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INTERCHANGEABLE LENS MODULE

Abstract

An image capture device includes a housing defining a receptacle having a housing electrical interface and a mechanical coupling mechanism coupled to or connected with the housing at a location of the receptacle. The image capture device includes an interchangeable lens module that releases connection with the mechanical coupling mechanism. The interchangeable lens module includes a module electrical interface and an imaging sensor. A collar rotatable about the interchangeable lens module and lockable to the mechanical coupling mechanism to secure the interchangeable lens module to the housing and couple the module electrical interface to the housing electrical interface.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) [0001] This application is a continuation of U.S. application Ser. No. 17/347,543, filed Jun. 14, 2021, which claims priority to and the benefit of U.S. Provisional Application Patent Ser. No. 63/039,520, filed Jun. 16, 2020, the entire disclosures of which are hereby incorporated by reference.

TECHNICAL FIELD
[0002] This disclosure relates to an interchangeable lens module for an image capture device.
BACKGROUND
[0003] Image capture devices have a wide range of uses for users that are capturing moments. For example, users often capture images on bike rides, or while skiing, diving, hiking, and surfing. In many cases, a user will desire to capture an image or video in an up close scenario, such as riding a trail on a bike, and capture another image or video at the destination, such as viewing a mountain side. Usually, image capture devices have a lens assembly that is permanently secured to a housing or body. With the permanent connection, the lens assembly has strong connections to other components in the housing of the image capture device that helps a user take high resolution images. However, with a permanently connected lens assembly, camera enthusiasts often use multiple cameras to capture different angles, panoramas, and landscapes. It would be desirable to have a camera that can capture multiple types of images while withstanding the vigor of outdoor activity.
SUMMARY
[0004] Disclosed herein are implementations of an image capture device that includes a housing defining a receptacle having a housing electrical interface and a mechanical coupling mechanism coupled to the housing at a location of the receptacle. The image capture device further includes an interchangeable lens module for a releasable connection with the mechanical coupling mechanism, and the interchangeable lens module includes a module electrical interface. Finally, the image capture device also includes a collar that is rotatable about the interchangeable lens module and lockable to the mechanical coupling mechanism to secure the interchangeable lens module to the image capture device and couple the module electrical interface to the housing electrical interface.
[0005] Disclosed herein are implementations of an image capture device that includes a housing defining a receptacle having a housing electrical interface and a bayonet secured to an outer surface of the housing at a location surrounding the receptacle. The image capture device further includes a lens module that includes a lens tube, a lens disposed in the lens tube, an image sensor spaced from the lens along an imaging axis, and a lens module electrical interface spaced from the image sensor along the imaging axis. Finally, the image capture device further includes a frame that surrounds the lens tube, is rotatable about the lens tube, and is lockable to the bayonet such that rotating the frame around the bayonet releases and locks the lens module to the housing.
[0006] Disclosed herein are implementations of an image capture device that include a housing defining a receptacle having an electrical connection and a bayonet attached to an outer surface of the housing at a location of the receptacle. The image capture device further includes an interchangeable lens module interface-able with the electrical connection of the housing and a collar that surrounds the interchangeable lens module and is rotatably lockable against the outer surface of the housing by coupling with the bayonet. Finally, the image capture device further includes a button positioned on a surface of the collar that is generally parallel to an imaging axis of the interchangeable lens module. The button has an uncompressed position associated with retaining the collar to the bayonet and a compressed position associated with releasing the collar

from the bayonet for removal or installation of the interchangeable lens module from or to the image capture device.

[0007] Disclosed herein is an image capture device that includes a housing defining a receptacle having a housing electrical interface and a mechanical coupling mechanism coupled to or connected with the housing at a location of the receptacle. The image capture device includes an interchangeable lens module that releases connection with the mechanical coupling mechanism. The interchangeable lens module including a module electrical interface and an imaging sensor. A collar rotatable about the interchangeable lens module and lockable to the mechanical coupling mechanism to secure the interchangeable lens module to the housing and couple the module electrical interface to the housing electrical interface.

[0008] Disclosed herein is an image capture device that includes a housing defining a receptacle having a housing electrical interface at a base of the receptacle. The image capture device includes locks disposed at the base of the receptacle adjacent to the housing electrical interface. The image capture device includes a lens module that includes a lens tube and a lens disposed in the lens tube; an image sensor spaced from the lens along an imaging axis. The lens module includes a lens module electrical interface spaced from the image sensor along the imaging axis and clips positioned around the lens module electrical interface. The image capture device includes a collar that surrounds the lens tube and is rotatable about the lens tube. The collar is securable to the locks so that rotating the collar around the lens tube releases or secures the clips and the locks to insert or remove the lens module to or from the housing.

[0009] Disclosed herein is an image capture device that includes a housing defining a receptacle having an electrical connection and a bayonet affixed to a wall of the receptacle. The image capture device includes an interchangeable lens module. The interchangeable lens module includes a lens tube and a lens disposed in the lens tube. The interchangeable lens module includes an image sensor spaced from the lens along an imaging axis and a lens module that electrically interfaces with the electrical connection of the housing. The lens module is spaced from the image sensor along the imaging axis. The image capture device includes a collar that surrounds the interchangeable lens module and is rotatably lockable against the outer surface of the housing by coupling with the bayonet.

[0010] Disclosed herein is an image capture device that includes an image lens mount. The image lens mount includes an imaging sensor that detects light, a image lens mount housing that encloses the imaging sensor, an image lens mount electrical connection that electrically interfaces with the image sensor and is located on an external surface of the image lens mount housing, and an image lens mount locator positioned on external surface of the image lens mount housing. The image capture device includes a body that includes a receptacle that receives the image lens mount; a body electrical connection that releasably connects with the image lens mount electrical connection, and a body locator that is releasably connected with the image lens mount such that the body electrical connection and the image lens mount electrical connection are aligned when the body locator and the image lens mount locator are connected.

[0011] In some examples, the body may include battery, and the image lens mount may not include a battery. The body may not include an imaging sensor that detects light. The image lens mount and the body may be waterproofed at a friction fit such that water does not impact the image lens mount electrical connection and/or the body electrical connection. The body may include a processor that processes signals from the imaging sensor. The body locator and/or the image lens mount locator may include a seal that forms a friction fit between the body and the image lens mount. The image lens mount may defines slots that receive a portion of the body. The image capture device may further include a button configured to release and/or connect the body locator and the image lens mount locator. The image capture device may further include a collar moves between a shifted position and a locked position to release and/or connect the body locator and the image lens mount locator. The collar may be connected with the body locator and/or the image lens mount locator.

[0012] Disclosed herein is an implementation of an image capture device that includes an image lens mount comprising an image sensor, a body comprising a processor, an electrical connection between the image sensor and the processor; and a locator connection that is configured to align the electrical connection between the body and the image lens mount and to waterproof a location at the electrical connection.
[0013] In some examples, the locator connection may have a friction fit between one or more first locators of the body and one or more second locators of the image lens mount. The locator connection may be defined within or on the image lens mount and the body and are configured to guide the body and the image lens mount into each other along an axis. The image capture device may further include a battery that is not incorporated into the image lens mount. The battery may be separate from the image lens mount and included with the body.
[0014] Disclosed herein is an implementation of an image capture device that includes an image lens mount that includes an imaging sensor configured to detect light; a body releasably connectable with the image lens mount; an external electrical connection included on the body and the image lens mount, the external electrical connection located on external surfaces of the image lens mount and the body; and a locking mechanism separate from the external electrical connection and configured to connect the body and the image lens mount such that the external electrical connection is waterproofed while the body and the image lens mount are connected. The image capture device may include a locator assembly that is separate from the locking mechanism and defined on the external surfaces of the body and the image lens mount. The locator assembly may be separate from the locking mechanism and electrical assembly on the external surfaces of the body and the image lens mount. The external electrical connection may be waterproofed at a seal included at the locator assembly. The seal is comprised of an elastic material.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0015] 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.
[0016] FIGS. **1**A-**1**B are isometric views of an example of an image capture device.
[0017] FIGS. **2**A-**2**B are isometric views of another example of an image capture device.
[0018] FIG. **3** is a block diagram of electronic components of an image capture device.
[0019] FIG. **4**A is a perspective view of an image capture device **400** with an interchangeable lens module (ILM) **402** that is threaded.
[0020] FIG. **4**B is a perspective view of the ILM **402** of FIG. **4**A.
[0021] FIG. **4**C is a cross-section of a side view of the ILM **402** of FIGS. **4**A-B connected to the image capture device **400** as indicated by dotted cross-sectional line **4**C viewed from the left side of the image capture device **400** in FIG. **4**A.
[0022] FIG. **5**A is a perspective view of an image capture device **500** with an ILM **502** in an unlocked position.
[0023] FIG. **5**B is another perspective view of the image capture device **500** of FIG. **5**A with the ILM **502** in a locked position.
[0024] FIG. **5**C is a perspective view of the ILM **502** of FIGS. **5**A-**5**B.
[0025] FIG. **5**D is a cross section of a side view of the image capture device **500** and the ILM **502** of FIGS. **5**A-**5**C as indicated by dotted cross-sectional line **5**D viewed from the left side of the image capture device **500** in FIG. **5**B.
[0026] FIG. **5**E is a cross section of a front view of the image capture device **500** and the ILM **502**

of FIGS. **5**A-**5**D as indicated by dotted cross-sectional line **5**E viewed from the back side of the image capture device **500** in FIG. **5**B.
[0027] FIG. **5**F is a perspective view of the body **504** of FIGS. **5**A-**5**B and **5**D-**5**E.
[0028] FIG. **5**G is a perspective view of a leaf spring **528** of FIGS. **5**D-**5**E.
[0029] FIG. **6**A is a perspective view of an image capture device **600** and an ILM **602***a* in a locked position.
[0030] FIG. **6**B is a perspective view of another ILM **602***b* that is in a locked position and is insertable into the image capture device **600** of FIG. **6**A.
[0031] FIG. **7** is a perspective view of an image capture device **700** and an ILM **702**.
[0032] FIG. **8**A is a perspective view of an image capture device **800** and an ILM **802**.
[0033] FIG. **8**B is a cross section of a side view of the image capture device **800** and the ILM **802** of FIG. **8**A as indicated by the dotted line **8**B in FIG. **8**A.
[0034] FIG. **8**C is an exploded view of the image capture device **800** of FIG. **8**A-**8**B.
[0035] FIG. **8**D is an exploded view of the ILM **802** of FIGS. **8**A and **8**B.
[0036] FIG. **8**E is an exploded view of the ILM **802** of FIGS. **8**A, **8**B, and **8**E.
[0037] FIG. **8**F is a sectional view of the image capture device **800** and the ILM **802** of FIGS. **8**A-**8**D showing the spring **838** and the hook **846** in a locked position as indicated by dotted cross-sectional line **8**F viewed from the side of an upper right corner of the image capture device **800** in FIG. **8**A.
[0038] FIG. **8**G is a sectional view of the image capture device **800** and the ILM **802** of
[0039] FIGS. **8**A-**8**F showing the spring **838** and the hook **846** in a released position as indicated by the dotted cross-sectional line **8**G viewed from the side of an upper right corner of the image capture device **800** in FIG. **8**A.
[0040] FIG. **9**A is a perspective view of an image capture device **900**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **902** that is has a keyed connection.
[0041] FIG. **9**B is perspective view of the ILM **902** of FIGS. **9**A.
[0042] FIG. **9**C is a cross section of a side view of the image capture device **900** and the ILM **902** of FIGS. **9**A-**9**B as indicated by dotted cross-sectional line **9**C viewed from the left side of the image capture device **900** of FIG. **9**A.
[0043] FIG. **9**D is another cross section of a rear view of the image capture device **900** and the ILM **902** of FIG. **9**A-C as indicated by dotted cross-sectional line **9**D viewed from the back side of the image capture device **900** of FIG. **9**A.
[0044] FIG. **10**A is a perspective view of an image capture device **1000** and an ILM **1002** that includes a button **1003**.
[0045] FIG. **10**B is a perspective view of the ILM **1002** of FIG. **10**A.
[0046] FIG. **10**C is a cross-section of a side view of the ILM **1002** and the image capture device **1000** of FIGS. **10**A-**10**B as indicated by dotted cross-sectional line **10**C viewed from the left side of the image capture device **1000** of FIG. **10**A.
[0047] FIG. **10**D is a perspective view of the body **1004** of FIGS. **10**A and **10**C that shows the bayonet **1028**.
[0048] FIG. **10**E is a perspective view of the bayonet of FIGS. **10**A, **10**C, and **10**D.
[0049] FIG. **10**F is perspective view of the ILM **1002** of FIGS. **10**A-**10**C with the collar **1008** shown as transparent.
[0050] FIG. **10**G is a side view of the image capture device **1000** of FIGS. **10**A-**10**F with the collar **1008** shown as transparent.
[0051] FIG. **11**A is perspective view of an image capture device **1100** and an ILM **1102** in a shifted position.
[0052] FIG. **11**B is a perspective view of the ILM **1102** of FIG. **11**A.
[0053] FIG. **11**C is a perspective view of the body **1104** of FIG. **11**A.
DETAILED DESCRIPTION

[0054] The image capture devices described herein provide an interchangeable lens module that is watertight (or waterproofed), easily interchangeable in the field, and capable of housing multiple types of lens modules. With an easily removable lens and sensor housing, the image capture device can use multiple interchangeable lens modules to take images with varying angle, resolution, and zoom capabilities. By providing a mounting mechanism(s) that pushes the interchangeable lens module against the electrical connections of the housing, the interchangeable lens module has a strong electrical connection that can be removed and easily switched with another interchangeable lens module that provides the user more situational capabilities, such as a wider angle or higher resolution lens. In conjunction with the forces of the mounting mechanism, the interchangeable lens module includes a strategic seal(s) that ensure switching the interchangeable lens module does not allow water to interfere with the camera lens, sensor, electrical interface, or any combination thereof. While switching or interchanging a different interchangeable lens module, the mounting mechanism, a locating feature, or both assist with aligning the electrical interfaces of the interchangeable lens module and the body of the image capture device so that image quality does not suffer due to connection issues.
[0055] FIGS. **1**A-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), 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.
[0056] The image capture device **100** may include an LED or another form of 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.
[0057] 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 **120** and a battery interface **122**. When the door **114** is an open position, access is provided to an input-output (I/O) interface **124** for connecting to or communicating with external devices as described below and to a battery receptacle **126** for placement and replacement of a battery (not shown). The battery receptacle **126** includes operative connections (not shown) for power transfer between the battery and the image capture device **100**. When the door **114** is in a closed position, the seal **120** engages a flange (not shown) or other interface to provide an environmental seal, and the battery interface **122** engages the battery to secure the battery in the battery receptacle **126**. 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**.
[0058] The image capture device **100** may include a microphone **128** on a front surface and another microphone **130** on a side 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 bottom 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.

[0059] A front surface of the image capture device **100** may include a drainage channel **134**. A bottom surface of the image capture device **100** may include an interconnect mechanism **136** for connecting the image capture device **100** to a handle grip or other securing device. In the example shown in FIG. **1**B, the interconnect mechanism **136** includes folding protrusions configured to move between a nested or collapsed position as shown and an extended or open position (not shown) that facilitates coupling of the protrusions to mating protrusions of other devices such as handle grips, mounts, clips, or like devices.

[0060] The image capture device **100** may include an interactive display **138** that allows for interaction with the image capture device **100** while simultaneously displaying information on a surface of the image capture device **100**.

[0061] 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 cuboid. Furthermore, both the front and rear surfaces of the image capture device **100** are rectangular. 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**.

[0062] 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.

[0063] 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**.

[0064] 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., the I/O interface **124**). 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.

[0065] 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.

[0066] 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.

[0067] 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.

[0068] 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.

[0069] 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**.

[0070] 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**.

[0071] 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.

[0072] 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**.

[0073] 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. The external user interface device, such as via an application, may display

[0074] 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.

[0075] 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.

[0076] 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.

[0077] 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**.
[0078] FIGS. **2**A-B illustrate another example of an image capture device **200**. The image capture device **200** includes a body **202** and two camera lenses **204** and **206** disposed on opposing surfaces of the body **202**, for example, in a back-to-back configuration, Janus configuration, or offset Janus configuration. The body **202** of the image capture device **200** may be made of a rigid material such as plastic, aluminum, steel, or fiberglass.
[0079] The image capture device **200** includes various indicators on the front of the surface of the body **202** (such as LEDs, displays, and the like), various input mechanisms (such as buttons, switches, and touch-screen mechanisms), and electronics (e.g., imaging electronics, power electronics, etc.) internal to the body **202** that are configured to support image capture via the two camera lenses **204** and **206** and/or perform other imaging functions.
[0080] The image capture device **200** includes various indicators, for example, LEDs **208**, **210** to indicate a status of the image capture device **100**. The image capture device **200** may include a mode button **212** and a shutter button **214** configured to allow a user of the image capture device **200** to interact with the image capture device **200**, to turn the image capture device **200** on, and to otherwise configure the operating mode of the image capture device **200**. It should be appreciated, however, that, in alternate embodiments, the image capture device **200** may include additional buttons or inputs to support and/or control additional functionality.
[0081] The image capture device **200** may include an interconnect mechanism **216** for connecting the image capture device **200** to a handle grip or other securing device. In the example shown in FIGS. **2**A and **2**B, the interconnect mechanism **216** includes folding protrusions configured to move between a nested or collapsed position (not shown) and an extended or open position as shown that facilitates coupling of the protrusions to mating protrusions of other devices such as handle grips, mounts, clips, or like devices.
[0082] The image capture device **200** may include audio components **218**, **220**, **222** such as microphones configured to receive and record audio signals (e.g., voice or other audio commands) in conjunction with recording video. The audio component **218**, **220**, **222** can also be configured to play back audio signals or provide notifications or alerts, for example, using speakers. Placement of the audio components **218**, **220**, **222** may be on one or more of several surfaces of the image capture device **200**. In the example of FIGS. **2**A and **2**B, the image capture device **200** includes three audio components **218**, **220**, **222**, with the audio component **218** on a front surface, the audio component **220** on a side surface, and the audio component **222** on a back surface of the image capture device **200**. Other numbers and configurations for the audio components are also possible.
[0083] The image capture device **200** may include an interactive display **224** that allows for interaction with the image capture device **200** while simultaneously displaying information on a surface of the image capture device **200**. The interactive display **224** may include an I/O interface, receive touch inputs, display image information during video capture, and/or provide status information to a user. The status information provided by the interactive display **224** may include battery power level, memory card capacity, time elapsed for a recorded video, etc.
[0084] The image capture device **200** may include a release mechanism **225** that receives a user input to in order to change a position of a door (not shown) of the image capture device **200**. The release mechanism **225** may be used to open the door (not shown) in order to access a battery incorporated into the image capture device **200**, a battery receptacle, an I/O interface, a memory card interface, etc. (not shown) that are similar to components described in respect to the image capture device **100** of FIGS. **1**A and **1**B.
[0085] In some embodiments, the image capture device **200** described herein includes features other than those described. For example, instead of the I/O interface and the interactive display **224**, the image capture device **200** may include additional interfaces or different interface features. For example, the image capture device **200** 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 **200**.
[0086] FIG. **3** is a block diagram of electronic components in an image capture device **300**. The image capture device **300** 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 **300** is also applicable to the image capture devices **100**, **200** of FIGS. **1**A-B and **2**A-B.
[0087] The image capture device **300** includes a body **302** which includes electronic components such as capture components **310**, a processing apparatus **320**, data interface components **330**, movement sensors **340**, power components **350**, and/or user interface components **360**.
[0088] The capture components **310** include one or more image sensors **312** for capturing images and one or more microphones **314** for capturing audio.
[0089] The image sensor(s) **312** 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) **312** detects light incident through a lens coupled or connected to the body **302**. The image sensor(s) **312** 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) **312** may be passed to other electronic components of the image capture device **300** via a bus **380**, such as to the processing apparatus **320**. In some implementations, the image sensor(s) **312** includes a digital-to-analog converter. A multi-lens variation of the image capture device **300** can include multiple image sensors **312**.
[0090] The microphone(s) **314** is configured to detect sound, which may be recorded in conjunction with capturing images to form a video. The microphone(s) **314** may also detect sound in order to receive audible commands to control the image capture device **300**.
[0091] The processing apparatus **320** 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) **312**. The processing apparatus **320** may include one or more processors having single or multiple processing cores. In some implementations, the processing apparatus **320** may include an application specific integrated circuit (ASIC). For example, the processing apparatus **320** may include a custom image signal processor. The processing apparatus **320** may exchange data (e.g., image data) with other components of the image capture device **300**, such as the image sensor(s) **312**, via the bus **380**.
[0092] The processing apparatus **320** 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 **320** may include executable instructions and data that can be accessed by one or more processors of the processing apparatus **320**. For example, the processing apparatus **320** 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 **320** may include a digital signal processor (DSP). More than one processing apparatus may also be present or associated with the image capture device **300**.
[0093] The data interface components **330** 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 **330** may be used to receive commands to operate the image capture device **300**, transfer image data to other electronic devices, and/or transfer other signals or information to and from the image capture device **300**. The data interface components **330** may be configured for wired and/or wireless communication. For example, the data interface components **330** may include an I/O interface **332** that provides wired communication for the image capture device,

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 **330** may include a wireless data interface **334** that provides wireless communication for the image capture device **300**, such as a Bluetooth interface, a ZigBee interface, and/or a Wi-Fi interface. The data interface components **330** may include a storage interface **336**, 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 **300** (e.g., for storing captured images and/or recorded audio and video).

[0094] The movement sensors **340** may detect the position and movement of the image capture device **300**. The movement sensors **340** may include a position sensor **342**, an accelerometer **344**, or a gyroscope **346**. The position sensor **342**, such as a global positioning system (GPS) sensor, is used to determine a position of the image capture device **300**. The accelerometer **344**, such as a three-axis accelerometer, measures linear motion (e.g., linear acceleration) of the image capture device **300**. The gyroscope **346**, such as a three-axis gyroscope, measures rotational motion (e.g., rate of rotation) of the image capture device **300**. Other types of movement sensors **340** may also be present or associated with the image capture device **300**.

[0095] The power components **350** may receive, store, and/or provide power for operating the image capture device **300**. The power components **350** may include a battery interface **352** and a battery **354**. The battery interface **352** operatively couples to the battery **354**, for example, with conductive contacts to transfer power from the battery **354** to the other electronic components of the image capture device **300**. The power components **350** may also include an external interface **356**, and the power components **350** may, via the external interface **356**, receive power from an external source, such as a wall plug or external battery, for operating the image capture device **300** and/or charging the battery **354** of the image capture device **300**. In some implementations, the external interface **356** may be the I/O interface **332**. In such an implementation, the I/O interface **332** may enable the power components **350** to receive power from an external source over a wired data interface component (e.g., a USB type-C cable).

[0096] The user interface components **360** may allow the user to interact with the image capture device **300**, for example, providing outputs to the user and receiving inputs from the user. The user interface components **360** may include visual output components **362** to visually communicate information and/or present captured images to the user. The visual output components **362** may include one or more lights **364** and/or more displays **366**. The display(s) **366** may be configured as a touch screen that receives inputs from the user. The user interface components **360** may also include one or more speakers **368**. The speaker(s) **368** can function as an audio output component that audibly communicates information and/or presents recorded audio to the user. The user interface components **360** may also include one or more physical input interfaces **370** that are physically manipulated by the user to provide input to the image capture device **300**. The physical input interfaces **370** may, for example, be configured as buttons, toggles, or switches. The user interface components **360** may also be considered to include the microphone(s) **314**, as indicated in dotted line, and the microphone(s) **314** may function to receive audio inputs from the user, such as voice commands.

[0097] FIG. **4**A is a perspective view of an image capture device **400**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, with an interchangeable lens module (ILM) **402** that is threaded. Connected to the ILM **402**, a body **404**, such as the bodies **102**, **202** of FIGS. **1**A-**1**B and **2**A-**2**B, houses or contains multiple components for capturing image and provides a base for the ILM **402**. The bodies **102**, **202**, **404** or any other body described herein may also be described as a housing. For protecting internal components of the ILM **402** from outside factors, such as dust, dirt, water (or waterproofed), or moisture, a cover lens **405** is positioned over the lens **406** at a front end of the ILM **402**. As a releasable mounting mechanism between the image capture device **400** and the ILM **402**, a collar **408** connects to and/or surrounds a frame **410** of the ILM **402**. The collar **408** may be integral to the frame **410**; the collar **408** may be a separate part; or the collar **408** may include one

or more connection parts that allow the collar **408** to rotate about the frame **410** and a connection feature of the body **404** so that the ILM **402** is releasably connectable to the body **404**. As the collar **408** is screw-able or rotatable about a central axis of the ILM **402**, a user can lock the collar **408** and know with a reasonable certainty that the ILM **402** is secure because the collar does not screw any farther.

[0098] FIG. **4**B is a perspective view of the ILM **402** of FIG. **4**A. Surrounding internal components and providing an internal contact point with the body **404**, a shell **412** of the ILM **402** includes a locator **414** for aligning the ILM **402** inside of the body **404** of the image capture device **400**. The locator **414** is useful to alert the user that a proper connection is being made between the ILM **402** and the body **404**. At the bottom end of the ILM **402**, a plate **416** covers an image sensor **422** (FIC. **4**C) within the ILM **402** and connects, by fasteners **418**, a module electrical interface **420** and the ILM **402** so that electrical signals are exchangeable between the body **404** and the ILM **402**. As the image sensor **422** may provide electromagnetic interference among components of the image capture device **400**, the plate **416** provides a buffer between the image sensor **422** and the module electrical interface **420** so that any electromagnetic interference does not disrupt communications between the ILM **402** and the body **404**, which would interfere with capturing quality images. For making an electrical connection between the ILM **402** and the body **404**, the module electrical interface **420** may be a printed circuit board that includes one or more electrical connection features that are mate-able with another electrical connection feature, such as pads, pogo pins, or a plug.

[0099] FIG. **4**C is a cross-section of a side view of the ILM **402** of FIGS. **4**A-AB connected to the image capture device **400** as indicated by dotted cross-sectional line **4**C viewed from the left side of the image capture device **400** in FIG. **4**A. A slot **421** of the body **404** receives the locator **414** of the ILM **402** as the ILM **402** is inserted into body **404**. Located inside the ILM **402**, the image sensor **422** is shown encased by the shell **412** of the ILM **402** and is illustrated with a space between the plate **416** and the image sensor **422** so that electromagnetic interference from the image sensor **422** to the module electrical interface **420** and a housing electrical interface **424** is mitigated. Further, the plate **416** prevents impact between the image sensor **422** and the module electrical interface **420** upon connection to the housing electrical interface **424**. Defined within the body **404**, a receptacle **426** houses the shell **412** of the ILM **402**. For securing the ILM **402** to the body **404**, the collar **408** rotatably interfaces with threads **428** extending outwardly from a wall of the receptacle **426** so that rotating or screwing the collar **408** will lock or release the ILM **402** from the receptacle **426**.

[0100] For preventing water entry to the inner portion of the receptacle **426**, a seal **430***a* is provided around the shell **412** of the ILM **402**. The seal **430***a* can be formed from a rubber or elastic material that surrounds the shell **412** and provides a watertight (or waterproofed) or friction fit with the receptacle **426**. For providing a water barrier for the image sensor **422**, another seal **430***b* is provided between the shell **412** and the frame **410**. As protection for the lens **406**, another seal **430***c*, which may be an adhesive, is positioned between the cover lens **405** and the frame **410**. In conjunction with use of the seals **430***a*, **430***b*, **430***c*, the ILM **402** is both removable from or insert-able into the receptacle **426** and watertight. In some examples, a watertight seal is formed when the ILM **402** is inserted into the receptacle **426**. In other examples, a watertight seal is formed when the ILM **402** is inserted into the receptacle **426** and the collar **408** is locked around the threads **428**.

[0101] As the collar **408** is locked around the threads **428**, the module electrical interface **420** is pushed into the housing electrical interface **424** so that an electrical connection, contact, or interface is securely formed. When the electrical connection is formed, signals may be sent between components inside the body **404** and the image sensor **422** through a wire **432** that is configured to send signals. For example, signals may be sent between the components when an operation to capture an image is initiated or completed.

[0102] FIG. **5**A is a perspective view of an image capture device **500**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, with an ILM **502** in an unlocked position. FIG. **5**B is another perspective view of the image capture device **500** of FIG. **5**A with the ILM **502** in a locked

position. For connecting with a body **504**, the ILM **502** of the image capture device **500** includes a cover lens **505** and a lens **506** that are non-rotatable when the ILM **502** is inserted into the body **504**. The insert-ability of the ILM **502** into the body **504** is useful because more than one type of ILM can be interchanged and added to the body **504**. In the unlocked position, a collar **508** is rotated about **45** degrees relative to a frame **510** that is non-rotatable and surrounds the lens **506** of the ILM **502** so that the frame **510** and the collar **508** are offset relative to each other. The collar **508** may be rotated clockwise, counterclockwise, or both so that the ILM **502** may be locked or unlocked (i.e., released) from the body **504** in an easy fashion. In some examples, the collar **508** may be rotated about **7** degrees to about **65** degrees relative to the frame **510** to unlock or lock the ILM **502** from the body **504** depending on the inner workings of a mounting mechanism associated with the collar **508**. However, in this example, the collar **508** rotates relative to the frame **510** at about a **45** degree angle.

[0103] FIG. **5**C is a perspective view of the ILM **502** of FIGS. **5**A-**5**B. For aligning the ILM **502** to the body **504**, a shell **512** includes a locator **514** formed as a depression into the shell **512** that may interface with a slot **515** (FIG. **5**E) on the body **504**. The locator **514** and the slot **515** are useful to ensure that the ILM **502** is oriented correctly in the body **504**. On a back-side of the ILM **502**, a plate **516** encloses the ILM **502** in conjunction with the shell **512** so that internal components are not exposed to outside factors, such as water, air, dust, dirt, or any combination thereof. For securing the plate **516** against portions of the shell **512**, fasteners **518***a*, **518***b* connect or adhere portions of the plate **516**, the shell **512**, and a module electrical interface **520** is configured to form an electrical connection with the body **504**, which may be similar to the module electrical interface **420** of FIGS. **4**A-**4**C. Specifically, the fastener **518***a* secures the module electrical interface **520** against the plate **516**, and the fastener **518***b* secures the plate **516** against the ILM **502** so that the plate **516**, the fastener **518***b*, and the module electrical interface **520** are non-rotatable and secured together. The fasteners **518***a*, **518***b* may be screws, nails, glue, pins, adhesive, bolts, or any combination thereof so that a mechanical connection is made among the components. In other examples, the plate **516** and the shell **512** may be integrally formed without fasteners.

[0104] FIG. **5**D is a cross section of a side view of the image capture device **500** and the ILM **502** of FIGS. **5**A-**5**C as indicated by dotted cross-sectional line **5**D viewed from the left side of the image capture device **500** in FIG. **5**B. Connected with the lens **506** for capturing images, an image sensor **522** is shown between walls of the shell **512** so that the image sensor **522** is free of physical interaction with external forces or factors such as physical impact, dust, dirt, water, moisture, or any combination thereof. Keeping out external forces or factors helps to keep connections between components, such as the module electrical interface **520**, in good working order. For sending electrical signals, a wire or connector (not shown) connects the image sensor **522** and the module electrical interface **520**. At an outside surface of the plate **516**, the module electrical interface **520** makes an electrical contact, connection, or interface with a housing electrical interface **524** by inserting the ILM **502** into a receptacle **526**. The housing electrical interface **524** and the module electrical interface **520** may be similar to the housing electrical interface **424** and the module electrical interface **420** of FIG. **4**B. As the ILM **502** is locked or secured into the receptacle **526** by the collar **508**, a pressure or a force in the z-direction against the housing electrical interface **524** is applied that assists the electrical connection or interface between the module electrical interface **520** and the housing electrical interface **524**. Specifically, the pressure or the force in the z-direction is applied when the collar **508** is locked into place and a leaf spring **528** interfaces with a portion of the receptacle **526**. As described herein, z-directionalforces may be described as forces or pressure traveling a direction parallel to an imaging axis of ILM **502** when the ILM **502** is coupled to the image capture device **500**.

[0105] On an outer edge of the shell **512**, a seal **530***a* provides a friction or watertight fit with the receptacle **526**, and water, dust, dirt, moist air, or any combination thereof is prevented from interfering with internal components of the image capture device **500**, such as the module electrical

interface **520**, the housing electrical interface **524**, or both. The seal **530***a* extends along an outer edge of the shell **512** in a substantially circular or radial shape so that the seal **530***a* provides a three hundred and sixty degree friction or watertight fit between the shell **512** and the receptacle **526**. Between the frame **510** and the shell **512**, another seal **530***b* is provided that mitigates or prevents entry of water, dust, dirt, or moist air so that the image sensor **522** or other components of the ILM **502** are protected. In a substantially circular or radial shape, the seal **530***b* provides a three hundred and sixty degree friction or watertight fit around the lens **506**. For preventing external interference with the lens **506**, such as dirt, dust, impact events, water, or any combination thereof, another seal **530***c* is positioned between the frame **510** and the cover lens **505**. The seals **530***a*, **530***b*, **530***c* may have similar characteristics as the seals **430***a*, **430***b*, **530***c* of FIG. **4**C.

[0106] FIG. **5**E is a cross section of a front view of the image capture device **500** and the ILM **502** of FIGS. **5**A-**5**D as indicated by dotted cross-sectional line **5**E viewed from the back side of the image capture device **500** in FIG. **5**B. FIG. **5**F is a perspective view of the body **504** of FIGS. **5**A-**5**B and **5**D-**5**E. To interface or connect the ILM **502** and the body **504**, the shell **512** is inserted into the receptacle **526** so that the receptacle **526** is between the shell **512** and the leaf spring **528**. The leaf spring **528** includes a detent **532**, and on an edge of the receptacle **526**, a stopper **534** and an indicator **536** interface with the leaf spring **528** to form a mechanical connection that prevents or inhibits rotational motion. When the leaf spring **528** is interfaced or connected with the receptacle **526**, the detent **532** is positioned between the stopper **534** and the indicator **536** so that the detent **532** is aligned with a central axis of a corner of the collar **508**.

[0107] When between the stopper **534** and the indicator **536**, the leaf spring **528** secures and/or holds the ILM **502** inside the receptacle **526**. In contact with the stopper **534**, a shelf portion **540** shown in FIG. **5**F is attached to the receptacle **526** to inhibit z-directional movement of the leaf spring **528**. To release the collar **508** from the receptacle **526**, the collar **508** is rotated a distance counterclockwise (or clockwise) to a position that is free of contact with the shelf portion **540** so that a snap sound is heard or the change in contact is felt as haptic feedback as the detent **532** of the leaf spring **528** crosses the indicator **536**. Even though the indicator **536** physically obstructs the rotational path of the detent **532**, the detent **532** is rotationally movable past the indicator **536** because the leaf spring **528** is compressible at a space **538** proximate to the detent **532** as shown in FIG. **5**E. When the leaf spring **528** crosses the shelf portion **540**, the leaf spring **528** is no longer obstructed in a z-direction, and thus, the ILM **502** is removable from the receptacle **526**. The combination of features in the leaf spring **528** provides a useful mechanism to confirm for a user that the image capture device **500** is securely connected and ready for use or that the ILM **502** and the body **504** are safely separable without damaging other components.

[0108] FIG. **5**G is a perspective view of the leaf spring **528** of FIGS. **5**D-**5**F. Above the detent **532**, an upper spring **542** functions to prevent z-directional movement of the ILM **502** by interfacing with the shelf portion **540** of the receptacle **526** shown in FIG. **5**F. In this way, the detent **532** prevents movement of the ILM **502** radially by interfacing with the indicator **536** and the stopper **534**, and the upper spring **542** prevents z-directional movement of the ILM **502**.

[0109] FIG. **6**A is a perspective view of an image capture device **600**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **602***a* in a locked position. The image capture device **600** can be similar to the image capture devices **100**, **200** of FIGS. **1**A-**2**B. The image capture device **600** may include similar internal components as image capture devices **100**, **200**, **400**, **500** of FIGS. **1**A-**2**B and **4**A-**5**E. A body **604** of the image capture device **600** receives image data through a lens **606** positioned on a distal end of the ILM **602***a*. For locking and unlocking the ILM **602***a* from the body **604**, a collar **608** is rotatable around a shell (not shown), such as the shells **412**, **512** of FIGS. **4**A-**5**E. The collar **608** rotates relative to the frame **610** in a similar configuration and degree to the collars **408**, **508** and frames **410**, **510** of FIGS. **4**A-**5**E. For example, the collar **608** may rotate relative to the frame **610** at about a **15** degree angle to about a **90** degree angle. In this example, the collar **608** rotates relative to the frame **610** at about a **45** degree angle. To assist with

rotating the collar **608**, protrusions **611***a* are included on an outer edge of the collar **608** so that a user can grip the protrusions **611***a* and rotate the collar **608** relative to the frame **610** and the body **604**. In this example, the protrusions **611***a* are positioned on a corner of the collar **608** and extend along sides (e.g., at the intersection of a top side and a lateral side) so when a user grips the protrusions **611***a* the user can be free of contact with the frame **610**, the body **604**, or both. In this way, rotatability of the collar **608** is made easier for the user, and the protrusions **611***a* expedite the process of interchanging the ILM **602***a*.

[0110] FIG. **6**B is a perspective view of another ILM **602***b* that is in a locked position and is insertable into the image capture device **600** of FIG. **6**A. In this example, when in a locked positioned, the ILM **602***b* includes protrusions **611***b* on the collar **608** that are pointed and positioned at a center of a side of the collar **608** (e.g., a top side or a lateral side). As the protrusions **611***b* are pointed and extend outward from the collar **608**, the protrusions **611***b* are easier to grip by a user, and thus, unlocking and/or locking the collar **608** is conducted without a user's hand making contact with the frame **610**. When the collar **608** is rotated relative to the frame **610** to an unlocked position, the protrusions **611***b* rotate closer to one of the corners.

[0111] FIG. **7** is a perspective view of an image capture device **700**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **702**. A body **704** of the image capture device **700** is positioned behind a front surface of a lens **706** and a collar **708**, and a user's fingers can rotate the collar **708**, which is square in shape, around the lens **706**, which is circular or round in shape, and can avoid contact with any other components. Because the lens **706** has a circular shape and the collar **708** has a square shape, a user can easily grip and rotate the collar **708** to about **15** degrees, about **30** degrees, or about **45** degrees in reference to a vertical axis (or a horizontal axis, not shown) without contacting the lens **706** or the body **704** and, thus, unlock the ILM **702** from the image capture device **700**. In this example, the collar **708** is rotatable about 45 degrees and may rotate in a similar way as the collars **408**, **508**, **608** of FIGS. **4**A-**6**B, and the image capture device **700** may include similar internal components as the image capture devices **100**, **200**, **400**, **500**, **600** of FIGS. **1**A-**2**B and **4**A-**6**B.

[0112] FIG. **8**A is a perspective view of an image capture device **800**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **802**. Between a body **804** and an external combination of a cover lens **805** and a lens **806**, a collar **808** rotates relative to a frame **810** and the body **804** so that the ILM **802** is releasable from the body **804** of the image capture device **800**. When a user engages with the collar **808**, a protrusion(s) **811** sits proud on an outer surface of the collar **808** and allows the user to engage the collar while being free of contact with the frame **810**, the body **804**, or both. This engagement system provides an easier and expedited connection or detachment of the ILM **802** from the image capture device **800**.

[0113] FIG. **8**B is a cross section of a side view of the image capture device **800** and the ILM **802** of FIG. **8**A as indicated by dotted cross-sectional line **8**B viewed from the left side of the image capture device **800** in FIG. **8**A. Around the ILM **802**, a shell **812** encases the internal components of the ILM **802** so that the internal components are free of exposure to outside environmental factors, which may interfere with electronic signal transmission or physical component connections. The shell **812** includes locators **814** that assist with aligning a plate **816** and a module electrical interface **820** inside the body **804** by interfacing or aligning with slots **821**. Encased within the shell **812**, an image sensor **822** is configured to capture images for the image capture device **800**. Inside the body **804**, the module electrical interface **820** interfaces or connects with a housing electrical interface **824** in a similar way as the housing electrical interfaces **424**, **524** of FIGS. **4**B-C and **5**C-D.

[0114] The image sensors, such as the image sensors **422**, **522**, **822**, and the lenses, such as the lenses **406**, **506**, **806**, in this application may be described as or associated with an image sensor lens assembly (ISLA), and the ISLA may have varying sizes in a given ILM, such as the ILMs **402**, **502**, **802**. Compared to the lens **506** and the image sensor **522** of FIG. **5**D, the lens **806** and the

image sensor **822** of FIG. **8**B are larger, and thus, less space is free of components within the ILM **802** than within the ILM **502**. The similarly sized shells **512**, **812** allow different sizes of the lenses **506**, **806** and the image sensors **522**, **822** to be utilized in similarly sized shells **512**, **812** so that varying types of images may be captured. In some examples, where ILMs (not shown) vary in size, portions of the ILMs that are outside the receptacles (e.g., the lens **506**, **806**, the collars **508**, **808**, or the frames **510**, **810** of the ILMs **502**, **802**) may extend outward at varied lengths or distances so that about **20** percent to about **60** percent of the exterior surfaces of the ILMs are free of contact with the receptacles. Finally, and as shown by comparison of FIGS. **5**D and **8**B, the image sensors **522**, **822** may have varying spaces that separate the image sensors **522**, **822** and the walls of the shells **512**, **812** or the plates **516**, **816** so that image sensors **522**, **822** with varying capabilities may be used with the image capture devices **500**, **800** in an interchangeable fashion.

[0115] Returning to FIG. **8**B, inside the body **804**, a receptacle **826** houses the ILM **802** and is interface-able or connectable with the collar **808** so that the ILM **802** is releasable from the body **804**. At an edge of the receptacle **826**, a seal **830***a* adhered to the shell **812** creates a friction or watertight fit with the receptacle **826** in a manner similar to that of the seals **430***a*, **430***b*, **530***a*, **530***b* of FIGS. **4**C and **5**D. Another seal **830***b* is positioned between the cover lens **805** and the frame **810** so that the lens **806** and other internal components are protected from water, dust, dirt, impact events, or any combination thereof. Between the image sensor **822** and the shell **812** or the plate **816**, an electrical connector **831** (e.g., a wire or a connector) provides an electrical connection or interface for transferring electrical signals between the image sensor **822** and the module electrical interface **820**.

[0116] FIG. **8**C is an exploded view of the image capture device **800** of FIG. **8**A-**8**B. For connecting with the ILM **802** of FIGS. **8**A-**8**B, the image capture device **800** includes an upper mount **832** and a lower mount **834** attachable to the body **804** and connectable by fasteners (not shown) at apertures **836***a*, **836***b*, **836***c* of the upper mount **832**, the lower mount **834**, and the receptacle **826**. However, in some examples, the upper mount **832** and the lower mount **834** may be simply welded or adhered together for ease of assembly. For interfacing with the collar **808** of FIGS. **8**A-**8**B, a spring **838** of the lower mount **834** is laterally compressible so that a component of the collar **808** can enter inserts **840***a*, **840***b* and lock the collar **808** against the receptacle **826**. On the outwardly facing portion of the upper mount **832**, pairs of recesses **842***a*, **842***b* assist with connecting to balls **844***a*, **844***b* of the collar, as shown in FIGS. **8**A-**8**C, and provide haptic feedback to the user to support a determination as to whether the ILM **802** is properly secured between the frame **810** and the receptacle **826**. At a lateral wall of the receptacle **826**, one of the slots **821** for connecting with one of the locators **814** of FIG. **8**B and aligning the housing electrical interface **824** with the module electrical interface **820** of FIG. **8**B is shown for providing guidance to the user as to whether the ILM **802** is properly positioned.

[0117] FIG. **8**D is an exploded view of the ILM **802** of FIGS. **8**A and **8**B. FIG. **8**E is an exploded view of the ILM **802** of FIGS. **8**A, **8**B, and **8**E. The collar **808** is rotatable relative to the cover lens **805**, the lens **806**, the frame **810**, and the shell **812** so that the collar **808** is connectable or interface-able with the upper mount **832**, the lower mount **834**, and the receptacle **826** of FIG. **8**C. As the collar **808** rotates, the recess **842***a* connects with the ball **844***a* when the collar **808** locks with the receptacle **826** of FIG. **8**C. When the collar **808** locks, a snap sound can be heard as the ball **844***a* is shifted between the pair of recesses **842***a* so that a user knows that the collar **808** is secured on the receptacle **826**. In a similar way to the pair of recesses **842***a* and the ball **844***a*, the pair of recesses **842***b* of FIG. **8**C connect with a ball **844***b* on another side of the collar **808**, and the pair of recesses **842***b* and the ball **844***b* snap together. When the snap sound from the pairs of recesses **842***a*, **842***b* based on movement of the balls **844***b*, **844***b* is heard by the user, the user knows that a hook **846** of the collar **808** has fully interfaced with the upper mount **832**, the lower mount **834**, and the receptacle **826**. Before the user engages the collar **808**, the user knows that the module electrical interface **820** is aligned by the locators **814** with the slots **821** of FIG. **8**B-**8**C so

that a sufficient electrical connection or interface is made.

[0118] FIG. **8**F is a sectional view of the image capture device **800** and the ILM **802** of FIGS. **8**A-**8**D showing the spring **838** and the hook **846** in a locked position as indicated by dotted cross-sectional line **8**F viewed from the side of an upper right corner of the image capture device **800** in FIG. **8**A. When the hook **846** enters the insert **840***b*, the slanted portion of the hook **846** contacts the slanted portion of the spring **838**, and the combination of downward forces from entry and lateral forces from the spring **838** slide the hook **846** into the locked position. On the collar **808**, a distal portion of the hook **846** is positioned between the insert **840***b* and the upper mount **832** to form the locked position. In the locked position, the spring **838** of the lower mount **834** applies a compressible force against another portion of the hook **846** to keep the hook **846** locked under the upper mount **832**. In the locked position, the collar **808**, the body **804**, and the frame **810** are substantially flush on a lateral side of the image capture device **800**, and the ILM **802** is secured to the body **804**.

[0119] FIG. **8**G is a sectional view of the image capture device **800** and the ILM **802** of FIGS. **8**A-**8**F showing the spring **838** and the hook **846** in a released position as indicated by the dotted cross-sectional line **8**G viewed from the side of an upper right corner of the image capture device **800** in FIG. **8**A. To move the hook **846** into the released position, a user rotates the collar **808** about 5 degrees to about 15 degrees, and in one example, about 7 degrees counterclockwise, which moves the distal portion of the hook **846** to a position that is free of contact with the upper mount **832**. As the distal portion of the hook **846** moves, the spring **838** compresses, and the hook **846** becomes removable from the insert **840***b* of the receptacle **826** (FIGS. **8**B and **8**C). When the hook **846** is in a released position, the collar **808** is rotated about 7 degrees, and the collar **808** is offset from the body **804** and frame **810** so that the recesses **842***a*, **842***b* and the balls **844***a*, **844***b* of FIGS. **8**C-**8**E are not interfaced or engaged, which would inhibit release-ability. Further, in the released position, the ILM **802** is removable from the body **804** of the image capture device **800**.

[0120] FIG. **9**A is a perspective view of an image capture device **900**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **902** that has a keyed connection. A body **904** houses the ILM **902** so that a cover lens **905** and a lens **906** are usable to capture images. Between the cover lens **905** and the body **904**, a collar **908** is rotatable relative to the body **904** and a frame **910** to allow locking and unlocking of the ILM **902**. The lens **906** and the frame **910** may be similar to the lenses **406**, **506**, **606**, **706**, **806** and the frames **410**, **510**, **610**, **710**, **810** of FIGS. **4**A-**8**G. For gripping any release mechanism, the collar **908** may include protrusions (not shown) similar to the protrusions **611***a*, **611***b*, **811** of FIGS. **6**A-**6**B and **8**A-**8**G.

[0121] FIG. **9**B is perspective view of the ILM **902** of FIGS. **9**A. A shell **912** is surrounded by the collar **908**, and the collar **908** is rotatable or shift-able around the shell **912**. For connecting to internal components of the body **904** of FIG. **9**A, clips **914** are positioned on a plate **916** that is connected or secured to the shell **912** by fasteners **918**. Additional fasteners **919** connect the shell **912** and the collar **908** at openings of the collar **908** that are proximate to the frame **910**. The collar **908** is rotatable at the fasteners **919** so that a module electrical interface **920** is connectable or interface-able with the body **904** of FIG. **9**A. As the collar **908** shifts or rotates about the fasteners **919**, the module electrical interface **920** remains non rotatable. When the collar **908** rotates, keys **921** can trigger an internal mechanism of the body **904** of FIG. **9**A so that the ILM **902** can be removed or inserted into the body **904**.

[0122] FIG. **9**C is a cross section of a side view of the image capture device **900** and the ILM **902** of FIGS. **9**A-**9**B as indicated by dotted cross-sectional line **9**C viewed from the left side of the image capture device **900** of FIG. **9**A. An image sensor **922** is encased by walls of the shell **912** so that the image sensor **922** is free of contact with outside environmental forces such as dust, moisture, water, dirt, or any combination thereof. At the plate **916** of the ILM **902**, the module electrical interface **920** forms an electrical connection or interface with a housing electrical interface **924** in a receptacle **926** so that electrical signals related to capturing images may be sent

between the ILM **902** and the body **904**. The connection or interface between the module electrical interface **920** and the housing electrical interface **924** may be similar to the connection or interface between the module electrical interfaces **420**, **520**, **820** and the housing electrical interface **424**, **524**, **824** of FIGS. **4**A-**5**E and **8**A-**8**G.

[0123] Since the collar **908** extends from a top portion of the frame **910** to a bottom portion of the frame **910** and substantially covers the shell **912** that is included with the frame **910**, a seal **930***a* is provided between the frame **910** and the plate **916**, and another seal **930***b* is provided between the cover lens **905** and the frame **910**. The seals **930***a*, **930***b* extend radially between the components and prevent water from entering the inside of the shell **912**, which may damage the image sensor **922**. To keep water and moisture out of the inside of the receptacle **926** during operation of the image capture device **900**, additional seals **930***c*, **930***d* are provided between the frame **910** and the collar **908**. In this example, further seals (not shown) may be provided proximate to the housing electrical interface **924** and configured to prevent water entry so that the water or moisture does not interfere with electrical components of the housing electrical interface **924**.

[0124] Inside of the receptacle **926** of the body **904**, the clips **914** are connectable with locks **932** that are rotatable for keying the connection between the ILM **902** and the body **904**. The locks **932** secure the ILM **902** inside the body **904** during use of the image capture device **900**. The locks **932** are rotatable towards and away from the clips **914** by utilizing springs **934**; however, the locks **932** could utilize any mechanism suitable to allow rotational movement in a similar way to the springs **934**. For engaging with the locks **932**, the collar **908** extends from the frame **910** to the plate **916** so that the keys **921** of FIG. **9**B are interface-able with the locks **932**.

[0125] FIG. **9**D is another cross section of a rear view of the image capture device **900** and the ILM **902** of FIG. **9**A-C as indicated by dotted cross-sectional line **9**D viewed from the back side of the image capture device **900** of FIG. **9**A. The fasteners **919** assist with rotational motion of the collar **908** so that the locks **932** are interface-able. At the fasteners **919**, the collar **908** is rotatable, and as the collar **908** rotates, the key **921** engages the lock **932**. As the collar **908** rotates and becomes offset with the frame **910** of FIGS. **9**A-**9**B, the key **921** pushes and rotates the lock **932** away from the clip **914** so that the ILM **902** becomes disconnect-able. In a similar way, as the collar **908** is rotated back into a flush position with the frame **910** of FIGS. of **9**A-**9**B, the key **921** allows the lock **932** to move back into engagement with the clip **914** so that the ILM **902** is fully connected to body **904** of the image capture device **900**.

[0126] FIG. **10**A is a perspective view of an image capture device **1000**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **1002** that includes a button **1003**. For capturing images or videos, a body **1004** is connectable with the ILM **1002** that includes a cover lens **1005** and a lens **1006**, and the cover lens **1005** and the lens **1006** are non-rotatable. To control the connect-ability of the ILM **1002** with the body **1004**, a collar **1008** that is rotatable around the cover lens **1005** includes the button **1003** for engaging and disengaging the ILM **1002** with or from the body **1004**. The collar **1008** may be similar to the collars **408**, **508**, **608**, **708**, **808**, **908** of FIGS. **4**A-**9**D. When the button **1003** is pressed or engaged, the collar **1008** is rotatable around the cover lens **1005**, and the ILM **1002** is insert-able or removable from the body **1004**.

[0127] FIG. **10**B is a perspective view of the ILM **1002** of FIG. **10**A. To encase components within the ILM **1002**, a shell **1012** surrounds internal components of the ILM **1002**, and a slot **1014** on a distal end of the ILM **1002** is mate-able with the body **1004** of FIG. **10**A so that the shell **1012** is align-able with internal components of the body **1004**. Also at the distal end of the ILM **1002**, a plate **1016** is connected to the shell **1012**, and the plate **1016** provides a physical barrier to separate internal components of the body **1004** of FIG. **10**A from outside forces. On the shell **1012**, a mounting mechanism **1017** is included that is interface-able with a bayonet or other mount (not shown). The plate **1016** utilizes fasteners **1018** to secure a module electrical interface **1020** to the ILM **1002**, and the module electrical interface **1020** may be similar to the module electrical interfaces **420**, **520**, **820**, **920** of FIGS. **4**A-**5**E and **8**A-**9**D.

[0128] FIG. **10**C is a cross-section of a side view of the ILM **1002** and the image capture device **1000** of FIGS. **10**A-**10**B as indicated by dotted cross sectional line **10**C viewed from the left side of the image capture device **1000** of FIG. **10**A. To properly align the ILM **1002** with the body **1004**, a locator **1021** guides the ILM **1002** by fitting with the slot **1014**. The fit between the locator **1021** and the slot **1014** may be a tight or a loose fit, and the fit may contact at a bottom wall of the locator **1021**, a lateral wall(s) of the locator **1021**, or any combination thereof. Within the ILM **1002**, an image sensor **1022** is included that is encased by the shell **1012** and the plate **1016** so that exposure to the outside environment is mitigated. For sending signals from the body **1004**, a housing electrical interface **1024** connects or interfaces with the module electrical interface **1020**, and the connection or interface between the module electrical interface **1020** and the housing electrical interface **1024** is protected from electromagnetic interference, which is emitted by the image sensor **1022**, by the plate **1016**. Specifically, the shell **1012** is insert-able to a receptacle **1026** and creates a watertight or friction fit by the seal **1030***a* of the shell **1012**, and another seal **1030***b* provides a watertight fit between the frame **1010** and the shell **1012** so that the image sensor **1022** is protected. In addition, another seal **1030***c* is positioned between the cover lens **1005** and the frame **1010** so that the lens **1006** is protected from impact events, water, dust, dirt, or any combination thereof. The seals **1030***a*, **1030***b*, **1030***c* may be similar to the seals **430***a*, **430***b*, **430***c*, **530***a*, **530***b*, **530***c* of FIGS. **4**A-**5**E. At a bayonet **1028**, which is positioned on a distal end or outer surface of the receptacle **1026**, the mounting mechanism **1017** forms a mechanical connection to the bayonet **1028** that secures the ILM **1002** to the body **1004**. Between the shell **1012** and the collar **1008**, a bearing system **1029** allows for rotational movement of the collar **1008** about the shell **1012** so that the collar **1008** is shift-able or rotatable around the shell **1012**.

[0129] FIG. **10**D is a perspective view of the body **1004** of FIGS. **10**A and **10**C that shows the bayonet **1028**. FIG. **10**E is a perspective view of the bayonet of FIGS. **10**A, **10**C, and **10**D. On a top surface of the bayonet **1028**, a locking pin **1032** extends perpendicularly from an external surface of the bayonet **1028** and can interface with the button **1003** of FIG. **10**A. On a bottom surface of the bayonet **1028**, springs **1036** are positioned between rotational stoppers **1038** at each corner of the bayonet **1028**, and the springs **1036** and the rotational stoppers **1038** are connectable or interface-able with the mounting mechanism **1017** of FIGS. **10**B and **10**C so that the ILM **1002** is securable to the body **1004** and rotation of the ILM **1002** is limited by the rotational stoppers **1038**.

[0130] FIG. **10**F is perspective view of the ILM **1002** of FIGS. **10**A-**10**C with the collar **1008** shown as transparent. On the collar **1008**, the button **1003** can be pushed, depressed, or compressed towards a central axis or imaging axis (not shown) of the ILM **1002** and can control the connect-ability of the ILM **1002**. For allowing push-ability or compressibility, a coil **1040** secured by a fastener **1042** provides external pressure or force on the button **1003** so that, when then button **1003** is pushed or compressed inward, the button **1003** will then be forced outward or away from the imaging axis as the pressure or force that is pushing or compressing the button **1003** is released. For connecting with the locking pin **1032** of FIGS. **10**D and **10**E, the button **1003** includes a hook **1044** that is positioned on an exterior of the collar **1008**.

[0131] FIG. **10**G is a side view of the image capture device **1000** of FIGS. **10**A-**10**F with the collar **1008** shown as transparent. To connect the ILM **1002** and the body **1004**, the ILM **1002** is inserted into the body **1004**, and corners of the collar **1008** are positioned at a **15** degree to a **90** degree angle, for example, at a **45** degree angle, relative to a flush position of the collar **1008** (e.g., FIG. **10**A). To lock the ILM **1002** and the body **1004**, the collar **1008** is rotated until corners of the collar **1008** are flush with corners of the body **1004**. As the collar **1008** is moved to a flush position, a slanted portion of the button **1003** slides the locking pin **1032** of the bayonet **1028** into the hook **1044** so that the locking pin **1032** and the hook **1044** prevent rotational motion of the collar **1008**. For axial movement (in a z-direction or along a direction of an imaging axis), the bayonet **1028** engages or interfaces with the mounting mechanism **1017** of FIG. **10**C so that the ILM **1002** and

the body **1004** are non-separable when the corners of the body **1004** and the collar **1008** are flush. To disconnect, disengage, or uninstall the ILM **1002** from the body **1004**, pressure is applied to the button **1003**, and the collar **1008** is twisted simultaneously, which releases the locked condition of the locking pin **1032** and the hook **1044** and disengages the interface of the collar **1008** and the bayonet **1028**.

[0132] FIG. **11**A is perspective view of an image capture device **1100**, such as the image capture devices **100**, **200** of FIGS. **1**A-**2**B, and an ILM **1102** in a shifted position. A body **1104** secures the ILM **1102** so that a lens **1106** is non-rotatable. Between the lens **1106** and the body **1104**, a collar **1108** is in a shifted position relative to a frame **1110** at about **30** degrees to about **90** degrees, for example, at about **45** degrees as shown. In other examples, where the collar **1108** is in a locked position, the collar **1108** would be flush with the body **1104** and the frame **1110**.

[0133] FIG. **11**B is a perspective view of the ILM **1102** of FIG. **11**A. FIG. **11**C is a perspective view of the body **1104** of FIG. **11**A. Again, the collar **1108** is shifted relative to the frame **1110**, which alters the position of a locator **1114**. On the ILM **1102**, a shell **1112** extends between the frame **1110**, the locator **1114**, and a plate **1116** and provides a secure casing for internal components, such as the image sensors **422**, **522**, **822**, **922**, **1022** of FIGS. **4**A-**5**E and **8**A-**10**G. The locators **1114** are positioned both in a manner spaced from and above a lateral side of the shell **1112**, and the locators **1114** may be pushed away from the lateral side of the shell **1112** by one or more compression springs (not shown) so that the locators **1114** remain spaced from the lateral side of the shell **1112** when free of downward force or pressure. Fasteners **1118***a* secure the plate **1116** to the shell **1112** to fully encase the internal components. Other fasteners **1118***b* are used to secure a module electrical interface **1120** to the plate **1116**, and the plate **1116** provides a shield for preventing or mitigating stray signals emitting from the internal components, such as the image sensor (not shown), from interfering with the module electrical interface **1120**. The module electrical interface **1120** may be similar to the module electrical interfaces **420**, **520**, **820**, **920**, **1020** of FIGS. **4**A-**5**E and **8**A-**10**G.

[0134] On the body **1104**, slots **1121** are interface-able or connectable with the locators **1114** of the ILM **1102**. When the locators **1114** and the slots **1121** are interfaced or connected, the ILM **1102** presses the module electrical interface **1120** into a housing electrical interface **1124** so that electrical signals may be sent between the ILM **1102** and the body **1104** of the image capture device **1100**. To engage the ILM **1102** to a receptacle **1126** of the body **1104**, a corner of the collar **1108** presses a cam surface **1128** of the locator **1114**. As the cam surface **1128** is pressed, the locator **1114** moves into contact with a lateral wall of the shell **1112** so that the ILM **1102** is insert-able into the receptacle **1126**. When the ILM **1102** is fully inserted into the receptacle **1126**, the collar **1108** is rotated back to a non-shifted or locked position, such as the locked positions shown in FIGS. **5**B, **6**A, **7**, **8**A, **9**A, and **10**A, and pressure on the cam surface **1128** is relieved so that a hook **1129** of the locator **1114** connects or interfaces with a deeper portion of the slot **1121**. The cam surface **1128** and the hook **1129** of the locator **1114** may be separate parts or have a contiguous structure so that assembly of the locator **1114** is optimized. In some examples, a seal (e.g., seals **430***a*, **530***a*, **830***a* of FIGS. **4**A-**5**E and **8**A-**8**G) is provided that radially surrounds the shell **1112** between the plate **1116** and the slot **1121** and creates a watertight or friction fit with the receptacle **1126** so that environmental factors such as moisture, water, dust, dirt, or any combination are kept away from the module electrical interface **1120**, the housing electrical interface **1124**, or both.

[0135] 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: an image lens mount, comprising: an imaging sensor configured to detect light; a image lens mount housing that encloses the imaging sensor; an image lens mount electrical connection that electrically interfaces with the imaging sensor and is located on an external surface of the image lens mount housing; and an image lens mount locator positioned on the external surface of the image lens mount housing; and a body, comprising: a receptacle configured to received the image lens mount; a body electrical connection configured to releasably connect with the image lens mount electrical connection; and a body locator configured to releasably connect with the image lens mount such that the body electrical connection and the image lens mount electrical connection are aligned when the body locator and the image lens mount locator are connected.
2. The image capture device of claim 1, wherein the body comprises a battery, and wherein the image lens mount does not include a battery.
3. The image capture device of claim 2, wherein the body does not comprise an imaging sensor configured to detect light.
4. The image capture device of claim 1, wherein the image lens mount and the body is waterproofed at a friction fit such that water does not impact the image lens mount electrical connection and/or the body electrical connection.
5. The image capture device of claim 1, wherein the body comprises a processor configured to process signals from the imaging sensor.
6. The image capture device of claim 1, wherein the body locator and/or the image lens mount locator comprises a seal configured to form a friction fit between the body and the image lens mount.
7. The image capture device of claim 1, wherein the image lens mount defines slots configured to receive a portion of the body.
8. The image capture device of claim 1, further comprising: a button configured to release and/or connect the body locator and the image lens mount locator.
9. The image capture device of claim 1, further comprising: a collar configured to move between a shifted position and a locked position to release and/or connect the body locator and the image lens mount locator.
10. The image capture device of claim 9, wherein the collar is connected with the body locator and/or the image lens mount locator.
11. An image capture device, comprising: an image lens mount comprising an image sensor; a body comprising a processor; an electrical connection between the image sensor and the processor; and a locator connection that is configured to align the electrical connection between the body and the image lens mount and waterproof a location at the electrical connection.
12. The image capture device of claim 11, wherein the locator connection has a friction fit between one or more first locators of the body and one or more second locators of the image lens mount.
13. The image capture device of claim 11, wherein the locator connection is defined within or on the image lens mount and the body and is configured to guide the body and the image lens mount toward one another along an axis.
14. The image capture device of claim 11, further comprising: a battery that is not incorporated into the image lens mount.
15. The image capture device of claim 14, wherein the battery is separate from the image lens mount and included with the body.
16. An image capture device, comprising: an image lens mount comprising an imaging sensor configured to detect light; a body releasably connectable with the image lens mount; an external electrical connection included on external surfaces of the body and the image lens mount; and a

locking mechanism separate from the external electrical connection and configured to connect the body and the image lens mount such that the external electrical connection is waterproofed while the body and the image lens mount are connected.

17. The image capture device of claim 16, further comprising: a locator assembly that is separate from the locking mechanism and defined on the external surfaces of the body and the image lens mount.

18. The image capture device of claim 17, wherein the locator assembly is separate from the locking mechanism and the external electrical connection on the external surfaces of the body and the image lens mount.

19. The image capture device of claim 18, wherein the external electrical connection is waterproofed at a seal included at the locator assembly.

20. The image capture device of claim 19, wherein the seal includes an elastic material.