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(54) **SURGICAL STAPLER**

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A61B 17/072 (2006.01)

(52) **U.S. Cl.** **606/139**; 227/19; 227/176.1; 227/82; 606/219

(58) **Field of Classification Search** 227/176.1, 227/175.1, 19, 82, 88; 606/139, 219
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,526,228 A	9/1970	Lyng	
3,958,576 A	5/1976	Komiya	
4,493,322 A *	1/1985	Becht	227/177.1
4,664,305 A *	5/1987	Blake et al.	227/19
4,667,674 A	5/1987	Korthoff et al.	
4,791,707 A	12/1988	Tucker	
4,796,627 A	1/1989	Tucker	
4,874,122 A *	10/1989	Froelich et al.	227/19
4,899,745 A	2/1990	Laboureau et al.	
4,983,176 A	1/1991	Cushman et al.	
5,007,921 A	4/1991	Brown	
5,026,390 A	6/1991	Brown	
5,047,047 A *	9/1991	Yoon	606/216

5,049,152 A *	9/1991	Simon et al.	606/143
5,089,009 A *	2/1992	Green	606/219
5,100,041 A *	3/1992	Storace	227/19
5,170,926 A *	12/1992	Ruckdeschel et al.	227/177.1
5,201,745 A	4/1993	Tayot et al.	
5,207,692 A	5/1993	Kraus et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

KR 1020000046780 7/2000

(Continued)

OTHER PUBLICATIONS

"Closure and Assisted-Compression Device Update", *Endovascular Today*, (Apr. 2004),22.

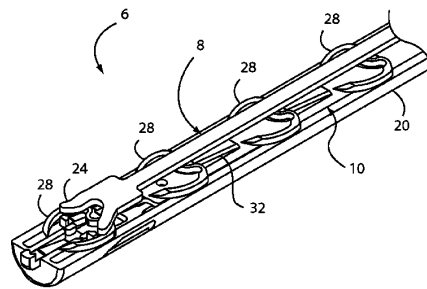
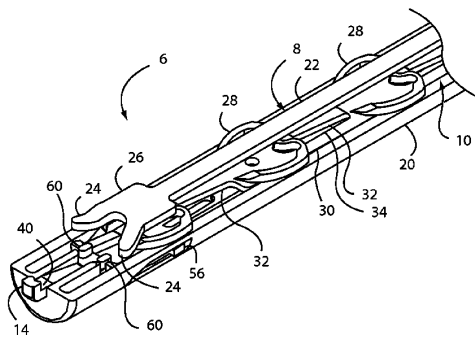
(Continued)

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(57) **ABSTRACT**

A method for surgically stapling tissue may include providing staples in a first configuration, plastically deforming at least one staple to a second configuration different from the first configuration; and then plastically deforming at least one staple to a third configuration different from the first configuration and the second configuration. The deformation of a staple from the first configuration to the second configuration may be performed by splaying the staple. The staple may be splayed by a splay arm or other suitable structure or mechanism.

13 Claims, 7 Drawing Sheets



U.S. PATENT DOCUMENTS

5,236,440 A * 8/1993 Hlavacek 606/219
 5,356,064 A * 10/1994 Green et al. 227/177.1
 5,395,381 A 3/1995 Green et al.
 5,413,584 A 5/1995 Schulze
 5,425,489 A * 6/1995 Shichman et al. 227/108
 5,431,669 A 7/1995 Thompson et al.
 5,439,468 A 8/1995 Schulze et al.
 5,464,416 A 11/1995 Steckel
 5,531,760 A * 7/1996 Alwafaie 606/216
 5,544,802 A * 8/1996 Crainich 227/176.1
 5,601,574 A 2/1997 Stefanchik et al.
 5,607,436 A 3/1997 Pratt et al.
 5,662,681 A 9/1997 Nash et al.
 5,674,231 A 10/1997 Green et al.
 5,695,504 A * 12/1997 Gifford et al. 606/153
 5,715,987 A * 2/1998 Kelley et al. 227/175.1
 5,725,554 A * 3/1998 Simon et al. 606/219
 5,782,397 A * 7/1998 Koukline 227/176.1
 5,810,846 A 9/1998 Virnich et al.
 5,829,662 A * 11/1998 Allen et al. 227/177.1
 5,843,124 A 12/1998 Hammerslag
 5,910,155 A 6/1999 Ratcliff et al.
 5,921,997 A 7/1999 Fogelberg et al.
 6,022,372 A 2/2000 Kontos
 6,197,042 B1 3/2001 Ginn et al.
 6,277,131 B1 * 8/2001 Kalikow 606/143
 6,277,140 B2 8/2001 Ginn et al.
 6,302,898 B1 10/2001 Edwards et al.
 6,322,580 B1 11/2001 Kanner
 6,348,064 B1 2/2002 Kanner
 6,352,541 B1 3/2002 Kienzle et al.
 6,368,341 B1 4/2002 Abrahamson
 6,371,974 B1 4/2002 Brenneman et al.
 6,391,048 B1 5/2002 Ginn et al.
 6,450,390 B2 * 9/2002 Heck et al. 227/176.1
 6,451,031 B1 9/2002 Kontos
 6,461,364 B1 10/2002 Ginn et al.
 6,494,896 B1 * 12/2002 D'Alessio et al. 606/213
 6,506,210 B1 1/2003 Kanner
 6,508,828 B1 1/2003 Akerfeldt et al.
 6,524,321 B2 2/2003 Kanesaka
 6,524,326 B1 2/2003 Zhu et al.
 6,533,762 B2 3/2003 Kanner et al.
 6,540,735 B1 4/2003 Ashby et al.
 6,623,510 B2 9/2003 Carley et al.
 6,626,918 B1 9/2003 Ginn et al.
 6,632,238 B2 10/2003 Ginn et al.
 6,652,539 B2 11/2003 Shipp et al.
 6,676,685 B2 1/2004 Pedros et al.
 6,695,867 B2 2/2004 Ginn et al.
 6,719,777 B2 4/2004 Ginn et al.
 6,726,704 B1 4/2004 Loshakove et al.
 6,743,248 B2 6/2004 Edwards et al.
 6,749,621 B2 6/2004 Pantages et al.
 6,755,842 B2 6/2004 Kanner et al.

6,767,356 B2 7/2004 Kanner et al.
 6,773,438 B1 8/2004 Knodel et al.
 6,780,197 B2 8/2004 Roe et al.
 6,942,674 B2 9/2005 Belef
 7,056,330 B2 * 6/2006 Gayton 606/219
 2001/0007077 A1 7/2001 Ginn et al.
 2001/0021855 A1 9/2001 Levinson
 2002/0072768 A1 6/2002 Ginn
 2002/0082641 A1 6/2002 Ginn et al.
 2002/0133193 A1 9/2002 Ginn et al.
 2002/0151921 A1 10/2002 Kanner
 2002/0156495 A1 10/2002 Brenneman et al.
 2002/0193808 A1 12/2002 Belef et al.
 2003/0078598 A1 4/2003 Ginn et al.
 2003/0097140 A1 5/2003 Kanner
 2003/0100920 A1 5/2003 Akin et al.
 2003/0109890 A1 6/2003 Kanner et al.
 2003/0158577 A1 8/2003 Ginn et al.
 2003/0158578 A1 8/2003 Pantages et al.
 2003/0229367 A1 12/2003 Viola
 2003/0229368 A1 12/2003 Viola
 2004/0002681 A1 1/2004 McGuckin, Jr. et al.
 2004/0010285 A1 1/2004 Carley et al.
 2004/0059375 A1 3/2004 Ginn et al.
 2004/0073236 A1 4/2004 Carley et al.
 2004/0073255 A1 4/2004 Ginn et al.
 2004/0153122 A1 8/2004 Palermo
 2004/0153123 A1 8/2004 Palermo et al.
 2004/0176798 A1 9/2004 Epstein et al.
 2004/0193189 A1 9/2004 Kortenbach et al.
 2004/0225301 A1 11/2004 Roop et al.
 2005/0021054 A1 1/2005 Ainsworth et al.
 2005/0021062 A1 1/2005 Dennis
 2005/0131460 A1 6/2005 Gifford, III et al.
 2006/0200197 A1 9/2006 Brenzel et al.

FOREIGN PATENT DOCUMENTS

WO WO-99/62408 12/1999
 WO WO-00/07640 2/2000
 WO WO-00/56223 9/2000
 WO WO-00/56227 9/2000

OTHER PUBLICATIONS

"Summary of Safety and Effectiveness Data (EVS (TM) Vascular Closure System)", (Nov. 3, 2004).
 "The EVS(TM) Vascular Closure System by Angiolink", *Business Briefing: US Cardiology 2004*, (2004).
 "VasoStasis (TM) Vascular Closure System 510(k) Notification" (Oct. 22, 2004).
 "Notification of Transmittal of the International Search Report and Written Opinion of the ISA", PCT/US2008/056328, (Jul. 28, 2008).
 "Written Opinion of the International Search Authority", PCT/US2008/056328, (Jul. 28, 2008).
 "PCT International Search Report", PCT/US2008/056328, (Jul. 28, 2008).

* cited by examiner

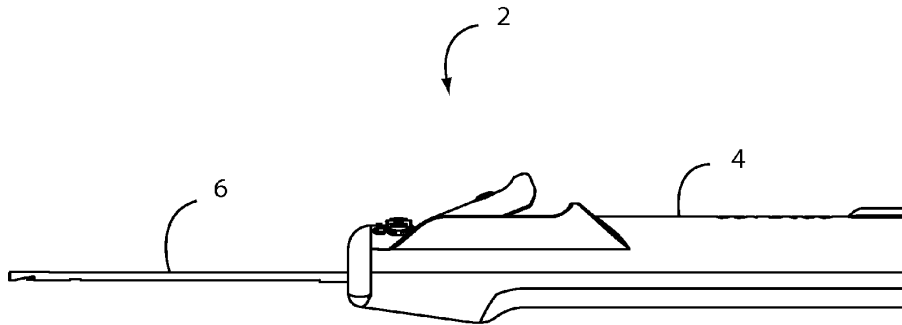


FIG. 1

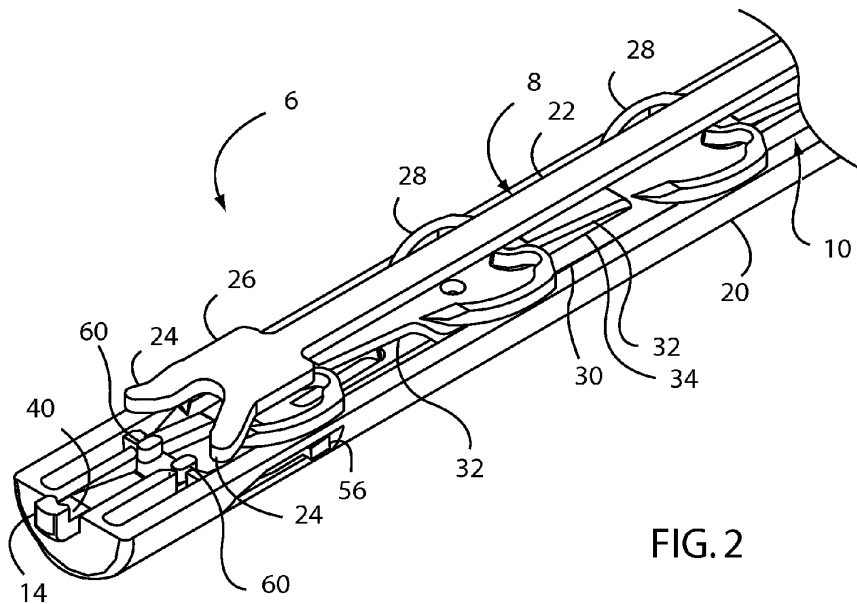


FIG. 2

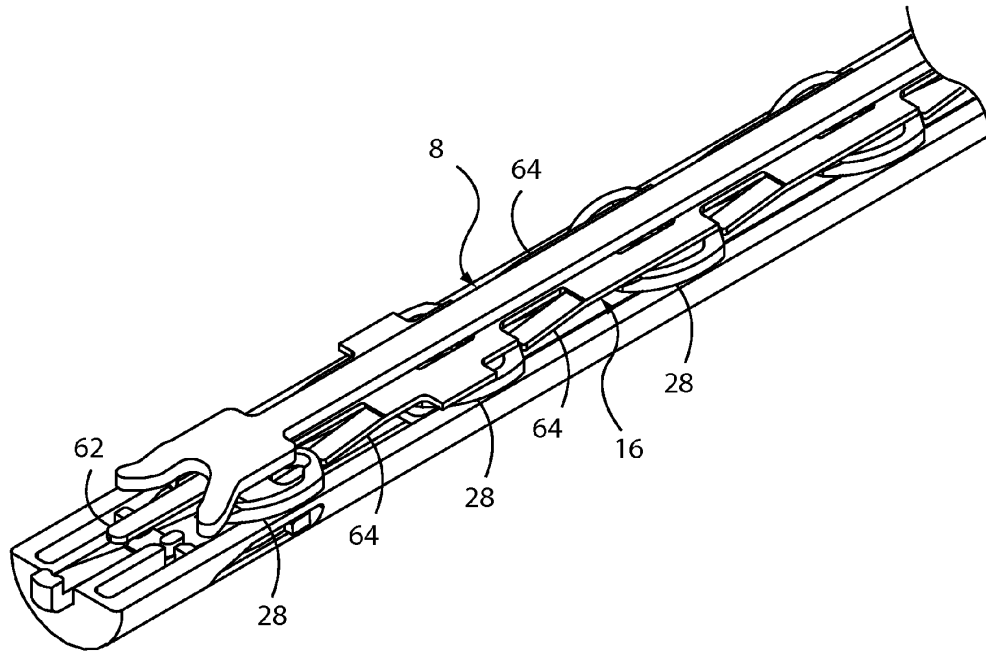


FIG. 2A

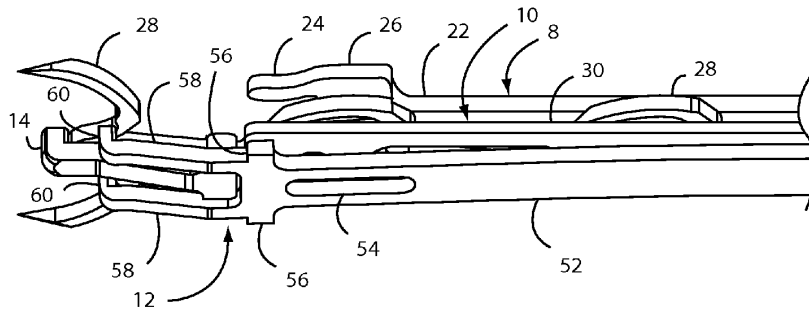


FIG. 3

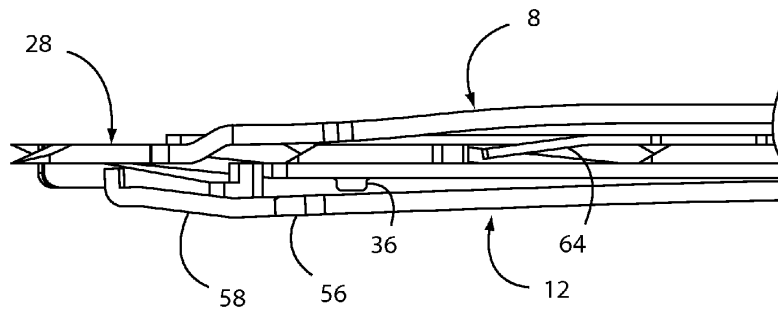


FIG. 4

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