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INTERCONNECT MECHANISM FOR IMAGE CAPTURE DEVICE

Abstract

A camera housing includes a first surface and a second surface noncoplanar with the first surface. A first interconnect mechanism is coupled to the first surface and rotatable between a collapsed position and an extended position. In the collapsed position, protrusions of the first interconnect mechanism extend parallel to the first surface. In the extended position, the protrusions of the first interconnect mechanism extend in a perpendicular manner away from the first surface. A second interconnect mechanism is coupled to the second surface and rotatable between a collapsed position and an extended position. In the collapsed position, protrusions of the second interconnect mechanism include coplanar surfaces and extend adjacent to the second surface. In the extended position, the protrusions of the second interconnect mechanism extend in a perpendicular manner away from the second surface.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) [0001] This application is a continuation of U.S. patent application Ser. No. 18/231,412, filed Aug. 8, 2023, which claims priority to and the benefit of U.S. Provisional Patent Application No. 63/397,454, filed Aug. 12, 2022. The entire contents of each of the above-referenced applications are hereby incorporated by reference.

TECHNICAL FIELD
[0002] This disclosure relates to an image capture device that includes multiple interconnect mechanisms to connect to a mounting component.
BACKGROUND
[0003] An image capture device may be mounted to a mounting surface with a mounting component using an interconnect mechanism. Based on the relative locations of the interconnect mechanism, the mounting component, and the mounting surface, the image capture device may impart an undesirable torque to the mounting surface.
SUMMARY
[0004] Disclosed herein are implementations of an image capture device with a body including a front surface positioned opposite a back surface and a top surface positioned opposite a bottom surface. The back surface defines a recess having a recessed surface that is positioned between the front surface and the back surface, and a lens is coupled to the front surface. A first interconnect mechanism is rotatably coupled to the bottom surface, has a collapsed position and an extended position, and extends away from the bottom surface in both the extended position and the collapsed position. A second interconnect mechanism is rotatably coupled to the recessed surface, has a collapsed position and an extended position, and extends away from the back surface in the extended position and is approximately flush with the back surface in the collapsed position.
[0005] In certain embodiments, the back surface includes fins configured to dissipate heat.
[0006] In certain embodiments, in a first configuration the first interconnect mechanism is configured to connect to a mounting component that is coupled to a mounting surface, and in a second configuration the second interconnect mechanism is configured to connect to the mounting component. A torque imparted to the mounting surface by the image capture device is smaller when in the second configuration than when in the first configuration.
[0007] In certain embodiments, in a first configuration the first interconnect mechanism is configured to connect to a mounting component that is coupled to a mounting surface, and in a second configuration the second interconnect mechanism is configured to connect to the mounting component. A distance from the mounting surface to a center of mass the image capture device is smaller when in the second configuration than when in the first configuration.
[0008] In certain embodiments, the first interconnect mechanism includes folding protrusions that are configured to rotate toward each other to move from the collapsed position to the extended position.
[0009] In certain embodiments, the second interconnect mechanism includes folding protrusions that are configured to rotate toward each other to move from the collapsed position to the extended

position.
[0010] In a second implementation, a camera housing includes a first surface and a second surface noncoplanar with the first surface. A first interconnect mechanism is coupled to the first surface and rotatable between a collapsed position and an extended position. In the collapsed position, protrusions of the first interconnect mechanism extend parallel to the first surface. In the extended position, the protrusions of the first interconnect mechanism extend in a perpendicular manner away from the first surface. A second interconnect mechanism is coupled to the second surface.
[0011] In a third implementation, the image capture device includes a body, an image sensor, and a lens coupled to the body that directs light along an optical axis onto the image sensor. A first interconnect mechanism coupled to the body includes a first protrusion and a second protrusion. The first protrusion is rotatable between a collapsed position and an extended position about a first axis of rotation that is parallel to the optical axis. The second protrusion is rotatable between a collapsed position and an extended position about a second axis of rotation that is parallel to the optical axis. A second interconnect mechanism coupled to the body includes a third protrusion and a fourth protrusion. The third protrusion is rotatable between a collapsed position and an extended position about a third axis of rotation that is perpendicular to the optical axis. The fourth protrusion is rotatable between a collapsed position and an extended position about a fourth axis of rotation that is perpendicular to the optical axis.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0012] The disclosure is best understood from the following detailed description when read in conjunction with the accompanying drawings. It is emphasized that, according to common practice, the various features of the drawings are not to-scale. On the contrary, the dimensions of the various features are arbitrarily expanded or reduced for clarity.
[0013] FIGS. **1**A-**1**B are isometric views of an example of an image capture device.
[0014] FIG. **2** is a block diagram of electronic components of an image capture device.
[0015] FIG. **3** is an illustration of the image capture device of FIG. **1** coupled to a helmet in a first configuration.
[0016] FIG. **4** is an illustration of the image capture device of FIG. **1** coupled to the helmet in a second configuration.
[0017] FIG. **5** is an illustration of the image capture device of FIG. **1** coupled to the helmet in a third configuration.
[0018] FIG. **6** is an illustration of the image capture device of FIG. **1** coupled to the helmet in a fourth configuration with an accessory mounted to the image capture device.
DETAILED DESCRIPTION
[0019] The present disclosure describes an image capture device that provides a user the ability to mount the image capture device to a structure in various orientations. The image capture device includes a first interconnect mechanism and a second interconnect mechanism that are configured to connect to a mating component that is coupled to a mating surface. The first interconnect mechanism and the second interconnect mechanism are arranged on surfaces of the image capture device that are perpendicular to each other.
[0020] In some implementations, the mating surface includes a helmet, and the image capture device is coupled to the helmet to capture images and/or video as a user wearing the helmet performs an activity (e.g., biking, skydiving, skiing, boating, etc.). The mating component may be secured to the helmet in various orientations such that a position and/or orientation of the image capture device is based on the position of the mating component relative to the helmet.
[0021] FIGS. **1**A-**1**B are isometric views of an example of an image capture device **100**. The image

capture device **100** may include a body **102**, a lens **104** structured on a front surface of the body **102**, various indicators on the front surface of the body **102** (such as light-emitting diodes (LEDs), displays, and the like, not shown), various input mechanisms (such as buttons, switches, and/or touch-screens), and electronics (such as imaging electronics, power electronics, etc.) internal to the body **102** for capturing images via the lens **104** and/or performing other functions. The lens **104** is configured to receive light incident upon the lens **104** and to direct received light onto an image sensor internal to the body **102**. The image capture device **100** may be configured to capture images and video and to store captured images and video for subsequent display or playback.
[0022] The image capture device **100** may include an LED or another form of an indicator **106** to indicate a status of the image capture device **100** and a liquid-crystal display (LCD) or other form of a display **108** to show status information such as battery life, camera mode, elapsed time, and the like. The image capture device **100** may also include a mode button **110** and a shutter button **112** that are configured to allow a user of the image capture device **100** to interact with the image capture device **100**. For example, the mode button **110** and the shutter button **112** may be used to turn the image capture device **100** on and off, scroll through modes and settings, and select modes and change settings. The image capture device **100** may include additional buttons or interfaces (not shown) to support and/or control additional functionality.
[0023] The image capture device **100** may include a door **114** coupled to the body **102**, for example, using a hinge mechanism **116**. The door **114** may be secured to the body **102** using a latch mechanism **118** that releasably engages the body **102** at a position generally opposite the hinge mechanism **116**. The door **114** may also include a seal (not shown) and a battery interface (not shown). When the door **114** is an open position, access is provided to an input-output (I/O) interface (not shown) for connecting to or communicating with external devices as described below, to a battery receptacle (not shown) for placement and replacement of a battery (not shown), and to an external memory slot (not shown) configured to receive an external memory device (e.g., a memory card such as an SD card, a microSD card, an SDHC card, an SDXC card, or any other type of external memory device configured to be received by the external memory slot). The battery receptacle includes operative connections (not shown) for power transfer between the battery and the image capture device **100**. The external memory slot includes operative connections (not shown) for reading and writing data to an external memory device such that videos can be stored on, and retrieved from, the external memory device. When the door **114** is in a closed position, the seal engages a flange (not shown) or other interface to provide an environmental seal, and the battery interface engages the battery to secure the battery in the battery receptacle. The door **114** can also have a removed position (not shown) where the entire door **114** is separated from the image capture device **100**, that is, where both the hinge mechanism **116** and the latch mechanism **118** are decoupled from the body **102** to allow the door **114** to be removed from the image capture device **100**.
[0024] The image capture device **100** may include a microphone **128** on a front surface and another microphone **130** on a top surface. The image capture device **100** may include other microphones on other surfaces (not shown). The microphones **128**, **130** may be configured to receive and record audio signals in conjunction with recording video or separate from recording of video. The image capture device **100** may include a speaker **132** on a recessed surface of the image capture device **100**. The image capture device **100** may include other speakers on other surfaces (not shown). The speaker **132** may be configured to play back recorded audio or emit sounds associated with notifications.
[0025] A bottom surface of the image capture device **100** may include a first interconnect mechanism **136** for connecting the image capture device **100** to a handle grip or other securing device such as a mating component. In the example shown in FIG. **1**B, the first interconnect mechanism **136** includes folding protrusions (e.g., a folding protrusion **138** and a folding protrusion **140**) configured to move between a nested or collapsed position (not shown) and an extended or

open position as shown that facilitates coupling of the folding protrusions **138**, **140** to mating protrusions of other devices such as handle grips, mounts, clips, or like devices. To move between the nested or collapsed position and the extended or open position, the folding protrusions **138**, **140** are configured to rotate toward and away from each other, respectively. When in both the collapsed and extended positions, the first interconnect mechanism **136** extends away from the bottom surface of the image capture device **100**. In the collapsed position, the folding protrusions **138**, **140** may include coplanar surfaces and extend adjacent to the bottom surface of the image capture device **100**. In other words, in the collapsed position, the folding protrusions **138**, **140** extend away from each other in a common plane located below a plane extending through a bottom surface of the image capture device **100**. In the extended position, the folding protrusions **138**, **140** may extend perpendicularly away from the bottom surface of the image capture device **100**.

[0026] A back surface of the image capture device **100** may define a recess **150** that has a recessed surface **152**. A second interconnect mechanism **142** for connecting the image capture device **100** to a handle grip or other securing device may be rotatably coupled to the recessed surface **152**. In the example shown in FIG. **1**B, the second interconnect mechanism **142** includes folding protrusions (e.g., a folding protrusion **144** and a folding protrusion **146**) configured to move between a nested or collapsed position (not shown) and an extended or open position as shown that facilitates coupling of the folding protrusions **144**, **146** to mating protrusions of other devices such as handle grips, mounts, clips, or like devices. When in the nested or collapsed position, an outer surface of the second interconnect mechanism **142** is approximately flush with the back surface of the image capture device **100**. The back surface of the image capture device includes fins **148** that are configured to dissipate heat generated by the internal components of the image capture device **100**. In some implementations, an outer surface of the second interconnect mechanism **142** is approximately flush with the fins **148** when the second interconnect mechanism **142** is in the collapsed position. To move between the nested or collapsed position and the extended or open position, the folding protrusions **144**, **146** are configured to rotate toward and away from each other, respectively.

[0027] In some implementations, the folding protrusions **138**, **140** of the first interconnect mechanism **136** and the folding protrusions **144**, **146** of the second interconnect mechanism **142** are approximately the same size (e.g., length, width, thickness, etc.). In their extended positions, the folding protrusions **144**, **146** of the second interconnect mechanism **142** do not extend as far from the back surface of the image capture device **100** as do the folding protrusions **138**, **140** of the first interconnect mechanism **136** from the bottom surface of the image capture device **100**. This occurs because the folding protrusions **144**, **146** of the second interconnect mechanism **142** are coupled to the recessed surface **152** whereas the folding protrusions **138**, **140** of the first interconnect mechanism **136** are coupled to the bottom surface of the image capture device **100**.

[0028] The image capture device **100** of FIGS. **1**A-B includes an exterior that encompasses and protects internal electronics. In the present example, the exterior includes six surfaces (i.e. a front face, a left face, a right face, a back face, a top face, and a bottom face) that form a rectangular or square cuboid. Furthermore, both the front and rear surfaces of the image capture device **100** are rectangular or square. In other embodiments, the exterior may have a different shape. The image capture device **100** may be made of a rigid material such as plastic, aluminum, steel, or fiberglass. The image capture device **100** may include features other than those described here. For example, the image capture device **100** may include additional buttons or different interface features, such as interchangeable lenses, cold shoes, and hot shoes that can add functional features to the image capture device **100**.

[0029] The image capture device **100** may include various types of image sensors, such as charge-coupled device (CCD) sensors, active pixel sensors (APS), complementary metal-oxide-semiconductor (CMOS) sensors, N-type metal-oxide-semiconductor (NMOS) sensors, and/or any other image sensor or combination of image sensors.

[0030] Although not illustrated, in various embodiments, the image capture device **100** may include other additional electrical components (e.g., an image processor, camera system-on-chip (SoC), etc.), which may be included on one or more circuit boards within the body **102** of the image capture device **100**.
[0031] The image capture device **100** may interface with or communicate with an external device, such as an external user interface device (not shown), via a wired or wireless computing communication link (e.g., an I/O interface). Any number of computing communication links may be used. The computing communication link may be a direct computing communication link or an indirect computing communication link, such as a link including another device or a network, such as the internet, may be used.
[0032] In some implementations, the computing communication link may be a Wi-Fi link, an infrared link, a Bluetooth (BT) link, a cellular link, a ZigBee link, a near field communications (NFC) link, such as an ISO/IEC 20643 protocol link, an Advanced Network Technology interoperability (ANT+) link, and/or any other wireless communications link or combination of links.
[0033] In some implementations, the computing communication link may be an HDMI link, a USB link, a digital video interface link, a display port interface link, such as a Video Electronics Standards Association (VESA) digital display interface link, an Ethernet link, a Thunderbolt link, and/or other wired computing communication link.
[0034] The image capture device **100** may transmit images, such as panoramic images, or portions thereof, to the external user interface device via the computing communication link, and the external user interface device may store, process, display, or a combination thereof the panoramic images.
[0035] The external user interface device may be a computing device, such as a smartphone, a tablet computer, a phablet, a smart watch, a portable computer, personal computing device, and/or another device or combination of devices configured to receive user input, communicate information with the image capture device **100** via the computing communication link, or receive user input and communicate information with the image capture device **100** via the computing communication link.
[0036] The external user interface device may display, or otherwise present, content, such as images or video, acquired by the image capture device **100**. For example, a display of the external user interface device may be a viewport into the three-dimensional space represented by the panoramic images or video captured or created by the image capture device **100**.
[0037] The external user interface device may communicate information, such as metadata, to the image capture device **100**. For example, the external user interface device may send orientation information of the external user interface device with respect to a defined coordinate system to the image capture device **100**, such that the image capture device **100** may determine an orientation of the external user interface device relative to the image capture device **100**.
[0038] Based on the determined orientation, the image capture device **100** may identify a portion of the panoramic images or video captured by the image capture device **100** for the image capture device **100** to send to the external user interface device for presentation as the viewport. In some implementations, based on the determined orientation, the image capture device **100** may determine the location of the external user interface device and/or the dimensions for viewing of a portion of the panoramic images or video.
[0039] The external user interface device may implement or execute one or more applications to manage or control the image capture device **100**. For example, the external user interface device may include an application for controlling camera configuration, video acquisition, video display, or any other configurable or controllable aspect of the image capture device **100**.
[0040] The user interface device, such as via an application, may generate and share, such as via a cloud-based or social media service, one or more images, or short video clips, such as in response

to user input. In some implementations, the external user interface device, such as via an application, may remotely control the image capture device **100** such as in response to user input.
[0041] The external user interface device, such as via an application, may display unprocessed or minimally processed images or video captured by the image capture device **100** contemporaneously with capturing the images or video by the image capture device **100**, such as for shot framing or live preview, and which may be performed in response to user input. In some implementations, the external user interface device, such as via an application, may mark one or more key moments contemporaneously with capturing the images or video by the image capture device **100**, such as with a tag or highlight in response to a user input or user gesture.
[0042] The external user interface device, such as via an application, may display or otherwise present marks or tags associated with images or video, such as in response to user input. For example, marks may be presented in a camera roll application for location review and/or playback of video highlights.
[0043] The external user interface device, such as via an application, may wirelessly control camera software, hardware, or both. For example, the external user interface device may include a web-based graphical interface accessible by a user for selecting a live or previously recorded video stream from the image capture device **100** for display on the external user interface device.
[0044] The external user interface device may receive information indicating a user setting, such as an image resolution setting (e.g., 3840 pixels by 2160 pixels), a frame rate setting (e.g., 60 frames per second (fps)), a location setting, and/or a context setting, which may indicate an activity, such as mountain biking, in response to user input, and may communicate the settings, or related information, to the image capture device **100**.
[0045] FIG. **2** is a block diagram of electronic components in an image capture device **200**. The image capture device **200** may be a single-lens image capture device, a multi-lens image capture device, or variations thereof, including an image capture device with multiple capabilities such as use of interchangeable integrated sensor lens assemblies. The description of the image capture device **200** is also applicable to the image capture device **100** of FIGS. **1**A-B.
[0046] The image capture device **200** includes a body **202** which includes electronic components such as capture components **210**, a processing apparatus **220**, data interface components **230**, movement sensors **240**, power components **250**, and/or user interface components **260**.
[0047] The capture components **210** include one or more image sensors **212** for capturing images and one or more microphones **214** for capturing audio.
[0048] The image sensor(s) **212** is configured to detect light of a certain spectrum (e.g., the visible spectrum or the infrared spectrum) and convey information constituting an image as electrical signals (e.g., analog or digital signals). The image sensor(s) **212** detects light incident through a lens coupled or connected to the body **202**. The image sensor(s) **212** may be any suitable type of image sensor, such as a charge-coupled device (CCD) sensor, active pixel sensor (APS), complementary metal-oxide-semiconductor (CMOS) sensor, N-type metal-oxide-semiconductor (NMOS) sensor, and/or any other image sensor or combination of image sensors. Image signals from the image sensor(s) **212** may be passed to other electronic components of the image capture device **200** via a bus **280**, such as to the processing apparatus **220**. In some implementations, the image sensor(s) **212** includes a digital-to-analog converter. A multi-lens variation of the image capture device **200** can include multiple image sensors **212**.
[0049] The microphone(s) **214** is configured to detect sound, which may be recorded in conjunction with capturing images to form a video. The microphone(s) **214** may also detect sound in order to receive audible commands to control the image capture device **200**.
[0050] The processing apparatus **220** may be configured to perform image signal processing (e.g., filtering, tone mapping, stitching, and/or encoding) to generate output images based on image data from the image sensor(s) **212**. The processing apparatus **220** may include one or more processors having single or multiple processing cores. In some implementations, the processing apparatus **220**

may include an application specific integrated circuit (ASIC). For example, the processing apparatus **220** may include a custom image signal processor. The processing apparatus **220** may exchange data (e.g., image data) with other components of the image capture device **200**, such as the image sensor(s) **212**, via the bus **280**.

[0051] The processing apparatus **220** may include memory, such as a random-access memory (RAM) device, flash memory, or another suitable type of storage device, such as a non-transitory computer-readable memory. The memory of the processing apparatus **220** may include executable instructions and data that can be accessed by one or more processors of the processing apparatus **220**. For example, the processing apparatus **220** may include one or more dynamic random-access memory (DRAM) modules, such as double data rate synchronous dynamic random-access memory (DDR SDRAM). In some implementations, the processing apparatus **220** may include a digital signal processor (DSP). More than one processing apparatus may also be present or associated with the image capture device **200**.

[0052] The data interface components **230** enable communication between the image capture device **300** and other electronic devices, such as a remote control, a smartphone, a tablet computer, a laptop computer, a desktop computer, or a storage device. For example, the data interface components **230** may be used to receive commands to operate the image capture device **200**, transfer image data to other electronic devices, and/or transfer other signals or information to and from the image capture device **200**. The data interface components **230** may be configured for wired and/or wireless communication. For example, the data interface components **230** may include an I/O interface **232** that provides wired communication for the image capture device **200**, which may be a USB interface (e.g., USB type-C), a high-definition multimedia interface (HDMI), or a FireWire interface. The data interface components **230** may include a wireless data interface **234** that provides wireless communication for the image capture device **200**, such as a Bluetooth interface, a ZigBee interface, and/or a Wi-Fi interface. The data interface components **230** may include a storage interface **236**, such as a memory card slot configured to receive and operatively couple to a storage device (e.g., a memory card) for data transfer with the image capture device **200** (e.g., for storing captured images and/or recorded audio and video).

[0053] The movement sensors **240** may detect the position and movement of the image capture device **200**. The movement sensors **240** may include a position sensor **242**, an accelerometer **244**, or a gyroscope **246**. The position sensor **242**, such as a global positioning system (GPS) sensor, is used to determine a position of the image capture device **200**. The accelerometer **244**, such as a three-axis accelerometer, measures linear motion (e.g., linear acceleration) of the image capture device **200**. The gyroscope **246**, such as a three-axis gyroscope, measures rotational motion (e.g., rate of rotation) of the image capture device **200**. Other types of movement sensors **240** may also be present or associated with the image capture device **200**.

[0054] The power components **250** may receive, store, and/or provide power for operating the image capture device **200**. The power components **250** may include a battery interface **252** and a battery **254**. The battery interface **252** operatively couples to the battery **254**, for example, with conductive contacts to transfer power from the battery **254** to the other electronic components of the image capture device **200**. The power components **250** may also include an external interface **256**, and the power components **250** may, via the external interface **256**, receive power from an external source, such as a wall plug or external battery, for operating the image capture device **200** and/or charging the battery **254** of the image capture device **200**. In some implementations, the external interface **256** may be the I/O interface **232**. In such an implementation, the I/O interface **232** may enable the power components **250** to receive power from an external source over a wired data interface component (e.g., a USB type-C cable).

[0055] The user interface components **260** may allow the user to interact with the image capture device **200**, for example, providing outputs to the user and receiving inputs from the user. The user interface components **260** may include visual output components **262** to visually communicate

information and/or present captured images to the user. The visual output components **262** may include one or more lights **264** and/or more displays **266**. The display(s) **266** may be configured as a touch screen that receives inputs from the user. The user interface components **260** may also include one or more speakers **268**. The speaker(s) **268** can function as an audio output component that audibly communicates information and/or presents recorded audio to the user. The user interface components **260** may also include one or more physical input interfaces **270** that are physically manipulated by the user to provide input to the image capture device **200**. The physical input interfaces **270** may, for example, be configured as buttons, toggles, or switches. The user interface components **260** may also be considered to include the microphone(s) **214**, as indicated in dotted line, and the microphone(s) **214** may function to receive audio inputs from the user, such as voice commands.

[0056] FIG. **3** is an illustration of the image capture device **100** of FIG. **1** coupled to a helmet **360** in a first configuration. A user may desire to wear the helmet **360** when performing an activity, such as biking, skydiving, boating, skiing, etc., and may desire to record a video of the activity to share with others (e.g., via social media, private messages, etc.). Prior to donning the helmet **360**, the user may secure a mounting component **362** to a mounting surface (e.g., an external surface) of the helmet **360** in a desired orientation. As shown in FIG. **3**, the user may secure the mounting component **362** to the helmet **360** on a side of the helmet **360** such that the mounting component **362** extends from the helmet **360** in a direction approximately perpendicular to the face of the user. To couple the image capture device **100** to the helmet **360**, the first interconnect mechanism **136** interfaces with the mounting component **362** and is secured to the mounting component **362** with a connector **364** (e.g., a threaded connector such as a thumbscrew, set screw, etc.). Assembled as shown, when the user wears the helmet **360**, the device **100** is positioned to a side of the head of the user (e.g., near an ear of the user). In this configuration, the lens **104** will capture a viewpoint that would be adjacent to a given side (vs. aligned with) a viewpoint of the user wearing the helmet **360**.

[0057] As shown in FIG. **3**, D.sub.1 indicates a first distance (e.g., a perpendicular distance) between the outer surface of the helmet **360** and a center of mass **370** of the image capture device **100**. Oriented as shown in FIG. **3**, the image capture device **100** imparts a torque T.sub.1 to the mounting surface of the helmet **360** that is equal to the weight of the image capture device **100** (e.g., the mass of the image capture device **100** multiplied by the gravitational acceleration) multiplied by D.sub.1. To counteract the torque T.sub.1 and prevent the helmet **360** from rotating in the direction of the torque T.sub.1, the user's neck must exert a torque that is equal and opposite to that imparted to the outer surface of the helmet **360** by the image capture device **100**. Over time, the user may tire from exerting this counteracting torque.

[0058] In addition, the user may desire to record the activity to provide a “first person view” of the activity. For example, when another person views the video, the user desires for the other person to view the activity through the eyes of the user (e.g., to feel as though the other person is actually performing the activity). However, mounting the image capture device **100** as described in FIG. **3** causes the lens **104** to be positioned away from the eyes of the user, and the other person may not feel as though they are actually performing the activity when they view the recorded video.

[0059] FIG. **4** is an illustration of the image capture device **100** of FIG. **1** coupled to the helmet **360** in a second configuration. The user may secure the mounting component **362** to the helmet **360** on a top of the helmet **360** such that the mounting component **362** extends from the helmet **360** in a direction approximately parallel to the face of the user. To couple the image capture device **100** to the helmet **360**, the first interconnect mechanism **136** interfaces with the mounting component **362** and is secured to the mounting component **362** with the connector **364**. Assembled as shown, when the user wears the helmet **360**, the image capture device **100** is positioned above the head of the user (e.g., above a top of the head of the user and approximately centered over the head of the user).

[0060] As shown in FIG. **4**, D.sub.2 indicates a second distance (e.g., a perpendicular distance) between the outer surface of the helmet **360** and the center of mass **370** of the image capture device **100**. When the user's face is straight (e.g., facing straight ahead, etc.) the image capture device **100** does not impart a torque to the mounting surface of the helmet **360**. In some implementations, when the user looks up, looks down, tilts the user's head to the right, to the left, etc., the image capture device **100** imparts a torque T.sub.2 to the mounting surface of the helmet **360** that is equal to the weight of the image capture device **100** (e.g., the mass of the image capture device **100** multiplied by the gravitational acceleration) multiplied by D.sub.2. To counteract the torque T.sub.2 and prevent the helmet **360** from over-rotating in the direction of the torque T.sub.2, the user's neck must exert a torque that is equal and opposite to that imparted to the outer surface of the helmet **360** by the image capture device **100**. Over time, the user may tire from exerting this counteracting torque.

[0061] In this configuration, the lens **104** will capture a viewpoint that would be vertically offset from (vs. aligned with) a viewpoint of the user wearing the helmet **360** (e.g., the image capture device **100** is positioned above the head of the user). Accordingly, the image capture device **100** may also provide a perspective that does not make the other person feel as though they are actually performing the activity when they view the recorded video.

[0062] FIG. **5** is an illustration of the image capture device **100** of FIG. **1** coupled to the helmet **360** in a third configuration. The user may secure the mounting component **362** to the helmet **360** on the front of the helmet **360** such that the mounting component **362** extends from the helmet **360** in a direction approximately parallel to the nose of the user. To couple the image capture device **100** to the helmet **360**, the second interconnect mechanism **142** interfaces with the mounting component **362** and is secured to the mounting component **362** with the connector **364**. Assembled as shown, when the user wears the helmet **360** the image capture device **100** is positioned in front of the head of the user (e.g., approximately in front of the eyes of the user). Positioned as described, the image capture device **100** may provide a view that more closely resembles the view of the user when another person views the captured video.

[0063] As shown in FIG. **5**, D.sub.3 indicates a third distance (e.g., a perpendicular distance) between the outer surface of the helmet **360** and the center of mass **370** of the image capture device **100**. Oriented as shown in FIG. **5**, the image capture device **100** imparts a torque T.sub.3 to the mounting surface of the helmet **360** that is equal to the weight of the image capture device **100** (e.g., the mass of the image capture device **100** multiplied by the gravitational acceleration) multiplied by D.sub.3. To counteract the torque T.sub.3 and prevent the helmet **360** from rotating in the direction of the torque T.sub.3, the user's neck must exert a torque that is equal and opposite to that imparted to the outer surface of the helmet **360** by the image capture device **100**.

[0064] When in the extended position, the folding protrusions **144**, **146** extend from the back surface of the image capture device **100** a shorter distance than the folding protrusions **138**, **140** extend from the bottom surface of the image capture device **100**. Accordingly, when mounting the image capture device **100** to the helmet **360** (or another mounting surface and/or component) using the second interconnect mechanism **142**, the image capture device **100** is closer to the helmet **360** than when using the first interconnect mechanism **136**. For example, the distance D.sub.3 is smaller than both distances D.sub.2 and D.sub.1 because the distance D.sub.3 is a result of using the second interconnect mechanism **142** instead of using the first interconnect mechanism **136**. Therefore, the torque T.sub.3 is also smaller than both torques T.sub.2 and T.sub.1. Using the second interconnect mechanism **142** may be more comfortable for the user because less effort from the user is required to counteract the torque T.sub.3 than to counteract the torques T.sub.2 and T.sub.1.

[0065] Furthermore, using the second interconnect mechanism **142** allows the user to mount the image capture device **100** closer to the helmet **360** than when using the first interconnect mechanism **136**. The position and orientation of the second interconnect mechanism **142** also

allows the image capture device **100** to be mounted closer to the eyes of the user than when using the first interconnect mechanism **136**. Accordingly, the view from the lens **104** when using the second interconnect mechanism **142** may be closer to a “first person view” than the views provided when using the first interconnect mechanism **136** and may provide another user a more immersive experience when viewing the recorded video.

[0066] FIG. **6** is an illustration of the image capture device of FIG. **1** coupled to the helmet **360** in a fourth configuration with an accessory **600** mounted to the image capture device **100**. Though a helmet **360** is shown, the mating surface may be another item, like a chest harness, a necklace, a wrist mount, a headband, etc.

[0067] In some implementations, both the first interconnect mechanism **136** and the second interconnect mechanism **142** are connected to a mating component that is coupled to a mating surface. For example, the first interconnect mechanism **136** may be coupled to the helmet **360** via the mounting component **362** and the connector **364** while the second interconnect mechanism **142** may be coupled to the accessory **600** via a mounting component **366** and a connector **368**. In another example, such as shown in FIG. **6**, the second interconnect mechanism **142** may be coupled to the helmet **360** via the mounting component **362** and the connector **364** while the first interconnect mechanism **136** may be coupled to the accessory **600** via the mounting component **366** and the connector **368**.

[0068] The accessory **600** may be an external microphone, a light, a speaker, an external battery, an external display, an external memory, a wireless communication device, a second camera, or the like. The accessory **600** may include or be coupled to the mounting component **366** and the connector **368** may be used with the mounting component **366** to secure the accessory **600** to the image capture device **100**. For example, the connector **368** may be a screw, a magnet, a rod, etc.

[0069] In some implementations, the first interconnect mechanism **136** and/or the second interconnect mechanism **142** may include an electrical terminal configured to connect with an electrical terminal on a mating component of another device such as the accessory **600**, a handle grip, a mount, a clips, or another device. The electrical terminal(s) on the first interconnect mechanism **136** and/or the second interconnect mechanism **142** may be electrically connected to components of the image capture device **100**, such as the data interface components **230** (i.e., the I/O interface **232**, the wireless data interface **234**, and/or the storage interface **236**) and the power components **250** (i.e., the battery interface **252**, the battery **254**, and/or the external interface **256**).

[0070] When the electrical terminal on the mating component of the other device is connected to the electrical terminal on the first interconnect mechanism **136** or the second interconnect mechanism **142**, the other device may be connected to components of the image capture device **100**. For example, when the accessory **600** includes a light connected to the first interconnect mechanism **136**, the light may draw power from the battery **254** of the image capture device **100**. In another example, when the accessory **600** includes an external memory connected to the image capture device **100** via the second interconnect mechanism **142**, the external memory may receive data from the data interface components **230** of the image capture device **100**.

[0071] In some implementations, both the first interconnect mechanism **136** and the second interconnect mechanism **142** may be mounted to a mating component on the same mounting surface. For example, both the first interconnect mechanism and the second interconnect mechanism may be connected to the helmet **360** at different locations or at the same location at different times. Mounting the image capture device **100** using the multiple interconnect mechanisms **136**, **142** may increase the stability and versatility of the image capture device **100** and may improve captured images.

[0072] While the disclosure has been described in connection with certain embodiments, it is to be understood that the disclosure is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within

the scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

Claims

1. An image capture device comprising: a body including: a front surface; a back surface opposite the front surface; a top surface extending between the front surface and the back surface; and a bottom surface opposite the top surface; a lens coupled to the front surface; a first interconnect mechanism coupled to the back surface; and a second interconnect mechanism coupled to the bottom surface, wherein the first interconnect mechanism and the second interconnect mechanism are each configured for connection to a mounting component.
2. The image capture device of claim 1, wherein the back surface includes fins configured to dissipate heat.
3. The image capture device of claim 1, wherein the first interconnect mechanism and the second interconnect mechanism are each configured to receive a connector such that the connector extends through the first interconnect mechanism and the second interconnect mechanism during connection of the first interconnect mechanism and the second interconnect mechanism to the mounting component.
4. The image capture device of claim 1, wherein the first interconnect mechanism is configured for movement between a collapsed position and an extended position.
5. The image capture device of claim 4, wherein the first interconnect mechanism is approximately flush with the back surface in the collapsed position.
6. The image capture device of claim 4, wherein the first interconnect mechanism is rotatable between the collapsed position and the extended position.
7. The image capture device of claim 6, wherein the first interconnect mechanism includes first folding protrusions.
8. The image capture device of claim 7, wherein the first folding protrusions are configured to rotate toward each other during movement of the first interconnection mechanism from the collapsed position into the extended position.
9. The image capture device of claim 1, wherein the second interconnect mechanism is configured for movement between a collapsed position and an extended position.
10. The image capture device of claim 9, wherein the second interconnect mechanism is rotatable between the collapsed position and the extended position.
11. The image capture device of claim 10, wherein the second interconnect mechanism includes second folding protrusions.
12. The image capture device of claim 11, wherein the second folding protrusions are configured to rotate toward each other during movement of the second interconnection mechanism from the collapsed position into the extended position.
13. An image capture device comprising: a body; a first interconnect mechanism coupled to a first surface of the body and including first folding protrusions; and a second interconnect mechanism coupled to a second surface of the body, wherein the first interconnect mechanism and the second interconnect mechanism are each configured for connection to a mounting component.
14. The image capture device of claim 13, wherein the first interconnect mechanism is configured for movement between a collapsed position, in which the first folding protrusions extend in parallel relation to the first surface, and an extended position, in which the first folding protrusions extend in perpendicular relation to the first surface.
15. The image capture device of claim 14, wherein the second interconnect mechanism includes second folding protrusions.
16. The image capture device of claim 15, wherein the second interconnect mechanism is configured for movement between a collapsed position, in which the second folding protrusions

extend in parallel relation to the second surface, and an extended position, in which the second folding protrusions extend in perpendicular relation to the first surface.

17. The image capture device of claim 16, wherein the first folding protrusions are configured to rotate toward each other during movement of the first interconnection mechanism from the collapsed position into the extended position, and the second folding protrusions are configured to rotate toward each other during movement of the second interconnection mechanism from the collapsed position into the extended position.

18. An image capture device comprising: a body including: a front surface; a back surface opposite the front surface and including fins configured to dissipate heat; a top surface extending between the front surface and the back surface; and a bottom surface opposite the top surface; a lens coupled to the front surface of the body and configured to direct light along an optical axis onto an image sensor; a first interconnect mechanism coupled to the back surface and including: a first protrusion rotatable between a collapsed position and an extended position about a first axis of rotation extending in perpendicular relation to the optical axis; and a second protrusion rotatable between a collapsed position and an extended position about a second axis of rotation extending in perpendicular relation to the optical axis; and a second interconnect mechanism coupled to the bottom surface, wherein the first interconnect mechanism and the second interconnect mechanism are each configured for connection to a mounting component.

19. The image capture device of claim 18, wherein the second interconnect mechanism includes: a third protrusion rotatable between a collapsed position and an extended position about a third axis of rotation extending in parallel relation to the axis; and a fourth protrusion rotatable between a collapsed position and an extended position about a fourth axis of rotation extending in parallel to the axis.

20. The image capture device of claim 18, wherein the first protrusion and the second protrusion are approximately flush with the back surface in the collapsed position thereof.