United States Patent Application Publication	20250255468
Kind Code	A1
Publication Date	August 14, 2025
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SYSTEMS, DEVICES, AND RELATED METHODS FOR COUPLING MEDICAL DEVICES

Abstract

Systems, devices, and related methods for coupling medical devices are described. A medical system may include a first medical device having a handle and a shaft extending distally from the handle, and may include a second medical device including a handle having an actuator and a shaft extending distally from the handle. The actuator may be configured to deflect the shaft of the second medical device. The medical system may further include an attachment device that may be configured to removably couple the first medical device to the second medical device. The attachment device may include a linkage that may be configured to be coupled to the actuator. The linkage may be external to the handle of the second medical device. The linkage may include a lever and movement of the lever may be configured to articulate the actuator of the second medical device.

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Appl. No.: **19/048245**

Filed: **February 07, 2025**

Related U.S. Application Data

us-provisional-application US 63552727 20240213

Publication Classification

Int. Cl.: **A61B1/018** (20060101)

U.S. Cl.:

CPC **A61B1/018** (20130101);

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application claims the benefit of priority to U.S. Provisional Application No. 63/552,727, filed on Feb. 13, 2024, which is incorporated by reference herein in its entirety.

TECHNICAL FIELD
[0002] Various aspects of this disclosure relate generally to systems, devices, and methods for coupling medical devices. In particular, aspects of this disclosure relate to systems, devices, and methods for coupling medical devices for accessing a body lumen and/or delivering medical instruments to a body lumen.
BACKGROUND
[0003] During medical procedures, such as endoscopy procedures, an operator may insert a medical device into a patient, and guide that medical device through tortuous anatomy for positioning the device at a target treatment site in the body. For example, an operator may insert a bronchoscope into lung passages to diagnose and/or treat the lungs. Accessing anatomy of small sizes, e.g., bronchioles of a lung, may present challenges to the device accessing the target treatment site. For example, a bronchoscope may have a diameter that is larger than a diameter of certain bronchioles.
SUMMARY
[0004] Each of the aspects disclosed herein may include one or more aspects of the features described in connection with any of the other disclosed aspects.
[0005] According to some aspects of the present disclosure, a medical system may include a first medical device having a handle and a shaft extending distally from the handle. The medical system may include a second medical device including a handle having an actuator and a shaft extending distally from the handle. The actuator may be configured to deflect the shaft of the second medical device. The medical system may also include an attachment device configured to removably couple the first medical device to the second medical device. The attachment device may include a linkage that may be configured to be coupled to the actuator. The linkage may be external to the handle of the second medical device. The linkage may include a lever and movement of the lever may be configured to articulate the actuator of the second medical device.
[0006] According to some aspects, the attachment device may include a housing that may be movably coupled to one or more elements of the linkage. The attachment device may further include a channel for receiving the second medical device. In some examples, the attachment device may be removably coupled to the first medical device and the second medical device. In some examples, the attachment device may be configured such that an actuator of the first medical device and the lever of the attachment device may be actuatable by a single hand of a user. In some examples, the linkage may further include a first arm, a second arm, and a third arm movably coupled to one another. In some examples, a first end of the lever may be free and a second end of the lever may be coupled to a first end of the first arm. A second end of the first arm may be coupled to a first end of the second arm. A second end of the second arm may be coupled to a first end of the third arm. A second end of the third arm may be coupled to the actuator of the second medical device. In some examples, the third arm may have an arcuate shape. In some examples, the

second end of the lever may be coupled to the first end of the first arm via a first pin which may be movable within a first slot of a housing of the attachment device. The second end of the first arm may be coupled to the first end of the second arm via a second pin which may be movable within a second slot of the housing. In some examples, the first slot and the second slot may extend parallel to one another. In some examples, the second end of the second arm may be coupled to the first end of the third arm via a hinge. In some examples, the hinge may be a living hinge. In some examples, the lever may include a contact element positioned outside of the housing of the attachment device. In some examples, the contact element may have a C or U shape. In some examples, the contact element may have a ring shape. In some examples, the linkage may further include a spring coupled to the lever and the spring may be configured to bias the lever to a relaxed state.

[0007] According to some aspects of the present disclosure, a medical system may include a first medical device having a handle coupled to a shaft and an actuator for deflecting the shaft of the first medical device. The medical system may include a second medical device having a handle, a shaft coupled to the handle, and an actuator for deflecting the shaft of the second medical device. The medical system may also include one or more attachment devices coupling the handle of the second medical device to a proximal portion of the handle of the first medical device, such that the actuator of the second medical device may be positioned on a first side of the handle of the first medical device. The actuator of the first medical device may be positioned on a second side of the handle of the first medical device. The first side may be opposite to the second side. The actuator of the second medical device and the actuator of the first medical device may be actuatable by a single hand of a user. In some examples, the one or more attachment devices may couple to a wheel of the actuator of the first medical device. In some examples, the actuator may be a lever angled towards the handle of the first medical device in a configuration in which the one or more attachment devices may couple the handle of the second medical device to the handle of the first medical device.

[0008] According to some aspects of the present disclosure, a medical system may include a first medical device having a handle coupled to a shaft and a second medical device. The second medical device may include a shaft and a handle coupled to the shaft. The handle of the second medical device may include a handle body, an actuation mechanism which may be for deflecting the shaft of the second medical device, and an attachment device that may be configured to couple the handle body of the second medical device to the handle of the first medical device. The handle of the second medical device may have a substantially “V” shape. In some examples, a distal portion of the handle body and the attachment device may extend away from a proximal portion of the handle body, and the proximal portion of the handle body may include the actuation mechanism.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0009] The accompanying drawings, which are incorporated in and constitute a part of this application, illustrate exemplary aspects of this disclosure and together with the description, serve to explain the principles of the present disclosure.

[0010] FIG. **1** illustrates an exemplary first medical device, in accordance with some aspects of the present disclosure.

[0011] FIG. **2**A illustrates an exemplary medical system including the first medical device of FIG. **1** coupled to an exemplary second medical device, in accordance with some aspects of the present disclosure.

[0012] FIG. **2**B illustrates an exemplary actuation mechanism of the exemplary medical system of FIG. **2**A.

[0013] FIG. **3** illustrates an exemplary medical system including the first medical device of FIG. **1** coupled to another exemplary second medical device, in accordance with some aspects of the present disclosure.
[0014] FIG. **4** illustrates an exemplary medical system including the first medical device of FIG. **1** coupled to another exemplary second medical device, in accordance with some aspects of the present disclosure.
[0015] FIG. **5** illustrates an exemplary medical system including the first medical device of FIG. **1** coupled to yet another exemplary second medical device, in accordance with some aspects of the present disclosure.
[0016] FIGS. **6**A-**6**B illustrate an exemplary medical system including the first medical device of FIG. **1** coupled to another exemplary second medical device, in accordance with some aspects of the present disclosure.
[0017] FIG. **7** illustrates an exemplary medical system including the first medical device of FIG. **1** coupled to yet another exemplary second medical device, in accordance with some aspects of the present disclosure.
[0018] FIGS. **8**A-**8**B illustrate an exemplary medical system including the first medical device of FIG. **1** coupled to a further exemplary second medical device, in accordance with some aspects of the present disclosure.

DETAILED DESCRIPTION

[0019] Particular aspects of the present disclosure are described in greater detail below. The terms and definitions provided herein control, if in conflict with terms and/or definitions incorporated by reference.
[0020] The terms “proximal” and “distal” are used herein to refer to the relative positions of the components of exemplary medical devices. As used herein, “proximal” refers to a position relatively closer to the exterior of the body or closer to an operator using the medical device. In contrast, “distal” refers to a position relatively further away from the operator using the medical device, or closer to the interior of the body.
[0021] As used herein, the terms “comprises,” “comprising,” “including,” “includes,” “having,” “has,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements, but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. The term “exemplary” is used in the sense of “example,” rather than “ideal.” Relative terms such as “about,” “substantially,” and “approximately,” etc., are used to indicate a possible variation of ±10% of the stated numeric value or range.
[0022] Although bronchoscopes are referenced herein for illustration purposes, it will be appreciated that the disclosure encompasses any suitable medical device configured to allow an operator to access and view internal body anatomy of a subject (e.g., patient) and/or to deliver medical instruments or accessory devices, such as, for example, biopsy forceps, graspers, baskets, snares, probes, scissors, retrieval devices, lasers, and other tools, into the subject's body. The medical devices herein may be inserted into a variety of body lumens and/or cavities, such as, for example, lungs, the urinary tract, or gastrointestinal tract. It will be appreciated that, unless otherwise specified, endoscopes, duodenoscopes, gastroscopes, endoscopic ultrasonography (“EUS”) scopes, colonoscopes, ureteroscopes, laparoscopes, cystoscopes, aspiration scopes, sheaths, catheters, or any other suitable delivery device or medical device may be used in connection with the features described herein.
[0023] Features of the medical systems herein may improve navigation through tortuous body anatomy (e.g., bronchioles of a lung) and/or accessibility to smaller body lumens. According to some aspects of the present disclosure, the medical system may include an accessory scope device coupled to a primary scope device (e.g., a bronchoscope). The accessory scope device may have a reduced profile, and may have a shaft that is sized and shaped to be received within a working

lumen of the primary scope device. During an exemplary medical procedure, the primary scope device may be used to position the accessory scope device at or proximate a target site. The primary scope device may provide structural support to the accessory scope device as the accessory scope device is navigated to or through tortuous anatomy. The accessory scope device may include a working lumen sized and shaped to receive medical instruments of varying sizes to facilitate a medical procedure and/or to deliver suction.

[0024] Features of the medical systems herein may improve the ergonomics and/or usability of the accessory scope device and the primary scope device. For example, features of the medical systems herein may allow an operator to control or actuate both the accessory scope device and the primary scope device using a single hand, simultaneously or independently. According to some aspects of the present disclosure, the accessory scope device may be coupled to the primary scope device via an attachment device. The attachment device may be or may include, e.g., clips or straps. Other suitable examples of attachment devices that may be used to couple the accessory scope to the primary scope are described in U.S. Pat. No. 8,353,493, the entire disclosure of which is hereby incorporated by reference. The accessory scope device may have a shape complementary to the shape of the primary scope device to further facilitate coupling the accessory scope device to the primary scope device. According to some aspects of the present disclosure, the attachment device may include an actuation assembly coupled to an actuation mechanism of the accessory scope for articulating a distal end of the accessory scope.

[0025] Reference will now be made in detail to examples of the present disclosure described above and illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0026] FIG. **1** illustrates an exemplary primary scope device **102** (e.g., a bronchoscope) having a handle **104** and a shaft **106** extending distally from handle **104**. A stress relief portion **124** may bridge handle **104** and shaft **106**. Shaft **106** may be at least partially flexible to facilitate navigation of shaft **106** through tortuous anatomical passages in the body. Shaft **106** may include a distal end portion that terminates at a distal tip **108**. Distal tip **108** may include an imaging device (e.g., camera, imager, etc.), one or more light sources (e.g., LEDs, fiber optics, etc.), and an opening in communication with a working lumen extending through shaft **106** and to a port **120** on handle **104**. An operator (i.e., a user) may remove a cap or seal **128** from port **120**, and may insert a medical instrument or other device into port **120** and may extend the medical instrument or other device distally through the working lumen of scope device **102**. Handle **104** may include a grip portion **126**, which may allow an operator to grasp handle **104** during a medical procedure.

[0027] Handle **104** may include an actuation mechanism **109** having a lever **112** and a wheel **114** (e.g., a cam wheel) on handle **104** to facilitate articulation, steering, and/or deflection of shaft **106** and distal tip **108** (e.g., 180 degree articulation). Handle **104** may also include a button **116** for image capture (e.g., capture video and/or still images from the imaging device at distal tip **108**) and a valve **118** to control suction, e.g., to provide air and/or water suction through the working lumen of scope device **102**. Handle **104** may be coupled to an umbilicus **122**. Umbilicus **122** may extend from handle **104** to one or more auxiliary devices. The one or more auxiliary devices may include a controller or control system, an imaging system, a power supply, a display, etc.

[0028] FIG. **2**A illustrates a medical system **200** that includes primary scope device **102** (e.g., a first medical device) coupled an accessory scope device **201** (e.g., a second medical device). Accessory scope device **201** may include a handle **204**, a shaft **206**, and a stress relief portion **224**. Handle **204** may include any of the features of handle **104**, and shaft **206** may include any of the features of shaft **106**, unless otherwise specified herein. For example, handle **204** may include an actuation mechanism **209** having a lever **212** coupled to a wheel **214** (e.g., a cam wheel), a port **220** in communication with a working lumen of shaft **206**, and a cap or seal **228**.

[0029] Shaft **206** of accessory scope device **201** may be sized and shaped to be received within port **120** and the working lumen of shaft **106** of primary scope device **102**. For example, the working

lumen of shaft **106** of primary scope device **102** may have a working lumen width of approximately 1.0 mm to approximately 2.6 mm. Shaft **206** of accessory scope device **201** may accordingly have an outer diameter/width that ranges from less than 1.0 mm to less than 2.6 mm. A length of shaft **206** may be such that shaft **206** may be passed through the working lumen of shaft **106** of primary scope device **102** and extended from an opening in distal tip **108** of primary scope device **102**.

[0030] Medical system **200** includes an attachment device **230** for coupling accessory scope device **201** to primary scope device **102**. Attachment device **230** may be removably coupled to primary scope device **102**, e.g., at a proximal portion **111** of handle **104** on a side of handle **104** opposite of lever **112**. Attachment device **230** may also be removably coupled to accessory scope device **201**. Alternatively, attachment device **230** may be integral with handle **204**.

[0031] In examples, attachment device **230** may include a channel **238** configured to receive handle **204** of accessory scope device **201**. Channel **238** may be at least partially defined by a first coupler **234***a* and a second coupler **234***b*. A longitudinal axis of channel **238** may extend approximately parallel to a longitudinal axis of handle **104** when attachment device **230** is coupled to primary scope device **102**. First and second couplers **234***a*, **234***b* may be used to secure handle **204** in place and to maintain a position of handle **204** relative to handle **104** (e.g., parallel to one another). As shown in FIG. **2**A, a proximal portion **215** of handle **204** may be proximal of proximal portion **111** of handle **104** and a distal portion **217** of handle **204** is proximal of a distal portion **113** of handle **104**. In examples, first and second couplers **234***a*, **234***b* may be clips or pincers, such that handle **204** of accessory scope device **201** may be clipped into channel **238**.

[0032] Attachment device **230** may include an actuation assembly **236** with portions of actuation assembly **236** being contained within housing **232** of attachment device **230**. Actuation assembly **236** may be coupled to actuation mechanism **209** (i.e., lever **212** and/or wheel **214**) of accessory scope device **201** to control articulation of shaft **206**. FIG. **2**B shows a view of attachment device **230** that shows details of actuation assembly **236**. For example, FIG. **2**B may show a back side of attachment device **230** or attachment device with a portion of housing **232** removed.

[0033] Actuation assembly **236** may include a lever **244**, a first arm **246***a*, a second arm **246***b*, and a third arm **246***c* movably coupled to one another for moving lever **212** (e.g., in an upward or downward direction). For example, third arm **246***c* may be coupled to lever **212**. As discussed in further detail below, portions of lever **244** may have a bent shape, first arm **246***a* and third arm **246***c* may have a straight shape, and second arm **246***b* may have an arcuate shape. Lever **244**, first arm **246***a*, second arm **246***b*, and third arm **246***c* may together form a linkage assembly, which may be external to primary scope device **102** and accessory scope device **201**.

[0034] Lever **244** may be pivotable about a pivot point **263** in a direction M or a direction O. Pivot point **263** may include a pin, rivet, or similar structure that is directly or indirectly coupled to housing **232**. Lever **244** may include a contact element **245** at a first end **255***a* (e.g., end **255***a* may be a free end). Contact element **245** may extend outside of housing **232**, such that contact element **245** may be accessible to a hand of an operator. Contact element **245** may have a C or U shape. For example, an operator may place or rest a finger on contact element **245** and apply a force to contact element **245** to depress lever **244** in direction M. Actuation assembly **236** may include a tension spring **248** or other resilient member (e.g., coil spring, leaf spring, etc.) to urge or move lever **244** in direction O when, e.g., an operator stops applying a force to contact element **245**. In other words, tension spring **248** may bias lever **244** to a relaxed/fully released configuration (i.e., a relaxed state). Alternatively, actuation assembly **236** may exclude tension spring **248**, and contact element **245** may have a ring shape to allow an operator to move lever **244** in direction O using, e.g., the nail side of their finger. In another alternative, actuation assembly **236** may include tension spring **248**, and contact element **245** may have a ring shape. In some examples, a bent shape of lever **244** may increase a mechanical advantage of lever **244** and/or provide a more ergonomic location of contact element **245**.

[0035] Still referring to FIG. **2**B, a second end **255***b* of lever **244** may be coupled to a first end **257***a* of first arm **246***a* via a first pin **242***a*. Although the term "pin" is used herein, it will be appreciated that the term "pin" may include rods, rivets, or the like. First pin **242***a* (and, thus, the junction of first arm **246***a* and lever **244**) may be movable within a first slot **240***a* formed in housing **232**. In some examples, first slot **240***a* may be approximately perpendicular to channel **238** and longitudinal axes of accessory scope device **201** and/or primary scope device **102**. Slot **240***a* may constrain a motion of first pin **242***a* to be within slot **240***a*.
[0036] A second end **257***b* of first arm **246***a* may be coupled to a first end **259***a* of second arm **246***b* via a second pin **242***b*. Second pin **242***b* (and, thus, a junction between first arm **246***a* and second arm **246***b*) may be movable within a second slot **240***b* formed in housing **232**. In some examples, second slot **240***b* may be approximately perpendicular to channel **238** and longitudinal axes of accessory scope device **201** and/or primary scope device **102**. Second slot **240***b* may have a smaller length than first slot **240***a*, such that second pin **242***b* is constrained to a smaller range of motion than first pin **242***a*. Slot **240***b* may constrain a motion of second pin **242***b* to be within slot **240***b*.
[0037] As shown in FIG. **2**B, slots **240***a*, **240***b* may be linear slots extending parallel to one another, and pins **242***a*, **242***b* may be movable within their respective slots **240***a*, **240***b* in directions A/B. Direction B may be opposite (e.g., approximately 180 degrees from) direction A. As shown in FIG. **2**B, when first pin **242***a* moves in direction A, second pin **242***b* may move in direction B. When first pin **242***a* moves in direction B, second pin **242***b* may move in direction A.
[0038] A second end **259***b* of second arm **246***b* may be coupled to a first end **261***a* of third arm **246***c* via a hinge **249**. A second end **261***b* of third arm **246***c* may be coupled (e.g., hingedly or fixedly coupled) to lever **212** of accessory scope device **201**. Hinge **249** may be a living hinge (e.g., second arm **246***b* and third arm **246***c* may be integral with each other to form a single piece). Alternatively, hinge **249** may include a pin, and second arm **246***b* and third arm **246***c* may be separate pieces. Second end **261***b* of third arm **246***c* may be coupled to lever **212** by any suitable means (e.g., jaws, clips, straps, etc.). In some examples (in which, second end **261***b* may be integrally formed with **212** in configurations in which attachment device **230** is integrally formed with accessory scope device **201**.
[0039] In use, movement of lever **244** in direction M about pivot point **263** may cause second end **255***b* of lever **244**, along with first pin **242***a* and first end **257***a* of first arm **246***a*, to move in direction A, within first slot **240***a*. Movement of first end **257***a* of first arm **246***a* in direction A may cause second end **257***b* of first arm **246***a*, along with second pin **242***b* and first end **259***a* of second arm **246***b*, to move in direction B within second slot **240***b*. Movement of first end **259***a* of second arm **246***b* in direction B may cause second end **259***b* of second arm **246***b* and third arm **246***c* to move in at least partially a downward direction of FIG. **2**B, which in turn moves lever **212** of accessory scope device **201** in the downward direction of FIG. **2**B. Movement of lever **244** in direction O (or towards the relaxed/fully released configuration) may move lever **212** of accessory scope device **201** in an upward direction via the above steps in reverse.
[0040] With reference to FIG. **2**A, during an exemplary medical procedure, an operator may couple accessory scope device **201** to primary scope device **102** using attachment device **230**. The operator may grasp onto handle **104** of primary scope device **102**, e.g., at grip portion **126**, with a single hand. The operator may navigate shaft **106** of primary scope device **102** to a position proximate a target site (e.g., upper and deeper bronchioles), and may then insert shaft **206** of accessory scope device **201** into port **120** of primary scope device **102** and extend shaft **206** through the working lumen of primary scope device **102**. Shaft **206** may exit the working lumen of primary scope device **102**. The operator may use their thumb (or another finger) to control lever **112** to articulate shaft **106** (and portions of shaft **206** within shaft **106**). The operator may use a finger (e.g., a finger of the same hand that controls lever **112**) to control lever **244** of actuator assembly **236** to articulate shaft **206** independently of shaft **106**. Articulation of shaft **206** may position shaft **206** at the target site (e.g., at a difficult to reach target site). The operator may actuate lever **112** and lever **212** (via lever

244) simultaneously or independently. The operator may then insert a medical instrument into port **220** and extend the instrument through a working lumen of shaft **206** and to the target site and/or deliver suction through shaft **206**.

[0041] FIG. **3** illustrates a medical system **300** that includes primary scope device **102** coupled to an accessory scope device **301**, which may have any of the features of accessory scope device **201**, unless otherwise specified herein. Accessory scope device **301** may include a handle **304**, a shaft **306**, a stress relief portion **324**, and a port **320** in communication with a working lumen of shaft **306**. Handle **304** may include an actuation mechanism **309** having a lever **312** coupled to a wheel **314** (e.g., a cam wheel) to facilitate articulation of shaft **306**.

[0042] Accessory scope device **301** may be sized and shaped to fit and/or rest against primary scope device **102**. For example, handle **304** of accessory scope device **301** may have a compact shape. Handle **304** may include surfaces complementary to surfaces of handle **104** to facilitate coupling of handle **304** to handle **104**. In other words, complementary surfaces of handle **104** and handle **304** may contact one another. For example, handle **304** may include surfaces complementary to surfaces of grip portion **126** of handle **104**. In one example, handle **304** may have a flat/straight side that faces a flat/straight side of grip portion **126**. Handle **304** may also include a curved surface **390** complementary to surfaces defining a nook **154** of handle **104**.

[0043] Handle **304** may include a strap or clamp **350** (e.g., on a side of handle **304** opposite of port **320**) for attaching accessory scope device **301** to primary scope **102**. For example, clamp **350** may attach to grip portion **126** of handle **104**. Alternatively, clamp **350** may attach to distal portion **113** of handle **104** (e.g., distal of port **120**). It will be appreciated that clamp **350** may be substituted with any suitable attachment device described above (e.g., clips, pincers, etc.).

[0044] FIG. **4** illustrates a medical system **400** that includes primary scope device **102** coupled to an accessory scope device **401**, which may have any of the features of accessory scope device **301** or **201**, unless otherwise specified herein. Accessory scope device **401** may include a handle **404**, a shaft **406**, a stress relief portion **424**, and a port **420** in communication with a working lumen of shaft **406**. Similar to handle **304**, handle **404** may include surfaces complementary to surfaces of handle **104**. For example, handle **404** may include a curved surface **490** similar to curved surface **390**. Handle **404** may have a shape that is similar to a rectangle having one or more curved corners (e.g., curved surface **490**).

[0045] In this example, handle **404** includes an actuation mechanism **409** comprising a ring **456** and an arm **467** coupled to structures internal to a housing of handle **404** for controlling articulation of shaft **406**. A housing of handle **404** may include an opening or slot, through which arm **467** may extend. An operator may move ring **456** relative to handle **404**, which in turn may move arm **467** along the opening or slot formed on handle **404** to articulate shaft **406**. Although not shown, handle **404** may include a clamp similar to clamp **350** or any other suitable attachment device for coupling handle **404** to handle **104**.

[0046] FIG. **5** illustrates a medical system **500** that includes primary scope device **102** coupled to an accessory scope device **501**, which may have any of the features of accessory scope devices **201**, **301**, **401**, unless otherwise specified herein. Accessory scope device **501** may include a handle **504**, a shaft **506**, a stress relief portion **524**, and a port **520** in communication with a working lumen of shaft **506**. Similar to handles **304**, **404**, handle **504** may include surfaces complementary to surfaces of handle **104**. For example, handle **504** may include a curved surface **590** similar to curved surfaces **390**, **490**.

[0047] In this example, handle **504** includes an actuation mechanism **509** comprising a knob **558** coupled to structure internal to handle **504** for controlling articulation of shaft **506**. An operator may rotate knob **558** relative to handle **504** to articulate shaft **506**. Although not shown, handle **504** may include a clamp similar to clamp **350** or any other suitable attachment device for coupling handle **504** to handle **104**.

[0048] FIGS. **6**A and **6**B illustrate a medical system **600** that includes primary scope device **102**

coupled to an accessory scope device **601**, which may have any of the features of accessory scope devices **201**, **301**, **401**, **501**, unless otherwise specified herein. FIG. **6**A shows a back view of medical system **600** and FIG. **6**B shows a side view of medical system **600**. Accessory scope device **601** may include a handle **604**, a shaft **606**, and a port **620** in communication with a working lumen of shaft **606**. Handle **604** may include an actuation mechanism **609** having a lever **612** coupled to a wheel **614** (e.g., a cam wheel) to facilitate articulation of shaft **606**.

[0049] Primary scope device **102** and accessory scope device **601** may be coupled to one another via a band or strap **664**. Strap **664** may wrap around portions of grip portions **126**, **626** of handles **104**, **604**. Handle **604** may include surfaces complementary to surfaces of handle **104** to further facilitate coupling of accessory scope device **601** to primary scope device **102**. For example, handle **604** may include convex side surfaces **662***a*, **662***b* complementary to concave side surfaces **160***b*, **160***a* of handle **104**, respectively. As shown in FIG. **6**A, convex side surface **662***a* of handle **604** may contact concave side surface **160***b* of handle **104**. Alternatively, handle **604** may be placed on an opposite side of handle **104**, such that convex side surface **662***b* of handle **604** may contact concave side surface **160***a* of handle **104**.

[0050] Handle **604** may be positioned relative to handle **104**, such that actuation mechanism **609** of accessory scope device **601** may be approximately aligned with actuation mechanism **109** of primary scope device **102**. In use, an operator may grasp onto both handles **104**, **604** with one hand, and may control levers **112**, **612** using their thumb or other finger(s). Alignment of levers **112**, **612** may allow the operator to more easily move their thumb back and forth from lever **112** to articulate shaft **106** to lever **116** to articulate shaft **606**. In some examples, an operator may contact levers **112**, **612** simultaneously to actuate levers **112**, **612** at the same time.

[0051] FIG. **7** illustrates a medical system **700** that includes primary scope device **102** coupled to an accessory scope device **701**. Accessory scope device **701** may include a handle **704** having any of the features of handles **204**, **304**, **404**, **504**, **604** and a shaft **706** having any of the features of shafts **206**, **306**, **406**, **506**, **606**, unless otherwise specified herein.

[0052] Handle **704** may include a clip **766** for attaching handle **704** to handle **104** of primary scope device **102**. Clip **766** may attach to proximal portion **111** of handle **104**, such that handle **704** may be on a side of handle **104** opposite of lever **112**. For example, clip **766** may attach to wheel **114** in such a manner that wheel **114** may move (rotate) relative to clip **766**. Handle **704** may extend substantially perpendicular to a longitudinal axis of handle **104** when handle **704** and handle **104** are coupled to one another. Although handle **704** is described as including clip **766**, it will be appreciated that handle **704** may include any suitable attachment device, such as those described above.

[0053] Handle **704** may include an actuation mechanism **709** having a first trigger **768***a* and a second trigger **768***b* coupled to structure internal to a housing of handle **704** for controlling articulation of shaft **706**. For example, first trigger **768***a* may be coupled to a first pull wire **770***a* and second trigger **768***b* may be coupled to a second pull wire **770***b*. First and second pull wires **770***a*, **770***b* may extend through handle **704** and through shaft **706** to facilitate articulation of shaft **706**. First and second triggers **768***a*, **768***b* may be movable within respective slots or openings of handle **704**. For example, first and second triggers **768***a*, **768***b* may be movable in proximal/distal directions relative to handle **704**. In some examples, triggers **768***a*, **768***b* may be linearly movable (e.g., may be sliders). In other examples, triggers **768***a*, **768***b* may be pivotably movable.

[0054] Movement of first trigger **768***a* in a first direction (e.g., a proximal direction) may move pull wire **770***a* in the same direction (e.g., a proximal direction). Similarly, movement of second trigger **768***b* in a second direction (e.g., a distal direction) may move second pull wire **770***b* in the same direction (e.g., a distal direction). In some examples, first trigger **768***a* and second trigger **768***b* may be simultaneously movable in opposite directions (one moved proximally and one moved distally) to articulate a distal end of shaft **706** in a first direction. In some examples, triggers **768***a* and/or **768***b* may include loops to facilitate proximal and distal movement of triggers **768***a*

and/or **768***b*. Moving first trigger **768***a* and second trigger **768***b* in respective opposite directions may articulate the distal end of shaft **706** in a second direction, opposite to the first direction. Alternatively, only one of first trigger **768***a* and second trigger **768***b* may be moved at a time. First trigger **768***a* and second trigger **768***b* may thus be used to articulate the distal end of shaft **706** in two directions. In examples, handle **704** may include additional triggers that may be used to articulate the distal end of shaft **706** in additional directions.

[0055] In use, an operator may grasp onto handle **104**, e.g., at grip portion **126**, with one hand. The operator may use their thumb to control lever **112** and other fingers of the same hand to control first and second triggers **768***a*, **768***b*. For example, the operator's fingers may wrap around grip portion **126** to actuate one or more of triggers **768***a*, **768***b*. The operator may be able to simultaneously actuate control lever **112** and first and second triggers **768***a*, **768***b*.

[0056] FIGS. **8**A and **8**B illustrate side views of a medical system **800** that includes primary scope device **102** coupled to an accessory scope device **801**. Accessory scope device **801** may include a handle **804** having any of the features of handles **204**, **304**, **404**, **504**, **604**, **704** and a shaft **806** having any of the features of shafts **206**, **306**, **406**, **506**, **606**, **706**, unless otherwise specified herein.

[0057] Handle **804** may include an attachment portion **830** and a strap **864** or other attaching mechanism for attaching and/or securing handle **804** to handle **104**. Portions of attachment portion **830** and/or strap **864** may extend substantially perpendicular to a longitudinal axis of handle **104**. Although a strap **864** is shown, it will be appreciated that, instead, handle **804** may include a clamp, pincer, or deformable housing for receiving a portion of handle **104** (such as, for example, grip portion **126**). Strap **864** may be at a distal portion **817** (e.g., near or at a distal end) of a handle body **896** of handle **804**.

[0058] Attachment portion **830** may, for example, attach and/or secure handle **804** on a side of handle **104** opposite of lever **112** (e.g., on the same side as button **116** and valve **118**). Attachment portion **830** may be positioned at a proximal portion **815** of handle body **896**. Attachment portion **830** may include openings, recesses, or holes **874***a*, **874***b* for receiving pins **178***a*, **178***b* (or other protruding portions) of handle **104**, respectively, to secure attachment portion **830** to proximal portion **111** of handle **104**. As shown in FIG. **8**B, pin **178***b* may extend from wheel **114** of handle **104**. Pin **178***a* may extend from an opposite side of handle **104** at a corresponding location to pin **178***b*. Alternatively, attachment portion **830** may include pins or other protrusions corresponding to openings, recesses, or holes of handle **104**. For example, pins **178***a*, **178***b* may instead be openings, recesses, or holes and openings, recesses, or holes **874***a*, **874***b* may instead be pins.

[0059] When attachment portion **830** is coupled to handle **104**, a distance from proximal portion **815** of handle body **896** to handle **104** may be greater than a distance from distal portion **817** of handle body **896** to handle **104**, such that handle body **896** may be angled relative to handle **104**, with handle body **896** extending away from handle **104** in a proximal direction. Handle **804**, including attachment portion **830**, may have an overall shape that is similar to a “V” or a “U.” Proximal portion **815** of handle body **896** having a lever **812** (discussed in further detail below) may be a vertex of the “V” or “U” shape, with attachment portion **830** and distal portion **817** extending away from proximal portion **815** of handle body **896**.

[0060] Handle **804** may include an actuation mechanism **809** having lever **812** coupled to wheel **814** (e.g., a cam wheel) to facilitate articulation of shaft **806**. In this example, lever **812** may extend downward from wheel **814** and toward handle **104**, e.g., toward button **116** and valve **118**, when attachment portion **830** is coupled to handle **104**. In use, lever **812** may extend downward toward an operator. Lever **812** may include a contact element **845** having a C or U shape facing handle **104** (or facing the operator during use of system **800**). Alternatively, contact element **845** may be a ring.

[0061] In use, an operator may grasp onto handle **104**, e.g., at grip portion **126**, with one hand. The operator may use their thumb to control lever **112** to articulate shaft **106** and a finger (e.g., an index finger) of the same hand to rotate lever **812** to articulate shaft **806**.

[0062] It will be apparent to those skilled in the art that various modifications and variations may

be made in the disclosed devices and methods without departing from the scope of the disclosure. Other aspects of the disclosure will be apparent to those skilled in the art from consideration of the specification and practice of the features disclosed herein. It is intended that the specification and embodiments be considered as exemplary only.

Claims

1. A medical system comprising: a first medical device including a handle and a shaft extending distally from the handle; a second medical device including a handle having an actuator and a shaft extending distally from the handle, wherein the actuator is configured to deflect the shaft of the second medical device; and an attachment device configured to removably couple the first medical device to the second medical device, the attachment device comprising a linkage that is configured to be coupled to the actuator, wherein the linkage is external to the handle of the second medical device, wherein the linkage includes a lever, and wherein movement of the lever is configured to articulate the actuator of the second medical device.
2. The medical system of claim 1, wherein the attachment device includes a housing that is movably coupled to one or more elements of the linkage, wherein the attachment device further comprises: a channel for receiving the second medical device.
3. The medical system of claim 1, wherein the attachment device is removably coupled to the first medical device and the second medical device.
4. The medical system of claim 1, wherein the attachment device is configured such that an actuator of the first medical device and the lever of the attachment device are actuatable by a single hand of a user.
5. The medical system of claim 1, wherein the linkage further includes a first arm, a second arm, and a third arm movably coupled to one another.
6. The medical system of claim 5, wherein a first end of the lever is free and a second end of the lever is coupled to a first end of the first arm, wherein a second end of the first arm is coupled to a first end of the second arm, wherein a second end of the second arm is coupled to a first end of the third arm, and wherein a second end of the third arm is coupled to the actuator of the second medical device.
7. The medical system of claim 5, wherein the third arm has an arcuate shape.
8. The medical system of claim 6, wherein the second end of the lever is coupled to the first end of the first arm via a first pin movable within a first slot of a housing of the attachment device, and wherein the second end of the first arm is coupled to the first end of the second arm via a second pin movable within a second slot of the housing.
9. The medical system of claim 8, wherein the first slot and the second slot extend parallel to one another.
10. The medical system of claim 6, wherein the second end of the second arm is coupled to the first end of the third arm via a hinge.
11. The medical system of claim 10, wherein the hinge is a living hinge.
12. The medical system of claim 2, wherein the lever includes a contact element positioned outside of the housing of the attachment device.
13. The medical system of claim 12, wherein the contact element has a C or U shape.
14. The medical system of claim 12, wherein the contact element has a ring shape.
15. The medical system of claim 1, wherein the linkage further includes a spring coupled to the lever, and wherein the spring is configured to bias the lever to a relaxed state.
16. A medical system comprising: a first medical device including a handle coupled to a shaft and an actuator for deflecting the shaft of the first medical device; a second medical device including a handle, a shaft coupled to the handle, and an actuator for deflecting the shaft of the second medical device; and one or more attachment devices coupling the handle of the second medical device to a

proximal portion of the handle of the first medical device, such that the actuator of the second medical device is positioned on a first side of the handle of the first medical device, wherein the actuator of the first medical device is positioned on a second side of the handle of the first medical device, wherein the first side is opposite to the second side, and wherein the actuator of the second medical device and the actuator of the first medical device are actuatable by a single hand of a user.

17. The medical system of claim 16, wherein the one or more attachment devices couple to a wheel of the actuator of the first medical device.

18. The medical system of claim 16, wherein the actuator is a lever angled towards the handle of the first medical device in a configuration in which the one or more attachment devices couple the handle of the second medical device to the handle of the first medical device.

19. A medical system comprising: a first medical device including a handle coupled to a shaft; and a second medical device including: a shaft; and a handle coupled to the shaft, wherein the handle includes: a handle body; an actuation mechanism for deflecting the shaft of the second medical device; and an attachment device configured to couple the handle body of the second medical device to the handle of the first medical device, wherein the handle has a substantially “V” shape.

20. The medical system of claim 19, wherein a distal portion of the handle body and the attachment device extend away from a proximal portion of the handle body, and wherein the proximal portion of the handle body includes the actuation mechanism.