

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QSC AUDIO PRODUCTS, LLC

Petitioner

v.

CREST AUDIO, INC.

Patent Owner

Case: IPR2014-00131

Patent No. 5,652,544

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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I. Summary of Argument

Using a removable connection, instead of a permanent connection, between an external programmer used to program a DSP and an amplifier would have been obvious to a person of skill in the art at the time of the invention of the '544 patent. In its response, the Patent Owner makes two main arguments.

First, Patent Owner argues that a removable connection would not have been obvious over the Sudo-Porambo or Sudo-Krokstad combinations because Sudo requires a high-speed connection. According to Patent Owner, Sudo's high-speed connection means that Sudo's connection is necessarily hardwired. This is wrong. Both experts acknowledge that (1) a PCI connection could be used in Sudo and (2) a PCI connection is removable. So, Sudo discloses both removable and permanent connections. Also, Krokstad demonstrates a removable connection. So, even if Patent Owner was correct about Sudo—and it is not—Patent Owner's argument would still fail.

Patent Owner's second main argument is that the combination of Sudo and Krokstad does not render the '544 patent obvious because Krokstad's DSP is not reprogrammable. Patent Owner claims that Krokstad's DSP is a special-purpose chip. This is factually wrong and legally irrelevant. It is factually wrong because it is based on Patent Owner's expert's incorrect understanding of Krokstad's disclosure. It is legally irrelevant because even if Krokstad's DSP were not reprogrammable—which it is—Sudo's DSP is reprogrammable. So, the combination still shows why the '544 patent would have been obvious.

Patent Owner makes a variety of other arguments. For instance, Patent

Owner builds a straw man by reading limitations into the claims that are not present, and then arguing that the prior art does not disclose these extraneous limitations. Under the correct claim constructions, all the limitations are present. Patent Owner also argues that Petitioner's expert is not qualified to testify on what would have been obvious because he is not an amplifier designer. But being an amplifier designer is not required to opine on the obviousness of the '544 patent, and so this criticism also misses the point.

Claims 1-15, 18-21, and 22-26 should be canceled as obvious.

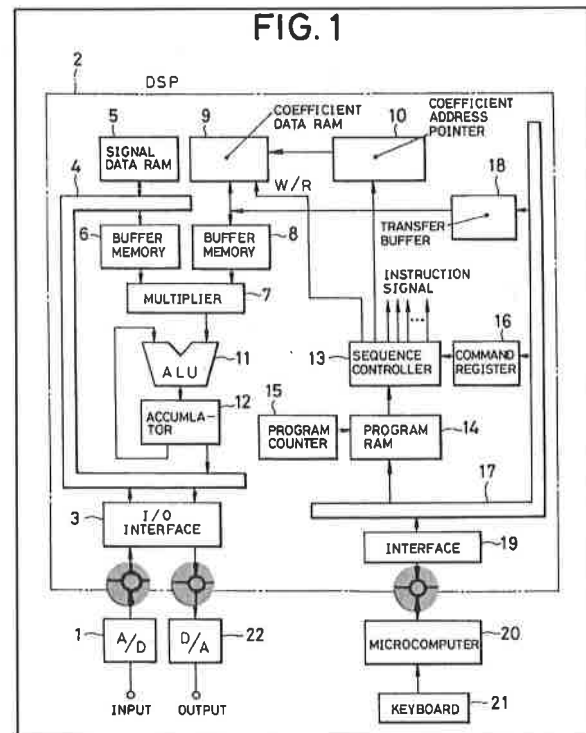
II. Patent Owner Fails to Rebut the *Prima Facie* Finding of Obviousness of Claim 1 Over Sudo and Porambo

Patent Owner makes three arguments purporting to show that Sudo's connection between the microcomputer (20) and the DSP must be hardwired. None survive review.

First, Patent Owner claims that the connection must be hardwired because the microcomputer must be connected to the DSP to allow signal processing functions and parameters to be loaded into the DSP during operation. PO Resp. at pg. 8. That is true as far as it goes. But this does not mean—and in fact does not even suggest—that the microcomputer must be *permanently* connected to the DSP. Patent Owner does not point to any disclosure in Sudo that suggests this connection must be permanent.

Patent Owner's second argument for a hardwired connection is that the connection must be hardwired because of the required speed of transfer. PO Resp. at 24-26. But both Dr. Ellis and Mr. Cordell agree that Sudo's high-speed connection could be implemented using a PCI bus. A PCI bus satisfies Sudo's speed requirement, and is, by definition, a removable connection. Ex. 2002 at pg. 178:10-17; Ex. 1012 at pp. 93:1-94:19.

Patent Owner's third argument relies on Sudo's Figure 1, shown right. Patent Owner claims that the three circles shown along the edge of Figure 1 (enlarged and shown in red) represent pins and hardwired connections, and so, the DSP must be an integrated circuit. PO Resp. at pp. 24-26. But Patent Owner does not—because it cannot—point to any actual disclosure in Sudo that supports this speculation. To the contrary, during his deposition, Mr. Cordell admitted that the words “pin,” “pad,” “hardwired,” “soldered,” “integrated circuit,” or “chip” do not appear *anywhere* in Sudo. Ex. 1012 at pp. 78:8-80:7.



Patent Owner's only attempt to distinguish Porambo is based on a misstatement of Porambo's specification. Patent Owner claims that Porambo's DSP “does not process a received audio signal.” PO Resp. at pg. 9. Porambo's

specification says otherwise. For example, Porambo discloses an AM/FM Tuner (24), CD player (15), and tape deck (25) all of which provide audio inputs to DSP (28) for delivery to amplifier (34) and playback through speakers (16, 18, 20, 22). Porambo also discloses circuitry for processing audio signals from various inputs and delivering them to the amplifier. *See, e.g.*, Ex. 1006 at Fig. 1; 4:1-27. These are examples of the DSP processing a received audio signal, contrary to Patent Owner's assertion.

Both experts agree that a removable connection, such as a PCI bus, could be used to connect the microcomputer of Sudo to the DSP, thus it would have been obvious to a person of ordinary skill that a removable connection could be used in Sudo. And while Sudo does not explicitly disclose the use of an amplifier with the DSP, the use of an amplifier with a DSP was well known as shown by Porambo. Claim 1 is obvious over Sudo in view of Porambo. *See* Ex. 1003 ¶¶ 30-33.

III. Patent Owner Fails to Rebut the *Prima Facie* Finding of Obviousness of Claim 1 Over Sudo and Krokstad

Patent Owner tries to distinguish Krokstad on the grounds that Krokstad does not disclose a DSP capable of receiving signal processing functions. But this argument is based on Mr. Cordell's misunderstanding of Krokstad's disclosure.

Mr. Cordell claims that "in Krokstad there is very little silicon real estate." Ex. 1012 at pg. 116:1-18. Based on this, Mr. Cordell concluded that the signal processing functions in Krokstad are "specific-purpose, hard-wired, fixed digital signal processing functions." *Id.* at pp. 115:11-22. When asked why he believed there was "very little silicon real estate," Mr. Cordell testified that the DSP in

Krokstad has to fit *inside the user's ear canal*. *Id.* at pp. 117:5-118:16. What Krokstad actually shows is that the DSP is *outside* the ear. Once Mr. Cordell understood his mistake, he retreated from his opinion, conceding that “the size restriction on the—the silicon integrated circuit would be relaxed.” *Id.* at pp. 117:7-123:14; *see also* Ex. 1007 at QSC pg. 10 (explaining that all the electrical and electronic components can be placed in the “first secondary section 2a”); *id.* at QSC pg. 40 Fig. 2.

Indeed, Mr. Cordell acknowledged, in relation to United States Patent No. 4,548,082 (“Engebretson”), that it was well known to use a general purpose DSP (a TMS320) in a hearing aid and to download programs and coefficients to the DSP from a personal computer. Ex. 1012 at pp. 131:14-132:25 (“This patent is describing the downloading of programs and filter coefficients to a TMS320”); Engebretson (Ex. 1013) at Figs. 3-4; 9:44-49 (alternate filtering algorithms that can be used); 11:30-32 (a TMS320 is a suitable DSP for use in a hearing aid); 12:17-20 (“host computer 14 ... downloads programs and filter coefficients to the hearing aid 12”).

Aside from being based on a misunderstanding of the disclosure, Patent Owner's argument that Krokstad does not disclose a reprogrammable DSP is contrary to Krokstad's express disclosure that the DSP can be reprogrammed. For instance, Krokstad says, “[t]he hearing aid can easily be *reprogrammed* to suit altered user conditions and changes in the hearing of the user or the hearing of another user.” Ex. 1007 at QSC pg. 23 (emphasis added). Krokstad also explains that an object of the invention is to provide a “hearing aid [that] is connected to a

computer via an interface for input of *new response functions*.” *Id.* at QSC pg. 7 (emphasis added). Krokstad even discloses specific signal functions that can be reprogrammed, including a “digital version of the crossover function [that] can be implemented in several ways” and tone control that can be implemented in several ways, including an IIR filter. *Id.* at QSC pp. 14-15.¹

Given that Krokstad explicitly describes an amplifier circuit with a DSP in which the functions and parameters are re-programmable with a computer that is removably connected, a person of ordinary skill in the art would have been motivated to use a removable connection to program the DSP. *See* Ex. 1003, ¶¶ 34-36. Therefore, the Board should find claim 1 obvious over Sudo and Krokstad.

IV. Patent Owner Fails to Rebut the Obviousness of the Dependent Claims

A. Patent Owner offers no evidence rebutting obviousness of dependent claims 2-6, 9-10 12, 15, and 19-26.

Patent Owner does not provide any evidence why claims 2-6, 9-10, 12, 15, and 19-26 are independently patentable other than by virtue of their dependency from claim 1. But because claim 1 is invalid as discussed above, Patent Owner has waived any arguments that the dependent claims are independently patentable. *See* 37 CFR Part 42 - Office Patent Trial Practice Guide, Section II.M.

B. Dependent claim 7 is obvious.

Patent Owner claims that Petitioners have not indicated how the prior art

¹ Claim 20 of the '544 patent identifies a crossover function as a signal processing function. Ex. 1001 at 10:8-11.

would be modified to make the claimed combination. Patent Owner fails to take into account the discussion of the APA in the '544 patent. *See* Ex. 1001 at 2:22-38 and 5:51-53 (“a plurality of control knobs 116 . . . are provided on the control panel 112 as is conventional”); Fig. 3.

Dr. Ellis's un rebutted testimony states that a person of ordinary skill would have considered putting the interface 19 of Sudo or the RS232 port of Krokstad on the control panel of the admitted prior-art amplifier to be an obvious way to group the input controls for the amplifier. Ex. 1003 ¶ 56. Additionally, providing the input port on the control panel is nothing more than a common sense design choice not sufficient to overcome an obviousness challenge. *PlaSmart, Inc. v. Kappos*, 2012 WL 1850650, at *4 (Fed. Cir. May 22, 2012) (reversing Board's holding that a claim would not have been obvious when placement of a physical element “would have been a common sense alternative design choice”).

C. Dependent claim 8 is obvious.

Patent Owner's attempt to save claim 8 turns on re-writing the claim language. The claim limitation “set performance characteristics” appears only in claim 8. In Patent Owner's arguments about this limitation, Patent Owner and its expert misquote claim 8 as claiming “a set of performance characteristics.” *See, e.g.*, PO Resp. at pp. 45-49; Ex. 2001 at ¶ 103 (emphasis added). But this is not the language of the claim.

Claim 8 requires that “the signal processing circuit further comprises . . . non-volatile storage means for storing a *set performance characteristics*.” Ex. 1001 at 8:62-65 (emphasis added). The word “of” does not appear in the claim limitation.

And the '544 patent specification explains that this is no mere oversight or typographical error: "The elements of the signal processing circuit 154 are preferably provided with a memory or storage device for storing *a set parameter value* so that the set parameter value is not changed or deleted upon an off-on operation of the amplifier." *Id.* at 6:60-64 and 3:21-24. The set "performance characteristics" of claim 8 are parameter values that are not changed; they are "set," as in fixed.

Mr. Cordell agrees that if claim 8 is read without Patent Owner's improperly inserted "of," the proper construction would be "a characteristic that had been set and intended to remain the same until it was changed" Ex. 1012 at pp. 141:15-142:25. The Board should interpret "set performance characteristics" as "characteristics which are fixed."

As properly interpreted, claim 8 is fully disclosed. The TMS 320 datasheet shows that the use of non-volatile memory (*e.g.* a ROM or EPROM) in a DSP was well known. A person of ordinary skill would understand that a non-volatile storage would be useful to store parameters values (*i.e.* a characteristic of the amplifier which is fixed) if power was removed. *See* Ex. 1003 ¶¶ 58-59. Therefore claim 8 is obvious.

D. Dependent claim 11 is obvious.

As with claim 8, Patent Owner bases its non-obviousness argument for claim 11 on the supposed absence—in the prior art—of a limitation that does not actually appear in the claim. According to Patent Owner's narrowing construction, claim 11 requires that the programming information be received *from the DSP*. PO Resp. at

28. But all claim 11 actually requires is that the external programmer store input programming information and previously selected control signals. As Dr. Ellis testified, a person of ordinary skill in the art would have considered this obvious in view of Sudo as a way to keep track of the last sound field selected to determine if a new sound field program should be downloaded to the DSP. Ex. 1003 at ¶ 65. Patent Owner provides no evidence why this would not be obvious.

E. Dependent claim 13 is obvious.

Patent Owner's argument for why claim 13 is not obvious also relies on an improper claim construction. Patent Owner claims that the phrase "programming information from at least one of the input device and a control circuit of the amplifier" must be construed to require that the controller receive "programming information" from *both* the input device *and* the DSP in the amplifier.

The specification does not support Patent Owner's narrow interpretation. To the contrary, the '544 specification describes two alternative modes of operation for the controller in the programmer. In a first mode, a microprocessor in the controller receives programming information from a keypad. *See* Ex. 1001 at 3:37-60. In a second mode, the user can select a "reading mode" where the microprocessor receives parameters from the signal processor. *Id.* at 4:12-34. The specification does not require—or even suggest—that the microprocessor must receive programming information *from both* sources to program the DSP.

Patent Owner relies on the interpretation given to claim 1 in the related case involving the '542 patent. But in the '542 patent, the specification states that the DSP *must* be capable of receiving *both* signal processing functions *and* signal

processing function parameters: “There exists a need for an improved amplifier signal processing circuit capable of modifying *both* signal processing functions and signal processing function parameters.” See U.S. Patent 5,652,542 (Ex. 2004) at 2:22-25 (emphasis added). No similar language exists in the '544 patent for the limitation “programming information from at least one of the input device and a control circuit of the amplifier.”

In *SuperGuide Corp v. DirectTV Enters., Inc.*, 358 F.3d 870, 887 (Fed. Cir. 2004), the Federal Circuit construed a claim requiring “at least one of . . . and . . .” in the conjunctive. But as other courts and this Board have held, *SuperGuide* only provides a guideline for construction. For example, the court in *Radware Ltd. v. A10 Networks, Inc.*, 2014 WL 1572644, at *6-*7 (N.D. Cal. Apr. 18, 2014) held that “*SuperGuide* has not been interpreted as a uniform rule that ‘at least one of . . . and’ be construed in the conjunctive” (collecting cases). The Board has also distinguished *SuperGuide* where, as here, the specification describes the use of the claimed items in the alternative. *Ricoh Americas Corp. v. MPHJ Tech. Invest., LLC*, 2013 WL 8563651, at *6 (IPR2013-00302, Pat. Tr. & App. Bd. Nov. 21, 2013) (rejecting a conjunctive interpretation of at least one of A and B where the specification refers to A and B in the alternative). As the Board acknowledged in *Ricoh Americas Corp.*, in applications filed pre-*SuperGuide*, it was accepted practice to draft claims in the form “at least one of A and B” as a way to cover “or” while avoiding the use of the troublesome word “or.” *Id.* at pg. 11 n.3.

Because the '544 patent's specification describes the microprocessor as receiving programming information from *either* an input device *or* from the control

circuit of the amplifier—but not necessarily both—claim 13 should be interpreted to require receiving signals from either the input device or the control circuit. This is different from the conjunctive interpretation for similar language in claim 1, because the specification describes the features of claim 13 in the disjunctive, but the features of claim 1 in the conjunctive. *See, e.g.*, Ex. 1001 at 3:9-17 (incorporating by reference the DSP of the '542 patent).

Sudo shows an input device that provides programming information (*i.e.*, the keyboard) and therefore meets the limitation of claim 13 as properly interpreted.

F. Dependent claims 14 and 18 are obvious.

Patent Owner has not submitted evidence why the use of a connector (claim 14) or an amplifier that executes operations according to stored signal processing functions or signal processing function parameters after the external programmer is disconnected (claim 18) would not be obvious when both ideas are disclosed by Krokstad. Therefore, these claims are obvious.

V. Patent Owner's Challenge to Dr. Ellis is Contradicted by Dr. Ellis's Testimony and the Testimony of Mr. Cordell

Patent Owner challenges Dr. Ellis on two grounds: (1) that he is not a person of ordinary skill in the art; and (2) that he did not spend enough time preparing his expert report. Both challenges are meritless.

A. Dr. Ellis is a POSITA and is well qualified to testify regarding the unpatentability of the challenged claims.

Patent Owner's claim that Dr. Ellis is not a POSITA rests on Patent Owner's assertion that Dr. Ellis does not have practical experience designing and testing

electronic amplifiers. PO Resp. at pp. 14-16. This challenge misses the point. The '544 patent is not directed to the design and testing of electronic amplifiers, and so practical experience in that field is beside the point. In fact, Patent Owner's expert, Mr. Cordell, admitted that the '544 patent does not describe how the power amplifier (156) of the claimed invention is different from the discussion of the admitted prior-art power amplifier (10). Ex. 1012 at pp. 58:16-59:12. The focus of the '544 patent is not on building and testing amplifiers; it is on the use of a DSP in audio amplifiers, which is right in Dr. Ellis's wheelhouse. *See, e.g.*, Ex. 1004 (Ellis CV).

Dr. Ellis is an expert in the field relevant to the patent—the use of DSPs in amplifiers. Dr. Ellis has a Ph.D. in electrical engineering from MIT and significant practical experience with using DSPs in audio equipment. Dr. Ellis is an expert in digital signal processing and designed amplifiers as part of his undergraduate education. Ex. 2002 at pp. 154:15-16; 124:7-20. Dr. Ellis designed and tested microphone amplifiers as a post-doctoral student at the Computer Science Institute at Berkeley, and is currently designing amplifiers that can drive speakers with the goal of incorporating these into his professional work. *Id.* at 111:13-113:4; 120:4-121:12.

Also, Patent Owner misstates Dr. Ellis's testimony. Immediately following the testimony that Patent Owner quotes, Dr. Ellis testified that although he did not meet the exemplary definition (of POSITA for the '542 patent, which is different from that of the definition of POSITA for the '544 patent) used in his declaration, he did not mean the definition "to be exclusive." Ex. 2003 at pg. 181:5-14.

Dr. Ellis further clarified during his deposition that in his opinion, a POSITA for the '544 patent would also include persons with a Ph.D. in electrical engineering who had covered signal processing topics or someone with a master's degree who had worked with digital signal processing. Ex. 2002 at pp. 230:10-231:16.

Even if the Board were to accept Patent Owner's definition of the field of the invention for the '544 patent, Dr. Ellis is still qualified to testify. As a sister panel noted in *Primera Tech., Inc. v. Automatic Mfg. Sys., Inc.*, IPR2013-00196, paper 50 (Pat. Tr. & App. Bd. July 17, 2014), a witness is not to be disqualified just because he does not have specific expertise with the subject at hand. Any objection to Dr. Ellis's qualifications goes to weight, not admissibility. *See id.* pp. 28-29 (citing *Liquid Dynamics Corp. v. Vaughan Co.*, 449 F.3d 1209, 1221 (Fed. Cir. 2006) (citing *Quiet Tech. DC-8, Inc. v. Hurel-Dubois UK Ltd.*, 326 F.3d 1333, 1344-45 (11th Cir. 2003)); *In re TMI Litig.*, 193 F.3d 613, 692 (3d Cir. 1999) ("So long as the expert's testimony rests upon 'good grounds,' it should be tested by the adversary process—competing expert testimony and active cross-examination." (quoting *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 85 (1st Cir. 1998)); *Wilmington v. J.I. Case Co.*, 793 F.2d 909, 920 (8th Cir. 1986)).

B. Patent Owner's challenge to the time Dr. Ellis spent analyzing the '544 patent is equally misplaced.

Patent Owner's second challenge to Dr. Ellis is that Dr. Ellis supposedly did not spend enough time doing his work. According the Patent Owner, Dr. Ellis should have spent more than the approximately 20 hours he spent analyzing the '542 and '544 patents and the prior art cited against those patents. Patent

Owner does not say why these 20 hours are inadequate. Also, Patent Owner does not offer any suggestion that additional time would have resulted in a different opinion, or that Dr. Ellis missed something of import because he spent 20 hours instead of, say, 50. Patent Owner's challenge is little more than rank speculation.


VI. Conclusion

As shown by the evidence submitted with this Petition, using DSPs in audio amplifiers was well known in the prior art, as was using a removably-connected external programmer to modify signal processing functions and parameters of the DSP. Because the Patent Owner has not provided any credible evidence why a POSITA would not be motivated to program a DSP in an amplifier with a computer that is connected via a removable connection or provided any evidence of secondary considerations of non-obviousness, the Board should cancel the challenged claims of the '544 patent.

Dated: November 3, 2014

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CERTIFICATE OF SERVICE


The undersigned hereby certifies that a true copy of the foregoing
PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE was filed through
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