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Paper 7
Entered: April 20, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTUITIVE SURGICAL, INC.,
Petitioner,

v.

P TECH, LLC,
Patent Owner.

IPR2020-01687
Patent 10,368,953 B2

Before SHERIDAN K. SNEDDEN, MICHELLE N. WORMMEESTER, and CYNTHIA M. HARDMAN, *Administrative Patent Judges.*

HARDMAN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Intuitive Surgical, Inc. ("Petitioner") filed a Petition requesting *inter partes* review of claims 1–4, 6–20, 22–25, 27, 29, and 30 of U.S. Patent No. 10,368,953 B2 ("the '953 patent," Ex. 1001). Paper 2 ("Pet."), 1. P Tech, LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp.").

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute *inter partes* review. We may institute only if the Petition and Preliminary Response "show[] that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). On this record, we determine that Petitioner has met this standard.

A. Real Parties in Interest

Petitioner and Patent Owner each identify themselves as the sole real parties in interest. Pet. 1; Paper 4, 2.

B. Related Matters

The '953 patent is asserted in *P Tech LLC v. Intuitive Surgical, Inc.*, 1:19-cv-00525-RGA (D. Del.) (the "Delaware litigation"), which Petitioner indicates is stayed. Pet. 1–2; Paper 4, 2.

Petitioner has also filed petitions for *inter partes* review of related U.S. Patent Nos. 9,149,281 and 9,192,395. Pet. 2; Paper 4, 2; *see also* IPR2020-00650; IPR2020-00649.

C. The '953 Patent

The '953 patent is generally directed to a robotic surgical system and its use in a "method of securing either hard or soft body tissue." Ex. 1001, 1:41–42. Figure 1, reproduced below, illustrates the robotic system:

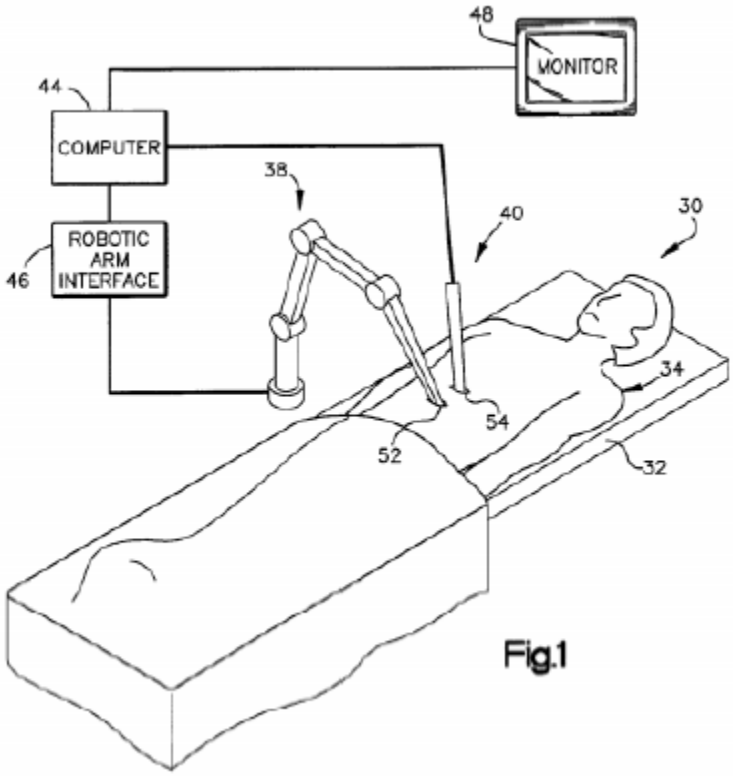
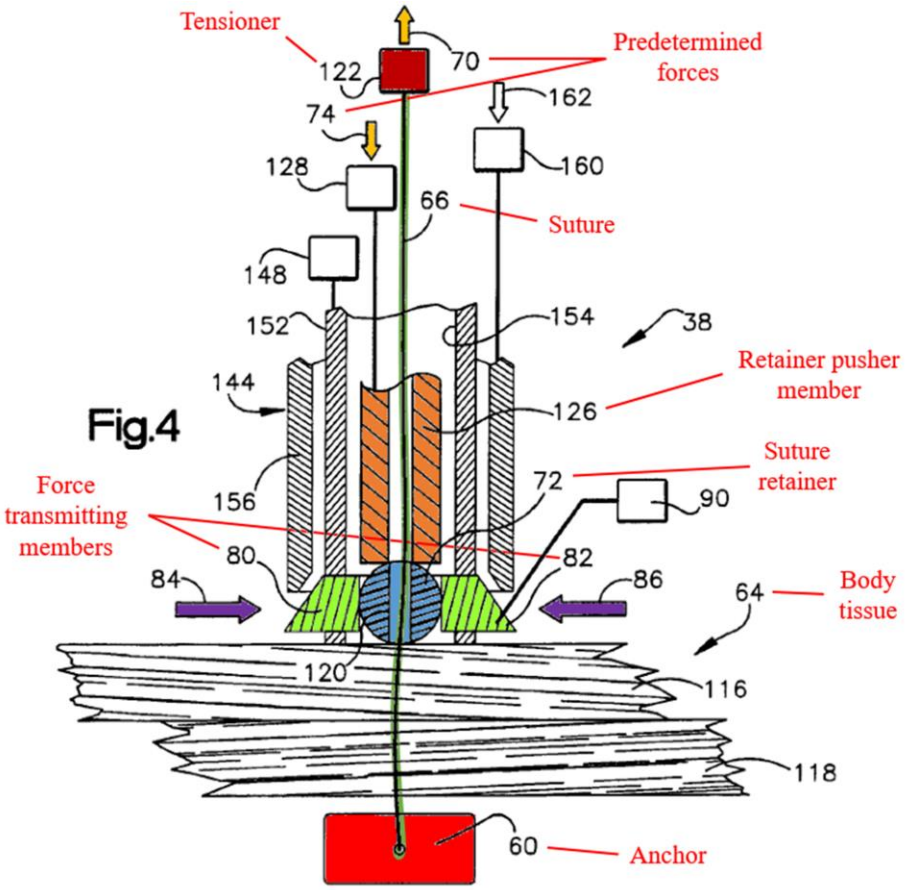


Figure 1 above depicts a robotic mechanism 38 used to position a fastener (e.g., a suture, staple, screw, etc.) relative to body tissue at a desired location within patient 34. *Id.* at 1:44–45, 5:11–14, 5:57–58. Robotic mechanism 38 includes one or more adaptive arms, and is guided by automatic controls including computer 44 and robotic arm interface 46. *Id.* at 5:25–27.

In one embodiment, the robotic surgical system fastens body tissue using a suture. Ex. 1001, 865–67. Petitioner's annotated version of Figure 4 (Pet. 6) is reproduced below:



Annotated Figure 4, above, is a schematic illustration depicting a suture assembly for use with the robotic system. *Id.* at 2:56–60. Petitioner's annotations highlight the various components of the suture assembly, including anchor 60, suture retainer 72, retainer pusher member 126, suture 66, tensioner 122, and force transmitting members 80, 82. Once robotic mechanism 38 moves anchor 60 into position (e.g., underneath two layers of body tissue 116, 118 as depicted in Figure 4), tensioner 122 grips suture 66 and tensions it (e.g., in the upward direction illustrated by arrow 70), with a predetermined force. *Id.* at 11:10–19, 11:30–31. "While the suture 66 is

tensioned . . . , a retainer pusher member 126 is pressed against the retainer 72 with a predetermined force [74]," which "presses the retainer 72 against the upper layer 116 of body tissue 64."[1] *Id.* at 11:47–56. This "results in the two layers 116 and 118 of body tissue being clamped between the suture [anchor] 60 and retainer 72 with a predetermined force." *Id.* at 11:65–67. While the tissue is clamped, robotic mechanism 38 operates to plastically deform retainer 72 to grip suture 66. *Id.* at 12:24–37. In particular, "force transmitting members 80 and 82" of robotic mechanism 38 press "radially inward against the suture retainer 72," causing "the material of the suture retainer 72 to move into engagement with and grip the suture 66." *Id.* at 12:45–13:6.

D. Illustrative Claim

Of the challenged claims, claims 1 and 6 are independent. Claim 1, reproduced below with bracketed numbering added, is illustrative:

> 1. [1.1] A method of fastening at least first and second portions of body tissue together, the method comprising:
>
> [1.2] imparting, using an adaptive arm of a robotic mechanism, a clamping force to the first and second portions of body tissue suitable to press the first and second portions against one another;
>
> [1.3] generating, using a force measurement system associated with the adaptive arm, a clamping force signal indicative of the clamping force imparted by the adaptive arm to the first and second portions of body tissue;
>
> [1.4] receiving, using a computer in communication with the force measurement system and the robotic mechanism, the clamping force signal from the force measurement system;
>
> [1.5] determining, using the computer and the received clamping

[1] Throughout this Decision, we omit bolding of reference numbers in quotes from the '953 patent and prior art patents.

> force signal, that the clamping force imparted by the adaptive arm to the first and second portions of body tissue has a predetermined magnitude; and
>
> [1.6] fastening, after said determining and simultaneously with the clamping force imparted by the adaptive arm to the first and second portions of body tissue having the predetermined magnitude, the first and second portions of body tissue together using the adaptive arm.

Ex. 1001, 45:43–65.[2]

E. Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability (Pet. 3):

Claim(s) Challenged	**35 U.S.C. §**	**References**
1, 2, 4, 6, 8–20, 22–25, 27, 29, 30	103[3]	Bonutti,[4] Tierney[5]
1, 2, 4, 6, 8–20, 22–25, 27, 29, 30	103	Bonutti, Tierney, Cooper,[6] Madhani[7]

[2] To identify claim 1's limitations, we adopt the same bracketed numbering used in the Petition. *See* Pet. 20–42.

[3] Petitioner contends that the America Invents Act ("AIA") applies to the '953 patent, but notes that the cited references are prior art under both the AIA and pre-AIA statutes. Pet. 3 n.1. At this stage of the proceeding, Patent Owner does not dispute these contentions. On this record, we agree with Petitioner that the asserted prior art references qualify as prior art to the challenged claims under both the AIA and pre-AIA statutes.

[4] US 6,159,234, issued December 12, 2000 (Ex. 1004).

[5] US 6,331,181 B1, issued December 18, 2001 (Ex. 1005).

[6] WO 98/25666, published June 18, 1998 (Ex. 1007).

[7] US 5,792,135, issued August 11, 1998 (Ex. 1013). Although Petitioner's summary of its grounds does not mention Madhani as part of Ground 3, the Petition later explains that Madhani is part of this challenge. *Compare* Pet. 3, *with* Pet. 78.

Claim(s) Challenged	35 U.S.C. §	References
24	103	Bonutti, Tierney, Bonutti-986[8]
1–4, 6–8, 24	103	Hooven,[9] Tierney

Petitioner also relies on the Declaration of Dr. Gregory Fischer (Ex. 1003, hereinafter "Fischer Decl.").

II. ANALYSIS

A. Legal Principles

A patent may not be obtained "if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains." 35 U.S.C. § 103 (2012). An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, and failure of others.[10] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18, 35–36 (1966). An obviousness determination requires finding "a motivation to combine accompanied by a reasonable expectation

[8] US 5,921,986, issued July 13, 1999 (Ex. 1008).

[9] US 5,518,163, issued May 21, 1996 (Ex. 1006).

[10] At this stage of the proceeding, neither party has pointed us to any evidence of objective indicia.

of achieving what is claimed in the patent-at-issue." *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include the type of problems encountered in the art and prior art solutions to those problems. *See Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). The prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

> Patent Owner proposes that a person of ordinary skill in the art would have had the equivalent of a Bachelor's degree or higher in mechanical engineering, electrical engineering, biomedical engineering, or a related field directed towards medical electro-mechanical systems and at least 3 years of experience working with robotic surgical instruments. Experience with robotic surgical instruments could take the place of formal training, as relevant skills may be learned on the job or through practical experience. Alternatively, a higher level of education might make up for less experience.

Prelim. Resp. 25. Dr. Fischer provides a similar proposal, except he indicates that the person of ordinary skill would have had experience in the research and development of "surgical instruments," whereas Patent Owner's proposal is more narrowly focused on "robotic surgical instruments." Fischer Decl. ¶ 32.

Based on the current record, including our review of the '953 patent and the types of problems and solutions described in the '953 patent and cited prior art, we adopt Patent Owner's proposal for purposes of this Decision.[11]

[11] Should the parties contend that the differences between Patent Owner's and Petitioner's proposals on level of ordinary skill in the art affect the obviousness

C. Claim Construction

In an *inter partes* review, we construe a patent claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2019); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

Petitioner argues that the limitations in independent claims 1 and 6 that recite "determining, using a computer"[12] "encompass mental steps that are not entitled to patentable weight," because they "do not exclude the situation where the surgeon, using the computer to display a force readout, performs the 'determining' step." Pet. 9 (citing *In re Venner*, 262 F.2d 91, 95 (CCPA 1958) ("Patentability cannot be predicated upon a mental step."); *Genetic Techs. Ltd. v. Merial L.L.C.*, 818 F.3d 1369, 1378 (Fed. Cir. 2016) (mental step of "detect[ing] the allele" did not supply inventive concept necessary for patent eligibility under § 101); Ex. 1001, 11:20–29). Patent Owner responds that "[t]he plain language of these [claim] steps makes clear that it is the computer that performs the 'determining'." Prelim. Resp. 26.

It is not necessary for us to decide whether the "determining" limitations are entitled to patentable weight, because we find that Petitioner adequately demonstrates where the cited prior art discloses these

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analysis, during trial they should explicitly address the impact of the differences.

[12] The full limitation in claim 1 states: "determining, using the computer and the received clamping force signal, that the clamping force imparted by the adaptive arm to the first and second portions of body tissue has a predetermined magnitude." Ex. 1001, 45:57–60. The full limitation in claim 6 states: "determining, using the computer and the received fastening signal, that the first and second portions of body tissue are suitable for being fastened to one another." *Id.* at 46:29–32.

limitations.[13] *See infra* Sections II.D.3(e), II.G.2(e); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).[14]

D. Alleged Obviousness Over Bonutti and Tierney

Petitioner contends that claims 1, 2, 4, 6, 8–20, 22–25, 27, 29, and 30 are unpatentable as obvious over the combination of Bonutti (which teaches a handheld suture securing tool) and Tierney (which teaches a robotic surgical system). Pet. 20–59. At this stage, Patent Owner's arguments focus on a lack of motivation to combine and lack of reasonable expectation of success.[15] For the reasons explained below, on this record we find that

[13] If the parties continue to dispute whether the "determining" limitations are entitled to patentable weight, they should specifically discuss case law that accords mental steps no patentable weight in the obviousness context (as opposed to the § 101 context).

[14] Petitioner also states that although the '953 patent purportedly does not disclose any stapler embodiment that practices the "determining" or "fastening" limitations of the challenged claims, it nevertheless construes these limitations to cover both suture and stapler embodiments, based on Patent Owner's apparent understanding of the claims in the Delaware litigation. Pet. 9–11. Patent Owner disputes that the '953 patent lacks disclosure of a stapler embodiment that practices these limitations. Prelim. Resp. 27–28. Because Petitioner does not request any particular construction of the "determining" or "fastening" limitations based on its contentions, on this record, we do not need to address Petitioner's arguments.

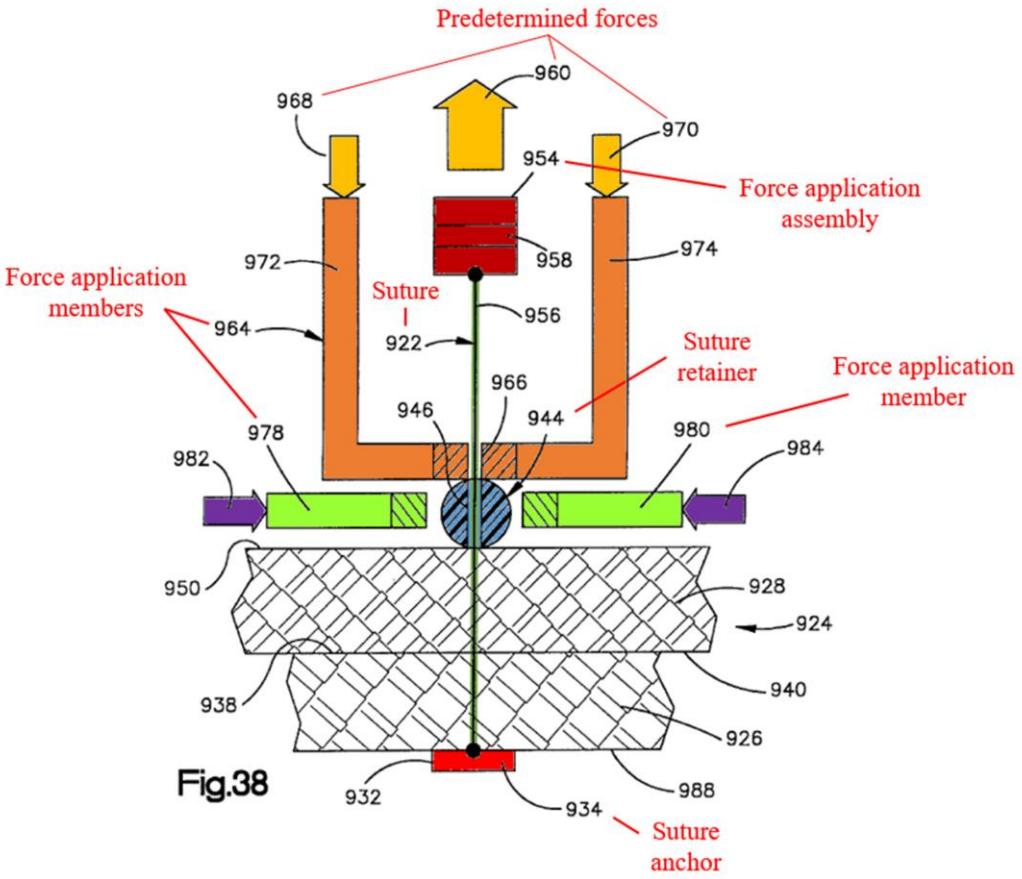
[15] Patent Owner also argues that Tierney does not disclose several claim limitations. Prelim. Resp. 29. These arguments do not undermine Petitioner's persuasive showing, because Petitioner relies on *combinations* of references that include Tierney—not Tierney alone—to disclose these limitations. *See, e.g.*, Pet. 20–81. The test for obviousness is not whether the claimed invention is expressly suggested in any one or all of the references, but whether the claimed subject matter would have been obvious to those of ordinary skill in the art in light of the

Petitioner establishes a reasonable likelihood that it would prevail in showing that Bonutti and Tierney would have rendered claims 1, 2, 4, 6, 8–20, 22–25, 27, 29, and 30 obvious.

We begin by summarizing Bonutti and Tierney, then turn to the parties' arguments.

1. Bonutti (Ex. 1004)

Bonutti discloses a system for securing body tissue using a suture and suture retainer, as illustrated in Petitioner's annotated version of Bonutti Figure 38, reproduced below:



combined teachings of those references. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

As shown in the annotated version of Figure 38 above, Bonutti's suture securing system comprises "force application assembly 954," which applies "predetermined" force 960 on suture 922, causing it to become "tensioned" and pull up on suture anchor 934. Pet. 12; Ex. 1004, 41:41–53, 42:19–23, 42:42–45. The system further comprises "force application member 964," which applies "predetermined" forces 968 and 970 to the top of suture retainer 944 so that it "press[es] . . . directly against the outer layer 928 of body tissue." Ex. 1004, 41:58–59, 42:1–11, 42:33–39. "[W]hile the suture retainer 944 is being pressed against the outer layer 928 of body tissue 924 under the combined forces 968 and 970 and while the suture 922 is being tensioned by the force 960, a pair of force application members 978 and 980 are pressed against opposite sides of the suture retainer 944." *Id.* at 42:51–56. "The force applied against the suture retainer 944 by the force application members 978 and 980 plastically deforms the material of the suture retainer" to grip the suture. *Id.* at 42:56–59, 1:46–47. "The plastic deformation of the material of the suture retainer may be performed while transmitting a predetermined force from the suture retainer to the body tissue." *Id.* at 1:50–53.

2. Tierney (Ex. 1005)

Tierney relates to a robotic surgical system for minimally invasive and other robotically enhanced surgical procedures. Ex. 1005, 1:12–15. The system comprises multiple robotic arms, which support surgical tools such as jaws, scissors, graspers, needle holders, staple appliers, tackers, cutting blades, and irrigators. *Id.* at 6:20–28.

Petitioner's annotated version of Tierney Figure 1 is reproduced below:

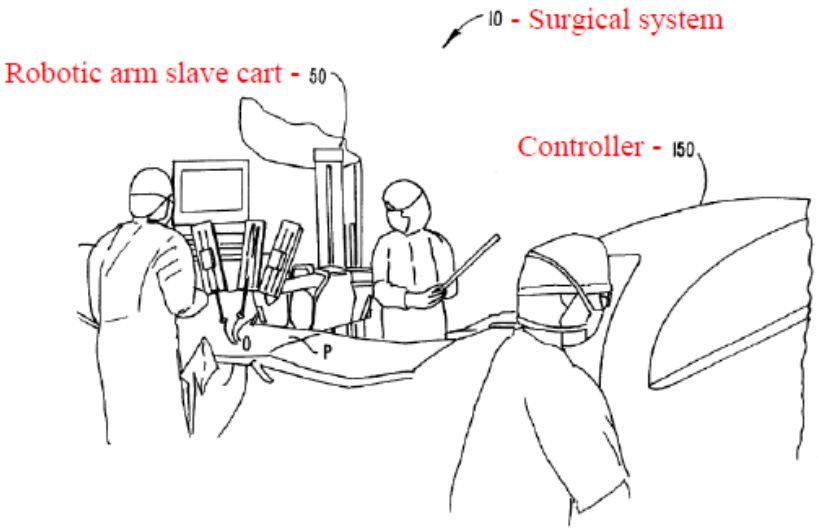


FIG. 1.

Petitioner's annotated version of Tierney Figure 1, above, shows a surgical system 10 comprising controller 150, which controls robotic arms on cart 50. Pet. 14; Ex. 1005, 6:61–63. In this system,

> controller 150 generally includes master controllers (not shown) which are grasped by the surgeon and manipulated in space while the surgeon views the procedure . . . [on] a stereo display. The master controllers are manual input devices which preferably move with six degrees of freedom, and which often further have an actuatable handle for actuating tools (for example, for closing grasping saws, applying an electrical potential to an electrode, or the like).

Ex. 1005, 6:63–7:4.

Figure 2 of Tierney is reproduced below:

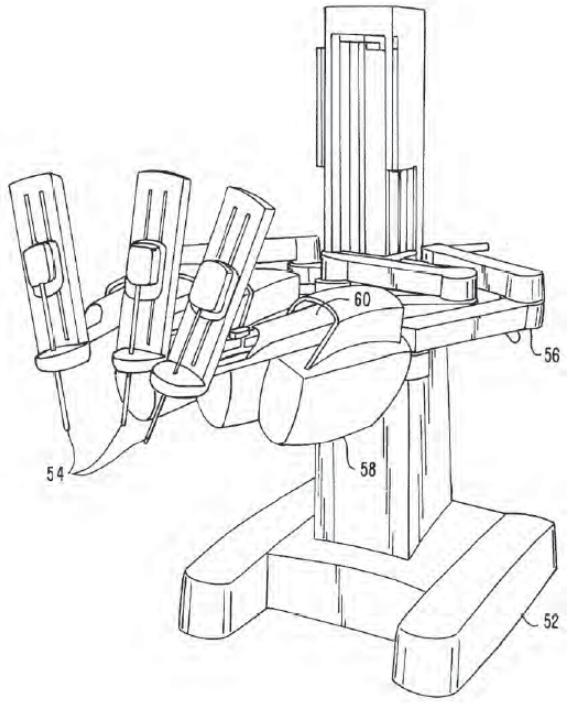


Figure 2 "is a perspective view of a robotic surgical arm cart system [50]," and "includes a base 52 from which three surgical tools 54 are supported." *Id.* at 5:29–32, 7:16–18. In the cart, "robotic manipulators 58 preferably include a linkage 62 [not shown] that constrains movement of tool 54." *Id.* at 7:41–48. Tierney further describes manipulation of the tools as follows:

> Linkage 62 . . . is driven by a series of motors 70. . . . Motors 70 are further coupled to tool 54 so as to rotate the tool about axis 66, and often to articulate a wrist at the distal end of the tool about at least one, and often two, degrees of freedom. Additionally, motors 70 can be used to actuate an articulatable end effector of the tool for grasping tissues in the jaws of a forceps or the like. Motors 70 may be coupled to at least some of the joints of tool 54 using cables, as more fully described in U.S. Pat. No. 5,792,135 [Madhani], the full disclosure of which is also incorporated herein by reference. As described in that reference, the manipulator will often include flexible members for transferring motion from the drive components to the surgical tool.

Id. at 7:63–8:10. Tierney also states that "[a] wide variety of alternative drive systems might be employed, including alternative cabling arrangements, drive chains or belts, hydraulic drive systems, gear trains, or the like." *Id.* at 9:31–34.

Tierney teaches that "a wide variety of alternative end effectors for differing tool-types may be provided," such that "the tools of the present invention may incorporate any of the illustrated end effectors, or any other end effector which is useful for surgery, particularly at an internal surgical site." *Id.* at 10:5–11. For example, the tool "will often comprise a surgical instrument suitable for manipulating tissue," and can be "articulated (such as jaws, scissors, graspers, needle holders, microdissectors, staple appliers, tackers, suction/irrigation tools, clip appliers, or the like) or non-articulated (such as cutting blades, cautery probes, irrigators, catheters, suction orifices, or the like)." *Id.* at 3:18–20; 6:22–28.

Tierney incorporates Cooper by reference. *Id.* at 1:60–2:11. Cooper relates to a robotic surgical system that includes force and torque feedback sensors, and a safety controller that can freeze all robot motion if excessive force is exerted on the patient. Ex. 1007, 1:17–21, 9:22–26, 16:38–17:3.[16]

3. Analysis of Claim 1

We begin by analyzing Petitioner's arguments regarding how the cited prior art combination teaches each limitation of claim 1, then turn to the parties' arguments regarding motivation to combine and reasonable expectation of success.

[16] We cite the page numbering intrinsic to Cooper, rather than the page numbering applied by Petitioner.

(a) Limitation [1.1]: A method of fastening at least first and second portions of body tissue together, the method comprising:

For purposes of institution, Petitioner sufficiently supports its position that Bonutti discloses fastening two layers of body tissue together with a suture. *See* Pet. 20–21 (citing, e.g., Ex. 1004, Fig. 38, 40:33–37).[17]

(b) Limitation [1.2]: imparting, using an adaptive arm of a robotic mechanism, a clamping force to the first and second portions of body tissue suitable to press the first and second portions against one another;

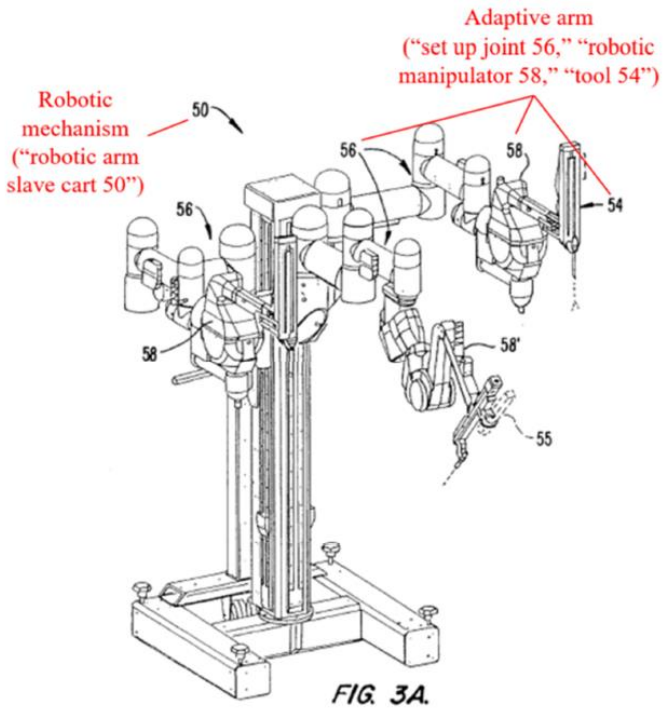
For purposes of institution, Petitioner sufficiently supports its position that Bonutti and Tierney together disclose this limitation. Pet. 21–34. For example, the annotated version of Bonutti Figure 38 reproduced above demonstrates "imparting a clamping force (combination of upward force 960 and opposing downward forces 968 and 970) to the first and second portions of body tissue suitable to press the first and second portions against one another between suture anchor 934 and suture retainer 944." *Id.* at 21; Fischer Decl. ¶ 67.

Petitioner also sufficiently shows, for purposes of institution, that a person of ordinary skill in the art would have been motivated to modify Tierney's robotic system to accommodate Bonutti's manual suture securing system.[18] *See* Pet. 22–32. For example, Petitioner's annotated version of

[17] Generally, a preamble does not limit a claim. *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 1's preamble is limiting because Petitioner sufficiently supports for purposes of institution its argument that Bonutti discloses the preamble.

[18] Following Petitioner's convention, we sometimes refer to the combination of Bonutti's suture system and Tierney's robotic system as the "Bonutti/Tierney robotic system." *See* Pet. 28. In Section II.D.3(g) below, we further discuss

Tierney Figure 3A, which exemplifies a portion of Tierney's robotic surgical system, is reproduced below:



In the annotated version of Tierney Figure 3A above, Petitioner highlights that robotic cart 50 includes an arm having a set up joint 56, robotic manipulator 58, and surgical tool 54. Pet. 24. Petitioner sufficiently shows, for purposes of institution, that these features collectively map to the "adaptive arm" recited in claim 1. Ex. 1005, 5:39–41, 7:16–20, 7:41–43; Pet. 23–24; Fischer Decl. ¶¶ 71–72.

As Petitioner notes, Tierney teaches that surgical tool 54 "may incorporate . . . any . . . end effector which is useful for surgery, particularly at an internal surgical site." Ex. 1005, 10:5–11; *see also* 6:22–28 (providing examples of articulated and non-articulated surgical tools); Pet. 24. Tierney also teaches that the mechanical linkages between Tierney's driven elements

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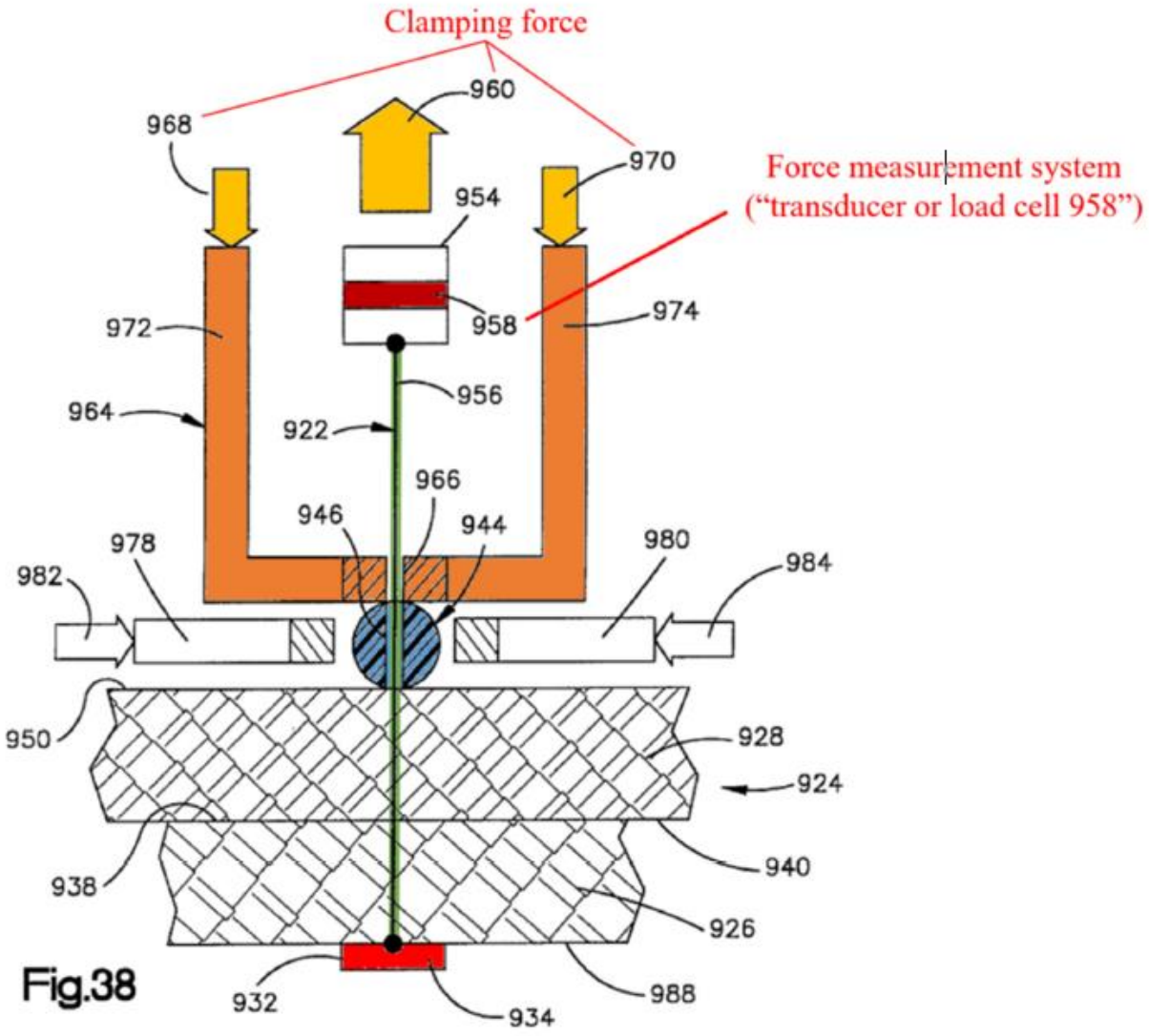
motivation to combine these systems.

and surgical tool 54 can be made via "cabling arrangements, drive chains or belts, hydraulic drive systems, gear trains, or the like." Ex. 1005, 9:31–45; *see also id.* at 8:4–7, 9:18–20 (disclosing "cables" and the drive system of Madhani, and incorporating Madhani by reference), 9:16–18, 10:13–15; Pet. 25–27. Dr. Fischer explains that in integrating Bonutti's suture system into Tierney's robotic system, a person of ordinary skill in the art would have mechanically coupled Bonutti's moving parts to Tierney's driven elements 118, which transmit torque from motors 70. Fischer Decl. ¶¶ 74–85, 103–107; *see also* Pet. 25–27. On this record, Petitioner sufficiently shows for purposes of institution that the combination would have resulted in a robotic system that "enables a surgeon to fasten at least first and second portions of body tissue (layers 926, 928) together with Bonutti-'234's suture securing assembly (including suture 922, suture anchor 934, and suture retainer 944) using an arm of Tierney's robotic system." Pet. 28; Fischer Decl. ¶ 85.

(c) Limitation [1.3]: generating, using a force measurement system associated with the adaptive arm, a clamping force signal indicative of the clamping force imparted by the adaptive arm to the first and second portions of body tissue;

Petitioner persuasively shows for purposes of institution that the "Bonutti-'234/Tierney robotic system generates, using a force measurement system (Bonutti-'234's 'transducer or load cell 958') associated with Tierney's adaptive arm, a clamping force signal ('output signal' of Bonutti-'234's transducer or load cell 958) indicative of the clamping force imparted by the adaptive arm to the first and second portions of body tissue." Pet. 34 (citing Fischer Decl. ¶ 109); *see also* Ex. 1004, 41:43–47 (indicating, in connection with Figures 37 and 38, that "[t]he force application assembly 954 includes a transducer or load cell 958 which provides an output signal

indicative of a force"). Petitioner's annotated version of Bonutti Figure 38 (different than the annotated version presented above) is reproduced below:



The annotated version of Bonutti Figure 38 above includes labels for the "force measurement system" (i.e., Bonutti's transducer or load cell 958), and "clamping force" 960, 968, 970. Fischer Decl. ¶ 110. As Dr. Fischer explains, "transducer or load cell 958 provides an output signal indicative of force 960, which applies the upward component of the clamping force and 'is contemplated' to be equal to forces 968 and 970, which apply the

downward component of the clamping force." *Id.* (citing Ex. 1004, 41:41–42:16, Fig. 38).

Dr. Fischer also explains that Tierney's robotic system can receive and process the output signal of a force measurement system like Bonutti's transducer 958, including because Tierney discloses (via incorporation of Cooper) that the drive motors preferably include sensors for transmitting force and torque feedback to the surgeon. *Id.* ¶¶ 111–13; Pet. 35–36.

> *(d) Limitation [1.4]: receiving, using a computer in communication with the force measurement system and the robotic mechanism, the clamping force signal from the force measurement system;*

For purposes of institution, Petitioner sufficiently supports its position that Tierney teaches or suggests that controller 150 would receive information about the tools attached to the robotic mechanism, including the clamping force signal from the force measurement system (i.e., Bonutti's transducer 958). Pet. 36–38; Fischer Decl. ¶¶ 115–17.

> *(e) Limitation [1.5]: determining, using the computer and the received clamping force signal, that the clamping force imparted by the adaptive arm to the first and second portions of body tissue has a predetermined magnitude; and*

Petitioner sufficiently shows for purposes of institution that Bonutti in view of Tierney discloses this limitation. Pet. 38–40. Specifically, Dr. Fischer explains that after Bonutti's suture retainer is positioned against the outer layer of body tissue, the system "increases the clamping force until it is determined, using the clamping force signal, that the clamping force is 'equal to a predetermined function of the strength of the suture 922'." Fischer Decl. ¶ 119 (quoting Ex. 1004, 42:33–39, 42:11–14, and citing *id.* at 42:28–45, 42:1–16, 41:41–53); *see also* Pet. 39–40; Fischer Decl. ¶¶ 120–25

(explaining why a person of ordinary skill in the art would have used Tierney's computer to determine whether the clamping force has a predetermined magnitude). Petitioner also sufficiently shows for purposes of institution that Tierney's controller 150 would store information about the strength of the suture, and would determine (or display the necessary information so the surgeon could determine) whether the clamping force is equal to the predetermined function. Pet. 39; Fischer Decl. ¶ 119.

> *(f) Limitation [1.6]: fastening, after said determining and simultaneously with the clamping force imparted by the adaptive arm to the first and second portions of body tissue having the predetermined magnitude, the first and second portions of body tissue together using the adaptive arm.*

For purposes of institution, Petitioner sufficiently supports its position that the Bonutti/Tierney robotic system fastens the first and second portions of body tissue together by plastically deforming the suture retainer. Pet. 40–42 (citing, e.g., Fischer Decl. ¶ 126; Ex. 1004, 42:28–59). To illustrate, reproduced below is another version of Bonutti Figure 38 annotated by Petitioner (different than the two annotated versions presented above):

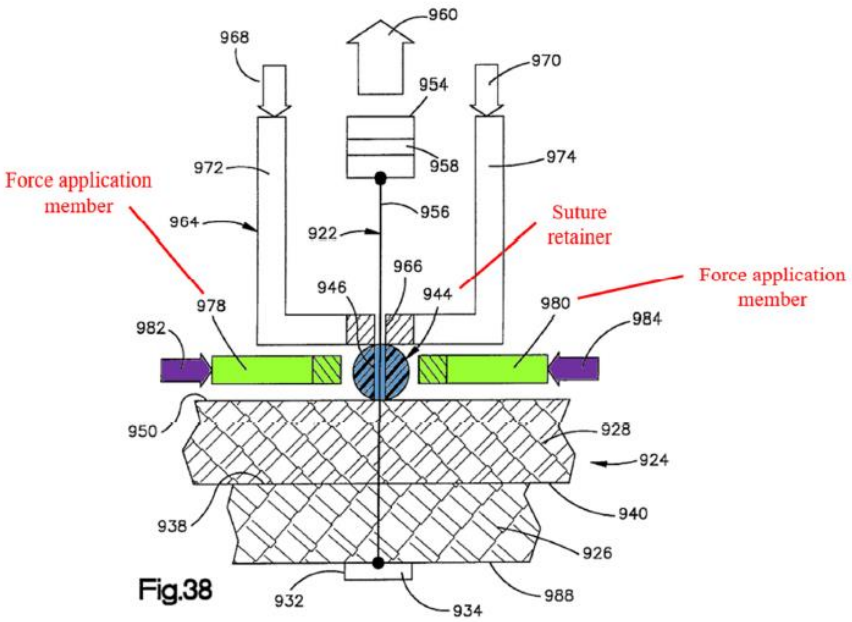


Fig.38

With reference to the annotated version of Figure 38 above, Dr. Fischer explains that a pair of force application members 978 and 980 (highlighted in green) are pressed against opposite sides of suture retainer 944 (highlighted in blue), such that "suture retainer 944 is plastically deformed to firmly grip the suture 922." Fischer Decl. ¶ 126 (quoting Ex. 1004, 42:50–51). Dr. Fischer further explains that in the Bonutti/Tierney robotic system, Bonutti's force application members 978 and 980 are integrated into Tierney's adaptive arm, such that the robotic system fastens the first and second portions of body tissue together using the adaptive arm. *Id.*

Petitioner also sufficiently shows for purposes of institution that the fastening occurs after the determining step and simultaneously with application of the clamping force having the predetermined magnitude. Pet. 41–42. Specifically, Petitioner asserts that determining whether the clamping force has a predetermined magnitude occurs before deforming suture retainer 944. *Id.* at 41 (citing Ex. 1004, 42:28–59; Ex. 1005, 15:59–16:19). "[T]he suture retainer is deformed '[w]hile the suture is tensioned'

with the predetermined clamping force so it 'maintain[s] the tension in the suture [922].'" *Id.* at 42 (quoting Ex. 1004, 2:6–10). Thus, "at the time of fastening, the adaptive arm simultaneously imparts the predetermined clamping force." *Id.*; *see also* Fischer Decl. ¶ 127.

(g) Motivation to Combine Bonutti and Tierney with a Reasonable Expectation of Success

Petitioner posits several reasons why a person of ordinary skill in the art would have been motivated to combine Bonutti's suture system with Tierney's robotic surgical system. Pet. 28–32. For example, Petitioner argues that Tierney teaches using its robotic system with "any . . . end effector which is useful for surgery," including end effectors "for suturing (i.e., 'needle drivers,' 'needle graspers,' and 'needle holders)," and that a person of ordinary skill in the art would have turned to Bonutti for details on how to implement Tierney's robotic system with a suture system. *Id.* at 28 (quoting Ex. 1005, 10:8–11, 1:30–37, 2:47–52, 6:22–28); *see also* Fischer Decl. ¶¶ 87–88. Petitioner also argues that a person of ordinary skill in the art would have known the benefits of using Tierney's robotic system, including increased accuracy and surgical dexterity. Pet. 28–30 (citing, e.g., Fischer Decl. ¶¶ 89–92; Ex. 1019, 2:16–55; Ex. 1013, 2:24–26, 2:33–38). Petitioner also argues that adaptation of handheld surgical tools like Bonutti's suture system for use with robotic systems like Tierney's was well known in the art. *Id.* at 30–31 (citing Fischer Decl. ¶¶ 93–96 (discussing prior art examples of adapting handheld tools for use with robotic surgical systems)).

Petitioner also argues that Bonutti "does not explicitly describe how to generate the forces necessary to operate its suture securing system," and Tierney discloses one of a finite number of predictable solutions, i.e., using

a robotic arm. *Id.* at 32 (citing Fischer Decl. ¶ 100). Thus, Petitioner argues that a person of ordinary skill in the art had a good reason to pursue Tierney's known option, and the resulting combination would have been the product not of innovation, but of ordinary skill and common sense. *Id.* (citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007)).

Petitioner asserts that a person of ordinary skill in the art would have reasonably expected the combination of Tierney and Bonutti to be successful, including because Tierney discloses multiple means of coupling its robotic system to Bonutti's suturing tool (e.g., "cabling arrangements, drive chains or belts, hydraulic drive systems, gear trains, or the like"). *Id.* at 32 (quoting Ex. 1005, 9:31–34); Fischer Decl. ¶¶ 101, 103. Additionally, Dr. Fischer testifies that adapting a surgical instrument like Bonutti's suture system for use with a robotic system like Tierney's was well within the level of ordinary skill in the art, and merely the application of a known technique (e.g., adapting manually controlled components for use with a robotic system) with known devices (Bonutti's suture securing system and Tierney's surgical robot), where each device in the combined system performs the same predictable function as it does separately. Fischer Decl. ¶ 102 (discussing prior art examples of converting handheld tools for robotic surgical systems); *see also* Pet. 33–34. Dr. Fischer explains that a person of ordinary skill in the art would have known how to make mechanical linkages between Tierney's driven elements and Bonutti's moveable components, e.g., by using cables and pulleys as taught in Tierney and Madhani, or by using gears.[19] Fischer Decl. ¶¶ 103–08.

[19] Patent Owner refers to Petitioner's proposed cable/pulley configuration as "Option A," and the gear configuration as "Option B." Prelim. Resp. 33–34.

On this record, we find Petitioner's rationales regarding why a person of ordinary skill in the art would have been motivated to combine Bonutti's and Tierney's teachings with a reasonable expectation of success to be reasonable and supported by the cited evidence and expert testimony. Nevertheless, Patent Owner raises several arguments regarding a lack of motivation to combine. We address each argument below.

Patent Owner argues that a person of ordinary skill in the art would not have modified Tierney's robotic system to work with Bonutti's rigid tool because the combination would "frustrate the very purpose Tierney's intricate cable and pulley system," which Patent Owner characterizes as designed to provide tools with "multiple degrees of freedom and a high degree of dexterity." Prelim. Resp. 31, 29; *see also id.* at 33 (arguing that Tierney (via its incorporation of Madhani) includes an "express contrary teaching" against utilizing rigid tools in robotic surgery). Patent Owner also argues that Bonutti's tool requires downward, pushing forces, whereas "the cable and pulley system of Tierney is designed to apply only 'pulling' forces." *Id.* at 42; *see also id.* at 49.

On this record, we find that Patent Owner's arguments do not undermine Petitioner's proposed motivation to combine. Tierney is not limited to non-rigid tools or tools that apply only "pulling forces." Rather, as Dr. Fischer explains, Tierney contemplates using its robotic system with "*any* . . . end effector which is useful for surgery," including end effectors for suturing. Fischer Decl. ¶ 87 (quoting Ex. 1005, 10:8–11) (emphasis added); Pet. 28. Although Madhani notes that tool rigidity is a disadvantage (*see* Ex. 1013, 2:16–18), Patent Owner has not pointed to a prohibition in either Tierney or Madhani regarding use of a rigid tool. We also disagree

that using a rigid tool or a tool that applies pushing forces would frustrate the purpose of Tierney because, at a minimum, Tierney is not limited to cable/pulley systems. Tierney teaches other drive systems for moving end effectors, including gears. Ex. 1005, 9:30–33; *see also* Pet. 27, 32; Fischer Decl. ¶¶ 103–07 (asserting that a person of ordinary skill would have been motivated to combine Bonutti and Tierney using either cables or gears).

Patent Owner disputes that an ordinarily skilled artisan would have been motivated to use gears to create mechanical linkages between Bonutti and Tierney's components, arguing that this would "change the basic principles of operation under which Tierney's surgical tool was designed to operate while also violating Tierney/Madhani's object of the invention." Prelim. Resp. 46. On this record, this argument is unavailing because it mischaracterizes Tierney. Again, Tierney is not limited to use of Madhani's cable system, but instead expressly discloses that the mechanical linkages can be "cabling arrangements, drive chains or belts, hydraulic drive systems, gear trains, or the like." Ex. 1005, 9:31–45. Moreover, even if Petitioner's proposed combination did result in some loss of a desired "degree of freedom" associated with Tierney's system, "a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate a motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006). Here, Petitioner adequately shows for purposes of institution that incorporating Bonutti's handheld tool into Tierney's robotic system would have resulted in benefits including increased accuracy compared to manually operated instruments, and would have allowed the surgeon to use Tierney's robotic system throughout surgery, rather than having to switch to Bonutti's handheld tool. Pet. 28–29.

On this record, Patent Owner has not shown that any purported loss of a degree of freedom would have outweighed the anticipated benefits of the combined system sufficient to undermine Petitioner's showing.

Patent Owner argues that Tierney contains no disclosure of how suturing tools would work in the disclosed system (Prelim. Resp. 48), and that Petitioner fails to describe "means for coupling the driven element" to the "input gear for each of [Bonutti's] three force application members." Prelim. Resp. 34–35. Patent Owner also argues that combining Tierney and Bonutti "would require substantial reconstruction and redesign of [Tierney's] drive system" (*id.* at 40), because there is "simply no room" in Tierney's system for the additional components needed to drive Bonutti's plunger (*id.* at 36). *See also id.* at 38–40 (arguing a lack of space in Tierney's drive system to accommodate Bonutti's tool); *id.* at 45 (arguing that Tierney/Madhani teach away from adding additional gears due to space requirements and added weight); *see also id.* at 47.

On this record, we find these arguments unavailing. "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference." *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321, 1343 (Fed. Cir. 2020) (citations omitted). Dr. Fischer persuasively testifies that a person of ordinary skill would have known how to make "mechanical linkages between Bonutti-'234's movable components (i.e., force application assembly 954 and force application members 964, 978, and 980) and Tierney's driven elements 118." Ex. 1003, ¶ 103; *see also id.* ¶¶ 66–127 (detailing how a person of ordinary skill in the art would have combined Tierney's robotic system with Bonutti's tool). Dr. Fischer also asserts that

adapting a handheld tool like Bonutti's for use with a robotic system like Tierney's was routine and well within the level of skill in the art. Fischer Decl. ¶ 102. On this record, Patent Owner does not undermine Petitioner's persuasive showing.

Patent Owner also asserts that Tierney (via Madhani) "is not designed for application of large forces," and "the Bonutti forces have a high likelihood of causing unwanted rotations of other pulleys in the mechanism, potentially causing erroneous movement of the suture system itself as the actuation begins." Prelim. Resp. 40–41. This argument is unavailing because Madhani expressly teaches that "using more cables may be desirable in situations where the forces required for actuation of different motions differ greatly in magnitude." Ex. 1013, 8:58–60. Patent Owner acknowledges Madhani's solution to applications involving large forces (Prelim. Resp. 42), but argues that Madhani teaches away from using more cables because they increase the system's weight, complexity, and size. *Id.* (citing Ex. 1009, 8:58–62, Abstract). On this record, however, Patent Owner has not sufficiently supported its arguments either that more cables would have been needed to accommodate Bonutti's tool, or that the potential drawbacks of increased system weight, complexity, and size would have outweighed the motivating benefit of using more cables (i.e., accommodating large forces), in a manner sufficient to undermine Petitioner's showing. *See Medichem*, 437 F.3d at 1165.

Patent Owner also argues that Madhani "teaches away from employing the types of gears proposed by Petitioner," because it teaches that compared to gears, cables minimize friction. Prelim. Resp. 44 (citing Ex. 1013, 10:1–6). On this record, we do not read Madhani's statement as

teaching away from gears. A reference teaches away when it "suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant." *Medichem*, 437 F.3d at 1165 (quoting *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)). Here, Madhani's mere suggestion that cables produce less friction than gears does not rise to a teaching away because it does not suggest that using gears would be unlikely to result in a working robotic system.

Patent Owner also argues a lack of motivation in using "the Tierney/Madhani cable and pulley system to drive the Bonutti tool" because "Madhani recognized that cable 'slippage' was an issue with its cable and pulley system," and fixing the issue would reduce the range of motion of the cable, add weight to the system, and adversely affect the accuracy and reliability of placing and securing a suture. Prelim. Resp. 42–43. On this record, however, Patent Owner has not established that the anticipated benefits of the proposed Bonutti/Tierney combination would have been outweighed by the drawbacks of Madhani's solutions to any cable slippage (e.g. potential reduced range of cable motion and added weight) sufficient to undermine Petitioner's showing. *See Medichem*, 437 F.3d at 1165. Nor has Patent Owner shown with citation to evidence that an ordinarily skilled artisan "would have known that cable slippage and stretching would have had adverse effects on the accuracy and reliability of placing and securing a suture." Prelim. Resp. 43.

(h) Summary as to Claim 1

As discussed above, Petitioner's analysis addresses every limitation in claim 1 and provides reasons with rational underpinnings why a person of ordinary skill would have been motivated to combine the teachings of

Bonutti and Tierney with a reasonable expectation of success. Thus, based on the current record, and taking into account Patent Owner's arguments, we find that Petitioner has demonstrated a reasonable likelihood of prevailing in proving claim 1 unpatentable under § 103(a) as obvious over Bonutti and Tierney.

4. Claims 2, 4, 6, 8–20, 22–25, 27, 29, and 30

We have reviewed Petitioner's obviousness contentions as to claims 2, 4, 6, 8–20, 22–25, 27, 29, and 30 on this ground of unpatentability. *See* Pet. 42–59. Patent Owner does not specifically address these claims. *See generally* Prelim. Resp. We are persuaded on the current record that Petitioner's arguments and evidence sufficiently show a reasonable likelihood that Petitioner would prevail in proving unpatentability of these claims as obvious over Bonutti and Tierney.

E. Alleged Obviousness Over Bonutti, Tierney, Cooper, and Madhani

Petitioner contends that claims 1, 2, 4, 6, 8–20, 22–25, 27, 29, and 30 would have been obvious over the combination of Bonutti, Tierney, Cooper, and Madhani. Pet. 78. This ground of unpatentability is the same as the Bonutti/Tierney ground discussed above, but adds Cooper and Madhani. Petitioner explains that this ground is necessary only if the Board finds that Tierney does not incorporate Cooper and Madhani by reference. That is, Petitioner explains that its argument over Bonutti and Tierney "[is] based in part on Tierney's incorporation of Cooper-'666 and Madhani by reference," but "[i]f Tierney is deemed not to include Cooper-'666 or Madhani's disclosures, it would have been obvious to combine Tierney with those references to arrive at the same subject matter." *Id.*

We find that Bonutti incorporates both Cooper and Madhani by reference. *See* Ex. 1004, 1:60–66 (incorporating the full disclosure of Cooper), 8:4–7 (incorporating the full disclosure of Madhani), 9:19–21 (same). Additionally, Patent Owner indicates that it "does not dispute that Madhani and Cooper '666 were incorporated by reference by Tierney." Prelim. Resp. 62. Under these circumstances, this ground is wholly duplicative of Petitioner's ground over the combination of Bonutti and Tierney. For the same reasons discussed above with respect to that ground, we are persuaded on the current record that Petitioner has shown a reasonable likelihood that it would prevail in proving unpatentability of claims 1, 2, 4, 6, 8–20, 22–25, 27, 29, and 30 over the combination of Bonutti, Tierney, Cooper, and Madhani, but given the redundancy over the previously-discussed ground, we do not need to further address this ground.

F. Alleged Obviousness Over Bonutti, Tierney, and Bonutti-986

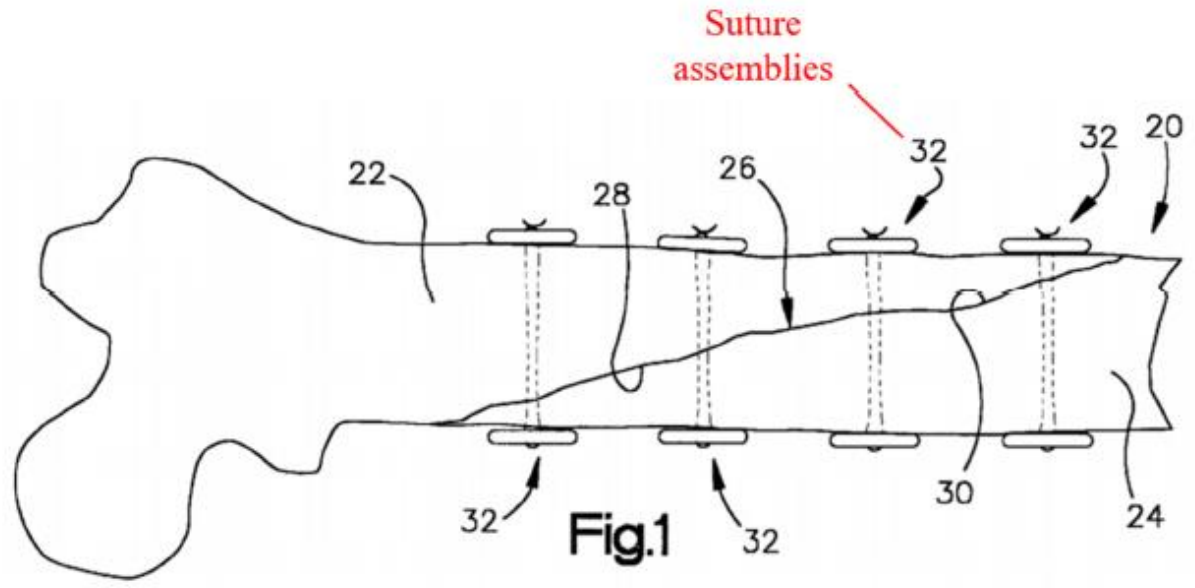
Claim 24 depends from independent claim 6. For purposes of this Decision, claim 24 recites a method of fastening two portions of body tissue that is similar to the method recited in claim 1, but additionally requires that "the first and second portions of body tissue are fastened together in linear apposition using a plurality of linearly aligned fasteners applied by the robotic mechanism." Ex. 1001, 48:12–16.

Petitioner contends that claim 24 would have been obvious over the combination of Bonutti, Tierney, and Bonutti-986. Pet. 79–81. Below, we summarize Bonutti-986, then address Petitioner's argument. At this stage, Patent Owner does not provide arguments for claim 24 beyond those presented for the ground involving Bonutti and Tierney. *See* Prelim. Resp. 62. For the reasons explained below, we find that Petitioner has established

a reasonable likelihood that it would prevail in showing that the combination of Bonutti, Tierney, and Bonutti-986 would have rendered claim 24 unpatentable as obvious.

1. Bonutti-986 (Ex. 1008)

Bonutti-986 discloses a suture securing system to interconnect two bone segments. Ex. 1008, 2:29–32. Petitioner's annotated version of Bonutti-986 Figure 1 is shown below:



Petitioner's annotated version of Bonutti-986 Figure 1, above, highlights bone suture assemblies 32, used to interconnect two bone segments. Pet. 20.

2. Analysis of Claim 24

On this record, Petitioner persuasively shows for purposes of institution that a person of ordinary skill in the art would have been motivated "to use the Bonutti-'234/Tierney robotic system to fasten the first and second portions of body tissue together in linear apposition using a plurality of linearly aligned fasteners applied by the robotic mechanism," including because the artisan would have recognized that using multiple

fasteners as depicted in Bonutti-986 would provide a strong and safe interconnection between body tissues. Pet. 79–80; Fischer Decl. ¶¶ 229–35. Thus, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing in proving claim 24 unpatentable under § 103(a) as obvious over Bonutti, Tierney, and Bonutti-986.

G. Alleged Obviousness Over Hooven and Tierney

Petitioner contends that claims 1–4, 6–8, and 24 would have been obvious over the combination of Hooven (which teaches a handheld surgical stapler) and Tierney (which teaches a robotic surgical system). Pet. 59–78. As will be discussed below, at this stage Patent Owner does not appear to contest that the cited prior art teaches each limitation of claim 1. Patent Owner instead focuses on a lack of motivation to combine and a lack of reasonable expectation of success. For the reasons explained below, on this record we find that Petitioner has established a reasonable likelihood that it would prevail in showing that the combination of Hooven and Tierney would have rendered claims 1–4, 6–8, and 24 obvious.

Below, we summarize Hooven, then turn to the parties' arguments.

1. Hooven (Ex. 1006)

Hooven discloses an endoscopic stapling and cutting instrument, interconnected with a controller and a video display monitor. Ex. 1006, 4:6–8. Hooven's device "staples tissue together and cuts that tissue between the stapled portions." *Id.* at 4:39–40. Figures 1 and 3, annotated by Petitioner and reproduced below, illustrate several components of Hooven's system.

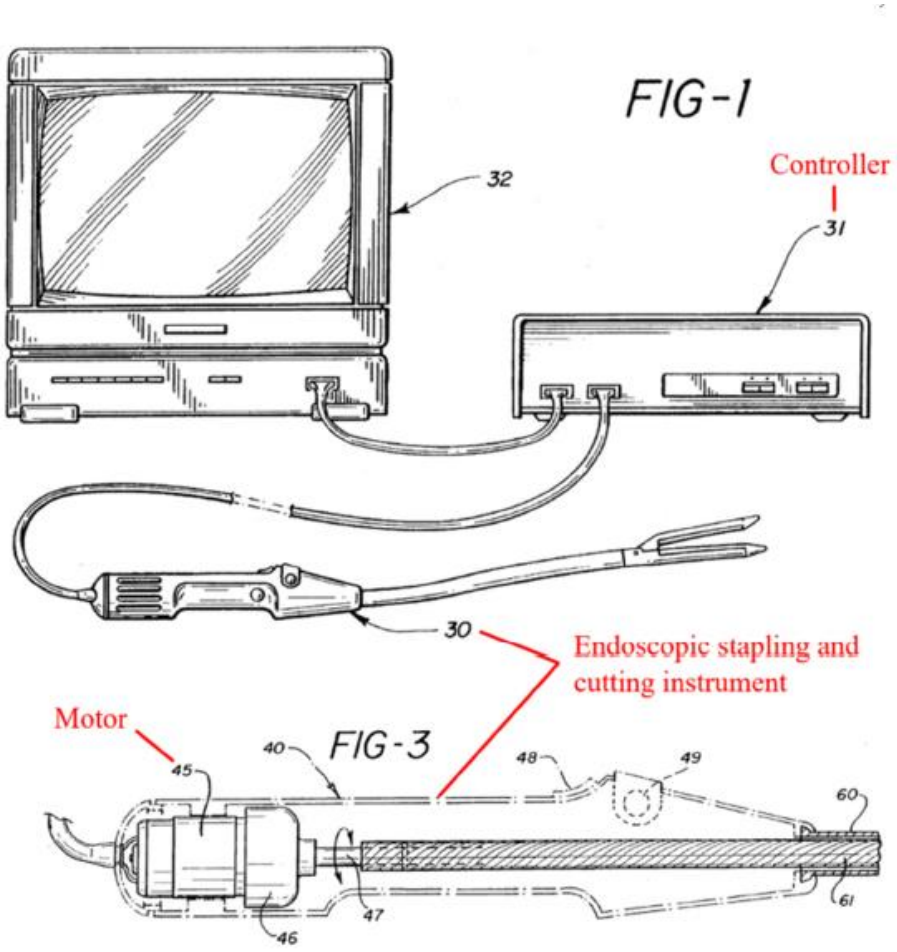
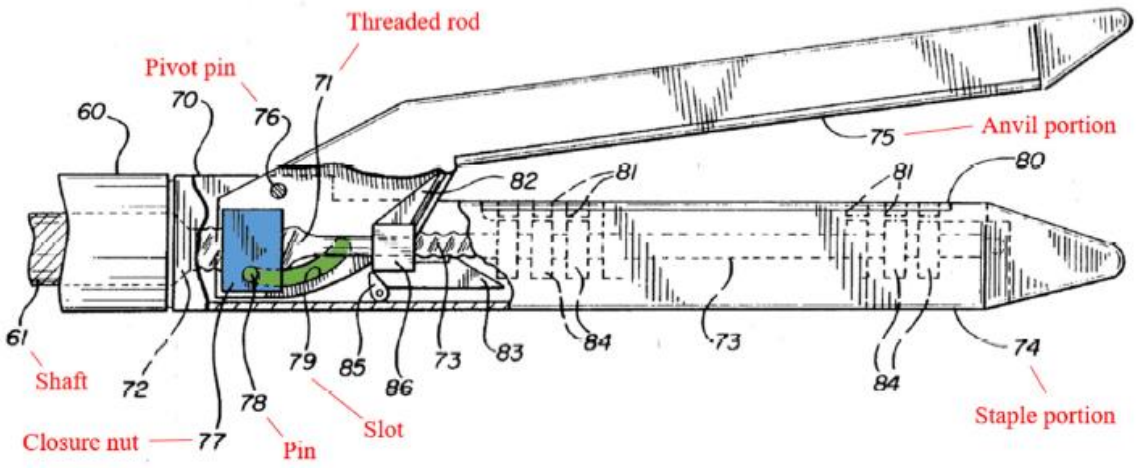


Figure 1 is a schematic view of Hooven's endoscopic surgical system, and Figure 3 "is a longitudinal cross-sectional view of the handle portion of one embodiment of [Hooven's] endoscopic stapling and cutting system." *Id.* at 3:14–16, 3:19–21; Pet. 17. Petitioner's annotation of Figure 1 highlights controller 31, and its annotations of Figure 3 highlight endoscopic stapling and cutting instrument 30 having motor 45.

In Hooven's system, "information is fed to a video display screen" so that "the surgeon using the instrument will instantaneously receive information as to the placement of the staples, the cutting of the tissue, the presence of staples in the cartridge, etc." Ex. 1006, 8:45–49, 6:33–47. Controller 31 may determine "the thickness of tissue between the anvil and

the staple portion" and "inform the surgeon as to whether or not he has the appropriate amount of tissue between the anvil portion and the staple portion . . . or whether he has too much or too little tissue and should re-manipulate the instrument." *Id.* at 5:39–48. Hooven's stapler also "includes miniature sensors to detect the power and/or force being used" by the motor. *Id.* at 8:29–32.

Petitioner's annotated version of Hooven Figure 6 is reproduced below:



Petitioner's annotated version of Hooven Figure 6, above, highlights (among other things) that Hooven's stapler 30 includes closure nut 77 and threaded rod 71. Pet. 61. The figure also depicts firing nut 86 and driving wedge member 83. *Id.* Closure nut 77, firing nut 86, and driving wedge member 83 are driven by motor-powered threaded rod 71. Ex. 1006, 6:9–22; *see also* Fischer Decl. ¶ 62. "To prepare the instrument for firing, motor 45 rotates threaded rod 71 to advance closure nut 77, causing anvil 75 to close and clamp body tissue against staple portion 74 (i.e., the portion containing staples 81)." Fischer Decl. ¶ 62. "Once anvil 75 is closed, threaded rod 71 engages firing nut 86 to drive wedge member 83 along the length of staple

portion 74, thereby pushing staple drivers 84 and staples 81 toward anvil 75." *Id.* "As a result, staples are ejected and formed against the recesses located on the anvil, causing the two legs of each staple 81 to be forced toward each other, securing the body tissue." *Id.*

2. Analysis of Claim 1

We begin by analyzing Petitioner's arguments regarding how the cited prior art combination teaches each limitation of claim 1, then turn to the parties' arguments regarding motivation to combine and reasonable expectation of success.

> *(a) Limitation [1.1]: A method of fastening at least first and second portions of body tissue together, the method comprising:*

To the extent the preamble is limiting, Petitioner sufficiently shows for purposes of institution that Hooven discloses a method of fastening body tissue together using a surgical stapler. *See* Pet. 59–60 (citing, e.g., Ex. 1006, 4:33–41); Fischer Decl. ¶ 169.

> *(b) Limitation [1.2]: imparting, using an adaptive arm of a robotic mechanism, a clamping force to the first and second portions of body tissue suitable to press the first and second portions against one another;*

Petitioner sufficiently shows for purposes of institution that Hooven and Tierney together disclose this limitation. Pet. 61–66. Petitioner's annotated version of Hooven Figure 6 (reproduced above) indicates anvil portion 75 and staple portion 74 (among other parts) of Hooven's stapler. Petitioner explains that the stapler imparts a clamping force—applied by closing anvil portion 75 against staple portion 74—to first and second portions of body tissue, suitable to press the tissue portions against one another. Pet. 61; Fischer Decl. ¶ 170.

Petitioner also sufficiently supports its position that it would have been obvious to use an adaptive arm of Tierney's robotic system to control Hooven's stapler, including because Tierney teaches using any end effector in its robotic system, including "staple appliers." Ex. 1005, 6:22–28; Pet. 61–64; Fischer Decl. ¶ 171.

> *(c) Limitation [1.3]: generating, using a force measurement system associated with the adaptive arm, a clamping force signal indicative of the clamping force imparted by the adaptive arm to the first and second portions of body tissue;*

Petitioner argues that "[t]he Hooven/Tierney robotic system generates, using a force measurement system (*e.g.*, Hooven's 'miniature sensors') associated with the adaptive arm, a clamping force signal (sensor output signal) indicative of the clamping force ('the power and/or force being used' by Hooven's motor 45 to close anvil portion 75) imparted by the adaptive arm to the first and second portions of body tissue." Pet. 66–67 (citing Fischer Decl. ¶ 197; Ex. 1006, 8:18–49, 5:9–53, 9:21–22, 3:2–8). More specifically, Hooven's "miniature sensors" detect the "the amount of torque required to pivot the anvil portion about the pivot pin," enabling "the thickness of the tissue between the anvil and the staple portion [to be] determined." Ex. 1006, 5:39–43; Fischer Decl. ¶ 198. As Dr. Fischer explains, a person of ordinary skill in the art would have understood the force used to close anvil portion 75 against staple portion 74 indicates the clamping force imparted by the adaptive arm to the first and second portions of body tissue. Fischer Decl. ¶¶ 198–200. We find that Petitioner's arguments sufficiently support for purposes of institution that Hooven and Tierney together disclose this limitation.

(d) Limitation [1.4]: receiving, using a computer in communication with the force measurement system and the robotic mechanism, the clamping force signal from the force measurement system;

Hooven discloses that its stapler is interconnected with a controller, which "can accept, store, manipulate, and present data," and that the sensors in the stapler are connected to the controller via interface cable 205. Ex. 1006, 4:9–11, 8:36–49; *see also* Fischer Decl. ¶ 203. Petitioner argues that "[i]n the Hooven/Tierney robotic system, Tierney's computer (controller 150) and 'remote interface adaptor' replace Hooven's computer (controller) and interface cable 205, respectively." Pet. 69; Fischer Decl. ¶ 204. In this way, "[t]he Hooven/Tierney robotic system receives, using a computer (Tierney's controller 150) in communication (via the 'remote interface adaptor') with the force measurement system and the robotic mechanism, the clamping force signal from the force measurement system." Pet. 67; Fischer Decl. ¶¶ 201–04. We find that Petitioner's arguments sufficiently support for purposes of institution that Hooven and Tierney together disclose this limitation.

(e) Limitation [1.5]: determining, using the computer and the received clamping force signal, that the clamping force imparted by the adaptive arm to the first and second portions of body tissue has a predetermined magnitude; and

Hooven teaches that "the amount of torque required to pivot the anvil portion about the pivot pin can be sensed and the thickness of tissue between the anvil and the staple portion determined," and the controller can manipulate this information to inform the surgeon as to whether he or she has the appropriate amount of tissue in the stapler. Ex. 1006, 5:35–48; Pet.

70. Dr. Fischer explains that a person of ordinary skill in the art would have understood that

> for the controller to "inform the surgeon" as to whether they have clamped "too much" tissue in the jaws based on "the amount of torque required to pivot the anvil portion," the controller must at least determine if the force applied to the tissues when the jaws are closed is more than a predetermined magnitude indicative of there being "too much" tissue.

Fischer Decl. ¶ 205 (quoting Ex. 1006, 5:39–48). Thus, Petitioner sufficiently shows for purposes of institution that Hooven discloses this limitation. *See* Pet. 69–70.

> *(f) Limitation [1.6]: fastening, after said determining and simultaneously with the clamping force imparted by the adaptive arm to the first and second portions of body tissue having the predetermined magnitude, the first and second portions of body tissue together using the adaptive arm.*

Petitioner sufficiently shows for purposes of institution that the Hooven/Tierney system discloses this limitation. Pet. 70–73. As discussed above, Hooven's controller "inform[s] the surgeon as to whether or not he has the appropriate amount of tissue between the anvil portion and the staple portion of the head of the instrument upon closure." Ex. 1006, 5:43–48; *see also id.* at 8:52–56 ("From the sensor input from the specific endoscopic instrument used, the control logic can make decisions and/or actions on things such as tissue compression . . . ."). Hooven's system also receives signals from sensors to determine whether the system is "in range to fire," and if it is, the system will "enable 'fire' button for physician," such that when the "fire" button is pressed, the system will "fire" the staples to secure body tissues together. *Id.* at Fig. 20A; Fischer Decl. ¶ 206. Thus, Dr. Fischer testifies that "Hooven confirms that the system is 'in range to fire'

only if the force applied to the tissues when the jaws are closed is less than a predetermined magnitude indicative of there being 'too much' tissue." Fischer Decl. ¶ 206. Dr. Fischer states that a person of ordinary skill in the art "would have understood that Hooven teaches fastening tissue only after it is determined that the jaws are in 'the closed position ready for firing' and the force applied to tissues by the jaws is less than a predetermined magnitude." *Id.*; *see also* Pet. 70–72.

Petitioner asserts that "Hooven also discloses [that] the firing (*i.e.*, fastening) occurs simultaneously with the jaws being closed and applying the clamping force." Pet. 72 (citing Fischer Decl. ¶ 207). According to Dr. Fischer,

> Hooven discloses: (1) that firing nut 86, which performs the firing, does not engage threaded rod 71 until *after* closure nut 77 fully closes the anvil, thereby applying the clamping force; and (2) that closure nut 77 does not "retract and open the anvil," thereby removing the clamping force, until *after* firing nut 86 has "drive[n] and form[ed] all of the staples."

Fischer Decl. ¶ 207 (quoting Ex. 1006, 6:9–47, Fig. 20B). Thus, Petitioner sufficiently supports its position that the fastening step occurs simultaneously with the application of the clamping force.

(g) Motivation to Combine Hooven and Tierney with a Reasonable Expectation of Success

On this record, Petitioner persuasively supports its position that a person of ordinary skill in the art would have been motivated to modify Tierney's robotic system to accommodate Hooven's stapler. *See* Pet. 61–65. As discussed above, Tierney teaches a robotic system with adaptive arms to control surgical tools, including "staple appliers." Ex. 1005, 6:22–28; *see also* Pet. 61–62; Fischer Decl. ¶¶ 171, 176–77. Petitioner argues, and we

agree, that the same reasons discussed above that would have motivated a person of ordinary skill to combine Bonutti's suture system with Tierney's robotic system also apply to Hooven's stapler, including to obtain the benefits robotic systems offer for handheld surgical tools. *See supra* Section II.D.3(a), (g); *see also* Pet. 64; Fischer Decl. ¶¶ 176–88. Petitioner also persuasively shows for purposes of institution that Tierney and Hooven have the common objectives of allowing for a high degree of control of end effectors, which would have motivated a person of ordinary skill to implement the computer-control features of Hooven's stapler in Tierney's robotic system, to obtain a high degree of control (and the ensuing safety benefits) over the resulting robotic surgical stapler. Pet. 64–65; Fischer Decl. ¶¶ 189–90; Ex. 1005, 1:12–16; Ex. 1006, 2:24–27.

Petitioner also persuasively asserts that a person of ordinary skill in the art would have reasonably expected the combination of Tierney and Hooven to be successful, including because Tierney discloses multiple means of coupling its robotic system to Hooven's stapler (e.g., "cabling arrangements, drive chains or belts, hydraulic drive systems, gear trains, or the like"), and because adapting a handheld surgical instrument like Hooven's stapler for use with a robotic system like Tierney's was well within the level of skill in the art. Pet. 65 (quoting Ex. 1005, 9:31–34); Fischer Decl. ¶¶ 191–96. Dr. Fischer posits several exemplary ways of integrating Hooven's stapler into Tierney's robotic system, and testifies that an ordinarily skilled artisan would have known how to modify each component to enable the robotic system to drive the stapler. Fischer Decl. ¶¶ 172–74, 193–96; *see also* Pet. 61–64.

Patent Owner argues several reasons why a person of ordinary skill in the art would not have been motivated to combine Hooven and Tierney in the exemplary ways suggested by Petitioner and Dr. Fischer. As background for the discussion, we note that Patent Owner summarizes Dr. Fischer's exemplary ways of integrating Hooven's stapler into Tierney's robotic system as Options 1–4, as follows:

> (1) "the components inside Hooven's handle 40 (*e.g.*, motor 45) [and Hooven's flexible shaft 61] . . . into the proximal housing 108 of Tierney's tool 54"; or (2) "Tierney's driven elements 118 and motors 70 rather than Hooven's motor 45" (*i.e.*, the components inside Hooven's handle but for the motor and Hooven's flexible shaft 61 into the proximal housing 108 of Tierney's tool 54; or (3) the components inside Hooven's handle 40 and Hooven's flexible shafts 60-61 with the proximal housing 108 of Tierney's tool 54; or (4) the components inside Hooven's handle but for the motor and Hooven's flexible shafts 60-61 with Tierney's tool 54 (including its driven elements 118, drive elements 119 and motors 70).

Prelim. Resp. 51–52.[20]

Patent Owner argues that "Options (1) and (3) fail" because they move Hooven's motor into Tierney's housing, but a person of ordinary skill in the art "would have known to avoid incorporating a motor into the housing of Tierney's sterilizable tool because sterilization occurs at high temperatures that would render the motor inoperable for re-use of the tool." *Id.* at 53 (citing Ex. 1005, 10:25–32).[21] This argument is unavailing on the current record. Although Tierney indicates that surgical tools "will

[20] Although Patent Owner's summary includes quoted material, Patent Owner does not indicate the source of the quotations.

[21] In support of this argument, Patent Owner also cites Exhibit 2008 at paragraph 224, but there is no Exhibit 2008 of record.

generally be sterile structures," it does not support Patent Owner's argument that sterilization requires high temperatures that would render Hooven's motor inoperable. *See* Ex. 1005, 10:25–32.

Patent Owner argues that Options (2) and (4) are inoperable because "there is no proposed means for coupling the driven elements to the input gear to rotate the shafts to form staples," and "[e]ven if cables and pulleys were used to couple the input gear to the one or more driven elements . . . Petitioner does not explain how it could provide sufficient force to the input gear to actuate the stapler." Prelim. Resp. 55. Patent Owner's arguments are unavailing on this record. At this stage, we credit Dr. Fischer's testimony that adapting a handheld tool like Hooven's stapler for use with a robotic system like Tierney's was well within the level of skill in the art, requiring only routine modifications. *See, e.g.*, Fischer Decl. ¶¶ 181–84, 192–93.

Patent Owner also argues that a person of ordinary skill "would not have been motivated to incorporate Hooven's flexible shaft 61 into Tierney's rigid shaft 102 or Hooven's flexible shaft 60 because flexibility in a shaft controlled by a robot could cause unexpected movement in the end effector and adversely affect the safety of the robotic stapler." Prelim. Resp. 56–57. Patent Owner argues that an ordinarily skilled artisan would have avoided such unwanted movement "given that surgical staplers have been known to result in malfunctions, serious injuries and deaths caused by misplaced or misdriven staplers." *Id.* at 57 (citing Ex. 2001). On this record, this argument is unavailing, because Patent Owner has not established that the amount of flexibility in Hooven's shaft would be sufficient to cause unwanted movement, sufficient to undermine Petitioner's

showing. Nor has Patent Owner pointed us to any specific portion of Exhibit 2001 that connects stapler shaft flexibility with misplaced or misdriven staplers.

Patent Owner also argues that "[r]emoving the hand-held feature of Hooven's stapler and Tierney/Madhani's cables and pulleys eliminates both Hooven's desired high degree of control in manipulating the linear stapler by hand and Tierney's dexterity resulting from wrist articulation." *Id.* Patent Owner contends that an ordinarily skilled artisan "would not have had a reasonable expectation of success knowing that a surgeon would be unable to properly position the linear stapler in many applications without Hooven's hand-held feature or Tierney/Madhani's wrist articulation." *Id.* at 58. On this record, Patent Owner has not established with citation to persuasive evidence either that (1) the Hooven/Tierney combination would in fact result in a loss of wrist articulation, or (2) such a loss would prevent a surgeon from properly positioning the stapler.[22]

Patent Owner also repeats some of the same arguments raised for the Bonutti/Tierney combination, including cable slippage (*id.* at 55–56); a purported lack of disclosure "in Tierney/Madhani that would have motivated a [person of ordinary skill in the art] to use any drive system other than a cable and pulley drive system" (*id.* at 59–60); and a purported lack of space in Hooven's shaft for Tierney's components (and vice versa) (*id.* at 60). On

[22] Patent Owner alternatively argues that "even if wrist articulation was maintained in the Tierney/Hooven stapler, the adaptations would be impractical or render the stapler inoperable." Prelim. Resp. 59. Patent Owner, however, asserts that such an arrangement "is not proposed by Petitioner." *Id.* at 58. Accordingly, we do not address this argument here.

this record, we find these arguments unavailing for the same reasons discussed above.

(h) Summary as to Claim 1

As discussed above, Petitioner's analysis addresses every limitation in claim 1 and provides reasons with rational underpinning as to why a person of ordinary skill would have been motivated to combine the teachings of Hooven and Tierney with a reasonable expectation of success. Thus, based on the current record, and taking into account Patent Owner's arguments, we find that Petitioner has demonstrated a reasonable likelihood of prevailing in proving claim 1 unpatentable under § 103(a) as obvious over Hooven and Tierney.

3. Claims 2–4, 6–8, and 24

We have reviewed Petitioner's obviousness contentions as to claims 2–4, 6–8, and 24 on this ground of unpatentability. *See* Pet. 73–78. Patent Owner does not specifically address these claims. *See generally* Prelim. Resp. We are persuaded on the current record that Petitioner's arguments and evidence sufficiently show a reasonable likelihood that Petitioner would prevail in proving unpatentability of these claims as obvious over Hooven and Tierney.

III. CONCLUSION

Based on the arguments and evidence presented in the Petition, the Preliminary Response, and the accompanying exhibits, we determine that there is a reasonable likelihood Petitioner would prevail with respect to at least one challenged claim. Additionally, we decline to exercise our discretion to deny institution.[23]

[23] The Petition addresses the Board's discretion to institute under 35 U.S.C.

At this preliminary stage, we have not made a final determination about the patentability of any challenged claim, the construction of any claim term, or any other legal or factual issue.

IV. ORDER

It is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review of claims 1–4, 6–20, 22–25, 27, 29, and 30 of the '953 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that according to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial that commences on the entry date of this Decision.

§§ 314(a) and 325(d). *See* Pet. 1, 4–5. Patent Owner does not argue that we should exercise discretion to deny institution of *inter partes* review. *See generally* Prelim. Resp. Accordingly, we do not consider exercising discretion to deny institution any further.

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