

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MAKO SURGICAL CORP.,
Petitioner,

v.

BLUE BELT TECHNOLOGIES, INC.,
Patent Owner.

Case IPR2015-00629
Patent 6,757,582 B2

Before SALLY C. MEDLEY, KEVIN F. TURNER, and
WILLIAM M. FINK, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, Petitioner has shown by a preponderance of the evidence that claims 1, 3, 5–9, 11, 13, 14, and 17 of U.S. Patent No. 6,757,582 B2 are unpatentable, but has not shown

by a preponderance of the evidence that claims 16, 21–30, 34–42, and 47–58 of U.S. Patent No. 6,757,582 B2 are unpatentable.

A. Procedural History

Petitioner, Mako Surgical Corporation, filed a Petition requesting an *inter partes* review of claims 1, 3, 5–14, 16–30, 34–42, and 47–58 of U.S. Patent No. 6,757,582 B2 (Ex. 1501, “the ’582 patent”). Paper 1 (“Pet.”). Patent Owner, Blue Belt Technologies, Inc., did not file a Preliminary Response. Upon consideration of the Petition, on July 30, 2015, we instituted an *inter partes* review of claims 1, 3, 5–9, 11, 13, 14, 16, 17, 21–30, 34–42, and 47–58, pursuant to 35 U.S.C. § 314. Paper 6 (“Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 10 (“PO Resp.”)) and Petitioner filed a Reply (Paper 13 (“Pet. Reply”)).

Patent Owner filed a Motion to Exclude (Paper 17; “PO Mot. Exclude”) certain portions of Exhibit 1016. Petitioner filed an Opposition to the Motion to Exclude (Paper 18; “Pet. Exclude Opp.”), and Patent Owner filed a Reply (Paper 20; “PO Exclude Reply”).

An oral hearing was held on April 7, 2016, and a transcript of the hearing is included in the record (Paper 23; “Tr.”).

B. Related Proceedings

The ’582 patent is involved in the following lawsuit: *Mako Surgical Corp. v. Blue Belt Technologies, Inc.*, No. 0:14-cv-61263-MGC (S.D. Fla.). Pet. 1.

C. The ’582 Patent

The ’582 patent relates to a method and system for providing control to a cutting tool. Ex. 1001, Abstract. The specification of the ’582 patent

describes a workpiece (e.g., a bone) that includes a target shape. *Id.* at 1:22–37. Markers can be associated with or otherwise affixed to the cutting tool and workpiece. *Id.* at 9:5–6. The markers may be tracked using the system, resulting in tracking data that can be used to provide a control for the cutting tool. *Id.* at 9:54–61.

D. Illustrative Claim

Claims 1, 17, and 24 are independent claims. Claims 3, 5–9, 11, 13, 14, and 16 directly or indirectly depend from claim 1; claims 21–23 directly or indirectly depend from independent claim 17; and claims 25–30, 34–42, and 47–58 directly or indirectly depend from claim 24. The independent claims 1, 17, and 24 are reproduced below.

1. A system, comprising:

a cutting tool;

a workpiece that includes a target shape;

a tracker to provide tracking data associated with the cutting tool and the workpiece, where the tracker includes at least one of: at least one first marker associated with the workpiece, and at least one second marker associated with the cutting tool; and

a controller to control the cutting tool based on the tracking data associated with the cutting tool and the tracking data associated with the workpiece.

Ex. 1001, 20:37–47.

17. A system, comprising:

a workpiece having a target shape included therein,

a tracker to track at least one of: a cutting tool and the workpiece, and,

a control system, the control system including instructions to cause a processor to track the cutting tool and the workpiece, to associate the tracked data to an image associated with the cutting tool and an image associated with the workpiece, where the workpiece includes an image associated with the target shape, to determine a relationship between the cutting tool and at least one of the workpiece and the target shape, and to provide a control to the cutting tool based on at least one of the relationship of the cutting tool and the workpiece, and the relationship of the cutting tool and the target shape.

Id. at 21:39–53.

24. A method, the method comprising:

providing a workpiece that includes a target shape,
providing a cutting tool,
providing a 4-D image associated with the workpiece,
identifying the target shape within the workpiece image,
providing a 4-D image associated with the cutting tool,
registering the workpiece with the workpiece image,
registering the cutting tool with the tuning tool image,
tracking at least one of the workpiece and the cutting tool,

transforming the tacking data based on image coordinates to determine a relationship between the workpiece and the

cutting tool, and based on the relationship, providing a control to the cutting tool.

Id. at 22:27–41.

E. Grounds of Unpatentability

We instituted an *inter partes* review of claims 1, 3, 5–9, 11, 13, 14, 16, 17, 21–30, 34–42, and 47–58 on the following grounds:

Claim(s)	Basis	Reference(s)
1, 5, 6, 8, 9, 13, 14, 16, 17, 21–30, 34–42, 47, and 50–58	§ 102(b)	Taylor ¹
3	§ 103(a)	Taylor and Glassman ²
48 and 49	§ 103(a)	Taylor and Delp ³
7	§ 103(a)	Taylor and DiGioia ⁴
11	§ 103(a)	Taylor

¹ Russell H. Taylor, et al., *An Image-Directed Robotic System for Precise Orthopaedic Surgery*, 10(3) IEEE TRANSACTIONS ON ROBOTICS AND AUTOMATION, 261–75 (June 1994) (Ex. 1008) (“Taylor”).

² U.S. Patent No. 5,408,409, issued Apr. 18, 1995 (Ex. 1009) (“Glassman”).

³ Scott L. Delp, et al., *An Interactive Graphics-Based Model of the Lower Extremity to Study Orthopaedic Surgical Procedures*, 37(8) IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, 757–67 (Aug. 1990) (Ex. 1011) (“Delp”).

⁴ U.S. Patent No. 6,205,411 B1 (issued Mar. 20, 2001) (Ex. 1010) (“DiGioia”).

II. ANALYSIS

A. *Level of Skill of Person in the Art*

We find that the level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

B. *Claim Interpretation*

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1277–78 (Fed. Cir. 2015) (“We conclude that Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA”), *aff’d sub nom. Cuozzo Speed Techs. LLC v. Lee*, No. 15–446, 2016 WL 3369425, at *12 (U.S. June 20, 2016). Consistent with the broadest reasonable interpretation, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Also, we must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“[L]imitations are not to be read into the claims from the specification”). However, an inventor may provide a meaning for a term that is different from its ordinary meaning by defining the term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner proposes interpretations for the following claim terms: “means to provide at least one image associated with the workpiece, and means to provide at least one image associated with the cutting tool” (claim 11, “means to provide at least one image”), “the tuning tool image” (claim 24), and “4-D image” (claim 24). Pet. 9–12. In our Decision to Institute, we agreed with Petitioner’s interpretations for “means to provide at least one image” (claim 11) and “the tuning tool image” (claim 24). Dec. 6, 8. Neither party has indicated that the interpretations for those phrases were improper and we do not perceive any reason or evidence that now compels any deviation from our initial determinations. Moreover, both parties apparently agree that, to the extent the term needs construing, the term “4-D image” means a 3-D image that is updated over time. PO Resp. 6–7, 37; Pet. Reply 10. We also agree with that interpretation.

Accordingly, the following interpretations are not in dispute and apply to this Decision:

Claim Term	Interpretation
means to provide at least one image (claim 11)	(corresponding structure) Computer Aided Design (CAD), CT, MRI, X-Ray, fluoroscopy and/or ultrasound
tuning tool image	cutting tool image
4-D image	3-D image that is updated over time

For purposes of this decision, it is necessary to construe the phrases “tracking data associated with the workpiece” (claim 1) and “track the cutting tool and the workpiece” (claim 17).

Tracking Data (claim 1)/Track the Cutting Tool and Workpiece (claim 17)

Claim 1 recites a tracker to provide “tracking data associated with the cutting tool and the workpiece” and a controller to control the cutting tool

based on the tracking data. Ex. 1001, 20:40–47. Independent claim 17 recites a processor to “track the cutting tool and the workpiece.” *Id.* at 21:45–47.

Patent Owner argues that the broadest reasonable interpretation of “tracking data associated with the workpiece” recited in claim 1 is “data that identifies a position of an object over time within a coordinate system.” PO Resp. 8 (citing Ex. 2004 ¶¶ 33–34). Patent Owner argues that the broadest reasonable interpretation of “track the cutting tool and the workpiece” recited in claim 17 is “identify a position of the cutting tool and of the workpiece over time within a coordinate system.” *Id.* at 8–9 (citing Ex. 2004 ¶ 35). Petitioner disagrees with Patent Owner’s proposed interpretations and argues that the term “track” or “tracking” is not explicitly defined in the Specification of the ’582 patent, and, therefore, the term “track” is used “according to its ordinary meaning, which is ‘to observe the progress of’ or ‘follow’ something.” Pet. Reply 1–2 (citing dictionary definitions for track); Tr. 5.

It is necessary for us to interpret the phrases because there is a dispute about whether the prior art (Taylor) describes tracking data associated with the workpiece (claim 1) or describes a system that tracks the workpiece (claim 17). In particular, Patent Owner disagrees that Taylor describes tracking the position or movement of the workpiece over time within a defined coordinate system. *See, e.g.*, PO Resp. 17–19. For the reasons that follow, we do not adopt Patent Owner’s narrow proposed interpretation.

We begin with the language of claims 1 and 17. Claim 1 recites a tracker to provide tracking data associated with the cutting tool and the workpiece. A controller controls the cutting tool based on the tracking data

associated with the cutting tool and the tracking data associated with the workpiece. Claim 1 does not define or further explain what the phrase “tracking data associated with the workpiece” means. For example, there is nothing in claim 1 that limits tracking data to data that identify a position of an object over time within a coordinate system. Like claim 1, independent claim 17 does not define or further modify the phrase to “track the cutting tool and the workpiece.” Unlike claim 1, claim 17 uses the term as a verb “to track” as opposed to claim 1, where the adjective “tracking” modifies the noun “data.”

As discussed above, Petitioner submits that the ordinary meaning of the word track means “to observe the progress of” or “follow” something. Pet. Reply 2 (citing Ex. 1017, 1432–33). Petitioner argues that the ordinary meaning of “track” encompasses monitoring characteristics in general. PO Resp. 4. Neither Patent Owner nor Patent Owner’s Declarant, Dr. Kevin Cleary, considers or presents an ordinary meaning of the word track or tracking.

Claims 1 and 17 lack an indication as to what about the workpiece is being tracked or what constitutes tracking data. In other words, there is nothing in the claims themselves that explicitly indicates that the position of the workpiece is being tracked, as opposed to motion (i.e., tracking if something moved), shape (i.e., tracking the shape of the workpiece after a portion has been cut), or size of the workpiece (i.e., tracking the size of the workpiece after a portion has been cut), or some other parameter associated with the workpiece. The record evidence supports Petitioner’s argument that the ordinary meaning of the word track encompasses monitoring characteristics in general of an object. In other words, “to observe the

progress of” or “to follow” something does not necessarily mean that it is the movement or position of something that is being observed or followed (i.e., that an object moved from point A to point B) as Patent Owner’s construction would seem to require. Indeed, the Specification of the ’582 patent itself describes that “in some systems and methods, *the cutting tool* can include an ultrasonic motor that can transmit an encoder signal to allow the computer to *track the motor characteristics (e.g., speed, rotation, etc.)*.” Ex. 1001, 14:40–43 (emphasis added). Thus, it appears to us that Patent Owner is reading limitations into the claims, because its proposed interpretation for at least to “track the cutting tool and the workpiece” would read out of the claim the embodiment that includes tracking a characteristic of the motor of the cutting tool, such as speed or rotation.

We next turn to Patent Owner’s arguments regarding specific embodiments in the Specification of the ’582 patent. Patent Owner focuses on three passages from the Specification of the ’582 patent in support of its interpretations for “tracking data associated with . . . the workpiece” and “to track the cutting tool and the workpiece.” PO Resp. 8. Those passages are reproduced as follows:

The tracker can measure and/or determine at least one position and at least one angle associated with the workpiece and/or the cutting tool, where in one embodiment, the tracker can track in three positions and three angles to provide six degrees of freedom.

Ex. 1001, 2:45–52.

In the disclosed systems, the relationship between the cutting tool and the workpiece can be based on position data and/or angle data associated with the cutting tool(s) and/or the workpiece, where the position data and angle data can be based on the tracker. The relationship between the cutting tool and the target

shape can thus be based on position data and/or angle data associated with the cutting tool and/or the target shape, where the position data and angle data are based on the tracker. The instructions to determine a relationship between the cutting tool and the target shape and/or workpiece can also include instructions to represent the workpiece as a group of volume pixels (voxels), classify voxels corresponding to the target shape, represent the cutting tool as a group of voxels, a surface model, and/or using constructive solid geometry or other geometric modeling, and, based on the tracker data, classify and/or update the voxels. The instructions to classify voxels corresponding to the target shape can include classifying voxels as target shape and classifying voxels as waste, and/or instructions to color-code voxels corresponding to the target shape. In an embodiment, the workpiece can be represented as a surface model.

Id. at 4:62–5:16.

FIG. 2A provides additional detail for one exemplary embodiment for the tracking and control method 114. As FIGS. 1 and 2 indicate, after image integration, probe calibration, and image registration, markers or other tracking scheme can be used to track the workpiece and the cutting tool 120. In an embodiment, the workpiece and the cutting tool can be tracked 120 in x, y, and z dimensions, and in three angles of yaw, pitch, and roll. As provided previously herein, in one system the OPTOTRAK system can be used to track LEDs or other markers placed on the workpiece and/or cutting tool. In some embodiments, inertial data from, for examples, gyroscopes and/or accelerometers may be available to provide tracking data. The tracking data can be transformed to image coordinates 122 and intersection and/or collision detection can be performed or otherwise computed to provide a control for the cutting tool 124.

Id. at 9:46–61.

Patent Owner does not provide an explanation in the Patent Owner Response tying the above passages to its proposed interpretations, but merely concludes that the above passages support interpreting the phrases as

proposed, directing attention to paragraphs 33–35 of Dr. Kevin Cleary’s Declaration (Ex. 2004). PO Resp. 8–9. For example, the above passages refer to “tracker,” “track” and “tracking data.” They are presumed to be separate terms, not one in the same. Yet Patent Owner’s reference to passages that include a description of the tracker, for example, without an explanation is not particularly helpful in determining what are tracking data or what it means to track the workpiece. The tracker does a whole host of things, one of which is to track, and another is to include tracking data.

We also have reviewed Dr. Cleary’s testimony in support of the proposed interpretations.⁵ Ex. 2004 ¶¶ 33–35. But, like Patent Owner, Dr. Cleary focuses only on certain embodiments. In doing so, Dr. Cleary never explains why the tracking data or the verb to track refers to the *position* of the workpiece, as opposed to some other characteristic of the workpiece. His testimony is based on the assumption that it is, and then based on that starting point, focuses on why the tracking of the position of the cutting tool or workpiece must be in a coordinate system updated over time. Ex. 2004 ¶¶ 33–35.

There are several other descriptions in the ’582 patent Specification, besides the ones discussed above, that are not explained by Patent Owner and that we find would indicate to a person of ordinary skill in the art that claims 1 and 17 are not necessarily as limited in scope as proposed. The

⁵ Patent Owner improperly incorporates four pages of Dr. Cleary’s testimony into its Patent Owner Response. The Declaration contains arguments and explanation that should have been contained in the brief, in violation of 37 C.F.R. § 42.6(a)(3). In any event, even considering what is contained in paragraphs 33–35 of Dr. Cleary’s Declaration, we decline to interpret the disputed phrases as proposed.

Specification of the '582 patent describes using the OPTOTRAK 3-D *motion* and position measurement and tracking system. Dr. Cleary does not tell us what this system contains, how it tracks, or all that it does. It would appear to us that it would at least include *motion* tracking—monitoring whether an object has moved. Moreover, the Specification of the '582 patent describes that “other tracking systems and mechanisms capable of tracking a rigid body can be used.” Ex. 1001, 8:61–63. Yet, neither Patent Owner nor Dr. Cleary discuss any of the other systems that a person of ordinary skill in the art could have used. And as explained above, the Specification of the '582 patent describes that at least with respect to the cutting tool, other parameters besides the position of the cutting tool may be tracked contrary to Patent Owner's assertions.

For all of the reasons discussed above, we are not persuaded by Patent Owner's arguments that “tracking data associated with the workpiece” recited in claim 1 means “data that identifies a position of an object over time within a coordinate system” or that “track the cutting tool and the workpiece” recited in claim 17 means “identify a position of the cutting tool and of the workpiece over time within a coordinate system.” Based on the record before us, we determine that the broadest reasonable interpretation of the term “track” should be accorded its plain, ordinary meaning, which encompasses monitoring a characteristic of an object, and that tracking data would be data that result from such monitoring.

C. Anticipation of Claims by Taylor

Petitioner contends that claims 1, 5, 6, 8, 9, 13, 14, 16, 17, 21–30, 34–42, 47, and 50–58 are anticipated by Taylor. Pet. 12–34. To support its contentions, Petitioner provides detailed explanations as to how Taylor

meets each claim limitation. *Id.* Petitioner also relies upon a Declaration of Robert D. Howe, who has been retained as an expert witness by Petitioner for the instant proceeding. Ex. 1004.

Taylor describes an image-directed robotic system to augment the performance of surgeons in precise bone machining procedures in orthopaedic surgery. Ex. 1008, 261. The system consists of an interactive CT-based presurgical planning component and a surgical system consisting of a robot, redundant motion monitoring, and man-machine interface components. *Id.*

Taylor describes a cutting tool, for example a ball probe cutter bit inserted into the collet of a cutting tool affixed to the robot end effector. *Id.* at 263. The system further includes a workpiece that includes a target shape, for example a model of prosthesis shape relative to a patient's anatomy. *Id.* at 267. Taylor also describes IO hardware to track position and orientation of a robot end effector and possible shifts of bone. *Id.* at 265.

Initially, titanium pins are implanted in a patient's femur and a CT scan is made of the patient's leg. *Id.* at 262. To enable tracking of the cutting tool, Taylor describes using a Northern Digital Optotrak™ 3D digitizer, which is capable of tracking light emitting diodes that may be affixed to the robot's wrist so that the cutting tool may be registered and tracked. *Id.* at 270. Taylor also describes a wrist-mounted force sensor that computes forces and torques at the cutter tip. *Id.* The system includes a robot controller that controls the cutting tool by using the pin location information to compute an appropriate transformation from CT coordinates to robot coordinates. *Id.* at 263. Taylor also describes that the system monitors the position of the robot's cutting tool relative to the shape that it is

to cut and stops cutting if the robot strays out of the desired area. *Id.* at 264. A redundant motion monitoring subsystem checks to verify that the cutter tool never strays more than a specified amount outside a defined implant volume. It also monitors strain gauges that can detect possible shifts of bone. If either condition is detected, a freeze motion signal is sent to the robot controller. *Id.* at 265.

Claim 1

Claim 1 requires a system comprising a cutting tool and a workpiece that includes a target shape. Ex. 1001, 20:37–39. For these limitations, Petitioner contends that Taylor discloses a system comprising a cutting tool and a workpiece. Pet. 21; Ex. 1008, 261, 263, and 267. As pointed out by Petitioner, Taylor describes an “Image-Directed Robotic System for Precise Orthopaedic Surgery” that includes a ball probe cutter bit inserted into collet of cutting tool, and positioning of 3D CAD model of desired prosthesis shape relative to CT image of anatomy. *Id.* We are persuaded by Petitioner’s showing, and adopt it as our own, that Taylor discloses a system comprising a cutting tool and a workpiece that includes a target shape.

Petitioner also contends that Taylor describes a tracker to provide tracking data associated with the cutting tool and the workpiece, directing our attention to page 265 of Taylor that describes “specialized IO hardware . . . track[s] the position and orientation of the robot end effector during the cutting phase of the surgery” and also to page 270 of Taylor which describes an “independent checking subsystem” that verifies that the bone (e.g., workpiece) does not move relative to the fixator. Pet. 21–22. Petitioner also contends that Taylor describes a first marker associated with the cutting tool by directing attention to page 270 of Taylor which describes

light emitting diodes attached to the robot's wrist, and a second marker associated with the workpiece, directing attention to page 262 of Taylor regarding implanting three titanium pins into a patient's femur. *Id.* at 22.

Patent Owner argues that claim 1 requires that the tracking data associated with the workpiece are derived from a first marker associated with the workpiece and that Taylor does not describe "at least one first marker associated with the workpiece." PO Resp. 15, 16, 20. However, Patent Owner's arguments are not commensurate in scope with the language of claim 1. Claim 1 does not recite that the tracking data associated with the workpiece are derived from a first marker associated with the workpiece. Moreover, claim 1 recites "where the tracker includes *at least one of*: at least one first marker associated with the workpiece, and at least one second marker associated with the cutting tool." Emphasis added. Accordingly, a marker associated with the workpiece is not even required. As long as the prior art describes a marker associated with either the workpiece or the cutting tool, the limitation is satisfied. Taylor describes a marker associated with the cutting tool as described above and Patent Owner does not present arguments that Taylor does not describe a marker associated with the cutting tool. In any event, we agree with Petitioner's showing (Pet. 22) that Taylor also describes a marker associated with the patient's femur (workpiece), for example, titanium pins implanted into the patient's femur. Ex. 1008, 262. While the markers (titanium pins inserted in femur) are for the purpose of imaging the femur (workpiece) pre-operatively, there is nothing in claim 1 that requires that the tracking data be derived from such markers. Claim 1 does not require that the tracking data be derived from markers associated with either of the workpiece or the cutting tool.

We also have considered Patent Owner’s argument that Taylor describes bone fixation, which is the exact disadvantageous system described in the Specification of the ’582 patent. PO Resp. 17, 20. However, Patent Owner has not shown this argument to be particularly relevant to the anticipation inquiry. In other words, Patent Owner does not contend that claim 1 forecloses bone fixation, and we conclude that it does not.

Patent Owner argues that Taylor does not describe tracking data associated with a workpiece because Taylor’s system does not provide tracking data that identify the location and position of the workpiece over time within a coordinate system. PO Resp. 15–21. As explained above in the claim interpretation section, Patent Owner has not shown that the term “tracking data” necessarily includes data that identify a position (location) of the workpiece over time within a coordinate system. Rather, as explained above, “tracking data” include data associated with monitoring a characteristic of the workpiece. Taylor describes a redundant motion monitoring subsystem that, among other things, monitors strain gauges that can detect possible shifts of bone relative to a fixation device. Taylor further describes that in using the strain gauge system for detecting shifts or motions of the bone relative to the fixator, motions on the order of 0.1 mm could be detected. *Id.* at 270.⁶ Taylor further describes that if such a shift is detected

⁶ This description in Taylor contradicts Dr. Cleary’s testimony that the “strain gauge described in Taylor, however, only signals whether the workpiece has moved.” Ex. 2004 ¶ 44. By detecting that the bone has moved by a certain amount, (e.g., described in Taylor as being on the order of 0.1 mm), we find that Taylor describes doing more than signaling whether a workpiece has moved, and, thus, would appear to meet even Patent

a “freeze motion” signal is sent to the robot controller. Ex. 1008, 265.

Under the correct interpretation, Petitioner has shown, by a preponderance of the evidence that Taylor meets the claim 1 “tracking data associated with the workpiece” limitation.

Claim 1 recites “a controller to control the cutting tool based on the tracking data associated with the cutting tool and the tracking data associated with the workpiece.” Petitioner relies on the description on pages 264 and 265 of Taylor (Ex. 1008) of the system monitoring the position of the robot’s cutting tool relative to the shape that it is supposed to cut and stop cutting if it strays out of the desired volume for any reason. Pet. 22. Petitioner further relies on the description on page 265 of Taylor (Ex. 1008) of the system monitoring strain gauges that can detect possible shifts of bone relative to the fixation device and if either a shift is detected or the cutter tip strays more than a prespecified amount outside of the defined implant volume, a freeze motion signal is sent to the robot controller. *Id.* at 22–23.

Patent Owner argues that Taylor does not provide any tracking data about the actual location of the bone, or any data about the position of the bone relative to the cutting tool. PO Resp. 21–23. Patent Owner’s arguments are based on its narrow interpretation of tracking data, which, as explained above, we do not adopt.

Claims 5, 6, 8, 9, 13, 14, and 16

Claim 5 depends from claim 1 and recites that “the controller transmits a control signal to the cutting tool, where the control signal

Owner’s narrow interpretation of “tracking data associated with the workpiece.” In any event, and as explained in this Decision, we are not persuaded that claim 1 should be interpreted so narrowly.

includes at least one of: an analog signal, a digital signal, and no signal.” Ex. 1001, 20:61–64. Petitioner contends that Taylor’s description that its system will monitor the position of the robot’s cutting tool relative to the shape that it is supposed to cut and stop cutting if it strays out of the desired volume for any reason inherently must result from a control signal that is analog, digital, or null. Pet. 14, 23 (citing Ex. 1008, 264).

Patent Owner argues that claim 5 requires that the controller transmit a control signal to the cutting tool and not to a robot controller or anywhere else. Patent Owner argues that, at best, Taylor transmits a freeze motion signal to the robot controller, not the cutting tool itself. PO Resp. 24–25. We are not persuaded by Patent Owner’s arguments.

As pointed out by Petitioner, Taylor describes a “freeze motion signal” in which “each of the major control components . . . is able to freeze all robot motion or to turn off manipulator and cutter power in response to recognized exception conditions.” Pet. Reply 11 (citing Ex. 1008, 266). Dr. Cleary acknowledged, during cross examination, that turning off cutter power constitutes a control signal to the cutting tool. Ex. 1016, 37:14–38:21. Accordingly, based on the preponderance of the evidence standard, we find that claim 5 is anticipated by Taylor.

Claims 6, 8, and 14 each depend from claim 1. Petitioner shows that Taylor meets the limitations of each of these claims. Pet. 14–15, 23–25. We are persuaded by Petitioner’s showing, which we adopt as our own, that Taylor describes the limitations set forth in each of claims 6, 8, and 14. Patent Owner does not argue for the separate patentability of these claims. PO Resp. 23–28.

Claim 8 recites “where the system further includes at least one image associated with the workpiece and at least one image associated with the cutting tool.” Ex. 1001, 21:6–8. Claim 9 depends from claim 8 and recites “where the at least one workpiece image is registered to the workpiece, and the at least one cutting tool image is registered to the cutting tool.” *Id.* at 21:9–11. Petitioner accounts for claim 9 by directing to pages 263, 268, and 269 of Taylor. Pet. 24. For example, and for the at least one image associated with the workpiece image (a workpiece image registered to the image), Taylor describes that the surgical plan is based on anatomical information derived from CT images taken prior to surgery and further explains that reliable and accurate methods to locate the corresponding anatomical structures relative to the robot are essential. Ex. 1008, 263. For the at least one image associated with the cutting tool, Petitioner relies on the description of Taylor’s geometric calibration for the robot that uses kinematic modeling of the robot. Pet. 24, Ex. 1008, 268–69.

Patent Owner argues that Taylor does not describe a cutting tool image and, therefore, it does not describe registering such an image to the cutting tool. PO Resp. 25–26. In particular, Patent Owner argues Taylor’s kinematic model of the robot arm and cutting tool is not equivalent to a cutting tool image. *Id.* (citing Ex. 2004 ¶¶ 53–54). In support of Patent Owner’s arguments, Dr. Cleary testifies that a person of ordinary skill in the art would not understand a model of the robot to be a “cutting tool image” and that a kinematic model refers to a mathematical representation of an object in motion, while the ’582 patent describes the “image” as data generated from an imaging device, such as a CT scanner. Ex. 2004 ¶¶ 53–54.

Patent Owner does not explain why an image cannot be represented by a model as Petitioner asserts. *See, e.g.*, Pet. 24, Ex. 1008, 268–269; Pet. Reply 12. As pointed out by Petitioner in its Reply, the Specification of the ’582 patent describes methods and systems that can include “generating one or more *computer models* and/or a workpiece image that includes the target shape and a cutting tool image.” Pet. Reply 12 (citing Ex. 1001, 7:5) (emphasis added). Dr. Cleary, on cross examination, agreed that the claimed cutting tool image could be a model and most likely is a model based on that description in the Specification of the ’582 patent. Ex. 1016, 42:2–24. We give substantial weight to that part of Dr. Cleary’s testimony, because it is consistent with the Specification of the ’582 patent. Accordingly, Petitioner has shown, by a preponderance of the evidence, that Taylor describes a cutting tool image.

Claim 13 depends from claim 1 and recites “wherein the workpiece comprises at least one of: bone, cartilage, tendon, ligament, muscle, connective tissue, fat, neuron, hair, skin, a tumor, and an organ. Ex. 1001, 21:25–28. Petitioner accounts for this limitation, by citing page 262 of Taylor that describes a surgical procedure involving a femur. Pet. 25. Patent Owner argues that Taylor does not describe a workpiece comprising any of the claimed options of claim 13, but does not explain why a femur does not satisfy claim 13. PO Resp. 26. Rather, Patent Owner’s arguments are focused on alleged missing claimed features of claim 1. We explain above why Patent Owner’s arguments are not persuasive with respect to claim 1. Patent Owner’s arguments also are not persuasive with respect to claim 13.

Claim 16 depends from claim 1 and recites “where the controller includes at least one of a collision detection module and an intersection detection module.” Ex. 1001, 21:36–38. Petitioner contends that Taylor meets claim 16 by directing attention to page 270 of Taylor and the description found there that the independent checking subsystem verifies that the end effector never strays from a defined volume in space. Pet. 25. Petitioner contends that this description necessarily is a form of collision or intersection detection between the end effector and the defined surgical volume. *Id.* at 15.

Patent Owner argues that the independent checking subsystem of Taylor is not described as providing either “collision detection” or “intersection detection.” Patent Owner also argues that claim 16 requires that the collision detection module or intersection detection module be present in the controller of claim 1 which is a controller to control the cutting tool. Patent Owner argues that Taylor explicitly states that its independent checking subsystem is implemented on a separate PC/AT computer from the robot controller. PO Resp. 27–28 (citing Ex. 2004 ¶¶ 56–57).

Petitioner responds by explaining how Taylor describes a *system* that evaluates whether the end effector strays from the prespecified positional envelope in which it is supposed to cut, and argues that that description meets the claim 16 collision detection or intersection detection. Pet. Reply 13–14. Petitioner, however, does not respond to Patent Owner’s arguments or supporting evidence regarding the claim 16 requirement that the collision detection module or the intersection detection module be present in the

controller of claim 1. We give substantial weight to Dr. Cleary's testimony⁷ that a person of ordinary skill in the art would have understood that Taylor's independent checking subsystem is a system that is independent and separate from the robot controller. Ex. 2004 ¶ 57. Based on the record before us, Petitioner has not met its burden of proving by a preponderance of the evidence that Taylor describes that the controller that controls the cutting tool *includes* either a collision or intersection module. In particular, Petitioner has not shown that Taylor's description of an independent checking subsystem implemented on a separate PC/AT computer from the robot controller meets the limitation.

Claims 17 and 21–23

Independent claim 17 is similar to claim 1. Petitioner contends that Taylor meets all of the claim 17 limitations. Pet. 25–26. We are persuaded by Petitioner's showing, which we adopt as our own, that Taylor describes the limitations set forth in claim 17. Patent Owner makes similar arguments for claim 17 as it did for claim 1, namely that Taylor does not describe a system that tracks the cutting tool and the workpiece based on Patent Owner's narrow interpretation. PO Resp. 28–31. For reasons provided above, we are not persuaded by Patent Owner's arguments. Based on the

⁷ In contrast, Petitioner did not provide evidence in the form of declaration testimony, for example, in support of how Taylor anticipates claim 16. Dr. Howe's testimony, the only declaration evidence submitted by Petitioner in support of its Petition, does not address the specific limitations of claim 16, such as *the controller including* at least one of a collision detection module and an intersection detection module. Petitioner provides no independent declaration testimony in support of its Reply.

record before us, Petitioner has met its burden of showing by a preponderance of the evidence that claim 17 is anticipated by Taylor.

Claim 21 depends from claim 17 and is reproduced as follows:

Claim 21. A system according to claim 17, where the instructions to determine a relationship include instructions to:

represent the workpiece as a group of volume pixels (voxels),

based on the tracker data, perform at least one of classify the voxels and update the voxels.

Ex. 1001, 22:12–17.

Petitioner argues that claim 21 is met by Taylor's description that its CT scan is generated using voxels; cross sections through the 3D CT data set are displayed; and as surgery proceeds, the controller sends messages to the display computer to change the color of the portions of the cross sectional images corresponding to the cutting stroke, then change color again once a complete layer is cut. Petitioner also argues that simultaneously, the system must monitor the position of the cutting tool relative to the target shape and stop cutting if it strays out of the desired volume. Pet. 15, 28 (citing Ex. 1008, 266, 269). With respect to independent claim 17, from which claim 21 depends, Petitioner identifies the checking subsystem to meet the "instructions . . . to determine a relationship" limitation. Pet. 26. Petitioner also identifies the checking subsystem (motion monitoring subsystem) as the control system that includes instructions to cause a processor to track the cutting tool and workpiece and also as the tracker to track at least one of the cutting tool and the workpiece. *Id.*

Patent Owner argues that the tracker data are provided by tracking the cutting tool and the workpiece as recited in claim 17, that Taylor does not

describe either classifying or updating voxels using the tracking data, and that the only classification of voxels disclosed in Taylor involves classifying the CT-based image data on the basis of bone density, which has nothing to do with tracking data for the location of the workpiece. PO Resp. 31–33 (citing Ex. 2004 ¶¶ 64–65).

Although we disagree with Patent Owner that tracking data or to track the workpiece includes the location or position of the workpiece in a coordinate system as explained above, we do agree with Patent Owner that Petitioner has not sufficiently accounted for the instructions (instructions Petitioner identifies as coming from the checking subsystem) to, based on tracker data, perform at least one of classify voxels or update voxels. In particular, Petitioner has not shown, by a preponderance of the evidence that instructions from Taylor’s checking subsystem, based on the tracker data, perform at least one of classify the voxels and update the voxels, as the claim requires. The instructions, as Petitioner contends, are for detecting whether the cutter tip strays from a defined implant volume or whether the bone moves relative to the fixation device. Taylor describes that the output of the checking subsystem is a freeze motion signal to the robot controller. Petitioner, however, has not demonstrated sufficiently that the signal is also used to classify or update voxels of the represented workpiece.

We have considered the portion of Petitioner’s Reply addressing claim 21, which is very brief. In particular, Petitioner argues “[a]s discussed above in regard to claim 24, Taylor discloses using 3D images that are updated in realtime using tracking data.” Pet. Reply 15. Petitioner does not otherwise explain how Taylor uses the tracking data to update the 3D images, let alone update workpiece voxels. Moreover, we do not

understand, nor does Petitioner explain, how independent *method* claim 24 is relevant to claim 21, a claim which depends from independent *apparatus* claim 17. Independent claim 24 does not contain many of the limitations in claim 17 or claim 21. Claim 24 does not recite voxels at all, or updating voxels based on tracking data. Accordingly, having reviewed the discussion of claim 24 in Petitioner's Reply, we do not find such a discussion meaningful with respect to dependent claim 21. Based on the record before us, Petitioner has not shown, by a preponderance of the evidence that claim 21 is anticipated by Taylor. Because claims 22 and 23 depend from claim 21, Petitioner also has not shown, by a preponderance of the evidence that those claims are anticipated by Taylor.

Claim 24

Independent claim 24 recites a method comprising “providing a 4-D image associated with the workpiece” and “providing a 4-D image associated with the cutting tool.” Ex. 1001, 22:30–32. As explained above, in the claim interpretation section, the term “4-D image” means a 3-D image that is updated over time. The parties agree with this interpretation. PO Resp. 6–7, 37; Pet. Reply 10.

Petitioner contends that Taylor describes a 4-D image associated with the workpiece and a 4-D image associated with the cutting tool. Pet. 11–12, 29. In particular, Petitioner relies on the description at page 269 of Taylor (Ex. 1008), regarding the intraoperative display, and to kinematic modeling of the robot. *Id.* at 12, 29.

Patent Owner argues that Taylor does not describe 4-D images associated with either the workpiece or the cutting tool. PO Resp. 37–39; Ex. 2004 ¶¶ 67–72. In particular, and with respect to the claim requirement

of providing a 4-D image associated with the workpiece and cutting tool, Patent Owner argues that neither the description of the intraoperative display in Taylor nor the description of Taylor's kinematic and mathematical models meet the disputed terms, but instead, at most corresponds to static 3-D representations of the patient's leg and the robot. PO Resp. 38. Patent Owner relies on Dr. Cleary's testimony in support of its assertions. We give Dr. Cleary's testimony substantial weight that those portions to which Petitioner directs attention to in Taylor for meeting the 4-D images associated with the workpiece and cutting tool are not 4-D images. Ex. 2004 ¶¶ 68–70. Petitioner, on the other hand, does not provide supporting evidence that would support its assertions that Taylor does describe 4-D images. Fundamentally the term 4-D images is found nowhere in Taylor and Petitioner does not sufficiently explain, with supporting evidence, how Taylor describes 3-D images of both the workpiece and the cutting tool that are updated over time.

In its Reply, Petitioner argues that claim 24 does not require a 4-D image associated with the cutting tool. Pet. Reply 9. Claim 24, however, clearly does require a 4-D image associated with the cutting tool. Petitioner also argues that Taylor describes a real-time display of the progress of a procedure by changing the color of the portions of the cross-sectional images corresponding to the cutting stroke. But Petitioner's *attorney* arguments are not supported by evidence explaining or contradicting Dr. Cleary's testimony that that display does not display 4-D images, but only 2D images updated over time, and at most only of the leg, but not of the cutting tool. Ex. 2004 ¶ 70. We give substantial weight to Dr. Cleary's testimony because it is consistent with the description in Taylor of using 2D images for

displaying the workpiece (e.g., bone). Ex. 1008, 267, 269. Moreover, Petitioner's listing, at page 10 of its Reply, of various places in Taylor that describes *using 3-D images* is not responsive to Patent Owner's supported assertions regarding 4-D images, which is what is claimed. For all of the above reasons, and based on the record before us, Petitioner has failed to show sufficiently, by a preponderance of the evidence that Taylor describes a 4-D image associated with the workpiece and a 4-D image associated with the cutting tool. Because claims 25–30, 34–42, 47, and 50–58 all depend from claim 24, Petitioner also has not shown, by a preponderance of the evidence that those claims are anticipated by Taylor.

D. Obviousness Over Taylor and Glassman

Petitioner contends that claim 3 is unpatentable under 35 U.S.C. § 103(a) based on Taylor and Glassman. Pet. 18–19, 23. To support its contentions, Petitioner provides a detailed showing mapping limitations of claim 3 to structures described by the prior art. *Id.* Petitioner also relies upon the Declaration of Robert D. Howe (Ex. 1004) to support its position.

Glassman describes a robotic surgical system that includes a multiple degree of freedom manipulator arm having a surgical tool. Ex. 1009, Abstract. The surgical tool is described as a cylindrical high-speed (65,000 rpm) pneumatic surgical cutting tool. *Id.* at 3:32–36.

Claim 3 depends directly from claim 1 and specifies that the cutting tool includes at least one cutting element, and where the cutting element comprises at least one of: at least one blade, at least one rotatable blade, at least one retractable blade, at least one water jet, at least one particulate jet, at least one lithotripter, and at least one ultrasonic lithotripter.

Petitioner relies on Glassman for its description of a cylindrical high-speed (65,000 rpm) pneumatic surgical cutting tool, which Petitioner characterizes as a drill or rotatable blade. Pet. 18–19, 23; Ex. 1004 ¶¶ 37, 46. Petitioner concludes that it would have been obvious to modify the ball cutter in Taylor with other known cutting elements, such as the one described in Glassman. *Id.*

Patent Owner does not contend that Glassman does not meet the additional limitations of claim 3, or that it would not have been obvious to a person of ordinary skill in the art to combine the teachings of Glassman and Taylor. PO Resp. 52–54. Rather, Patent Owner argues that Glassman does describe the claim 1 elements. *Id.* The argument is misplaced as the Petition does not rely on Glassman to meet any of the claim 1 elements.

For all of these reasons, we agree with Petitioner’s showing, and adopt it as our own, that Taylor in combination with Glassman disclose a rotatable blade and that modifying Taylor’s ball cutter with Glassman’s rotatable blade would have been obvious for the reasons provided by Petitioner.

E. Obviousness Over Taylor and DiGioia

Petitioner contends that claim 7 is unpatentable under 35 U.S.C. § 103(a) over the combination of Taylor and DiGioia. Pet. 19–20. To support its contentions, Petitioner provides a detailed showing mapping limitations of claim 7 to structures described by the prior art. *Id.* Petitioner also relies upon the Declaration of Robert D. Howe for support. Ex. 1004.

DiGioia describes an apparatus for facilitating the implantation of an artificial component in, for example, a hip joint. The apparatus includes a pre-operative geometric planner and a pre-operative geometric kinematic

biomechanical simulator in communication with the pre-operative geometric planner. Ex. 1010, 4:59–65. During intra-operative stages, a computer system is used to display relative locations of the objects being tracked with a tracking device. The tracking device uses markers that may be attached to bones, tools, or other objects to provide precision tracking of the objects. The markers are described as including any of emitter/detector systems including optic, acoustic, video-based, mechanical, electromagnetic and radio frequency (RF) systems, and one embodiment describes using a camera to track light emitting from light emitting diodes. *Id.* at 6:24–43.

Claim 7 depends indirectly from claim 1 and specifies the claimed markers include at least one of an infrared source, RF source, ultrasound source, and transmitter. Ex. 1001, 21:1–5.

Petitioner contends that Taylor describes infrared markers on the cutting tool (light emitting diodes), but does not explicitly disclose a marker on the workpiece that meets claim 7. Rather, as pointed out by Petitioner, the markers on the workpiece are titanium pins. Petitioner argues that DiGioia describes a tracking system that uses infrared markers, citing to column 6, lines 24 to 43 of DiGioia. Pet. 19–20, 23 (citing Ex. 1008, 6:24–43); Ex. 1004 ¶¶ 45, 47. Petitioner concludes that it would have been obvious to substitute the titanium pin markers in Taylor for other known markers, such as the ones described in DiGioia. *Id.*

Patent Owner argues that Taylor teaches away from using image-based tracking of the workpiece because Taylor (1) relies on bone fixation, (2) highlights drawbacks of using additional equipment in a crowded operating room, and (3) provides no guidance for how its automatic robotic

system could be combined with image-based tracking using a manual or semi-automatic robotic system as claimed. PO Resp. 55–56.

A reference does not teach away if it merely expresses a general preference for an alternative invention but does not “criticize, discredit, or otherwise discourage” investigation into the invention claimed. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Here, Patent Owner has not shown sufficiently that Taylor would have discouraged a person of ordinary skill in the art from replacing Taylor’s titanium pin markers with infrared markers. As explained already, the claims do not preclude bone fixation, and, therefore, whether Taylor fixes the bone during operation has not been shown to be particularly relevant in determining whether claim 7 would have been obvious based on Taylor and DiGioia.

Patent Owner’s arguments regarding items 2 and 3 above also are not persuasive, because such arguments are narrowly based on incorporating physically all technicalities of DiGioia into Taylor. *See, e.g.*, PO Resp. 55–56. The test for obviousness is what the combined teachings of the references would have suggested to a person of ordinary skill in the art, not whether one reference may be bodily incorporated into the structure of another reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). In particular, and in support of Patent Owner’s arguments, Dr. Cleary opines that Taylor discourages using an image-based tracking system, such as DiGioia’s, in the operating room. Ex. 2004 ¶ 112. But Petitioner does not propose using DiGioia’s whole system with Taylor’s system. Rather, DiGioia is relied on for its teaching of infrared markers. Patent Owner’s arguments, and the supporting testimony of Dr. Cleary, are premised on the

assumption of incorporating all features of DiGioia into Taylor, which is not what Petitioner proposes.

For all of the above reasons, we agree with Petitioner's showing, and adopt it as our own, that Taylor in combination with DiGioia disclose the limitations of claim 7 and that substituting Taylor's titanium pins with DiGioia's infrared markers would have been desirable for the reasons provided by Petitioner.

F. Obviousness Over Taylor

Petitioner contends that claim 11 is unpatentable under 35 U.S.C. § 103(a) as obvious over Taylor. Pet. 20, 24–25. To support its contention, Petitioner provides detailed explanations as to how the prior art meets each claim limitation of claim 11. *Id.* Petitioner also relies upon the Declaration of Robert D. Howe for support. Ex. 1004.

Claim 11 depends directly from claim 1 and recites means to provide at least one image associated with the workpiece, and means to provide at least one image associated with the cutting tool. As discussed above in the claim interpretation section, the corresponding structure for the means in both instances is a CAD, CT, MRI, X-Ray, fluoroscopy and/or ultrasound, and equivalent structures.

Petitioner argues that while Taylor describes providing an image of the workpiece using CT, Taylor does not expressly describe any of the structures to provide an image of the cutting tool. Pet. 20. Petitioner concludes that it would have been obvious to a person having ordinary skill in the art to modify Taylor and use a CAD model for the cutting tool in order to accurately track cutting progress that is described in Taylor. Pet. 20; Ex. 1004 ¶ 48.

Patent Owner argues that even if Taylor were modified such that it disclosed means to provide at least one image associated with the cutting tool, Taylor still would not render claim 11 obvious because Taylor does not meet claim 1. PO Resp. 57. The argument is not persuasive. We have explained above why we are not persuaded by Patent Owner's arguments regarding Taylor not anticipating claim 1, and, therefore, determine that such arguments are not persuasive here.

Patent Owner also argues that Petitioner does not provide a reason why a person of ordinary skill in the art would have modified the automatic robotic surgical system of Taylor to provide means for imaging the cutting tool. *Id.* Petitioner does provide a reason, supported by evidence. Pet. 20; Ex. 1004 ¶ 48. In particular, Dr. Howe testifies that it would have been obvious to a person of ordinary skill in the art to use the known technique of a CAD model for the cutting tool in order to more accurately track cutting progress with computer-aided imaging and identify tissue remaining to be cut. Ex. 1004 ¶ 48. Patent Owner does not provide sufficient evidence to rebut Dr. Howe's testimony, which we give more weight to than Dr. Cleary's testimony as to this issue.

For all of these reasons, we agree with Petitioner's showing, and adopt it as our own, that it would have been obvious to modify Taylor and use a CAD model for the cutting tool for the reasons provided by Petitioner.

G. Obviousness Over Taylor and Delp

Petitioner contends that claim 48 and 49 is unpatentable under 35 U.S.C. § 103(a) over Taylor and Delp. Pet. 56–59. To support its contentions, Petitioner provides a detailed showing mapping limitations of

claims 48 and 49 to the prior art. *Id.* Petitioner also relies upon the Declaration of Dr. Gregory F. Welch (Ex. 1013) to support its position.

Claims 48 and 49 depend from claim 24. As explained above, Petitioner has not shown, by a preponderance of the evidence, that Taylor anticipates claim 24. Petitioner does not rely on Delp to teach any of the features of claim 24, but relies on the disclosure of Delp for the features in dependent claims 48 and 49. *Id.* Because claims 48 and 49 include all of the elements of claim 24, we conclude that Petitioner has not sufficiently shown, by a preponderance of the evidence, that Taylor in combination with Delp meet all of the elements of claims 48 and 49.

H. Patent Owner's Motion to Exclude

Patent Owner moves to exclude certain portions of Dr. Cleary's cross-examination testimony (Exhibit 1016). PO Mot. to Exclude. In particular, Patent Owner seeks to exclude certain questions (Ex. 1016, 65:22–24, 66:21–23) along with the answers to those questions (Ex. 1016, 66:4–11, 67:3–6). *Id.*

In rendering the Final Written Decision, we did not rely on those portions of Dr. Cleary's testimony that Patent Owner seeks to exclude. Accordingly, we *dismiss* Patent Owner's Motion to Exclude as moot.

III. CONCLUSION

Based on the evidence and arguments, Petitioner has demonstrated by a preponderance of the evidence that claims 1, 5, 6, 8, 9, 13, 14, and 17 of the '582 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by Taylor; claim 3 is unpatentable under 35 U.S.C. § 103(a) as obvious over Taylor and Glassman; claim 7 is unpatentable under 35 U.S.C. § 103(a) as obvious over Taylor and DiGioia; and claim 11 is unpatentable under 35

U.S.C. § 103(a) as obvious over Taylor. Petitioner has not shown by a preponderance of the evidence that claims 16, 21–30, 34–42, 47, and 50–58 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Taylor, or that claims 48 and 49 are unpatentable under 35 U.S.C. § 103(a) as obvious over Taylor and Delp.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1, 3, 5–9, 11, 13, 14, and 17 of the '582 patent are held unpatentable;

FURTHER ORDERED that the Patent Owner's motion to exclude evidence is *dismissed*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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