

# United States Court of Appeals for the Federal Circuit

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SIRONA DENTAL SYSTEMS GMBH,  
*Appellant*

v.

INSTITUT STRAUMANN AG, DENTAL WINGS INC.,  
*Cross-Appellants*

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2017-1341, 2017-1403

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Appeals from the United States Patent and Trade-  
mark Office, Patent Trial and Appeal Board in No.  
IPR2015-01190.

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Decided: June 19, 2018

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Washington, DC, argued for appellant. Also represented  
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FEIGELSON.

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Before PROST, *Chief Judge*, MOORE and STOLL, *Circuit Judges*.

MOORE, *Circuit Judge*.

Sirona Dental Systems GmbH appeals the final written decision of the Patent Trial and Appeal Board (“Board”) holding claims 1–8 of U.S. Patent No. 6,319,006 unpatentable as obvious over the combination of German Patent No. 195 10 294 (“Bannuscher”) and U.S. Patent No. 5,842,858 (“Truppe”), and denying Sirona’s contingent motion to amend the claims. Institut Straumann AG and Dental Wings Inc. (collectively, “Petitioners”) cross-appeal the Board’s decision holding patentable claims 9–10 of the ’006 patent. For the following reasons, we affirm-in-part, vacate-in-part, and remand-in-part.

#### BACKGROUND

The ’006 patent “relates to a method for producing a drill assistance device,” i.e., a drill template, “to precisely place a pilot hole for a tooth implant, wherein the pilot hole for the tooth implant is aligned relative to the teeth that still remain in the jaw.” ’006 patent at 1:6–9. The specification discloses taking X-ray images of the jaw and taking a three-dimensional optical image of the visible surfaces of the jaw and teeth. *Id.* at 2:15–20, 3:50–59. These images are compiled into “measured data records” and correlated. *Id.* at 2:21–23, 2:58–3:11. One way to correlate the images is by placing markers at fixed points that are visible in both images and superimposing the images based on the locations of the markers. *Id.* at 2:58–65, 3:63–4:3. From this correlation, the position for the implant is determined and a drill template is prepared. *Id.* at 2:33–45, 2:51–57, 4:17–36, 4:55–62.

Petitioners sought inter partes review of claims 1–10 of the ’006 patent. Ground 1 argued claims 1–4 and 9–10 were anticipated by U.S. Patent No. 5,562,448 (“Mushabec”); ground 2 argued claims 1–4 and 9–10 were antici-

pated by a printed publication titled “Computer-Assisted Dental Implant Surgery Using Computed Tomography” (“Fortin”); ground 3 argued claims 1–10 would have been obvious based on Bannuscher and Truppe; and ground 4 argued claims 1–10 would have been obvious based on Fortin and Truppe. The Board instituted inter partes review based on grounds 1 and 3. After institution, Sirona filed a contingent motion to amend the claims pursuant to 37 C.F.R. § 42.121. Petitioners opposed the motion, arguing that the proposed substitute claims would have been obvious based on Mushabec, U.S. Patent No. 5,725,376 (“Poirer”), a printed publication titled “Computer-Assisted Milling of Dental Restorations Using a New CAD/CAM Data Acquisition System” (“Willer”), and U.S. Patent No. 5,967,777 (“Klein”), as well as obvious based on Mushabec, International Publication No. WO 95/28688 (“Swaelens”), and Klein.

The Board held that claims 1–8 would have been obvious based on Bannuscher and Truppe. It held that Petitioners had not met their burden of demonstrating claims 9–10 would have been obvious based on Bannuscher and Truppe, or that claims 1–4 and 9–10 were anticipated by Mushabec. The Board denied Sirona’s contingent motion to amend because Sirona failed to meet its burden of demonstrating that proposed substitute claims 11–18 would not have been obvious over Bannuscher and Truppe in view of Klein and Poirer.

Sirona appeals the determination that claims 1–8 are unpatentable and the denial of its contingent motion to amend. Petitioners cross-appeal the determination that claims 9–10 are patentable. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

#### DISCUSSION

We review the Board’s legal determination of obviousness de novo and its factual findings for substantial evidence. *Outdry Techs. Corp. v. Geox S.p.A.*, 859 F.3d

1364, 1367 (Fed. Cir. 2017). We review its procedures for compliance with the Administrative Procedure Act (“APA”) de novo, and we must set aside Board decisions if they are “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. § 706; *EmeraChem Holdings, LLC v. Volkswagen Grp. of Am., Inc.*, 859 F.3d 1341, 1345 (Fed. Cir. 2017).

## I. Sirona’s Appeal

### A

Sirona appeals the Board’s obviousness determination regarding claims 1–8 based on the combination of Ban-nuscher and Truppe. Claim 1 of the ’006 patent recites:

1. Method for producing a drill assistance device for a tooth implant in a person’s jaw, comprising the following process steps:

taking an x-ray picture of the jaw and compiling a corresponding measured data record,

*carrying out a three-dimensional optical measuring of the visible surfaces of the jaw and of the teeth and compiling a corresponding measured data record,*

correlating the measured data records from the x-ray picture and from the measured data records of the three-dimensional optical measuring,

determinating the optimal bore hole for the implant, based on the x-ray picture, and

determinating a pilot hole in a drill template relative to surfaces of the neighboring teeth based on the x-ray picture and optical measurement.

Claims 2–8 depend on claim 1. Sirona does not raise separate patentability arguments for dependent claims 2–8, so their patentability depends on the patentability of claim 1.

Petitioners and Sirona filed different translations of Bannuscher, a German reference. It describes a method of determining an optimal position for a dental implant based on 3-D model geometry of the mouth or jaw region and an X-ray image of the same and producing a surgical template with this optimal position to use in implant surgery. The structures of the mouth can be recorded, combined with other parameters, and presented graphically in a 3-D computer simulation to assist in surgical preparation. The different translations both describe digitally inputting plaster models cast from impressions taken of the “patient’s oral situation” into a computer, but do so differently. J.A. 665; *id.* at 1555. According to Petitioners’ translation, the plaster models are transferred into a skull-based simulator in a 3-D relationship “using a recording sheet.” J.A. 665 at 8:23–32. According to Sirona’s translation, the plaster models are transferred “into a skull-referenced simulation device with the aid of a recording bow.” J.A. 1555. Based on these different translations, the parties dispute whether Bannuscher digitally inputs structures of the mouth or movements of the jaw into the simulation.

Truppe relates to enabling “planning of a surgical operation in the region of the jaw from a model” that incorporates “representations from imaging methods.” J.A. 656. It describes using a video camera with a position sensor to create an optical representation of a jaw or a model, which is displayed on a monitor. It discloses taking at least one picture of the jaw with an X-ray imaging process and storing the picture as a data set. Three-dimensional sensors located on the jaw and the camera allow a computer to calculate “a representation of the data set from the imaging process in real time and

display[] it on the screen” with the proper viewing angle and scale. J.A. 657–58.

## B

The obviousness framework under 35 U.S.C. § 103 requires determining “(1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the art; and (4) objective considerations of nonobviousness.” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1358 (Fed. Cir. 2017). These are questions of fact reviewed for substantial evidence. *Id.*

The Board construed “carrying out a three-dimensional optical measuring of the visible surfaces of the jaw and of the teeth” as “using light to measure the visible surfaces of the jaw and teeth in three dimensions,” which the parties do not dispute. J.A. 9. It concluded that claims 1–8 would have been obvious over Bannuscher and Truppe. Sirona does not challenge the Board’s legal analysis. The only questions on appeal are whether substantial evidence supports the Board’s findings that the combination of Bannuscher and Truppe discloses “carrying out a three-dimensional optical measuring of the visible surfaces of the jaw and of the teeth and compiling a corresponding measured data record” based on the Board’s construction, and whether a person of ordinary skill in the art would have been motivated to combine the references. Specifically, the Board found that “Bannuscher discloses digitally inputting the X-ray image and 3-D model geometry of a patient’s jaw and teeth into a computer for ‘correlating’ the data sets.” J.A. 32. It found that Bannuscher does not disclose carrying out a 3-D optical measuring of the visible surfaces of a patient’s jaw and teeth but found that Truppe did, “using light from a conventional video camera, with reference to a three-dimensional coordinate system provided by the relative positions of the magnetic sensors.” J.A. 35. It

found that a person of ordinary skill in the art would have been motivated to use Truppe's optical measurement system to generate 3-D surface data of the jaw and teeth for use in Bannuscher's planning simulation software to assist in determining the optimal implant position.

Sirona argues that Bannuscher uses a "recording bow," which only measures movement of the jaw joint, not surface structures, to transfer the 3-D relationship of the plaster models into a computer. It argues Bannuscher never indicates that data reflecting the topography of the plaster models is input into a computer and Petitioners never identified an instrument in Bannuscher that could do so. Substantial evidence, however, supports the Board's finding that such data is input. The Board determined that whether Bannuscher uses a recording bow to measure jaw movement is not dispositive in light of Bannuscher's other disclosures. Bannuscher discloses that "a three-dimensional model geometry of the mouth or jaw region and an X-ray image thereof are input digitally, relative to the patient's skull, into a computer." J.A. 663; *see also id.* at 665 (disclosing taking impressions of a patient's "oral situation," forming 3-D plaster models from the impressions, and digitally inputting the plaster models into a computer). The 3-D model geometry refers to the plaster model of the mouth or jaw region, which represents the visible surfaces of the jaw and teeth. Based on this disclosure, substantial evidence supports the Board's finding that Bannuscher digitally inputs the structures from the plaster model for correlation and not simply jaw movement.

Substantial evidence also supports the Board's finding that Truppe discloses "carrying out a three-dimensional optical measuring of the visible surfaces of the jaw and teeth," as claimed. Truppe discloses using a video camera provided with a position sensor to create an optical representation of the jaw. It discloses that, based on the known 3-D locations of the camera and the jaw, a 3-D

optical representation of the structures of the jaw can be calculated. This 3-D representation can be made from the actual jaw or a model of the jaw. It discloses that 3-D structures are inserted into a digital X-ray image of the jaw to make it easier to see the structures and perform a simulation. The optical representation and the X-ray image are joined in a “positionally correct relationship” such that the structures of the X-ray image always match the structures of the optical representation even if the jaw moves three-dimensionally. J.A. 657.

Sirona does not dispute that Truppe discloses an optical measuring of the visible surfaces of the jaw and teeth. Instead, it argues that Truppe’s camera measures only in 2-D and that Truppe uses electromagnetic sensors to determine the relative positions of the jaw in 3-D. The Board construed this claim term as “using light to measure the visible surfaces of the jaw and teeth in three dimensions.” J.A. 9. This construction, which was not challenged on appeal, does not require any specific type of optical measuring instrument. Indeed, the ’006 patent describes measuring the jaw and teeth “using a three-dimensional system of coordinates.” ’006 patent at 3:50–53. That is precisely what Truppe discloses. Truppe uses an optical camera along with 3-D sensors and a device for positional determination to create a 3-D optical representation that can be inserted into the 3-D X-ray image in a positionally-correct manner. The Board’s construction requires no more than that.

Substantial evidence also supports the Board’s finding that a person of ordinary skill in the art would have been motivated to combine Bannuscher and Truppe. As the Board noted, Petitioners did not propose substituting Truppe’s camera in place of Bannuscher’s recording bow. Rather, the Board found that a person of ordinary skill “would have had reason to incorporate the teaching of Truppe’s enhanced 3-D optical measurement technique into Bannuscher’s method for correlating 3-D X-ray image



and model geometry data sets, to determine an optimal bore hole and corresponding pilot hole in the drill template.” J.A. 41. It relied on Petitioners’ expert, who testified that it would have been desirable to have as much diagnostic information as possible when planning for dental implant surgery. It also relied on advantages disclosed in Truppe of incorporating optical imaging data to obtain a vivid representation of the jaw. Relying on Petitioners’ expert, the Board found that both Truppe and Bannuscher disclose a similar process of correlating 3-D X-ray and visible imaging data of the jaw and teeth to generate the best representation of a patient’s jaw and teeth. This evidence is enough to support the Board’s finding of a motivation to combine.

Because substantial evidence supports the factual findings challenged on appeal and no issues were raised regarding the Board’s legal analysis, we affirm the Board’s conclusion that claims 1–8 would have been obvious over the combination of Bannuscher and Truppe.

### C

Sirona challenges the Board’s final written decision, arguing that the Board relied on theories that first appeared in the final written decision. Specifically, it argues that the petition relied on Bannuscher’s disclosure of a “recording sheet” to input surface structures of the plaster models into a computer, but the proper translation is “recording bow,” which cannot digitally input surface structures. It argues the Board violated the APA when it determined that Sirona’s recording bow argument was not relevant and put together its own obviousness theory based on Bannuscher’s input of “geometry data,” which does not appear in the petition.

An inter partes review must proceed “in accordance with or in conformance to the petition.” *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) (internal quotations omitted). “Nothing suggests the Director enjoys a license

to depart from the petition and institute a *different* inter partes review of his own design.” *Id.* (emphasis in original). “The rest of the statute confirms, too, that the petitioner’s petition, not the Director’s discretion, is supposed to guide the life of the litigation.” *Id.* “[T]he statute tells us that the petitioner’s contentions, not the Director’s discretion, define the scope of the litigation all the way from institution through to conclusion.” *Id.* at 1357. It would thus not be proper for the Board to deviate from the grounds in the petition and raise its own obviousness theory, as Sirona contends.

## 1

We hold that the Board’s unpatentability determination regarding claims 1–8 did not, as Sirona contends, deviate from the grounds alleged in the petition. The petition discussed Bannuscher’s 3-D plaster models being input into a computer and cited to Bannuscher’s 3-D model geometry of the mouth or jaw region as disclosing the claimed “measured data record” of the 3-D measuring. The Board cited to these same portions of Bannuscher to support its finding that “Bannuscher discloses using digitized 3-D X-ray data and 3-D geometry data of the jaw and teeth to determine the optimum 3-D position of a bore hole and corresponding pilot hole in the drill template.” J.A. 33. The Board did not change theories simply because the petition did not use the exact words “geometry data.” See *Rambus Inc. v. Rea*, 731 F.3d 1248, 1255 (Fed. Cir. 2013) (“[T]he Board is not required to ‘recite and agree with the examiner’s rejection *in haec verba*’ in order to ensure that the PTO has provided adequate notice.” (quoting *In re Leithem*, 661 F.3d 1316, 1319 (Fed. Cir. 2011))).

We conclude that the Board did not deviate from the grounds in the petition by relying upon the geometry data and citing for support the same portions of Bannuscher that the petition cited. Moreover, Sirona itself spent

much of its Patent Owner Response arguing that Bannuscher does not disclose inputting the geometry data of the plaster models into a computer because of its disclosure of a recording bow. The Board addressed this argument but dismissed it as not dispositive of the issue because other portions of Bannuscher, to which the petition cited, explain that the plaster models, not jaw articulation movements represented by the plaster models, are digitally input into a computer. It is not the case that the Board deviated from the grounds or evidence cited in the petition. The Board simply used the term “geometry data” to refer to the digitized plaster models that were expressly cited in the petition. Because the petition provided Sirona notice and opportunity to address the portions of Bannuscher relied on by the Board, the Board’s reliance on these portions of Bannuscher did not violate the APA and is not inconsistent with SAS.

## 2

Sirona also challenges the Board’s denial of its contingent motion to amend. Sirona filed its contingent motion to amend concurrently with its Patent Owner Response. Its proposed substitute claim 11 amended claim 1 as follows:

1. Method for producing a drill assistance device for a tooth implant in a person’s jaw, the tooth implant to be positioned between neighboring teeth, comprising the following process steps:

taking an x-ray picture of the jaw and compiling a corresponding measured data record,

carrying out a three-dimensional optical measuring of the visible surfaces of the jaw and of surfaces of the neighboring teeth and compiling a corresponding measured data record,

correlating the measured data records from the x-ray picture and from the measured data records of the three-dimensional optical measuring,

determinating the optimal bore hole for the implant, based on the x-ray picture, and

determinating a pilot hole in a drill template relative to surfaces of the neighboring teeth based on the x-ray picture and optical measurement, and

producing the drill template containing the pilot hole and negatives of the surfaces of the neighboring teeth, wherein the negatives of the surfaces of the neighboring teeth are formed by a machine based on the measured data record obtained from the three-dimensional optical measuring in the carrying out step.

J.A. 336–38. Proposed substitute claims 12–18 depend from claim 11 and are otherwise identical to claims 2–8.

The Board erred when it denied Sirona’s contingent motion to amend. Sirona challenged the Board’s denial on multiple grounds. It argued that the Board improperly placed the burden on Sirona to prove that the proposed substitute claims were patentable. It argued that the Board improperly rejected the proposed substitute claims based on a combination of references not raised by Petitioners. It argued that, even if the Board *could* rely on a combination of references not raised by Petitioners, Sirona did not receive notice and an opportunity to respond to the combination of references the Board relied on, as required under the APA.

The petitioner bears the burden of proving that proposed amended claims are unpatentable. *Aqua Prods.*,

*Inc. v. Matal*, 872 F.3d 1290, 1324–25 (Fed. Cir. 2017) (en banc) (plurality opinion). The final written decision, which issued prior to our en banc decision in *Aqua Products*, improperly placed the burden on Sirona to demonstrate that the proposed substitute claims were patentable. Thus, we must vacate the Board’s denial of Sirona’s contingent motion to amend and remand for the Board to reconsider in light of *Aqua Products*.

We need not address Sirona’s other alleged errors at this time. Instead, we leave to the Board to determine in the first instance, in light of recent precedent including *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348 (2018), whether it may consider combinations of references not argued by the petitioner in opposing the motion to amend claims, and, if so, what procedures consistent with the APA are required to do so.

## II. Petitioners’ Cross-Appeal

The Board concluded that Petitioners did not demonstrate that claims 9 and 10 were unpatentable over Bannuscher and Truppe. Claim 9 depends from claim 1 and recites:

9. The method according to claim 1, wherein the drill assistance device is ground out from a dimension-stable material, and said material represents the form of occlusal surfaces of neighboring teeth as a negative with respect to an implant position.

Claim 10 depends from claim 9.

The Board found that Bannuscher did not satisfy the “drill assistance device” limitation of claims 9–10. It found that Bannuscher’s plaster model was not “ground out” and was a positive representation of the teeth, not a negative representation. It noted Petitioners inconsistently cited Bannuscher’s operation template as the “drill assistance device” in claim 1, but cited the plaster models

for the same term in claim 9. It credited Sirona's expert, who testified that Bannuscher's operation template "typically would be molded on the surface of the plaster model, not ground out or milled," and found that Petitioners did not demonstrate "why or how Bannuscher would have taught a [person of ordinary skill] to grind out a drill assistance device" satisfying claim 9. J.A. 44. Substantial evidence supports these findings.

Petitioners do not argue that the combination of Bannuscher and Truppe discloses the claimed "drill assistance device" of claim 9. Rather, they argue that the Board, as a legal matter, should have applied findings from its analysis of Sirona's contingent motion to amend to its analysis of claims 9–10. They argue, when analyzing the motion to amend, the Board found that the use of machines to make the claimed drill assistance device was known. They argue claim 11 covers similar scope to the term "ground out from a dimension-stable material" in claim 9, which refers to removal of material by grinding or cutting operations to form a relief pattern that represents negatives of the neighboring teeth surfaces. Petitioners are, in essence, attempting to add references to the ground of unpatentability put forth in their petition. When analyzing the contingent motion to amend, the Board considered multiple references in combination with Bannuscher and Truppe that were not asserted together in the petition. Poirier contains the disclosures that Petitioners contend show the limitations of claim 9 were known to a person of ordinary skill. But Petitioners never argued Poirier in combination with Bannuscher and Truppe. We see no error in the Board's decision not to decide grounds of unpatentability not raised in the petition. *See SAS*, 138 S. Ct. at 1355–57. Thus, we affirm the Board's determination regarding claims 9–10.

CONCLUSION

For the forgoing reasons, we affirm the Board's conclusion that claims 1–8 of the '006 patent are unpatentable, we affirm the Board's conclusion that Petitioners failed to demonstrate claims 9–10 were unpatentable, and we vacate the denial of the contingent motion to amend and remand for further proceedings consistent with this opinion.

**AFFIRMED-IN-PART, VACATED-IN-PART,  
REMANDED-IN-PART**

COSTS

No costs.