US009918771B2

(12) **United States Patent**
Regadas

(10) **Patent No.: US 9,918,771 B2**
(45) **Date of Patent: Mar. 20, 2018**

(54) **POLYP REMOVAL DEVICE AND METHOD OF USE**

(71) Applicant: **Covidien LP**, Mansfield, MA (US)

(72) Inventor: **F. Sergio P. Regadas**, Fortaleza-Ceara (BR)

(73) Assignee: **COVIDIEN LP**, Mansfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 134 days.

(21) Appl. No.: **13/711,201**

(22) Filed: **Dec. 11, 2012**

(65) **Prior Publication Data**

US 2013/0103041 A1 Apr. 25, 2013

Related U.S. Application Data

(63) Continuation of application No. 12/363,086, filed on Jan. 30, 2009, now Pat. No. 8,328,803.
(Continued)

(51) **Int. Cl.**
A61B 18/00 (2006.01)
A61B 17/3205 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A61B 18/00*** (2013.01); ***A61B 17/32056*** (2013.01); ***A61B 18/14*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC A61B 17/221; A61B 17/32056; A61B 2017/2212; A61B 2018/1407; A61B 17/26; A61B 2018/141; A61B 2018/144; A61B 18/1445; A61B 2018/00601; A61B 2018/0063; A61B 2018/126; A61B 2018/1412; A61B 17/32; A61B 18/14; A61B 18/18; A61B 18/20;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

749,689 A 1/1904 Houghton
1,952,617 A 3/1934 Wappler
(Continued)

FOREIGN PATENT DOCUMENTS

DE 2415263 10/1975
DE 2514501 10/1976
(Continued)

OTHER PUBLICATIONS

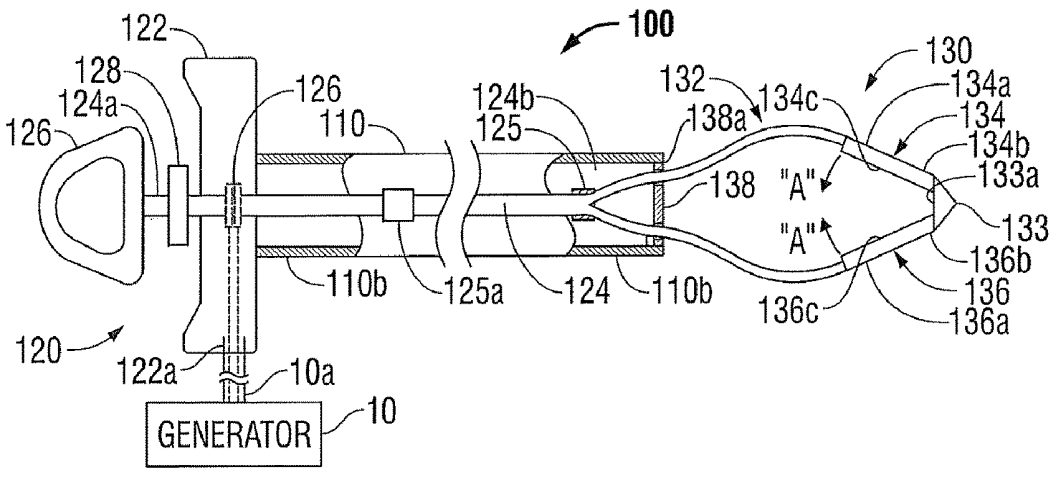
U.S. Appl. No. 12/176,679, filed Jul. 21, 2008.
(Continued)

Primary Examiner — Nathan R Price
Assistant Examiner — Weng Lee

(57) **ABSTRACT**

A device and system for removing polyps is provided and includes a tubular member having proximal and distal ends, a snare portion operably extending from within the distal end of the tubular member, the snare portion including a cutting member for severing the sealed tissue. The polyp removal device may further include a handle portion operatively extending from within the proximal end of the tubular member. The handle portion may be configured for operable engagement by a user and the cutting member may extend between distal ends of the first and second electrodes.

21 Claims, 4 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 61/063,158, filed on Jan. 31, 2008.

(51) **Int. Cl.**

A61B 18/14	(2006.01)
A61B 17/24	(2006.01)
A61B 17/221	(2006.01)
A61B 17/32	(2006.01)
A61B 18/18	(2006.01)
A61B 18/20	(2006.01)

(52) **U.S. Cl.**

CPC *A61B 17/221* (2013.01); *A61B 17/24* (2013.01); *A61B 17/32* (2013.01); *A61B 18/18* (2013.01); *A61B 18/20* (2013.01); *A61B 2018/00345* (2013.01); *A61B 2018/00404* (2013.01); *A61B 2018/00482* (2013.01); *A61B 2018/00571* (2013.01); *A61B 2018/00607* (2013.01); *A61B 2018/00619* (2013.01); *A61B 2018/141* (2013.01); *A61B 2018/1407* (2013.01)

(58) **Field of Classification Search**

CPC A61B 2018/00345; A61B 2018/00404; A61B 2018/00482; A61B 2018/00619; A61B 2018/00607

USPC 606/39, 47–52, 110, 111, 113, 127–128

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,963,636	A		6/1934	Wappler
1,967,015	A		7/1934	Wappler
2,002,559	A		5/1935	Wappler
2,008,525	A		7/1935	Wappler
2,054,149	A		9/1936	Charles
2,442,966	A		6/1948	Wallace
2,532,043	A		11/1950	Wallace
3,149,633	A		9/1964	Zingale
3,752,159	A		8/1973	Wappler
3,856,015	A		12/1974	Iglesias
4,011,872	A		3/1977	Komiya
4,024,869	A		5/1977	Bonnet
4,060,087	A		11/1977	Hiltebrandt et al.
4,068,667	A		1/1978	Iglesias
4,116,198	A		9/1978	Roos
4,134,406	A		1/1979	Iglesias
4,202,338	A		5/1980	Bitrolf
4,294,254	A		10/1981	Chamness
4,311,143	A		1/1982	Komiya
4,493,320	A	*	1/1985	Treat A61B 18/14 606/47
4,503,855	A		3/1985	Maslanka
4,718,419	A		1/1988	Okada
4,905,691	A		3/1990	Rydell
5,026,371	A		6/1991	Rydell et al.
5,066,295	A		11/1991	Kozak et al.
5,078,716	A	*	1/1992	Doll A61B 18/14 606/47
5,192,280	A		3/1993	Parins
5,197,964	A		3/1993	Parins
5,207,686	A		5/1993	Dolgin
5,290,284	A		3/1994	Adair
5,318,564	A		6/1994	Eggers
5,417,697	A		5/1995	Wilk et al.
5,460,629	A		10/1995	Shlain et al.
5,462,553	A		10/1995	Dolgin
5,817,093	A		10/1998	Williamson et al.
5,971,994	A		10/1999	Fritzsch
6,015,415	A		1/2000	Avellanet
6,050,995	A		4/2000	Durgin
6,071,283	A		6/2000	Nardella et al.
6,152,922	A		11/2000	Ouchi
6,235,026	B1		5/2001	Smith
6,440,138	B1	*	8/2002	Reiley A61B 17/1671 606/45
6,517,539	B1		2/2003	Smith et al.
6,730,097	B2		5/2004	Dennis
6,743,228	B2		6/2004	Lee et al.
6,773,432	B1		8/2004	Clayman
6,827,717	B2		12/2004	Brommersma et al.
6,852,108	B2		2/2005	Barry
6,852,111	B1		2/2005	Lieber
6,860,848	B2		3/2005	Wosnitza et al.
6,942,017	B2		9/2005	Gokan et al.
7,008,420	B2		3/2006	Okada
7,037,307	B2		5/2006	Dennis
7,104,990	B2		9/2006	Jenkins et al.
2001/0009985	A1		7/2001	Durgin et al.
2002/0072739	A1		6/2002	Lee et al.
2002/0151889	A1		10/2002	Swanson et al.
2002/0165540	A1		11/2002	Bales et al.
2003/0009166	A1		1/2003	Moutafis et al.
2003/0040744	A1		3/2003	Latterell et al.
2003/0109870	A1		6/2003	Lee et al.
2003/0114850	A1		6/2003	McClurken et al.
2003/0125731	A1		7/2003	Smith et al.
2003/0144661	A1		7/2003	Brommersma et al.
2003/0153909	A1		8/2003	Levinson
2003/0176859	A1		9/2003	Levinson
2003/0181906	A1		9/2003	Boebel et al.
2003/0204188	A1		10/2003	Morrison et al.
2003/0212389	A1		11/2003	Durgin et al.
2003/0216731	A1		11/2003	Dennis
2004/0064139	A1		4/2004	Yossepowitch
2004/0106920	A1		6/2004	Jenkins et al.
2004/0153059	A1		8/2004	Okada
2004/0199159	A1		8/2004	Lee et al.
2004/0220564	A1		11/2004	Ho et al.
2005/0070889	A1		3/2005	Nobis et al.
2005/0085808	A1		3/2005	Nakao
2005/0096650	A1		5/2005	Ouchi
2005/0119652	A1		6/2005	Vetter et al.
2005/0131402	A1		6/2005	Ciarrocca et al.
2005/0131403	A1		6/2005	Chang
2005/0137591	A1		6/2005	Barry et al.
2005/0171531	A1		8/2005	Eliachar et al.
2005/0171532	A1		8/2005	Ciarrocca
2005/0209590	A1		8/2005	Terakura
2005/0222568	A1		10/2005	O'Sullivan
2005/0251134	A1		11/2005	Woloszko
2005/0283150	A1		12/2005	Moutafis et al.
2006/0009759	A1		1/2006	Christian et al.
2006/0030846	A1		2/2006	Buehlmann et al.
2006/0036234	A1		2/2006	Durgin et al.
2006/0052774	A1		3/2006	Garrison et al.
2006/0178670	A1		8/2006	Woloszko et al.
2007/0198011	A1		8/2007	Sugita
2007/0208339	A1	*	9/2007	Arts A61B 17/32056 606/47
2007/0250012	A1	*	10/2007	Lu A61B 17/32056 604/168.01
2007/0270796	A2	*	11/2007	Girard A61B 18/14 606/45
2008/0221587	A1		9/2008	Schwartz

FOREIGN PATENT DOCUMENTS

DE	2627679	1/1977
DE	3423356	6/1986
DE	3612646	4/1987
DE	8712328	3/1988
DE	4303882	8/1994
DE	4403252	8/1995
DE	19515914	7/1996
DE	29616210	1/1997
DE	19608716	4/1997
DE	19751106	5/1998
DE	19751108	5/1999

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

DE	10045375	10/2002
DE	19738457	1/2009
EP	0 467 501 A	1/1992
EP	1159926	12/2001
EP	1 829 494	9/2007
GB	1 490 585 A	11/1977
JP	61-501068	9/1984
JP	65-502328	3/1992
JP	5-5106	1/1993
JP	5-40112	2/1993
JP	06343644	12/1994
JP	07265328	10/1995
JP	08056955	3/1996
JP	08252263	10/1996
JP	09010223	1/1997
JP	10-014922	1/1998
JP	H10 14922 A	1/1998
JP	11-070124	5/1998
JP	2000-102545	9/1998
JP	11244298	9/1999
JP	2000-342599	12/2000
JP	2000-350732	12/2000
JP	2001-008944	1/2001
JP	2001-029356	2/2001
JP	2001-128990	5/2001
SU	401367	11/1974
WO	WO 93/21845 A	11/1993
WO	WO 00/36986	6/2000
WO	WO 01/54604	8/2001
WO	WO 05/110264	11/2005

OTHER PUBLICATIONS

U.S. Appl. No. 12/192,170, filed Aug. 15, 2008.
U.S. Appl. No. 12/192,189, filed Aug. 15, 2008.
U.S. Appl. No. 12/192,243, filed Aug. 15, 2008.
U.S. Appl. No. 12/195,624, filed Aug. 21, 2008.
U.S. Appl. No. 12/200,154, filed Aug. 28, 2008.
U.S. Appl. No. 12/200,246, filed Aug. 28, 2008.
U.S. Appl. No. 12/200,396, filed Aug. 28, 2008.
U.S. Appl. No. 12/200,526, filed Aug. 28, 2008.
U.S. Appl. No. 12/204,976, filed Sep. 5, 2008.
U.S. Appl. No. 12/210,598, filed Sep. 15, 2008.
U.S. Appl. No. 12/211,205, filed Sep. 16, 2008.
U.S. Appl. No. 12/233,157, filed Sep. 18, 2008.
U.S. Appl. No. 12/236,666, filed Sep. 24, 2008.
U.S. Appl. No. 12/237,515, filed Sep. 25, 2008.
U.S. Appl. No. 12/237,556, filed Sep. 25, 2008.
U.S. Appl. No. 12/237,582, filed Sep. 25, 2008.
U.S. Appl. No. 12/244,873, filed Oct. 3, 2008.
U.S. Appl. No. 12/246,553, filed Oct. 7, 2008.
U.S. Appl. No. 12/248,104, filed Oct. 9, 2008.
U.S. Appl. No. 12/248,115, filed Oct. 9, 2008.
U.S. Appl. No. 12/254,123, filed Oct. 20, 2008.
U.S. Appl. No. 12/331,643, filed Dec. 10, 2008.
U.S. Appl. No. 12/336,970, filed Dec. 17, 2008.
U.S. Appl. No. 12/352,942, filed Jan. 13, 2009.
U.S. Appl. No. 12/353,466, filed Jan. 14, 2009.
U.S. Appl. No. 12/353,470, filed Jan. 14, 2009.
U.S. Appl. No. 12/353,474, filed Jan. 14, 2009.
U.S. Appl. No. 12/363,086, filed Jan. 30, 2009.
U.S. Appl. No. 12/410,195, filed Mar. 24, 2009.
U.S. Appl. No. 12/411,542, filed Mar. 26, 2009.
U.S. Appl. No. 12/419,729, filed Apr. 7, 2009.
U.S. Appl. No. 12/429,533, filed Apr. 24, 2009.
U.S. Appl. No. 12/434,382, filed May 1, 2009.
U.S. Appl. No. 12/503,256, filed Jul. 15, 2009.
U.S. Appl. No. 12/508,052, filed Jul. 23, 2009.
U.S. Appl. No. 12/535,869, filed Aug. 5, 2009.
U.S. Appl. No. 12/543,831, filed Aug. 19, 2009.
U.S. Appl. No. 12/543,969, filed Aug. 19, 2009.
U.S. Appl. No. 12/548,031, filed Aug. 26, 2009.
U.S. Appl. No. 12/548,534, filed Aug. 27, 2009.
U.S. Appl. No. 12/548,566, filed Aug. 27, 2009.
U.S. Appl. No. 12/551,944, filed Sep. 1, 2009.
U.S. Appl. No. 12/553,509, filed Sep. 3, 2009.
U.S. Appl. No. 12/556,025, filed Sep. 9, 2009.
U.S. Appl. No. 12/556,407, filed Sep. 9, 2009.
U.S. Appl. No. 12/556,427, filed Sep. 9, 2009.
U.S. Appl. No. 12/556,796, filed Sep. 10, 2009.
U.S. Appl. No. 12/562,281, filed Sep. 18, 2009.
U.S. Appl. No. 12/565,281, filed Sep. 23, 2009.
U.S. Appl. No. 12/568,199, filed Sep. 28, 2009.
U.S. Appl. No. 12/568,282, filed Sep. 28, 2009.
U.S. Appl. No. 12/569,395, filed Sep. 29, 2009.
U.S. Appl. No. 12/569,710, filed Sep. 29, 2009.
U.S. Appl. No. 12/574,001, filed Oct. 6, 2009.
U.S. Appl. No. 12/574,292, filed Oct. 6, 2009.
U.S. Appl. No. 12/576,380, filed Oct. 9, 2009.
U.S. Appl. No. 12/607,191, filed Oct. 28, 2009.
Michael Choti, "Abdominoperineal Resection with the LigaSure Vessel Sealing System and LigaSure Atlas 20 cm Open Instrument" ; Innovations That Work, Jun. 2003.
Chung et al., "Clinical Experience of Sutureless Closed Hemorrhoidectomy with LigaSure" Diseases of the Colon & Rectum vol. 46, No. 1 Jan. 2003.
Carbonell et al., "Comparison of theGyrus PlasmaKinetic Sealer and the Valleylab LigaSure Device in the Hemostasis of Small, Medium, and Large-Sized Arteries" Carolinas Laparoscopic and Advanced Surgery Program, Carolinas Medical Center, Charlotte, NC; Date: Aug. 2003.
Peterson et al. "Comparison of Healing Process Following Ligation with Sutures and Bipolar Vessel Sealing" Surgical Technology International (2001).
"Electrosurgery: A Historical Overview" Innovations in Electrosurgery; Sales/Product Literature; Dec. 31, 2000.
Johnson et al. "Evaluation of a Bipolar Electrothermal Vessel Sealing Device in Hemorrhoidectomy" Sales/Product Literature; Jan. 2004.
E. David Crawford "Evaluation of a New Vessel Sealing Device in Urologic Cancer Surgery" Sales/Product Literature 2000.
Johnson et al. "Evaluation of the LigaSure Vessel Sealing System in Hemorrhoidectormy" American College of Surgeons (ACS) Clinicla Congress Poster (2000).
Muller et al., "Extended Left Hemicolectomy Using the LigaSure Vessel Sealing System" Innovations That Work, Sep. 1999.
Kennedy et al. "High-burst-strength, feedback-controlled bipolar vessel sealing" Surgical Endoscopy (1998) 12: 876-878.
Carus et al., "Initial Experience With the LigaSure Vessel Sealing System in Abdominal Surgery" Innovations That Work, Jun. 2002.
Heniford et al. "Initial Research and Clinical Results with an Electrothermal Bipolar Vessel Sealer" Oct. 1999.
Heniford et al. "Initial Results with an Electrothermal Bipolar Vessel Sealer" Surgical Endoscopy (2000) 15:799-801.
Herman et al., "Laparoscopic Intestinal Resection With the LigaSure Vessel Sealing System: A Case Report"; Innovations That Work, Feb. 2002.
Koyle et al., "Laparoscopic Palomo Varicocele Ligation in Children and Adolescents" Pediatric Endosurgery & Innovative Techniques, vol. 6, No. 1, 2002.
W. Scott Helton, "LigaSure Vessel Sealing System: Revolutionary Hemostasis Product for General Surgery"; Sales/Product Literature 1999.
LigaSure Vessel Sealing System, the Seal of Confidence in General, Gynecologic, Urologic, and Laparaoscopic Surgery; Sales/Product Literature: Apr. 2002.
Joseph Ortenberg "LigaSure System Used in Laparoscopic 1st and 2nd Stage Orchiopexy" Innovations That Work, Nov. 2002.
Sigel et al. "The Mechanism of Blood Vesesl Closure by High Frequency Electrocoagulation" Surgery Gynecology & Obstetrics, Oct. 1965 pp. 823-831.
Sampayan et al, "Multilayer Ultra-High Gradient Insulator Technology" Discharges and Electrical Insulation in Vacuum, 1998. Netherlands Aug. 17-21, 1998; vol. 2, pp. 740-743.

(56) **References Cited**

OTHER PUBLICATIONS

Paul G. Horgan, "A Novel Technique for Parenchymal Division During Hepatectomy" The American Journal of Surgery, vol. 181, No. 3, Apr. 2001 pp. 236-237.
Olsson et al. "Radical Cystectomy in Females" Current Surgical Techniques in Urology, vol. 14, Issue 3, 2001.
Palazzo et al. "Randomized clinical trial of Ligasure versus open haemorrhoidectomy" British Journal of Surgery 2002, 89, 154-157.
Levy et al. "Randomized Trial of Suture Versus Electrosurgical Bipolar Vessel Sealing in Vaginal Hysterectomy" Obstetrics & Gynecology, vol. 102, No. 1, Jul. 2003.
"Reducing Needlestick Injuries in the Operating Room" Sales/Product Literature 2001.
Bergdahl et al. "Studies on Coagulation and the Development of an Automatic Computerized Bipolar Coagulator" J.Neurosurg, vol. 75, Jul. 1991, pp. 148-151.
Strasberg et al. "A Phase I Study of the LigaSure Vessel Sealing System in Hepatic Surgery" Section of HPB Surger, Washington University School of Medicine, St. Louis MO, Presented at AHPBA, Feb. 2001.
Sayfan et al. "Sutureless Closed Hemorrhoidectomy: A New Technique" Annals of Surgery vol. 234 No. 1 Jul. 2001; pp. 21-24.
Levy et al., "Update on Hysterectomy—New Technologies and Techniques" OBG Management, Feb. 2003.
Dulemba et al. "Use of a Bipolar Electrothermal Vessel Sealer in Laparoscopically Assisted Vaginal Hysterectomy" Sales/Product Literature; Jan. 2004.
Strasberg et al., "Use of a Bipolar Vessel-Sealing Device for Parenchymal Transection During Liver Surgery" Journal of Gastrointestinal Surgery, vol. 6, No. 4, Jul./Aug. 2002 pp. 569-574.
Sengupta et al., "Use of a Computer-Controlled Bipolar Diathermy System in Radical Prostatectomies and Other Open Urological Surgery" ANZ Journal of Surgery (2001) 71.9 pp. 538-540.
Rothenberg et al. "Use of the LigaSure Vessel Sealing System in Minimally Invasive Surgery in Children" Int'l Pediatric Endosurgery Group (IPEG) 2000.
Crawford et al. "Use of the LigaSure Vessel Sealing System in Urologic Cancer Surgery" Grand Rounds in Urology 1999 vol. 1 Issue 4 pp. 10-17.
Craig Johnson, "Use of the LigaSure Vessel Sealing System in Bloodless Hemorrhoidectomy" Innovations That Work, Mar. 2000.
Levy et al. "Use of a New Energy-based Vessel Ligation Device During Vaginal Hysterectomy" Int'l Federation of Gynecology and Obstetrics (FIGO) World Congress 1999.
Barbara Levy, "Use of a New Vessel Ligation Device During Vaginal Hysterectomy" FIGO 2000, Washington, D.C.
E. David Crawford "Use of a Novel Vessel Sealing Technology in Management of the Dorsal Veinous Complex" Sales/Product Literature 2000.
Jarrett et al., "Use of the LigaSure Vessel Sealing System for Peri-Hilar Vessels in Laparoscopic Nephrectomy" Sales/Product Literature 2000.
Crouch et al. "A Velocity-Dependent Model for Needle Insertion in Soft Tissue" MICCAI 2005; LNCS 3750 pp. 624-632, Dated: 2005.
McLellan et al. "Vessel Sealing for Hemostasis During Pelvic Surgery" Int'l Federation of Gynecology and Obstetrics FIGO World Congress 2000, Washington, D.C.
McLellan et al. "Vessel Sealing for Hemostasis During Gynecologic Surgery" Sales/Product Literature 1999.
Int'l Search Report EP 98944778.4 dated Oct. 31, 2000.
Int'l Search Report EP 98957771 dated Aug. 9, 2001.
Int'l Search Report EP 98958575.7 dated Sep. 20, 2002.
Int'l Search Report EP 04013772.1 dated Apr. 1, 2005.
Int'l Search Report EP 04027314.6 dated Mar. 10, 2005.
Int'l Search Report EP 04027479.7 dated Mar. 8, 2005.
Int'l Search Report EP 04027705.5 dated Feb. 3, 2005.
Int'l Search Report EP 04752343.6 dated Jul. 20, 2007.
Int'l Search Report EP 05002671.5 dated Dec. 22, 2008.
Int'l Search Report EP 05002674.9 dated Jan. 16, 2009.
Int'l Search Report EP 05013463.4 dated Oct. 7, 2005.
Int'l Search Report EP 05013895.7 dated Oct. 21, 2005.
Int'l Search Report EP 05016399.7 dated Jan. 13, 2006.
Int'l Search Report EP 05017281.6 dated Nov. 24, 2005.
Int'l Search Report EP 05019130.3 dated Oct. 27, 2005.
Int'l Search Report EP 05019429.9 dated May 6, 2008.
Int'l Search Report EP 05020665.5 dated Feb. 27, 2006.
Int'l Search Report EP 05020666.3 dated Feb. 27, 2006.
Int'l Search Report EP 05021197.8 dated Feb. 20, 2006.
Int'l Search Report EP 05021779.3 dated Feb. 2, 2006.
Int'l Search Report EP 05021780.1 dated Feb. 23, 2006.
Int'l Search Report EP 05021937.7 dated Jan. 23, 2006.
Int'l Search Report—extended—EP 05021937.7 dated Mar. 15, 2006.
Int'l Search Report EP 05023017.6 dated Feb. 24, 2006.
Int'l Search Report EP 06002279.5 dated Mar. 30, 2006.
Int'l Search Report EP 06005185.1 dated May 10, 2006.
Int'l Search Report EP 06006716.2 dated Aug. 4, 2006.
Int'l Search Report EP 06008515.6 dated Jan. 8, 2009.
Int'l Search Report EP 06008779.8 dated Jul. 13, 2006.
Int'l Search Report EP 06014461.5 dated Oct. 31, 2006.
Int'l Search Report EP 06020574.7 dated Oct. 2, 2007.
Int'l Search Report EP 06020583.8 dated Feb. 7, 2007.
Int'l Search Report EP 06020584.6 dated Feb. 1, 2007.
Int'l Search Report EP 06020756.0 dated Feb. 16, 2007.
Int'l Search Report EP 06 024122.1 dated Apr. 16, 2007.
Int'l Search Report EP 06024123.9 dated Mar. 6, 2007.
Int'l Search Report EP 07 001480.8 dated Apr. 19, 2007.
Int'l Search Report EP 07 001488.1 dated Jun. 5, 2007.
Int'l Search Report EP 07 009026.1 dated Oct. 8, 2007.
Int'l Search Report Extended—EP 07 009029.5 dated Jul. 20, 2007.
Int'l Search Report EP 07 009321.6 dated Aug. 28, 2007.
Int'l Search Report EP 07 010672.9 dated Oct. 16, 2007.
Int'l Search Report EP 07 013779.9 dated Oct. 26, 2007.
Int'l Search Report EP 07 014016 dated Jan. 28, 2008.
Int'l Search Report EP 07 015191.5 dated Jan. 23, 2008.
Int'l Search Report EP 07 015601.3 dated Jan. 4, 2008.
Int'l Search Report EP 07 020283.3 dated Feb. 5, 2008.
Int'l Search Report EP 07 021646.0 dated Mar. 20, 2008.
Int'l Search Report EP 07 021646.0 dated Jul. 9, 2008.
Int'l Search Report EP 07 021647.8 dated May 2, 2008.
Int'l Search Report EP 08 002692.5 dated Dec. 12, 2008.
Int'l Search Report EP 08 004655.0 dated Jun. 24, 2008.
Int'l Search Report EP 08 006732.5 dated Jul. 29, 2008.
Int'l Search Report EP 08 006917.2 dated Jul. 3, 2008.
Int'l Search Report EP 08 016539.2 dated Jan. 8, 2009.
Int'l Search Report EP 09 003813.4 dated Aug. 3, 2009.
Int'l Search Report EP 09 004491.8 dated Sep. 9, 2009.
Int'l Search Report EP 09 005575.7 dated Sep. 9, 2009.
Int'l Search Report EP 09 152267.2 dated Jun. 15, 2009.
Int'l Search Report EP 09 152898.4 dated Jun. 10, 2009.
Int'l Search Report EP 09 154850.3 dated Jul. 20, 2009.
Int'l Search Report EP 09 160476.9 dated Aug. 4, 2009.
Int'l Search Report EP 09 164903.8 dated Aug. 21, 2009.
Int'l Search Report PCT/US98/18640 dated Jan. 29, 1999.
Int'l Search Report PCT/US98/23950 dated Jan. 14, 1999.
Int'l Search Report PCT/US98/24281 dated Feb. 22, 1999.
Int'l Search Report PCT/US99/24869 dated Feb. 3, 2000.
Int'l Search Report PCT/US01/11218 dated Aug. 14, 2001.
Int'l Search Report PCT/US01/11224 dated Nov. 13, 2001.
Int'l Search Report PCT/US01/11340 dated Aug. 16, 2001.
Int'l Search Report PCT/US01/11420 dated Oct. 16, 2001.
Int'l Search Report PCT/US02/01890 dated Jul. 25, 2002.
Int'l Search Report PCT/US02/11100 dated Jul. 16, 2002.
Int'l Search Report PCT/US03/28534dated Dec. 19, 2003.
Int'l Search Report PCT/US04/03436 dated Mar. 3, 2005.
Int'l Search Report PCT/US04/13273 dated Dec. 15, 2004.
Int'l Search Report PCT/US04/15311dated Jan. 12, 2005.
Int'l Search Report PCT/US07/021438 dated Apr. 1, 2008.
Int'l Search Report PCT/US07/021440 dated Apr. 8, 2008.
Int'l Search Report PCT/US08/61498 dated Sep. 22, 2008.
Int'l Search Report PCT/US09/032690 dated Jun. 16, 2009.
International Search Report and Written Opinion of the International Searching Authority dated Jun. 16, 2009 issued by the

(56) **References Cited**

OTHER PUBLICATIONS

European Patent Office in counterpart International Application No. PCT/US2009/032690 filed Jan. 30, 2009.
European Search Report dated Nov. 7, 2013.
Japanese Office Action from Japanese Patent Application No. 2013-146277 dated Feb. 2, 2015.
Canadian Office Action corresponding to Canadian Application No. 2,713,898 dated Oct. 26, 2015.

* cited by examiner

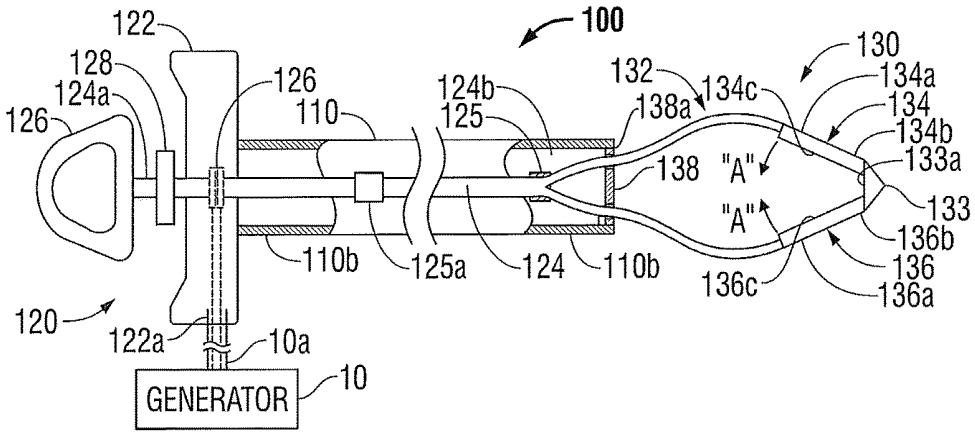


FIG. 1

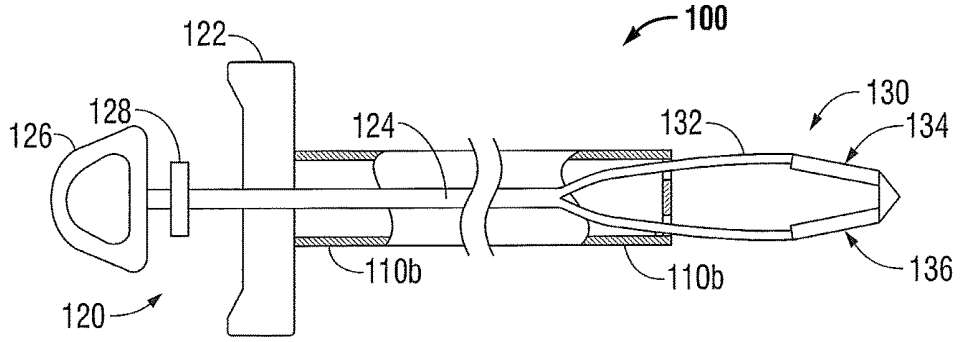


FIG. 2

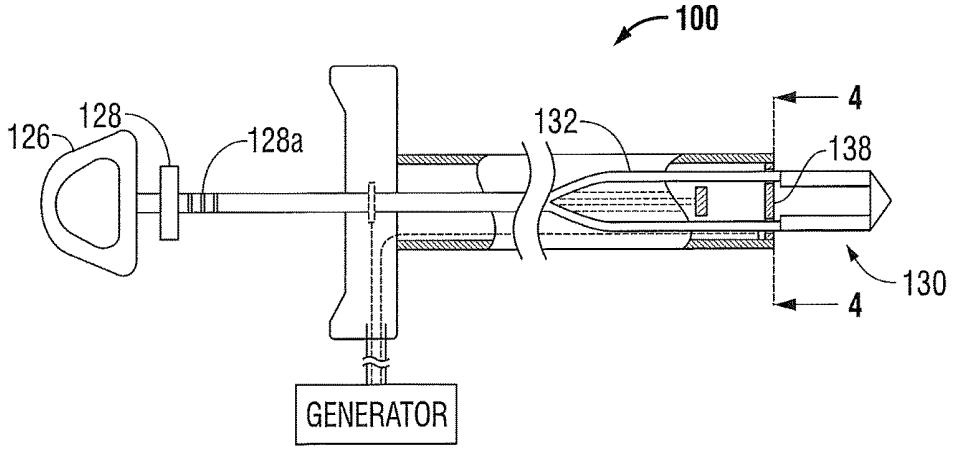


FIG. 3

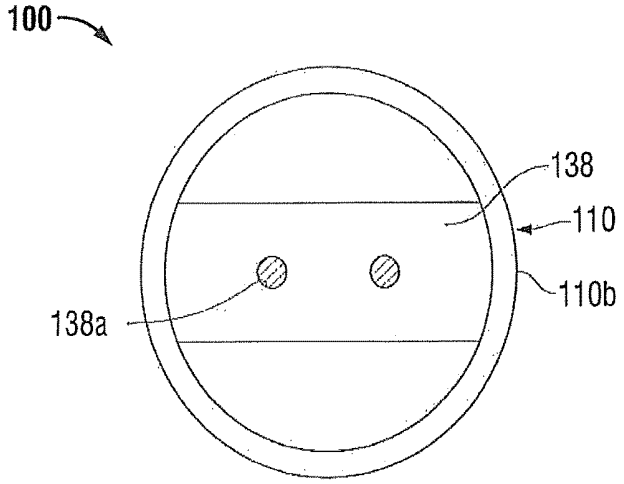

100
138
110
110b
138a

FIG. 4

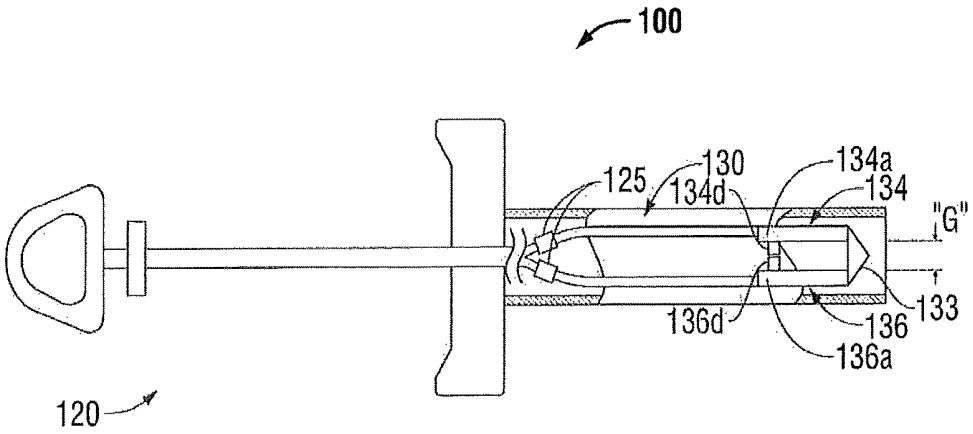

100
125
130
134d
134a
134
"G"
133
136
136a
136d
120

FIG. 5

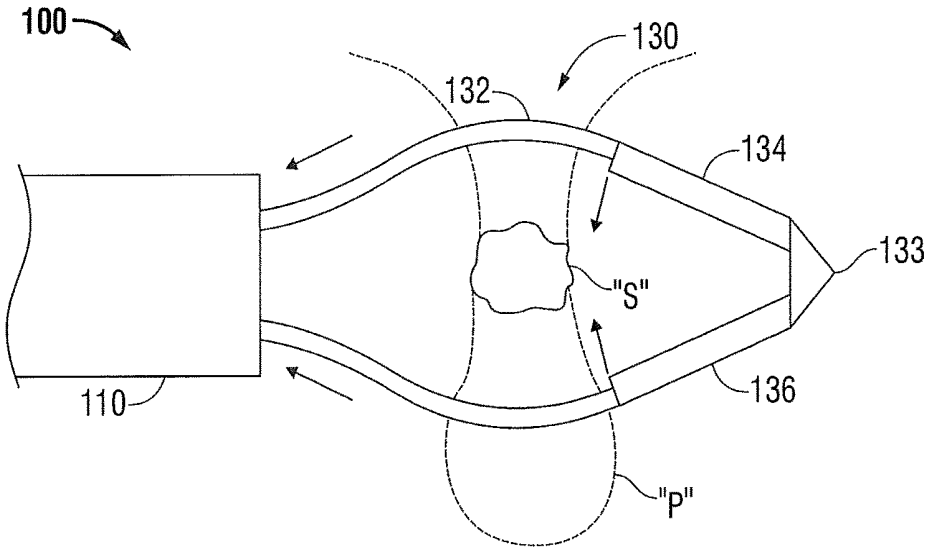


FIG. 6

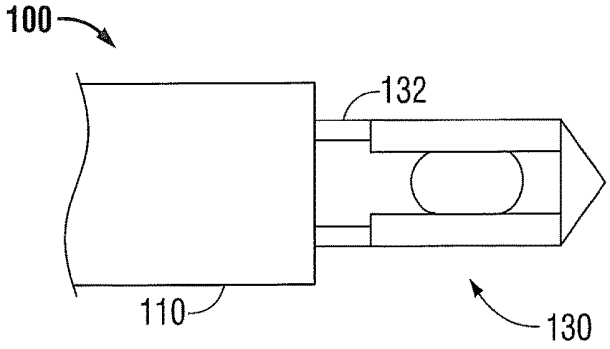


FIG. 7

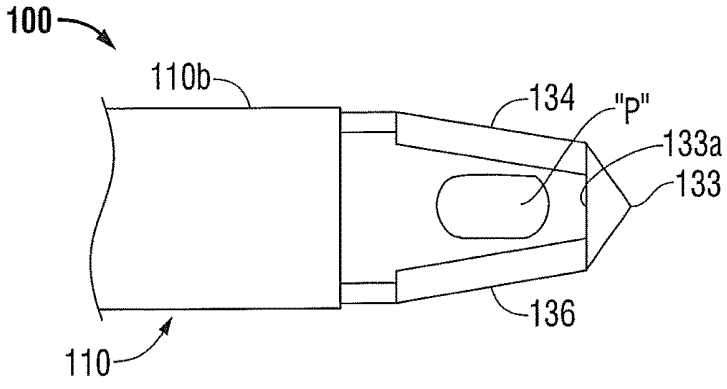


FIG. 8

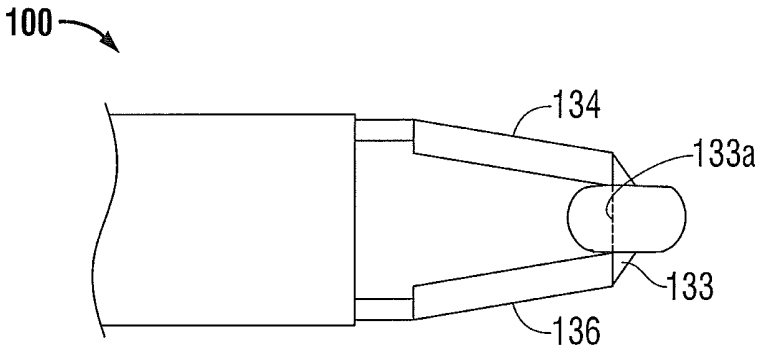


FIG. 9

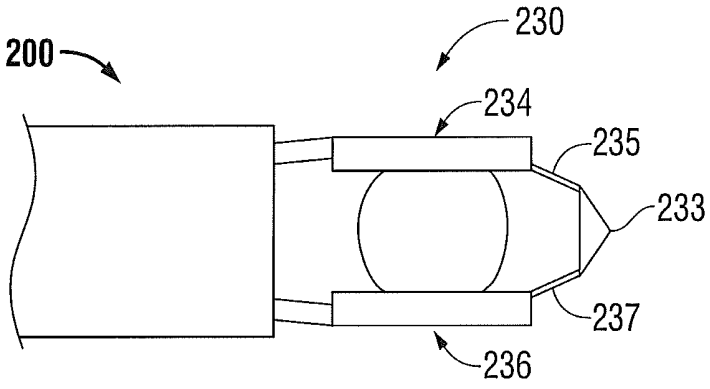


FIG. 10

POLYP REMOVAL DEVICE AND METHOD OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation application of U.S. patent application Ser. No. 12/363,086, filed Jan. 30, 2009, which claims the benefit of and priority to U.S. Provisional Patent Application Ser. No. 61/063,158, titled "Endoscopic Flexible Loop for Gastrointestinal Polypectomy and Mucosal Resection Using LigaSure™ Sealing Technology", by Wexner et al., filed Jan. 31, 2008, the entire contents of these applications are incorporated by reference herein.

BACKGROUND

Technical Field

The present disclosure relates to devices and methods for the removal of internal tissue and, more particularly, to snare-type devices including a pair of electrodes for treating tissue prior to excision.

Background of Related Art

A polyp is an abnormal growth of tissue projecting from a mucous membrane. A polyp that is attached to the surface of the mucous membrane by a narrow elongated stalk is said to be pedunculated. If no stalk is present, the polyp is said to be sessile. Polyps are commonly found in the colon, stomach, nose, urinary bladder and uterus. Polyps may also form elsewhere in the body where mucous membranes exist, for example, the cervix and small intestine.

The surgical procedure for removing a polyp is generally referred to as a "polypectomy". Polypectomys are generally endoscopic or laparoscopic procedures performed through the oral or anal cavities. When the location of the polyp permits, the polypectomy may be performed as an open procedure. Conventional polypectomys are completed using various apparatus and techniques known in the art.

As noted above, there are two forms of polyps, sessile and pedunculated. The stalkless or sessile polyps are generally removed using electrical forceps. For example, the excess tissue projecting from the mucous membrane is cauterized and torn from the tissue wall. Pedunculated polyps, or those with stalks, tend to be larger with a greater blood supply. The size and shape of pedunculated polyps typically do not lend themselves to being removed using traditional forceps. Unlike sessile polyps, polyps with a stalk cannot simply be grasped in the jaw members of an electrosurgical forceps and be torn from the tissue wall. Instead, the polypectomy is performed using a surgical snare device.

Conventional snare devices are configured with a snare for looping over the distal end of a hanging polyp and tightening securely around the stalk of the polyp. By constricting the snare, and selectively applying energy to the snare, the device may cauterize or seal the polyp at the stalk as the polyp is severed from the tissue wall. Conventional snare devices may be configured for monopolar or bipolar use. Excising a polyp using a conventional snare device typically involves cutting or otherwise separating the polyp from the tissue wall as the snare device is activated and constricted about the stalk of the polyp. In this manner, the polyp is cauterized as the snare passes through the tissue.

SUMMARY

Disclosed is a device configured for removing polyps. In one embodiment, the polyp removal device includes a tubular member having proximal and distal ends, a snare portion operably extending from within the distal end of the tubular member and including first and second electrodes configured to seal tissue therebetween, the snare portion further including a cutting member for severing the sealed tissue. The polyp removal device may further include a handle portion operatively extending from within the proximal end of the tubular member. The handle portion may be configured for operable engagement by a user. The cutting member may extend between distal ends of the first and second electrodes.

The polyp removal device may be configured to grasp the stalk of a polyp between the first and second electrodes. The first and second electrodes may be hingedly attached to the cutting member. The snare portion may be configured to be retracted within the tubular member. The snare portion may be retracted within the tubular member upon retraction of the handle portion relative to the base portion.

A system including the polyp removal device may further include an electrosurgical generator. The electrodes may be electrically connected to the electrosurgical generator. The distal end of the tubular member may include a spacer member for preventing the first and second electrodes from contacting one another. Alternatively, at least one of the first and second electrodes may include a spacer mounted thereon for preventing contact between the first and second electrodes.

Also provided is a polyp removal device including a tubular member having proximal and distal ends, a handle portion operatively extending from the proximal end of the tubular member, and a snare portion slidably supported within the lumen of the tubular member and operably extending from the distal end of the tubular member, the snare portion including first and second electrodes operably mounted thereto for sealing tissue therebetween, wherein at least one of the first and second electrodes includes at least one spacer mounted thereon for preventing contact between the first and second electrodes. The snare portion of the polyp removal device may be retractable with the tubular member.

Additionally provided is a method of removing a polyp. The method includes the steps of providing a polyp removal device including, a tubular member having proximal and distal ends, a snare portion slidably supported within the lumen of the tubular member and operably extending from the distal end of the tubular member, the snare portion including first and second electrodes operably mounted thereto for sealing tissue therebetween, wherein at least one of the first and second electrodes includes at least one spacer mounted thereon for preventing contact between the first and second electrodes, extending the snare portion relative to the tubular member, looping the snare portion about a portion of a polyp, retracting the snare portion relative to the tubular member to capture the portion of the polyp between the first and second electrodes, and activating the first and second electrodes.

The method may further include the steps of partially advancing the snare portion relative to the tubular member, retracting the tubular member and the snare portion relative to the polyp and severing the polyp from surrounding tissue.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure and, together with the

detailed description of the embodiments given below, serve to explain the principles of the disclosure.

FIG. **1** is a partial cross-sectional, top plan view of a polyp removal device according to an embodiment of the present disclosure, shown in a first or extended position;

FIG. **2** is a partial cross-sectional top plan view of the polyp removal device of FIG. **1**, shown in a partially retracted position;

FIG. **3** is a partial cross-sectional top plan view of the polyp removal device of FIG. **1**, shown in a retracted position;

FIG. **4** is a cross-section end view of the polyp removal device of FIGS. **1-3** taken along line **4-4** of FIG. **3**;

FIG. **5** is a partial cross-section top plan view of an alternative embodiment of a polyp removal device according to the present disclosure in a completely retracted position;

FIG. **6** is a partial top plan view of the distal end of the polyp removal device of FIGS. **1-4**, in a first or extending position about a polyp;

FIG. **7** is a partial top plan view of the distal end of the polyp removal device of FIG. **6**, in a retracted position about a polyp;

FIG. **8** is a partial top plan view of the distal end of the polyp removal device of FIGS. **6** and **7**, in a partially advanced position about a polyp;

FIG. **9** is a partial top plan view of the distal end of the polyp removal device of FIGS. **6-8**, as the stalk of the polyp is being severed; and

FIG. **10** is a partial top plan view of another illustrative embodiment of a polyp removal device of the present disclosure, in a retracted position about a polyp.

DETAILED DESCRIPTION OF EMBODIMENTS

The foregoing summary, as well as the following detailed description will be better understood when read in conjunction with the appended figures. For the purpose of illustrating the present disclosure, various embodiments are shown. It is understood, however, that the present disclosure is not limited to the precise arrangement and instrumentalities shown.

As shown in the drawings and described throughout the following description, as is traditional when referring to relative positioning on an object, the term "proximal" refers to the end of the apparatus that is closer to the user and the term "distal" refers to the end of the apparatus that is further from the user.

Referring to FIGS. **1-4**, an embodiment of the presently disclosed polyp removal device is shown therein and is generally designated as polyp removal device **100**. Polyp removal device **100** includes an elongated tubular member **110**, a handle portion **120** extending proximally from tubular member **110**, and a snare portion or assembly **130** operably engaged with handle portion **120** and extending distally from within elongated tube **110**. Polyp removal device **100** may be any suitable length and size for accessing various locations throughout the body. Device **100** may be configured for removal of suitable types of polyps of any size, or may be configured for general mucosal resection or removal of any suitable tissue mass. Preferably, polyp removal device **100** is configured for endoscopic, laparoscopic or transluminal insertion.

Referring initially to FIGS. **1-3**, elongated tubular member **110** includes proximal and distal ends **110***a*, **110***b*. Proximal end **110***a* of tubular member **110** is operably coupled to handle portion **120**. As will be described in further detail below, handle portion **120** may be integrally formed with tubular member **110**. Alternatively, handle portion **120** may be releasably secured to tubular member **110**, or may instead be securely affixed to tubular member **110**. Tubular member **110** may be flexible, semi-rigid, or rigid and may be constructed of metal, alloy, plastic, polymers, or any other suitable material. Distal end **110***b* of tubular member **110** is configured to slidingly receive a proximal end of snare portion **130**.

Although the following description of the polyp removal device **100** will be described in the form of a snare-type device, the aspects of the present disclosure may be modified for used with alternative handle configurations, including a pistol grip style device, mechanically and/or remotely actuated handles, other suitable types of devices or handle arrangements. As one example, polyp removal device **100** may be incorporated as a pistol grip style laparoscopic device like some of the LigaSure™ tissue fusion devices sold by Valleylab of Boulder, Colo.

Still referring to FIGS. **1-3**, handle portion **120** of polyp removal device **100** includes a base **122** coupled to proximal end **110***a* of tubular member **110**, a connector shaft **124** extending through base **122**, and a handle **126** operably coupled to a proximal end **124***a* of connector shaft **124**. In one embodiment, base **122** of handle portion **120** may be securely affixed to proximal end **110***a* of tubular member **110** using adhesive, bonding, mechanical fasteners, welding or other suitable methods. Alternatively, base **122** may be releasably connected to tubular member **110** using mechanical fasteners, threaded engagement, friction fitting, bayonet connections, or the like. In this manner, snare portion **130** may be removed and replaced through proximal end **110***a* of tubular member **110**. Base **122** of handle portion **120** may instead be integrally formed with proximal end **110***a* of tubular member **110**. Handle **126** is configured for operable engagement by a user. Handle **126** may be knurled or may include a coating for facilitating engagement by a user.

Base **122** of handle portion **120** is further configured for operable engagement with a generator **10**. Base **122** defines a connection port **122***a* for receiving an electrical cord **10***a* extending from generator **10**. Electrical cord **10***a* extends from connection port **122***a* through base **122** and is operably coupled to first and second electrodes **134**, **136** of snare portion **130**. Electrical cord **10***a* may be directly coupled to first and second electrodes **134**, **136**. Alternatively, electrical cord **10***a* may couple with a coupling member **123** mounted to shaft **124**. In this manner, coupling member **123** electrically couples generator **10** with first and second electrodes **134**, **136** along shaft **124**. Generator **10** may include any suitable generator configured to selectively provide energy to electrodes **134**, **136**. For example, radiofrequency energy, either monopolar or bipolar may be provided to electrodes **134**, **136**. In other embodiments, ultrasonic, microwave, or laser energy may be provided. Depending on the energy modality utilized, snare **130** and/or electrodes **134**, **136** may have to be reconfigured in order the handle the different types of energy.

In an embodiment where radiofrequency energy is utilized, to increase safety, bipolar radiofrequency energy is preferred because the energy will travel between first and second electrodes **134**, **136** instead of between the snare **130** and some remote return pad. In one particular embodiment, generator **10** takes the form of a battery-powered generator that is integral with, or releasably coupled to, polyp removal device **100**. In this example, electrical cord **10***a* is not needed. Generator **10** may also be configured to monitor the electrical properties of the tissue maintained between first

and second electrodes **134**, **136** and signal to the clinician when conditions have been met that are suitable for sealing of tissue.

Still referring to FIGS. **1-3**, connector shaft **124** includes an elongated tubular shaft including proximal and distal ends **124***a*, **124***b*. Proximal end **124***a* is configured for operable engagement with handle **126**. Handle **126** may be securely affixed, releasable coupled, or integrally formed with proximal end **124***a* of connector shaft **124**. Handle portion **120** may further include a stop member **128** positioned about connector shaft **124** between base **122** and handle **126**. Stop member **128** prevents complete retraction of connector shaft **124** past base **122**. Proximal end **124***a* may be configured to securely retain stop member **128**, or instead, may include grooves or indents **128***a* for selectively positioning stop member **128** thereabout. In this manner, adjustment of stop member **128** reduces or increases the amount of extension of snare portion **130**. Alternatively, stop member **128** may be configured to selectively engage distal end **124***a* of connector shaft **124** through the incorporation of a mechanical fastener or the like (not shown). Distal end **124***b* of connector shaft **124** is operably coupled to snare portion **130**. Distal end **124***b* may be permanently coupled, releasably coupled or integrally formed with snare portion **130**.

Snare portion **130** includes a snare **132** formed of a loop of rigid or semi-rigid wire or flexible band. Snare **132** may be constructed of metal, polymer or other suitable material. In the illustrated embodiment, snare **132** is non-conductive; however, snare **132** may be conductive or partially conductive. Coupled to snare **132** in any suitable manner near a distal end **130***b* of snare portion **130** are first and second electrodes **134**, **136**. As discussed above, first and second electrodes **134**, **136** are electrically coupled to generator **10** to receive electrosurgical energy therefrom. First and second electrodes **134**, **136**, which may be of any suitable construction, each include at least a tissue contacting surface **134***c*, **136***c*. In some embodiments, first and second electrodes **134**, **136** are each formed from a tissue contacting surface **134***c*, **136***c* and an insulative body portion. Tissue contacting surfaces **134***c*, **136***c* may include any configuration suitable for treating tissue, including hatching, grooves and detents (not shown). In one embodiment, generator **10**, first and second electrodes **134**, **136**, and tissue contacting surfaces **134***c*, **136***c*, are all configured for sealing tissue.

Positioned between first and second electrodes **134**, **136** is a connection member **133**. Distal ends **134***b*, **136***b* of first and second electrodes **134**, **136**, respectively, are coupled to connection member **133**. First and second electrodes **134**, **136** and connection member **133** are configured such that in a first or extended position, proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136**, respectively, are substantially spaced from one another. As will be discussed in further detail below, this configuration opens snare **132** to facilitate the looping of snare **132** over a polyp "P" (FIG. **6**) and the positioning of first and second electrodes **134**, **136** about stalk "S" of polyp "P".

First and second electrodes **134**, **136** and connection member **133** are further configured such that as proximal end **130***a* of snare portion **130** is retracted within distal end **110***b* of tubular member **110**, proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136**, respectively, are approximated towards each other, in the direction of arrows "A" (FIG. **1**). In this manner, first and second electrodes **134**, **136** and connection member **133** act like a jaw assembly, thereby compressing stalk "S" of polyp "P" between first and second electrodes **134**, **136**. To prevent first and second electrodes **134**, **136** from contacting one another, distal end **110***b* of tubular member **110** may include a spacer member **138** through which snare **132** may extend. Spacer member **138** spans distal end **110***b* of tubular member **110** and includes a pair of apertures **138***a* through which snare **132** is received. Apertures **138***a* are spaced such that upon retraction of proximal end **130***a* of snare portion **130** within tubular member **110**, proximal end **134***a*, **136***a* of first and second electrodes **134**, **136** are approximated towards one another. Apertures **138***a* are further configured to prevent first and second electrodes **134**, **136** contacting one another. Release of proximal end **130***a* of snare portion **130** from within distal end **110***b* of tubular member **100** permits proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** to approximate away from one another and eventual return to their initial position.

In an alternative embodiment, one or both of first and second electrodes **134**, **136** may include one or more spacers **134***d*, **136***d* (FIG. **5**) formed on respective proximal ends **134***a*, **136***a*. Spacers **134***d*, **136***d* are configured to prevent contact between first and second electrodes **134**, **136**.

Connection member **133** extends between first and second electrodes **134**, **136** and is configured to maintain distal ends **134***b*, **136***b* of first and second electrodes **134**, **136**, in a spaced relationship throughout the tissue excising procedure. As described above, in a first or extended position, proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** are maintained in a substantially spaced apart relationship. This configuration facilitates positioning of snare **132**, and first and second electrodes **134**, **136** in particular, about stalk "S" of a polyp "P" (FIG. **6**). Distal ends **134***b*, **136***b* of first and second electrodes **134**, **136** are coupled to connection member **133** in a manner that permits pivoting, hinging, or flexing of first and second electrodes **134**, **136** relative to connection member **133** as snare **132** is constricted about stalk "S" of polyp "P". First and second electrodes **134**, **136** and/or connection member **133** may be formed of flexible material, or may instead include a hinge mechanism or any other suitable configuration capable of permitting first and second electrodes **134**, **136** to pivot, hinge, or flex relative to connection member **133**. In the event that proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** are approximated away from one another by the configuration of connection member **133**, snare **132** may provide the spring force to maintain proximal ends **134***a*, **136***a* substantially spaced apart when polyp removal device **100** is in a first or extended position.

Connection member **133** further includes at least a first sharpened surface **133***a*. First sharpened surface **133***a* is formed between distal ends **134***b*, **136***b* of first and second electrodes **134**, **136** and may be configured to severe stalk "S" of polyp "P" after proper sealing of the tissue. In addition, or alternatively, the outer surface of connection member **133** may be sharpened to facilitate excising of polyp "P".

Referring now to FIGS. **1-3** and **6-8**, one embodiment of the operation of polyp removal device **100** will be described. Initially, distal end **110***b* of tubular member **110** is inserted into a patient. As discussed above, introduction of polyp removal device **100** may be accomplished through an endoscopic or laparoscopic port, or may be inserted transluminally through the mouth or anus. To facilitate insertion of tubular member **110** into the body, in one embodiment (FIG. **5**), snare portion **130***a* is completely retracted within tubular member **110**.

Once distal end **110***b* of tubular member **110** is positioned near a polyp "P" to be removed, snare portion **130** is

extended distally by advancing handle **126** of handle portion **120** relative to base **122**. The spring-like configuration between first and second electrodes **134**, **136** and connection member **133** results in proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** approximating away from each other as handle **126** is advanced and proximal end **130***a* of snare portion **130** is released from tubular member **110**. The separating of proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** opens snare **132** and facilitates positioning of snare **132** about stalk "S" of polyp "P". Once snare **132** positioned such that stalk "S" is received between first and second electrodes **134**, **136**, handle **126** may be retracted or, in the alternative, tubular member **110** may be advanced to constrict snare **132** about stalk "S". As proximal end **130***a* of snare portion **130** is received within distal end **110***b* of tubular member **110** through spacer member **138**, proximal ends **134***a*, **136***a* of first and second electrodes **134**, **136** are approximated towards one another, thereby capturing stalk "S" of polyp "P" therebetween. Other methods of approximating first and second electrodes **134**, **136** towards one another are contemplated by the present invention. For example, another instrument separate from polyp removal device **100** may be utilized.

Continued retraction of snare portion **130** within tubular member **110** causes first and second electrodes **134**, **136** to compress stalk "S" of polyp "P". Once the clinician is satisfied stalk "S" is sufficiently received between first and second electrodes **134**, **136**, generator **10** may be activated to treat the tissue between first and second electrodes **134**, **136**. Alternatively, and as discussed above, generator **10** may include a system for monitoring the electrical properties of the tissue between first and second electrodes **134**, **136**. Once a predetermined condition has been satisfied, preferably, a condition suitable to promote tissue sealing, generator **10** signals to the clinician that the tissue is ready to be sealed, at which point, generator **10** may automatically provide electrosurgical energy to tissue contacting surfaces **134***c*, **136***c*, or the clinician may activate generator **10** to provide the energy to seal the tissue. Electrosurgical energy is provided to tissue contacting surfaces **134***c*, **136***c* until the tissue of stalk "S" is properly sealed. Electrosurgical energy may be provided at a range of frequencies, over a variable duration, and may be continuous or intermittent, depending of the type of tissue being treated and the thickness of the tissue. Furthermore, the monitoring function may include for a signal to denote that the sealing is finished and that severing of the polyp "P" may take place.

In some embodiments, in order to effectively seal larger vessels (or tissue) two predominant mechanical parameters should be accurately controlled—the pressure applied to the vessel (tissue) and the gap distance between the electrodes—both of which are affected by the thickness of the sealed vessel. More particularly, accurate application of pressure may be important to oppose the walls of the vessel; to reduce the tissue impedance to a low enough value that allows enough electrosurgical energy through the tissue; to overcome the forces of expansion during tissue heating; and to contribute to the end tissue thickness, which is an indication of a good seal. It has been determined that a typical fused vessel wall is preferably between 0.001 and 0.006 inches. Below this range, the seal may shred or tear and above this range the lumens may not be properly or effectively sealed.

With respect to smaller vessels, the pressure applied to the tissue tends to become less relevant, whereas the gap distance between the electrically conductive surfaces becomes more significant for effective sealing. In other words, the chances of the two electrically conductive surfaces touching during activation increases as vessels become smaller.

As mentioned above, at least one electrode, e.g., **134**, may include a stop member **134***d* that limits the movement of the two opposing electrodes **134**, **136** relative to one another. Stop member **134***d* may extend from the tissue contacting surface **134***c* a predetermined distance according to the specific material properties (e.g., compressive strength, thermal expansion, etc.) to yield a consistent and accurate gap distance "G" during sealing (FIG. **5**). In one embodiment, the gap distance between opposing tissue contacting surfaces **134***c*, **136***c* during sealing ranges from about 0.001 inches to about 0.006 inches and, preferably, between about 0.002 and about 0.003 inches. The non-conductive stop members **134***d*, **136***d* may be molded onto electrodes **134**, **136** (e.g., overmolding, injection molding, etc.), stamped onto electrodes **134**, **136** or deposited (e.g., deposition) onto electrodes **134**, **136**. For example, one technique involves thermally spraying a ceramic material onto the surface of the electrodes **134**, **136** to form the stop members **134***d*, **136***d*, respectively. Several thermal spraying techniques are contemplated that involve depositing a broad range of heat resistant and insulative materials on various surfaces to create stop members **134***d*, **136***d* for controlling the gap distance between electrically conductive surfaces **134***c*, **136***c*.

It has also been found that the pressure range for assuring a consistent and effective seal may be between about 3 kg/cm.sup.2 to about 16 kg/cm.sup.2 and, preferably, within a working range of 7 kg/cm.sup.2 to 13 kg/cm.sup.2. Manufacturing an instrument that is capable of providing a closure pressure within this working range has been shown, in some embodiments, to be effective for sealing arteries, tissues and other vascular bundles.

As can be appreciated, controlling the compressive force between with first and second electrodes **134**, **136** as snare portion **130** is retracted may facilitate and assure consistent, uniform and accurate closure pressure about the tissue within the desired working pressure range of about 3 kg/cm-.sup.2 to about 16 kg/cm.sup.2 and, preferably, about 7 kg/cm.sup.2 to about 13 kg/cm.sup.2. By controlling the intensity, frequency and duration of the electrosurgical energy applied to the tissue, the user can either cauterize, coagulate/desiccate, seal and/or simply reduce or slow bleeding.

In one embodiment, by controlling the force applied to handle **126**, the resulting tension in snare portion **130** may be adjusted, which, in turn, regulates the overall pressure between electrodes **134**, **136** to within the above-identified desired sealing range. A sensor **125** may be employed to accomplish this purpose and may be mechanically coupled to handle portion **120** and/or snare portion **130**. A visual or audible indicator (not shown) may be operably coupled to handle portion **120**, snare portion **130** and/or sensor **125** to provide visual, audible or tactile feed back to the user to assure that the clamping pressure is within the desired range prior to activation of the instrument.

Alternatively, handle portion **120** may incorporate a spring mechanism **125***a* configured to prevent excessive force being applied to snare portion **130**, thereby preventing overcompression of the tissue between first and second electrodes **134**, **136**. Spring mechanism **125***a* may include a compression spring (not shown) that deforms once the force applied to handle **126** exceeds the force necessary to accomplish effective sealing between first and second electrodes **134**, **136**. In an alternative embodiment, snare portion **130** may instead be advanced and retracted through the rotation

of handle **126**. In this manner, handle portion **120** may include a torque mechanism, e.g., torque wrench or the like, (not shown) which is precisely set to measure the torque (rotational force) applied to snare portion **130** so the closure pressure between electrodes **134**, **136** will fall within the desired pressure range.

Once the tissue of stalk "S" is sealed, handle **126** is partially advanced to extend a length of snare portion **130** from tubular member **110**, thereby approximating proximal ends **134***a*, **136***a* of first and second electrodes, respectively, away from each other and exposing sealed stalk "S" to first sharpened surface **133***a* of connection member **133**. While maintaining snare portion **130** relative to tubular member **110**, tubular member **110** is retracted relative to polyp "P", thereby causing the engagement of stalk "S" with first sharpened surface **133***a* of connection member **133**. Continued retraction of tubular member **110** causes the complete severing of stalk "S" (see FIG. **9**).

When using polyp removal device **110**, the likelihood of excessive bleeding is greatly reduced because the tissue is completely sealed prior to being cut. Using polyp removal device **110** further reduces the likelihood of creating an open wound that is susceptible to infection. In addition, the utilization of bipolar energy to seal a polyp or other tissue is safer than monopolar, e.g., because of less thermal and energy spread, thereby reducing the likelihood of perforations.

With reference now to FIG. **10**, an alternative embodiment of the present disclosure is shown generally as polyp removal device **200**. Polyp removal device **200** is substantially similar to polyp removal device **100** and will, therefore, only be described as relates to the differences therebetween. Snare portion **230** includes first and second electrodes **234**, **236** and a connection member **233**. Extending between first and second electrodes **234**, **236** and connection member **233** are extension members **235**, **237**, respectively. Extension member **235**, **237** permit first and second electrodes **234**, **236** to be spaced further apart from one another in a second or sealing condition. In this manner, polyp removal device **200** may be used to excise larger polyps having a larger stalk.

Various changes in form, detail and operation of the polyp removal devices of the present disclosure may be made without departing from the spirit and scope of the present disclosure.

What is claimed is:

1. A tissue removal system comprising:

a tubular member having proximal and distal ends, the distal end including a spacer member that defines a plurality of apertures therethrough;

a connector shaft supported within the tubular member and having proximal and distal ends; and

a snare portion having first and second ends monolithically formed with the distal end of the connector shaft, the snare portion operably extending through the plurality of apertures of the spacer member and from the distal end of the tubular member, the snare portion movable relative to the spacer member and including a cutting member having a sharpened surface.

2. The tissue removal system of claim **1**, further comprising a handle portion secured to the proximal end of the connector shaft and operatively coupled to the proximal end of the tubular member.

3. The tissue removal system of claim **2**, wherein the handle portion is configured for operable engagement by a user and movable relative to the tubular member.

4. The tissue removal system of claim **2**, wherein the sharpened surface of the cutting member is configured to cut tissue in response to movement of the handle portion in a proximal direction relative to the tubular member.

5. The tissue removal system of claim **1**, wherein the snare portion is configured to grasp a stalk of a polyp.

6. The tissue removal system of claim **1**, wherein the snare portion is configured to be retracted within the tubular member in response to movement of the connector shaft in a proximal direction.

7. The tissue removal system of claim **1**, further including an electrosurgical generator.

8. The tissue removal system of claim **7**, wherein the snare portion is electrically coupled to the electrosurgical generator.

9. The tissue removal system of claim **1**, wherein first and second apertures of the plurality of apertures of the spacer member are spaced from one another to prevent a first portion of the snare portion from contacting a second portion of the snare portion.

10. The tissue removal system of claim **1**, wherein the tubular member is configured for endoscopic insertion, laparoscopic insertion or transluminal insertion.

11. The tissue removal system of claim **2**, wherein the handle portion includes handle configurations selected from the group consisting of pistol grip style handles, mechanically-actuated handles and remotely-actuated handles.

12. A tissue removal system comprising:

a tissue removal device comprising:

a tubular member having proximal and distal ends, the distal end including a spacer member that defines a plurality of apertures therethrough;

a handle portion operatively extending from the proximal end of the tubular member;

a connector shaft having a proximal end secured to the handle portion and a distal end;

a snare portion having first and second ends monolithically formed with the distal end of the connector shaft, the snare portion slidably supported within the tubular member, the snare portion movable through the plurality of apertures of the spacer member and from the distal end of the tubular member; and

a cutting member having a sharpened surface positioned on the snare portion; and

a generator configured to generate and deliver energy to the tissue removal device.

13. The tissue removal system of claim **12**, wherein the energy is selected from the group consisting of radiofrequency energy, ultrasonic energy, microwave energy, and laser energy.

14. A method of removing a tissue mass of a body comprising:

providing a tissue removal device including a snare portion and a cutting member having a sharpened surface positioned on the snare portion, the snare portion including first and second ends monolithically formed with a distal end of a connector shaft;

moving the snare portion through a plurality of apertures defined through a spacer member to surround the tissue mass;

retracting the snare portion to capture the tissue mass within the snare portion;

delivering energy to the snare portion;

discontinuing delivery of energy to the snare portion; and

further retracting the snare portion such that the sharpened surface of the cutting member severs the tissue mass from the body.

15. The method of claim 14, wherein delivering energy to the snare portion further includes sealing the tissue mass.

16. The method of claim 15, further comprising:

monitoring electrical properties of the tissue mass during energy delivery;

detecting a predetermined condition; and

signaling that the tissue mass is ready to be severed.

17. The method of claim 14, further including preventing contact between a first portion of the snare portion and a second portion of the snare portion with the spacer member.

18. The tissue removal system of claim 1, wherein the snare portion includes at least one electrode that is hingedly connected to the cutting member.

19. The tissue removal system of claim 12, wherein the snare portion includes a proximal portion and a distal portion, the first and second ends of the snare portion are monolithically formed with the distal end of the connector shaft at the proximal portion of the snare portion.

20. The tissue removal system of claim 19, wherein a length of the snare portion extends from the proximal portion to the distal portion, the length of the snare portion remaining substantially constant as the snare portion moves between fully approximated and fully unapproximated positions to sever a tissue mass enclosed by the snare portion.

21. The tissue removal system of claim 1, wherein the spacer member is fixedly secured to the distal end of the tubular member.

* * * * *

专利名称(译)	息肉清除装置和使用方法		
公开(公告)号	US9918771	公开(公告)日	2018-03-20
申请号	US13/711201	申请日	2012-12-11
[标]申请(专利权)人(译)	柯惠有限合伙公司		
申请(专利权)人(译)	COVIDIEN LP，		
当前申请(专利权)人(译)	COVIDIEN LP		
[标]发明人	REGADAS F SERGIO P		
发明人	REGADAS, F. SERGIO P.		
IPC分类号	A61B18/00 A61B17/3205 A61B18/14 A61B17/221 A61B17/24 A61B17/32 A61B18/20 A61B18/18		
CPC分类号	A61B18/00 A61B18/14 A61B17/32056 A61B2018/1407 A61B17/221 A61B17/24 A61B17/32 A61B18/18 A61B18/20 A61B2018/00345 A61B2018/00404 A61B2018/00482 A61B2018/00571 A61B2018/00607 A61B2018/00619 A61B2018/141		
助理审查员(译)	李，翁		
优先权	61/063158 2008-01-31 US		
其他公开文献	US20130103041A1		
外部链接	Espacenet USPTO		

摘要(译)

提供了一种用于移除息肉的装置和系统，其包括具有近端和远端的管状构件，可操作地从管状构件的远端内延伸的圈套部分，圈套部分包括用于切断密封组织的切割构件。息肉去除装置可进一步包括手柄部分，其可操作地从管状部件的近端内延伸。手柄部分可以被配置用于由使用者可操作地接合，并且切割构件可以在第一电极和第二电极的远端之间延伸。