cause the one or more theft deterrent devices to invoke at least one fear-potentiated startle response in a perpetrator.

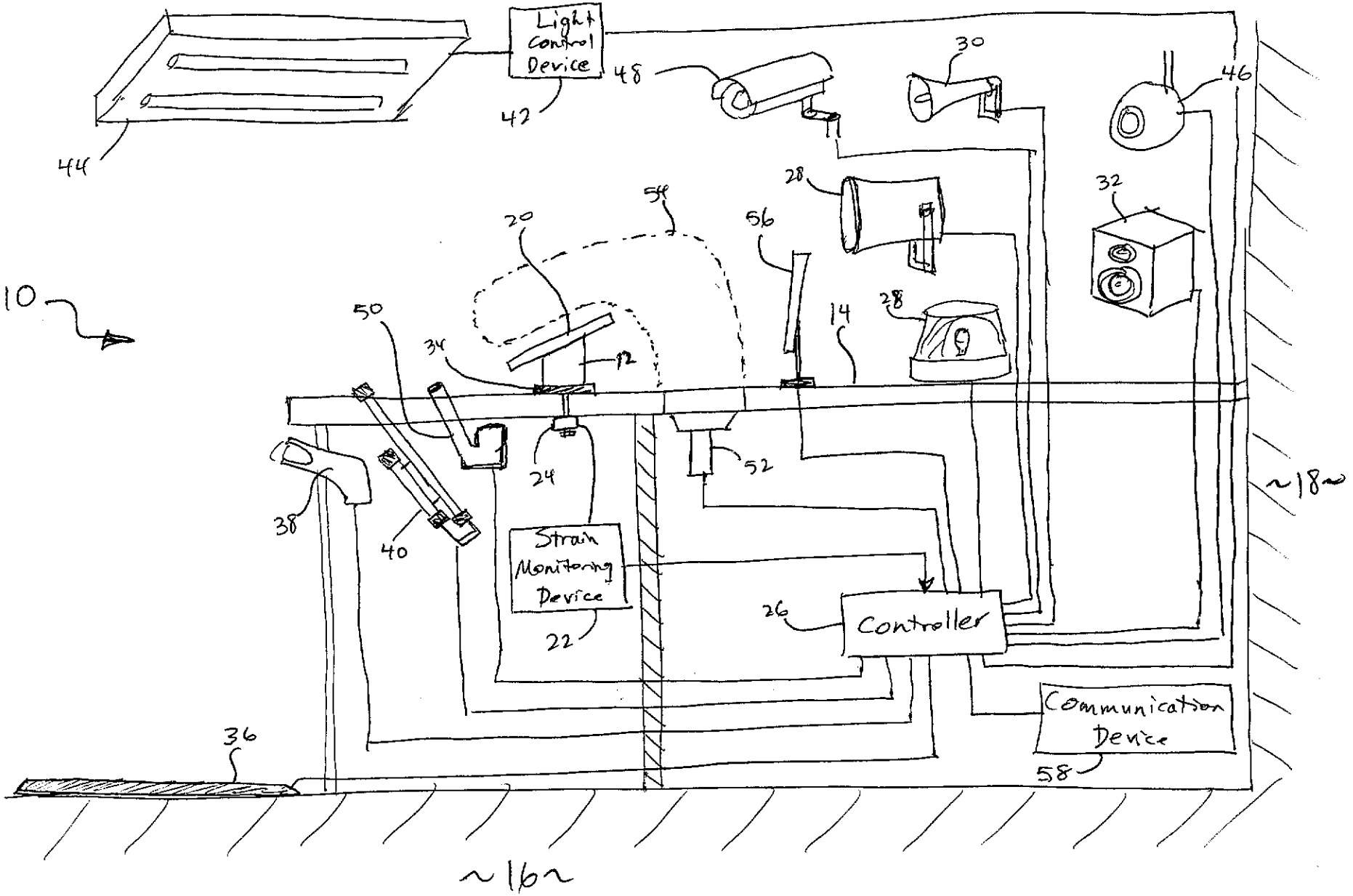
Light Control Device
42
44
48
30
46
28
32
20
54
56
10
50
34
12
14
28
24
52
38
40
18
Strain Monitoring Device
22
26
Controller
Communication Device
58
36
16

FIG. 1

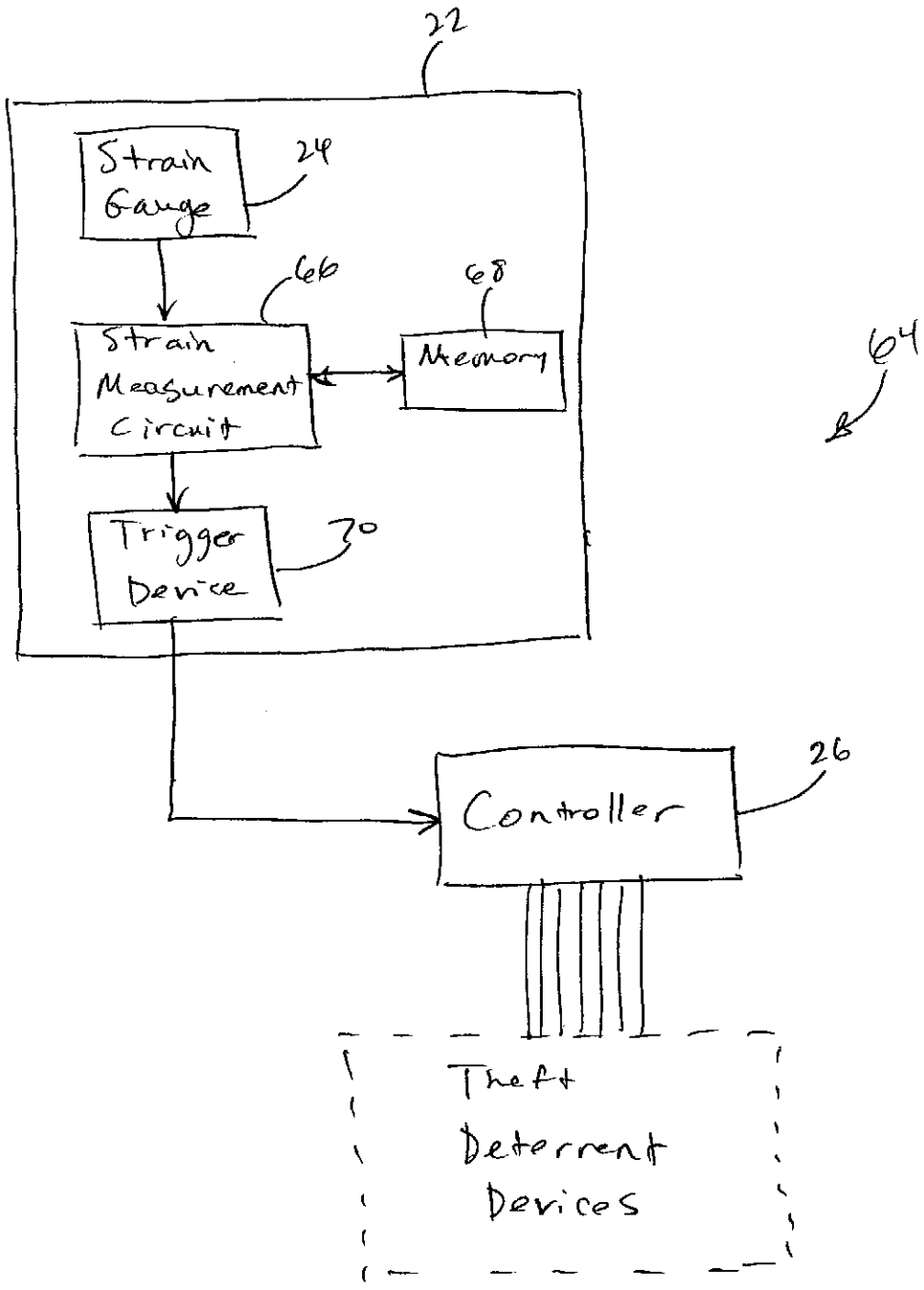
22
Strain Gauge
24
66
68
Strain Measurement Circuit
Memory
64
Trigger Device
30
Controller
26
Theft Deterrent Devices

FIG. 2

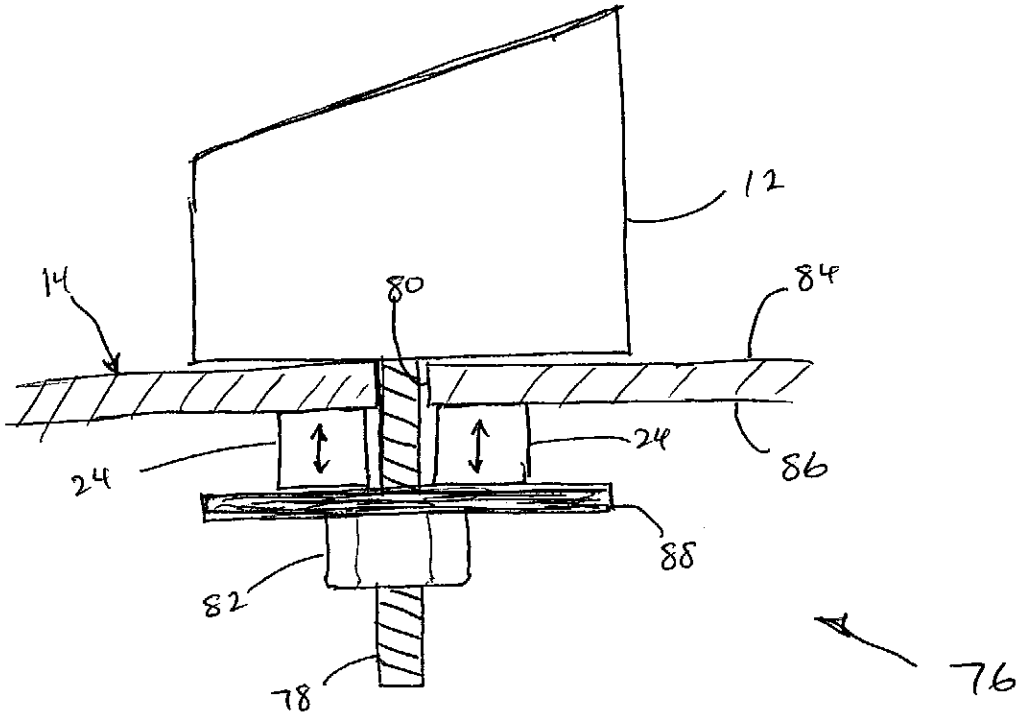

FIG. 3

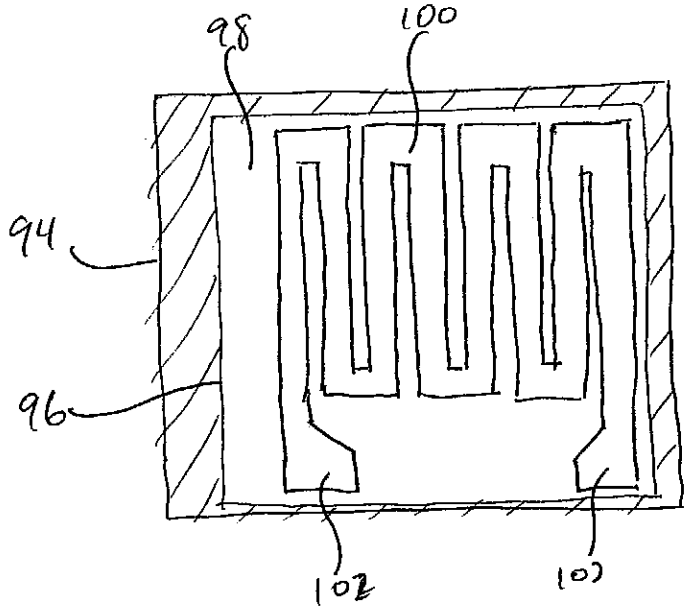

FIG. 4

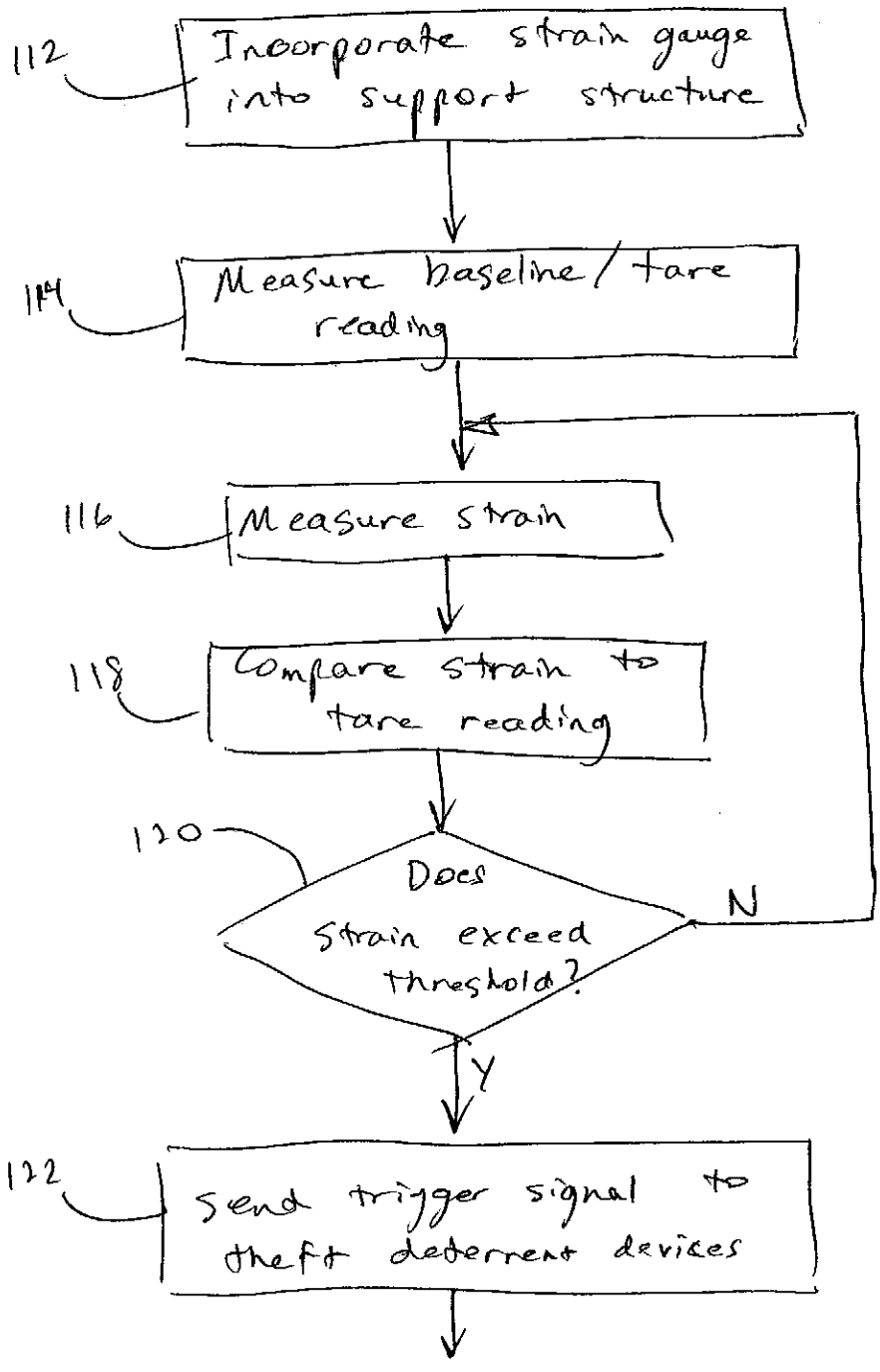
112
Incorporate strain gauge into support structure
110
114
Measure baseline / tare reading
116
Measure strain
118
Compare strain to tare reading
120
Does strain exceed threshold?
N
Y
122
Send trigger signal to theft deterrent devices

FIG. 5

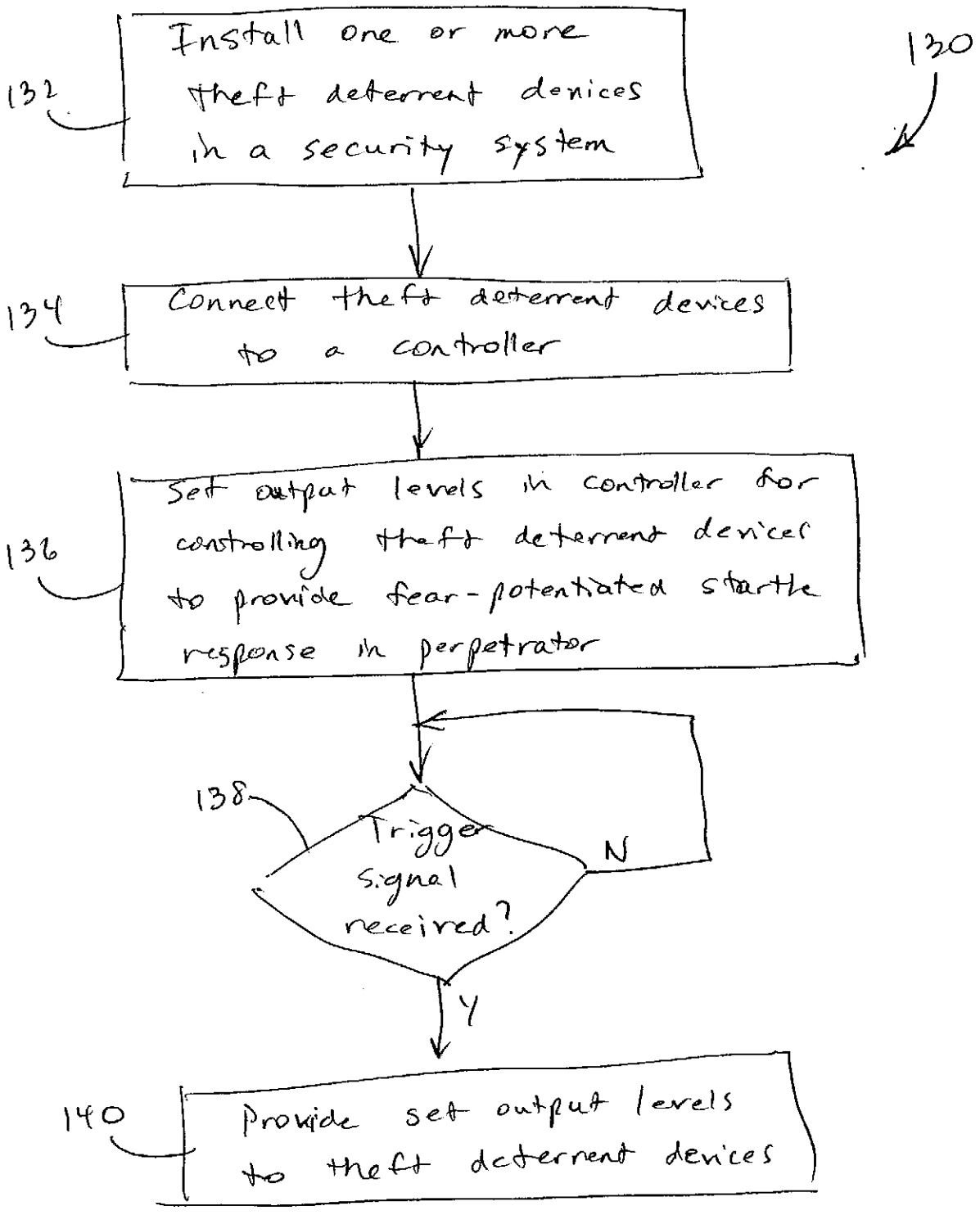
130
132
Install one or more theft deterrent devices in a security system
134
Connect theft deterrent devices to a controller
136
Set output levels in controller for controlling theft deterrent devices to provide fear-potentiated startle response in perpetrator
138
Trigger signal received?
N
Y
140
Provide set output levels to theft deterrent devices

FIG. 6