



(51) International Patent Classification:

A61B 1/00 (2006.01) *A61B 1/05* (2006.01)
A61B 1/005 (2006.01) *A61B 1/06* (2006.01)
A61B 1/015 (2006.01)

(21) International Application Number:

PCT/US2020/044092

(22) International Filing Date:

29 July 2020 (29.07.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/890,166 22 August 2019 (22.08.2019) US

(71) Applicant: **BOSTON SCIENTIFIC SCIMED, INC.**

[US/US]; One Scimed Place, Maple Grove, Minnesota
55311 (US).

(72) Inventors: **RAUNIYAR, Niraj Prasad**; 15644 60th Ave
N, Plymouth, Minnesota 55446 (US). **CARLSON, Steven
T.**; 51 Hatch Avenue, St. Paul, Minnesota 55118 (US).

(74) Agent: **KAPLUN, Oleg F.** et al.; 150 Broadway, Suite 702,
New York, New York 10038 (US).

(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN,
KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO,
NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW,
SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,

(54) Title: DISPOSABLE ENDOSCOPIC DEVICE

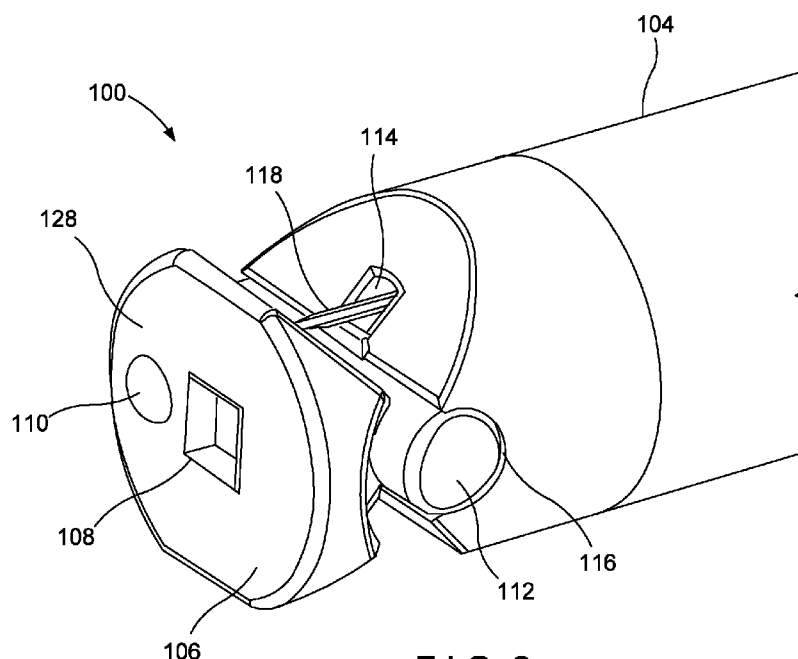


FIG. 2

(57) Abstract: An endoscopic device includes a flexible shaft extending distally from a handle which, during use remains outside a living body, the shaft comprising a pull wire extending therethrough from the handle and a distal tip rotatably coupled to a distal end of the shaft, the distal tip comprising an imager directed distally from a distal face of the distal tip, the imager including a chip and a lens, a distal end of the pull wire being coupled to the distal tip in combination with an actuation mechanism coupled to a proximal end of the pull wire so that, actuation of the actuation mechanism, pulls the pull wire proximally through the shaft rotating the distal tip relative to the shaft to alter a field of view of the imager.



GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Disposable Endoscopic Device

Inventors: Niraj Prasad RAUNIYAR and Steven T. CARLSON

5 **Priority Claim**

[0001] The present disclosure claims priority to U.S. Provisional Patent Application Serial No. 62/890,166 filed August 22, 2019; the disclosure of which is incorporated herewith by reference.

10 **Field**

[0002] The present disclosure relates to an endoscopic device and, in particular, to a disposable endoscope.

15 **Background**

[0003] Urological procedures such as cystoscopy, nephroscopy and hysteroscopy are typically performed using rod-lens systems that utilize a series of lenses in a rigid, semi-rigid or flexible reusable shaft. Such lens systems are expensive and difficult to maintain. Improper sterilization may result in decreased image quality over time, infection in subsequent procedures and an
20 increase in waste chemicals. Rod-lens systems have a fixed camera angle with respect to the distal end of the scope, typically resulting in a need to have multiple scopes available at varying angles. Additionally, valuable space in the scope of rod-lens systems is occupied by the rod lenses themselves.

25

Summary

[0004] The present disclosure relates to an endoscopic device which includes a flexible shaft extending distally from a handle which, during use remains outside a living body, the shaft comprising a pull wire extending therethrough from the handle; a distal tip rotatably coupled to a
30 distal end of the shaft, the distal tip comprising an imager directed distally from a distal face of the distal tip, the imager including an imager chip and a lens, a distal end of the pull wire being

coupled to the distal tip; and an actuation mechanism coupled to a proximal end of the pull wire so that, actuation of the actuation mechanism, pulls the pull wire proximally through the shaft rotating the distal tip relative to the shaft to alter a field of view of the imager.

5 [0005] In an embodiment, the lens is a fish eye lens for wide angle viewing.

[0006] In an embodiment, the distal tip further comprises a proximal hinge sized and shaped to be coupled rotatably within a cylindrical slot at the distal end of the shaft.

10 [0007] In an embodiment, the distal tip moves laterally relative to a longitudinal axis of the shaft.

[0008] In an embodiment, the distal tip further comprises two slanted portions adjacent to a cylindrical portion of the hinge and angled relative to the distal face of the distal tip.

15 [0009] In an embodiment, the shaft further comprises two slanted portions adjacent to the cylindrical slot, the slanted portions being angled relative to a plane perpendicular to a longitudinal axis of the shaft and corresponding to the slanted portions of the distal tip to increase a range of angulation of the distal tip.

20 [0010] In an embodiment, the pull wire extends out of the slanted portions of the shaft via a working channel.

[0011] In an embodiment, the working channel is also an irrigation channel.

25 [0012] In an embodiment, the device further includes a light source on the distal face of the distal tip.

[0013] In addition, the present disclosure relates to an endoscopic device includes a flexible shaft
30 extending distally from a proximal part that, during use, remains outside a living body, to a distal end, which, during use, is inserted to a target site within the living body, the proximal part

including a power connection, the shaft comprising: a fluid channel extending therethrough from a proximal fluid port to a distal end of the shaft; and an imager directed distally from the distal end of the shaft, the imager including an imager chip and a lens, wherein the fluid channel and the imager are molded directly into the shaft.

5

[0014] In an embodiment, the lens is a fisheye lens for wide angle viewing.

[0015] In an embodiment, the distal end of the shaft is angled with respect to a longitudinal axis of the shaft.

10

[0016] In an embodiment, the angle of the distal end of the shaft is one of 0-degrees, 30-degrees, and 70-degrees relative to a plane perpendicular to the longitudinal axis.

[0017] In an embodiment, the device further includes a battery; and a wireless data transmitter.

15

[0018] In an embodiment, the device further includes a light source on the distal end of the shaft.

[0019] Also, the present disclosure relates to a method which includes inserting into a target site within a living body an endoscopic device, the device comprising a handle, a flexible shaft extending distally from a handle and including a pull wire extending therethrough, a distal tip rotatably coupled to a distal end of the shaft, an imager directed distally from a distal face of the distal tip including an imager chip and a lens, and an actuation mechanism coupled to a proximal end of the pull wire; and actuating the actuation mechanism to pull the pull wire proximally through the shaft to rotate the distal tip relative to the shaft to alter a field of view of the imager.

20

25

[0020] In an embodiment, the lens is a fisheye lens for wide angle viewing, further comprising using an algorithm to correct for distortions caused by the lens.

30

[0021] In an embodiment, the distal tip has slanted portions angled relative to the distal face of the distal tip and the shaft has slanted portions angled relative to a plane perpendicular to a

longitudinal axis of the shaft and corresponding to the slanted portions of the distal tip to increase a range of angulation of the distal tip

5 [0022] Furthermore, the present disclosure relates to a method comprising inserting into a target site within a living body an endoscopic device, the device comprising a flexible shaft extending distally from a power connection, a fluid channel extending through the shaft from a proximal fluid port to a distal end of the shaft, and an imager directed distally from the distal end of the shaft including an imager chip and a lens, wherein the fluid channel and the imager are molded directly into the shaft; actuating the device to angle the imager to a desired orientation; and
10 transferring, through the power connection, data collected by the imager.

[0023] In an embodiment, the method further comprising transferring a fluid from the fluid port, through the fluid channel, to the target site.

15

Brief Description

[0024] Fig. 1 shows an endoscopic device with an articulating distal tip according to various exemplary embodiments of the present disclosure.

20 [0025] Fig. 2 shows the articulating distal tip of the device of Fig. 1.

[0026] Figs. 3a-3b show the articulating distal tip of the device of Fig. 1 at varying angles.

[0027] Fig. 4 shows the handle of the device of Fig. 1.

25

[0028] Fig. 5 shows an endoscopic device according to various exemplary embodiments of the present disclosure.

[0029] Fig. 6 shows the distal end of the device of Fig. 5.

30

[0030] Fig. 7 shows an overmolded endoscopic device having irrigation channels according to

various exemplary embodiments of the present disclosure.

[0031] Fig. 8 shows the distal tip of the device of Fig. 7.

5

Detailed Description

[0032] The present disclosure may be further understood with reference to the following description and the appended drawings, wherein like elements are referred to with the same reference numerals. The exemplary embodiments describe endoscopes including a small wafer-based camera chip at the distal tip of the scope, allowing for high resolution imaging with a smaller scope diameter and/or increased space within the scope for other components and/or channels for e.g. irrigation as compared with typical rod-lens systems. The combined lens and chip disposed at the tip of the scope allows for the use of variable angle control, dispensing with the need for multiple scopes of varying angles. The described endoscopes may be disposable or reusable.

[0033] The disposable scopes may be manufactured via plastic overmolding over the various camera and/or irrigation components. There are a variety of methods that may be used to protect the chip and lens during the overmolding process. A common method is to make the distal tip and then attach the chip onto that molded or machined distal tip. In such a case, the scope elements such as, e.g., the camera and a light source, may be molded directly into the body of the scope. Extruded plastic or injection molded plastic may also be used for the body of the scopes. Other mechanical, adhesive and soldering methods may be used to join the scope elements and the body of the scope. In another embodiment, reusable scopes may be fashioned from stainless steel hypo-tube.

[0034] Figs. 1-4 show an endoscopic device 100 with an articulating distal tip 106 according to various exemplary embodiments of the present disclosure. The device 100 includes a proximal handle 102 with an elongated shaft 104 extending therefrom to the distal tip 106. The shaft 104 may be flexible, semi-flexible or rigid. The shaft 104 has at least one longitudinal working channel 114 extending through its length for feeding at least one pull wire 118 therethrough. In

the present embodiment the shaft 104 has two working channels 114 and two pull wires 118, however, other configurations may be used as explained in more detail below. An actuation mechanism in the handle 102 for pulling the wire 118 is also explained in more detail below. The distal ends of the pull wires 118 are connected to the distal tip 106 and may be actuated to rotate the distal tip 106 through a range of angles, as shown in Figs. 3A and 3B.

[0035] As shown in Fig. 2, the distal tip 106 houses a camera assembly 108 and a light source 110 facing distally out of a flat distal face 128. In the present embodiment the distal tip 106 has a proximal hinge 112 with a cylindrical portion sized to be coupled rotatably within a cylindrical slot 116 at the distal end of the shaft 104. The distal tip 106 has two slanted portions 120 adjacent to the cylindrical portion of the hinge 112, and the shaft 104 has two slanted portions 122 adjacent to the cylindrical slot 116. The pull wires 118 extend out of the slanted portions 122 of the shaft via the working channels 114, with each pull wire 118 connecting to one of the slanted portions 120 of the distal tip 106.

[0036] The slanted portions 120 of the distal tip 106 and the slanted portions 122 of the shaft 104 are sized and angled such that the distal tip 106 may articulate within a permitted range of rotation without interference from the shaft 104. Those skilled in the art will ascertain that a variety of ways may be used to join the wire 118 to the distal tip 106. Although in the above embodiment the working channels 114 each contain a pull wire, in another embodiment, the working channels 114 may be used as irrigation channels as well. In another embodiment, the device 100 has the articulating distal tip 106 and the working channels 114, where each of the working channels 114 is an irrigation channel and has the pull wire 118 running through it.

[0037] The camera assembly 108 of this embodiment comprises the small wafer-based chip discussed above or any other camera chip of comparable resolution and dimensions. For example, the chip may have a 400 x 400 pixel resolution, a cross-sectional area of under 1mm². The light source 110 may be a single LED, an LED array, or any other suitable light source. The light source 110 may be fiber optic and capable of producing different spectrums and/or intensities of light. Both the camera assembly 108 and the light source 110 may have wiring running through the scope to control mechanisms at the handle 102. Alternately, the camera

assembly 108 and/or the light source 110 may include a wireless transceiver at the distal tip 106. The wireless transceiver requires a wire extending from the chip to the handle 102 and a transmitter.

5 [0038] The handle 102 is shaped for ease of gripping during the endoscopic procedure and has an actuator 124 on its distal end for implementing an actuation mechanism internal to the handle 102, as shown in Fig. 4. In the present embodiment the actuator 124 is a simple push/pull ring that is rotatable about a portion of the curved distal end of the handle 102. Rotation of the actuator 124 in a first one of two initial directions, e.g., distally, causes the actuation mechanism
10 to pull a first one of the two pull strings 118, e.g., the top string, proximally, causing the distal tip 106 to rotate upward as seen in Fig. 3A.

[0039] In a similar manner, rotation of the actuator 124 in a second one of the two directions, e.g., proximally, causes the actuation mechanism to pull a second one of the two pull strings 118,
15 e.g., the bottom string, proximally, causing the distal tip 106 to rotate downward as seen in Fig. 3B. The extent of the rotation of the distal tip 106 may be keyed to tip angle indicators 126 represented as a series of distances along the curved distal end of the handle 102. For example, rotation of actuator 124 to a first one of the tip angle indicators 126 may reflect a rotation of the distal tip 106 of 5deg upward. The angle indicators 126 may provide tactile feedback to the user
20 when a certain angle increment is reached by the distal tip 106. The value of the tip angle at which the tactile feedback is generated may be preset or customizable as would be understood by those skilled in the art.

[0040] The present description of the actuator 124 and actuation mechanism is for exemplary
25 purposes only. The actuation of the pull strings 118 may be gear-based, spring-based, or electrical. If the actuation of the pull strings 118 is electrical the handle 102 may not have an actuator built in. Rather, the handle 102 may instead have an electrical port for an external actuator that may be manually manipulated by a touch display or otherwise to trigger the actuation mechanism and pull the pull strings 118. Further, the present description of two pull
30 strings 118 is for exemplary purposes only. In an alternate embodiment, one pull string 118 may be used and connected to one of the two slanted surfaces 120 while a spring mechanism is used

on the opposing side or is built into the hinge mechanism.

[0041] Figs. 5-6 show an endoscopic device 200 according to various exemplary embodiments of the present disclosure. The device 200 comprises an elongated overmolded shaft 202 and a connector 204 configured to attach to a scope handle or other suitable equipment so as to transfer data and/or power therebetween. The connector 204 may be, e.g., a USB connector or any custom connector. In an alternate embodiment, a battery and/or wireless data transmitter may be used and forego the need for a connector. The present embodiment shows a cable 206. In an alternate embodiment, the connector 204 may be located at the proximal end of the shaft 202 and forego the need for a cable.

[0042] A camera assembly 208, a light source 210 and any associated wiring are molded into the distal end of the shaft 202. In other words, the shaft 202 is molded around the aforementioned elements during the fabrication of the shaft 202 in an overmolding process. The distal end of the shaft may be shaped at an angle with respect to the longitudinal axis of the shaft 202. For example, the angle may be 0deg, 30deg or 70deg. The shaft 202 may be fabricated from, e.g., a rigid or semi-rigid biocompatible plastic. The camera assembly 208 may comprise the small wafer-based chip, similar to the camera assembly 108 of the endoscopic device 100. The light source 210 may be a single LED, an LED array, or any other suitable light source, including a fiber optic light source having an adjustable spectrum and/or intensity of light, similar to the light source 110 of the endoscopic device 100. In the present embodiment the camera assembly 208 and the light source 210 are disposed at the distal end of the shaft 202. However, if the molded material of the shaft 202 is transparent or semi-transparent the light source 210 may be embedded further proximally in the shaft 202.

[0043] Figs. 7-8 show an overmolded endoscopic device 300 according to various exemplary embodiments of the present disclosure. The device 300 is similar to the device 200 in that various elements are molded into the device during the fabrication of a shaft 302, including a camera assembly 308 and a light source 310. The device 300 may also have a connector 304 and a cable 306, similar to the device 200. However, the device 300 also includes one or more irrigation channels 312 incorporated into the shaft 302.

[0044] The present embodiment shows two irrigation channels 312, however, one irrigation channel or more than two irrigation channels may be implemented depending on user requirements. The irrigation channels 312 may be molded directly into the shaft 302 during the
5 fabrication of the shaft 302. In an alternate embodiment, the irrigation channels 312 may be constructed of e.g. steel and the shaft 302 may be molded over the channels 312. The irrigation channels 312 terminate at a port 314 at the proximal end of the shaft 302, the port 314 having a number of tubular connections in proportion to the number of irrigation channels 312, which in the present embodiment is two.

10 [0045] The device 300 has a distal tip 316 that houses the camera assembly 308 and the light source 310. In the present embodiment the tip 316 is fabricated separately from the shaft 302 and is subsequently connected thereto. This arrangement of components allows for a reusable shaft 302 that be fashioned from e.g. steel while the tip 316 is fashioned by the overmolding
15 process discussed previously. However, the shaft 302 and the tip 316 may be fabricated as one piece, in which case the tip 316 will be the distal end of the shaft 316 rather than being connected thereto.

20 [0046] It will be appreciated by those skilled in the art that changes may be made to the embodiments described above without departing from the inventive concept thereof. It should further be appreciated that structural features and methods associated with one of the embodiments can be incorporated into other embodiments. It is understood, therefore, that this invention is not limited to the particular embodiment disclosed, but rather modifications are also covered within the scope of the present invention as defined by the appended claims.

Claims

1. An endoscopic device, comprising:
a flexible shaft extending distally from a handle which, during use remains outside a
5 living body, the shaft comprising a pull wire extending therethrough from the handle;
a distal tip rotatably coupled to a distal end of the shaft, the distal tip comprising an
imager directed distally from a distal face of the distal tip, the imager including an imager chip
and a lens, a distal end of the pull wire being coupled to the distal tip;
and
10 an actuation mechanism coupled to a proximal end of the pull wire so that, actuation of
the actuation mechanism, pulls the pull wire proximally through the shaft rotating the distal tip
relative to the shaft to alter a field of view of the imager.
2. The device of claim 1, wherein the lens is a fish eye lens for wide angle viewing.
- 15 3. The device of any of claims 1-2, wherein the distal tip further comprises a proximal hinge
sized and shaped to be coupled rotatably within a cylindrical slot at the distal end of the shaft.
4. The device of any of claims 1-3, wherein the distal tip moves laterally relative to a
20 longitudinal axis of the shaft.
5. The device of claim 3, wherein the distal tip further comprises two slanted portions
adjacent to a cylindrical portion of the hinge and angled relative to the distal face of the distal tip.
- 25 6. The device of claim 5, wherein the shaft further comprises two slanted portions adjacent
to the cylindrical slot, the slanted portions being angled relative to a plane perpendicular to a
longitudinal axis of the shaft and corresponding to the slanted portions of the distal tip to
increase a range of angulation of the distal tip.
- 30 7. The device of claim 6, wherein the pull wire extends out of the slanted portions of the
shaft via a working channel.

8. The device of claim 7, wherein the working channel is also an irrigation channel.
9. The device of any of claims 1-8, further comprising:
5 a light source on the distal face of the distal tip.
10. An endoscopic device, comprising:
a flexible shaft extending distally from a proximal part that, during use, remains outside a
living body, to a distal end, which, during use, is inserted to a target site within the living body,
10 the proximal part including a power connection, the shaft comprising:
a fluid channel extending therethrough from a proximal fluid port to a distal end
of the shaft; and
an imager directed distally from the distal end of the shaft, the imager including
an imager chip and a lens, wherein the fluid channel and the imager are molded directly
15 into the shaft.
11. The device of claim 10, wherein the lens is a fisheye lens for wide angle viewing.
12. The device of any of claims 10-11, wherein the distal end of the shaft is angled with
20 respect to a longitudinal axis of the shaft.
13. The device of claim 12, wherein the angle of the distal end of the shaft is one of 0-
degrees, 30-degrees, and 70-degrees relative to a plane perpendicular to the longitudinal axis.
- 25 14. The device of any of claims 10-13, further comprising:
a battery; and
a wireless data transmitter.
15. The device of any of claims 10-14, further comprising:
30 a light source on the distal end of the shaft.

1 / 4

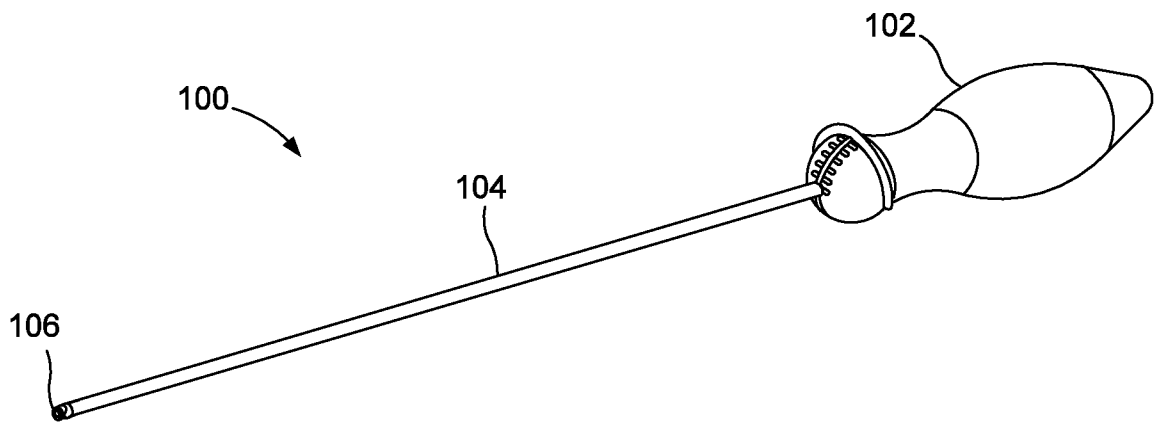


FIG. 1

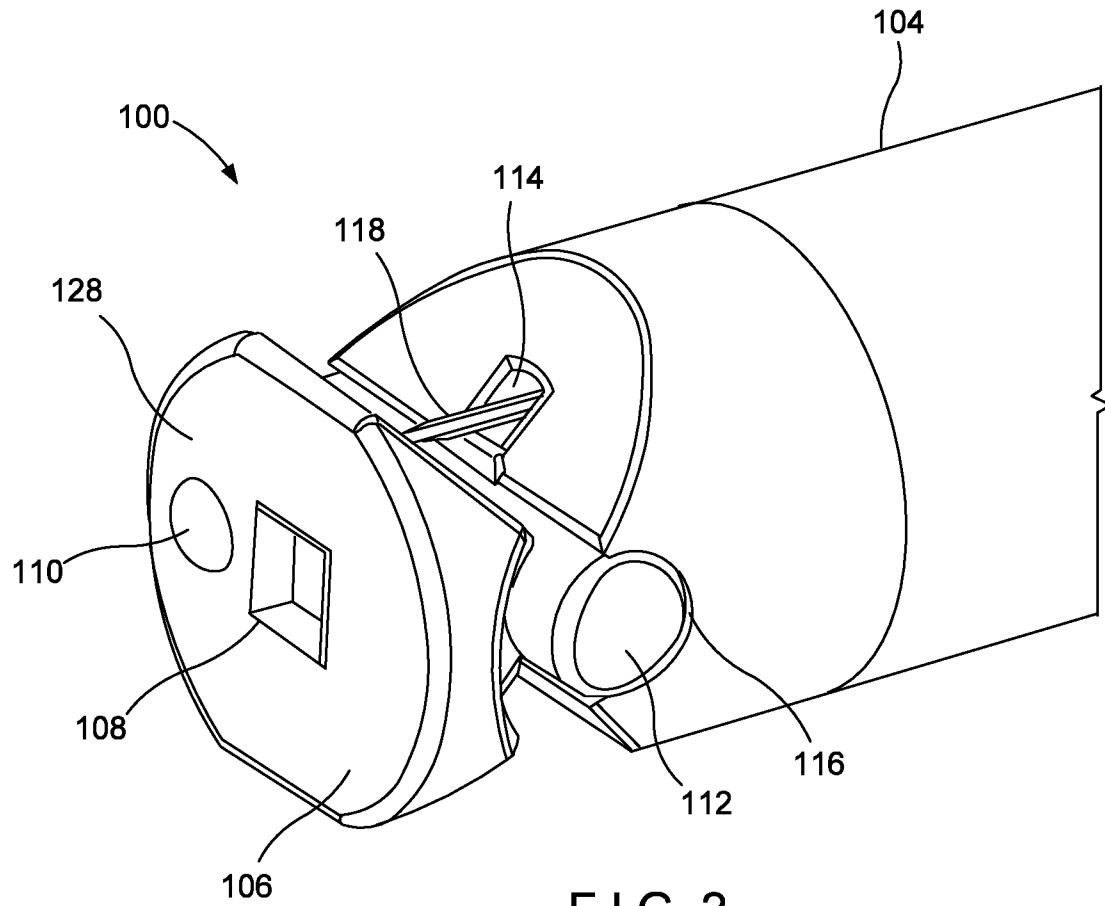


FIG. 2

2 / 4

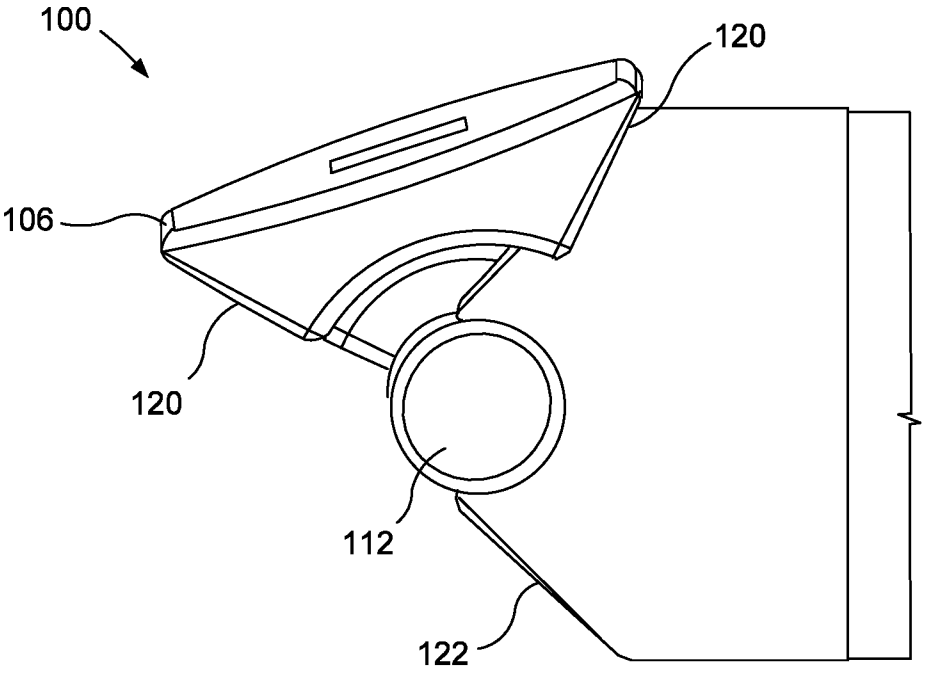


FIG. 3A

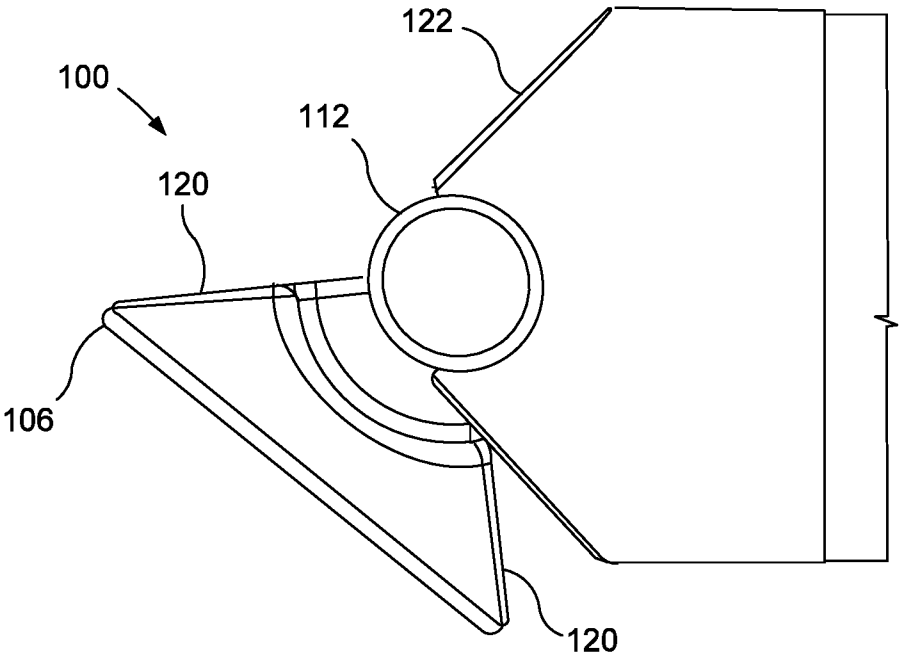


FIG. 3B

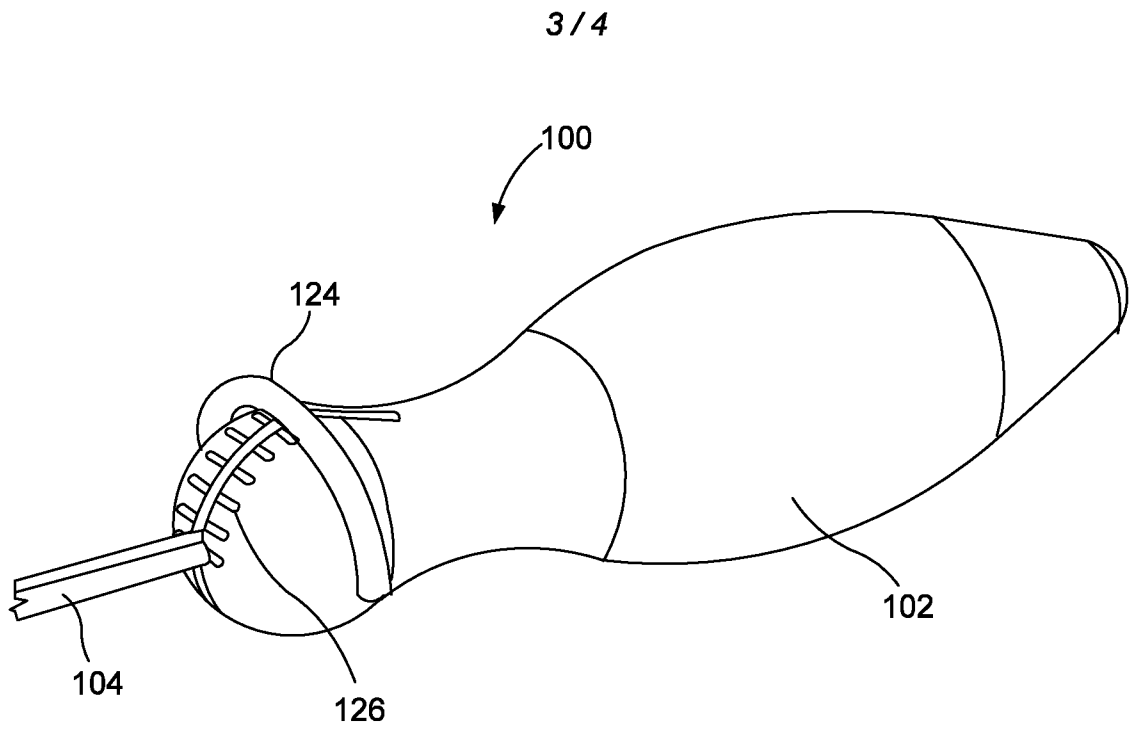


FIG. 4

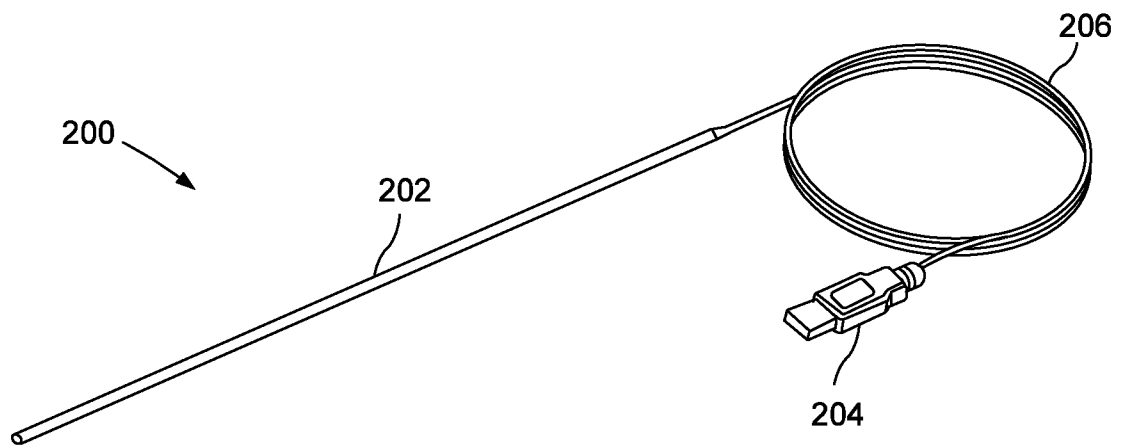


FIG. 5

4 / 4

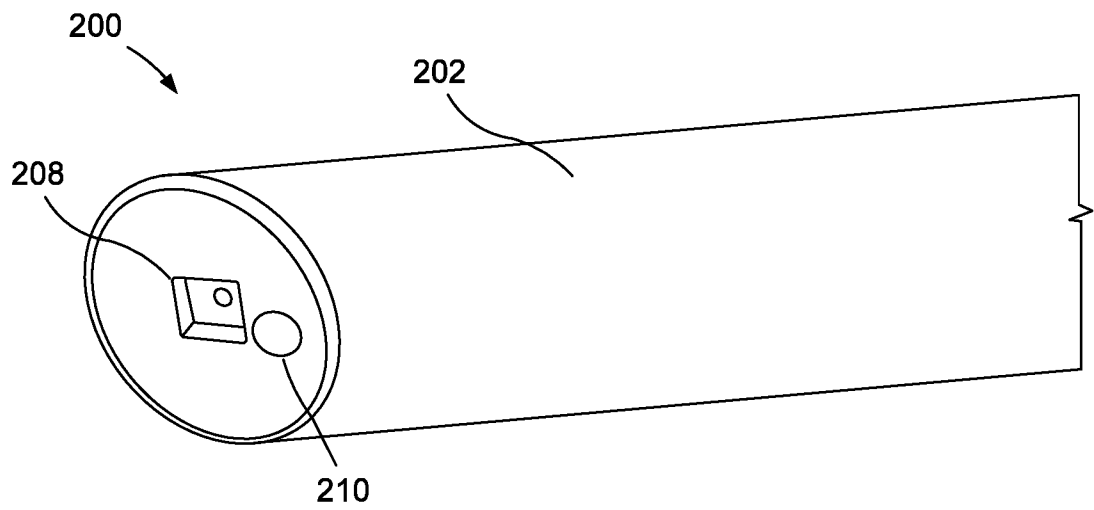


FIG. 6

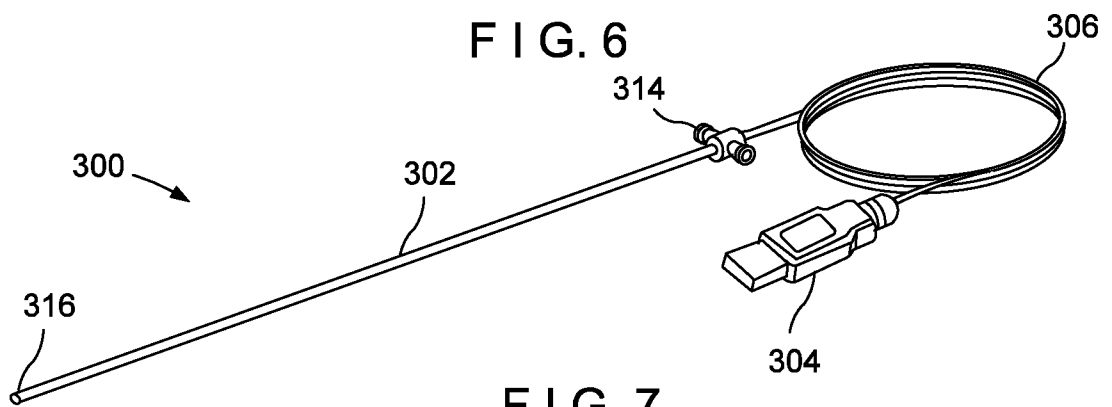


FIG. 7

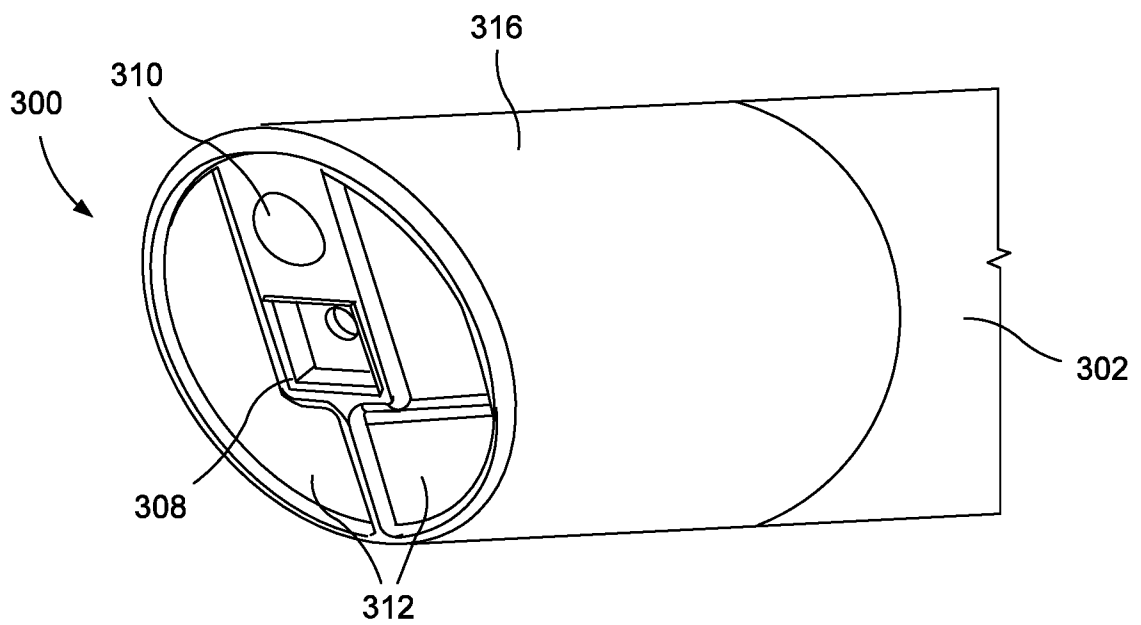


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/044092

A. CLASSIFICATION OF SUBJECT MATTER		
INV. A61B1/00	A61B1/005	A61B1/015 A61B1/05 A61B1/06
ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A61B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008/108869 A1 (SANDERS GERALD J [US] ET AL) 8 May 2008 (2008-05-08) paragraph [0122] - paragraph [0225]; figures 1, 26-29; 46 - 49 -----	1,3-9
X	US 2014/088361 A1 (HRAYR SHAHINIAN KARNIG [US] ET AL) 27 March 2014 (2014-03-27) paragraph [0081] - paragraph [0110]; figures 4A-10E -----	1,3-7,9
X	EP 1 322 214 A2 (MEDIGUS LTD [IL]) 2 July 2003 (2003-07-02) paragraph [0033] - paragraph [0045]; figures 1-7 -----	1,2,4
X	EP 3 243 426 A1 (STORZ KARL ENDOVISION INC [US]) 15 November 2017 (2017-11-15) paragraph [0028] - paragraph [0050]; figures 1-9 -----	1,4,9
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 2 October 2020		Date of mailing of the international search report 14/12/2020
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Mäki-Mantila, M

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2020/044092

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-9

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9

Endoscopic device comprising a pull wire rotating the distal tip to alter the field of view

2. claims: 10-15

Endoscopic device comprising a fluid channel and an imager molded directly into the shaft

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2020/044092

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008108869 A1	08-05-2008	EP 2086386 A2 JP 2010506669 A US 2008108869 A1 WO 2008048688 A2	12-08-2009 04-03-2010 08-05-2008 24-04-2008
US 2014088361 A1	27-03-2014	US 2014088361 A1 US 2017020372 A1	27-03-2014 26-01-2017
EP 1322214 A2	02-07-2003	AT 387882 T AU 8802901 A AU 2001288029 B2 CA 2422525 A1 DE 60133113 T2 EP 1322214 A2 IL 138632 A JP 4481565 B2 JP 2004508868 A MX PA03002425 A NZ 524728 A US 2003163029 A1 WO 0224058 A2 ZA 200302136 B	15-03-2008 02-04-2002 18-05-2006 28-03-2002 20-05-2009 02-07-2003 05-06-2008 16-06-2010 25-03-2004 10-09-2004 28-05-2004 28-08-2003 28-03-2002 16-02-2004
EP 3243426 A1	15-11-2017	EP 3243426 A1 US 2017325671 A1	15-11-2017 16-11-2017