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(54) Title: FLASHLIGHT

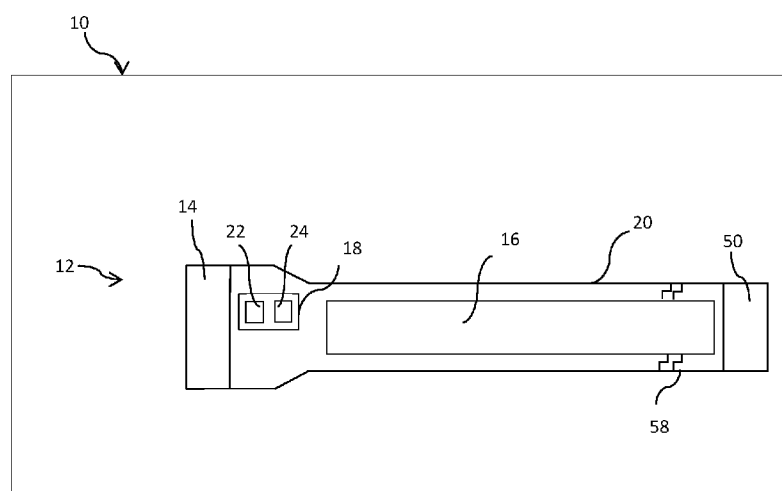


FIG. 1

(57) Abstract: Some examples include a safety equipment system including a flashlight device. The flashlight device includes an illumination source, an energy source to power the illumination source, a gesture detection module, a housing, an identifying end cap, and a recording module. The gesture detection module includes a sensor to sense at least one of acceleration and orientation of the illumination source and to provide an electronic signal indicative of the at least one of acceleration and orientation. The control module receives the electronic signal from the sensor and selectively modifies an output of the illumination source in response. The housing contains the illumination source, the energy source, and the gesture detection module and is shaped to be handheld. An identifying end cap is detachably coupled to the housing. A recording module is sealed within the identifying end cap. The recording module stores the electronic signal.

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TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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FLASHLIGHT

Background

[0001] Law enforcement, safety and security personnel use a variety of devices. Considerations of an officer's safety and detection and collection of evidence can influence the personnel's selection. Handheld flashlights are one of several devices that can be selected.

Brief Description of the Drawings

[0002] Figure 1 is a diagrammatic view of a safety equipment system including a flashlight device according to an example of the present disclosure.

[0003] Figure 2 is a diagrammatic view of a flashlight device according to an example of the present disclosure.

[0004] Figure 3 is a diagrammatic view of another safety equipment system including a flashlight device and a receiver according to an example of the present disclosure.

[0005] Figure 4 is a flow chart illustrating an example method of operating a flashlight device in accordance with aspects of the present disclosure.

Detailed Description

[0006] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific examples in which the disclosure may be practiced. It is to be understood that other examples may be utilized and structural or logical changes may be made without departing from the scope of the present disclosure. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present disclosure is defined by the

appended claims. It is to be understood that features of the various examples described herein may be combined, in part or whole, with each other, unless specifically noted otherwise.

[0007] Law enforcement, safety and security personnel must be attentive to the safety of themselves and others who might be present and routinely carry and use flashlights when they work, particularly at night. Personnel also have an interest in obtaining and identifying images and other data in capturing a scene or otherwise record events and areas, often without prior planning. In a chase, for example, it is desirable to record and identify a fleeing suspect. Personnel have available vehicle mounted and body mounted cameras that provide useful evidence collection and ensure the officer's safety as well as other independent devices useful for evidence collection and safety. However, carrying too many devices can impede an officer's response and safety. Due to weight and/or space constraints, an officer or security personnel will limit the tools he or she will carry on his or her person. Combining functions into a single device provides more efficient use of the officer's facilities and provides convenience and ease of use.

[0008] The present disclosure relates generally to a safety equipment system. More specifically, the present disclosure relates to a flashlight device that is a multi-functional safety equipment device useful to law enforcement, safety and security personnel. More particularly, a multi-functional flashlight device including functions that can be controlled by gestured movements of the device by a user and where device usage can be recorded for use in later analysis and reconstruction.

[0009] Figure 1 is a diagrammatic view of a safety equipment system 10 including a flashlight device 12 according to an example of the present disclosure. Flashlight device 12 includes an illumination source 14, an energy source 16, a gesture detection module 18, a housing 20, an identifying end cap 58, and a recording module 50. Identifying end cap 58 is detachably coupled to housing 20. Housing 20 contains illumination source 14, energy source 16, and gesture detection module 18. Identifying end cap 58 contains recording module

50. Gesture detection module 18 includes a sensor 22 and a control module 24.

[0010] Flashlight device 12 is a handheld portable device. Flashlight device 12 can be similar in shape, size, and weight to a flashlight that would be conventionally employed in that person's normal activities. Housing 20 is a protective housing capable of withstanding impact and elements of weather, as is typical of flashlights used by law enforcement, safety and security personnel. Housing 20 is durable, lightweight, and rugged and can be formed of any suitable material including Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) polymer composite, metal, plastic, rubber, or combination thereof. Other suitable lightweight and durable materials are also acceptable.

[0011] Energy source 16 provides power to illumination source 14 within housing 20. Energy source 16 can also provide power to gesture detection module 18. Gesture detection module 18 can be used to modify an output (e.g., candlelight power, pattern, color, etc.) of illumination source 14. More particularly, sensor 22 of gesture detection module 18 can sense acceleration and/or orientation of illumination source 14 and can provide an electronic signal indicative of acceleration and/or orientation. Control module 24 can receive the electronic signal from sensor 22 and selectively modify an output of illumination source 14 in response to the electronic signal. Recording module 50 can receive and retain the electronic signal of the acceleration and/or orientation.

[0012] Removable end cap 58 is durable lightweight and rugged, and may be formed from the same or similar material as housing 20. Identifying end cap 58 contains recording module 50 that can receive and store the detected gestures from gesture detection module 18. Identifying end cap 58 is detachable and removable from housing 20, allowing the contained recording module 50 to be retained for evidence, or destroyed for privacy while the remainder of flashlight device 10 can be reused. Identifying end cap 58 is also identifiable and can allow different end caps 58 containing different recording modules 50 to be distinguished visually and/or electronically.

[0013] Figure 2 is a diagrammatic view of a flashlight device 112 according to an example of the present disclosure. Flashlight device 112 is similar to flashlight

device 12 and can be used as part of safety equipment system 10. Flashlight device 112 is a handheld portable device that can include a variety of detection and collection capabilities in addition to providing illumination. A housing 120 contains an illumination source 114, an energy source 116, and a gesture detection module 118. Gesture detection module 118 and other modules contained in housing 120 can be used to modify the output of illumination source 114, capture still picture and video imaging, and data collection. Sensors and other electronics of gesture detection module 118 and other modules, further described below, are small relative to illumination source 114 and an energy source 116 and may only minimally increase a size of housing 120 of flashlight device 112.

[0014] Housing 120 has a first end 126, an opposing second end 128, a body 130 extending between first end 126 and second end 128. Illumination source 114 disposed at first end 126 includes a transparent front lens 132 that covers lamp(s) 134, such as one or more light-emitting diodes (LEDs). Lamps 134 can produce a single or more than one color, wavelength, or light range. In one example, at least one of lamps 134 can be visible during daylight; for example, lamp 134 can be a laser pointer with a fixed or variable pattern generator. In one example, at least a portion of front end 126 is removable to provide for replacement of all or portions of illumination source 114 and/or other components. Housing 120 includes an identifying end cap 158 detachable from body 130 of housing 120 at second end 124 to provide access for removing and replacing energy source 116 and other components contained within housing 20. Energy source 116 extends within a chamber of body 130 that has electrical connections (not shown) to electrically connect energy source 116 to electrical components of flashlight device 112 including illumination source 114 and gesture detection module 118. Electrical connections, such as contacts or wires, can be included within an interior of, or formed with, housing 112 to provide electrical connection of energy source 116, illumination source 114, gesture detection module 118, recording module 150, and other electrical components. Energy source 116 can include at least one battery and can be rechargeable (see, e.g., Figure 3).

[0015] In some examples, identifying end cap 158 contains a recording module 150 and has an externally-visible identification marking 156. Recording module 150 contains a memory module 142, a clock module 143, and an identification module 146. Recording module 150 includes a clock module 143 for time stamping of information recorded in memory module 142 to aid in reconstruction of recorded information as evidence. Identifying end cap 158 containing recording module 150 can be detachable from body 130 of housing 120 and retained as evidence and a replacement identifying end cap 158 installed on body 130 for continued use of flashlight device 112. Identifying end cap 158 containing recording module 150 can also, or alternatively, be removed and replaced when a full capacity of recording module 150 is realized.

[0016] Identifying end cap 158 can have externally-visible identification marking 156 and can have internal electronic identification module 146. In one example, identification marking 156 can be a pattern consisting of various colors and shapes and can be repeated around and on second end 124 to be visible from several different viewing orientations. In one example, identification marking 156 provides a visual indication allowing identification to be verified both by the user and in video recordings. For example, an officer could hold flashlight device 112 in front of their body (or other) camera in order to capture identification marking 156 of flashlight device 112 within the video recording. Identification module 146 can identify recording module 150 and include an electronic description of identification markings 156 to provide proof of consistency between identification marking 156 and the internal recording.

[0017] Flashlight device 112 can include any or all of additional sensing modules 140a...140x, memory module 142, a transmitter 144, and identification module 146. Due to the small size, sensing modules 140a...140x and transmitter 144 can be contained in various locations within flashlight device 112. In some examples, memory module 142, clock module 143, transmitter 144, identification module 146 are embedded in a resin forming at least a portion of end cap 158. Sensitive electronics, such as gesture control module 118, for example, can be otherwise sealed inside a portion of housing 120. In some examples, recording module 150 is sealed within end cap 158 and is tamper-

resistant and memory module 142 is write-once to provide for evidence collection and storage. In one example, removal of modules 118, 140a...140x and other electronics from body 130 of housing 120 is facilitated in the same manner that energy source 116 replacement occurs (e.g., unscrewing and detaching identifying end cap 158 at second end 124 from body 130).

[0018] Housing 120 can include and be partially formed on material transparent to wireless signals, allowing flashlight device 112 to communicate directly and/or wirelessly with other devices. Communication can include transmitting electronic signals of sensed data and electronic signals of data stored in databases to and from flashlight device 112 with transmitter 144. Identification module 146 can electronically identify flashlight device 112 to other devices.

[0019] Manual movement of flashlight device 112 in predetermined patterns can be employed to select and indicate information to be sensed using gesture detection module 118. More particularly, sensor 122 of gesture detection module 118 can sense acceleration and/or orientation of illumination source 114 and can provide an electronic signal indicative of acceleration and/or orientation. Control module 124 can receive the electronic signal from sensor 122 and selectively modify an output of illumination source 14 in response to the electronic signal. Recording module 150 can record, or store, the electronic signal. The modified output of illumination source 114 can serve as a visual indication that the electronic signal was recognized and stored. Control module 124 includes a processor that operates in accordance with a program stored in the processor's program memory or in a separate memory module. Control module 124 is programmed to respond to electronic signals received from sensors of sensing modules 140a...140x and sensor 122.

[0020] Manual movement and repositioning of flashlight device 112 in predetermined patterns can be employed to select and indicate information to be sensed using gesture detection module 118. For example, the acceleration and orientation can be sensed by gesture detection module 118 as flashlight device 112 is moved and repositioned. The sensed acceleration and orientation is used to modify an output (e.g., candlelight power, pattern, color, etc.) of illumination source 114. The brightness, color, pattern, or illumination frequency

of illumination source 114 can be adjusted. The output of illumination source 114 can also be manually and/or electronically controlled. In one example, the output width of the output illumination can be narrowed to indicate a small object or area of interest or widened to indicate a general area of interest. In another example, intermittent flashing of illumination source 114 can occur to indicate an object of interest. In another example, the operator moves illumination source 114 in a circle around an item and illumination source 114 then pulses briefly to indicate the item has been recorded. In another example, the operator can point the illumination source 114 in a direction and briefly flash the illumination source 114 on and off to indicate the operator's location to be converted to an electronic signal and transmitted to devices of other officers. Additionally, the operator could turn the illumination source 114 on and off using a manual switch 150 on housing 120 to begin or end sensor operation or as part of a specific control operation sequence. The detected gestures and/or the modified output are recorded in the recording module 150 for later analysis.

[0021] In one example, sensing module 140a is a camera and can capture still or video images. Sensing module 140a can be mounted within housing 120, such as on an interior of lens 132 of illumination source 114 and positioned to capture images of the area being illuminated by illumination source 114.

Sensing module 140a can be oriented and aligned with illumination source 114 to capture images in the projected area of illumination output of illumination source 114. In one example, flashlight device 112 is employed by personnel to indicate and/or identify a person or item of interest. For example, flashlight device 112 is positioned to illuminate a vehicle license plate. A still image of the license plate can be captured by sensing module 140a. The still image can be converted to an electronic signal of the license plate number and the still image and/or the license plate number can be recorded by recording module 150 and timestamped using clock module 143 and persisted in memory module 146. The still images and/or license plate number may further be transmitted and used to query a database of license plate numbers. The database can also be searched to see if the model/color of a vehicle registered to the captured license plate matches the vehicle being illuminated, if the vehicle has been stolen, or

has been marked as being in the same location for more than a predetermined time (e.g., 12 hours), or other information that may be relevant to the personnel. Further manual movements of flashlight device 112 can initiate feedback to the operator in response to electronic signals from modules 118, 140 due to the sensed movements. Alternatively, feedback can be automatically included as part of the sequence. An indication of the stolen status is communicated back to the operator in a manner that alerts the operator such as with the flashing, brighten, widening or changing an output pattern of the illumination (e.g., a red box or typed message projected on or around the license plate). Feedback to the personnel can be audio (e.g., a series of pre-selected intermittent beeps to indicate relevant information, or voiced information to wireless earpiece), visual (e.g., projected red box around the license plate number, flashing light, etc.), or tactile (e.g., vibration of housing). In one example, a portion or all of housing 120 of flashlight device 112 can vibrate to signal the operator in response to sensed and processed data.

[0022] In another example, a suspect's face is illuminated by illumination source 114 and an image is captured by image sensing module 140a. The image is converted to an electronic signal and received by a control module for processing using a facial recognition program and database. The operator/personnel can be notified of the results using predetermined visual, audio, or tactile notification.

[0023] In another example, sensing modules 140 of flashlight device 114 include movement sensors. Movement sensors can be acceleration/deceleration sensors, orientation sensors, or positional (global positional sensors (GPS)) sensors. Sensing modules 140 can be used to sense whether the flashlight device is in an operator's belt, being held in the operator's hand, or attached to another device such as a gun. When in the operator's belt, sensing modules 140 may also indicate an orientation of the operator's body (e.g., vertical or horizontal). Sensing modules 140 can also be used to indicate the location of the operator. In another example, the same orientation sensors may be used to determine the direction the operator is looking as indicated by the direction the front of the flashlight device is being orientated toward. In one example, the

flashlight device can be mounted or used with a gun. If mounted on a gun, orientation and acceleration/deceleration sensors can be used to detect the motion of the gun and the direction the gun is being pointed. Electrical signals of the sensed information (e.g., acceleration, position, location, or image) can be recorded in memory module 142.

[0024] Flashlight device 112 can be employed to indicate items of interest, and to associate additional information with the item of interest. In another example, flashlight device 112 can detect the location and/or orientation of the personnel's body, their gaze, and/or their gun. In one example, if an item of interest is located on a walking path, the operator could move the illumination forward and then swipe the illumination back and forth across the path a number of times to indicate the direction of travel along the path. In another example, the operator could point the illumination at an object on the ground and then direct the illumination in a circle around the object, for example, a shell casing on the ground.

[0025] In another example, a single tapping of button 150 can turn illumination source 114 on, a long tap may turn illumination source 114 off, and additional single tapping while illumination source 114 is on can initiate additional actions, for example, operating or controlling transmissions from various sensing modules 140 of flashlight device 112. In one example, additional tapping of button 150 activates an image sensing module 140a to capture an image of an item of interest and transmit an electronic signal of the image to a remote device, such as a computing device. In another example, the additional tapping can change the output of illumination source 114 to enhance a sensing module 140b to projecting one or several colors singularly or in a predetermined pattern. Additional manual actions or sensed data (e.g., orientation of the device) may also be used to determine and control the operation of flashlight device 112. In one example, illumination source 114 is oriented with the front end extended downward while button 150 is repeatedly tapped, initiating a position sensing module 140x (e.g., GPS) to activate. In another example, illumination source 114 is oriented to extend generally horizontally while button 150 is repeatedly tapped, initiating image sensing module 140a to capture a high or low resolution

image of the illuminated area. In another example, the detected gestures and any sensed data may be recorded by recording module 150 and timestamped using clock module 143 and persisted in memory module 146 for use in later analysis.

[0026] Figure 3 is a diagrammatic view of another safety equipment system 200 including according to an example of the present disclosure. Safety equipment system 200 includes a flashlight device 212 and a receiver 213. Flashlight device 212 is similar to flashlight devices 12 and 112 described above.

Receiver 213 can include a communication module to receive electronic signals from a transmitter 244, a recording module 250, a memory module 242, an encoded identifier 246, and/or modules 240 of flashlight device 212 and/or an electrical connection to provide electrical charge to a rechargeable energy source 216 of flashlight device 212. Energy source 216 may or may not be removable from housing to be recharged. In one example, flashlight device 212 can be releasably mounted to receiver to provide electrical connection. In one example, receiver includes a flat bottom for mounting on a horizontal or vertical surface, such as a table or wall, and has a top surface appropriate shape and size for a portion of flashlight device to mount within or to. In one example, ports (not shown) are included on housing 220 for electrically connection flashlight device 212 to receiver.

[0027] In one example, receiver 213 can communicate via either a wired or wireless connection with recording module 250, allowing receiver 213 to communicate electronic signals to/from memory module 242, identifier 246 and clock module 243. In one example, receiver 213 can update clock module 243 for later synchronization of the recorded information from recording module 250 with other devices outside flashlight device 200.

[0028] Figure 4 is a flow chart illustrating an example method 300 of operating a flashlight device in accordance with aspects of the present disclosure. At 302 an illumination source of a handheld flashlight device is powered. At 304, an area of interest is illuminated with the illumination source. At 306, the illumination source is manually repositioned in one of multiple predetermined gesture patterns. At 308, one of the multiple predetermined gesture patterns is

sensed. At 310, one of the multiple predetermined gesture patterns is recorded. At 312, an output of the illumination source is electronically modified in response to the sensed gesture pattern.

[0029] Although specific examples have been illustrated and described herein, a variety of alternate and/or equivalent implementations may be substituted for the specific examples shown and described without departing from the scope of the present disclosure. This application is intended to cover any adaptations or variations of the specific examples discussed herein. Therefore, it is intended that this disclosure be limited only by the claims and the equivalents thereof.

CLAIMS

1. A safety equipment system comprising:
 - a flashlight device comprising:
 - an illumination source;
 - an energy source to power the illumination source;
 - a gesture detection module including:
 - a sensor to sense at least one of acceleration and orientation of the illumination source and to provide an electronic signal indicative of the at least one of acceleration and orientation, and
 - a control module to receive the electronic signal from the sensor and to selectively modify an output of the illumination source in response to the electronic signal;
 - a housing to contain the illumination source, the energy source, and the gesture detection module, the housing is shaped to be handheld;
 - an identifying end cap detachably coupled to the housing; and
 - a recording module sealed within the identifying end cap, the recording module to store the electronic signal of the at least one of acceleration and orientation.
2. The system of claim 1, wherein the housing sealably contains the gesture detection module.
3. The system of claim 1, comprising:
 - an image sensor contained in the housing and orientated and aligned with the illumination source to capture images in the projected area of illumination of the illumination source.

4. The system of claim 1, wherein the control module to process the information and provide notification to a user based on the data received from the sensor.
5. The system of claim 1, wherein the recording module includes a memory module, a clock module, and an identification module.
6. The system of claim 1, wherein the end cap includes an external identification marking.
7. The system of claim 1, comprising:
 - a receiver to receive the flashlight, the receiver including a communication module to receive electronic signals from the flashlight and an electrical connection to provide electrical charge to the flashlight.
8. A flashlight device comprising:
 - an illumination source;
 - a gesture detection sensor to detect at least one of acceleration and orientation of the device and to provide an electronic signal indicative of the at least one of acceleration and orientation;
 - an image sensor to detect and convert images into an image electronic signal;
 - an illumination source control module to modify output of the illumination source in response to gesture and image electronic signals;
 - a recording module to store the electronic signal; and
 - a housing to contain the illumination source, the image sensor, the gesture detection sensor, and the illumination source control module, wherein the recording module is sealed within an identifying end cap at a second end opposite the first end.
9. The device of claim 8, comprising:
 - an encoded identifier to electronically identify the device to other devices.

10. The device of claim 8, wherein the image sensor can be a camera or video image sensor.
11. The device of claim 8, wherein the housing sealably contains the gesture detection module.
12. A method of operating a handheld flashlight device comprising:
 - powering an illumination source of a handheld flashlight device;
 - illuminating an area of interest with the illumination source;
 - manually repositioning the illumination source in one of multiple predetermined gesture patterns;
 - sensing the one of multiple predetermined gesture patterns;
 - recording the one of multiple predetermined gesture patterns in a module sealably retained in an identifying end cap of the handheld flashlight device; and
 - electronically modifying an output of the illumination source in response to the sensed gesture pattern.
13. The method of claim 12, comprising:
 - recording one of at least acceleration, position, and location of the handheld flashlight device.
14. The method of claim 12, comprising:
 - recording an item of interest in the illuminated area.
15. The method of claim 14, comprising:
 - electronically comparing the recorded item of interest with data in a database; and
 - communicating a notification to a user based on the compared data.

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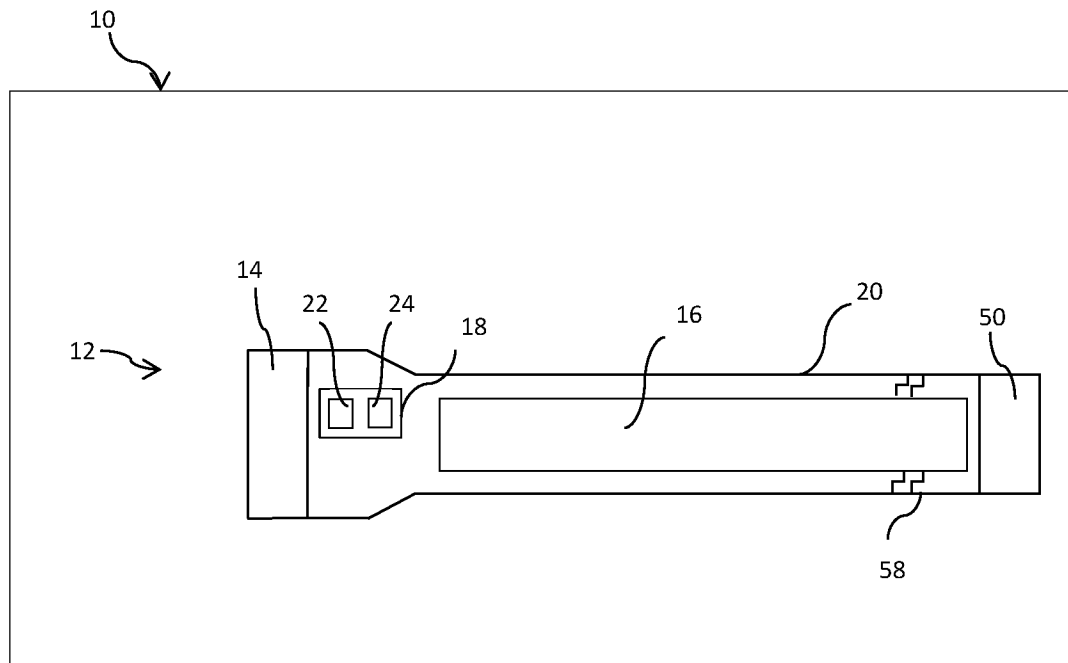


FIG. 1

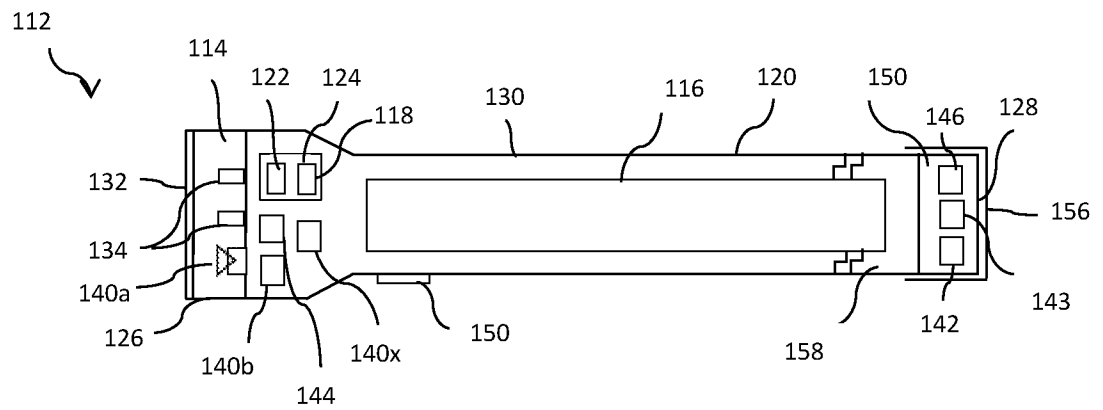


FIG. 2

200 →

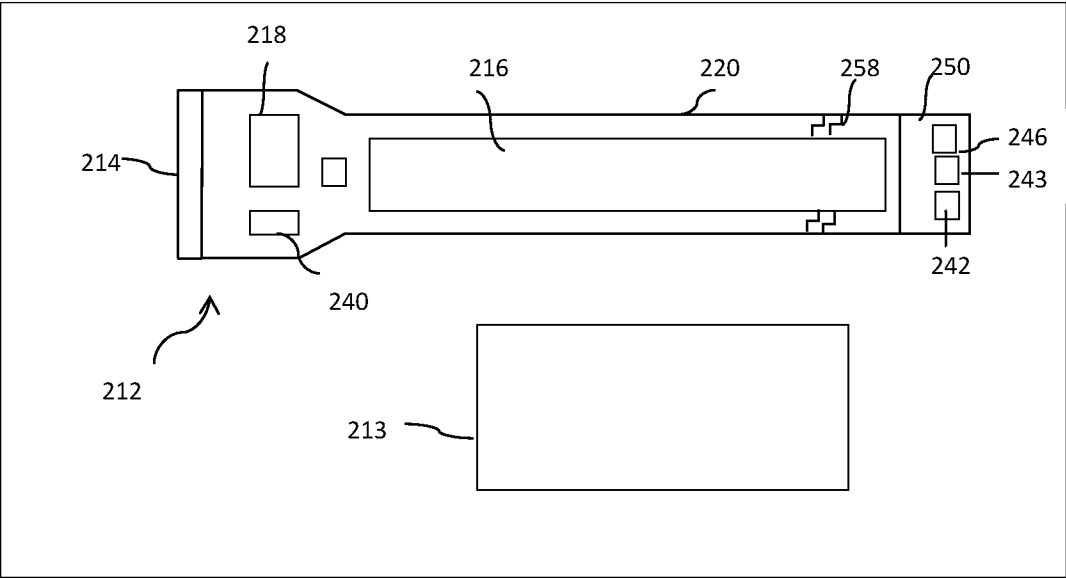


FIG. 3

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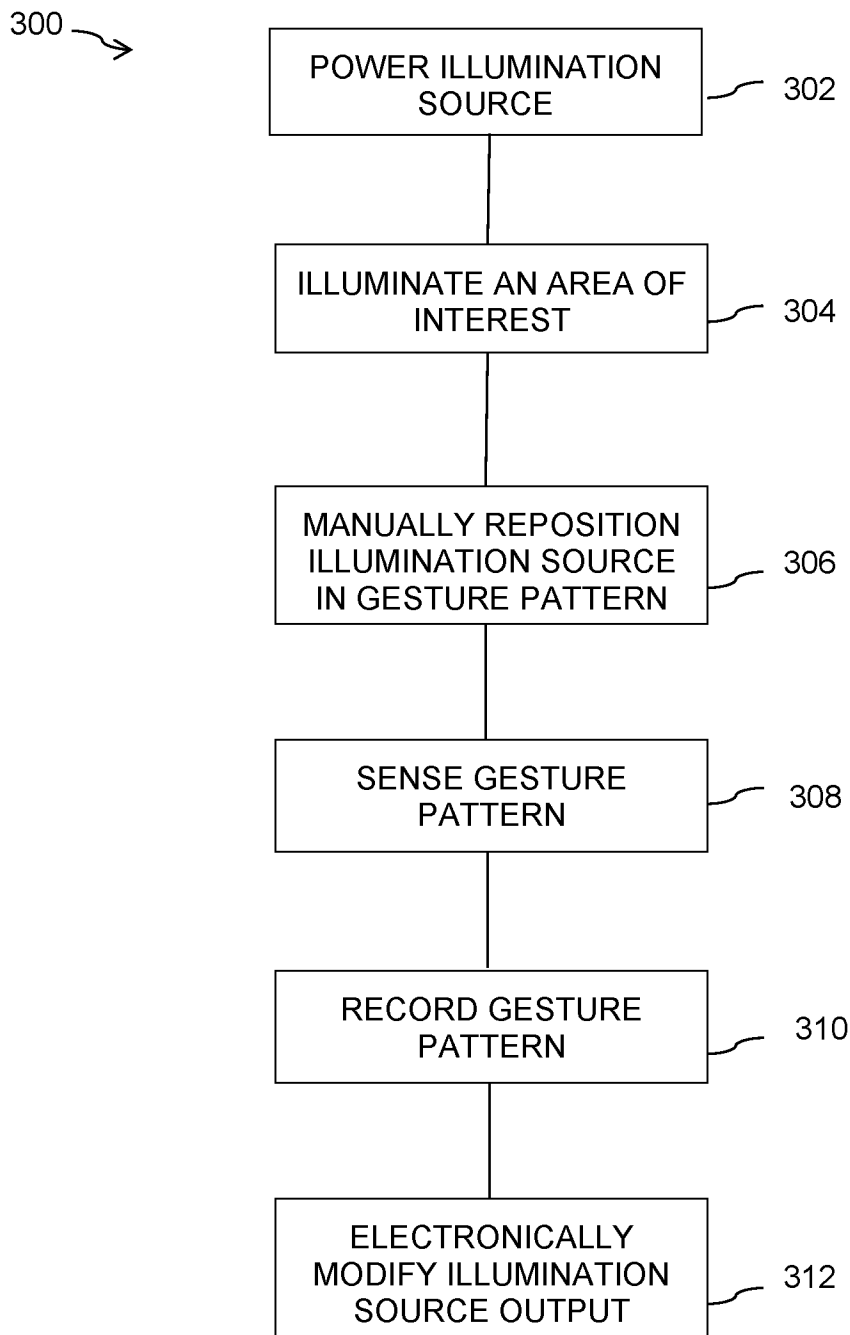


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2016/058865

A. CLASSIFICATION OF SUBJECT MATTER <i>F21L 4/00 (2006.01)</i> <i>F21B 33/00 (2006.01)</i> <i>G08B 5/36 (2006.01)</i> According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F21L 4/00, 33/00, G08B 5/00, 5/22, 5/36, H05B 37/00, 37/02, H04W 4/00, H01F 38/00, F41 G 1/00, 1/32, 1/34, 1/36, F41A 35/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, DWPI, EAPATIS, PATENTSCOPE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9057585 B1 (TRIFECTA TACTICAL LLC) 16.06.2015	1-2
Y	fig. 1,2,3, col. 1, line 37- col. 2, line 2; col. 5, line 57- col. 6, line 57; col. 7, line 3-14; col. 7, line 56 –col. 8, line 16; col. 8, line 48 –col.9, line 3	3-15
Y	US 2015113851 A1 (MAIQUEL BENSAYAN et al) 30.04.2015, [0054], [0056], [0078], [0082]	3, 8-11, 14
Y	US 2008/272928 A1 (SHUSTER GARY S.) 06.11.2008 [0008],[0009],[0024],[0027],[0030]-[0034],[0036]	12-14
Y	US 2010/219775 A1 (MAG INSTRUMENTS, INC.) 02.09.2010, [0239]-[0240]	4
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
*	Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family
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“E”	earlier document but published on or after the international filing date	
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13 April 2017 (13.04.2017)		27 April 2017 (27.04.2017)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer O. Tsykanovskaya Telephone No. 8 499 240 25 91

INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2016/169603 A1 (YARDARM TECHNOLOGIES, INC.) 16.06.2016, [0029]-[0030], [0033]-[0034],[0035],[0038]	5, 9, 12-15
Y	US 5909952 A (TBI CONCEPTS LLC) 08.06.1999, abstract, fig.1	6
Y	US 2010/0013322 A1 (SEICO EPSON CORPORATION) 21.01.2010, [0062], [0073]	7