IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Kyle P. Moore, et al.	
U.S. Patent No.:	8,991,677	Attorney Docket No.: 11030-0049IP3
Issue Date:	March 31, 2015	
Appl. Serial No.:	14/283,729	
Filing Date:	May 21, 2014	
Title:	DETATCHABLE MOTOR POWERED SURGICAL INSTRUMENT	

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,991,677 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

TABLE OF CONTENTS

EXHIBITS

IS1001	U.S. Patent No. 8,991,677 to Moore et al. ("the '677 patent")
IS1002	Excerpts from the prosecution histories of U.S. Pat. Nos. 9,084,601 (Serial No. 13/832,522), 8,998,058 (Serial No. 14/282,494), 8,991,677 (Serial No. 14/283,729), 8,752,749 (Serial No. 13/118,210), 8,196,795 (Serial No. 12/856,099), and 7,793,812 (Serial No. 12/031,628)
IS1003	Declaration of Dr. Gregory S. Fischer
IS1004	U.S. Patent No. 5,383,880 to Hooven ("Hooven")
IS1005	U.S. Patent App. Pub. No. 2005/0131390 to Heinrich et al. ("Heinrich")
IS1006	U.S. Patent No. 5,865,361 to Milliman et al. ("Milliman")
IS1007	U.S. Patent No. 7,524,320 to Tierney et al. ("the '320 patent")
IS1008	U.S. Patent No. 8,196,795 to Moore et al. ("the '795 patent")
IS1009	U.S. Patent No. 8,752,749 to Moore et al. ("the '749 patent")
IS1010	U.S. Patent No. 5,779,130 to Alesi et al. ("Alesi")
IS1011	[Reserved]
IS1012	[Reserved]
IS1013	U.S. Patent No. 6,783,524 to Anderson et al. ("the '524 patent")

Intuitive Surgical, Inc. ("Petitioner") petitions for *Inter Partes* Review ("IPR") of claims 1-18 of U.S. Patent No. 8,991,677 ("the '677 patent"). The '677 patent relates to a "detachable motor-powered surgical instrument" in general and to a "surgical cutting and stapling instrument" in particular. The claimed motor is operably disconnected from a power source when the housing of the stapling sub-system is not attached to the surgical instrument system, and operably connected to the power source when the housing of the stapling sub-system is attached to the surgical instrument system. IS1001, Claim 6.

Such instruments were not new at the time of the alleged priority date of the '677 patent. As explained below, claims 1-18 are obvious over U.S. Patent No. 5,383,880 to Hooven ("Hooven") in view of U.S. Patent App. Pub. No. 2005/0131390 to Heinrich et al. ("Heinrich"), U.S. Patent No. 5,779,130 to Alesi et al. ("Alesi"), and/or U.S. Patent No. 5,865,361 to Milliman et al. ("Milliman"). Petitioner therefore requests IPR of the challenged claims on Grounds 1-3 below.

I. MANDATORY NOTICES UNDER 37 C.F.R § 42.8

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Intuitive Surgical, Inc. is the real party-in-interest. No other party had access to the Petition, and no other party had any control over, or contributed to any funding of, the preparation or filing of the present Petition.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates, or petitions for IPR of the '677 patent. The '677 patent is the subject of Civil Action No. 1:17-cv-00871-LPS, filed on June 30, 2017 in the United States District Court for the District of Delaware. Petitioner was served with the complaint in that action on July 12, 2017. Concurrently with this petition, Petitioner filed IPR petitions for U.S. Pat. Nos. 8,998,058 and 9,084,601, which are related to the '677 patent.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above. Petitioner consents to electronic service by email at IPR11030-0049IP3@fr.com (referencing No. 11030-0049IP3 and cc'ing PTABInbound@fr.com, phillips@fr.com, katz@fr.com, and oconnor@fr.com).

II. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioner authorizes the Office to charge Deposit Account No. 06-1050 for the petition fee set in 37 C.F.R. § 42.15(a) and for any other required fees.

III. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies that the '677 patent is available for IPR, and Petitioner is not barred or estopped from requesting IPR.

B. Challenge Under 37 C.F.R. § 42.104(b) and Relief Requested

Petitioner requests IPR of claims 1-18 of the '677 patent on the following grounds. Dr. Gregory S. Fischer's declaration (IS1003) is included in support.

Ground	Claims	Basis for Rejection
Ground 1	1-18	Obvious under 35 U.S.C. § 103 over **Hooven** (IS1004) in view of **Heinrich** (IS1005)
Ground 2	1-5, 16	Obvious under 35 U.S.C. § 103 over **Hooven** (IS1004) in view of **Heinrich** (IS1005) and further in view of **Milliman** (IS1006)
Ground 3	1-5, 16	Obvious under 35 U.S.C. § 103 over **Hooven** (IS1004) in view of **Heinrich** (IS1005) and further in view of **Alesi** (IS1010)

The '677 patent issued from U.S. App. No. 14/283,729, filed on May 21, 2014, which is a continuation of U.S. App. No. 13/832,522, filed on Mar 15, 2013, now U.S. Pat. No. 9,084,601, which is a continuation of U.S. App. No. 13/118,210,

filed on May 27, 2011, now U.S. Pat. No. 8,752,749, which is a continuation-in-part of U.S. App. No. 12/856,099, filed on Aug. 13, 2010, now U.S. Pat. No. 8,196,795, which is a continuation of U.S. App. No. 12/031,628, filed on Feb. 14, 2008, now U.S. Pat. No. 7,793,812. Accordingly, the earliest possible date to which the '677 patent could claim priority (hereinafter the "earliest effective filing date") is Feb. 14, 2008.

Petitioner does not concede that the challenged claims of the '677 patent are entitled to this priority date, but has elected not to argue the issue in the present Petition because all prior art references identified in the Grounds presented below pre-date the earliest possible priority date for the '677 patent. However, Petitioner reserves the right to present such an argument in this proceeding or other proceedings involving the '677 patent.

Hooven (IS1004) issued on Jan. 24, 1995, which is more than one year before the earliest effective filing date, and thus qualifies as prior art under 35 U.S.C. § 102(b). Hooven was made of record during prosecution of the '677 patent, but never was discussed by the examiner or the applicant.[1]

Heinrich (IS1005) published on June 16, 2005, which is more than one year before the earliest effective filing date, and thus qualifies as prior art under 35

[1] Applicants cited more than 4000 references during prosecution of the '677 patent.

U.S.C. § 102(b). Heinrich was made of record during prosecution of the '677 patent, but never was discussed by the examiner or the applicant.

Milliman (IS1006) issued on Feb. 2, 1999, which is more than one year before the earliest effective filing date, and thus qualifies as prior art under 35 U.S.C. § 102(b). Milliman was made of record during prosecution of the '677 patent. In fact, it is incorporated by reference into the specification of the '677 patent. However, it never was discussed by the examiner.

Alesi (IS1010) issued on July 14, 1998, which is more than one year before the earliest effective filing date, and thus qualifies as prior art under 35 U.S.C. § 102(b). Alesi was cited by the examiner during prosecution of the '677 patent's priority applications.

IV. SUMMARY OF THE '677 PATENT

The '677 patent describes a detachable motor-powered stapling sub-system, such as a surgical stapler, that is removably attachable to a surgical instrument system, such as a surgical robot or hand-held actuator. The motor residing in the stapling sub-system is disconnected from its power source when the stapling sub-system's housing is not attached to the surgical instrument system, and is connected to the power source when the housing is attached to the surgical instrument system. IS1001, Abstract, Claim 6. In other words, the motor can receive power only when the surgical stapler is connected to the surgical

instrument system that controls the stapler.

In a first embodiment, "a disposable loading unit 16 [(*i.e.*, stapling sub-system)] is coupled to a conventional surgical cutting and stapling apparatus 10." IS1001, 10:54-58, Fig. 1.

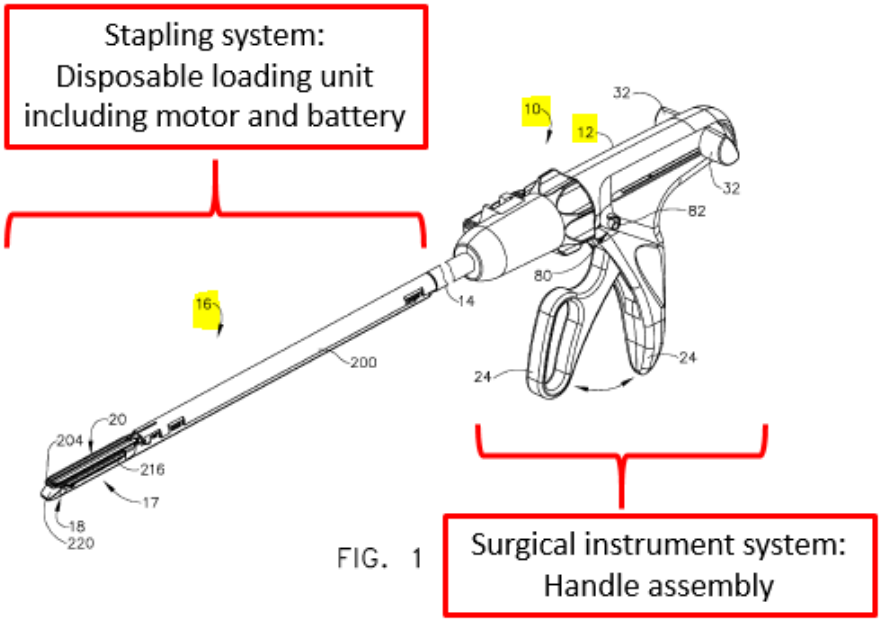


FIG. 1

As explained below, disposable loading unit 16 includes a mechanism that separates its motor from its power source (*i.e.*, battery) when the disposable loading unit 16 is detached from the handle assembly 12 of the surgical cutting and stapling apparatus 10. IS1001, 11:62-12:24, Figs. 2-12. "The construction and general operation of a cutting and stapling apparatus 10 is described in [Milliman], the disclosure of which [is] incorporated by reference" into the '677 patent. IS1001, 10:58-61; *compare* IS1001, Fig. 1 *with* IS1006, Fig. 1.

Figs. 13 and 14 show a second embodiment in which the surgical tool 1200 (*i.e.*, stapling sub-system) is coupled to a robotic system 1000 (*i.e.*, surgical

instrument system) comprising a robotic arm cart 1100 and a controller 1001.[2] IS1001, 15:58-63, 16:11-13, Figs. 13-14. The motor 3011 to drive the tool 1200, and its power source (*i.e.*, battery 3022), reside within a detachable tool mounting portion 3010. IS1001, 38:46-40:5, Fig. 52. As explained below, in this example, an on-off solenoid powered switch 3024, which is controlled by a signal from the robotic system 1000, electrically isolates the motor from its power source when the tool-mounting portion 3010 is detached from the robot 1100. *Id*. Thus, power can be supplied to the motor only when the tool mounting portion 3010 is attached to the robotic arm cart 1100 and controller 1001. *Id*.; IS1003, ¶ 54.

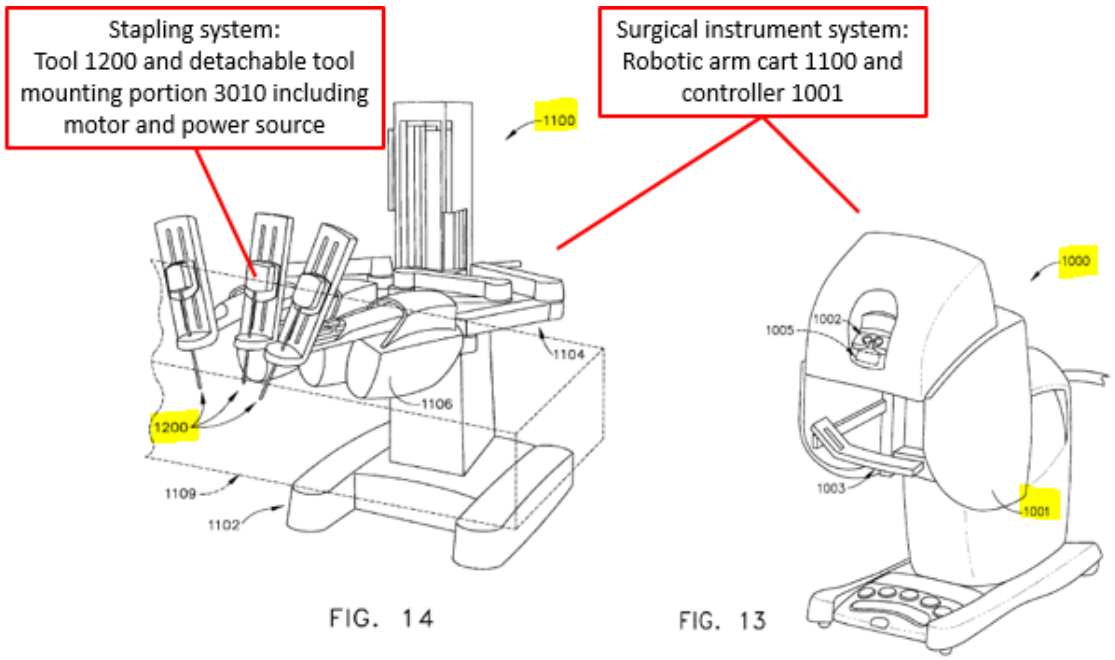


FIG. 14 FIG. 13

[2] Applicants added this robotic embodiment to the specification for the first time on May 27, 2011. Thus, May 27, 2011 may be the earliest priority date for one or more claims of the '677 patent.

"Examples of [robotic system 1000] are disclosed in U.S. Pat. No. 7,524,320, [one of Petitioner's prior art patents,] which [is] incorporated by reference" into the '677 patent. IS1001, 15:60-65. Indeed, Figures 13, 14, and 16 all appear to be taken from Petitioner's prior art '320 patent. *Compare* IS1001, Figs. 13, 14, 16 *with* IS1007, Figs. 2, 3A, 8B.

With regard to the first embodiment shown in Figs. 1 and 2 of the '677 patent, "the disposable loading unit 16 may generally comprise a tool assembly 17 for performing surgical procedures such as cutting tissue and applying staples on each side of the cut. The tool assembly 17 may include a cartridge assembly 18 that includes a staple cartridge 220 that is supported in a carrier 216. An anvil assembly 20 may be pivotally coupled to the carrier 216 in a known manner for selective pivotal travel between open and closed positions. . . . An actuation sled 234 is supported within the tool assembly 17 and is configured to drive . . . pushers and staples in the staple cartridge 220 in a direction toward the anvil assembly 20 as the actuation sled 234 is driven from the proximal end of the tool assembly 17 to the distal end 220." IS1001, 11:11-29, Fig. 2.

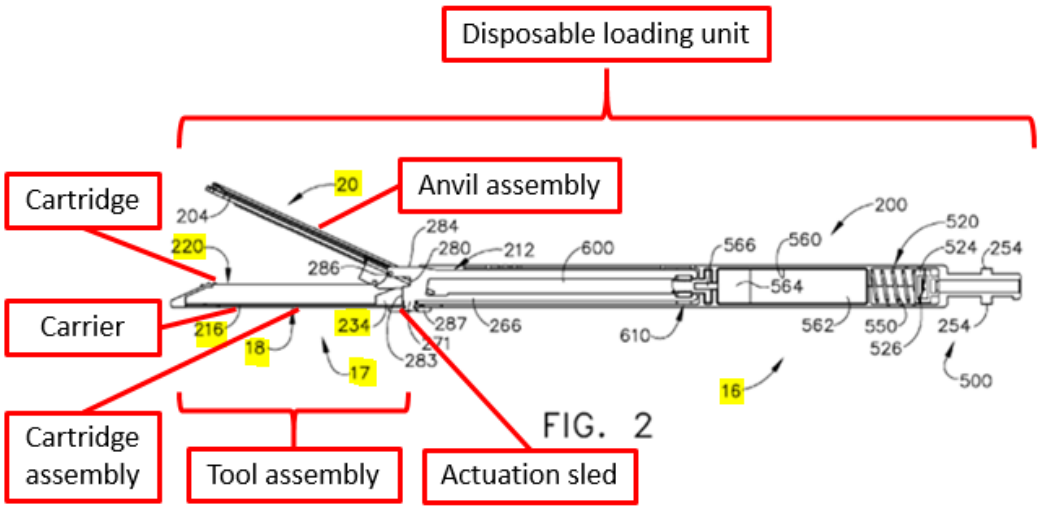


FIG. 2

"The disposable loading unit 16 may further include an axial drive assembly 212 that comprises a drive beam 266 . . . . The distal end of drive beam 266 may include a vertical support strut 271 which supports a knife blade 280 and an abutment surface 283 which engages the central portion of actuation sled 234 during a stapling procedure." IS1001, 11:30-38, Fig. 2.

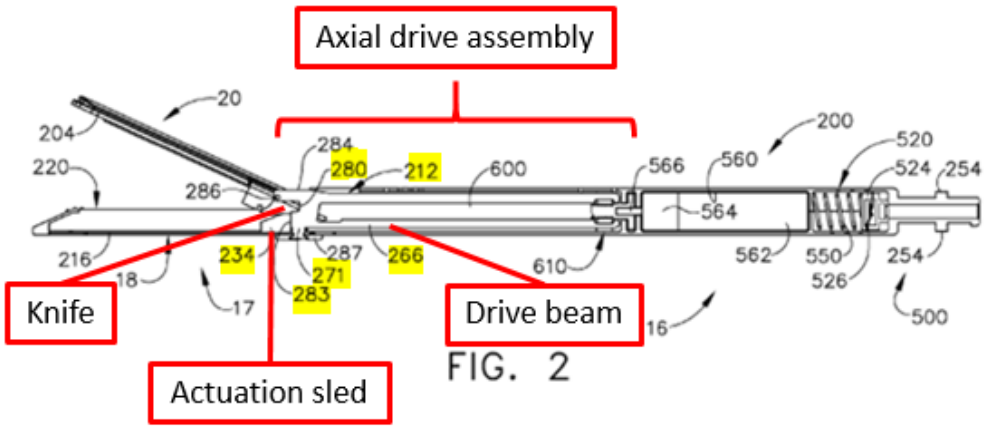


FIG. 2

The housing 200 of disposable loading unit 16 ("DLU 16") may further include: (1) a switch portion 520 that movably houses a battery 526 therein; (2) a motor 562; (3) a drive screw 600; and (4) a drive nut 610. IS1001, 11:62-12:48, 13:3-17, Fig. 5.

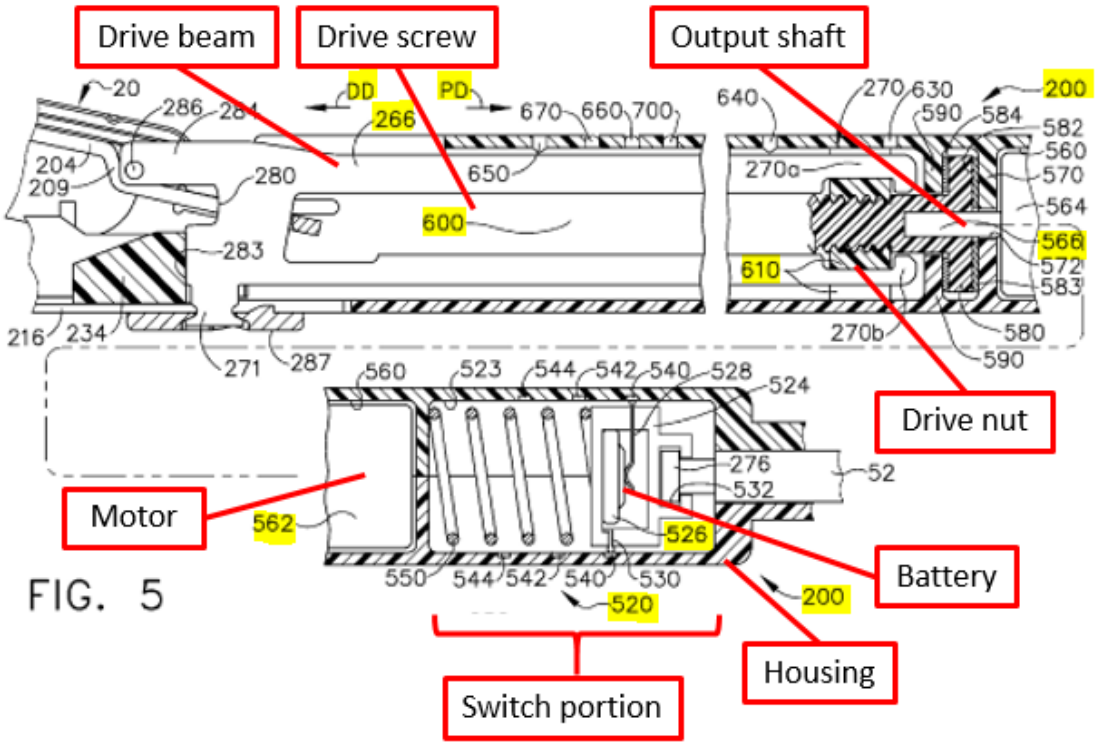


FIG. 5

Battery 526 provides power to the motor 562, the operation of which causes an output shaft 566 to rotate. *Id*. Rotation of output shaft 566 effects "rotation of the drive screw 600 within the drive nut 610 [to] drive the drive beam 266 in the distal direction 'DD' or in the proximal direction 'PD' depending upon the direction of rotation of the drive screw 600." *Id*.

When DLU 16 is detached from surgical/stapling apparatus 10, battery 526 is disconnected from the motor 562 (*i.e.*, a biasing/spring member 550 is not providing connectivity between battery 526 and motor 562) resulting in no power being supplied to the motor 562. *Id*. Battery 526 makes contact with contacts 540, 542, or 544 (thereby supplying power to the motor 562) when the DLU 16 is connected to the surgical apparatus 10. *Id*. Surgical apparatus 10 includes a

control rod 52 that inserts into a control rod socket 532 of the housing 200 of DLU 16 to cause the battery contacts 528, 530 to make a connection with contacts 540, 542, or 544. *Id.* Conversely, when the control rod 52 is not inserted into the control rod socket 532 (*i.e.*, when the disposable loading unit 16 is detached from the surgical apparatus 10), there is no longer any contact between battery 526 and motor 562. *Id.* This breaks the electrical connection between the battery 526 and the contacts 540, 542, 544. *Id.* Consequently, the battery 526 supplies power to motor 562 only when the housing 200 of DLU 16 is attached to the surgical apparatus 10. *Id.* The '677 patent states that the purpose of this mechanism is to "prevent the battery 526 from being drained during non-use." *Id.*

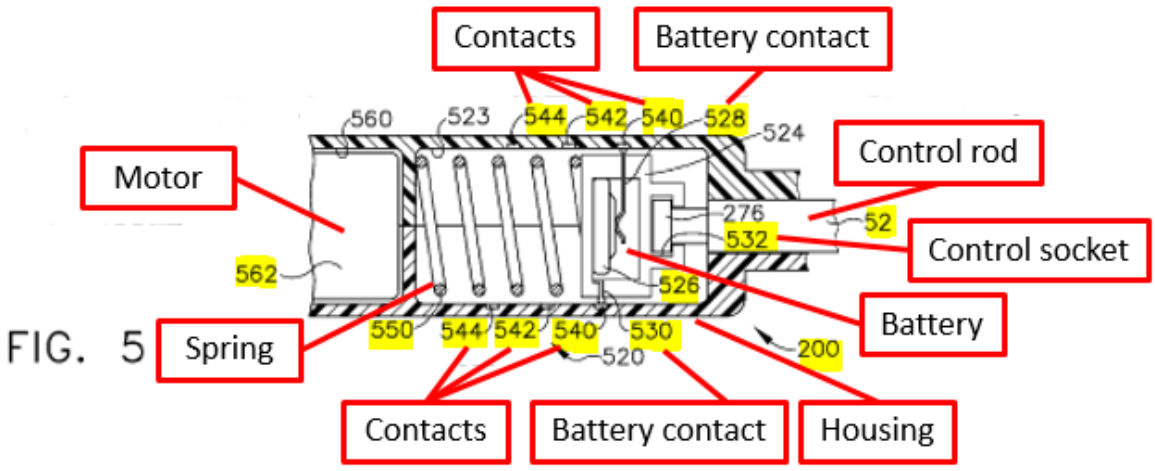
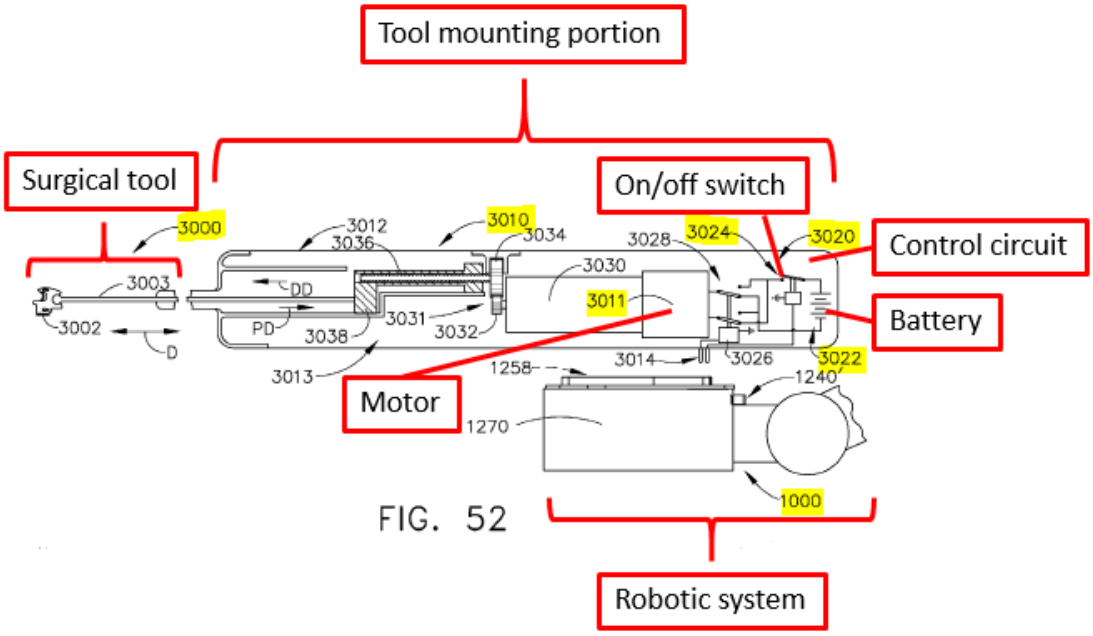


FIG. 5

In the second embodiment, the '677 patent describes a tool mounting portion 3010 that sits in between the surgical tool 3000 and the robotic system 1000. *See, e.g.*, IS1001, 38:46-40:5, Fig. 52.



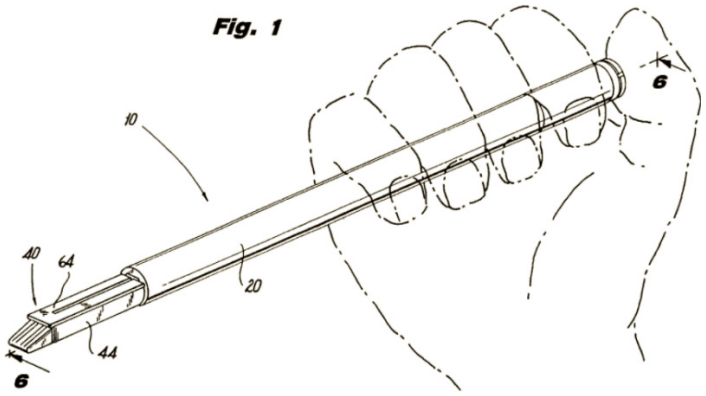
The surgical tool 3000 is detachable from the tool mounting portion 3010, which in turn is detachable from the robotic system 1000. *Id*. The tool mounting portion 3010 has a control circuit 3020, which includes "a power supply in the form of a battery 3022 that is coupled to an on-off solenoid powered switch 3024." IS1001, 39:37-55. "Thus, when the controller 1001 of the robotic system 1000 supplies an appropriate control signal, switch 3024 will permit battery 3022 to supply power to the double pole switch 3028 . . . to supply power to the motor 3011." *Id*. Because the switch 3024 will change from an open (off) state to a closed (on) state only upon receiving a control signal from the robotic system 1000, power can be supplied to the motor 3011 only when an electrical connection is made between tool mounting portion 3010 and robotic system 1000 (*e.g.*, the housing of tool mounting portion 3010 is physically attached to robotic system 1000). *Id*.; IS1003, ¶¶ 47, 52.

"In alternative embodiments, [however,] the power supply may comprise alternating current 'AC' that is supplied to the motors by the robotic system 1000. That is, the AC power would be supplied from the system powering the robotic system 1000 through the tool holder and adapter. In still other embodiments, a power cord or tether may be attached to the tool mounting portion 3300 to supply the requisite power from a separate source of alternating or direct current." IS1001, 44:29-40; *see also* 52:61-66 ("In one form or embodiment, the control circuit 3910 includes a power supply in the form of a battery 3912 . . . In other embodiments, however, the power supply may comprise a source of alternating current."). In this latter embodiment, the electrical connection between the motor and the robotic system supplies power to the motor and this power is cut off when the housing of tool-mounting portion 3010 is detached from the robotic system 1000. IS1003, ¶ 53.

V. SUMMARY OF THE PROSECUTION HISTORY

The chain of applications to which the '677 patent claims priority is provided above. *See* Section III.B, *supra*. Notably, the '210 continuation-in-part priority application added descriptions of various robotic systems that were not disclosed in the earlier priority applications. *Compare* IS1008 ('795 patent) *with* IS1009 ('749 patent) (adding the text at 3:8-4:5, 15:18-80:2, and Figs. 13-130 to the '795 patent). During prosecution of the '677 patent's priority applications, the

USPTO rejected one or more of applicant's original claims as anticipated by Alesi or obvious over Alesi in view of other references. IS1002, 2-6, 21-22, 38. Like the '677 patent, Alesi discloses a self-contained powered surgical stapler.



IS1010, Fig. 1.

In response to these rejections, applicant amended all of the pending claims to require a battery/power source in the housing of the disposable loading unit that is movable from a disconnected position to a connected position when attached to a control rod/member of a surgical instrument. IS1002, 10-15, 26-31.

The claims presented in the application that issued as the '677 patent, however, included no such limitations. IS1002, 74-77. As a result, they are broader than the claims examined during prosecution of the '677 patent's priority applications. For example, instead of the specific movable battery configuration claimed in the earlier priority applications, the '677 patent's claims require only "an electric motor . . . [that] is operably disconnected from a power source when [the] housing [of the stapling sub-system] is not attached to the surgical instrument system, and . . . is operably connected to the power source when [the] housing is

attached to the surgical instrument system." IS1001, Claim 6. There is no requirement that the surgical instrument include its own power source at all, much less one that is movable from a disconnected position to a connected position. *Id*. The examiner, however, appears to have incorrectly assumed that the challenged claims had the same or narrower scope as the claims allowed in the parent applications. Thus, provisional non-statutory double patenting rejections in view of claims in pending applications co-owned by applicant were the only rejections of the '677 patent's claims during prosecution.

This broader scope of the '677 patent's claims encompasses known devices. Indeed, numerous references disclose the purportedly missing feature—*i.e*., an electric motor that is operably disconnected from a power source when the housing of the stapling sub-system is not attached to the surgical instrument system, and is operably connected to the power source when the housing is attached to the surgical instrument system. Hooven and Heinrich, for example, disclose an electric motor in the housing of a stapling sub-system that is removably connected to a surgical instrument system wherein the surgical instrument system supplies power to the motor. IS1004; IS1005; IS1003, ¶¶ 78, 83. Thus, the motor is operably disconnected from a power source when the housing of the stapling sub-system is not attached to the surgical instrument system, and is operably connected to the power source when the housing is attached to the surgical instrument system,

as required by the '677 patent's claims. IS1003, ¶¶ 78, 83.

VI. CLAIM CONSTRUCTION

For the purposes of this IPR only, Petitioner submits that the terms of the '677 patent are to be given their broadest reasonable interpretation as understood by one of ordinary skill in the art at the time in view of the specification ("BRI").[3] 37 C.F.R. § 42.100(b). Also, for purposes of this IPR only, Petitioner submits the following specific constructions for certain terms.

A. "Means for removably attaching said housing to the surgical instrument" (claims 1, 16)

This claim element includes the words "means" and therefore presumptively invokes 35 U.S.C. § 112, ¶ 6 ("112/6"). The claimed function performed by the "means" is "removably attaching said housing to the surgical instrument." IS1001,

[3] Petitioner acknowledges that the Office has proposed to change from the BRI standard to the standard applied in District Courts. *See* 83 Fed. Reg. 21221 (proposed May 9, 2018). Petitioner submits that the prior art discussed herein invalidates the challenged claims under either standard. If the Office changes the rule after the filing of the Petition and applies the new standard to this proceeding, then due process requires the Office afford Petitioner an opportunity to provide additional argument and evidence on that issue.

Claim 1. The corresponding structures in the '677 patent that perform this function include engagement nubs 254. IS1001, 11:56-59, Fig. 2; IS1003, ¶¶ 62-65.

Fig. 2 of the '677 patent shows "engagement nubs 254 [on disposable loading unit 16] for releasably engaging elongated body 14 of a surgical stapling apparatus [10]." IS1001, 11:56-59.

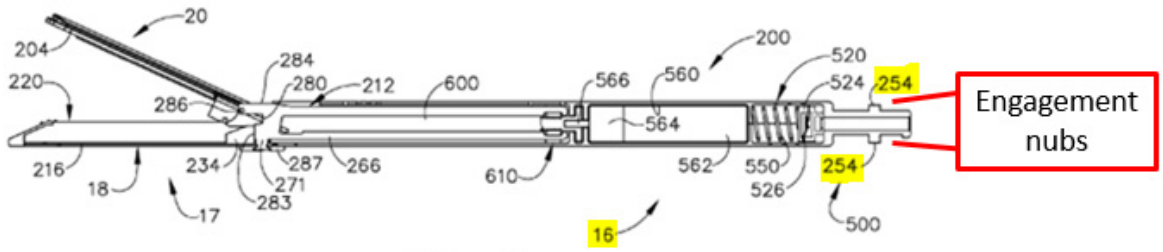


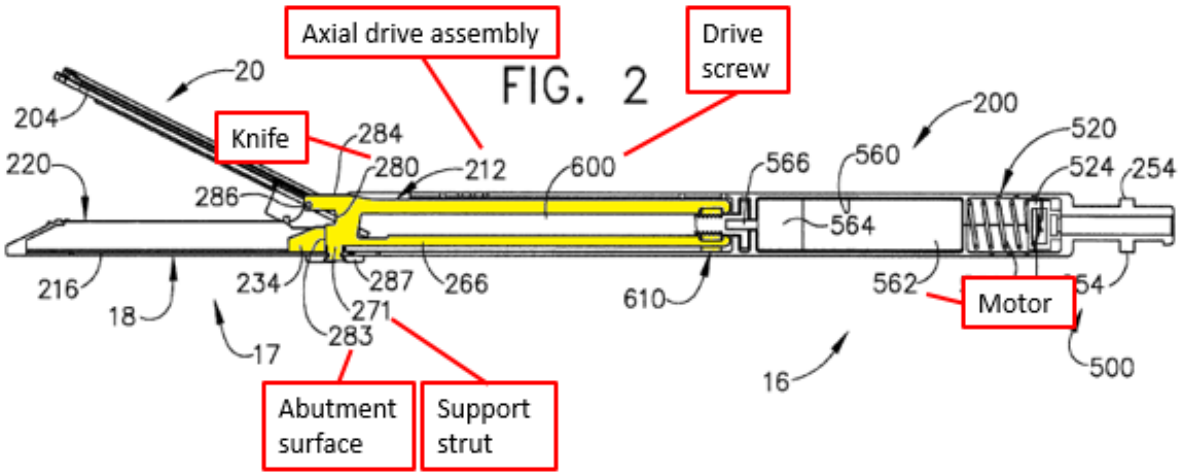
FIG. 2

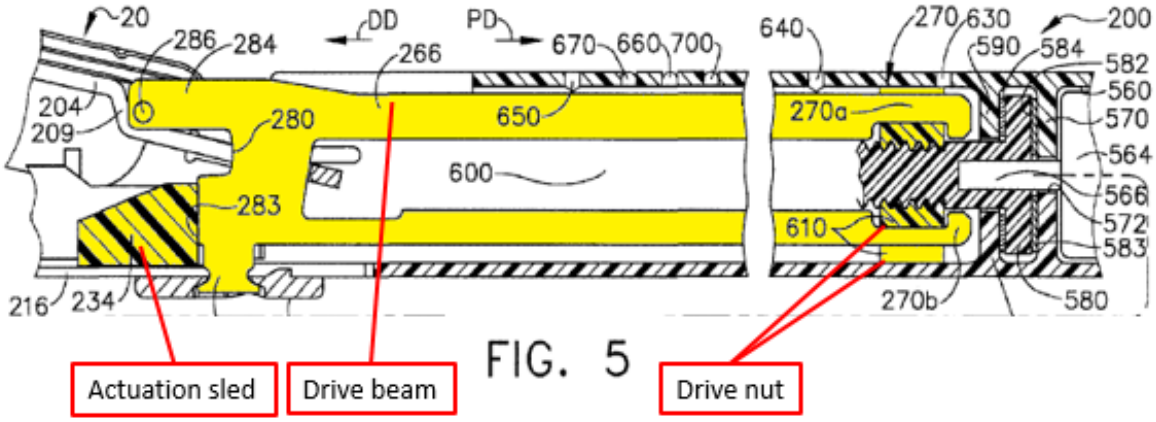
B. "Drive means for converting the rotational motion produced by said electric motor to translational motion to eject said staples from said staple cartridge body" (claims 11, 18)

This claim element includes the words "means for" and therefore presumptively invokes 112/6. The claimed functions performed by the "means" are "driv[ing]" and "converting the rotational motion produced by said electric motor to translational motion to eject said staples from said staple cartridge body," which require no further construction. IS1001, Claims 11 and 18. The corresponding structures in the '677 patent that perform this function include (1) the combination of drive nut 610, axial drive assembly 212, and actuation sled 234; (2) the combination of cutting instrument 2332, sled portion 2333, and the drive

nut to which they are attached; and (3) the combination of screw nut arrangement 3038, firing bar 3003, cutting instrument 3002, and sled 2033. IS1003, ¶¶ 66-69.

In the first embodiment of the '677 patent, "a drive screw 600 . . . threadedly engages a drive nut 610 that is supported within an engagement section 270 formed on the distal end of the drive beam 266." IS1001, 12:36-40, Figs. 2, 5; *see also* 11:30-31 ("[A]xial drive assembly 212 . . . comprises a drive beam 266."). "The distal end of drive beam 266 may include a vertical support strut 271 which supports a knife blade 280 and an abutment surface 283 which engages the central portion of actuation sled 234 during a stapling procedure." IS1001, 11:35-38. "[R]otation of the drive screw 600 [by motor 562] within the drive nut 610 will drive the drive beam 266 in the distal direction 'DD' or in the proximal direction 'PD' depending upon the direction of rotation of the drive screw 600." IS1001, 12:45-48; *see also* 14:15-16 ("the motor 562 . . . rotate[s] the drive screw 610"). "As the drive screw 600 is rotated, the drive beam 266 and knife nut 610 are driven in the distal direction 'DD' to advance actuation sled 234 through staple cartridge 220 to effect ejection of staples and cutting of tissue." IS1001, 13:57-61. Thus, a POSITA would have understood that the combination of drive nut 610, axial drive assembly 212, and actuation sled 234 performs the claimed functions of the "drive means." IS1003, ¶ 67.





In an embodiment of the ’677 patent added to the CIP application, the cutting instrument 2332 “may be, for example, a knife” that “has a sled portion 2333 formed thereon.” IS1001, 24:47-54, Figs. 34-38. “[R]otation of the end effector drive shaft 2336 [produced by the electric motor] will cause the cutting instrument 2332 and sled portion 2333 to axially travel through the surgical staple cartridge 2334 to move between a starting position and an ending position. The direction of axial travel of the cutting instrument 2332 depends upon the direction in which the end effector drive shaft 2336 is rotated.” IS1001, 24:54-61; *see also*

24:67-25:8 ("When the end effector drive shaft 2336 is rotated, the cutting instrument 2332 and sled 2333 will travel longitudinally through the surgical staple cartridge 2334 from the starting position to the ending position, thereby cutting tissue clamped within the surgical end effector 2312. The movement of the sled 2333 through the surgical staple cartridge 2334 causes the staples therein to be driven through the severed tissue and against the closed anvil 2324, which turns the staples to fasten the severed tissue."), 28:63-30:13. Thus, a POSITA would have understood that cutting instrument 2332 and sled portion 2333 are attached to a drive nut, and that the combination of the drive nut, cutting instrument 2332, and sled portion 2333 performs the functions of the "drive means." IS1003, ¶ 68.

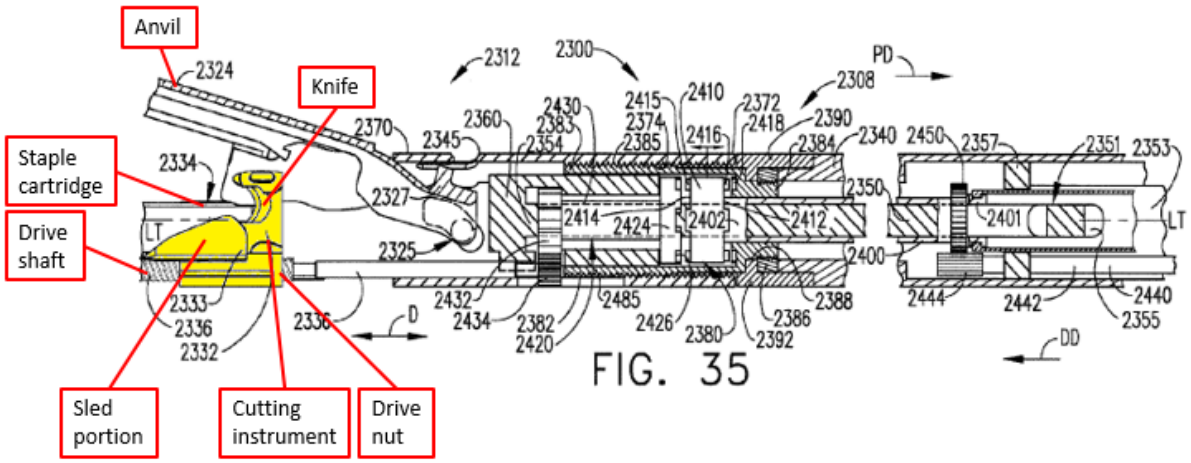


FIG. 35

In another embodiment added to the CIP application, motor 3011 of surgical tool 3000 generates a "driving force necessary to drive the cutting instrument 3002 through tissue and to drive and form staples." IS1001, 39:56-63. "[T]he driven

gear 3034 is coupled to a screw shaft 3036 that is in threaded engagement with a screw nut arrangement 3038 that is constrained to move axially (represented by arrow 'D'). The screw nut arrangement 3038 is attached to the firing bar 3003. Thus, by rotating the screw shaft 3036 in a first direction, the cutting instrument 3002 is driven in the distal direction 'DD' and rotating the screw shaft in an opposite second direction, the cutting instrument 3002 may be retracted in the proximal direction 'PD'." IS1001, 39:63-40:5, Fig. 52; *see also* 38:46-55 ("[S]urgical tool 3000 includes a surgical end effector . . . of the types and constructions described above."), 19:19-31 ("[S]urgical end effector 2012 further includes a cutting instrument 2032 and a sled 2033. . . . As the cutting instrument 2032 is driven distally . . . it forces the sled 2033 distally as well. As the sled 2033 is driven distally, its 'wedged-shaped' configuration contacts the movable staple drivers and drives them vertically toward the closed anvil 2024."), Fig. 28. Thus, a POSITA would have understood that the combination of screw nut arrangement 3038, firing bar 3003, cutting instrument 3002, and sled 2033 performs the functions of the "drive means." IS1003, ¶ 69.

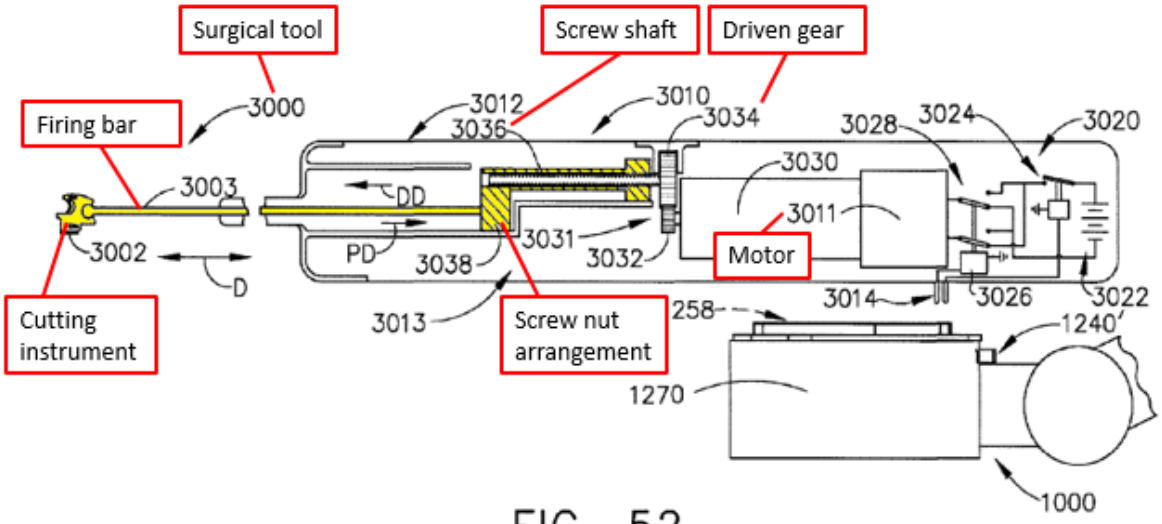


FIG. 52

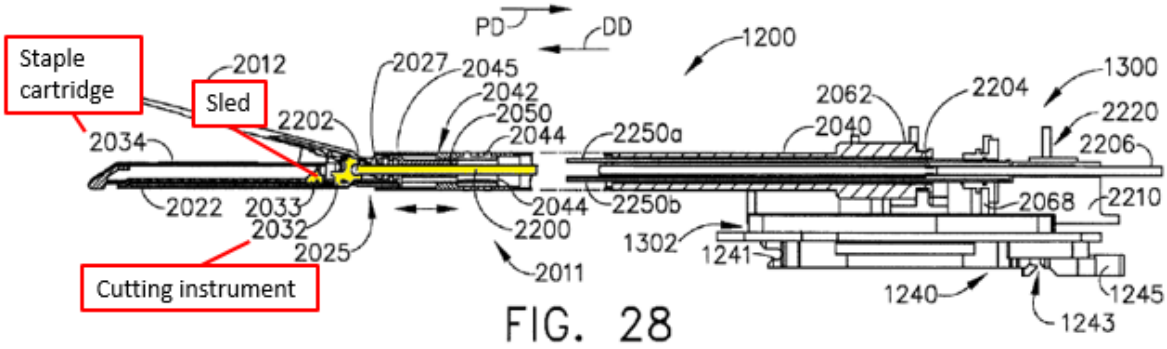
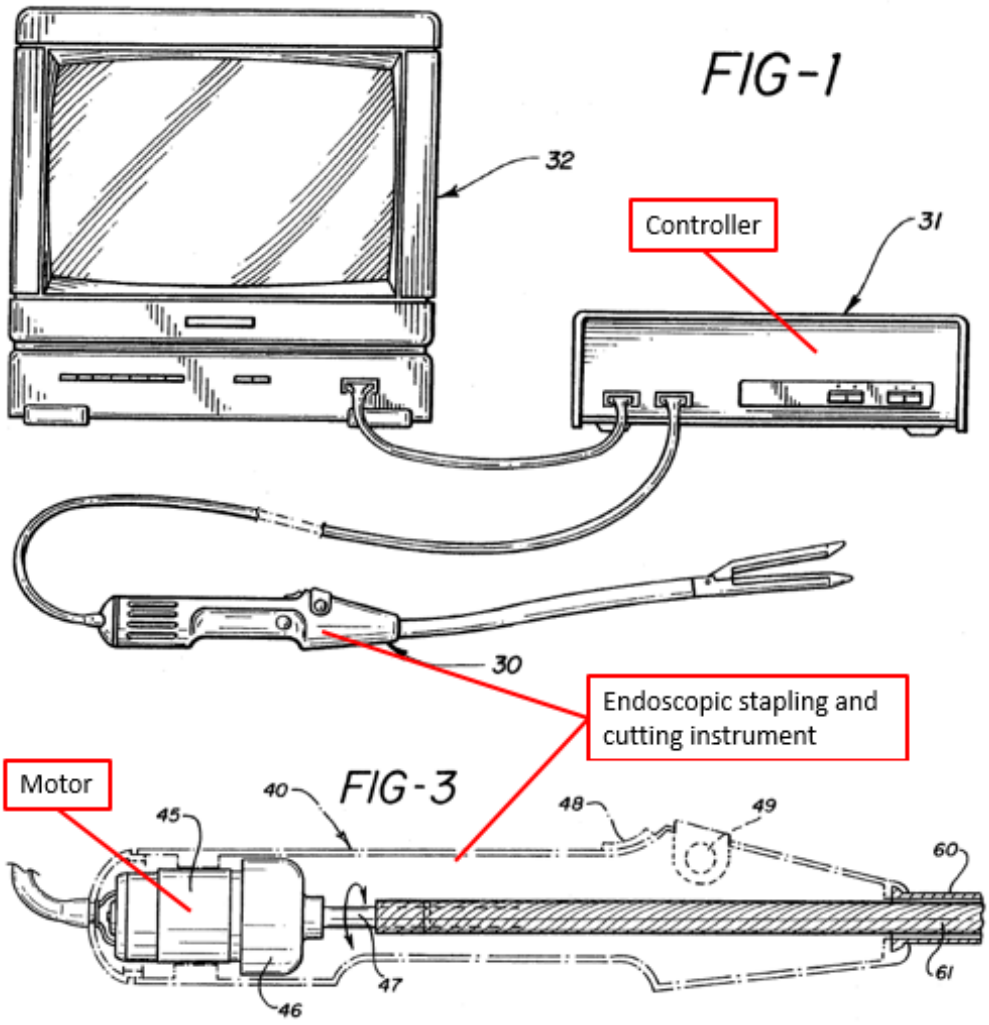


FIG. 28

VII. SUMMARY OF HOOVEN AND HEINRICH

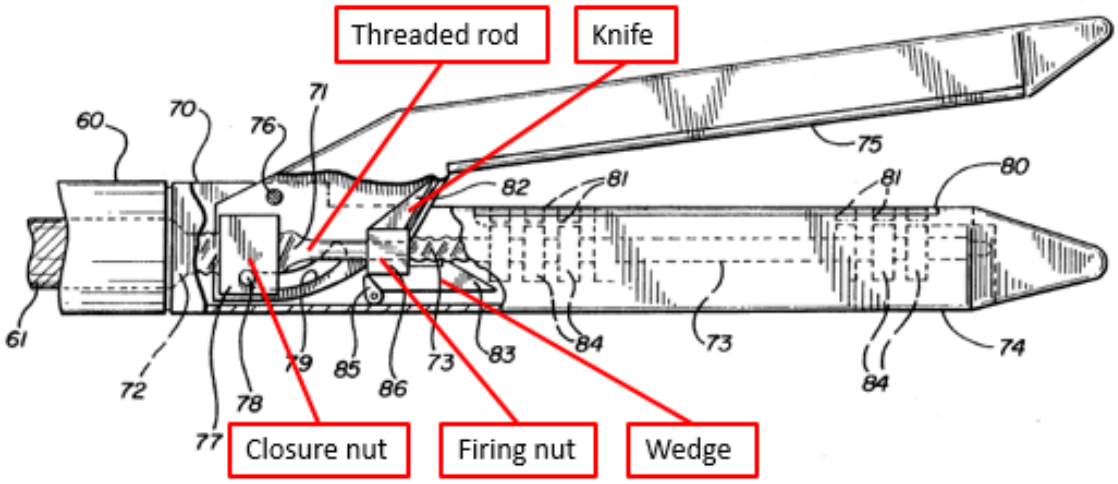
A. Hooven

Hooven discloses a controller 31 removably connected to an endoscopic surgical cutting and stapling instrument 30 that is capable of applying lines of staples to tissue while cutting the tissue between those staple lines. *E.g.*, IS1004, Figs. 1, 3, 6; IS1003, ¶ 82.



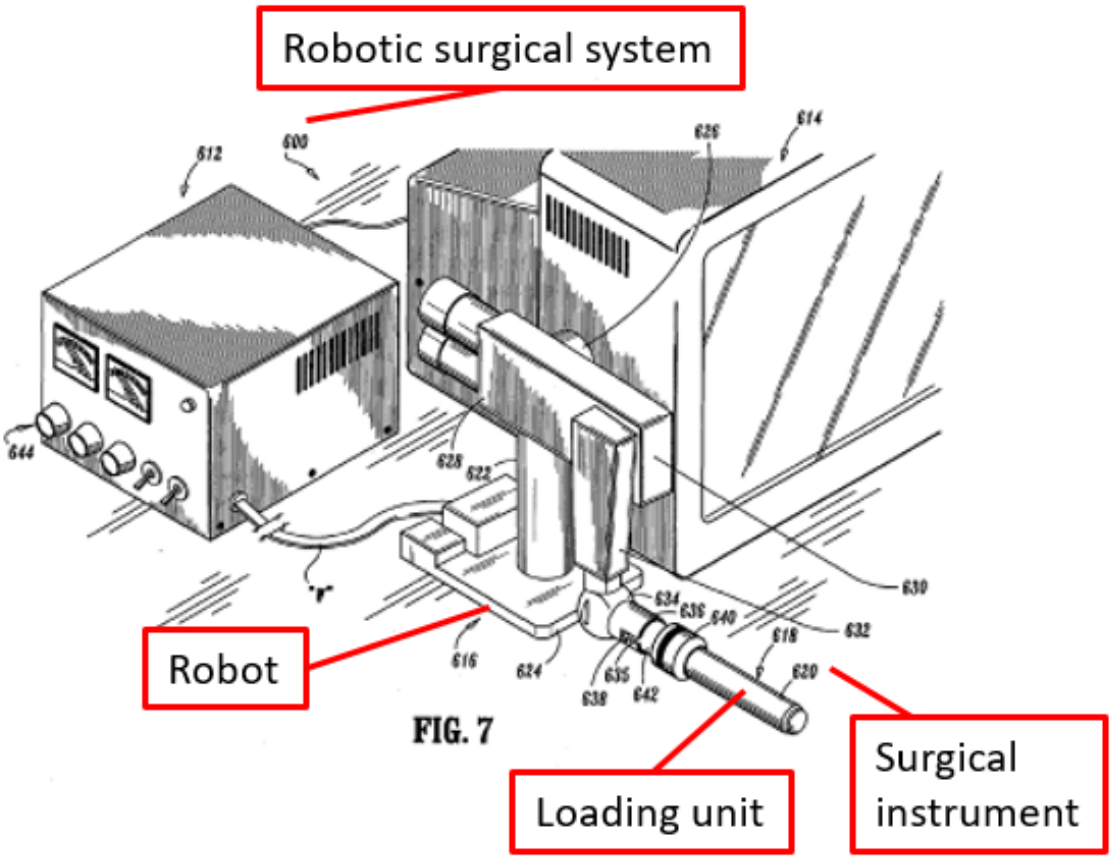
As shown below, Hooven's instrument 30 includes a closure nut 77, a firing nut 86, a knife 82, and a wedge 83 that are all driven by a motor-powered threaded rod 71. *Id*. The motor 45 residing in the instrument 30 is disconnected from its power source, which resides in controller 31, when the instrument 30 is not attached to the controller 31, and is connected to the power source when the instrument 30 is attached to the controller 31. IS1003, ¶ 83; IS1004, 4:24-26. In other words, the motor can receive power only when the surgical stapler is connected to the surgical instrument system that controls the stapler. *Id*.

FIG-6



B. Heinrich

Heinrich discloses an actuation assembly 612 and a robotic arm 616 removably attached to a motor powered disposable loading unit 618 that can be a surgical stapler. *See, e.g.*, IS1005, ¶¶ 132, 140, Figs. 7, 9. "Disposable loading unit 618 . . . includes a head portion 640 for housing an electro-mechanical assembly 619 (see Fig. 8) therein for operating surgical instrument 620 and an attachment platform 642 for releasably attaching disposable loading unit 618 to robot 616 via mounting flange 636." IS1005, ¶ 134; *see also* claim 37.



The motor (*i.e.*, electro-mechanical assembly 619) residing in the disposable loading unit 618 is disconnected from its power source in the robotic surgical system 600 when the disposable loading unit 618 is not attached to the robotic surgical system 600, and is connected to the power source when the disposable loading unit 618 is attached to the robotic surgical system 600. *See, e.g.*, IS1005, ¶ 134, Fig. 8; IS1003, ¶ 78. Thus, the motor can receive power only when the disposable loading unit is connected to the robotic surgical system.

Like the ’677 patent, Heinrich incorporates by reference the entire contents of Milliman for a more detailed explanation of the operation of the surgical stapler.

IS1005, ¶ 99; IS1003, ¶ 76. Specifically, Milliman discloses an endoscopic surgical cutting and stapling apparatus 10 comprising disposable loading units 16 that are capable of applying lines of staples to tissue while cutting the tissue between those staple lines. *E.g.*, IS1006, Fig. 1.

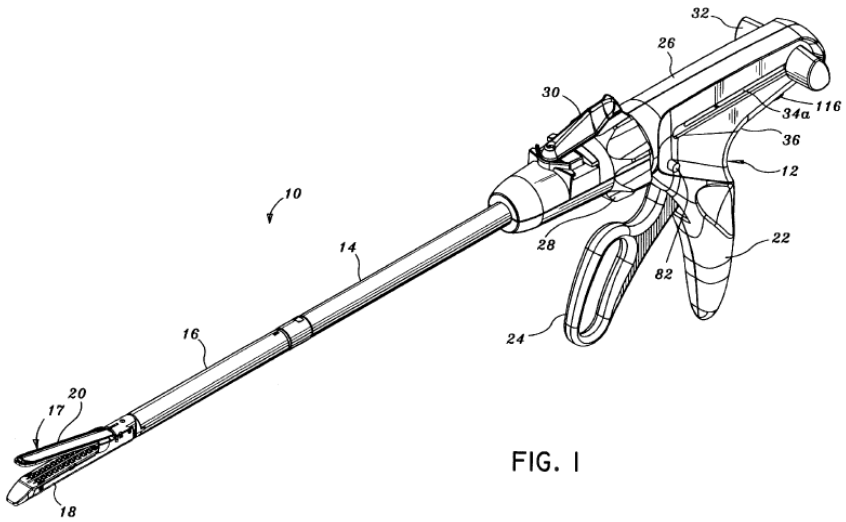


FIG. 1

Milliman also discloses an axial drive assembly 212 that includes a drive beam 266 that supports a knife blade 280, a camming pin 286, and an abutment surface 283 that engages the central portion of a sled during a stapling procedure. IS1006, Figs. 32-34, 49.

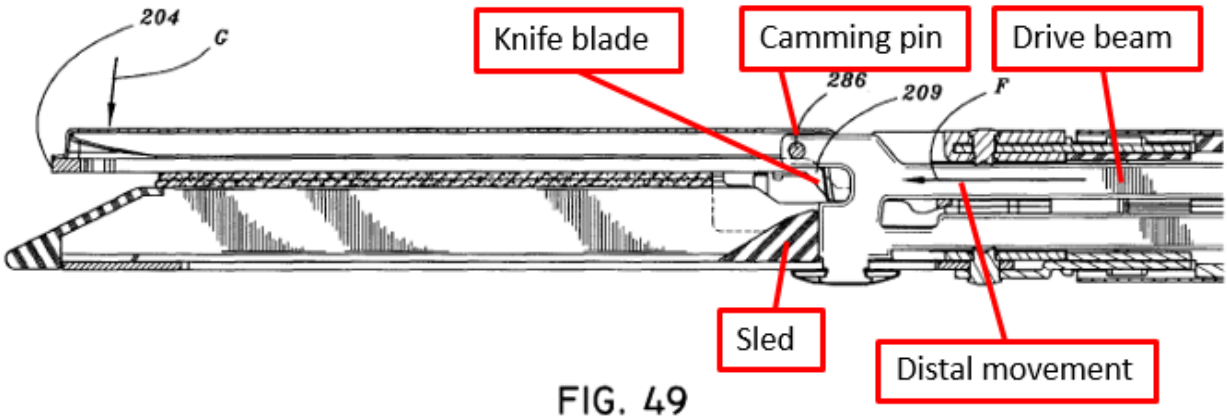


FIG. 49

And Milliman discloses the internal structure of the surgical stapler, including its carrier 216 and removable staple cartridge 220. IS1006, Fig. 21.

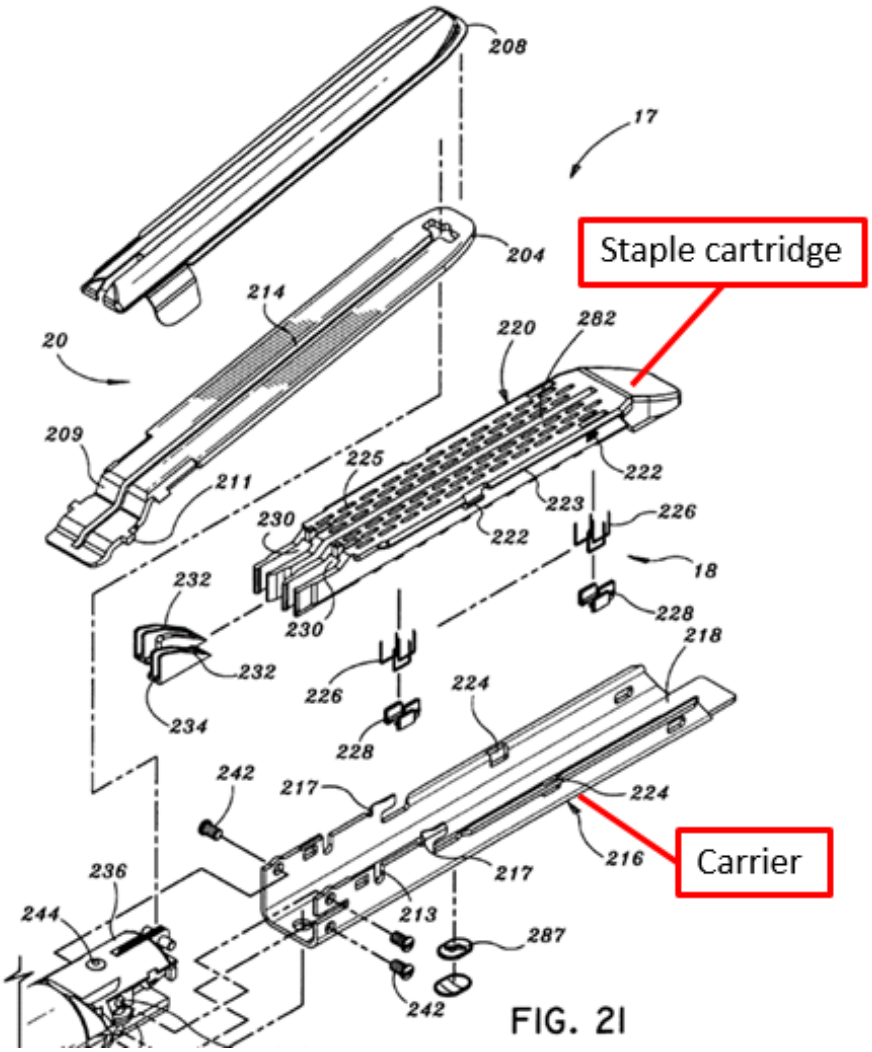


FIG. 21

VIII. THERE IS A REASONABLE LIKELIHOOD THAT AT LEAST ONE CLAIM OF THE '677 PATENT IS UNPATENTABLE

For the reasons explained below, claims 1-18 of the '677 patent are invalid.

A. Ground 1: Claims 1-18 are obvious over Hooven in view of Heinrich

Because claims 6-15 and 17-18 have been asserted in litigation, we begin with those claims.

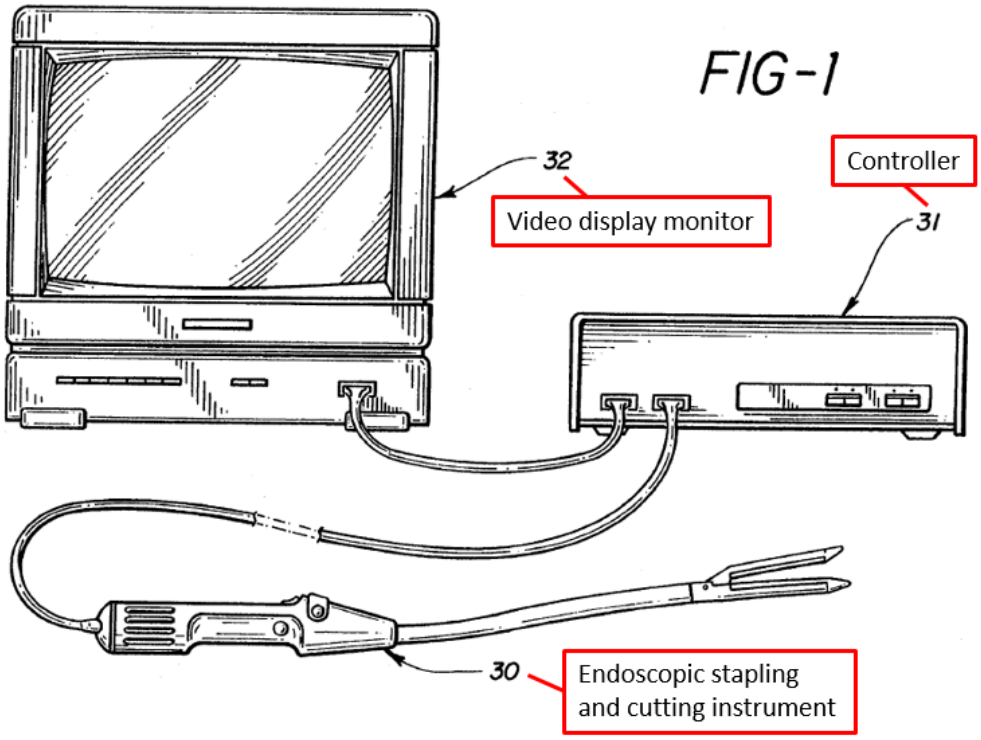
Claims 6-15 and 17-18

[6.1] A stapling sub-system configured to be operably engaged with a surgical instrument system, said stapling sub-system comprising

If this preamble is deemed to be a limitation, Hooven discloses it. IS1003, ¶ 296; *see also* ¶¶ 205-12 (discussing a similar limitation in the '058 patent).

"Stapling sub-system"

Hooven discloses a stapling sub-system (*i.e.*, endoscopic stapling and cutting instrument 30). *Id.*; IS1004, 4:15-17; *see also* 2:58-63 ("[E]ndoscopic instrument [30] has a head portion for carrying out a step in an endoscopic procedure. The step may be . . . stapling, cutting . . . etc. or combinations of these steps."), 4:45-53 ("In the embodiment depicted in FIGS. 2 through 9, the head portion is a linear stapler and cutter."), Figs. 1-9.



"Configured to be operably engaged with a surgical instrument system"

As shown above, Hooven's stapling sub-system (*i.e.*, endoscopic stapling and cutting instrument 30) is configured to be operably engaged with a surgical instrument system (*i.e.*, the combination of controller 31 and video display monitor 32) by a cable. IS1003, ¶¶ 207, 269; IS1004, 4:13-17 ("an endoscopic stapling system [30] is interconnected with a controller 31 and a video display monitor 32"), Fig. 1; *see also* 8:57-59 ("The endoscopic instrument [200] is . . . connected to the controller [203] by a cable 205."), 9:1-3 ("All sensors, switches, and motors [204] [in instrument 200] are connected to the controller [203] via the interface cable 205."), Fig. 18.

If Hooven is deemed not to disclose a "surgical instrument system," then it would have be obvious in view of Heinrich to combine Hooven's stapling sub-system (*i.e.*, endoscopic stapling and cutting instrument 30) with a surgical instrument system. IS1003, ¶¶ 208-12, 269. As shown below, Heinrich discloses a surgical instrument system (*i.e.*, the combination of actuation assembly 612, monitor 614, and robot 616) that is very similar to a surgical instrument system disclosed in the '677 patent.

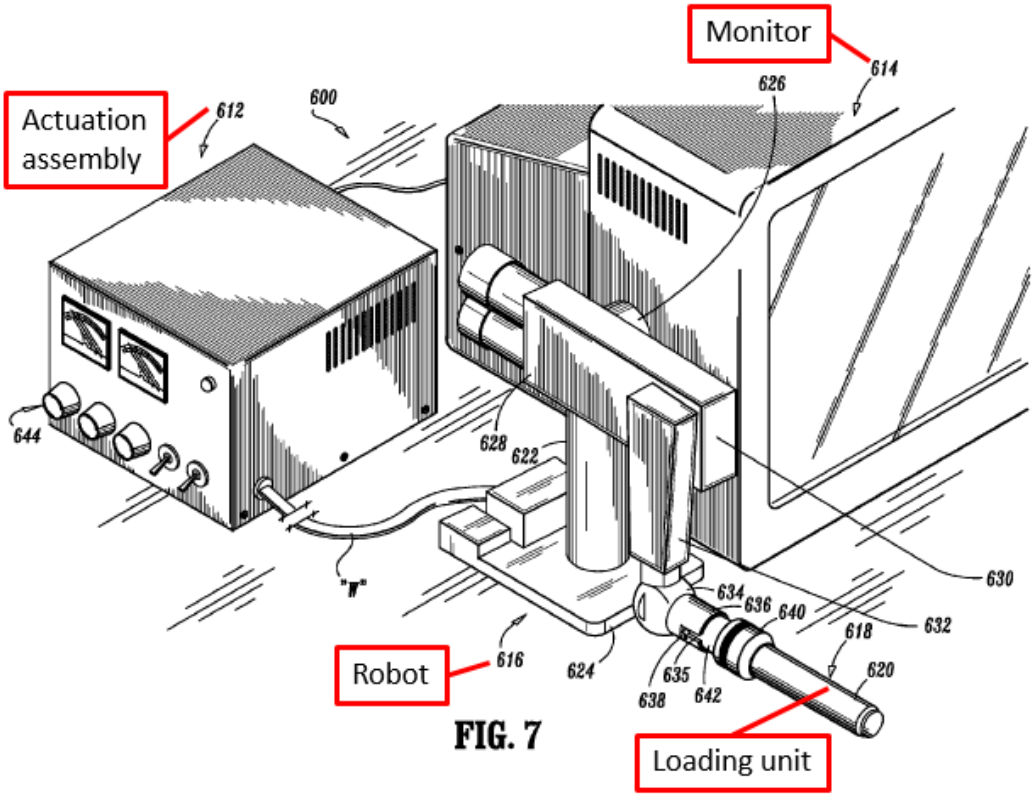


FIG. 7

When, as here, "there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). In this case, Hooven describes one predictable solution for manipulating the surgical instrument—*i.e.*, by hand. And Heinrich describes another predictable solution—*i.e.,* using a robotic arm. IS1005, ¶ 132 ("[L]oading unit 618 [is] releasably attached to robot 616."), Fig. 7.

A POSITA would have been motivated to configure Hooven's stapling sub-system for operable attachment to Heinrich's robotic surgical instrument system for several reasons. IS1003, ¶¶ 210-12, 269. For example, as recognized by the '677 patent, "robotic (or 'telesurgical') systems . . . increase surgical dexterity

[and] permit a surgeon to operate on a patient in an intuitive manner." IS1001, 15:26-29; *see also* 15:29-40 (incorporating U.S. Pat. No. 6,783,524 by reference); IS1013 ('524 patent), 2:37-55 (describing advantages of robotic systems over manual systems and noting that: "The surgeon can [also] typically perform the surgical procedure at [a] location remote from the patient").

Moreover, such a modification of Hooven's endoscopic stapling and cutting instrument 30 would have been well within a POSITA's abilities. Indeed, it would have been merely the application of a known technique (*e.g.*, using a robotic arm) to a known system (*e.g.*, Hooven's disposable loading unit) in the same field of endeavor (*i.e.*, remote controlled surgical staplers). IS1003, ¶¶ 211, 269; *KSR*, 550 U.S. at 417 ("[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.") (internal quotation marks omitted). In combination, each element (*i.e.*, Heinrich's robotic system and Hooven's disposable loading unit) merely performs the same function as it does separately. IS1003, ¶¶ 211, 269. And the combination of Hooven and Heinrich proposed here would have yielded predictable results without significantly altering or hindering the functions performed by Hooven's device. *Id.* Not surprisingly, the '677 patent concedes that a POSITA would have known how to use a "wide variety of alternative robotic structures." IS1001, 17:6-13.

Finally, it would have been an obvious design choice. IS1003, ¶¶ 212, 269. As recognized by the '677 patent, "[m]any [robotic] systems are disclosed in [the prior art]." IS1001, 15:29-54; *see also* 16:13-19, 16:42-49, 17:6-13. And, as shown by Heinrich, making a manual surgical stapler compatible with a robotic system was desirable. IS1003, ¶¶ 212, 269. Accordingly, a POSITA would have recognized that a robotic system, like Heinrich's, is an effective and efficient mechanism for manipulating Hooven's endoscopic stapling and cutting instrument 30. *Id*.

[6.2] a staple cartridge carrier

Hooven discloses this limitation. IS1003, ¶ 297; *see also* ¶ 213 (discussing the same limitation in the '058 patent). Hooven discloses a "staple holding portion" and a staple cartridge holding member 161, which are staple cartridge carriers. *Id*.; IS1004, 6:3-9 ("Mounted in the staple holding portion of the instrument is a removable staple cartridge 80. The cartridge holds four rows of staples 81. The rows are parallel and in adjacent rows the staples are off-set as is well known in the art. The cartridge is placed so that it is opposite the anvil portion of the instrument and snaps into the staple holding portion of the instrument as shown."), 8:20-23 ("The head comprises a staple or staple cartridge holding member 161."), Figs. 6, 17.

FIG-6

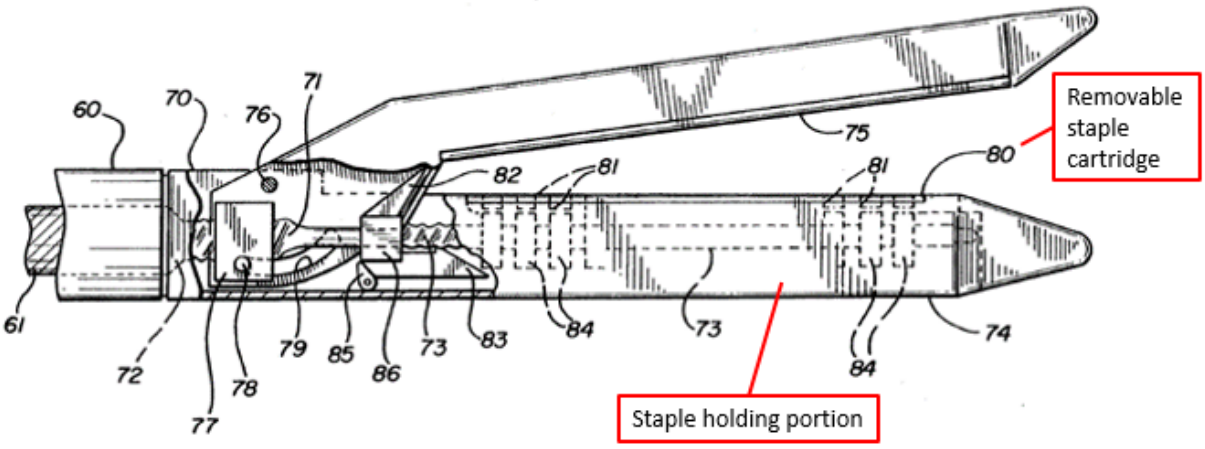
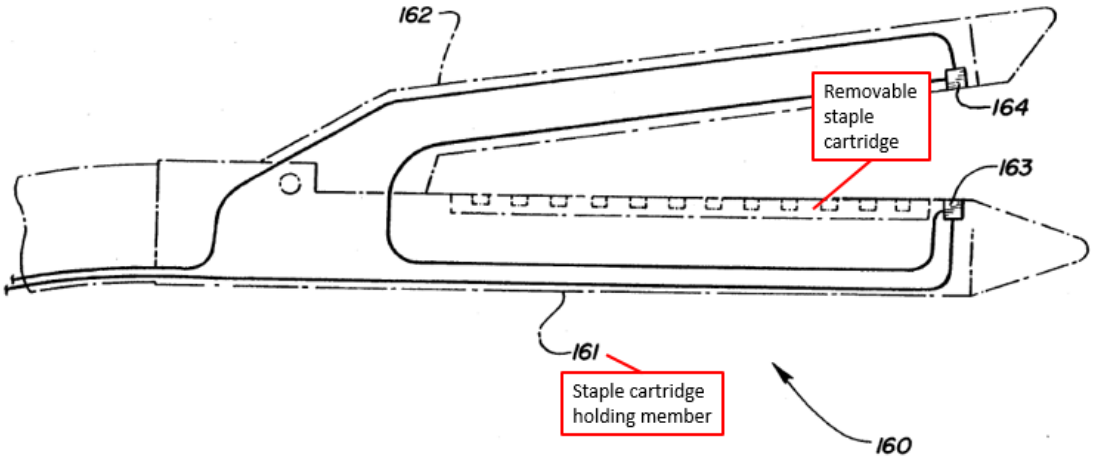


FIG-17



[6.3] a staple cartridge assembly supported by said staple cartridge carrier

Hooven discloses this limitation. IS1003, ¶ 298; *see also* ¶ 214 (discussing the same limitation in the '058 patent). "Mounted in the staple holding portion of the instrument is a removable staple cartridge 80. The cartridge holds four rows of staples 81. . . . The cartridge is placed so that it is opposite the anvil portion of the

instrument and snaps into the staple holding portion of the instrument as shown." IS1004, 6:3-9, Fig. 6; *see also* 8:20-23 ("The head comprises a staple or staple cartridge holding member 161."), Fig. 17.

FIG-6

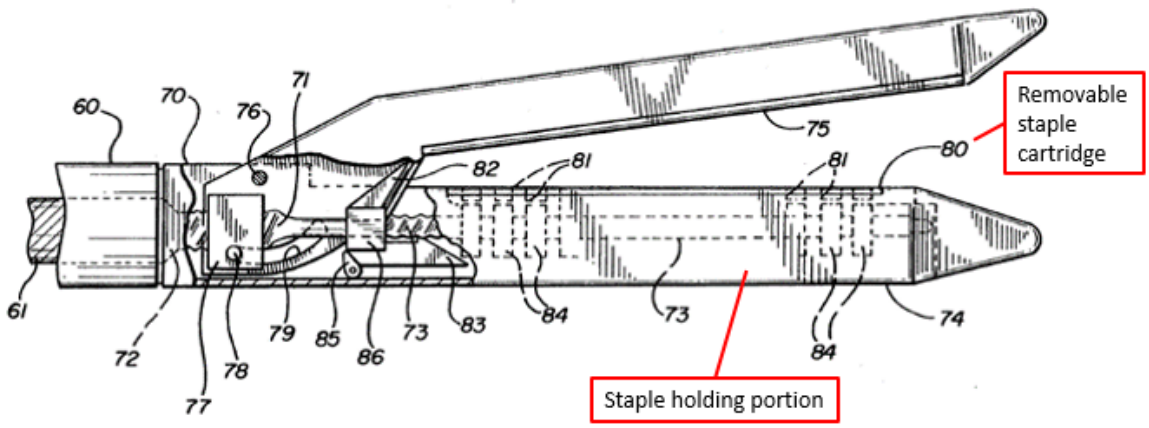
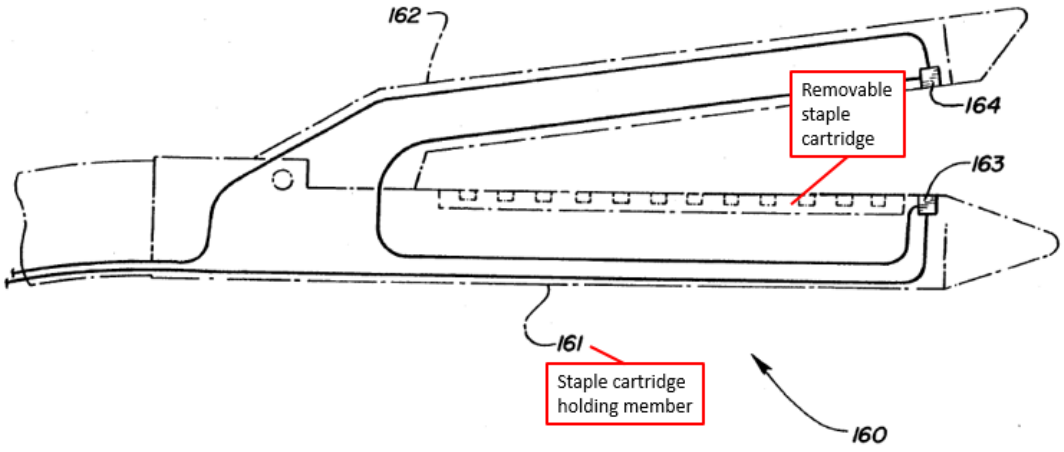


FIG-17



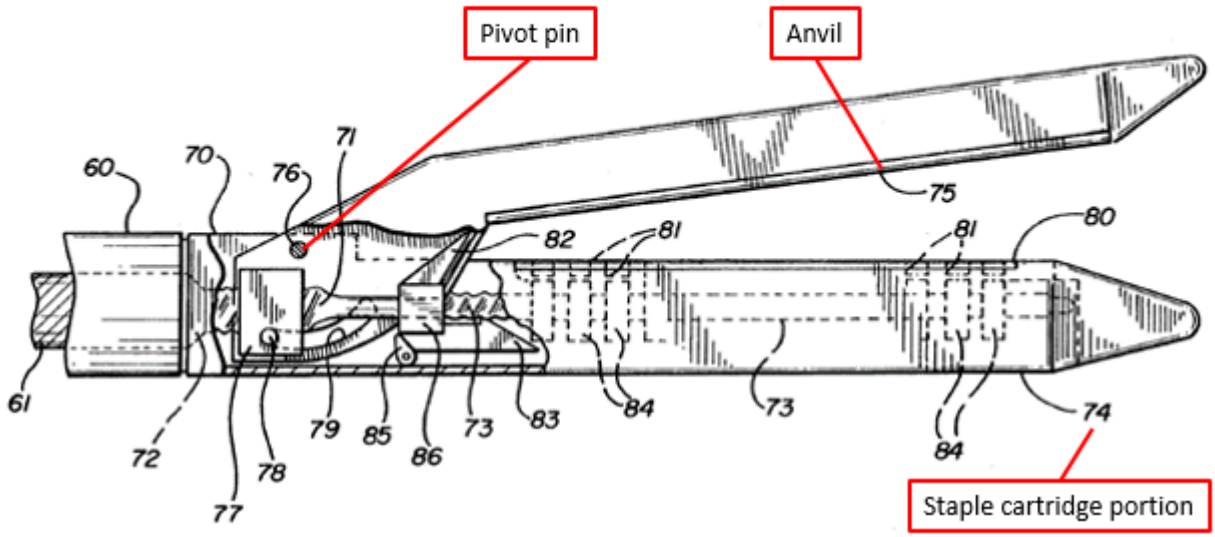
[6.4] an anvil supported relative to said staple cartridge carrier and movable from an open position to a closed position

Hooven discloses this limitation. IS1003, ¶ 299; *see also* ¶ 215-17 (discussing the same limitation in the '058 patent).

"Anvil supported relative to said staple cartridge carrier"

Hooven discloses "anvil portion 75." IS1003, ¶ ¶ 216, 299; IS1004, 5:38-40, Fig. 6. Furthermore, the "staple [cartridge] portion [74] and the anvil portion [75] are pivotally connected to each other by the anvil pivot pin 76." IS1004, 5:40-41.

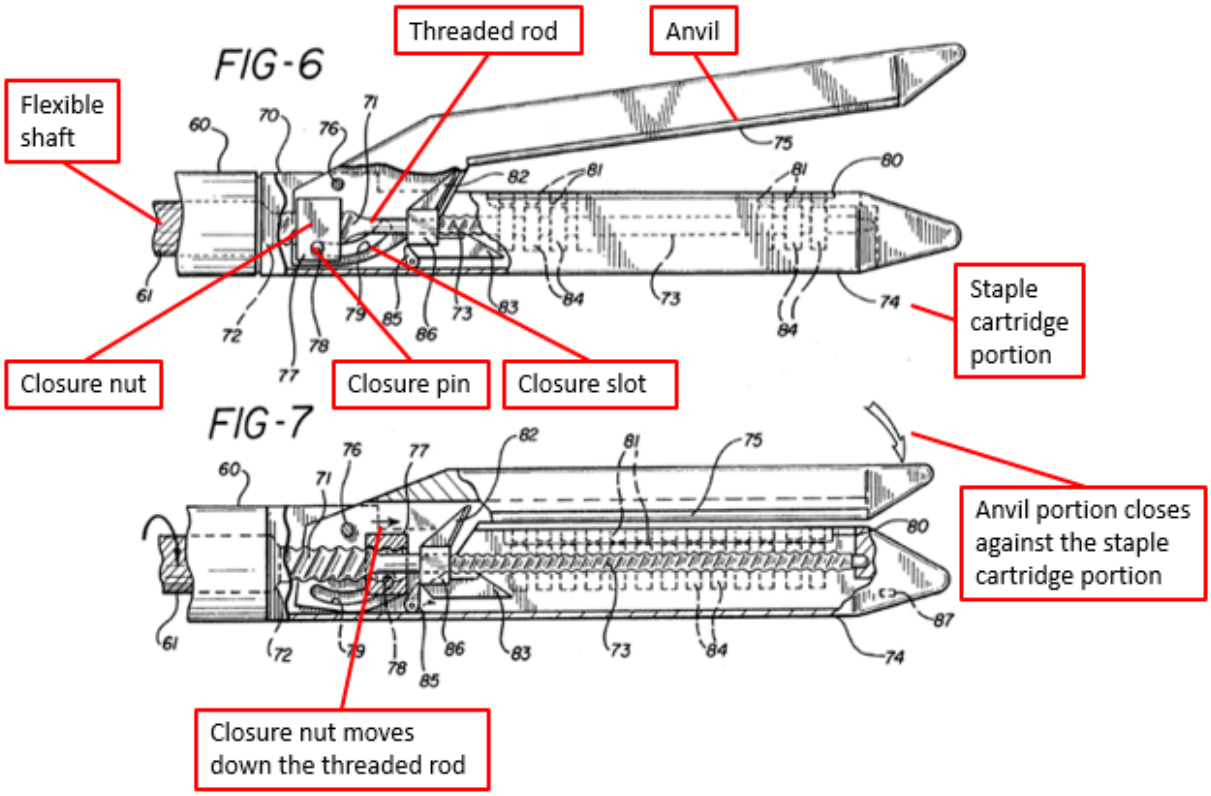
FIG-6



"Movable from an open position to a closed position"

In Hooven, "[w]hen the flexible shaft [61] is rotated, the threaded rod [71] is also rotated and on rotating the closure nut [77] will move down the threaded rod [71] and move the closure pin [78] in the closure slot [79] to close the anvil portion [75] against the staple [cartridge] portion [74] of the head of the instrument. Tissue to be treated or manipulated is placed between the anvil portion and the staple [cartridge] portion of the head of the instrument when in the open position.

Power is applied to the flexible shaft to rotate the shaft and the threaded rod and close the anvil portion." IS1004, 5:40-55; *compare* Fig. 6 (open position) *with* Fig. 7 (closed position).

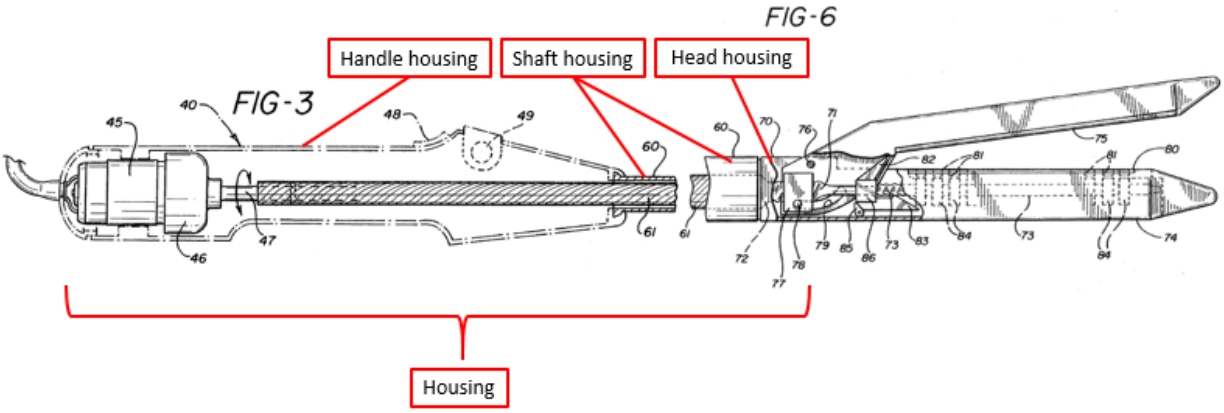


[6.5] a housing, wherein said staple cartridge carrier extends from said housing, and wherein said housing comprises a housing connector removably attachable to the surgical instrument system

"Housing"

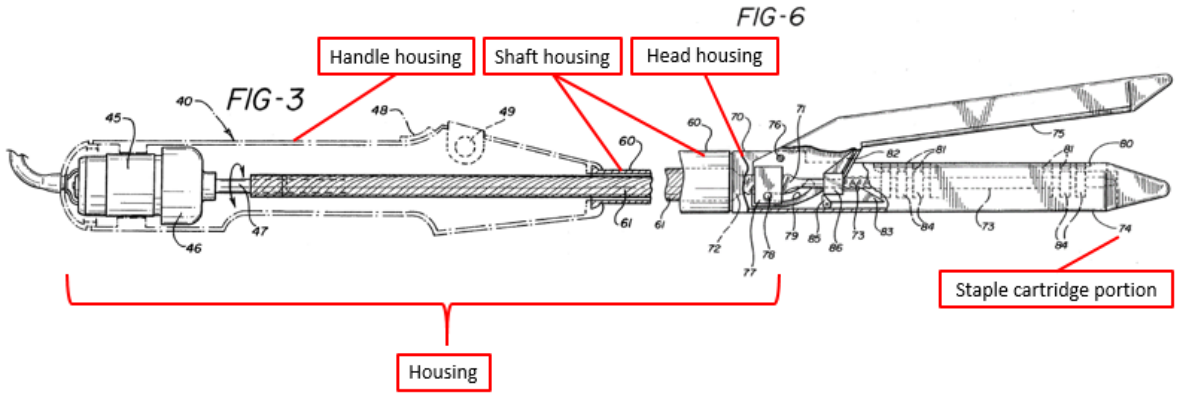
Hooven discloses this limitation. IS1003, ¶ 300; *see also* ¶ 218 (discussing the same limitation in the '058 patent). Hooven discloses a housing (*i.e.*, the combination of the housing of handle portion 40, shaft housing 60, and the housing 70 of the head) that houses the drive train of the stapling system. *Id.*; IS1004, 4:34-35 ("The instrument has a handle portion 40."), 5:14-21 ("[T]he shaft housing

60 is flexible . . . [and] connects the handle of the instrument [40] to the head of the instrument."), 5:31-33 ("The housing 70 of the head is suitably connected to the shaft housing 60 either by a press fit or ultrasonic welding or other similar means."), Figs. 3, 5, 6.



"Staple cartridge carrier extends from said housing"

Hooven's staple cartridge carrier (*i.e.*, staple cartridge portion 74) extends from the housing 70 of the head portion of the stapling sub-system's housing. *See, e.g.*, IS1004, Figs. 6 and 17; IS1003, ¶¶ 219, 300.



"Housing connector removably attachable to the surgical instrument system"

For the reasons explained above, it would have been obvious to combine Hooven's stapling sub-system with Heinrich's surgical instrument system. *See* Ground 1, element [6.1]. In doing so, a POSITA would have modified Hooven's stapling sub-system (*i.e.*, instrument 30) to include Heinrich's housing connector (*i.e.*, the bayonet-type connector comprising attachment platform 642 and protrusions 638, which are shown below) to removably attach instrument 30 to Heinrich's surgical instrument system (*i.e.*, actuation assembly 612, monitor 614, and robot 616) as taught by Heinrich. *Id.*; IS1003, ¶¶ 220-21, 300; IS1005, ¶ 134 ("Disposable loading unit 618 . . . includes . . . an attachment platform 642 for releasably attaching disposable loading unit 618 to robot 616 via mounting flange 636. Mounting flange 636 preferably includes two slots 635 which inter-engage with protrusions 638 of platform 642 to connect to mounting flange 636 with disposable loading unit 618."), Figs. 7, 9.

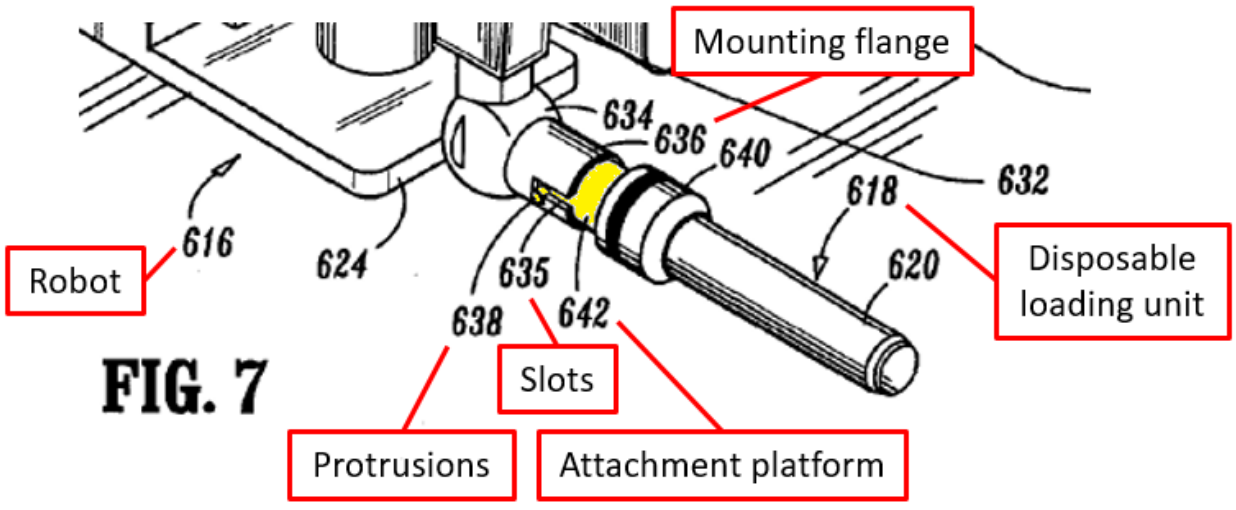
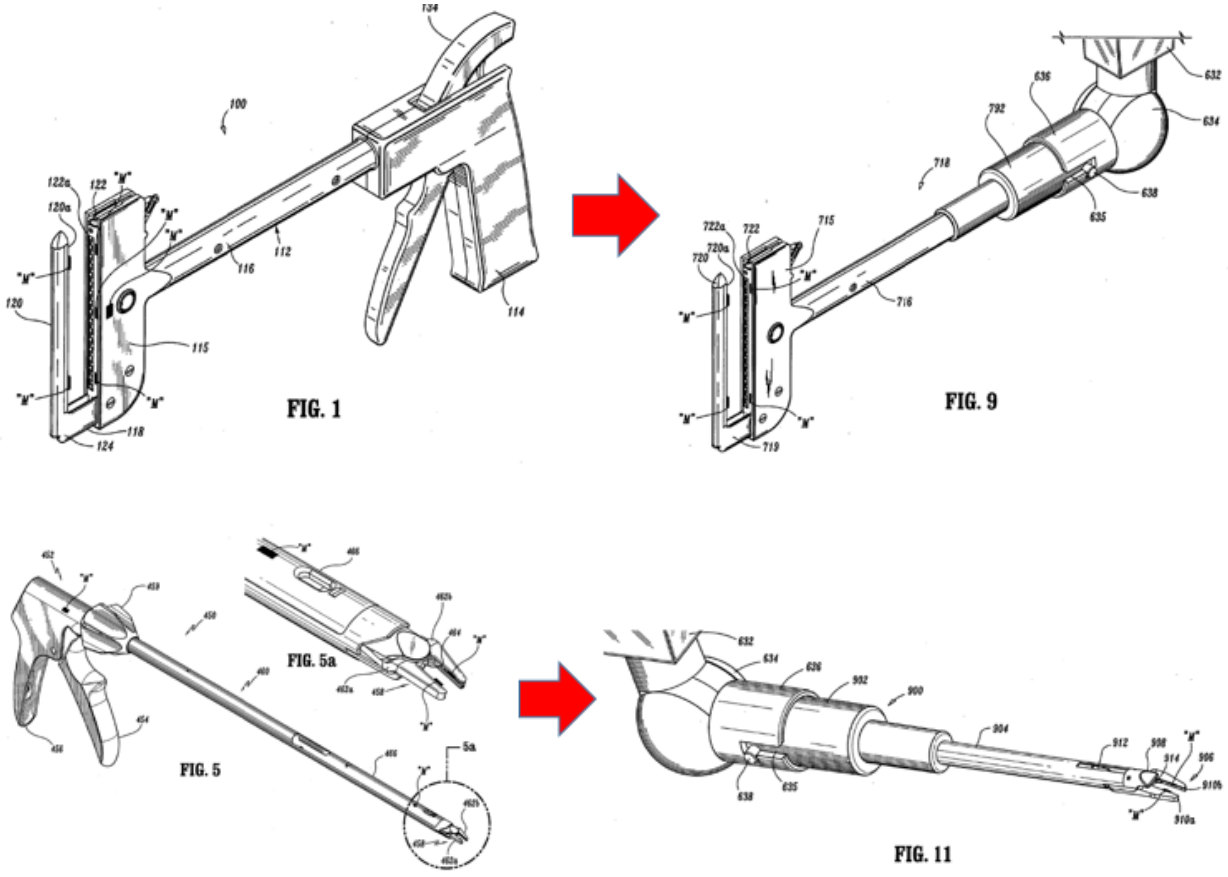
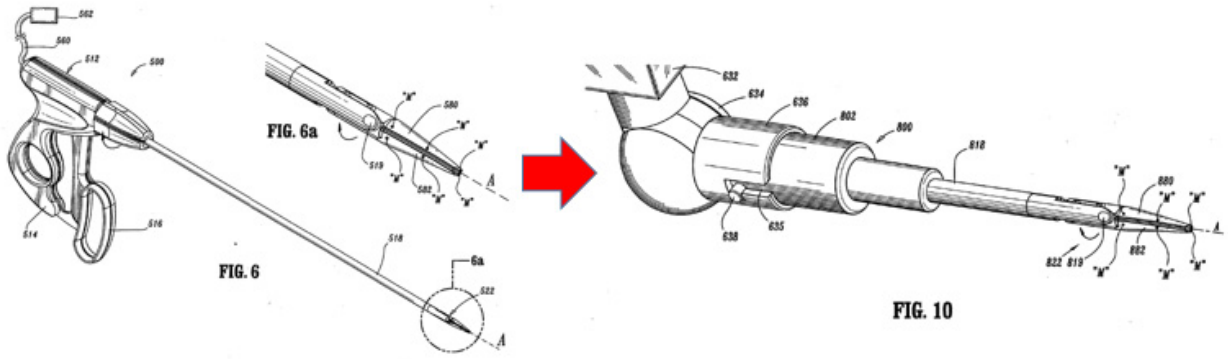


FIG. 7

Indeed, as shown below, Heinrich provides several examples of modifying hand-held stapling sub-systems, like Hooven's instrument 30, to include a housing connector (*i.e.*, attachment platform 642 and protrusions 638) that is removably attachable to the surgical instrument system (*i.e.*, the combination of actuation assembly 612, monitor 614, and robot 616). *Compare* IS1005, Figs. 1, 5, 6 *with* IS1005, Figs. 9, 11, 10, respectively; *see also* ¶ 139 ("By way of example only, as shown in FIG. 9, a disposable loading unit 718 [], including an end effector of a surgical stapler, similar to the end effector of surgical stapler 100 described above, is operatively connected to robot 616 (*see* FIG. 7).").



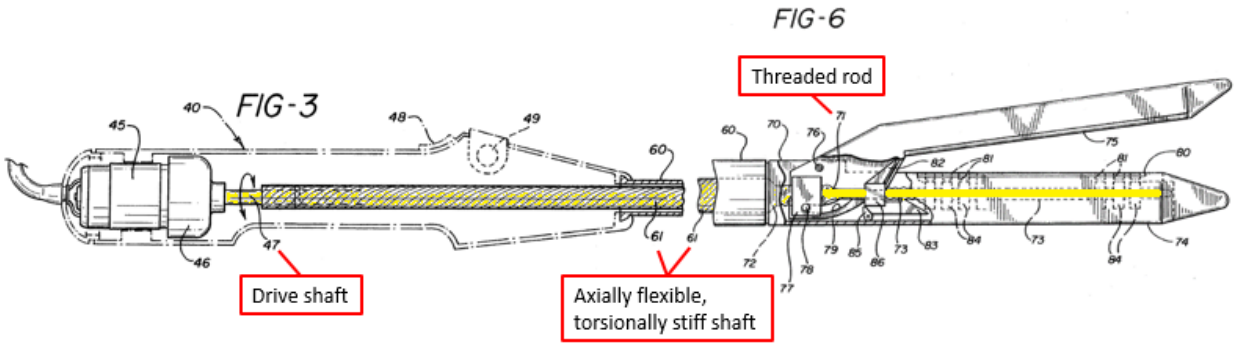


[6.6] a rotary drive system, comprising

See Ground 1, elements [6.6.1]-[6.6.3].

[6.6.1] a rotary shaft

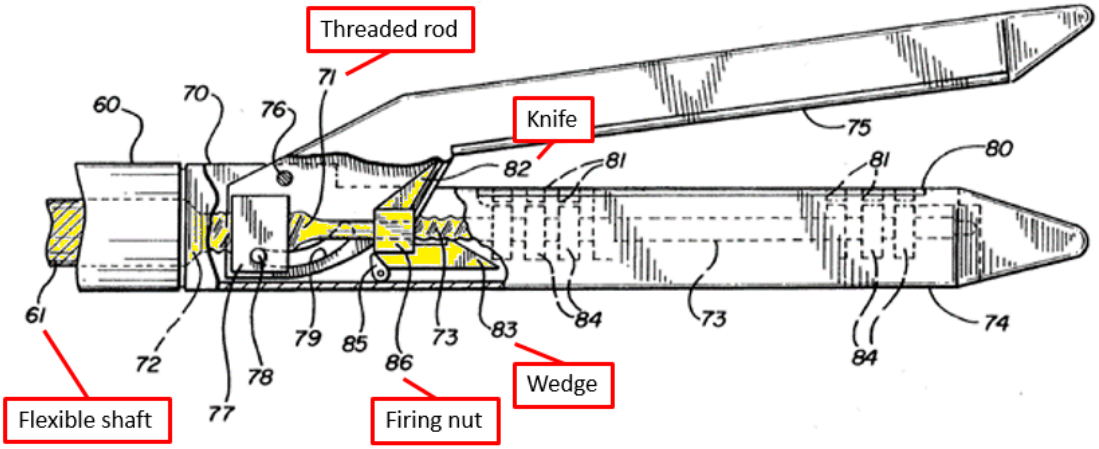
Hooven discloses this limitation. IS1003, ¶ 302; *see also* ¶ 222 (discussing the same limitation in the '058 patent). Hooven discloses the combination of threaded rod 71, drive shaft 47, and axially flexible, torsionally stiff shaft 61, which is a rotary shaft. IS1004, 5:19-21 ("[F]lexible shaft [61] is connected to the drive shaft 47."), 5:34-50 ("Extending substantially the length of the head and connected to the rotating shaft 61 is a threaded rod 71. . . . When the flexible shaft [61] is rotated, the threaded rod [71] is also rotated."), Figs. 3, 6



[6.6.2] a translatable drive member operably engaged with said rotary shaft, wherein said translatable drive member is selectively translatable through said staple cartridge assembly from a start position to an end position when a rotary motion is applied to said rotary shaft

Hooven discloses this limitation." IS1003, ¶ 303; *see also* ¶¶ 223-26 (discussing a similar limitation in the '058 patent). Hooven discloses a translatable drive member (*i.e.*, the combination of firing nut 86, knife 82, and wedge 83) operably engaged (*i.e.*, in threaded engagement) with the rotary shaft (*i.e.*, the combination of drive shaft 47, flexible shaft 61, and threaded rod 71). *Id.*; IS1004, Fig. 6.

FIG-6

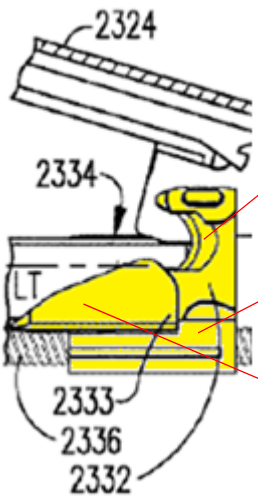
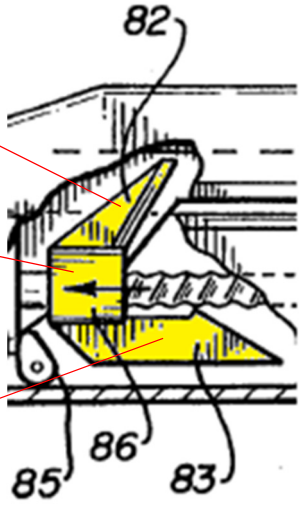


Hooven's translatable drive member (*i.e.*, the combination of firing nut 86, knife 82, and wedge 83) is also translatable from a start position (*i.e.*, the proximal end of the smaller diameter portion 73 of threaded rod 71) to an end position (*i.e.*, the distal end of the smaller diameter portion 73 of threaded rod 71). IS1003, ¶¶

224, 303; IS1004, Figs. 6-10, 20. "When the anvil portion 75 is closed . . . the firing nut 86 on which the knife 82 and wedges 83 are disposed is moved forward and engages the threads of the smaller diameter portion 73 of the threaded rod [71] to move forward along the rod and drive the staples 81 and cut tissue. . . . Once the firing nut has moved to its most forward position to drive and form all of the staples and cut the tissue, it engages a suitable contact 87 which immediately reverses the motor to retract the firing nut." IS1004, 6:27-40, Figs. 6-7; *see also* 6:12-15 ("Mounted on this rod, to move along the rod as the rod rotates, is a knife member 82 and a driving wedge member 83 which are inner-connected.").

The movement of Hooven's translatable drive member is also selective. IS1003, ¶¶ 225, 303; IS1004, 4:60-63 ("Also included in the handle and interconnected with the DC motor are a suitable on/off switch 48 and a switch 49 to control the power supply being provided by the motor."), 8:40-45 ("The operations that might be controlled would be the opening and closing of the anvil member and/or the firing of the staples. This is accomplished by feeding the light measurement to a controller which would in turn control the power source used to operate the instrument."), 8:62-65 ("The instrument includes miniature sensors to detect the power and/or force being used and limit switches and contacts to turn the motor on and off at predetermined positions.").

Indeed, the combination of Hooven's firing nut 86, knife 82, and wedge 83 is nearly identical to the '677 patent's cutting instrument 2332. *Id*.

'677 patent, Fig. 35	Hooven, Fig. 9
	

Knife

Drive nut

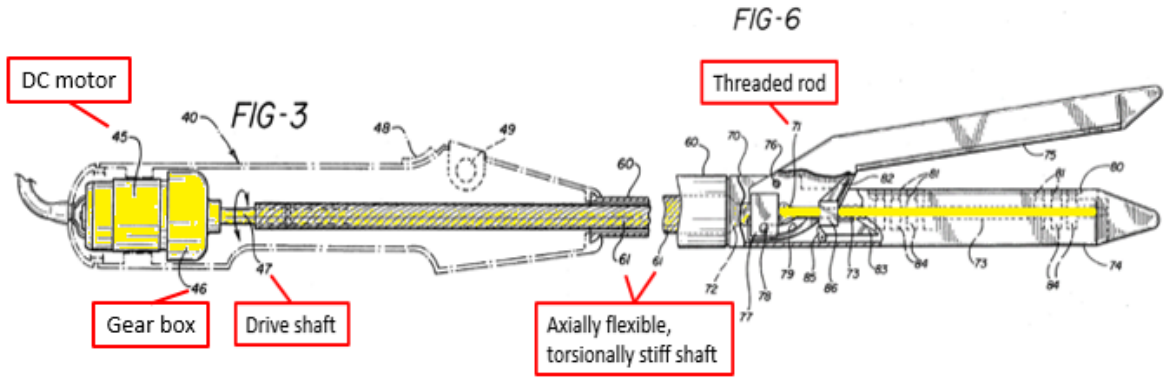
Wedge

[6.6.3] an electric motor operably interfacing with said rotary shaft to selectively apply said rotary motion to said rotary shaft, wherein said electric motor is operably disconnected from a power source when said housing is not attached to the surgical instrument system, and wherein said electric motor is operably connected to the power source when said housing is attached to the surgical instrument system.

Hooven in view of Heinrich discloses this limitation. IS1003, ¶¶ 304-307; *see also* ¶¶ 227-31 (discussing similar limitations in the '058 patent).

"Electric motor operably interfacing with said rotary shaft"

Hooven discloses an electric motor (*i.e.*, DC motor 45) operably interfacing with the rotary shaft (*i.e.*, the combination of drive shaft 47, shaft 61, and threaded rod 71) via gear box 46. IS1003, ¶¶ 228, 305; IS1004, 4:56-57, Figs. 3, 6.



"To selectively apply said rotary motion to said rotary shaft"

Hooven's on/off switch 48, switch 49, firing button, and controller 31 selectively control the power supply being provided by the motor, which applies rotary motion to the rotary shaft (*i.e.*, the combination of drive shaft 47, axially flexible shaft, torsionally stiff shaft 61, and threaded rod 71). IS1003, ¶¶ 229, 305; IS1004, 4:60-63 ("Also included in the handle [40] and interconnected with the DC motor [45] are a suitable on/off switch 48 and a switch 49 to control the power supply being provided by the motor."), 4:22-26 ("The controller may feed appropriate signals back to the instrument in order to operate the instrument. The controller also acts to supply power to the instrument at the appropriate level, frequency, timing, etc."), 8:59-65 ("The controller is microprocessor based and includes circuits for sensing, motor control . . . and power supply. The instrument includes miniature sensors to detect the power and/or force being used and limit switches and contacts to turn the motor on and off at predetermined positions."), Fig. 3 (showing on/off switch 48 and switch 49), Fig. 20A (showing that system fires when physician presses the fire button). In the proposed combination of

Hooven's stapling system (*i.e.*, instrument 30) with Heinrich's surgical instrument system (*i.e.*, the combination of actuation assembly 612, monitor 614, and robot 616), Heinrich's surgical instrument system would selectively control the power supplied to the motor. *Id.*; IS1005, ¶ 131, 134.

"Electric motor is operably disconnected from a power source when said housing is not attached to the surgical instrument system, and . . . operably connected to the power source when said housing is attached to the surgical instrument system"

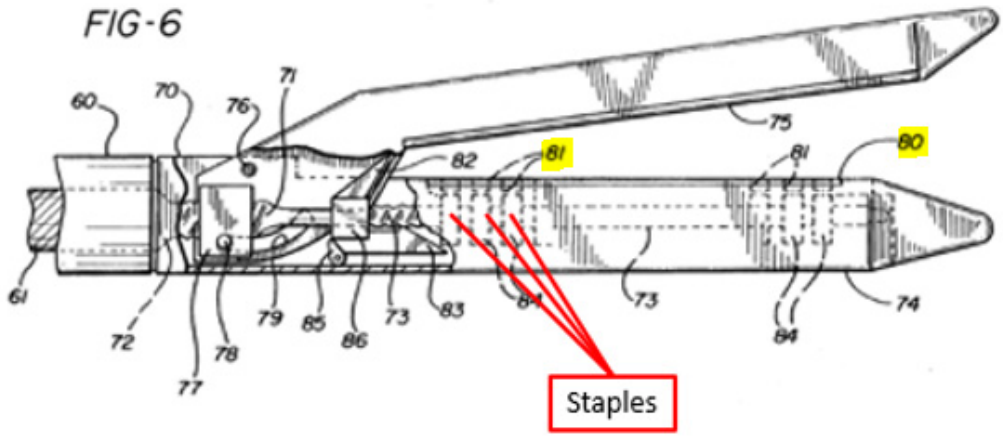
Hooven's electric motor (*i.e.*, DC motor 45) is configured to receive power from controller 31, which includes a power source. IS1003, ¶ 306; IS1004, 9:1-3 ("All sensors, switches, and motors are connected to the controller via the interface cable 205."), 4:17-26 ("The controller includes a . . . power supply . . . and motor drive circuits. . . . The controller also acts to supply power to the instrument at the appropriate level, frequency, timing, etc."). Furthermore, DC motor 45 is in handle 40. IS1004, Fig. 3. And the power supply for DC motor 45 is in controller 31. IS1004, 4:17-26; IS1003, ¶ 306. Because handle 40 is detachable from controller 31, the motor 45 is operably disconnected from the power source in controller 31 when the housing (*i.e.*, handle 40) is not attached to the surgical instrument system (*i.e.*, controller 31). *Id.* Likewise, motor 45 is operably connected to the power source in the controller 31 when the handle 40 is attached

to controller 31. *Id*.

Thus, in the proposed combination of Hooven's stapling sub-system (*i.e*., instrument 30) with Heinrich's surgical instrument system (*i.e*., the combination of actuation assembly 612, monitor 614, and robot 616), Hooven's DC motor 45, which is in handle 40, would be configured to receive power from Heinrich's surgical instrument system, which includes a power source. IS1003, ¶ 307; IS1004, Fig. 3; IS1005, ¶ 134 ("It is further contemplated that an electrical connection 633 (*see* FIG. 8) be provided between slots 635 and protrusions 638 in order to provide power to electro-mechanical assembly 619."); *see also* ¶ 131 ("[T]he power and control systems [of the surgical instrument] can be integrated or interfaced with the robotic surgical system."), Fig. 8 (showing no power source in loading unit 618). Because the housing of Hooven's instrument 30 (*i.e*., the housing of handle portion 40) would be detachable from Heinrich's surgical instrument system (*i.e*., robot 616 portion of the surgical instrument system), Hooven's DC motor 45 would be operably disconnected from the power source in Heinrich's surgical instrument system when the housing of Hooven's handle 40 is not attached to Heinrich's robot 616. IS1003, ¶ 307. Likewise, Hooven's DC motor 45 would be operably connected to the power source in Heinrich's surgical instrument system when the housing of Hooven's handle 40 is attached to Heinrich's robot 616. *Id*.

[7] The stapling sub-system of claim 6, wherein said staple cartridge assembly comprises a plurality of staples removably stored therein.

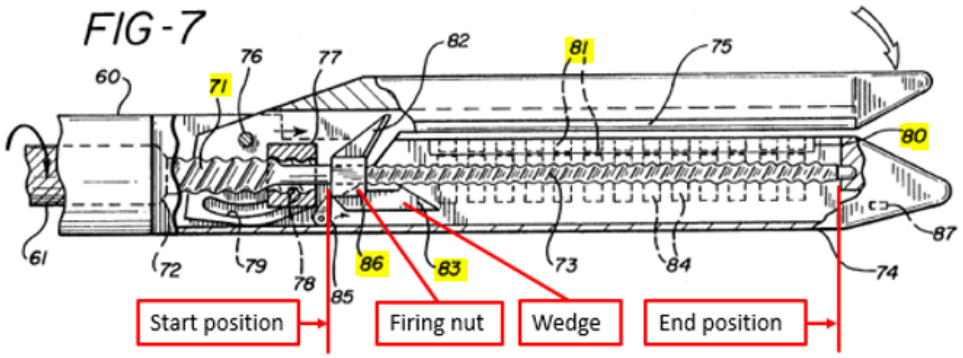
Hooven discloses this element. IS1003, ¶ 308; *see also* ¶ 232 (discussing a similar limitation in the '058 patent). Hooven's "removable staple cartridge 80 . . . holds four rows of staples 81." IS1004, 6:3-7, Fig. 6. And staples 81 are removably stored in cartridge 80. IS1003, ¶ 232. As explained in Hooven, "wedge member [83] . . . drives the staples [81] out of the cartridge [80], via the individual staple drivers 84." IS1004, 6:15-19.



[8] The stapling sub-system of claim 7, wherein said translatable drive member comprises a sled movable between said start position and said end position to eject said staples from said staple cartridge assembly.

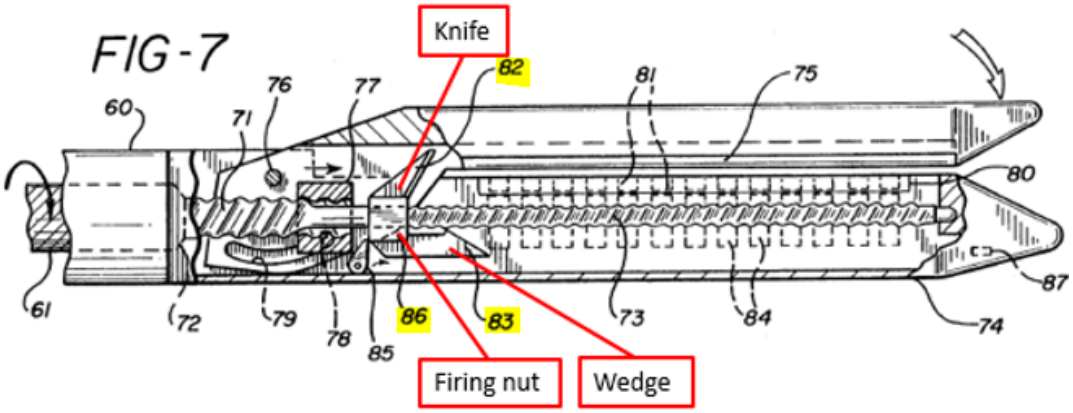
Hooven discloses this element. IS1003, ¶ 309; *see also* ¶ 233 (discussing a similar limitation in the '058 patent). Hooven's translatable drive member (*see* Ground 1, element [6.6.2]) comprises a sled (*i.e.*, wedge 83). *Id.*; IS1004, 6:27-44 ("firing nut 86 on which the knife 82 and wedges 83 are disposed"), Fig. 7. Wedge 83 is movable between the start position (*i.e.*, the proximal end of the smaller diameter portion of the threaded rod 73) and the end position (*i.e.*, the distal end of

the smaller diameter portion of the threaded rod 73) to eject said staples from said staple cartridge assembly. IS1003, ¶¶ 233, 309; IS1004, 6:15-19 ("As the wedge member [83] moves down the threaded rod [71], it drives the staples [81] out of the cartridge [80]."); 6:27-40 ("[T]he knife 82 and wedges 83 are . . . moved forward and engage[] the threads of the smaller diameter portion 73 of the threaded rod [71 (*i.e.*, said start position)] to move forward along the rod and drive the staples 81 . . . . Once the firing nut has moved to its most forward position [(*i.e.*, said end position)] . . . it engages a suitable contact 87 which immediately reverses the motor to retract the firing nut.").



[9] The stapling sub-system of claim 8, wherein said translatable drive member further comprises a knife configured to incise tissue captured between said anvil and said staple cartridge assembly.

Hooven discloses this element. IS1003, ¶ 310; *see also* ¶ 234 (discussing a similar limitation in the '058 patent). Hooven's translatable drive member (*see* Ground 1, element [6.6.2]) further comprises "knife 82[, which] follow[s] the driving wedge [83 and] cuts the tissue between adjacent rows of staples." IS1004, 6:20-22, Fig. 7.



[10] The stapling sub-system of claim 6, wherein said staple cartridge assembly is configured to be removed from said staple cartridge carrier and replaced with a different staple cartridge assembly.

Hooven discloses this element. IS1003, ¶ 311; *see also* ¶ 235 (discussing a similar limitation in the '058 patent); IS1004, 6:3-4 ("Mounted in the staple holding portion of the instrument is a removable staple cartridge 80."), 6:7-9 ("The cartridge is placed so that it is opposite the anvil portion of the instrument and snaps into the staple holding portion of the instrument as shown."), 6:63-65 ("[T]he presence of a cartridge and the presence of staples in that cartridge may also be sensed."), Figs. 6-10.

[11.1] A stapling attachment configured to be operably attached to a surgical instrument system, said stapling attachment comprising:

See Ground 1, element [6.1]. Hooven's instrument 30 is a stapling attachment. IS1003, ¶ 312; IS1004, Fig. 1.

[11.2] a staple cartridge carrier

See Ground 1, element [6.2].

[11.3] a staple cartridge body supported by said staple cartridge carrier, wherein said staple cartridge body comprises a proximal end and a distal end

See Ground 1, element [6.3].

[11.4] a plurality of staples removably stored in said staple cartridge body

See Ground 1, claim [7].

[11.5] an anvil supported relative to said staple cartridge carrier and movable from an open position to a closed position

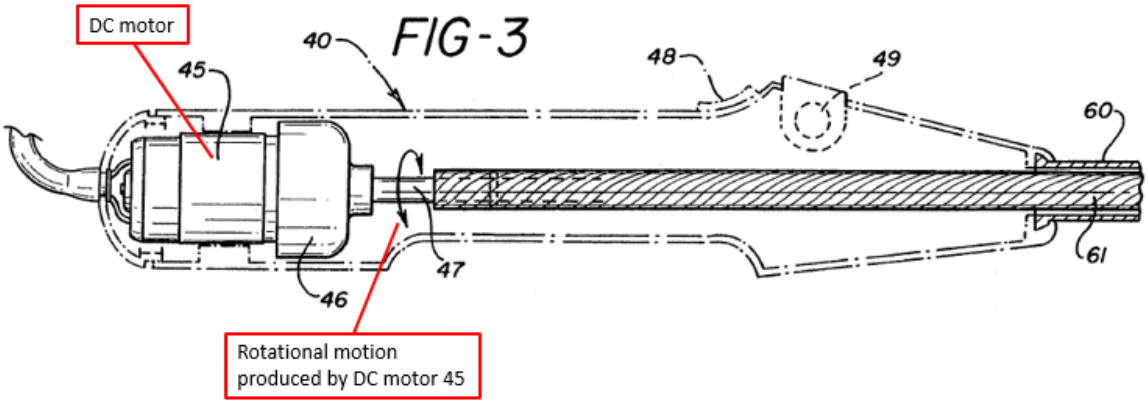
See Ground 1, element [6.4].

[11.6] a housing, wherein said staple cartridge carrier extends from said housing, and wherein said housing is removably attachable to the surgical instrument system

See Ground 1, element [6.5].

[11.7] an electric motor configured to produce rotational motion, wherein said electric motor selectively receives power from a power source only when said housing is coupled to said surgical instrument system

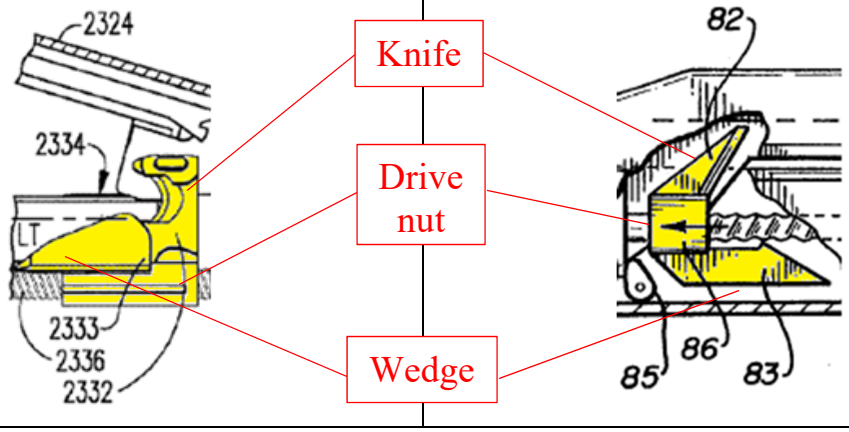
Hooven in view of Heinrich discloses this element. IS1003, ¶¶ 318-19; Ground 1, element [6.6.3]. Hooven's electric motor (*i.e.*, DC motor 45) is configured to produce rotational motion. *See, e.g.*, IS1004, 4:54-58, 5:8-14, Fig 3; IS1003, ¶ 318.



Hooven's DC motor 45 also selectively receives power from the power source in the surgical instrument system (*i.e.*, Heinrich's actuation assembly 612, monitor 614, and robot 616) only when the housing of Hooven's stapling attachment (*i.e.*, handle portion 40) is coupled to the surgical instrument system. *See* Ground 1, elements [6.6.3], [1.6].

[11.8] drive means for converting the rotational motion produced by said electric motor to translational motion to eject said staples from said staple cartridge body

Hooven discloses this means-plus-function element. IS1003, ¶¶ 320-22. As explained above, the corresponding structures disclosed in the '677 patent include (1) the combination of drive nut 610, axial drive assembly 212, and actuation sled 234; (2) the combination of cutting instrument 2332, sled portion 2333, and the drive nut to which they are attached; and (3) the combination of screw nut arrangement 3038, firing bar 3003, cutting instrument 3002, and sled 2033. Section VI.B. The combination of Hooven's firing nut 86, knife 82, and wedge 83 is the same as, or, at a minimum, equivalent to, each of these structures. IS1003, ¶ 320. Indeed, the combination in the '677 patent of cutting instrument 2332, sled portion 2333, and the drive nut to which they are attached is nearly identical to the combination in Hooven of firing nut 86, knife 82, and wedge 83. *Id*.

'677 patent, Fig. 35	Hooven, Fig. 9
	

Thus, Hooven's and the '677 patent's drive means are interchangeable. *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus.*, 145 F.3d 1303, 1309-10 (Fed. Cir. 1998); IS1003, ¶ 321. To the extent there are any relevant differences between these two structures or the other two corresponding structures described above, they are insubstantial and add nothing of significance. *Id.* Indeed, all of these structures perform the identical function (*i.e.*, converting the rotational motion produced by the electric motor to translational motion to eject the staples from the staple cartridge body). IS1003, ¶ 321; *IMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422, 1430 (Fed. Cir. 2000). Each structure performs that function in the same way (*i.e.*, using a drive nut that rides on a drive screw). IS1003, ¶ 321. And each structure performs the claimed function to achieve the same result (*i.e.*, cutting and stapling). *Id.*

Hooven also discloses this limitation even if it is not a means-plus-function term. IS1003, ¶ 322. Hooven discloses a collection of components that convert

the rotational motion (*i.e*., the rotation of threaded rod 71) produced by the electric motor (*i.e*., DC motor 45) to translational motion of wedge 83 to eject staples 81 from the staple cartridge 80. *Id*.; IS1004, 6:30-34 ("[T]he firing nut 86 on which the knife 82 and wedges 83 are disposed is moved forward and engages the threads of the smaller diameter portion 73 of the threaded rod [71] to move forward along the rod and drive the staples 81 and cut tissue.").

[12] The stapling attachment of claim 11, wherein said drive means comprises a sled movable between a proximal position and a distal position to eject said staples from said staple cartridge body

See Ground 1, claim [8], element [11.8].

[13] The stapling attachment of claim 12, wherein said drive means further comprises a knife configured to incise tissue captured between said anvil and said staple cartridge body

See Ground 1, claim [9], element [11.8].

[14] The stapling attachment of claim 11, wherein said staple cartridge body is configured to be removed from said staple cartridge carrier and replaced with a different staple cartridge body

See Ground 1, claim [10].

[15] The stapling attachment of claim 11, wherein the translational motion is directed toward said distal end

See Ground 1, claim [8], element [6.6.2].

[17.1] A stapling sub-system configured to be operably engaged with a surgical instrument system

See Ground 1, element [6.1].

[17.2] a stapling portion

See Ground 1, elements [6.2], [6.3]. The head or business portion 42 of the instrument 30 is a stapling portion. IS1003, ¶ 334. The combination of the staple cartridge carrier, staple cartridge assembly, and anvil is also a stapling portion. *Id*.

[17.3] a housing, wherein said stapling portion extends from said housing, and wherein said housing comprises a housing connector removably attachable to the surgical instrument system

See Ground 1, element [6.5].

[17.4] a rotary drive system, comprising

See Ground 1, element [6.6].

[17.4.1] a rotary shaft

See Ground 1, element [6.6.1].

[17.4.2] a translatable drive member operably engaged with said rotary shaft, wherein said translatable drive member is selectively translatable through said stapling portion from a start position to an end position when a rotary motion is applied to said rotary shaft

See Ground 1, element [6.6.2].

[17.4.3] an electric motor operably interfacing with said rotary shaft to selectively apply said rotary motion to said rotary shaft, wherein said electric motor is operably disconnected from a power source when said housing is not attached to the surgical instrument system, and wherein said electric motor is operably connected to the power source when said housing is attached to the surgical instrument system.

See Ground 1, element [6.6.3].

[18.1] A stapling attachment configured to be operably attached to a surgical instrument system

See Ground 1, elements [6.1], [17.1].

[18.2] a staple cartridge body comprising a proximal end and a distal end

See Ground 1, element [6.3].

[18.3] a plurality of staples removably stored in said staple cartridge body

See Ground 1, claim [7].

[18.4] an anvil supported relative to said staple cartridge body

See Ground 1, element [6.4].

[18.5] a housing removably attachable to the surgical instrument system

See Ground 1, element [6.5].

[18.6] an electric motor configured to produce rotational motion, wherein said electric motor selectively receives power from a power source only when said housing is coupled to said surgical instrument system; and

See Ground 1, elements [6.6.3], [11.7].

[18.7] drive means for converting the rotational motion produced by said electric motor to translational motion to eject said staples from said staple cartridge body.

See Ground 1, element [11.8]. In addition, as explained above, the structure of Hooven's drive means is the same as or equivalent to the structure corresponding to the claimed drive means.

Claims 1-5 and 16

[1.1] A disposable loading unit configured to be operably attached to a surgical instrument which is configured to selectively generate at least one control motion for the operation of said disposable loading unit

If this preamble is deemed to be a limitation, Hooven discloses it. IS1003, ¶ 269; *see also* ¶ 186-91 (discussing a similar preamble in the '058 patent).

"Disposable loading unit configured for operable attachment to a surgical instrument"

See Ground 1, element [6.1]. Hooven's endoscopic stapling and cutting instrument 30 is a disposable loading unit. *Id*.; IS1004, 2:34-36 ("My new endoscopic system may be disposable."); IS1003, ¶ 187. And the combination of Hooven's controller 31 and video display monitor 32 is a surgical instrument. IS1004, Figs. 1, 18; IS1003, ¶¶ 187-89, 269 (explaining that a POSITA would have understood that the terms "surgical instrument system" and "surgical instrument" are interchangeable in the context of the '677 patent). If Hooven is deemed not to disclose a surgical instrument, then it would have been obvious to configure Hooven's endoscopic stapling and cutting instrument 30 for operable attachment to Heinrich's surgical instrument (*i.e*., the combination of actuation assembly 612, monitor 614, and robot 616) for the reasons explained above. *See* Ground 1, element [6.1].

"Surgical instrument configured to selectively generate at least one control motion for the operation of said disposable loading unit"

Hooven also discloses this element. IS1003, ¶¶ 190-91, 269. Hooven's surgical instrument (*i.e*., the controller 31 portion) can "control some or all of the instrument [(*i.e*., disposable loading unit)] functions." IS1004, 9:15-25; *see also* 8:40-45 ("The operations that might be controlled would be the opening and

closing of the anvil member and/or the firing of the staples. This is accomplished by feeding the light measurement to a controller which would in turn control the power source used to operate the instrument."). And the movement of the motor or drive shaft to operate the instrument (*e.g.*, to open and close the anvil) is a control motion generated by the surgical instrument. IS1003, ¶¶ 190, 269.

If Hooven is deemed not to disclose a surgical instrument, then it would have been obvious to combine Hooven's disposable loading unit (*i.e.*, endoscopic stapling and cutting instrument 30) with Heinrich's surgical instrument (*i.e.*, the combination of actuation assembly 612, monitor 614, and robot 616) for the reasons explained above. *See* Ground 1, element [6.1]. And the resulting structure meets this limitation. IS1003, ¶¶ 191, 269. Indeed, the actuation assembly 612 portion of Heinrich's surgical instrument is "adapted to transmit electrical signals to an electro-mechanical assembly 619 housed within head portion 640 of loading unit 618 for actuating electro-mechanical assembly 619." IS1005, ¶ 137; *see also* ¶ 136 ("Actuation assembl[y] 612 can also transmit electrical signals . . . for positioning and operating loading unit 618."). The movements to position, and the movement of electro-mechanical assembly 619 to operate, a loading unit 618 (like Hooven's instrument 30) are control motions generated by the surgical instrument (element 31 in Hooven, or elements 612 and 616 in Heinrich). IS1003, ¶¶ 191, 269.

[1.2] a carrier operably supporting a cartridge assembly therein

See Ground 1, element [6.2].

[1.3] an anvil supported relative to said carrier and being movable from an open position to closed positions upon application of at least one control motion thereto

See Ground 1, elements [1.1], [6.4].

[1.4] a housing coupled to said carrier, said housing including means for removably attaching said housing to the surgical instrument

"Housing coupled to said carrier"

See Ground 1, element [6.5].

"Means for removably attaching said housing to the surgical instrument"

If Hooven is deemed not to disclose the structure corresponding to this means-plus-function limitation (*i.e.*, engagement nubs 254), it would have been obvious to add Heinrich's housing connector (*i.e.*, attachment platform 642 and protrusions 638) to Hooven's instrument 30 for the reasons explained above. IS1003, ¶ 272; *see also* ¶¶ 195-97 (discussing a similar limitation in the '058 patent); Ground 1, element [6.5]; Section VI.A, *supra*).

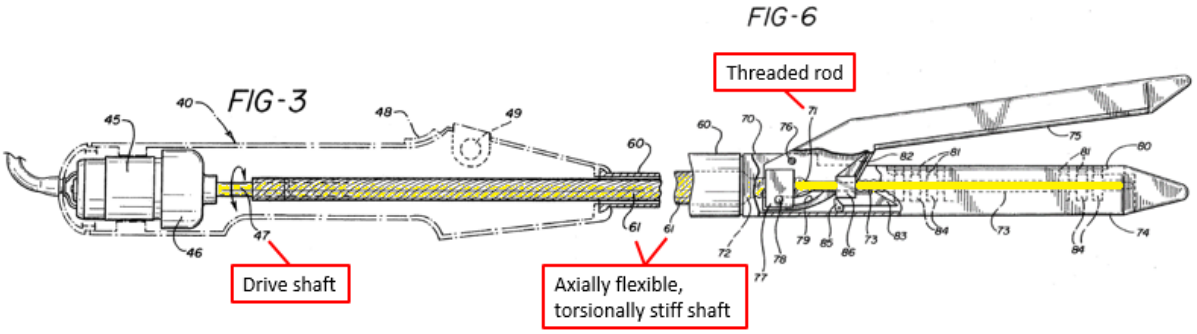
Heinrich's protrusions 638 (*see* Ground 1, element [6.5]) are the same as, or, at a minimum, equivalent to, the '677 patent's engagement nubs 254. IS1003, ¶¶ 196, 272; *compare* IS1001, 11:59-61 ("Nubs 254 form a bayonet type coupling with the distal end of the elongated body portion 14 of the surgical stapling apparatus.") *with* IS1005, claim 37 ("[T]he [disposable loading unit] is connected

to the robotic arm via a bayonet-type connection."). Because the structures are essentially identical, they are also interchangeable. IS1003, ¶¶ 196, 272; *Chiuminatta,* 145 F.3d at 1309-10.

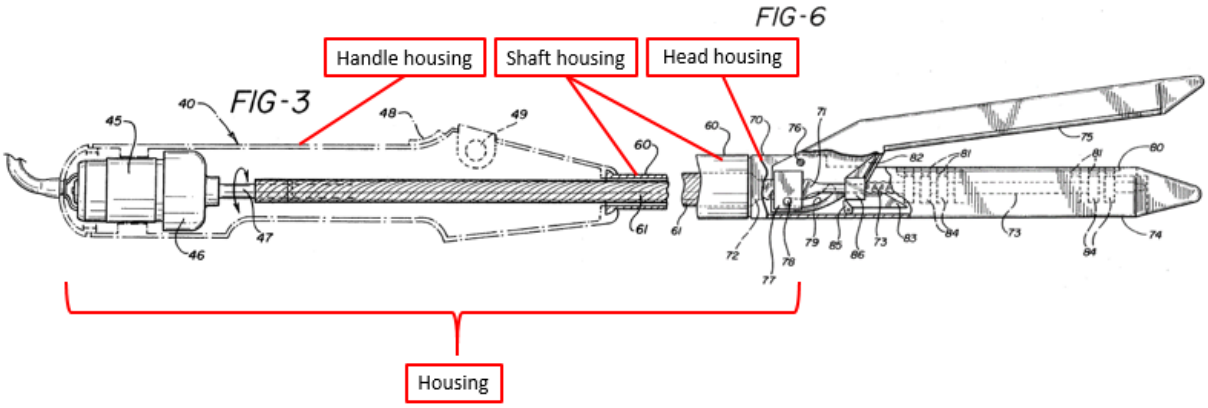
The relevant differences (if any) between these structures are insubstantial and add nothing of significance. *Id.*; *Chiuminatta*, 145 F.3d at 1309. Both structures perform the identical function (*i.e.*, removably coupling the housing of the disposable loading unit to a surgical instrument). IS1003, ¶¶ 197, 272; *IMS Tech.*, 206 F.3d at 1430. And they perform that function in the same way (*i.e.*, using a bayonet type connection) to achieve the same result (*i.e.*, attaching the disposable loading unit to, and detaching it from, the surgical instrument). *IMS Tech.*, 206 F.3d at 1437; IS1003, ¶¶ 197, 272.

[1.5] a rotary drive at least partially supported within said housing

See Ground 1, elements [6.6]-[6.6.3]. The combination of Hooven's drive shaft 47, axially flexible, torsionally stiff shaft 61, and threaded rod 71 is a rotary drive. *Id.*; IS1003, ¶¶ 273-74.

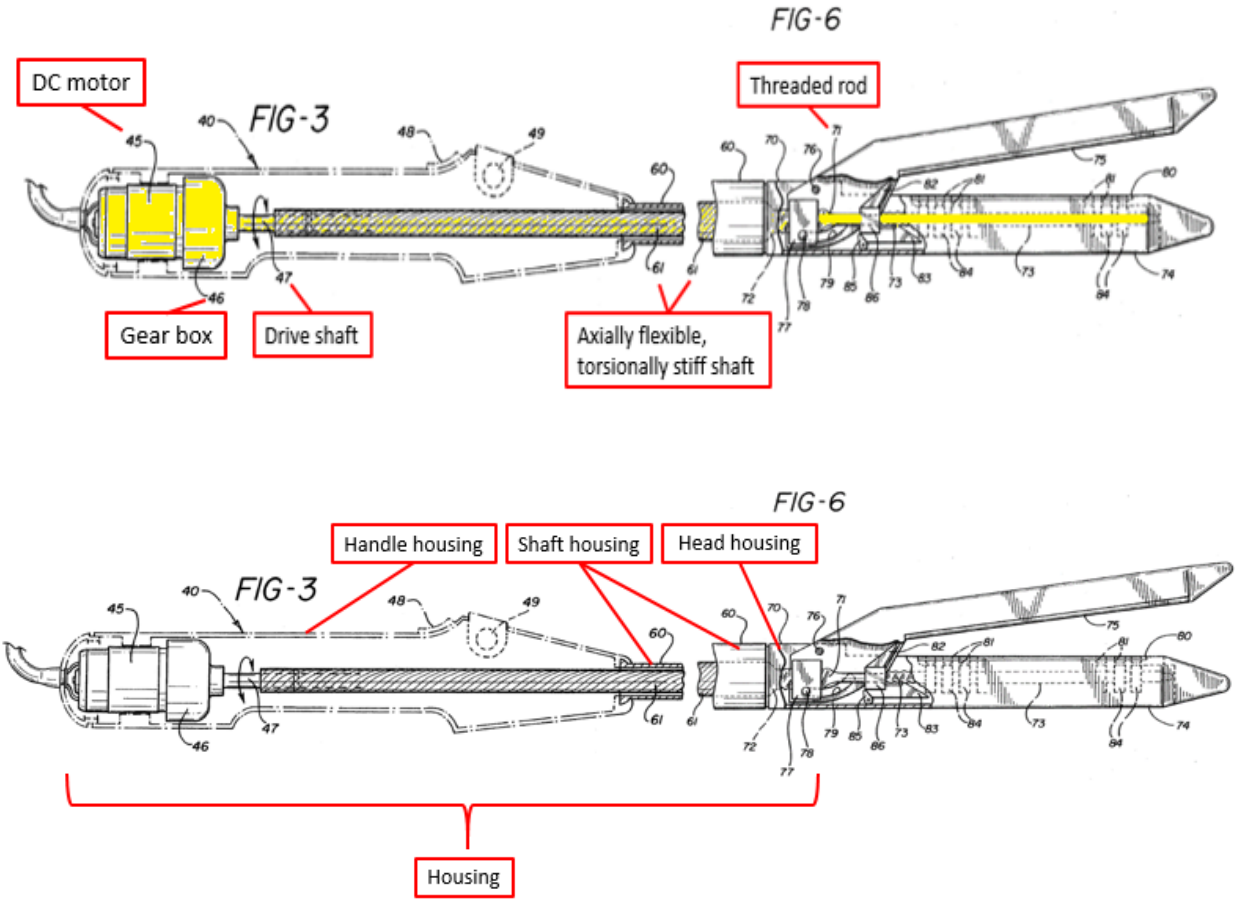


And, as shown in the images of Figures 3 and 6 of Hooven above and below, it is at least partially supported within the housing (*i.e.*, the combination of the housing of handle portion 40, shaft housing 60, and the housing 70 of the head) of Hooven's disposable loading unit (*i.e.*, instrument 30). *Id.*



[1.6] a motor supported within said housing and operably interfacing with said rotary drive to selectively apply a rotary motion thereto, wherein said motor is configured to receive power from a power source such that said motor can only selectively receive power from said power source when said means for removably attaching said housing to the surgical instrument is operably coupled to the surgical instrument

See Ground 1, element [6.6.3]. As shown below in the images of Figures 3 and 6 of Hooven, Hooven discloses a motor (*i.e.*, DC motor 45) supported within the housing (*i.e.*, the combination of the housing of handle portion 40, shaft housing 60, and the housing 70 of the head) of the disposable loading unit (*i.e.*, instrument 30). *Id.*; IS1003, ¶ 275.



Furthermore, in the proposed combination of Hooven's disposable loading unit (*i.e.*, instrument 30) with Heinrich's surgical instrument (*i.e.*, the combination of actuation assembly 612, monitor 614, and robot 616), Hooven's motor 45, which is in handle 40, would be configured to receive power from Heinrich's surgical instrument, which includes a power source. IS1003, ¶ 276; IS1004, Fig. 3; IS1005, ¶ 134 ("[A]n electrical connection 633 (*see* FIG. 8) [is] provided between slots 635 and protrusions 638 in order to provide power to electro-mechanical assembly 619."); *see also* IS1004, Fig. 3 (showing no power source in instrument

30); IS1005, ¶ 131 ("the power and control systems [of the surgical instrument] can be integrated or interfaced with the robotic surgical system"), Fig. 8 (showing no power source in loading unit 618). Because the housing of Hooven's instrument 30 (*i.e.*, the housing of handle portion 40) would be detachable from Heinrich's surgical instrument system (*i.e.*, the robot 616 portion of the surgical instrument system), Hooven's motor 45 could only selectively receive power from the power source when the means for removably attaching the housing of handle portion 40 to robot 616 (*i.e.*, protrusions 638) is operably coupled to robot 616. IS1003, ¶ 276.

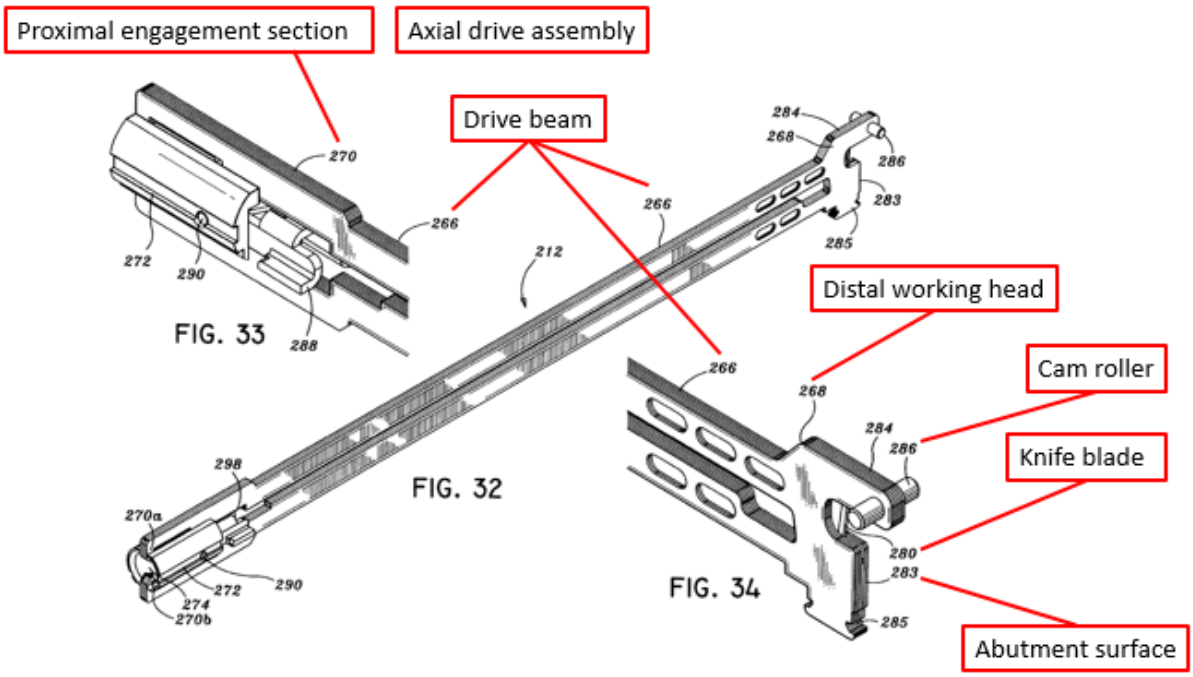
[1.7] a linear member coupled with said rotary drive which moves axially upon the application of a rotary motion thereto from said motor

"Linear member"

Hooven discloses this limitation. *See* Ground 1, element [6.6.2]. Hooven discloses a linear member (*i.e.*, the combination of Hooven's firing nut 86 with knife 82 and/or wedge 83). IS1003, ¶ 277; *see also* Ground 1, element [6.6.2] (Hooven's translatable drive member, which includes the linear knife 82 and wedge 83 structures, is a linear member).

If the combination of Hooven's firing nut 86 with knife 82 and/or wedge 83 is deemed not to be a linear member, then it would have been obvious in view of Heinrich to add a linear member connecting Hooven's firing nut 86 to Hooven's knife 82 and wedge 83. IS1003, ¶ 278. Heinrich, by incorporating Milliman's

"detailed explanation of the operation of surgical stapler 300," discloses "axial drive assembly 212," which is a linear member. IS1003, ¶ 279; IS1005, ¶ 99 (incorporating Milliman by reference); IS1006, 12:40-67. Figs. 32-34 of Milliman show axial drive assembly 212.



As shown above, "axial drive assembly 212 includes an elongated drive beam 266 including a distal working head 268 and a proximal engagement section 270." IS1006, 12:40-67. "The distal end of drive beam 266 is defined by a vertical support strut 278 which supports a knife blade 280, and an abutment surface 283 which engages the central portion of actuation sled 234 during a stapling procedure." *Id.*; *see also* Figs. 2, 5. And a "retention flange 284 projects distally from vertical strut 278 and supports a cylindrical cam roller 286 at its distal

end." IS1006, 12:40-67. Thus, combining Hooven's firing nut 86, knife 82, and wedge 83 with Milliman's axial drive assembly 212, which Heinrich incorporates by reference, would have produced a structure that is essentially identical to the '677 patent's axial drive assembly 212 and actuation sled 234, which are coupled to drive screw 600 by drive nut 610. IS1003, ¶ 280; *see also* IS1001, Fig. 2.

A POSITA would have been motivated to add Milliman's axial drive assembly 212 to Hooven's firing nut 86, knife 82, and wedge 83 for several reasons. IS1003, ¶¶ 281-83. First, Heinrich teaches "detecting the status of staple firing by measuring the position of the assembly member responsible for pushing the staples out of the cartridge . . . or an associated member [(*e.g.*, axial drive assembly 212) . . . to determine whether the staples have been fired or not." IS1005, ¶ 141. Thus, a POSITA would have been motivated to add Heinrich's axial drive assembly 212 to Hooven's firing nut 86 such that the "robotic system 600 can accept the information from loading unit 718 and respond accordingly, for example, by either altering performance, making adjustments, notifying the user, modifying or stopping operation or any combination thereof." *Id*.; IS1003, ¶ 281. Second, the proposed modification would keep the drive screw out of the staple cartridge and therefore away from fluid and debris during a surgical procedure. IS1003, ¶ 281. Third, removing the drive screw from the staple cartridge would have also made it easier to replace the staple cartridge. *Id*. And, finally, adding a

drive beam with a camming bar or cam roller, like Heinrich's drive beam, would help "maintain anvil closure during a stapling procedure" because it translates with the knife to oppose the forces associated with clamping and stapling and to maintain a uniform gap between the anvil and the staple cartridge during stapling. *Id*.; IS1010, 7:4-8.

Furthermore, when "there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp." *KSR*, 550 U.S. at 421. Here, the prior art (*e.g*., Heinrich and Alesi) includes at least two other surgical staplers that use a drive beam (*i.e*., a linear member) coupled with a motor-powered rotary drive shaft. IS1004; IS1010; IS1003, ¶ 282; Ground 2. Thus, a POSITA would have recognized that drive beams are an effective and efficient way to keep Hooven's drive screw away from fluid and debris during a surgical procedure, to make it easier to replace Hooven's staple cartridges, and to maintain closure of Hooven's anvil during a stapling procedure. IS1003, ¶ 282. Thus, a POSITA would have been motivated to combine the teachings of these references. *Id*.

It was also an obvious design choice. IS1003, ¶ 283. As demonstrated by Heinrich and Alesi, drive beams were used in similar devices (*i.e.*, disposable motor-powered surgical staplers). *Id*.; IS1010, Fig. 4; Ground 2. A POSITA could have easily used a drive beam with Hooven's firing nut 86. *Id*. And, in

combination, each element performs the same function as it does separately. *Id*.

"Coupled with said rotary drive"

Hooven discloses this limitation. IS1003, ¶ 290. Hooven's linear member (*i.e*., the combination of firing nut 86 with knife 82 and/or wedge 83) is coupled with the rotary drive (*i.e*., the combination of Hooven's shaft 47, shaft 61, and threaded rod 71). *Id*.; IS1004, Figs. 3, 6. Similarly, if Heinrich's axial drive assembly 212 was added to Hooven's firing nut 86 as described above, then the resulting structure would still be coupled with Hooven's rotary drive by firing nut 86. IS1003, ¶ 290.

"Moves axially upon the application of a rotary motion thereto from said motor"

Hooven discloses this limitation. IS1003, ¶ 291. Hooven's linear member (*i.e*., the combination of firing nut 86 with knife 82 and/or wedge 83) moves axially (*i.e*., along the axis of threaded rod 71) upon application of a rotary motion (*i.e*., the rotation of threaded rod 71) thereto from the motor (*i.e*., DC motor 45). IS1004, 6:12-15 ("Mounted on [threaded rod 71], to move along the rod as the rod rotates, is a knife member 82 and a driving wedge member 83 which are inner-connected."); *see also* 6:30-34 ("[T]he firing nut 86 on which the knife 82 and wedges 83 are disposed is moved forward and engages the threads of the smaller diameter portion 73 of the threaded rod [71] to move forward along the rod and

drive the staples 81 and cut tissue."). Similarly, if Heinrich's axial drive assembly 212 was added to Hooven's firing nut 86 as described above, then the resulting structure would also move axially upon the application of a rotary motion thereto from the motor due to the threaded engage of Hooven's firing nut 86 with threaded rod 71. IS1003, ¶ 291.

[2] The disposable loading unit of claim 1, wherein said cartridge assembly comprises a plurality of staples removably stored therein.

See Ground 1, claim [7].

[3] The disposable loading unit of claim 2, wherein said linear member comprises a sled movable between a start position and an end position to eject said staples from said cartridge assembly

Hooven discloses this limitation. *See* Ground 1, claim [8], element [1.7]. If Hooven is deemed to not disclose this limitation, then it is obvious over the combination of Hooven's firing nut 86, knife 82, and wedge 83 with Heinrich's axial drive assembly 212. *Id*.

[4] The disposable loading unit of claim 3, wherein said linear member further comprises a knife configured to incise tissue captured between said anvil and said cartridge assembly

Hooven discloses this limitation. *See* Ground 1, claim [9], element [1.7]. If Hooven is deemed to not disclose this limitation, then it is obvious over the combination of Hooven's firing nut 86, knife 82, and wedge 83 with Heinrich's axial drive assembly 212. *Id*.

[5] The disposable loading unit of claim 1, wherein said cartridge assembly is configured to be removed from said carrier and replaced with a different cartridge assembly

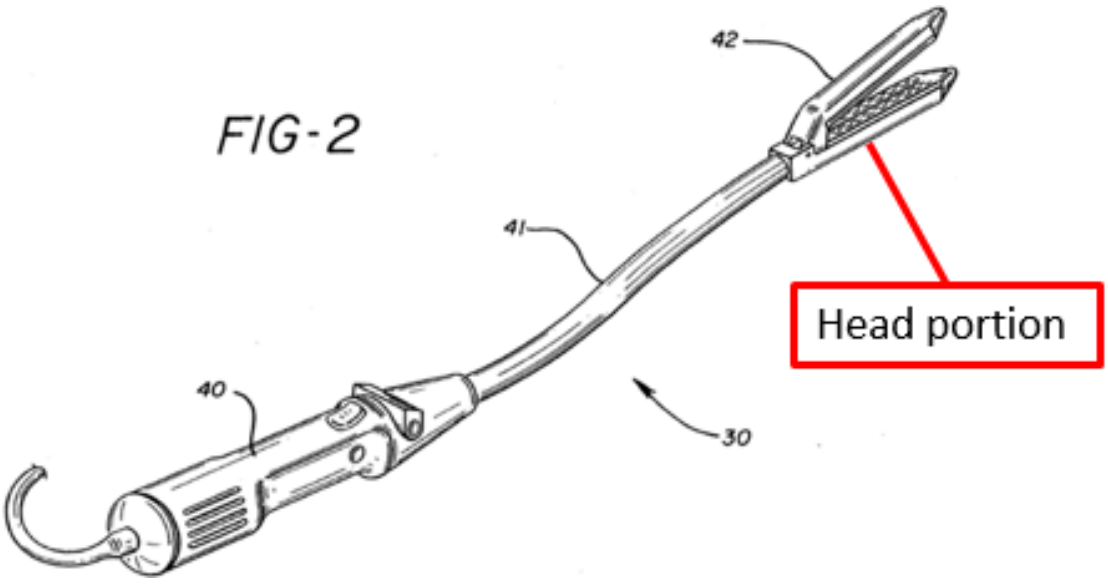
See Ground 1, claim [10].

[16.1] A loading unit configured to be operably attached to a surgical instrument which is configured to selectively generate at least one control motion for the operation of said loading unit, said loading unit comprising

See Ground 1, element [1.1].

[16.2] an end effector

Hooven discloses the limitation. IS1003, ¶ 328. The desired head or business portion 42 of Hooven's instrument is an end effector. *Id.*; IS1004, Fig. 2.



[16.3] a housing including means for removably attaching said housing to the surgical instrument

See Ground 1, elements [1.4], [6.5].

[16.4] a rotary drive at least partially supported within said housing

See Ground 1, element [1.5].

[16.5] a motor supported within said housing and operably interfacing with said rotary drive to selectively apply a rotary motion thereto, wherein said motor is configured to receive power from a power source such that said motor can only selectively receive power from said power source when said means for removably attaching said housing to the surgical instrument is operably coupled to the surgical instrument

See Ground 1, element [1.6].

[16.6] a linear member coupled with said rotary drive which moves axially upon the application of a rotary motion thereto from said motor.

See Ground 1, element [1.7].

B. Ground 2: Claims 1-5 and 16 are obvious over Hooven in view of Heinrich and further in view of Milliman

As discussed above, claims 1-5 and 16 of the '677 patent are obvious over Hooven in view of Heinrich. If Heinrich is deemed not to disclose the Milliman subject matter incorporated by reference, it would have been obvious to combine Heinrich and Milliman to arrive at the same subject matter. IS1003, ¶ 268, n. 3; *see also* ¶¶ 99-101 (discussing the same issue for the '058 patent).

A POSITA implementing the embodiments of Heinrich wherein disposable loading unit 316 of surgical stapler 300 interfaces directly with robotic surgical system 600 would have been motivated to combine Heinrich with Milliman for at least two reasons. IS1003, ¶¶ 100, 268, n. 3. First, if Heinrich's incorporation of Milliman by reference is insufficient, then Heinrich does not disclose the internal structure of disposable loading unit 316 and a POSITA would have needed to find a reference describing it or something similar to implement Heinrich's invention.

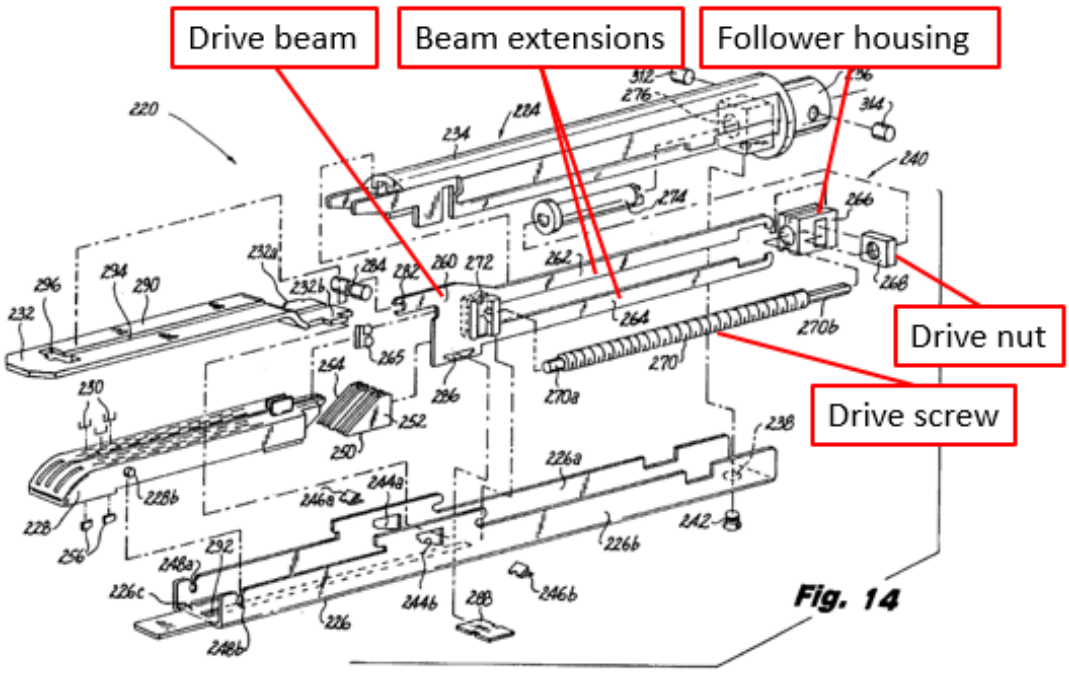
Id. Accordingly, that POSITA would naturally have turned to a reference such as Milliman, which teaches how to design and construct the loading unit's internal structure. *Id*.; IS1005, ¶¶ 92-99. Second, Heinrich conveniently and explicitly directs a POSITA to Milliman for its "detailed explanation of the operation of surgical stapler 300." IS1003, ¶¶ 100, 268, n. 3; IS1005, ¶ 99. It is difficult to imagine a stronger suggestion to combine the teachings of two references.

C. Ground 3: Claims 1-5 and 16 are obvious over Hooven in view of Heinrich and further in view of Alesi

As discussed above, claims 1-5 and 16 of the '677 patent were obvious over Hooven in view of Heinrich and, if necessary, further in view of Milliman. *See* Grounds 1, 2. If Hooven is deemed not to disclose the "linear member coupled with said rotary drive which moves axially upon the application of a rotary motion thereto from said motor" recited in element [1.7], and this element is deemed to be not obvious over Hooven in view of Heinrich and, if necessary, Milliman, then it would have been obvious in view of Alesi to add a linear member connecting Hooven's firing nut 86 to knife 82 and wedge 83. IS1003, ¶¶ 286-89.

As shown below, Alesi discloses a linear member (*i.e*., actuation beam 260, which "has a pair of parallel elongate beam extensions 262 and 264 the proximal ends of which are mounted to a follower housing 266. Follower housing 266 supports a drive nut 268 which is threadably associated with axial drive screw 270 . . . in such a manner so that axial rotation of drive screw 270 causes the

longitudinal translation thereof." IS1010, 10:25-32; *see also* 6:55-64, Fig. 4 (describing camming beam 100).



IS1010, Fig. 14. Thus, combining Hooven's firing nut 86, knife 82, and wedge 83 with Alesi's actuation beam 260 produces a structure that is nearly identical to the corresponding structure disclosed in the '677 patent (*i.e.*, drive beam 266 coupled to drive screw 600 by drive nut 610). IS1003, ¶ 288; *see also* IS1001, Fig. 5.

A POSITA would have been motivated to add Alesi's actuation beam 260 to Hooven's firing nut 86, knife 82, and wedge 83 for the same reasons they would have been motivated to add Milliman's axial drive assembly 212. IS1003, ¶ 289; Ground 1, element [1.7]. And the resulting structure would meet element [1.7] for the same reasons the combination of Milliman's axial drive assembly 212 with Hooven's firing nut 86, knife 82, and wedge 83 meets element [1.7]. *Id.*

IX. CONCLUSION

Claims 1-18 of the '677 patent are invalid pursuant to Grounds 1-3 set forth above. Accordingly, Petitioner requests *Inter Partes* Review of these challenged claims.

Respectfully submitted,

Dated: May 22, 2018

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(Trial No. IPR2018-00935)

CERTIFICATION UNDER 37 C.F.R. § 42.24

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 12,715 words, which is less than the 14,000 allowed under 37 C.F.R. § 42.24.

Respectfully submitted,

Dated: May 22, 2018

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on May 22, 2018, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

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