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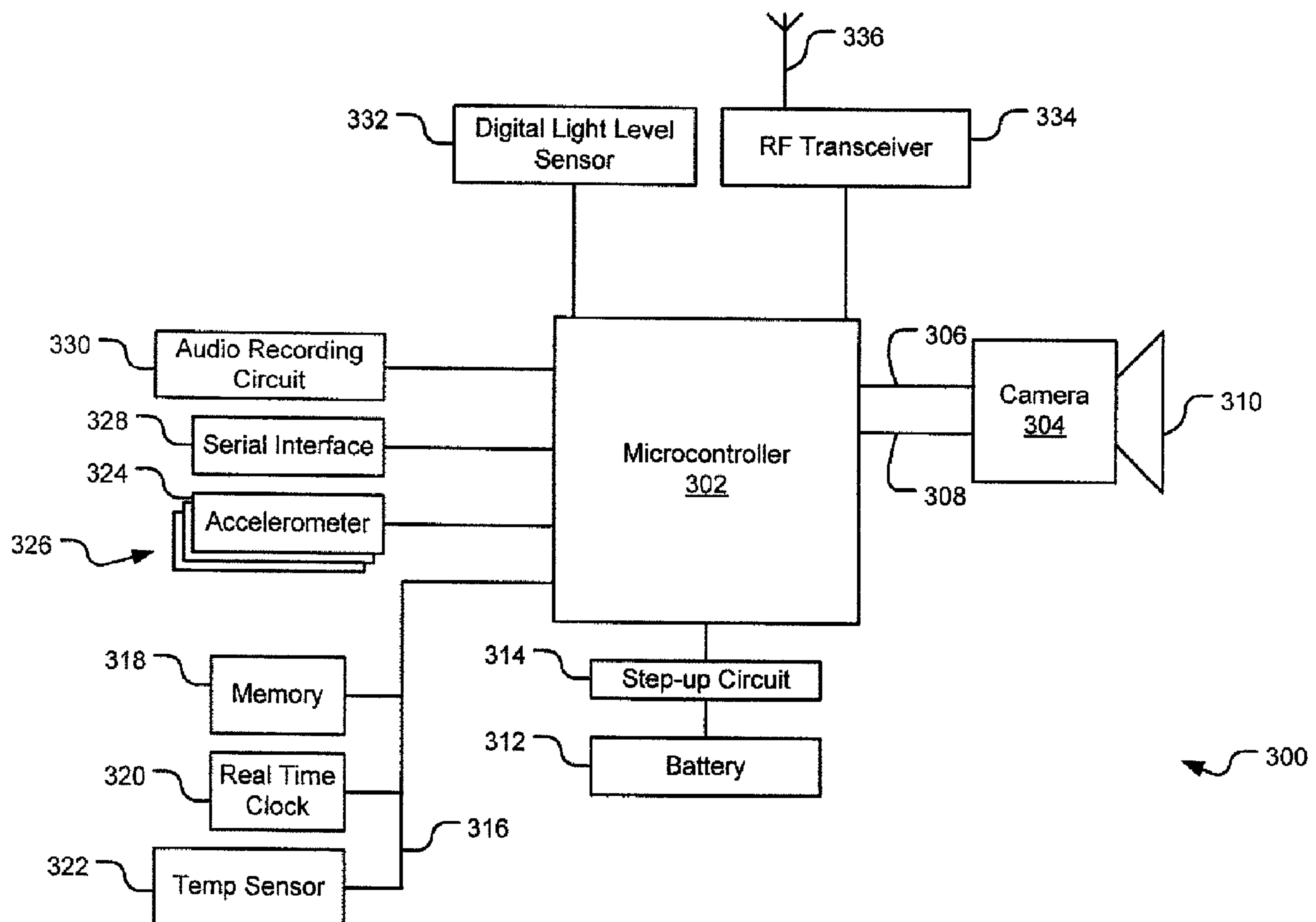
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(54) Titre : DISPOSITIF DE RAPPEL

(54) Title: RECALL DEVICE



(57) Abrégé/Abstract:

A small wearable recall device is provided to capture images triggered by a combination of a detection of a capture condition (e.g., changes in motion, temperature or light level) followed by a relatively stable period, as detected by an accelerometer. By

(57) **Abrégé(suite)/Abstract(continued):**

triggering on the combination of a detected capture condition followed by a detected stability condition, a clearer image of the environment of an interesting event is expected to be captured. The small size of the recall device makes it possible to integrate it into common portable consumer products, such as MP3 players, purses, clothing, hats, backpacks, necklaces, collars, and other human-wearable products.

RECALL DEVICE

ABSTRACT

A small wearable recall device is provided to capture images triggered by a combination of a detection of a capture condition (e.g., changes in motion, temperature or light level) followed by a relatively stable period, as detected by an accelerometer. By triggering on the combination of a detected capture condition followed by a detected stability condition, a clearer image of the environment of an interesting event is expected to be captured. The small size of the recall device makes it possible to integrate it into common portable consumer products, such as MP3 players, purses, clothing, hats, backpacks, necklaces, collars, and other human-wearable products.

RECALL DEVICE

Technical Field

The invention relates generally to electronic devices, and more particularly to a recall device.

Background

An ability to recall events, personal parameters, and environmental parameters experienced by an individual has many applications. For example, a memory-impaired individual, such as a victim of Alzheimer's Disease, and his/her caregiver can reconstruct a portion of the individual's daily activity to assist in filling in gaps in the individual's memory (e.g., to determine where the individual put their house keys, to identify people with whom the individual interacted, etc.). In another application, the events and parameters associated with a traumatic event, such as an elderly person's fall resulting in injury, etc., may be reconstructed by physicians to better understand the cause and extent of the injuries. Likewise, recalling events and parameters experienced by a child through the day can help a parent or teacher diagnose the child's behavior problems.

However, existing approaches for monitoring such events and parameters do not lend themselves to application in an unobtrusive, wearable device. Such approaches include surveillance cameras and microphones in a room or defined area, and bulky, video cameras and other monitoring devices that are not realistically intended for comfortable, personal use for long periods of time (e.g., all day use) because of their size, storage limitations, power limitations, and other limitations.

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Summary

Implementations described and claimed herein address the foregoing problems by providing a small wearable recall device to capture images triggered by a combination of a detection of a capture condition (e.g., changes in motion, temperature or light level) followed by a relatively stable period, as detected by an accelerometer. By triggering on the combination of a detected capture condition followed by a detected stability condition, a clearer image of the environment of an interesting event is expected to be captured. The small size of the recall device makes it possible to integrate it into common portable consumer products, such as MP3 players, purses, clothing, hats, backpacks, necklaces, spectacles, watches, bracelets, collars, and other human-wearable products.

In some implementations, articles of manufacture are provided as computer program products. One implementation of a computer program product provides a computer program storage medium readable by a computer system and encoding a computer program.

The computer program product encodes a computer program for executing a computer process on a computer system. Acceleration of a camera along at least one axis is monitored using an accelerometer. A capture condition experienced by the camera is detected. A stable condition is detected by the at least one accelerometer along the at least one axis, responsive to the operation of detecting the capture condition. Capture of an image by the camera is triggered based on detection of the capture condition followed by detection of the stable condition.

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In another implementation, a method is provided. Acceleration of a camera along at least one axis is monitored using an accelerometer. A capture condition experienced by the camera is detected. A stable condition is detected by the at least one accelerometer along the at least one axis, responsive to the operation of detecting the capture condition. Capture of an image by the camera is triggered based on detection of the capture condition followed by detection of the stable condition.

In yet another implementation, a portable recall device is provided to be carried by a wearer. The portable recall device includes a camera and at least one accelerometer operably connected to the camera. The accelerometer triggering capture of an image by the camera based on detection of a capture condition followed by detection of a stable condition by the at least one accelerometer.

According to another implementation of the present invention, there is provided a digital media player configured to be carried by a wearer comprising: a camera; and at least one accelerometer operably connected to the camera, the accelerometer triggering capture of an image by the camera based on detection of a capture condition followed by detection of a stable condition by the at least one accelerometer.

According to another implementation of the present invention, there is provided a portable recall device configured to be carried by a wearer comprising: a camera; at least one accelerometer operably connected to the camera, the accelerometer triggering capture of an image by the camera based on detection of a stable condition by the at least one accelerometer; and a memory maintaining storage of the image, responsive to the triggering of the capture of image, if a capture condition is detected in temporal proximity of the capture; the memory deleting the storage of the image if no capture condition is detected in a defined temporal proximity of the capture.

According to still another implementation of the present invention, there is provided a method comprising: monitoring acceleration of a camera along at least one axis using an accelerometer; detecting a stable condition by the at

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least one accelerometer along the at least one axis; triggering capture of an image by the camera into memory based on detection of the stable condition; and deleting the image from the memory if a capture condition is not detected in a defined temporal proximity of the capture.

5 According to yet another implementation of the present invention, there is provided the computer program product encodes a computer program for executing a computer process on a computer system, the computer process comprising: monitoring acceleration of a camera along at least one axis using an accelerometer; detecting a stable condition by the at least one accelerometer
10 along the at least one axis; triggering capture of an image by the camera into memory based on detection of the stable condition; and deleting the image from the memory if a capture condition is not detected in a defined temporal proximity of the capture.

 According to a further implementation of the present invention, there
15 is provided a digital media player configured to be carried by a wearer comprising: a camera; at least one accelerometer operably connected to the camera, the accelerometer triggering capture of an image by the camera based on detection of a stable condition by the at least one accelerometer; and a memory storing the captured image, responsive to the triggering of the capture of image, if a capture
20 condition is detected in temporal proximity of the capture; the memory deleting the storage of the image if no capture condition is detected in a defined temporal proximity of the capture.

 According to yet a further implementation of the present invention, there is provided a portable recall device configured to be carried by a wearer
25 comprising: a camera; and at least one accelerometer operably connected to the camera, the accelerometer triggering capture of an image by the camera based on detection of a capture condition, wherein the portable recall device is adapted to delay the triggering of said capture of an image until the at least one accelerometer detects movement within a predefined range or at or below a
30 predefined threshold.

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According to still a further implementation of the present invention, there is provided a portable recall device configured to be carried by a wearer, comprising: a camera; and a gyroscope operably connected to the camera, the gyroscope triggering capture of an image by the camera based on detection of a capture condition, wherein the portable recall device is adapted to delay the triggering of said capture of an image until the gyroscope detects a signal indicating that yawing movement of the camera is below a defined threshold.

According to another implementation of the present invention, there is provided a method comprising: monitoring acceleration of a camera along at least one axis using an accelerometer; detecting a capture condition experienced by the camera; detecting movement within a predefined range or at or below a predefined threshold by the at least one accelerometer along the at least one axis, responsive to the operation of detecting the capture condition; and triggering capture of an image by the camera based on detection of the capture condition followed by detection of the movement within the predefined range or at or below the predefined threshold.

According to yet another implementation of the present invention, there is provided a computer program product comprising computer-executable instructions that, when carried out by a processor, cause the processor to perform a method as described above or below.

According to another implementation of the present invention, there is provided a method comprising: detecting a capture condition experienced by a camera; detecting a signal from a gyroscope that indicates that yawing movement of the camera is below a defined threshold; and triggering capture of an image by the camera based on detection of the capture condition followed by detection of the signal from the gyroscope.

Other implementations are also described and recited herein.

Brief Description of the Drawings

FIG. 1 illustrates an exemplary human-wearable recall device.

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FIG. 2 illustrates an internal plan view and an external perspective view of an exemplary recall device.

FIG. 3 illustrates a schematic of an exemplary recall device.

FIG. 4 illustrates exemplary operations of a selective image capture
5 process.

FIG. 5 illustrates exemplary sensor readings relative to image capture events.

FIG. 6 illustrates an image captured through a normal lens, an image captured through a fish-eye lens, and a corrected version of the captured image.

Detailed Description

FIG. 1 illustrates an exemplary human-wearable recall device. A wearer 100 is shown wearing a recall device 102 on a necklace. It should be understood, however, that a wearer need not be human, but that animals, vehicles, and other objects may wear a recall device for the purpose of selectively recording monitored environmental conditions.

An exploded view of the recall device 102 is shown in box 104. A camera 106, which may include a fish-eye lens, a wide angle lens, or any other kind of lens, is positioned in the center of the recall device 102, although the camera 106 may be positioned at other locations in the recall device 102.

Four light emitting diodes (LEDs) are shown on the face of the recall device 102. LED 108 signals detection of an audio capture condition, such as an increase in detected audio level over a given threshold or a substantial change in average audio level within a given period. LED 110 signals detection of a motion capture condition, such as a detected change of angle of greater than a threshold (e.g., 20°). LED 112 signals detection of a light level capture condition, such as a substantial change in average light level within a given period or an increase in detected light level over a given threshold. LED 114 signals detection of a temperature capture condition, such as an increase in detected ambient temperature level over a given threshold or a substantial change in ambient temperature level within a given period. Other capture conditions than those listed above may alternatively be employed.

A serial port 116 is shown in the recall device 102 to download data monitored by the recall device 102 to a computer system. Recorded data from various in the recall device 102 is saved into memory in the recall device 102.

1 Such data may also be downloaded via the serial port 116 to a more substantial
2 computer system, such as a desktop computer, for subsequent analysis (e.g., using
3 a Microsoft EXCEL spreadsheet application or other analysis tools). Internal
4 settings, such as condition parameters, time settings, etc., may also be uploaded to
5 the recall device 102 via the serial port.

6 A wireless transceiver (not shown) is coupled to an antenna running up the
7 cord 118. The wireless transceiver may be used to upload and download data as
8 well as to interface with wireless networking protocols, such as Wi-Fi and
9 Bluetooth, and to detect radio frequency signals.

10 FIG. 2 illustrates an internal plan view 200 and an external perspective
11 view 202 of an exemplary recall device. Specific components of exemplary recall
12 devices are described herein; however, it should be understood that other
13 components may be employed in other implementations of a recall device. A
14 microcontroller (not shown) is mounted to the underside of the printed circuit (PC)
15 board 204. In one implementation, a Microchip 20Mhz PIC16F876
16 microcontroller is used. A camera 206 and lens 208 are operably connected to the
17 PC board 204 of the recall device. In one implementation, a 50 mm x 30 mm x 14
18 mm Sipix Snap 300 kpixel camera module with an additional f2, f2.2, mm lens
19 from Edmunds Optics is employed. In an alternative configuration, a Philips
20 Key008 Camera is employed with an added 2.9mm lens from Edmunds Optics.
21 An interface to the shutter and mode controls of the camera are provided by reed
22 relays, although other switching elements, such as optical MOSFET transistors,
23 may alternatively be employed.

24 An accelerometer 210 is mounted to the PC board 204. In the illustrated
25 implementation, a single dual axis +/-10g ADXL210 accelerometer from Analog

1 Devices is employed. In alternative implementations, multiple multi-axis or single
2 axis accelerometers may be employed. For example, individual single axis
3 accelerometers may be configured to detect acceleration in each of three axes (X,
4 Y, and Z). In an alternative implementation, the 3 axes are designated as roll,
5 pitch and yaw, and a gyroscope is used to detect yaw (rotational acceleration).

6 A light level sensor 212 mounted to the PC board 204. In one
7 implementation, a digital ambient light level sensor from TAOS, Inc., such as the
8 TCS230, is employed to detect magnitudes of and changes in ambient light levels
9 in experienced by the recall device and, therefore, by the wearer. A change in
10 ambient light level represents an exemplary capture condition that can indicate
11 movement of the wearer from one room to another or from inside to outside. In
12 addition, a change in ambient light level may be imitated by a gesture, such as
13 waving one's hand across the recall device to create a shadow on the light level
14 sensor. As such, an image capture may be triggered by the wearer's gestures
15 without requiring the wearer to actually touching a trigger switch on the recall
16 device. In one such implementation, the delay between detection of the capture
17 event and the triggering of the image capture is prolonged at least as long as a
18 predefined delay period in order to allow proper aiming of the camera at a target.

19 An ambient temperature sensor (not shown) is mounted to the PC
20 board 204. In one implementation, a National Semiconductor LM75 sensor is
21 employed to detect magnitudes and changes in ambient temperature levels
22 experienced by the recall device. A change in ambient light level represents an
23 exemplary capture condition that can indicate, for example, movement of the
24 wearer from inside to outside.
25

1 A serial bus port 214 is mounted to the PC board 204. In one
2 implementation, a universal serial bus interface is employed, although other serial
3 ports, such as an RS-232 interface or IRDA interface, or any other data port, may
4 be employed. The serial bus port (or other interface) may be used to upload and
5 download data to/from the recall device. LEDs 216 indicate detection of various
6 capture events, as discussed with regard to FIG. 1.

7 FIG. 3 illustrates a schematic of components 300 in an exemplary recall
8 device. A microcontroller 302 is coupled to control a camera 304 using a shutter
9 control line 306 and a mode control line 308. A signal issued by the
10 microcontroller 302 on the shutter control line 306 triggers an image capture in the
11 camera 304. A signal issued by the microcontroller 302 on the mode control
12 line 308 sets the camera in high resolution mode, low resolution, or triggers an
13 erasure of a captured image. A lens 310, such as a normal lens, a wide angle lens,
14 or a fish eye lens, is connected to the camera 304.

15 A battery 312, such as a NiMH AA 1.5 volt battery, powers the illustrated
16 recall device, including the camera 304. A step-up circuit 314 increases the
17 voltage provided by the battery 312 to 3.7 volts to power the microcontroller 302
18 and other components on the PC board.

19 An I²C bus 316 connects a memory block 318 to the microcontroller 302.
20 The memory block 318 may be used to store logged sensor data and captured
21 images and sound. In one implementation, two 128Kbyte FLASH memory chips
22 (Microchip 24LC512) are employed. In an alternative implementation, a larger
23 and possibly removable memory modules, such as an SD or MMC card, can be
24 connected will allow up to 1Gbyte of storage. A real time clock chip 320
25

1 (Dallas/Maxim) and an ambient temperature sensor 322 (National Semiconductor
2 LM75) also connected to the microcontroller 302 by the I²C bus 316.

3 At least one accelerometer 324 is connected to the microcontroller 302 to
4 detected changes in location and movement. In the illustrated implementation,
5 three single axis accelerometers 326 are employed, one for each axis (X, Y, and
6 Z). A serial bus interface 328, such as a USB or RS-232 interface, is connected to
7 the microcontroller 302 to allow uploading and downloading of data. An audio
8 recording circuit 330 is also connected to the microcontroller 302 to record
9 ambient sound. In one implementation, the audio recording circuit 330 can record
10 continuously for a period of time, although in other implementations, the audio
11 recording circuit 330 is triggered to record in response to detection of a capture
12 condition. A digital light level sensor 332 is connected to the microcontroller 302
13 to detect light level capture conditions. An RF transceiver 334 and an antenna 336
14 are connected to the microcontroller to provide or detect Wi-Fi signal
15 communications, to detect RFID transponders, and/or to detect RF signals. In one
16 implementation, a 433 MHz transceiver is employed. In another implementation,
17 a 2.4 GHz radio receiver is employed to detect wireless networks. If the recall
18 device is brought into proximity of a computer having wireless communication
19 capabilities, the recall device can access and transfer images, audio, and other
20 sensor data to the computer (e.g., using Bluetooth or Wi-Fi). As such, a remote
21 computer system can be used to provide device settings, such as camera settings,
22 sensor settings, time settings, etc.

23 Another user interface mode may be employed in a recall device having a
24 no capacity or limited capacity for switches, buttons, etc. To enable transmission
25 of captured and logged data to a computer system without requiring switches, the

1 camera may be set in a predefined position (e.g., face-down on a table). On power
2 up, one or more accelerometers that detect the predefined position can trigger an
3 automatic download of data to a computer over a wireless network link without
4 any user intervention.

5 Other exemplary input components that may be employed for monitoring
6 and logging sensor data, including without limitation a Global Positioning System
7 (GPS) transceiver (e.g., a GPS transceiver from Garmin Geko with 10m resolution
8 and geographic location, altitude, and compass direction detection), a heart rate
9 monitor (e.g., a Polar monitor), a video camera, a gyroscope for detecting
10 rotational conditions (e.g., ADXRS gyroscope from Analog Devices), a chemical
11 sensor (e.g., a Figaro carbon monoxide sensor or a smoke detector), a reverse-
12 biased LED providing a crude optical motion detection based on ambient light
13 changes, and a passive infrared radiation detector (e.g., a Seiko Passive infrared
14 temperature detector) for detecting humans up to 2.5m from the wearer.

15 Other exemplary capture conditions may be satisfied by a change in sound
16 level, a change in light level, a change in motion (e.g., as detected by an
17 accelerometer or gyroscope), a change in heart rate, a change in ambient
18 temperature or the wear's body temperature, a change in chemical composition of
19 local environment (e.g., air), detection of a Wi-Fi signal, detection of an RFID
20 transponder, or expiration of a real time clock period.

21 The various combinations of these components may be used to selectively
22 capture ambient sound and images based on detection of a potentially interesting
23 condition, marked by detection of a capture condition. In this manner, the
24 selective image and sound capture make more efficient use of storage resources by
25 avoiding continuous capture of uninteresting conditions.

FIG. 4 illustrates exemplary operations 400 of a selective image capture process. A monitoring operation 402 monitors motion of a camera using at least one accelerometer. A detecting operation 404 detects an environmental condition experienced by the camera that is designated as a "capture condition". A capture condition indicates that something that has been previously associated with a potentially interesting environmental event has occurred. For example, if movement from one room to another is deemed to be an interesting environmental event, changes in ambient light level may be deemed to indicate that the wearer has moved to a different room.

In one implementation, an exemplary detecting operation includes the following steps described in pseudocode:

Detect_light_level:

- (1) Read ambient light level in Lux using TCS230 in current monitoring interval
- (2) Compare current light level reading with the light level reading from previous monitoring interval (e.g., 1 second ago)
- (3) If current reading < 50% of previous reading or current reading > 200% of previous reading, then indicate capture condition
- (4) Goto Detect_light_level

A purpose of detecting the capture condition is to "prime" the triggering of an image capture. However, as the recall device is a wearable device, subject to jitter, the image capture itself is delayed (i.e., managed) until a stable condition is detected by the accelerometer. Therefore, a delay operation 406 delays a trigger operation 408 until a stable condition is detected by the accelerometer(s). In this manner, the quality (e.g., clarity) of the captured image is expected to be better than an image from an unmanaged image capture.

1 A stable condition is detected when one or more of the accelerometers in
 2 the camera detect movement within a predefined range or at or below a predefined
 3 threshold. For example, an exemplary recall device may be set to detect a stable
 4 condition when all accelerometers sense no movement in their respective axes.
 5 However, this setting may severely limit the likelihood of an image capture during
 6 periods of otherwise acceptable camera movement, such as when the wearer is
 7 standing nearly still. Accordingly, the stable condition may be set to less than a
 8 threshold degree change in angle (e.g., 20°) of any given accelerometer output
 9 during a measurement period (e.g., 1 second).

10 In one implementation, an exemplary delay operation includes the
 11 following steps described in pseudocode:

12 Capture_image:

- 13 (5) Read tilt angle(s) of accelerometer(s) in current
monitoring interval
- 14 (6) Compare tilt angle(s) with tilt angle(s) from previous
monitoring interval (e.g., 1 second ago)
- 15 (7) If any tilt angle difference exceed 20 degrees, goto
Capture_image
- 16 (8) Trigger image capture in camera
- 17 (9) Return

18 After detection of the stable condition, a triggering operation 408 triggers
 19 an image capture through the camera module. In alternative implementations,
 20 other environmental states may also be captured, including without limitation an
 21 audio recording for a given period of time, a GPS reading, a real time clock
 22 reading, etc. A purpose of the capture events is to establish a snapshot of the
 23 environment as it existed in the temporal proximity of a capture condition.
 24 Thereafter, the captured data may be downloaded to a computer system to
 25

1 facilitate reconstruction of the environmental conditions associated with a
2 potentially relevant event.

3 In another implementation, image capture (including video capture) may
4 occur continuously or periodically, even in the absence of a previous capture
5 condition. For example, the recall device detects a stable condition and triggers an
6 image capture to memory. Thereafter, a temporally proximate capture condition is
7 detected so the captured image is maintained in association with the subsequent
8 capture condition. If no temporally proximate capture condition is detected, the
9 captured image may be deleted from memory to manage storage space. In this
10 manner, the environmental conditions existing just prior to a capture event may be
11 captured and efficiently recorded. A similar algorithm may be applied to audio
12 recordings and other sensory data.

13 FIG. 5 illustrates exemplary sensor readings 500 relative to image capture
14 events. Data 502 indicates readings of an accelerometer associated with the X axis
15 over time. Data 504 indicates readings of an accelerometer associated with the Y
16 axis over time. (Accelerometer readings in the chart correspond to an angle. For
17 example, in one implementation, an accelerometer signal with amplitude 0
18 represents 0 degrees, an accelerometer signal with amplitude 90 represents 90
19 degrees, etc.) Data 506 indicates readings of an ambient light level sensor. Data
20 508 indicates image captures triggered by detection of a capture condition
21 followed by detection of a stable condition.

22 As shown at time 510, a capture condition has been detected based on the
23 dramatic change in the light level data 506 followed by detection of a stable
24 condition, as indicated by both data 502 and 504. In contrast, at time 512, a
25 dramatic change in light level data 506 represents a capture condition, but an

1 image capture is delayed until time 514, when the stable condition is detected with
2 regard to both data 502 and 504. By managing captures in this manner, images are
3 selectively captured based on detection of a potentially interesting event coupled
4 with a stable period.

5 FIG. 6 illustrates an image 600 captured through a normal lens, an
6 image 602 captured through a fish-eye lens, and a corrected version 604 of the
7 fish-eye image. Using commercially available image editing software, an image
8 captured through the fish-eye lens may be corrected to remove the radial distortion
9 introduced by the fish-eye lens. Coupling the fish-eye image capture with the
10 correction software allows a wearer to capture a maximum amount of environment
11 in an image and to later remove the radial distortion to obtain a relatively normal
12 image. As such, the use of a fish-eye lens is particularly suited to a recall device
13 which captures images with relatively random alignment with the environment.

14 It should be understood that a variety of data can be logged and
15 downloaded to a computer system for post-processing and/or analysis in order to
16 reconstruct events in the wearer's recent experience. Exemplary outputs of the
17 recall device may include without limitation a continuous audio log; a sequence of
18 audio snapshots; a sequence of image snapshots; a sequence of GPS location,
19 altitude, and direction readings; a motion log; an ambient temperature log; a heart
20 rate log; an RFID detection log; and a wireless network detection log.

21 Furthermore, in applications intended to facilitate memory recall, a
22 technique referred to as "Rapid Serial Visual Presentation" or RSVP may be
23 employed. RSVP represents the electronic equivalent of riffling a book in order to
24 assess its content, as described in "Rapid Serial Visual Presentation: A space-time
25 trade-off in information presentation", Oscar de Bruijn and Robert Spence,

1 <http://www.iis.ee.ic.ac.uk/~o.debruijn/avi2000.pdf>, May 2000. Using this
2 technique, a user interface, such as on the recall device or on a client computer
3 system to which the captured data is downloaded, can rapidly display the images
4 in the sequence in which they were captured, under direct user control of various
5 factors, including without limitation speed, direction, and the number of
6 simultaneously visible images. Such display may be combined with temporally
7 synchronized audio captured by the recall device or other logged data.

8 Manufacturers have not put GPS features in small portable digital cameras
9 at present due to high battery drain. The ADXL210 accelerometer use about
10 1/130th of the power of a GPS transceiver when operating (typically, 0.6mA) and,
11 therefore, may be used as an efficient power management component. In one
12 implementation, an accelerometer may be used as a power management
13 component for the GPS receiver. As GPS receiver integrated circuits generally
14 use much current (e.g. 80mA), the batteries powering the system can be drained
15 easily. By periodically sampling the motion read by the accelerometer (e.g., every
16 second or so), the GPS can be switched off if there is no movement because no
17 change in GPS location has occurred. When movement is detected by the low
18 power accelerometer, the GPS system can be switched back on. A similar power
19 management mechanism can be used to power off the camera, which also has a
20 high current drain. Other sensor inputs, such as light level sensors, can be used for
21 power saving. For example, a camera need not powered in the presence of total
22 darkness.

23 The embodiments of the invention described herein are implemented as
24 logical steps in one or more computer systems. The logical operations of the
25 present invention are implemented (1) as a sequence of processor-implemented

1 steps executing in one or more computer systems and (2) as interconnected
2 machine modules within one or more computer systems. The implementation is a
3 matter of choice, dependent on the performance requirements of the computer
4 system implementing the invention. Accordingly, the logical operations making
5 up the embodiments of the invention described herein are referred to variously as
6 operations, steps, objects, or modules.

7 The above specification, examples and data provide a complete description
8 of the structure and use of exemplary embodiments of the invention. Since many
9 embodiments of the invention can be made without departing from the spirit and
10 scope of the invention, the invention resides in the claims hereinafter appended.
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CLAIMS:

1. A portable recall device configured to be carried by a wearer comprising:

a camera; and

5 at least one accelerometer operably connected to the camera, the accelerometer triggering capture of an image by the camera based on detection of a capture condition,

wherein the portable recall device is adapted to delay the triggering of said capture of an image until the at least one accelerometer detects movement
10 within a predefined range or at or below a predefined threshold.

2. The portable recall device of claim 1 wherein the at least one accelerometer detects both the capture condition and the movement within the predefined range or at or below the predefined threshold.

3. The portable recall device of claim 1 further comprising:
15 an environmental sensor that monitors ambient conditions to detect the capture condition.

4. The portable recall device of claim 1 further comprising:
an audio recording circuit recording ambient sounds, responsive to detection of the capture condition.

20 5. The portable recall device of claim 1 wherein the camera includes a wide-angle lens.

6. The portable recall device of claim 1 wherein the camera includes a fish-eye lens.

7. The portable recall device of claim 1 wherein detection of the
25 capture condition comprises detection of a change in ambient light.

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8. The portable recall device of claim 1 wherein detection of the capture condition comprises detection of a change in ambient sound.

9. The portable recall device of claim 1 wherein detection of the capture condition comprises detection of a change in ambient temperature.

5 10. The portable recall device of claim 1 wherein detection of the capture condition comprises detection of a change in motion of the wearer.

11. The portable recall device of claim 1 wherein detection of the capture condition comprises detection of a change in heart rate of the wearer.

12. The portable recall device of claim 1 wherein the at least one
10 accelerometer comprises:

a plurality of accelerometers, each accelerometer oriented to detect acceleration along different axis, wherein the portable recall device is further adapted to delay the triggering until a signal from each accelerometer indicates that camera acceleration is below a defined threshold in each axis.

15 13. The portable recall device of claim 1 wherein detection of the capture condition comprises detection of a change in ambient light and the triggering of the capture of the image is delayed by at least a predefined delay period after the detection of the capture condition.

14. The portable recall device of claim 1 wherein detection of the
20 capture condition comprises detection of a change in a signal from a passive infrared detector triggered by heat from a person in the proximity of the recall device.

15. The portable recall device of claim 1, further comprising:

a memory maintaining storage of the image, responsive to the triggering of the capture of image, if a capture condition is detected in temporal
25 proximity of the capture, wherein the memory deletes the storage of the image if no capture condition is detected in a defined temporal proximity of the capture.

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16. The portable recall device of claim 15 wherein the image is one image of a video sequence.

17. The portable recall device of claim 15 further comprising:

an audio recording circuit recording ambient sounds, wherein the
5 memory further maintains storage of the recorded ambient sounds if the capture condition is detected in temporal proximity of the capture, and wherein the memory deletes the storage of the recorded ambient sounds if no capture condition is detected in the temporal proximity of the capture.

18. The portable recall device of one of claims 1 to 17, wherein the
10 portable recall device is further a digital media player.

19. A portable recall device configured to be carried by a wearer,
comprising:

a camera; and

a gyroscope operably connected to the camera, the gyroscope
15 triggering capture of an image by the camera based on detection of a capture condition, wherein the portable recall device is adapted to delay the triggering of said capture of an image until the gyroscope detects a signal indicating that yawing movement of the camera is below a defined threshold.

20. A method comprising:

20 monitoring acceleration of a camera along at least one axis using an accelerometer;

detecting a capture condition experienced by the camera;

detecting movement within a predefined range or at or below a
predefined threshold by the at least one accelerometer along the at least one axis,
25 responsive to the operation of detecting the capture condition; and

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triggering capture of an image by the camera based on detection of the capture condition followed by detection of the movement within the predefined range or at or below the predefined threshold.

21. The method of claim 20 wherein the at least one accelerometer
5 detects both the capture condition and the movement within the predefined range or at or below the predefined threshold.

22. The method of claim 20 wherein detecting the capture condition comprises:

10 monitoring ambient conditions with an environmental sensor to detect the capture condition.

23. The method of claim 20 further comprising:

recording ambient sounds responsive to detection of the capture condition.

15 24. The method of claim 20 wherein the camera includes a wide-angle lens.

25. The method of claim 20 wherein the camera includes a fish-eye lens.

26. The method of claim 20 wherein detecting the capture condition comprises:

detecting a change in ambient light.

20 27. The method of claim 20 wherein detecting the capture condition comprises:

detecting a change in ambient sound.

28. The method of claim 20 wherein detecting the capture condition comprises:

25 detecting a change in ambient temperature.

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29. The method of claim 20 wherein detecting the capture condition comprises:

detecting of a change in motion of the wearer.

30. The method of claim 20 wherein detecting the capture condition
5 comprises:

detecting of a change in heart rate of the wearer.

31. The method of claim 20 wherein detecting the capture condition comprises:

10 detecting a change in ambient light, and triggering of the capture of the image is delayed by at least predefined delay period after the detection of the capture condition.

32. The method of claim 20 further comprising:

reviewing in sequence a plurality of captured images downloaded from the portable recall device.

15 33. The method of claim 20, wherein the capture of the image by the camera is triggered into a memory, and further comprising:

deleting the image from the memory if a capture condition is not detected in a defined temporal proximity of the capture.

20 34. The method of claim 33 wherein the image is one image of a video sequence.

35. The method of claim 33 further comprising:

recording ambient sounds in the memory; and

deleting the recorded ambient sounds if no capture condition is detected in temporal proximity of the capture.

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36. A computer program product comprising a computer readable medium having stored thereon computer-executable instructions that, when carried out by a processor, cause the processor to perform the method of one of claims 20 to 35.

5 37. The computer program product of claim 36, wherein the capture of the image by the camera is triggered into a memory, the computer process further comprising:

deleting the image from the memory if a capture condition is not detected in a defined temporal proximity of the capture.

10 38. The computer program product of claim 37 wherein the image is one image of a video sequence.

39. The computer program product of claim 37 wherein the computer process further comprises:

recording ambient sounds in the memory; and

15 deleting the recorded ambient sounds from the memory if no capture condition is detected in temporal proximity of the capture.

40. A method comprising:

detecting a capture condition experienced by a camera;

20 detecting a signal from a gyroscope that indicates that yawing movement of the camera is below a defined threshold; and

triggering capture of an image by the camera based on detection of the capture condition followed by detection of the signal from the gyroscope.

41. A computer program product comprising a computer readable medium having stored thereon computer-executable instructions that, when
25 carried out by a processor, cause the processor to perform the method of claim 40.

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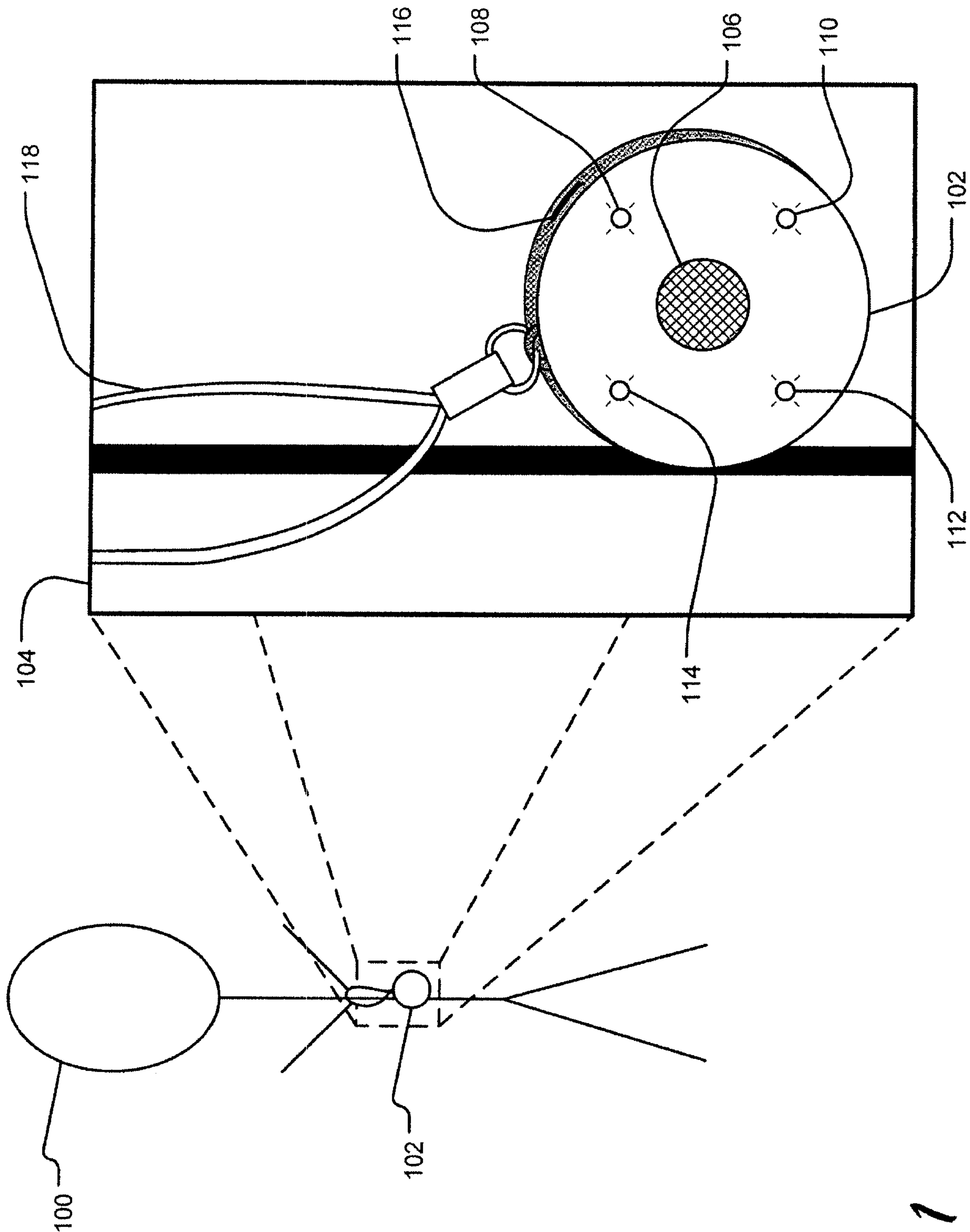


Fig. 1

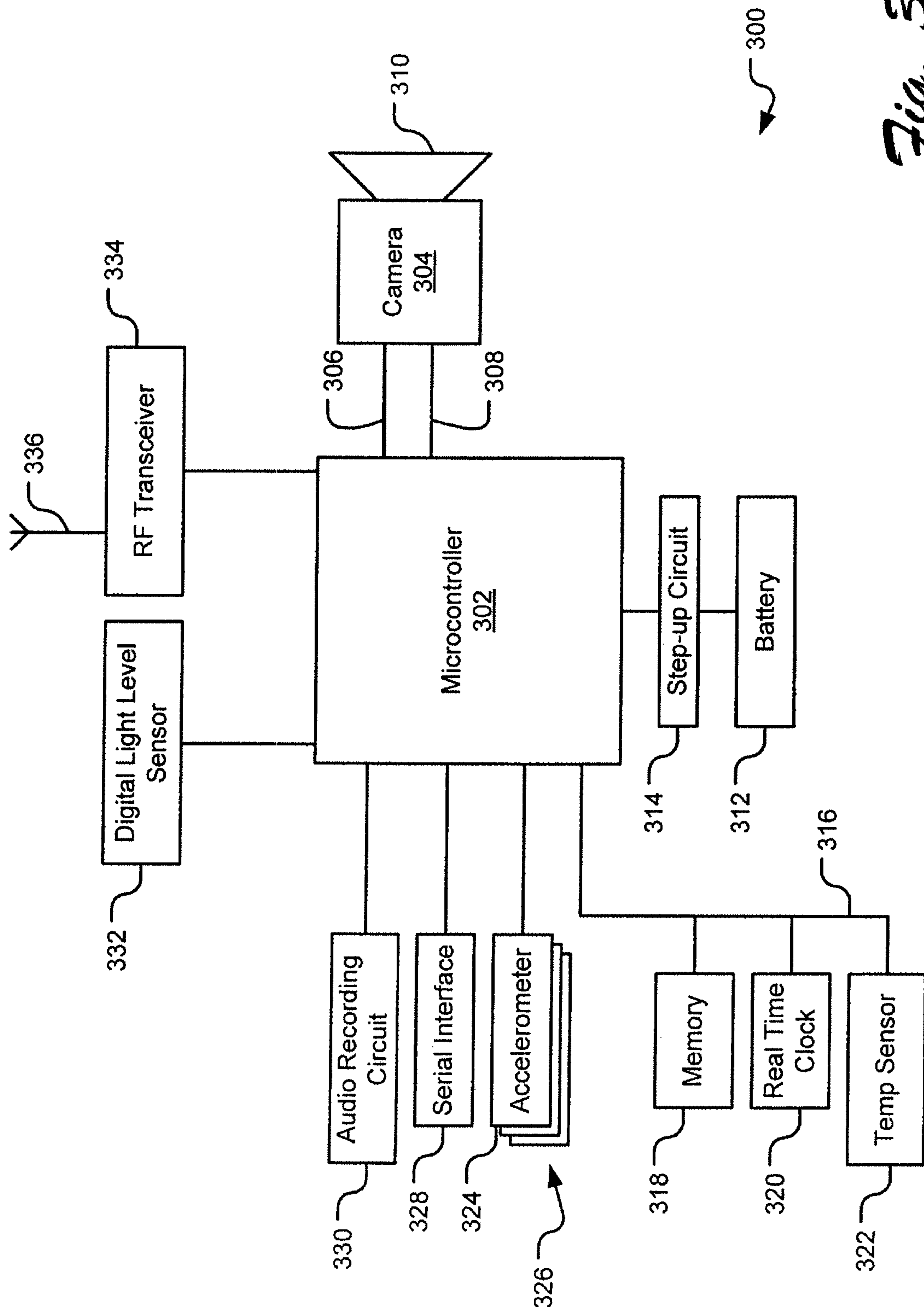
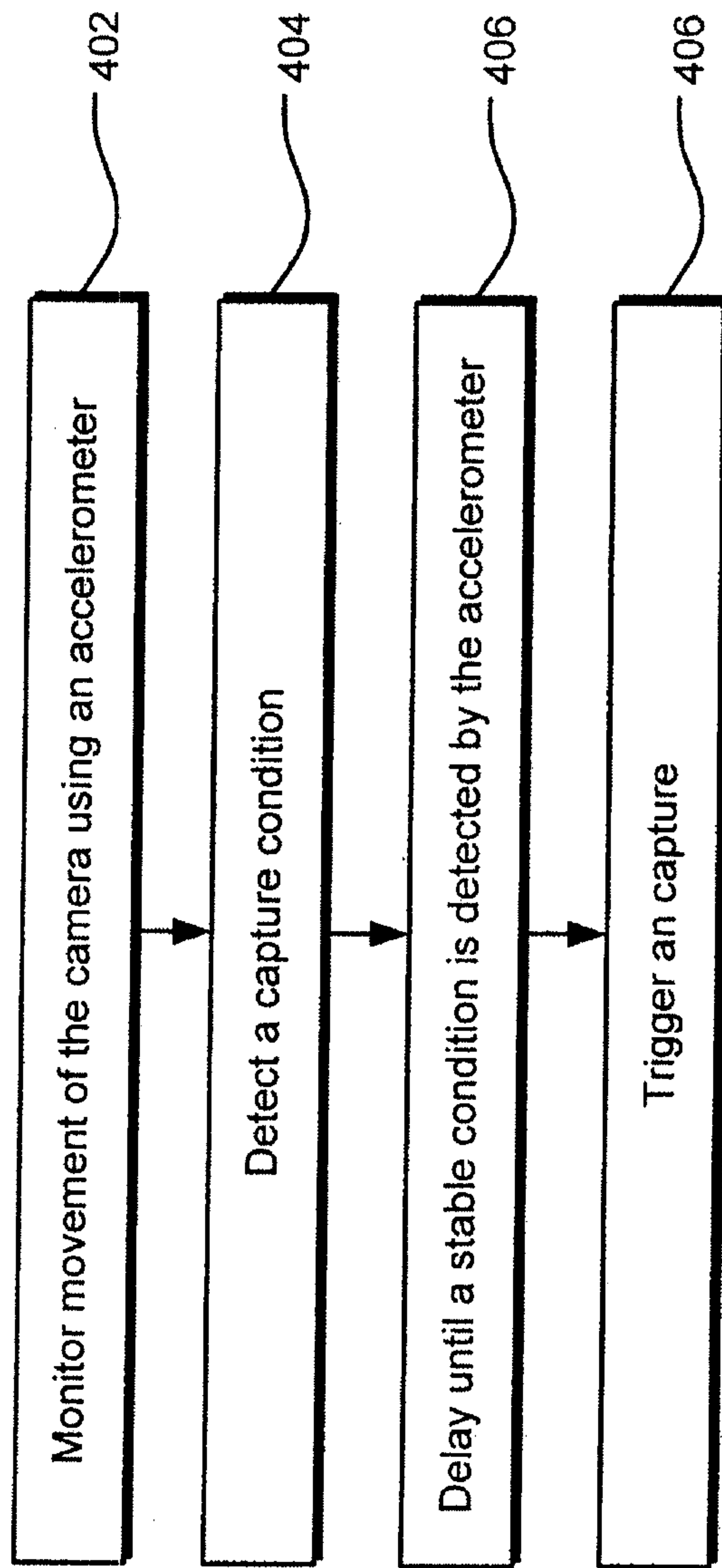


Fig. 3

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Fig. 4

