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(54) **CAMERA GIMBAL MOUNT SYSTEM**

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(71) Applicant: **GoPro, Inc.**, San Mateo, CA (US)

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(72) Inventors: **Theresa Loney Casarez**, San Carlos, CA (US); **John George Muhlenkamp, IV**, Brisbane, CA (US); **Stephen Yui**, Pacifica, CA (US); **Ryan Harrison**, Walpole, NH (US)

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(73) Assignee: **GoPro, Inc.**, San Mateo, CA (US)

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Primary Examiner — Kenneth Whittington

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(74) *Attorney, Agent, or Firm* — Young Basile Hanlon & MacFarlane, P.C.

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(57) **ABSTRACT**

U.S. Applications:

A gimbal mount system is configured to a couple to a gimbal coupled to and securing a camera. The gimbal mount system includes a handle, a power source, a user interface, a mounting interface, a communication interface, and a communication bus. The mounting interface is located within an end of the gimbal mount system and includes an opening configured to receive a reciprocal mounting protrusion of the gimbal. A locking mechanism removably couples the gimbal to the gimbal mount system. The communication interface is located within the mounting interface and is configured to couple to a reciprocal communication interface of the gimbal. The communication bus is coupled to the power source, user interface, and communication interface and is configured to provide power from the power source to the gimbal. The communication bus may provide instructions to the gimbal based on user input received via the user interface.

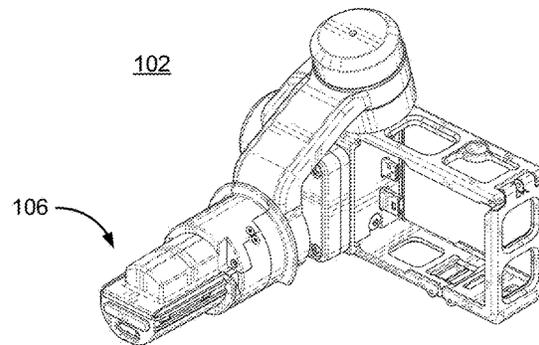
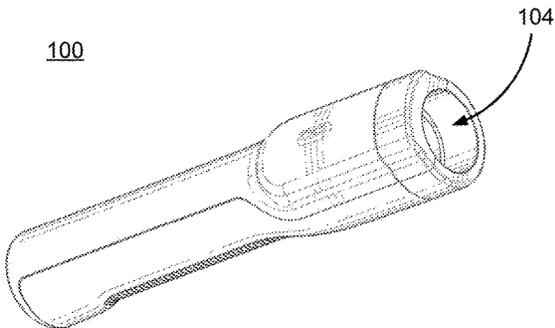
(63) Continuation of application No. 15/385,279, filed on Dec. 20, 2016, now Pat. No. 9,904,149.
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(58) **Field of Classification Search**
CPC G03B 17/561; G03B 17/38; G03B 17/563; G03B 17/566; A45F 5/10; F16M 11/123; F16M 1/16; F16M 11/18
See application file for complete search history.

19 Claims, 12 Drawing Sheets



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F16M 11/16 (2006.01)
F16M 11/18 (2006.01)
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- (52) **U.S. Cl.**
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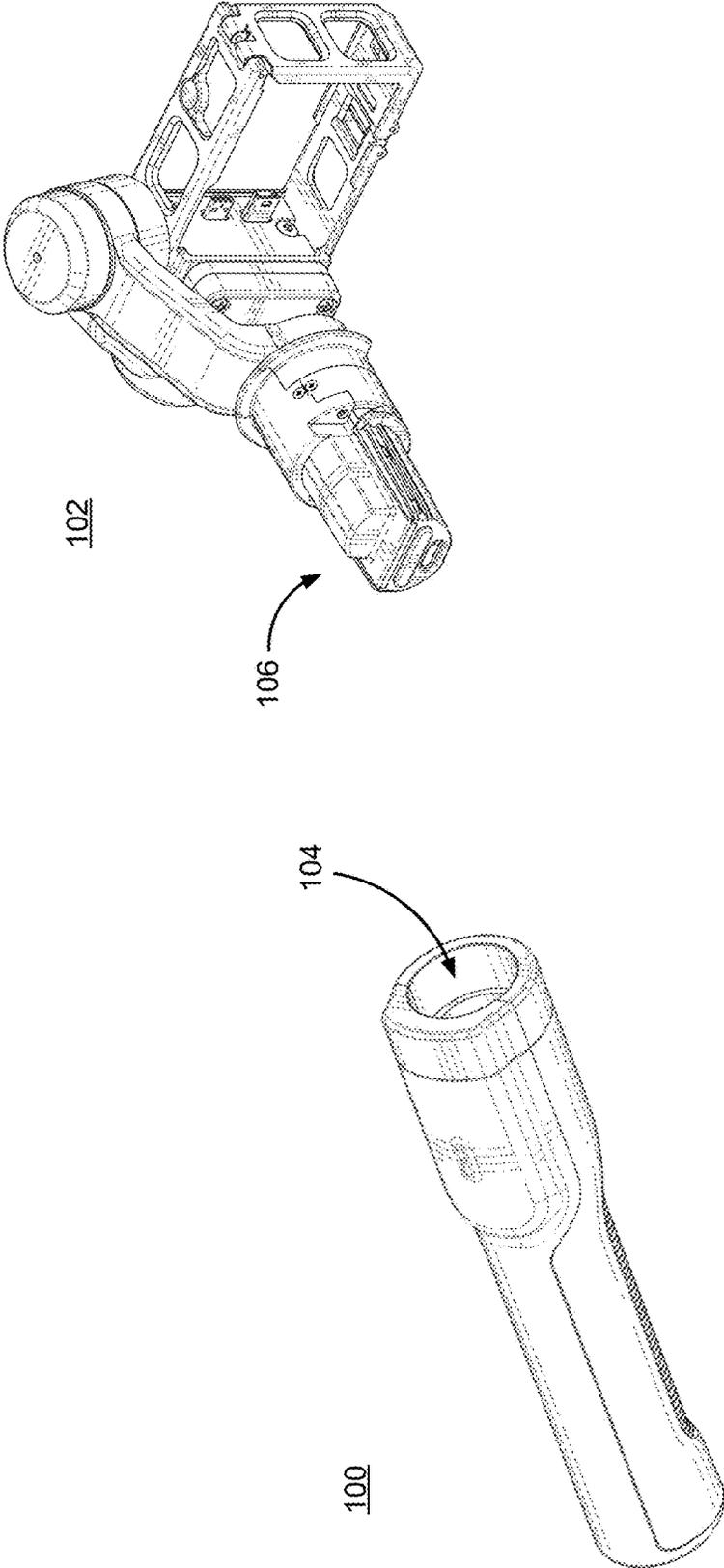


FIG. 1

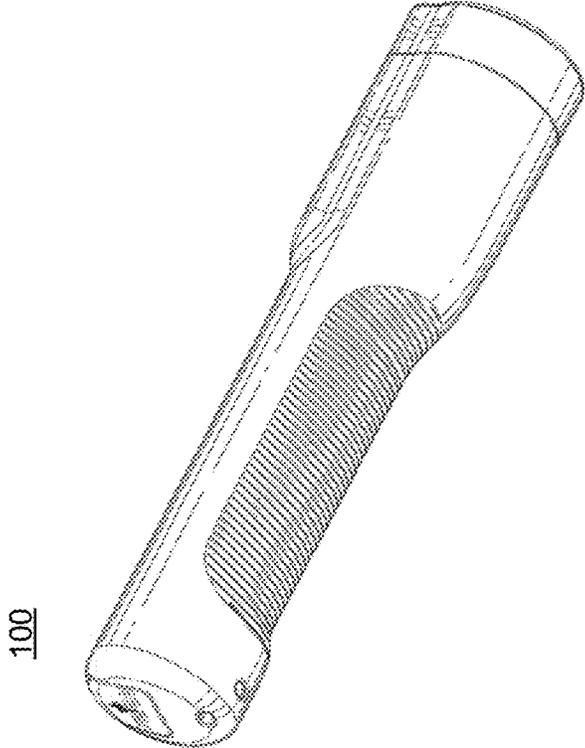


FIG. 2B

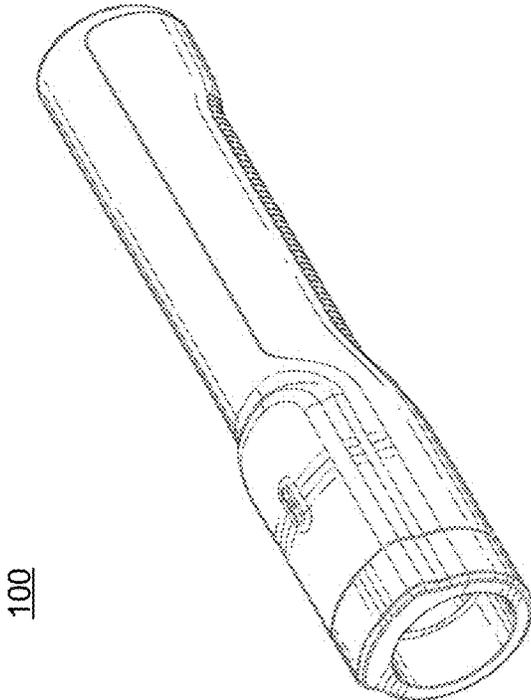


FIG. 2A

100

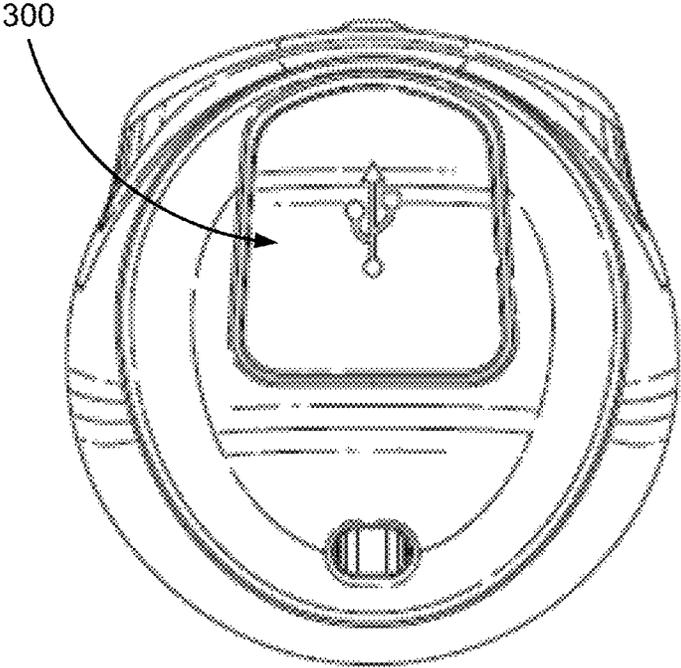


FIG. 3

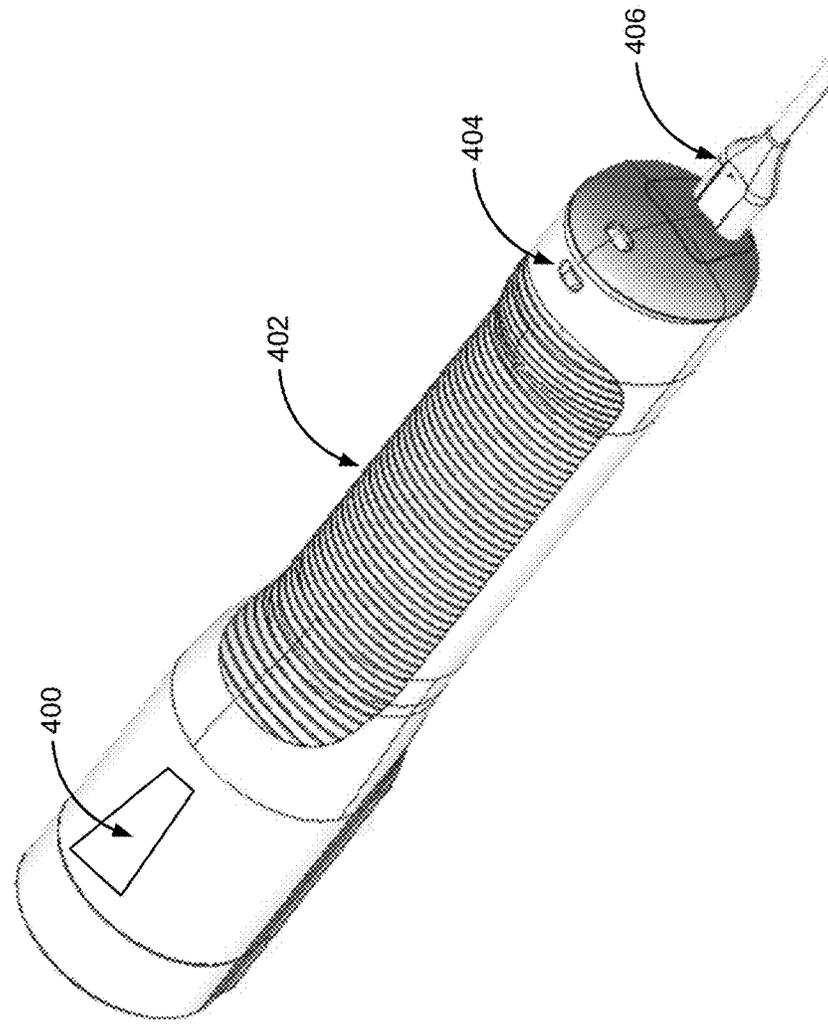


FIG. 4

100

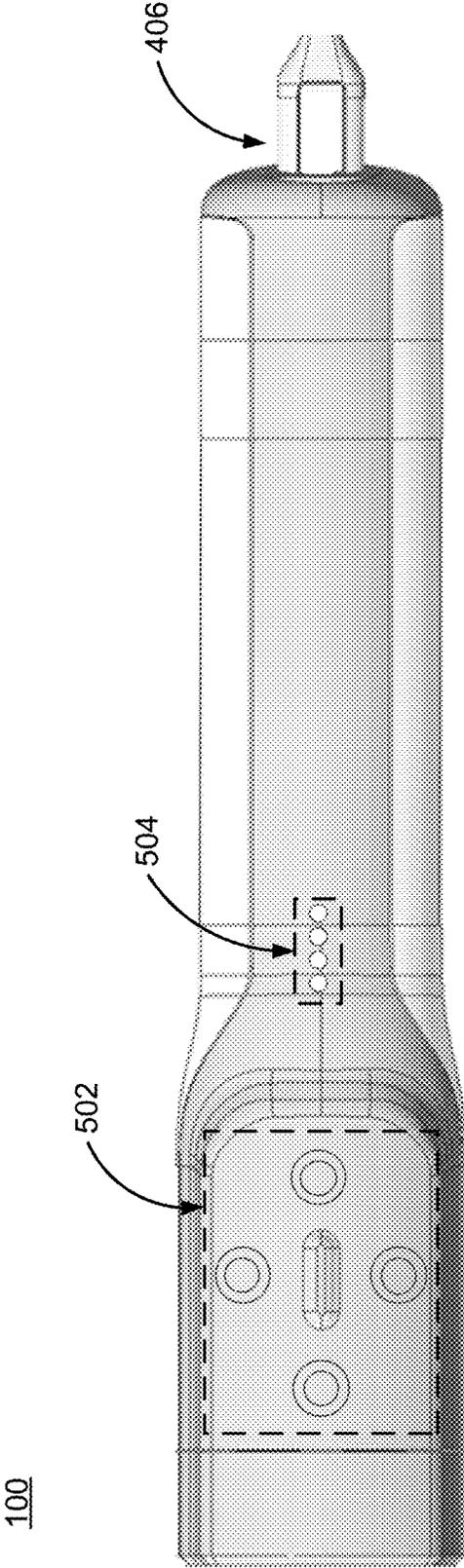


FIG. 5

102

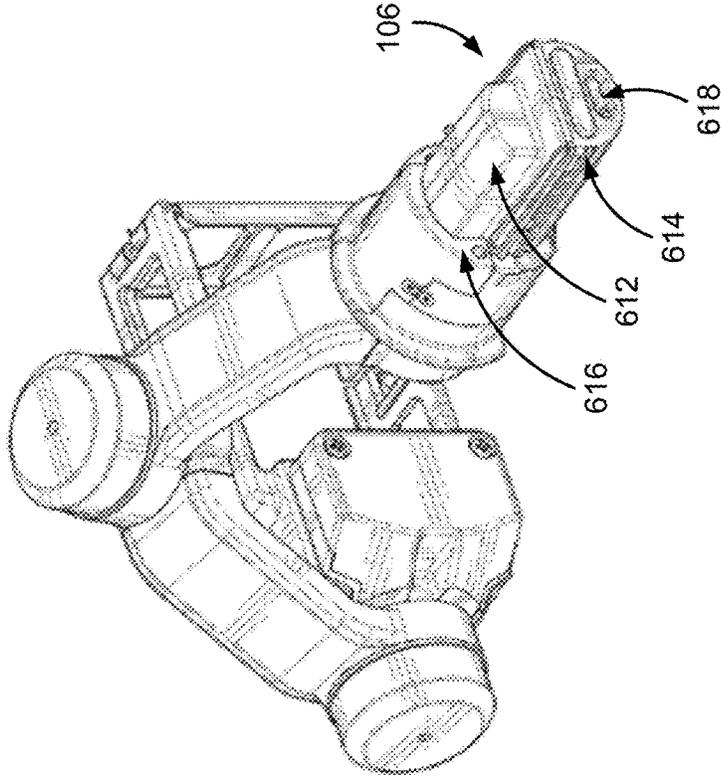


FIG. 6B

100

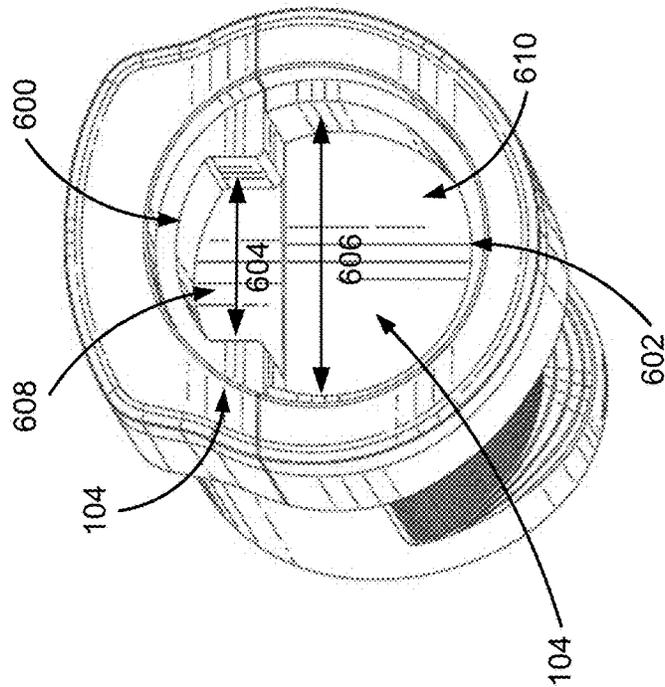


FIG. 6A

100

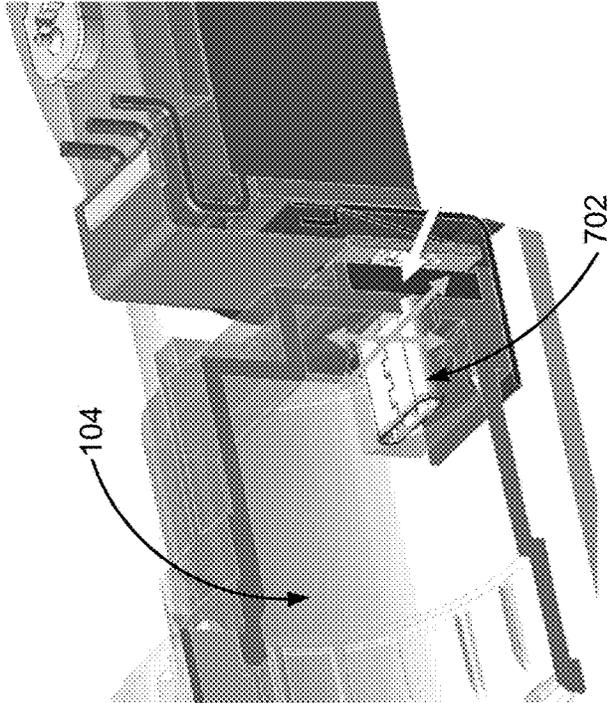


FIG. 7A

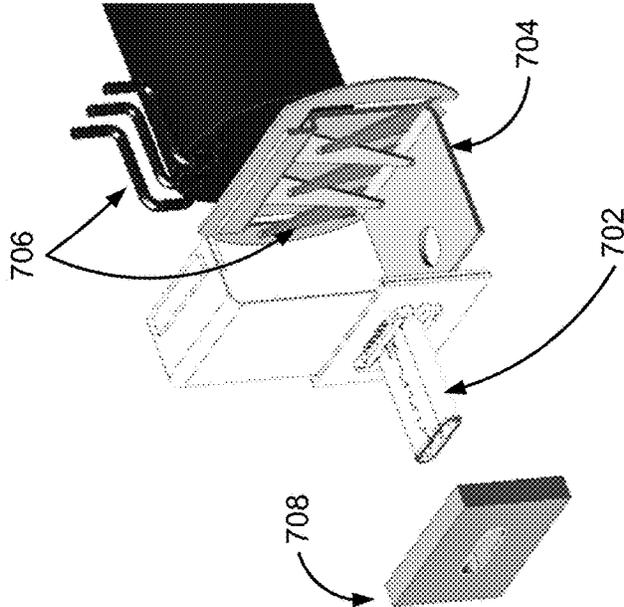


FIG. 7B

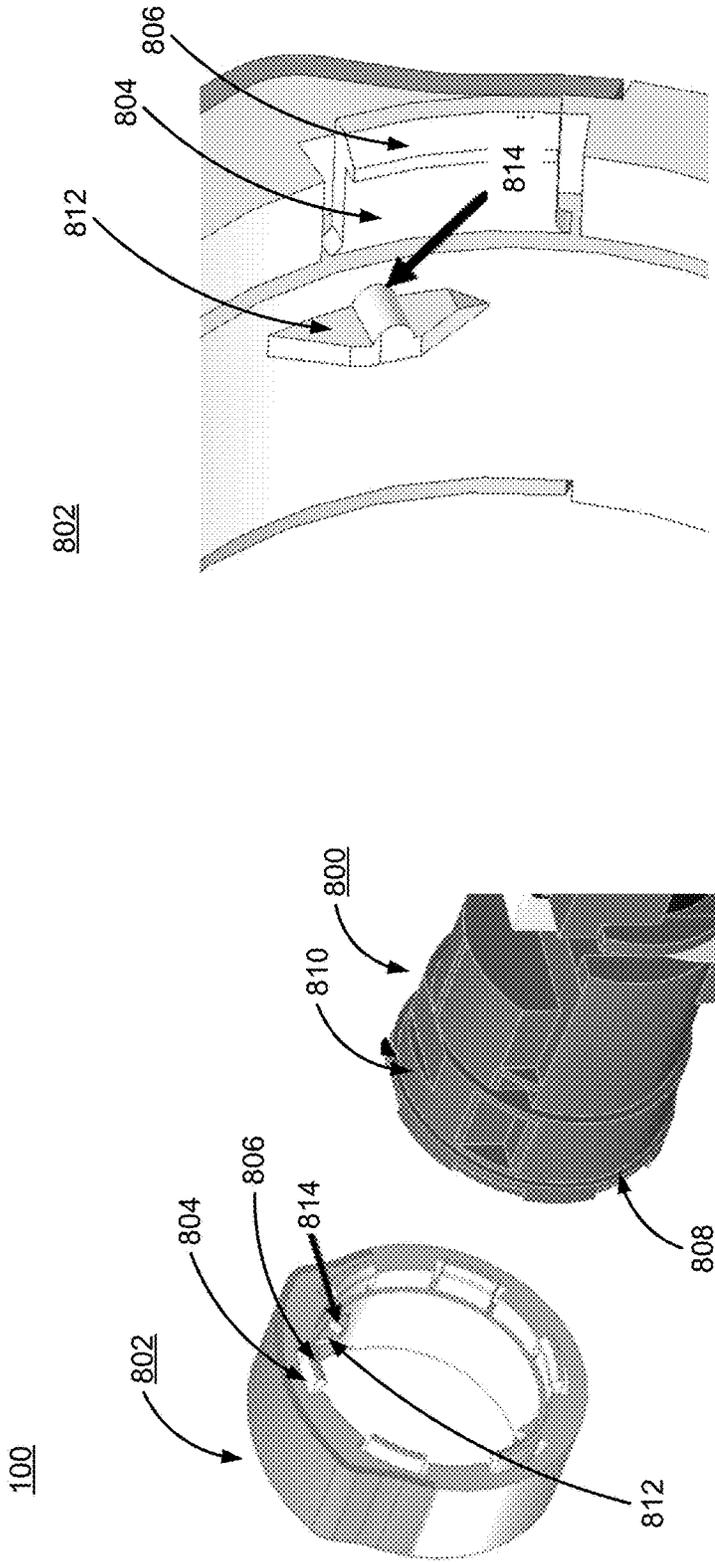


FIG. 8B

FIG. 8A

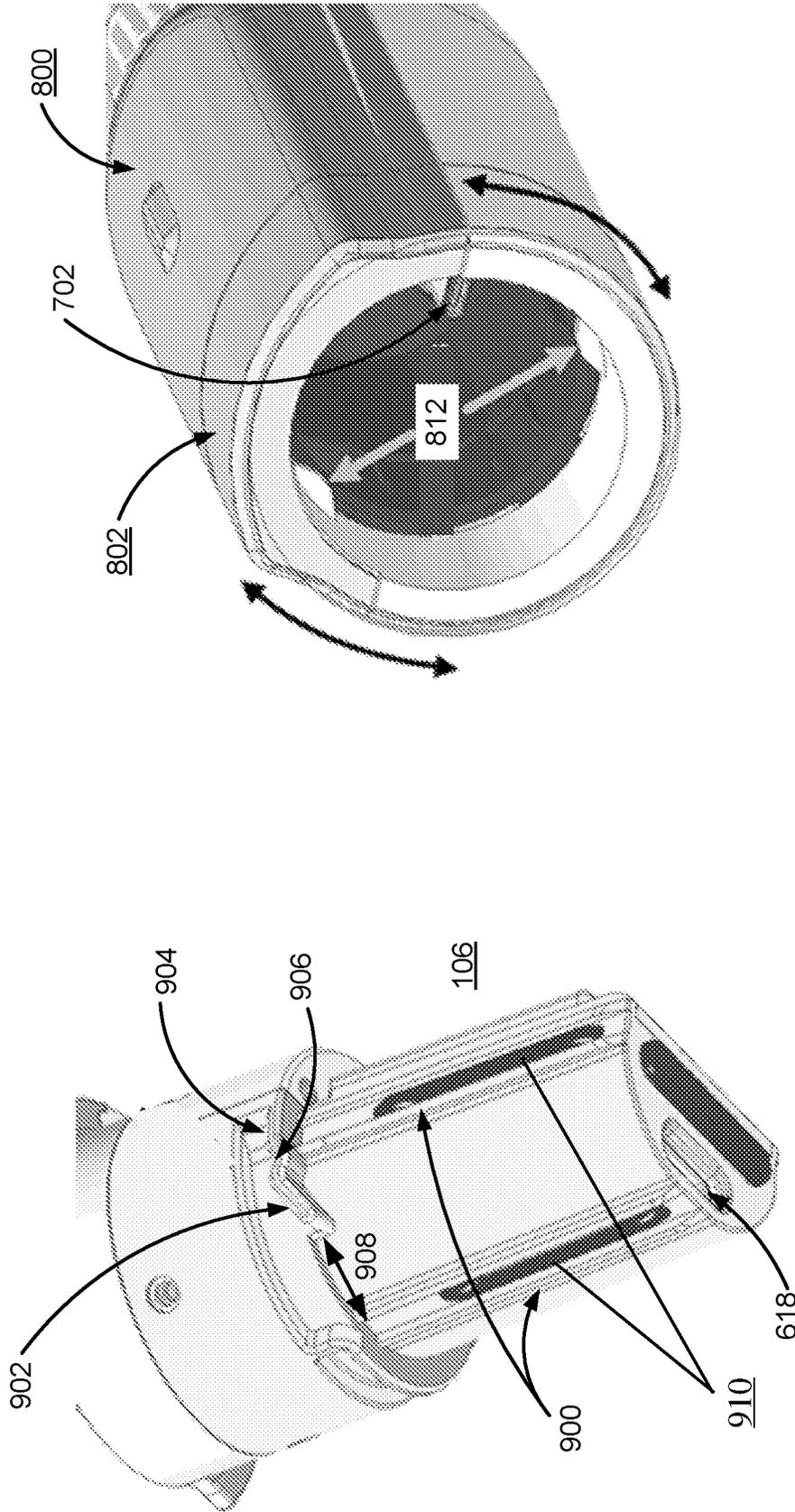


FIG. 9B

FIG. 9A
(Amended)

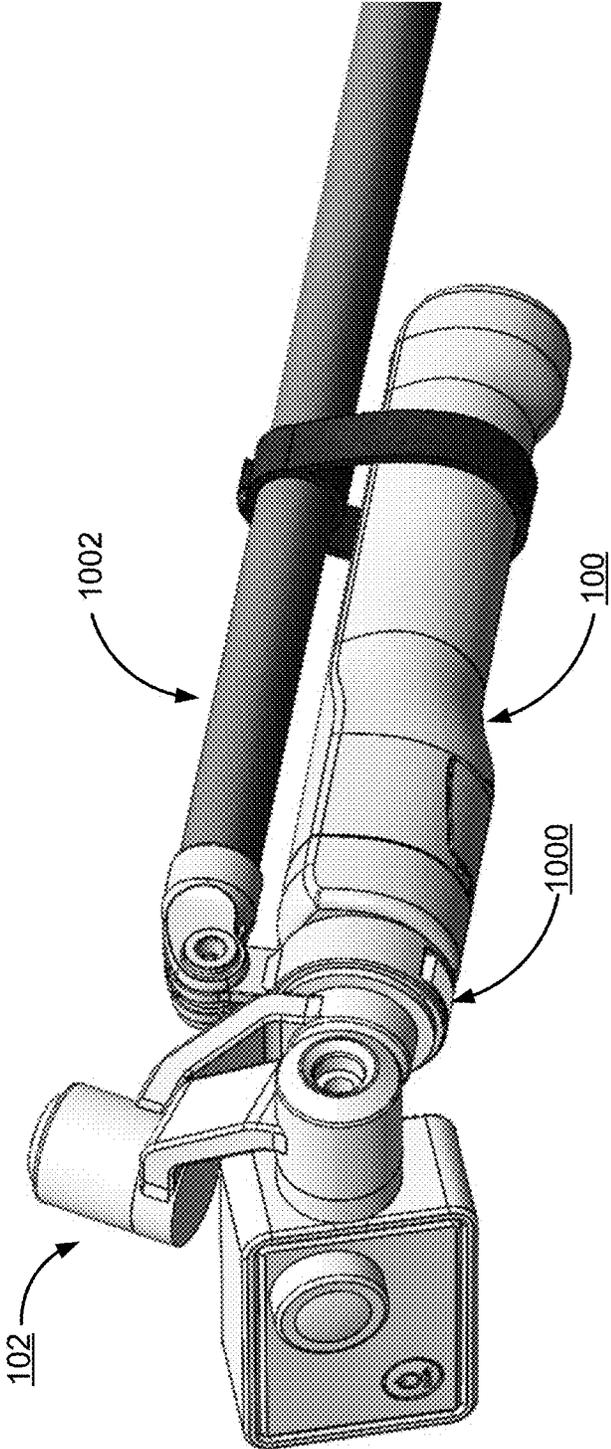


FIG. 10A

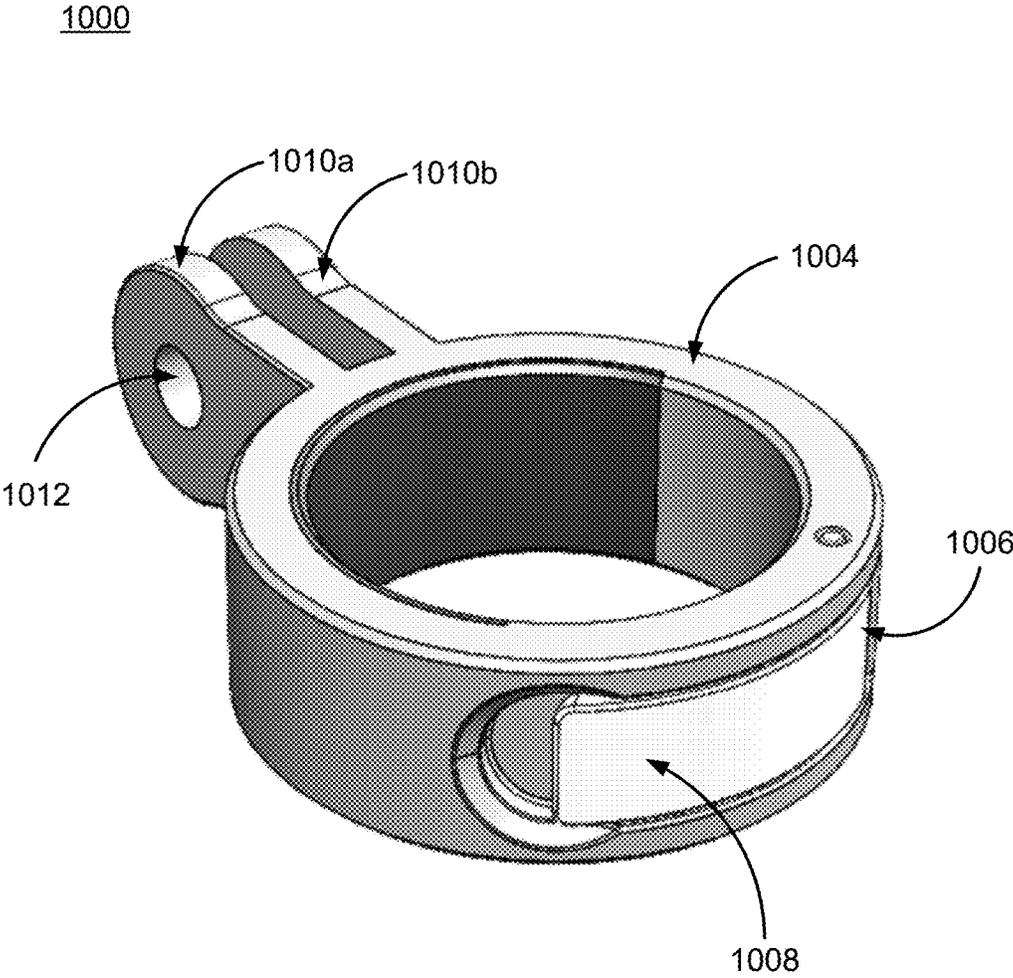


FIG. 10B

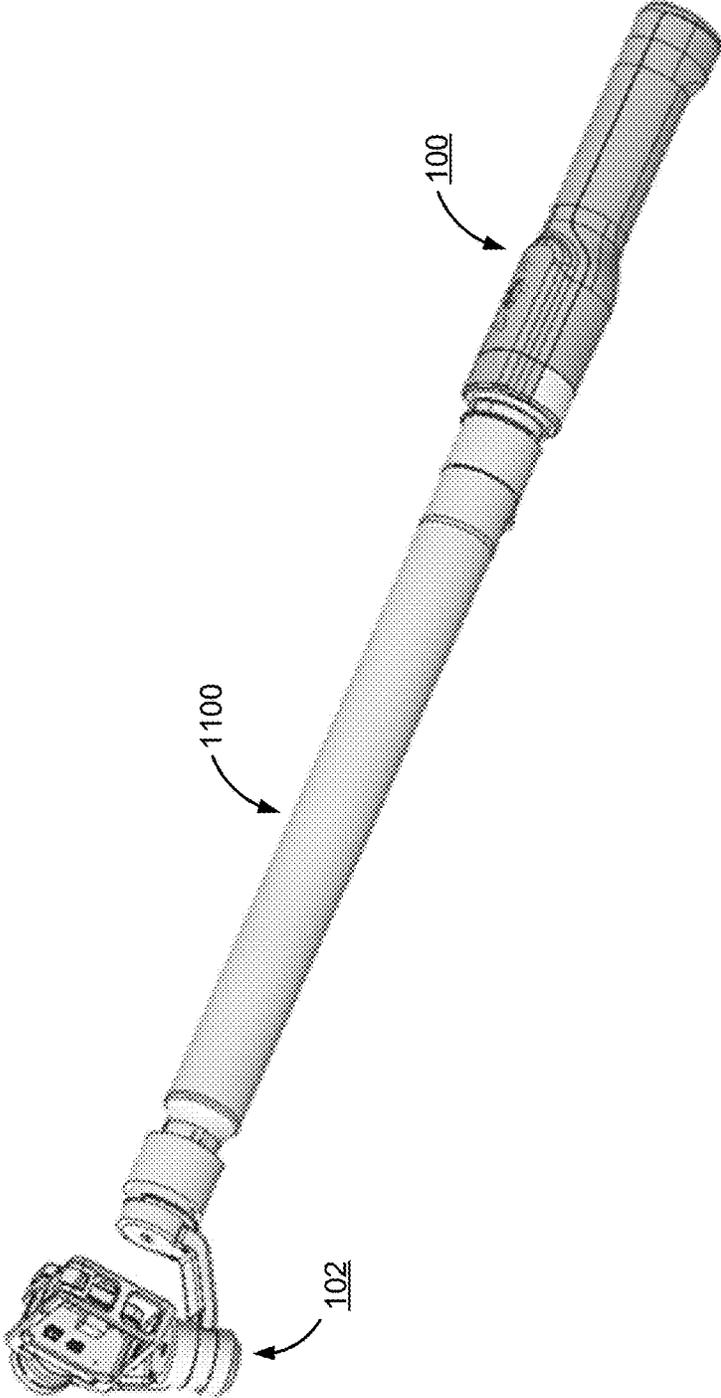


FIG. 11

CAMERA GIMBAL MOUNT SYSTEM

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a *reissue of U.S. application Ser. No. 15/818,741, filed on Nov. 21, 2017, now U.S. Pat. No. 10,228,609 issued on Mar. 12, 2019, which is a continuation of U.S. application Ser. No. 15/385,279, filed Dec. 20, 2016, which claims the benefit of U.S. Provisional Application No. 62/274,077, filed Dec. 31, 2015, which is incorporated by reference in its entirety.*

BACKGROUND

Technical Field

This disclosure relates to camera gimbals, and in particular, to gimbal mount systems configured to power and control cameras and gimbals coupled to the gimbal mount system.

Description of the Related Art

Digital cameras are increasingly used in outdoors and sports environments. In these environments, digital cameras may be held by a user performing an activity or may be mounted to an object in motion. As a result, the motion may affect the quality of the media captured by the digital camera, causing blurry pictures, shaky footage, or other low-quality media. To ensure that high quality media is captured, a user may secure a digital camera to a gimbal, a mechanical device that includes inertial measurement units and motors and can sense and manipulate the orientation of the digital camera to correct for movement. However, existing gimbals may not be configured to be handheld by a user or may not be user-friendly. As such, a gimbal mount system that secures a gimbal and enables a user to easily hold and control the functions of the gimbal and/or camera is desired.

BRIEF DESCRIPTIONS OF THE DRAWINGS

The disclosed embodiments have other advantages and features which will be more readily apparent from the following detailed description of the invention and the appended claims, when taken in conjunction with the accompanying drawings, in which:

Figure (or "FIG.") 1 illustrates a gimbal mount system and a gimbal, according to one example embodiment.

FIGS. 2A and 2B illustrate perspective views of the gimbal mount system, according to one example embodiment.

FIG. 3 illustrates a bottom view of the gimbal mount system, according to one example embodiment.

FIG. 4 illustrates a handle of the gimbal mount system, according to one example embodiment.

FIG. 5 illustrates a user interface of the gimbal mount system, according to one example embodiment.

FIGS. 6A and 6B illustrate close-up perspective views of a mounting interface of the gimbal mount system, according to one example embodiment.

FIGS. 7A and 7B illustrate a communicative interface between the gimbal mount system and the gimbal, according to one example embodiment.

FIGS. 8A and 8B illustrate the features of a locking collar of the gimbal mount system, according to one example embodiment.

FIGS. 9A and 9B illustrate a locking mechanism for securing the gimbal to the gimbal mount system, according to one example embodiment.

FIGS. 10A and 10B illustrate an adapter for coupling the gimbal mount system to various mount components within a camera mount ecosystem, according to one example embodiment.

FIG. 11 illustrates the gimbal mount system coupled to an extension arm that couples the gimbal, according to one example embodiment.

DETAILED DESCRIPTION

The figures and the following description relate to preferred embodiments by way of illustration only. It should be noted that from the following discussion, alternative embodiments of the structures and methods disclosed herein will be readily recognized as viable alternatives that may be employed without departing from the principles of what is claimed.

Reference will now be made in detail to several embodiments, examples of which are illustrated in the accompanying figures. It is noted that wherever practicable similar or like reference numbers may be used in the figures and may indicate similar or like functionality. The figures depict embodiments of the disclosed system (or method) for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles described herein.

As used herein, "gimbal" refers to a mechanical device for use with and coupling to a camera and mounting configurations. The gimbal includes an inertial measurement unit that can sense the orientation of the camera and a predetermined number of electronic motors (e.g., three motors) which can manipulate the orientation of the camera. This orientation corresponds to the pitch, roll, and yaw of the camera. The gimbal can be removably coupled to a variety of mount platforms, such as an aerial vehicle, a handheld grip (a "gimbal mount system" hereinafter), or a rotating mount. Moreover, the camera can be removably coupled to the gimbal and can be held in a removable camera frame.

The gimbal can also provide a communicative interface between the camera and a gimbal mount system, such that the gimbal mount system receives images and video content from the camera, and such that the camera receives power and configuration/operating instructions from the gimbal mount system. As described below, the gimbal mount system enables for the control of the movement of the gimbal based on, for instance, user instructions or interactions. Such configurations beneficially enable the camera mounted to the gimbal to capture images and video in a way best suited to a media capture environment, the wishes of a user, and the like.

65 Configuration Overview

In one embodiment, a gimbal mount system is configured to couple to a gimbal configured to in turn secure a camera.

The body of the gimbal mount system includes a handle, a power source, a user interface, a mounting interface, a communication interface, and a communication bus. The mounting interface is located within an end of the body of the gimbal mount system and comprises an opening configured to receive a reciprocal mounting protrusion of the gimbal. A locking mechanism removably couples the gimbal to the gimbal mount system. The communication interface is located within the mounting interface and is configured to couple to a reciprocal communication interface of the gimbal. The communication bus is coupled to the power source, user interface, and communication interface and is configured to provide power from the power source to the gimbal. The communication bus may provide one or more instructions to the gimbal based on user input received via the user interface.

Example Camera System and Camera Controller Configuration

FIG. 1 illustrates a gimbal mount system **100** and a gimbal **102**, according to one example embodiment. As noted above, a gimbal, such as gimbal **102**, is a mechanical device that is configured to secure a camera and manipulate the orientation of the camera along one or more axes. In the embodiment of FIG. 1, the gimbal mount system **100** is configured to couple to the gimbal **102** and serve as a gimbal mount that can be handheld by a user. In some embodiments, the gimbal mount system **100** may also be configured to provide power and control instructions to the gimbal **102** and/or to the camera secured by the gimbal. In the embodiment of FIG. 1, the gimbal mount system **100** may include a power source, e.g., a battery. The gimbal mount system **100** may provide power from the power source to the gimbal **102** and/or the camera via a communicative interface between the gimbal mount system and the gimbal. The gimbal mount system **100** may also include a controller configured to provide instructions to the gimbal **102** and/or the camera, as described below in greater detail. In order to enable a user to provide instructions to the gimbal **102** and/or the camera via the controller, the gimbal mount system **100** may include a user interface. The user interface can include buttons, displays, switches, or any other suitable interaction means.

To couple the gimbal **102** to the gimbal mount system **100**, the gimbal mount system may include a mounting interface **104** configured to receive and secure a mounting protrusion **106** of the gimbal. The mounting protrusion **106** may include structural features that allow the gimbal **102** to reciprocally mate with the mounting interface **104**, which will be described in further detail with regards to FIGS. 6-7. The gimbal mount system **100** may further include a securing mechanism for removably coupling the gimbal **102** to the gimbal mount system. In some embodiments, the communicative interface between the gimbal mount system **100** and the gimbal **102** may be located within the mounting interface **104** of the gimbal mount system.

FIGS. 2A and 2B illustrate perspective views of the gimbal mount system **100**, according to one example embodiment. The gimbal mount system **100** may serve as a handheld gimbal mount for a user, allowing the user to easily hold the gimbal while capturing images or video with the camera. As such, the gimbal mount system **100** may have an ergonomic shape such as the substantially cylindrical body illustrated in FIGS. 2A and 2B. However, the shape may vary in other embodiments such that it provides an ergonomic grip for the user. The gimbal mount system **100** may be composed of rigid materials, e.g., metal or hard plastics, that may be lightweight, waterproof, and durable.

FIG. 3 illustrates a bottom view of the gimbal mount system **100**, according to one example embodiment. In the embodiment of FIG. 3, the gimbal mount system **100** includes a communication I/O port **300** located at the base of the gimbal mount system (under a protective and removable door). In other embodiments, the I/O port **300** may be located on a side of the gimbal mount system **100**. The communication I/O port **300** may enable a user to couple the gimbal mount system **100** to an external power source, enabling the user to charge the power source of the gimbal mount system. The communication I/O port **300** may also be configured for data transmission and may enable a user to couple the gimbal mount system **100** to a computing system. In this configuration, a camera or a gimbal **102** communicatively coupled to the gimbal mount system **100** through the mounting interface **104** may in turn be communicatively coupled to the computing system via the communication I/O port **300**. For instance, this configuration may enable a user to transfer media files from the camera to the computing system via the communication I/O port **300** when the camera is coupled to the gimbal, which in turn is coupled to the gimbal mount system. In some embodiments, the communication I/O port **300** may include a protective cover (as illustrated in FIG. 3) that may create a waterproof or water-resistant seal or may protect the communication I/O port from external debris.

FIG. 4 illustrates a side view of the gimbal mount system **100**, according to one example embodiment. In some embodiments, the gimbal mount system **100** includes a kickstand **400**, a handle grip **402**, and a lanyard hole **404**. In the embodiment of FIG. 4, the kickstand **400** may be an integrated hinging surface that may or may not sit flush with an outer surface of the gimbal mount system **100** in a folded configuration. In an extended configuration, the kickstand **400** is flipped out and extends away from the surface of the gimbal mount system **100**. The extended configuration may allow a user to place the gimbal mount system **100** on a surface without laying it flat against the surface or to prop the gimbal mount system against a surface or object. This may permit the user to continue to use the gimbal hands-free without affecting the function of the gimbal. When the kickstand **400** is not in use, the user may return the kickstand to the folded configuration, such that the kickstand no longer extends away from the surface of the gimbal mount system **100**.

The handle grip **402** may be a textured area on an outer surface of the gimbal mount system **100**. The handle grip **402** may provide a comfortable, ergonomic grip for the user, allowing the user to easily hold the gimbal mount system **100**. In some embodiments, the handle grip **402** may be composed of a pliable material, e.g., rubber, silicone, or any other suitable material. The lanyard hole **404** may be configured to attach a lanyard that may help secure the gimbal mount system **100** to the user while holding the gimbal mount system. The lanyard hole **404** may also be configured to attach to tethers, wristbands, or any other suitable strap. Also illustrated in FIG. 4 is a cord **406** plugged into the communication I/O port **300** at the base of the gimbal mount system **100**. The cord **406** may charge or provide power to the gimbal mount system **100** or gimbal or may be transfer data from the gimbal mount system or gimbal to a computing system, as described with regards to FIG. 3.

FIG. 5 illustrates a user interface **500** of the gimbal mount system **100**, according to one example embodiment. In the embodiment of FIG. 5, the user interface **500** includes a set of buttons **502** configured to perform a variety of functions. These functions may include but are not limited to: power-

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ing a gimbal or camera on and off, controlling a camera shutter, selecting one or more camera or gimbal modes, tagging highlights within media (including an indicator of a moment of interest within media metadata for simplified identification in post-processing), control/locking of gimbal pitch or yaw, powering a Wi-Fi function on and off, and any other operation of a camera or a gimbal. A user may press one or more of the buttons **502** to control a function. The buttons **502** may have various behaviors, such that a short press of a button controls a first function while a long press (press and hold) controls a second function. Each button can correspond to a different camera or gimbal function.

In the embodiment of FIG. **5**, the user interface **500** also includes a set of LEDs **504**. The set of LEDs **504** may be configured to indicate one or more of: an amount of battery power remaining within the gimbal mount system; a mode, status, or characteristic of the gimbal mount system, camera, or gimbal; or any other suitable property of the gimbal mount system, gimbal, and camera. The set of LEDs **504** may provide these indications by illuminating a specific pattern or a specific number of LEDs for a specific amount or frequency of time. For example, a number of illuminated LEDs may correspond to a percentage of the remaining battery life of the gimbal mount system **100**. Similarly, a number of LEDs may flash while the gimbal mount system **100** is charging to indicate the progress of the battery charge. In addition to LEDs, the gimbal mount system can include other indicators or displays, such as LCDs, monitors, and the like.

FIG. **6A** illustrates a close-up perspective view of a mounting interface **104** of the gimbal mount system **100**, according to one example embodiment. The mounting interface **104** includes recesses configured to receive the reciprocal mounting protrusion **106** of the gimbal **102**. The configuration of the mounting interface **104** is such that it comprises two recesses **600**, **602**, wherein the recesses are each substantially C-shaped and are aligned along the respective flat planes of the C-shape. The first recess **600** has a smaller width (width **604** of FIG. **6A**) relative to the second C-shaped recess **602** (width **606** of FIG. **6A**). In addition, the first recess **600** extends a first depth into the gimbal mount system **100** (the depth between the front of the gimbal mount system and surface **608** of FIG. **6A**), and the second recess **602** extends a second depth into the gimbal mount system **100** (the depth between the front of the gimbal mount system and surface **610** of FIG. **6A**), greater than the first depth. Increased depths may provide greater stability and support of the gimbal **102** when secured to the gimbal mount system **100**. In the embodiment of FIG. **6A**, the second depth is greater than the first depth, but the depths may be equal or vice versa in other embodiments. In some embodiments, the recesses may vary in shape, given that they are structured to reciprocally mate with the mounting protrusion **106**.

FIG. **6B** illustrates a perspective view of the gimbal **102** described herein. The mounting protrusion **106** of the gimbal **102** is structured such that the geometry is complementary to the mounting interface **104** of the gimbal mount system **100**. In the embodiment of FIG. **6B**, the mounting protrusion **106** comprises two protrusions **612**, **614** that are each substantially C-shaped and are mated along the respective flat planes. The protrusions **612**, **614** extend outward from a surface **616** of the gimbal **102**. In this configuration, the protrusions **612**, **614** are configured to be inserted into the recesses **600**, **602** to reciprocally mate the mounting interface **104** and the mounting protrusion **106**. The first protrusion **612** extends less than the second protrusion **614**, accounting for the reciprocal depths of the surfaces **608** and

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610 within the mounting interface **104**, respectively. Additionally, in some embodiments, the mounting protrusion **106** of the gimbal **102** can have features on the protrusions **612**, **614**, such as foam, rubber, any sort of padding material or additional padding structures, to ensure a secure fit between the reciprocal recesses **600**, **602** and protrusions. In the embodiment of FIG. **6B**, the gimbal **102** includes a communicative interface **618** configured to align with and communicatively couple to a communicative interface (not shown) of the gimbal mount system **100**, discussed in further detail with regards to FIGS. **7A** and **7B**. The asymmetric configuration of the mounting interface **104** may ensure that the gimbal **102** is secured to the gimbal mount system **100** in a specific orientation, which may also ensure correct alignment of the communicative interface between the gimbal mount system and the gimbal **102**.

FIGS. **7A** and **7B** illustrate a communicative interface between the gimbal mount system **100** and the gimbal **102**, according to one example embodiment. In the embodiments of FIGS. **7A** and **7B**, a communication I/O port **702** is positioned within the mounting interface **104** of the gimbal mount system **100** such that the communication I/O port is exposed within and protruding from an inside bottom surface of the mounting interface. The communication I/O port **702** may be coupled to a communication bus within the gimbal mount system **100**. The communication bus may be coupled to the power source, the user interface, and the communicative interface of the gimbal mount system **100**. The communication bus may provide one or more instructions to the gimbal **102** based on user input received via the user interface **502**. The communication I/O port **702** may be positioned such that when a gimbal **102** is coupled to and secured to the gimbal mount system **100**, the communication I/O port **702** may communicatively couple to a communication I/O port within the gimbal, such as communicative interface **618** of FIG. **6**. As previously mentioned, the communication I/O port **300** of the gimbal mount system **100** may enable a user to couple the gimbal mount system to a computing system. Through the communicative interface between the gimbal mount system **100** and the gimbal **102**, the gimbal and/or the camera may also be communicatively coupled to the computing system. For instance, the communicative interface may enable a user to transfer media files from the camera to the computing system. In addition, the communication bus of the gimbal mount system **100** may be electrically coupled to the power source of the gimbal **102** and may act as a power bus for the gimbal. In some embodiments, the gimbal mount system **100** may include a power source, such as a battery, and may provide power from the power source to the gimbal **102** and/or camera via a power bus between the power source and the gimbal. In some embodiments, the power bus is a communication bus with one or more power lines within the communication bus, for instance in embodiments where the communication bus is a USB Type-C bus.

It should be noted that in some embodiments, a camera coupled to a gimbal can identify moments of interest within captured media based on patterns of motion data measured during the capture of the media. As the gimbal is configured to counter such motion, the gimbal can further be configured to provide information across the communicative interface to the gimbal mount system **100** describing such motion to the camera and the gimbal mount system, beneficially enabling the camera (or a media processing system that receives captured media from the gimbal mount system and/or camera) to identify such moments of interest without the camera experiencing such motion itself.

In some embodiments, the gimbal mount system **100** may further include a suspension system for the communicative interface within the gimbal mount system. In the embodiments of FIGS. **7A** and **7B**, the suspension system is configured to enable the gimbal mount system **100** to flexibly couple to the gimbal **102** while maintaining a communicative interface between the gimbal mount system and the gimbal during movement or misalignment of the gimbal relative to the gimbal mount system. In the embodiments of FIGS. **7A** and **7B**, the suspension system may include a spring plate **704**. The spring plate **704** may be inserted in front of, adjacent to, or behind the communication I/O port **702** protruding from the gimbal mount system **100**. The spring plate **704** may include a plurality of protrusions **706** that are capable of suspending the communication I/O port **702** or the communication bus from a circuit or other electronic interface, or any other surfaces within the gimbal mount system **100**. In the embodiments of FIGS. **7A** and **7B**, the plurality of protrusions **706** are capable of bending or flexing to account for tri-directional movement of the communicative interface between the gimbal **102** and the gimbal mount system **100**, thereby beneficially isolating the communicative interface from vibrations or external forces. The plurality of protrusions **706** may also be capable of accommodating for alignment mismatch between the gimbal **102** and the gimbal mount system **100**. Such a spring plate **704** beneficially enables the communicative interface to flex relative to the gimbal mount system **100** while maintaining the connection between the gimbal **102** and the gimbal mount system via the communicative interface. In addition, the communicative interface of the gimbal mount system **102** can be surrounded by a foam layer, such as foam layer **708**. In some embodiments, the foam layer **708** may serve as a spacer between the communication I/O port **702** and the mounting interface **104**, may help to absorb vibration or external forces, or may establish a waterproof or water-resistant seal between the communicative interface and the outside surface of the gimbal mount system. The foam layer **708** may be composed of any suitable compliant material.

FIGS. **8A** and **8B** illustrate the features of a locking collar **802** of the gimbal mount system **100**, according to one example embodiment. The gimbal mount system **100** comprises a chassis **800** and a locking collar **802** configured to couple to a distal end of the chassis. In the embodiments of FIGS. **8A** and **8B**, the locking collar **802** is a ring structured such that the inner diameter substantially sheaths the distal end of the chassis **800** when coupled. The mounting interface **104** begins at the distal end of the chassis **800** and extends into the body of the chassis, aligning with the inner diameter of the locking collar **802** when coupled to the chassis. Surrounding the ring is a plurality of protrusions **804** extending outwardly normal from a bottom surface of the locking collar **802**. Each protrusion **804** comprises a wedge **806** structured such that a flat edge of the wedge mates with a reciprocal ridge **808** on the chassis **800**. When the locking collar **802** is coupled to the chassis **800**, each of the plurality of wedges **806** is secured underneath the ridge **808**, preventing the locking collar **802** from being removed from the chassis. The chassis **800** further comprises a protruding surface **810** around the outer circumference of the chassis, which allows the locking collar **802** to abut and rotate around the protruding surface while secured. This configuration allows the locking collar **802** to rotate from a locked configuration to an unlocked configuration, and vice versa. In the embodiments of FIGS. **8A** and **8B**, the angle of rotation is 45 degrees, but it may vary in other embodiments,

e.g., between 10-180 degrees. In the embodiment of FIGS. **8A** and **8B**, the locking collar **802** further comprises a plurality of ribs **812** located along the circumference of the inner ring. Each rib **812** includes a rounded detent feature **814** that is configured to mate with a reciprocal dimple on a gimbal.

FIGS. **9A** and **9B** illustrate a locking mechanism for securing the gimbal **102** to the gimbal mount system **100**, according to one example embodiment. In the embodiment of FIG. **9A**, the mounting protrusion **106** of the gimbal **102** comprises a plurality of alignment features **900** and a plurality of detented ramps **902**. The alignment features **900** may be configured to serve as guides as the mounting protrusion **106** is inserted into the mounting interface **104** of the gimbal mount system **100**. In some embodiments, the alignment features **900** may include padding material **910** or padding structures **910** to ensure a secure fit between the mounting protrusion **106** and the mounting interface **104**. Each detented ramp **902** is structured such that the ramp ramps up to a plateau **906** that comprises a dimple **908** within in the plateau. At a lower portion of each detented ramp **902** is an opening **908** that is configured to align with the ribs **812** of the locking collar **802** when the mounting protrusion **106** has been inserted into the mounting interface **106**. In this position, the gimbal **102** and the gimbal mount system **100** are in the unlocked configuration, wherein the mounting protrusion **106** is reciprocally mating with the mounting interface **106**, but the gimbal is not secured to the gimbal mount system.

To secure the gimbal **102** to the gimbal mount system **100**, a user rotates the locking collar **802** by 45 degrees from the unlocked configuration to the locked configuration. As noted above, the degree of rotation may vary in other embodiments. As the locking collar **802** is rotated, the plurality of ribs **812** slide up respective detented ramps **902** until each rib **812** (and specifically, the rounded detent feature **814** of each rib) mates with a respective dimple **906** such that the rounded detent feature is inserted into and abuts a surface of the reciprocal dimple. To uncouple the gimbal **102** from the gimbal mount system **100**, the locking collar **802** is rotated in the opposite direction, the plurality of rounded detented features **814** are displaced from the respective dimples **906**, and the locking collar transitions to the unlocked configuration, allowing the gimbal to be removed from the gimbal mount system. This configuration of the locking mechanism allows a user to quickly secure the gimbal **102** to the gimbal mount system **100** without the use of a tool set.

FIGS. **10A** and **10B** illustrate an adapter **1000** for coupling the gimbal mount system **100** to various mount components within a camera mount ecosystem, according to one example embodiment. As illustrated in FIG. **10A**, the gimbal **102** and the gimbal mount system **100** have been mounted to an extension arm **1002** via the adapter **1000**. In the embodiments of FIGS. **10A** and **10B**, the adapter **1000** includes a shaft collar **1004** that is substantially ring-shaped and is configured to securely enclose a structure of the gimbal **102**. The adapter **1000** includes an integrated hinge **1006** and lever **1008**. When the lever **1008** is in an unlocked position, a user can slide the adapter **1000** onto a shaft of a gimbal **102**. Once the adapter **1000** has been positioned on the shaft of the gimbal **102**, the user rotates the lever **1008** to the locked position, causing the shaft collar **1004** to exert compressive forces onto the shaft of the gimbal and securing the adapter to the gimbal. In some embodiments, the adapter **1000** has a plurality of protrusions **1010** protruding outward from an exterior surface of the ring that are configured to couple to a reciprocal mount component. In the embodiment

of FIG. 10B, each protrusion 1010 comprises a hole 1012 at the distal end of the protrusion. The protrusions 1010 on the adapter 1000 can interlock with a plurality of protrusions of a reciprocal mount such that the holes of each set of protrusions are aligned along an axis and such that a screw or pin can be inserted into the aligned holes, rotatably securing the adapter to the reciprocal mount component. The adapter beneficially enables the gimbal mount system to couple to existing camera mounts, such as pole mounts, head/chest/wrist mounts, bike/surfboard/car tripods, rotating tables, or any other suitable mount. It should be noted that although the adapter 1000 of FIGS. 10A and 10B is configured to couple to the gimbal 102 itself, in other embodiments, the adapter can be configured to securely enclose a portion of the gimbal mount system 100, which in turn is configured to couple to the gimbal. The configuration of adapter 1000 is designed to be easy-to-use and easy-to-remove and does not require the use of a tool set.

FIG. 11 illustrates the gimbal mount system 100 coupled to an extension arm 1100 that couples the gimbal 102, according to one example embodiment. As illustrated in FIG. 11, a first end of the extension arm 1100 mates with the mounting interface 104 of the gimbal mount system 100 while a second end of the extension arm mates with the mounting protrusion 106 of the gimbal 102. Each respective end of the extension arm 1100 may be structured to reciprocally mate with the mounting interface 104 and the mounting protrusion 106. It should be noted that the gimbal mount system 100 can couple to any component configured to secure to the gimbal 102 using the locking mechanism described above with regards to FIGS. 8-9. Such components preferably include a communication/power bus thereby enabling the components to communicatively couple the gimbal mount system 100 to the gimbal 102.

Additional Configuration Considerations

Throughout this specification, some embodiments have used the expression “coupled” along with its derivatives. The term “coupled” as used herein is not necessarily limited to two or more elements being in direct physical or electrical contact. Rather, the term “coupled” may also encompass two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other, or are structured to provide a thermal conduction path between the elements.

Likewise, as used herein, the terms “comprises,” “comprising,” “includes,” “including,” “has,” “having” or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus.

In addition, use of the “a” or “an” are employed to describe elements and components of the embodiments herein. This is done merely for convenience and to give a general sense of the invention. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

Finally, as used herein any reference to “one embodiment” or “an embodiment” means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment.

Upon reading this disclosure, those of skilled in the art will appreciate still additional alternative structural and functional designs for camera gimbal mount systems as disclosed from the principles herein. Thus, while particular embodiments and applications have been illustrated and described, it is to be understood that the disclosed embodiments are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation and details of the method and apparatus disclosed herein without departing from the spirit and scope defined in the appended claims.

The invention claimed is:

[1. A gimbal mount system configured to couple to a gimbal, the gimbal configured to secure a camera, the gimbal mount system comprising:

- a handle;
- a power source located within the handle;
- a display located on an outer surface of the handle;
- a mounting interface located within an end of the handle, the mounting interface securely coupling the gimbal to the gimbal mount system;
- a communication interface located within the handle and configured to couple to a reciprocal communication interface of the gimbal and of the camera; and
- a communication bus coupled to the power source, the display, and the communication interface, the communication bus configured to provide power from the power source to the gimbal and to the camera and configured to provide one or more instructions based on a user input received via the display to the gimbal and to the camera.]

[2. The gimbal mount system of claim 1, further comprising:

- a kickstand configured to extend from the handle.]

[3. The gimbal mount system of claim 1, further comprising:

- a second communication interface located within the handle, the second communication interface communicatively coupled to the communication bus and configured to couple to one or more of an external power source and an external computing system.]

[4. The gimbal mount system of claim 1, wherein the one or more instructions comprises one or more of:

- powering the gimbal on and off, controlling a camera shutter, selecting a camera mode or a gimbal mode, tagging a moment of interest within media captured by the camera, and controlling a pitch or yaw of the gimbal.]

[5. The gimbal mount system of claim 1, further comprising:

- an adapter configured to couple to the gimbal mount system, the adapter configured to couple with a reciprocal mount component, thereby coupling the gimbal mount system to the reciprocal mount component.]

[6. The gimbal mount system of claim 1, wherein the mounting interface comprises:

- a recess extending into the handle;
- the recess comprises a diameter and extends from an opening proximate the end at a depth.]

[7. The gimbal mount system of claim 1, wherein the gimbal mount system is removably coupled to both the gimbal and the camera securely coupled together as a single device.]

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[8. A system, comprising:

a gimbal mount system comprising a handle, a power source within the handle, a display located on an outer surface of the handle, and a mounting interface located within a distal end of the handle; and

a camera system configured to removably couple to the gimbal mount system via the mounting interface, the camera system comprising a gimbal securely coupled to a camera.]

[9. The system of claim 8, wherein the mounting interface comprises an opening for receiving a reciprocal mounting protrusion of the gimbal and a recess comprising a first diameter and extending.]

[10. The system of claim 9, wherein the reciprocal mounting protrusion comprises:

a protrusion of substantially the first diameter and a first length,

wherein the reciprocal mounting protrusion is configured for insertion into the mounting interface such that the protrusion is inserted into the recess.]

[11. The system of claim 8, wherein the reciprocal mounting protrusion comprises padding structures to securely fit the reciprocal mounting protrusion within the mounting interface.]

[12. The system of claim 9, wherein the gimbal mount system further comprises a locking collar located at the distal end of the body, the locking collar comprising an opening substantially aligned with the opening of the mounting interface such that the gimbal is securely coupled to the gimbal mount system.]

[13. The system of claim 8, wherein the gimbal is configured to provide information across the communication interface to the gimbal mount system thereby enabling the camera to identify moments of interest within captured media, the information including patterns of motion data measured during the capture of media.]

[14. The system of claim 13, wherein the information comprises patterns of motion data measured during the capture of media.]

[15. The system of claim 8, wherein the outer surface is a front side of the handle, the display comprising any of a LED display, a LCD display, a monitor, and any combination thereof.]

[16. The system of claim 8, wherein the gimbal mount system further comprising a user interface located on the outer surface of the handle.]

[17. The system of claim 8, wherein a communication interface is located within the gimbal mount system and is configured to couple to a reciprocal communication interface of the camera system.]

[18. The system of claim 17, wherein the communication interface comprises a suspension system that allows the communication interface to flexibly pivot in one or more directions.]

19. A gimbal mount system configured to couple to a gimbal that is adapted to secure a camera, the gimbal mount system comprising:

a handle comprising:

a power source;

a communication interface configured to communicate with the gimbal and the camera; and

a mounting interface configured to connect the handle to the gimbal, wherein the mounting interface comprises:

a recess that receives a portion of the gimbal; and ribs within the recess that are configured to mate with the portion of the gimbal; and

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the gimbal comprising:

a protrusion that directly connects the gimbal to the handle;

alignment features extending along an exterior of the protrusion that assist in guiding the protrusion into the recess to form a connection;

padding material or padding structures within the alignment features to provide a secure fit between the protrusion and the alignment features; and

a communication bus coupled to the power source, a display, and the communication interface, the communication bus configured to provide power from the power source to the gimbal and to the camera and configured to provide one or more instructions based on a user input received via the display to the gimbal and to the camera;

wherein the one or more instructions comprises one or more of:

powering the gimbal on and off, controlling a camera shutter, selecting a camera mode, selecting a gimbal mode, tagging a moment of interest within media captured by the camera, controlling a pitch of the gimbal, or controlling a yaw of the gimbal.

20. The gimbal mount system of claim 19, wherein the ribs comprise a rounded detent that is configured to fit within the portion of the gimbal.

21. The gimbal mount system of claim 20, wherein the recess extends into an end of the handle, and wherein the recess comprises:

a diameter and

a depth that extends from an opening proximate the end.

22. The gimbal mount system of claim 19, further comprising:

a second communication interface, the second communication interface communicatively coupled to the communication bus and configured to couple to at least one of an external power source or an external computing system.

23. The gimbal mount system of claim 19, further comprising:

a kickstand configured to extend from the handle.

24. The gimbal mount system of claim 19, further comprising:

an adapter configured to couple to both the gimbal mount system and a reciprocal mount component thereby coupling the gimbal mount system to the reciprocal mount component.

25. A system, comprising:

a gimbal mount system comprising:

a handle, and

a mounting interface located within the handle;

a camera system comprising:

a gimbal integrated with a camera, the camera system configured to couple to the gimbal mount system via the mounting interface; and

an adapter connected to the gimbal, wherein the adapter comprises:

an opening extending around a portion of the gimbal; and

protrusions extending from the adapter that are configured to interlock with protrusions of a reciprocal mount.

26. The system of claim 25, wherein the mounting interface includes an opening for receiving a protrusion of the gimbal, and wherein the protrusion extends into a recess of the mounting interface to form a connection between the handle and the gimbal.

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27. The system of claim 26, wherein the gimbal mount system further comprises: a locking mechanism including another opening substantially aligned with the opening of the mounting interface such that the gimbal is securely coupled to the gimbal mount system.

28. The system of claim 26, wherein the adapter further comprises:

an integrated hinge, and

a lever movably connected to the integrated hinge so that the lever is movable between a locked position and an unlocked position.

29. The system of claim 25, wherein the gimbal mount system further comprises:

a power source within the handle;

a display located on an outer surface of the handle; and

a communication interface located within the handle that is configured to communicate with the camera system.

30. The system of claim 29, wherein the display is an LED display, an LCD display, a monitor, or any combination thereof.

31. The system of claim 29, wherein the gimbal mount system further comprises:

a communication bus coupled to the power source, the display, and the communication interface, the communication bus configured to provide power from the power source to the camera system.

32. The system of claim 29, wherein the gimbal is configured to provide information across the communication interface to the gimbal mount system thereby enabling the camera to identify moments of interest within captured media, and

wherein the information includes patterns of motion data that are measured during capture of the captured media.

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33. The system of claim 32, wherein the information includes patterns of motion data measured during capture of the captured media.

34. The system of claim 25, wherein the gimbal mount system further comprises:

a kickstand configured to extend from the handle.

35. The system of claim 28, wherein the adapter extends around a shaft of the gimbal, and wherein the lever when in the locked position exerts compressive forces on the shaft of the gimbal.

36. A system, comprising:

an imaging device;

a gimbal secured to the imaging device, the gimbal comprising:

a protrusion; and

detented ramps located on the protrusion and extending up to a plateau; and

a handle comprising:

a mounting interface secured to the gimbal, wherein the mounting interface comprises:

a recess that directly receives the protrusion of the gimbal so that the recess is configured to mechanically mate with protrusion of the gimbal; and

ribs located within the recess that are configured to align with and extend into the detented ramps so that the handle and the gimbal are connected when the rib extends over a detent on the detented ramps; and

buttons electrically connected to the gimbal and the imaging device so that the gimbal and/or the imaging device are controllable via the buttons on the handle.

37. The system of claim 36, wherein the plateau includes a dimple.

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