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Paper 51
Entered: August 4, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

QUEEN'S UNIVERSITY AT KINGSTON,
Patent Owner.

Case IPR2015-00604
Patent 8,672,482 B2

Before RICHARD E. RICE, LYNNE E. PETTIGREW, and MITCHELL G. WEATHERLY, *Administrative Patent Judges.*

WEATHERLY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively "Samsung") filed a Petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–

42 (the "challenged claims") of U.S. Patent No. 8,672,482 B2 (Ex. 1001, "the '482 patent"). 35 U.S.C. § 311. Queen's University at Kingston ("Queen's") timely filed a Preliminary Response. Paper 9 ("Prelim. Resp."). On August 6, 2015, based on the record before us at the time, we instituted an *inter partes* review of claims 1–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–42. Paper 10 ("Institution Decision" or "Dec."). We instituted the review on the following challenges to the claims:

References	Basis	Claims challenged
U.S. Published Application No. 2003/0038754 A1 ("Goldstein") (Ex. 1005)	§ 102(e)	1, 3, 17, 19–21, 24, and 28–33
Goldstein and U.S. Published Application No. 2003/0052911 A1 ("Cohen-solal") (Ex. 1007)	§ 103	4, 5, 7, 10, 11, 13, 14, 16, 23, and 26
U.S. Patent No. 5,944,530 ("Ho") (Ex. 1006)	§ 102(b)	1–4, 10, 17, 19–21, 23, 24, and 26–42
U.S. Patent No. 6,618,716 B1 ("Horvitz") (Ex. 1014) and U.S. Patent No. 5,831,594 ("Tognazzini") (Ex. 1015)[1]	§ 103	1, 3, 10, 17, 19–21, 23–34, and 36–42

After we instituted this review, Queen's filed a Patent Owner Response in opposition to the Petition (Paper 19, "PO Resp.") that was supported by declarations from Dr. Ravin Balakrishnan (Ex. 2028) and Dr. Jeff B. Pelz (Ex. 2008). Samsung filed a Reply in support of the Petition

[1] Samsung contends that Goldstein, Cohen-solal, and Horvitz each qualify as prior art under 35 U.S.C. § 102(e). Queen's does not contest the prior art status of any of these references. For purposes of this Decision, we accept Samsung's contention.

(Paper 26, "Reply") that was supported by a declaration from Dr. Irfan A. Essa (Ex. 1085).

With our authorization, Queen's filed a combined Motion to Strike Samsung's Reply and/or File a Surreply to Samsung's Reply (Paper 31), to which Samsung filed an Opposition (Paper 34). We denied Queen's request to strike the Reply, but authorized Queen's to file a surreply responding to Samsung's arguments and evidence with respect to enablement of the Goldstein publication (identified in the table above). Paper 36. Queen's then filed a Surreply (Paper 42, "Surreply").

The parties each filed a Motion to Exclude (Papers 37, 40), an Opposition to the Motion of the other party (Papers 44, 46), and a Reply to the other party's Opposition (Papers 47, 48). Queen's also filed a Motion for Observation on Cross Examination of Dr. Essa (Paper 41), to which Samsung filed a Response (Paper 45). Queen's did not move to amend any claim of the '482 patent.

We heard oral argument on April 27, 2016. A transcript of the argument has been entered in the record (Paper 49 (confidential session), Paper 50 (open session)) ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(c). The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons expressed below, we conclude that Samsung has demonstrated, by a preponderance of evidence, that claims 1–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–42 are unpatentable. We also deny the parties' respective motions to exclude evidence.

B. Related Proceedings

The parties have collectively identified as a related proceeding the co-pending district court litigation of *Queen's University at Kingston, et al. v. Samsung Electronics Co., Ltd., et al.*, Case No. 2:14-cv-00053 (E.D. Tex.). Pet. 1; Paper 7, 2. Queen's also identifies IPR2015-00583, -00584, and -00603 as related to this proceeding. Paper 7, 2–3.

C. The '482 Patent

The '482 patent is directed generally to "attentive user interfaces for improving communication between humans and devices" and more particularly to the "use of eye contact/gaze direction" to enable a device to communicate more effectively with its user. Ex. 1001, 1:18–23. The Specification explains:

> an attentive user interface according to the invention applies . . . social rules to device-initiated interactions or communications, by assessing a user's attentive state, and making a determination as to whether, when, and how to interrupt (e.g., notify) the user on the basis of the user's attentive state.
>
> To facilitate turn-taking between devices and users in a non-intrusive manner, an attentive user interface according to the invention assesses a user's attentive state by sensing one or more parameters of the user. Such parameters are indicative of the user's attentive state, and include, but are not limited to, eye contact, eye movement, eye position, eye gaze direction, voice, body presence, body orientation, head and/or face orientation, activity, and brain activity/arousal.

Id. at 5:17–30. For example, the '482 patent describes an embodiment in which a "television is augmented with an attentive user interface having an eye contact sensor" to detect when the television is "being watched." *Id*. at 17:21–35. When the television is not being viewed, it "pauses because its

eye contact sensor reports that no one is watching." *Id*. at 17:29–30. When a user looks at the television, it "resumes the program." *Id*. at 17:39.

Claims 1 and 34, which are the independent claims among the challenged claims, are directed to an "apparatus for controlling operation of a device." *Id*. at 22:23–24 (claim 1), 24:1–2 (claim 34). Claims 2–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–33 depend directly or indirectly from claim 1, and claims 35–42 depend directly or indirectly from claim 34. *Id*. at 22:38–24:44. Independent claims 1 and 34 recite:

> 1. An apparatus for controlling operation of a device, comprising:
>
> at least one sensor coupled to the device that outputs a sensor signal;
>
> a processor that processes the sensor signal and produces a user state signal that is indicative of user attention toward a screen of the device;
>
> wherein the apparatus uses the user state signal as a basis for controlling operation of the device, the controlling operation including determining whether to output information to the user;
>
> wherein the information is visual information, audible information, or visual and audible information; and
>
> wherein the outputting of information is initiated by the device.

Id. at 22:23–37.

> 34. An apparatus for controlling operation of a device, comprising:
>
> at least one sensor coupled to the device that outputs a sensor signal;
>
> a processor that processes the sensor signal and produces a user state signal that is indicative of user attention toward a screen of the device;

> wherein the apparatus uses the user state signal as a basis for controlling operation of the device, the controlling operation including determining whether to output information to the user;
>
> wherein the information is visual information, audible information, or visual and audible information; and
>
> wherein the controlling operation comprises notifying the user when the user state signal indicates that the user attention toward the screen is at least at a selected level.

Id. at 24:1–17.

II. ANALYSIS

A. Claim Interpretation

"A claim in an unexpired patent that will not expire before a final written decision is issued shall be given its broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (affirming that USPTO has statutory authority to construe claims according to Rule 42.100(b)). When applying that standard, we interpret the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010). Thus, we give claim terms their ordinary and customary meaning. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) ("The ordinary and customary meaning 'is the meaning that the term would have to a person of ordinary skill in the art in question.'"). For the purposes of this decision, and on this record, we determine that no claim term needs express interpretation. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (only those terms which are

in controversy need to be construed, and only to the extent necessary to resolve the controversy).

1. "initiated by the device"

Claims 1 and 36 recite that "outputting information is *initiated by the device*." Ex. 1001, 22:36–37 (claim 1), 24:21–22 (claim 36) (emphasis added). In our Institution Decision, we preliminarily determined that the broadest reasonable interpretation consistent with the Specification of "initiated by the device" is its ordinary meaning, i.e., "set going by the device." Dec. 6–8 (citing Ex. 3001 (MERRIAM- WEBSTER'S COLLEGIATE DICTIONARY 601 (10th ed. 1993)). Below, we revisit our preliminary interpretation but determine to maintain it.

Samsung asserted in the Petition that "[t]he '482 patent draws a distinction between 'user-initiated' and 'device-initiated' operations." Pet. 4 (citing Ex. 1001, 2:8–11, 9:58–64). Samsung contends that "[f]or a user-initiated operation, the operation initiates in response to explicit user input control provided by a user and, for a device-initiated operation, the operation initiates without explicit user input control provided by a user." *Id*. at 5 (citing Ex. 1003 ¶ 16 (Declaration of Dr. Don Turnbull)). Samsung asserts that the scope of the phrase "must be broad enough to include 'initiated without explicit user input control provided by a user.'" *Id*. at 6. In our Institution Decision, we disagreed with Samsung's proposed construction based on the following analysis:

> To the extent Samsung argues that the Specification requires that a device-initiated operation *must* begin without explicit user input control provided by a user, we disagree. The Specification provides several examples in which a user's explicit attention toward a device functions as an input control with respect to device-initiated operations. *See, e.g.*, Ex. 1001,

> 10:32–44 (user's attention directed to a particular device in a network of devices controls routing of device-initiated messages to that device), 11:58–65 (user's acknowledgment of a device's request for attention controls the method of device-initiated communication to the user), 19:66–20:7 (user's fixed gaze at a display icon controls enlargement of the icon to reveal a device-initiated message). Accordingly, we are not persuaded that an ordinarily skilled artisan "would have understood that the specification differentiates a user-initiated operation and a device-initiated operation based on the explicit user input control needed to initiate the operation," as Samsung contends. Ex. 1003 ¶ 16; *see* Pet. 6.

Dec. 6–7.

In the Patent Owner Response, Queen's proposes to clarify our preliminary interpretation of "initiated by the device" as "set going by the device *without explicit user-initiated control*." PO Resp. 14 (emphasis added). Queen's asserts that the prosecution history of the parent application to the '482 patent supports its proposed claim construction, because the claims were amended during prosecution "specifically to distinguish over prior art related to user-initiated control of the device." *Id.* (citing Ex. 2006, 55–56). Samsung's Reply does not substantively address Queen's proposed clarification.

Queen's has not persuaded us that any change to our preliminary interpretation is necessary. We note that the portion of the prosecution history cited by Queen's does not indicate that the term "initiated by the device" was added or changed during prosecution. Accordingly, we maintain our interpretation.

2. "the apparatus uses the user state signal as a basis for controlling operation of the device"

Independent claims 1 and 34 each recite "the apparatus uses the user state signal as a basis for controlling operation of the device." Ex. 1001, 22:30–31 (claim 1), 24:9–10 (claim 34). Neither party proposes an explicit construction of this phrase, but Queen's asserts an implicit construction in arguing that, in the Ho prior art reference,

> modulating of an operation is essentially triggered by time (i.e., comparing multiple scans over a predetermined time threshold)—in stark contrast to the claimed features where the controlling of an operation is *triggered based on the instant a user state signal is produced (the user state signal indicative of whether the user's attention is not directed toward the device or attention is redirected toward the device).*

PO Resp. 35 (emphasis added) (citing Ex. 2028 ¶¶ 104–115).

Dr. Balakrishnan explains this asserted instantaneous, or immediate, triggering requirement as follows:

> The controlling an operation based on attention toward the device described by the '482 patent is only useful when the modulation occurs *immediately* in response to a determination that the user is either paying attention or not paying attention. For example, in the '482 patent's augmented television device, if the television is configured to pause audiovisual material when the user is not paying attention, the pausing operation should occur *immediately* when it is determined that the user's attention is not directed toward the device (e.g., glint, pupil and camera are not aligned on the camera axis). *Immediate* pausing is necessary so that the user does not miss any portion of the audiovisual material. If the television did not pause *immediately*, then the '482 patent's controlling of an operation would prove to be ineffective and indeed not a true controlling based on the user's attention toward the device, as claimed. The same holds true for the '482 patent's attention monitor example, where a user would need *immediate* re-routing or prioritization of

> messages/calls, in order for the modulation of the operation based on the user's attention to prove meaningful and effective. This aspect of the '482 patent is important in order to properly appreciate the significant differences between Ho and the claimed invention of the '482 patent.

Ex. 2028 ¶ 108 (emphases added). We do not agree with Dr. Balakrishnan that modulating based on attention, as described in the '482 patent, is useful only when the modulation occurs immediately in response to a determination that the user is or is not paying attention. *See id.* As Samsung argues, Dr. Balakrishnan's analysis fails to consider examples described in the '482 patent that require monitoring attention over time. *See* Reply 18–19; Ex. 1001, 13:9–20, 15:4–21, 19:34–37; Ex. 1068, 180:13–193:22.

In one example described in the '482 patent, "attentive user interfaces employing eye contact sensors or other related eye tracking technology may be used to initiate the retrieval of information on the basis of progressive disclosure." Ex. 1001, 18:9–12. "For example, information may initially be shown with limited resolution on the side of a display." *Id.* at 18:12–14. If the user looks at that information "for a set amount of time, [however,] more detailed information is retrieved and rendered on the screen using a larger surface." *Id.* at 18:15–17. "Examples include stock market tickers that grow and provide more information when users pay attention to it." *Id.* at 18:17–18.

Accordingly, we are not persuaded by Queen's that "using the user state signal as a basis for controlling operation of the device" requires instantaneous, or immediate, triggering. To the contrary, as described in the '482 patent, operation of the device may be modulated on the basis of a user state signal that is indicative of the user's attention toward the device over a period of time.

B. The Parties' Post-Institution Arguments

In our Institution Decision, we concluded that the argument and evidence adduced by Samsung demonstrated a reasonable likelihood that various selections of claims 1–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–42 were unpatentable as either anticipated by Goldstein, Dec. 9, or Ho, *id*. at 13–17, or obvious in view of the combinations of Goldstein and Cohen-solal, *id*. at 10–13, or Horvitz and Tognazzini, *id*. at 17–21. We must now determine whether Samsung has established by a preponderance of the evidence that the specified claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e). In this connection, we previously instructed Queen's that "any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived." Paper 11, 6; *see also* 37 C.F.R. § 42.23(a) ("Any material fact not specifically denied may be considered admitted."). Additionally, the Board's Trial Practice Guide states that the Patent Owner Response "should identify all the involved claims that are believed to be patentable and state the basis for that belief." Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

In connection with the arguments and evidence adduced by Samsung to support its positions that Queen's chose not to address in its Patent Owner Response, the record now contains unrebutted arguments and evidence presented by Samsung regarding the manner in which the asserted prior art teaches all other elements of the claims against which that prior art is asserted. Based on the preponderance of the evidence before us, we conclude that the prior art identified by Samsung describes all limitations of the reviewed claims except for those that Queen's contested in the Patent Owner Response, which we address below.

C. The Challenges to the Claims

Samsung challenges the patentability of claims on the grounds that they are either anticipated or obvious. To anticipate a patent claim under 35 U.S.C. § 102, "a single prior art reference must expressly or inherently disclose each claim limitation." *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1334 (Fed. Cir. 2008). Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claim limitations, it anticipates, even though artisans of ordinary skill may not have recognized the inherent characteristics or functioning of the prior art. *MEHL/Biophile Int'l Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999) (citation omitted); *In re Cruciferous Sprout Litig.*, 301 F.3d 1343, 1349–50 (Fed. Cir. 2002).

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), reaffirmed the framework for determining obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The *KSR* Court summarized the four factual inquiries set forth in *Graham* that we apply in determining whether a claim is reasonably likely to be unpatentable as obvious under 35 U.S.C. § 103(a) as follows:

1. determining the scope and content of the prior art,
2. ascertaining the differences between the prior art and the claims at issue,
3. resolving the level of ordinary skill in the pertinent art, and
4. considering objective evidence present in the application indicating obviousness or nonobviousness.

KSR, 550 U.S. at 406. With these standards in mind, we address each challenge below.

1. Anticipation of Claims 1, 3, 17, 19–21, 24, and 28–33 by Goldstein

Samsung compares Goldstein's teachings in detail to the limitations recited in claims 1, 3, 17, 19–21, 24, and 28–33, Pet. 11–24, and further supports its comparisons with testimony from its expert witness, Dr. Don Turnbull, Ex. 1003 ¶¶ 18–34. For the reasons discussed below, we determine that Samsung has established by a preponderance of evidence that Goldstein anticipates claims 1, 3, 17, 19–21, 24, and 28–33.

a) Overview of Goldstein

Goldstein is a U.S. Patent Application Publication titled "Method and Apparatus for Gaze Responsive Text Presentation in RSVP[2] Display." Ex. 1005, at (10), (54).[3] Goldstein discloses that, "[b]y means of the invention, adjustments for . . . *inattention* . . . are modeled . . . into the RSVP electronic reading paradigm." *Id.* ¶ 8 (emphasis added). "More particularly, if the user of an RSVP text display device becomes *inattentive* so that his eyes are no longer focused on the text display window, text presentation is automatically paused or halted." *Id.* (emphasis added). "Thereafter, when the reader's eyes again focus on the display window, text presentation is automatically resumed, usefully at the beginning of the last sentence previously read." *Id.* The Abstract mirrors this disclosure:

> Eye tracking sensors are used to detect when a reader's focus shifts outside the text window, indicating that the reader has become *inattentive* to displayed text. Thereupon, presentation of text is halted. When the eye tracking sensors detect that the focus

[2] "RSVP" is an acronym for "rapid serial visual presentation."

[3] The inventors listed on the face of the publication are Mikael Goldstein, Bjorn Jonsson, and Per-Olof Nerbrant. *Id.*, at (76).

> of the reader's eyes has shifted back into the text window, text presentation is resumed.

Id. at (57) (emphasis added).

b) Independent Claim 1

The only dispute regarding Goldstein's alleged anticipation of independent claim 1 focuses on whether Goldstein describes the "processor that processes the sensor signal and produces a user state signal that is indicative of user attention toward a screen of the device." *See* PO Resp. 28–31. Samsung contends that Goldstein describes the claimed processor because Goldstein's "processor 46 carries out . . . geometric computation . . . to determine the direction of the reader's point of gaze." Pet. 13–14 (citing Ex. 1005 ¶ 31). When Goldstein's system determines that the user's "point of gaze has moved out of the display window 12 . . ., processor 46 sends a signal to a text presentation control 48." Ex. 1005 ¶ 31. Samsung contends that Goldstein's signal to text presentation control 48 "represents a binary measure of the user's attention toward the device" which the device uses to pause or resume the presentation of the text scrolling in display window 12. Pet. 14–15 (citing Ex. 1003 ¶¶ 24, 25; Ex. 1005 ¶ 31).

Queen's responds that Goldstein's signal to pause or resume presentation of text is not a "user state signal" because it contains no information from Goldstein's eye tracking sensor that indicates the state of the user's attention toward the device. PO Resp. 29 (citing Ex. 2028 ¶¶ 67–70). Queen's argument is unpersuasive because it fails to explain why Goldstein's pause/resume signal is not a binary signal indicative of user attention toward Goldstein's device 10. Reply 9–10. Samsung contends that Goldstein's "sensor 20 . . . only needs to detect one of two states of the

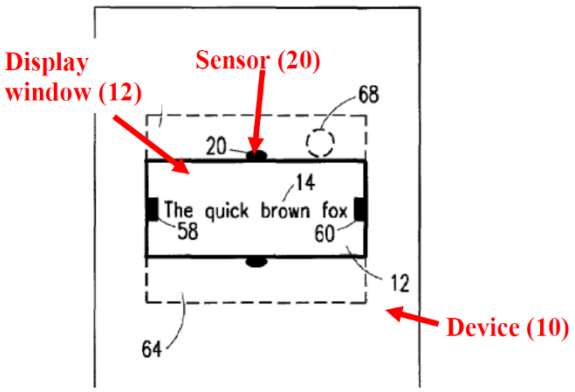
user's eyes" and the pause/resume signal matches the "one of two states" detected by the sensor 20. *Id*. at 10 (citing Ex. 1005 ¶¶ 21, 22, 31); Ex. 1085 ¶¶ 30–32.

We are persuaded that Goldstein's pause/resume signal directly corresponds to output provided by Goldstein's eye contact sensor 20 and indicates whether the user is looking at Goldstein's display screen. The '482 patent includes sensing simple eye contact as being indicative of a user's attention toward a device. *See e.g.*, Ex. 1001, 5:23–30, 6:14–17 (listing eye contact as indicating attentive state along with eye movement, eye gaze direction, and eye position), 6:65–7:8 (distinguishing eye contact sensors which detect whether user is looking at sensor from eye tracker sensing direction in which user's eyes are looking). Accordingly, we are persuaded that Goldstein describes the processor of claim 1. Queen's identifies no other deficiency in Samsung's argument and evidence relating to other aspects of claim 1. *See* PO Resp. 15–31. We, therefore, determine that Samsung has persuasively demonstrated by a preponderance of evidence that Goldstein anticipates claim 1.

c) Dependent Claims 19 and 20

Claim 1 recites a "sensor coupled to the device," Ex. 1001, 22:25, and claim 19, which depends from claim 1, further recites that "the sensor is physically coupled to the device," *id*. at 23:5–6. Claim 20 depends from claim 19 and further limits the sensor as being "attached to or embedded in the screen" of the device. *Id*. at 23:7–8.

(1) Goldstein's Disclosure



Samsung contends that Goldstein meets all limitations of claims 19 and 20 by describing its sensor 20 being physically attached to display window 12 of device 10 as shown in the annotated and excerpted version of Goldstein's Figure 6, which is reproduced at right. Pet. 20–21. Samsung contends that Goldstein's description of sensor 20 as being "mounted proximate to a display screen" supports its conclusion that sensor 20 is physically coupled to device 10 as required in claim 19 and also attached to screen 12 as required in claim 20. *Id.* (citing Ex. 1005 ¶ 21, Ex. 1003 ¶ 21).

Queen's disputes Samsung's assertion that Goldstein discloses disposing a hardware sensor "physically coupled to the device." *See* PO Resp. 16–17. According to Queen's, "Goldstein only states that sensors 20 and 22 are 'mounted proximate to a display screen, in a known positional relationship.'" *Id.* at 17 (citing Ex. 1005 ¶ 21). Queen's argues that the "words 'mounted proximate' indicate that the sensors are *near*—but not 'physically coupled to'—the device." *Id.* (citing Ex. 2028 ¶¶ 45, 46, 53–55).

Queen's also asserts that "the frontal views" shown in Goldstein's figures do not show depth and thus do not disclose "the true proximity of the sensors to the device." *Id.* at 17–18. Accordingly, Queen's argues, "a proper analysis must consider what a POSA would interpret the disclosure to mean." *Id.* at 18 (citing *In re Daniel*, 34 F.2d 995, 999–1000 (CCPA 1929)). Queen's further asserts that a "POSA would have understood that

Goldstein's Fig. 1, for example, is *not to scale*." *Id.* According to Queen's, "a POSA would have understood Goldstein's figures to simply illustrate the general concept, and not an actual to-scale implementation of Goldstein's system—let alone the claimed combination." *Id*.

Further, relying on extrinsic evidence, Queen's argues that "Goldstein actually identifies an exemplary sensor—IBM's MAGIC tracker," *id.* (citing Ex. 1005 ¶ 21), but "such a system was not conventionally 'physically coupled to the device'" as required by claims 19 and 20, *id.* (citing Ex. 2028 ¶¶ 56–59; Ex. 2008 ¶¶ 17–33). "Instead," according to Queen's, "IBM's MAGIC tracker was placed 'proximate to' or near a display screen—consistent with Goldstein's explicit disclosure." *Id.* Queen's asserts that "IBM's MAGIC tracker was three times larger than Goldstein's entire 1½ inch display window." *Id.* at 18–19.

Queen's further argues that a "POSA would not have envisioned the remote eye tracking systems referenced at 20 and 22 to have actually been 'physically coupled to the device.'" *Id.* at 19. This is because, as asserted by Queen's, the large size of eye tracking technology would have destroyed the mobile device's mobility, and "it was not uncommon to place an eye tracker in a central, proximate relation to a computer screen without having the sensor 'physically coupled to the device.'" *Id.* (citing Ex. 2011; Ex. 2014, ch. 7; Ex. 2028 ¶¶ 60–64). Queen's argues that, consistent with Goldstein's disclosure, a separate eye tracker could have been mounted in front of the screen and aimed at the eyes of a user, who looks at the screen. *Id.* (citing Ex. 1005, Fig. 1; Ex. 2011, Figs. 3–6; Ex. 2028 ¶¶ 62–63).

We have considered Queen's arguments, but we are persuaded that Goldstein discloses disposing a hardware sensor "physically coupled to the

device," as claims 19 and 20 require. As stated in Goldstein, Figure 1 "is a simplified view showing an RSVP display disposed to operate in accordance with an embodiment of the invention." Ex. 1005 ¶ 13. The referenced "RSVP display" is "window 12 for displaying a text segment 14 on a single line." *Id.* ¶ 19, Fig. 1. Goldstein describes device 10 as "provided with" window 12, and Figure 1 clearly indicates that window 12 and its boundary 16 are physically coupled to device 10. *Id.* ¶¶ 19, 20, Fig. 1.

Similarly, Goldstein describes sensors 20 and 22 as located proximate to boundary 16, above and below window 12, respectively. *See* Ex. 1005 ¶ 21, Fig. 1. Figure 1 shows sensors 20 and 22 touching the outside of boundary 16. In that context, we are persuaded that an ordinarily skilled artisan would have understood Figure 1 to depict a simplified view of sensors 20 and 22 physically coupled or attached to device 10, proximate to boundary 16, and above and below window 12. *See* Ex. 1085 ¶ 26 (opining that "sensors 20 and 22 are physically coupled or attached to the mobile device 10 in the same way the display window 12 is physically coupled or attached to the mobile device 10").

Claim 11 of Goldstein confirms that sensors 20 and 22 are located in or on mobile device 10. The claim pertinently recites:

> 11. *In a device* provided with an RSVP display window for presenting text to a reader, said window having a boundary, apparatus for selectively adjusting said presentation of text comprising:
>
> *a sensor* for detecting changes in orientation of a reader's eyes . . . .

Ex. 1005, claim 11 (emphases added). As expressly recited, a sensor is located "in" the device. *See* Ex. 1085 ¶ 25 (asserting that "claim 11 in Goldstein also discloses 'a sensor' as being '[i]n a device'").

Furthermore, the only reasonable understanding of Goldstein's disclosure is that sensors 20 and 22 are attached to display window 12 of device 10. Queen's has not explained credibly how sensors 20 and 22 can be mounted as described in Goldstein, i.e., "proximate to boundary 16, above and below window 12, respectively," unless they are attached to display window 12 of mobile device 10. Queen's argument that a separate sensor could be located in front of screen 12 would require a structure for mounting the sensor in the disclosed positional relationship. As Dr. Essa testifies, however, "[o]ther than the mobile device 10, no mounting structure for the sensors 20 and 22 is shown in FIG. 1, and no additional mounting structure is disclosed in Goldstein." Ex. 1085 ¶ 26. Further, Goldstein discloses a mobile device, not a stationary device. Queen's has not explained how the sensor could be mounted in the required positional relationship with respect to the screen of Goldstein's mobile device.

For these reasons, we are persuaded that Goldstein describes a sensor that meets the additional requirements recited in claims 19 and 20. Queen's identifies no other elements of claims 19 and 20 that are not disclosed by Goldstein. *See* PO Resp. 15–31. Based on our review of the record before us, we determine that Samsung has demonstrated by a preponderance of evidence that Goldstein describes all elements of claims 19 and 20. Nevertheless, Queen's does argue that Goldstein fails to enable an ordinarily skilled artisan to have made and used the inventions of claims 19 and 20. We address this argument immediately below.

(2) Enablement by Goldstein

"In order to anticipate a claimed invention, a prior art reference must enable one of ordinary skill in the art to make the invention without undue

experimentation." *Impax Labs., Inc. v. Aventis Pharms., Inc*., 545 F.3d 1312, 1314 (Fed. Cir. 2008) (citations omitted). In examining the "without undue experimentation" requirement, we consider such factors as: (1) the quantity of experimentation; (2) the amount of direction or guidance present; (3) the presence or absence of working examples; (4) the nature of the invention; (5) the state of the prior art; (6) the relative skill of those in the art; (7) the predictability or unpredictability of the art; and (8) the breadth of the claims." *See id.* at 1314–15 (citing *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988)).

For prior art to be anticipating, it must have enabled an ordinarily skilled artisan to have combined the publication's description of the invention with his own knowledge to make the claimed invention. *See Impax Labs., Inc. v. Aventis Pharms., Inc.*, 468 F.3d 1366, 1381 (Fed. Cir. 2006) (citing *In re Donohue*, 766 F.2d 531, 533 (Fed. Cir. 1985) (citation omitted)). "The standard for what constitutes proper enablement of a prior art reference for purposes of anticipation under section 102, however, differs from the enablement standard under section 112." *Verizon Servs. Corp. v. Cox Fibernet Virginia, Inc.*, 602 F.3d 1325, 1337 (Fed. Cir. 2010) (citing *Rasmusson v. SmithKline Beecham Corp.*, 413 F.3d 1318, 1325 (Fed. Cir. 2005)). "It is well-settled that utility or efficacy need not be demonstrated for a reference to serve as anticipatory prior art under section 102." *Id.* (citations omitted).

Queen's argues that Goldstein's disclosure would not have enabled an ordinarily skilled artisan to make the invention of claims 19 and 20 because of "significant technical problems" that an ordinarily skilled artisan would

have faced when trying to "physically couple" Goldstein's eye tracker to a mobile device or embed that eye tracker in the screen. PO Resp. 21–28.

As discussed below, we determine that Samsung's reply evidence, particularly, the testimony of Samsung's reply expert, Dr. Essa, successfully rebuts Queen's evidence, including the testimony of Dr. Balakrishnan and Dr. Pelz, that a POSA could not have implemented an eye-tracking system on a PDA or cell phone, as of the Critical Date, without undue experimentation. *Compare* Ex. 1085 ¶¶ 33–108, *with* Ex. 2028 ¶¶ 65–66 *and* Ex. 2008 ¶¶ 27, 34–51.

(a) Goldstein's Disclosure of the IBM Almaden Eye Tracker

As discussed above, with respect to Figure 1, Goldstein discloses that "[s]ensor 20 could, for example, comprise an eye tracking device developed by the IBM Corporation at its Almaden Research Center . . . ." Ex. 1005 ¶ 21, Fig. 1. Referring to Figure 2, Goldstein further discloses "there is shown an eye tracking device of a type developed by the IBM Corporation and referred to above, which may be adapted for use as the sensor 20." *Id.* ¶ 26. As described in Goldstein, the eye tracking device comprises two near infrared time multiplexed light sources, each composed of a set of infrared "light emitting diodes ('LEDs') synchronized with the camera frame rate." *Id.* ¶ 27. Goldstein further discloses that "[t]he eye tracker device disclosed above is described in further detail in a paper entitled Manual and Gaze Input Cascaded (Magic), S. Zhai, C. Morimoto and S. Ihde, In Proc. CHI '99: ACM Conference on Human Factors in Computing Systems, pages 246–253. Pittsburgh, 1999" (Ex. 1017, the "MAGIC paper"). *Id.* ¶ 30.

(b) *The MAGIC Paper*

The MAGIC paper describes the "IBM Almaden Eye Tracker" as follows:

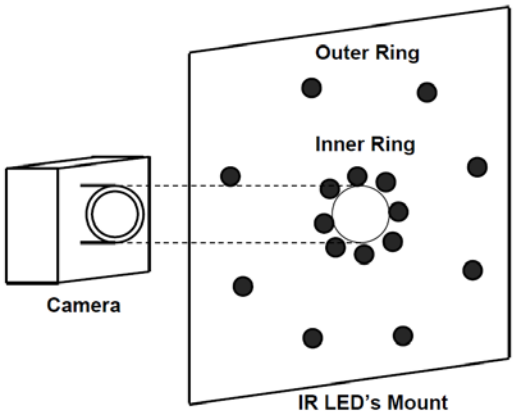
> We . . . chose to develop and use our own eye tracking system [10]. . . .
>
> The Almaden system uses two near infrared (IR) time multiplexed light sources, composed of two sets of IR LED's, which were synchronized with the camera frame rate. One light source is placed very close to the camera's optical axis and is synchronized with the even frames. Odd frames are synchronized with the second light source, positioned off-axis. The two light sources are calibrated to provide approximately equivalent whole-scene illumination. Pupil detection is realized by means of subtracting the dark pupil image from the bright pupil image. After thresholding the difference, the largest connected component is identified as the pupil. This technique significantly increases the robustness and reliability of the eye tracking system. . . .
>
> Once the pupil has been detected, the corneal reflection (the glint reflected from the surface of the cornea due to one of the light sources) is determined from the dark pupil image. The reflection is then used to estimate the user's point of gaze in terms of the screen coordinates where the user is looking at. The estimation of the user's gaze requires an initial calibration procedure, similar to that required by commercial eye trackers.

Ex. 1017, 4.

Reference "[10]" of the MAGIC paper, cited in the above quotation, is "Morimoto, C., *et al.*, *Pupil detection and tracking using multiple light sources*, 1998, IBM Almaden Research Center: San Jose" (Ex. 1062, the "Morimoto paper"). *Id.* at 8.

(c) *The Morimoto Paper*

The Abstract of the Morimoto paper contains a description of a pupil detection and tracking system that is similar to the description of the "IBM Almaden Eye Tracker" set forth in the MAGIC paper. Ex. 1062, Abstract. The pupil detection and tracking system described in the Morimoto paper consists of a camera and two light sources. *Id.* at 3. Figure 1 of the Morimoto paper, which is reproduced at right, is a diagram showing the configuration of the camera and the light sources (illuminators). *Id.*, Fig. 1. As described in the Morimoto paper, the illuminators consist of 16 infrared LEDs distributed around two concentric rings, with 8 LEDs in each ring. *Id.* at 3. The Morimoto paper further describes a real-time implementation of the pupil detection system "running at 15 frames per second on a single processor Pentium 200 machine." *Id.* at 5. The implementation uses a 1/3 inch CCD B & W board camera. *Id.* "[T]he system is quite robust even for people wearing glasses." *Id.* at 6, Fig. 3. The Morimoto paper concludes: "The system has been successfully tested for a very large number of people, and it has proven to be very robust indoors, particularly for office environments, although it has not been tested outdoors, where high intensity illumination might introduce difficulties." *Id.* at 7. Further, "[t]he system is inexpensive and very compact (the dimensions of the current implementation [are] about 9x9x3cm), and we are confident that his method could greatly increase the



robustness and accuracy of current remote face and eye-tracking systems." *Id.*

(d) *Implementation of IBM Eye Sensing Technology*

We credit the testimony of Dr. Essa that, as of the Critical Date, "processing capabilities of mobile devices (e.g., cellular phones or PDAs) were sufficient to enable a POSITA to implement the IBM eye sensing technology," including the eye-tracking system described in the Morimoto paper (Ex. 1062) and the eye sensing described in Dr. Essa's work with Myron Flickner (Exs. 1063 and 1064).[4] *See* Ex. 1085 ¶ 102. Contrary to Dr. Pelz's testimony that the most powerful PDA processor, the iPAQ 3630, operated at 206 MHz (Ex. 2008 ¶ 39), Dr. Essa testified credibly that, in fact, there were a number of cellular phones and PDAs with 400 MHz processors, including the iPAQ 3950 released in July 2002 as an updated version of the iPAQ 3630. *See* Ex. 1085 ¶ 72 (citing Ex. 1044, 2; Ex. 1052, 1, 3), ¶¶ 73–88. In fact, the Tiqit eightythree was a handheld device with cellular capability that ran a desktop operating system with a Pentium 300 MHz processor. *Id.* ¶¶ 87–88.

We give little weight to Dr. Balakrishnan's enablement analysis because it is based on a SONY EVI-D30 camera implementation of the IBM MAGIC Tracker, without consideration of other relevant eye sensing

[4] Dr. Essa's work with Myron Flickner was directed to improving pupil detection and eye tracking technology for "creating attentive user interfaces." *See* Ex. 1085 ¶ 43 (citing Ex. 1064, Abstract). Dr. Essa and Myron Flickner built a reliable, real-time, non-invasive eye tracker using computer vision that could robustly locate and track eyes without any calibration, and estimate the user's focus of attention. *Id.* The eye tracker ran on a single Pentium II 200 MHz processor. *Id.* ¶ 46 (citing Ex. 1063, 5).

technology of which a POSA would have known. *See*, *e.g.*, Ex. 2028 ¶¶ 65–66; Ex. 1085 ¶¶ 33–47, 64. Dr. Balakrishnan testified, for example, that eye-tracking devices at the time, such as IBM's MAGIC Tracker, were too massive for a POSA to have considered placing them on a mobile device. Ex. 2028 ¶¶ 56–58. Dr. Balakrishnan, however, did not consider the eye-tracking system described in the Morimoto paper (Ex. 1062)[5] or the eye sensing described in Dr. Essa's work with Myron Flickner (Exs. 1063 and 1064). *See* Ex. 1085 ¶¶ 36–38, 42–47. We credit the testimony of Dr. Essa that the Tiqit eightythree, discussed above, could have implemented the eye sensing described in the Morimoto paper (Ex. 1062) and the eye sensing described in Dr. Essa's work with Myron Flickner (Exs. 1063 and 1064):

> For instance, the Tiqit eightythree included a Pentium Class 300 MHz processor that ran a full PC operating system (Microsoft Windows XP). . . . This device certainly could have implemented the eye sensing described in the Morimoto paper (Ex. 1062) and the eye sensing described in my prior work with Myron Flickner (Exs. 1063 and 1064), as those systems ran on less powerful Pentium processors. . . . These eye sensing technologies could have been used to implement the eye sensing needed for Goldstein's automated pause/resume functionality. Moreover, the Tiqit eightythree device shows that it was possible to include a Pentium processor running a full PC operating system in a handheld form factor.

Id. ¶ 102.

[5] The Morimoto paper describes a pupil detection system that is "very compact (the dimensions . . . [are] about 9x9x3 cm)." *See* Ex. 1085 ¶ 38 (quoting Ex. 1062, 7). The pupil detection system ran on a single Pentium 200 processor. *See id.* (citing Ex. 1062, 5).

(e) *The Smart Bailando Prototype*

Mikael Goldstein, one of the inventors named on the face of the asserted Goldstein prior art reference, co-authored a paper titled: "Utilizing Gaze Detection to Simulate the Affordances of Paper in the Rapid Serial Visual Presentation Format" (the "Goldstein paper"). Ex. 1067, 1. The Goldstein paper states:

> If one enhanced the RSVP application with sensors that register the reader's gaze, *gaze detection*, the application could become context-aware [15] and automatically stop/start the text presentation when the reader looked away from the text. A pre-condition for this would be that the terminal using the RSVP format would have a built-in camera focused on the reader's eyes continuously during RSVP reading. Mobile phones are currently being released on the market with such a camera integrated into their design (e.g. the Sony Ericsson P800 and the Nokia 7650) and cameras can be bought as add-on modules for PDAs (e.g. the HP Pocket Camera) soon making this requirement very easy to fulfill. Based on the observations presented above, we believe that adding gaze detection functionality to RSVP reading on hand-held PDAs and cellular phones is one feasible route to making reading on small devices as convenient as ordinary screen or paper reading.

Id. at 2–3. The Goldstein paper discusses the "Smart Bailando," which also is the subject of a Master's Thesis titled "Smart Bailando, Eye controlled RSVP on handhelds." *Id.* at 3; Ex. 2010, 1.

As discussed below, the Smart Bailando prototype constitutes a *working model* of the invention of claims 1 and 34 of the '482 patent as implemented on a handheld device. *See Impax Labs.*, 545 F.3d at 1314; Ex. 1085 ¶ 105. Built as the client of a client-server application running on a PC, the Smart Bailando prototype utilizes a camera mounted "on" a PDA to control text presentation by starting and pausing RSVP text flow based on

gaze detection, i.e., sensing attention of a user specifically toward the device. Ex. 1085 ¶¶ 54–56 (citing Ex. 1067, Abstract, 4); Ex. 1067, 3; Ex. 2010, 8. With respect to the processor required of claim 1 of the '482 patent, we concur with Dr. Essa's conclusion that "[a]lthough the processing in the Smart Bailando prototype does not occur on the PDA, . . . the claims of the '482 patent do not require the processor to be part of the device." Ex. 1085 ¶ 62.

We have considered the statement in Exhibit 2010, on which Queen's relies, that porting the Smart Eye gaze detection system to an iPAQ 3630 PDA "would not work," as well as the related testimony of Dr. Pelz concluding that the attempt of the Smart Eye Company to port its system to a handheld device was a "failure." *See* Surreply 6 (citing Ex. 2010, 27); Ex. 2008 ¶ 47. We, however, accord little weight to this evidence for two reasons, which we discuss below.

First, we are not persuaded that claim 19 and claim 20 of the '482 patent require directly *porting* an eye detection system to a device such that the required processing occurs on the device. Claims 19 and 20 recite an apparatus for controlling operation of a device that includes a "processor that processes the sensor signal and produces a user state signal that is indicative of user attention toward a screen of the device." As discussed above, nothing in this language precludes utilizing a client/server implementation whereby the signal is processed at the server rather than the client device. *See* Ex. 1085 ¶ 62. Accordingly, directly porting an eye gaze detection system to a device, such that processing occurs on the device, is not necessary to implement the claimed method.

Second, the Smart Eye Company's unsuccessful attempt to port its eye gaze detection system to an iPAQ 3630 PDA is of little probative value in determining whether a POSA could have ported an eye-tracking system to a handheld device as of the Critical Date, without undue experimentation. This is because: (1) the Smart Eye system required significantly more processing power than other eye-tracking systems available to a POSA as of the Critical Date, such as the eye-tracking system described in the Morimoto paper (Ex. 1062) or the eye sensing described in Dr. Essa's work with Myron Flickner (Exs. 1063 and 1064); and (2) the iPAQ 3630 PDA possessed significantly less processing power than other handheld devices available to a POSA as of the Critical Date, such as the Tiqit eightythree handheld device (Ex. 1081). *See* Ex. 2008 ¶ 47; Ex. 2010, 21, 27; Ex. 1085 ¶¶ 38, 46, 72, 102, 103. Specifically, the Smart Eye system required a 1 GHz processor, and the iPAQ 3630 PDA ran at 206 MHz. Ex. 2008 ¶ 47; Ex. 2010, 21, 27. In contrast, the eye-tracking system described in the Morimoto paper required only a 200 MHz Pentium processor and the eye tracker built by Dr. Essa and Myron Flickner required only a Pentium II 200 MHz processor, while the Tiqit eightythree handheld device included a Pentium Class 300 MHz processor that ran a full PC operating system (Microsoft Windows XP). Ex. 1085 ¶¶ 38, 43, 46, 72, 88.

We also are not persuaded that claims 19 and 20 of the '482 patent require a solution to the problem of "relative movement of the user and the tracker in a handheld environment," as Queen's contends. PO Resp. 8, 24–26 (citing Ex. 2008 ¶¶ 38–59; Ex. 2010, 19); Surreply 8 (citing Ex. 2008 ¶¶ 46–59; Ex. 2010, 19). Dr. Pelz testifies that "remote eye detection systems" at the time, including the Smart Eye system, suffered from "limited

ability to cope with head movement of the user," a "problem [that] became especially acute for attempts to implement eye detection on a handheld device." Ex. 2008 ¶ 40 (citing Ex. 2010, 37). Dr. Pelz further testifies that the Smart Bailando researchers concluded:

> The handheld market is not yet ready to introduce gaze detection, partly because the lack of processor capacity and partly for the reason that all too few units have built-in cameras. Some handheld devices have a camera as an add-on, but it makes the unit all too heavy to make it feel comfortable in the every day use.

Id. ¶ 41 (quoting Ex. 2010, 41). But Samsung does not need to demonstrate utility or efficacy for enablement of Goldstein's relevant disclosures. *See Verizon Servs.*, 602 F.3d at 1337. The evidence establishes that eye detection systems of the time, such as the Smart Eye system, the eye-tracking system described in the Morimoto paper, and the eye sensing described in Dr. Essa's work with Myron Flickner, functioned reliably when head and device were held still. *See*, *e.g.*, Ex. 2010, 17; Ex. 1062, 4–7; Ex. 1085 ¶ 43. Claims 1, 19, and 20 of the '482 patent do not recite a device that must be able to cope with head movement as Queen's contends.

d) Dependent Claims 3, 17, 21, 24, and 28–33

Claims 3, 17, 21, 24, and 28–33 all depend directly from claim 1. Ex. 1001, 22:40–23:19. Queen's relies solely upon its arguments directed to claim 1 in opposition to Samsung's argument and evidence that Goldstein anticipates dependent claims 3, 17, 21, 24, and 28–33. *See* PO Resp. 15–31. Based on our review of the record before us and for the reasons that we identify in Part II.C.1.b) above and those stated in Samsung's Petition, which we adopt, we determine that Samsung has demonstrated by a

preponderance of evidence that Goldstein anticipates claims 3, 17, 21, 24, and 28–33.

e) Summary of Goldstein Anticipation Analysis

For the reasons given, we determine that Samsung has shown by a preponderance of the evidence that claims 1, 3, 17, 19–21, 24, and 28–33 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Goldstein.

2. Obviousness of Claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 in View of Goldstein and Cohen-solal

Samsung contends that the combination of Goldstein and Cohen-solal renders dependent claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 unpatentable as obvious. Pet. 24–29. These claims depend directly or indirectly from independent claim 1 and further require either specific types of attention sensing (e.g., claims 4, 7, 10, and 13) or the use of specific types of sensors or input/output hardware (e.g., claims 5, 11, 14, 16, 23, and 26). Ex. 1001, 22:42–23:23. For the reasons discussed below, we determine that Samsung has established by a preponderance of evidence that the combination of Goldstein and Cohen-solal renders claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 unpatentable as obvious.

Samsung relies on Goldstein as describing all the limitations of claim 1 and contends that Cohen-solal describes the limitations introduced in the dependent claims. Pet. 24–29. Samsung argues that an ordinarily skilled artisan would have found it obvious to modify Goldstein to include Cohen-solal's attention sensing apparatus, which is capable of sensing many more types of "attention" than Goldstein's eye gaze sensor. *Id*. at 25–26 (citing Ex. 1003 ¶ 38 and Ex. 1007 ¶¶ 31–33). Samsung contends that an ordinarily skilled artisan would have been motivated to incorporate Cohen-solal's additional sensing techniques into Goldstein's apparatus to "increase the

accuracy of the user attention calculation." Pet. 26. Samsung supports this contention with Dr. Turnbull's testimony, Ex. 1003 ¶ 38, and material from Ho, Ex. 1006, 7:13–20 ("monitor[ing] more than one type of behavior substantially simultaneously . . . increase[s] the accuracy in determining the student's concentration level."). Pet. 26. Samsung concludes that the results of combining Goldstein and Cohen-solal "would have been predictable." Pet. 26 (citing Ex. 1003 ¶¶ 37, 38).

Queen's responds to Samsung's obviousness challenge based upon Goldstein and Cohen-solal solely by arguing that Goldstein fails to describe all the elements of independent claim 1. PO Resp. 31. For the reasons expressed in Part II.C.1.b) above, we determine that Goldstein describes all the elements of claim 1. Based on our review of the record before us, our consideration of objective indicia of non-obviousness as discussed in Part II.C.5 below, and the reasons stated in Samsung's Petition, which we adopt, we determine that the combination of Goldstein and Cohen-solal renders claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 unpatentable as obvious under 35 U.S.C. § 103(a).

3. Anticipation of Claims 1–4, 10, 17, 19–21, 23, 24, and 26–42 by Ho

Samsung contends that Ho anticipates claims 1–4, 10, 17, 19–21, 23, 24, and 26–42. *See* Pet. 29–43, 60. For the reasons discussed below, we determine that Samsung has established by a preponderance of evidence that Ho anticipates claims 1–4, 10, 17, 19–21, 23, 24, and 26–42.

a) Overview of Ho

Ho discloses "a computer-aided-educational system and method that automatically consider a student's concentration-sensitive behavior while the student is working on the study materials." Ex. 1006, 1:48–51. In one

embodiment, the system includes a presenter, a non-intrusive sensor, a controller, and an indicator. *Id.* at 1:52–54. In this embodiment, the presenter presents study materials to a student, the sensor automatically senses the student's concentration-sensitive behavior, the controller analyzes the behavior based on one or more rules, and the indicator indicates the student's concentration level based on the analysis. *Id.* at 1:54–61. One rule taught by Ho is that "if the student is not looking at the monitor showing the study materials for a predetermined period of time, the student has lost concentration in the study materials." *Id.* at 2:10–13. Ho discloses an embodiment that reacts according to the indication of the student's concentration. *Id.* at 1:61–62, 11:9–10, Fig. 3. Examples of reactions taught by Ho include stimulation, reward, punishment, or change of study materials. *Id.* at 11:10–12.

b) Independent Claims 1 and 34

Queen's argues that Ho fails to anticipate independent claims 1 and 34 because Ho does not describe "using the user state signal as a basis for controlling operation of the device," as recited in each of these claims. PO Resp. 34–35. Queen's argues that Ho's system monitors "a student's concentration level over a period of time—a modulation that is not the same as and will result in a different functionality than the claimed using the user state signal as a basis for controlling operation of the device." *Id.* at 34 (citing Ex. 2028 ¶¶ 102–116). Queen's further explains:

> Since, Ho's modulation is triggered by time, Ho cannot, for example, modulate a device (e.g., pausing) *immediately upon a determination that the user's attention is not directed toward the device* (e.g., the user steps away or looks away from device). [Ex. 2028] ¶¶ 114–115. Thus, the result of Ho's modulation is different from the result of the claimed using the user state signal

> as a basis for controlling operation of the device. *Id.* Samsung has failed to explain how Ho's time-based modulation is analogous to the claimed features and has not met its burden in showing how Ho anticipates this feature.

Id. at 35 (emphasis added).

Samsung responds that claims 1 and 34 do not require controlling the device "immediately" or "the instant a user state signal is produced." Reply 18–19. We agree. As discussed above, Queen's implied claim interpretation is inconsistent with the '482 patent, which discloses multiple examples of monitoring attention over time. *See* Part II.A.2 above; Ex. 1001, 13:9–20, 15:4–21, 19:34–37. Accordingly, we agree with Samsung that Ho discloses "using the user state signal as a basis for controlling operation of the device" as required by claims 1 and 34.

For the reasons given, we determine that Samsung has shown by a preponderance of the evidence that Ho anticipates independent claims 1 and 34 under 35 U.S.C. § 102(b).

c) Dependent Claims 19 and 20

Queen's argues that Ho fails to disclose a sensor that is "physically coupled to the device" as recited in claim 19 or further "attached to or embedded in the screen" as recited in claim 20. PO Resp. 32–34. Queen's argues that Ho's "digital camera 180 (the alleged claimed hardware sensor) . . . is not 'physically coupled to the device,' but rather placed 'adjacent to the monitor' of the device." *Id.* at 33 (citing Ex. 1006, 8:40–48). In support of that argument, Queen's asserts that Ho's "Fig. 2B illustrates that digital camera 180 is connected to the system via peripheral controller 106, indicating that digital camera 180 is external to Ho's device, not 'physically

coupled to' the device." *Id.* (citing Ex. 2028 ¶¶ 95–97). Queen's further argues:

> Ho's Fig. 2A has a vertical line extending from digital camera 180 to Ho's computer. However, the vertical line connecting digital camera 180 and the computer does not indicate that the digital camera 180 is "physically coupled to the device." Ex. 2028, ¶¶ 98–100. Rather, consistent with Ho's specification (and other lines in Fig. 2A), this vertical line only represents an artistic rendering of a *communicative* link between Ho's digital camera and the client computer. *Id.*

PO Resp. 33–34. For these reasons, Queen's contends that "a POSA would have understood that Ho's digital camera is merely next to the monitor." *Id.* at 33 (citing Ex. 2028 ¶ 115). Queen's further argues that Ho fails to describe "anything with respect to claim 20's requirement of the sensor being, not only physically coupled to the device, but also attached to or embedded in a screen of the device." *Id*. (citing Ex. 2028 ¶¶ 95–97, 115)

In its Reply, Samsung argues, and we agree, that Queen's ignores Ho's other disclosures, for example, that "[t]he sensor 110 includ[es] the digital camera 180" and that "the sensor 110 can be *in a client computer*." Reply 17 (quoting Ex. 1006, 3:38, 8:43). Samsung further argues, and we agree, that "Ho also describes that 'there is no restriction preventing all components to reside *in one element, such as a client computer*.'" *Id.* (quoting Ex. 1006, 3:44–46). Accordingly, we agree with Samsung that Ho discloses the sensor being "physically coupled to the device" as required by claim 19 and being "attached to or embedded in the screen" as required by claim 20.

d) Dependent Claims 2–4, 10, 17, 21, 23, 24, 26–33, and 35–42

Claims 2–4, 10, 17, 21, 23, 24, and 26–33 depend directly or indirectly from independent claim 1, Ex. 1001, 22:38–23:46, and claims 35–

42 depend directly or indirectly from independent claim 34, *id*. at 24:18–45. Queen's relies solely upon its arguments directed to claims 1 and 34 in opposition to Samsung's argument and evidence that Ho anticipates dependent claims 2–4, 10, 17, 21, 23, 24, 26–33, and 35–42. *See* PO Resp. 32–35. Based on our review of the record before us and for the reasons that we identify in Parts II.C.1.b)–c) above and the reasons stated in Samsung's Petition, which we adopt, we determine that Samsung has demonstrated by a preponderance of evidence that Ho anticipates claims 2–4, 10, 17, 21, 23, 24, 26–33, and 35–42.

4. Obviousness of Claims 1, 3, 10, 17, 19–21, 23–34, and 36–42 in View of Horvitz and Tognazzini

Samsung contends that the combination of Horvitz and Tognazzini renders claims 1, 3, 10, 17, 19–21, 23–34, and 36–42 unpatentable as obvious. Pet. 43–60. For the reasons expressed below, we agree.

a) Overview of Horvitz

Horvitz discloses a computerized system for managing alerts. Ex. 1014, 2:14–24. The system analyzes how and when to render an alert to a user based on "the likelihood of alternate states of attention." *Id.* at 2:56–57. In one embodiment, the system determines whether to alert the user "in an audio or visual manner, or on a mobile device such as a cell phone or a pager." *Id.* at 2:62–65.

Horvitz describes system 200, which includes peripheral information notification and alerts module 202, attentional status module 204, and notification decision-making module 206. *Id.* at 6:20–23. "[T]he attentional status module 204 ultimately generates a probability distribution over different states of attention 300." *Id.* at 7:4–6, Fig. 3. The output of the attentional status module can be *the single availability probability*—the

probability, for example, that the user is receptive to receiving an alert. *Id.* at 7:6–11 (emphasis added). "The probability 300 is generated in one embodiment by considering a profile of prior knowledge 302, as well as one or more contextual events 304." *Id.* at 7:16–18. Those contextual events include computer information and external information. *Id.* at 7:27–28. Computer information may indicate, for example, that the user has been focused on a single application and is typing quickly on the keyboard. *Id.* at 7:28–31. External information includes, for example, "visual cues 314" including "gaze 318." *Id.* at 7:49–50, 58–59, Fig. 3. "The gaze 318 can be used to determine whether the user is attentive to the computer, or whether the user is looking at a book, has his or her head turned to one side, etc." *Id.* at 7:62–65. "[T]he contextual events 304 and/or the profile 302 are used to determine the probability distribution over a user's focus of attention, or of the single availability probability that a user is open to or actively seeking notifications." *Id.* at 8:1–4.

b) Overview of Tognazzini

Tognazzini discloses an eye gaze tracking device mounted below the display of a personal computer. Ex. 1015, 6:58–60, Fig. 2. Tognazzini teaches utilizing the detected eye gaze of the computer user to regain lost context, e.g., where the user was looking, after an interruption or distraction. *Id*. at 8:23–54, Figs. 5A, 5B, 5C.

c) Claims 1 and 34

Samsung relies on Horvitz as describing all the limitations of claims 1 and 34 except for the sensor coupled to the device to generate a signal "indicative of user attention toward a screen of the device." Pet. 43–50, 55–59. Samsung relies upon Tognazzini's description of its gaze tracking

device 201 and contends that an ordinarily skilled artisan would have modified Horvitz to include Tognazzini's eye sensing hardware and technique as a "known technique to improve similar devices in the same way." Pet. 45. Samsung contends that Horvitz relies upon "visual cues 314" like "gaze 318 . . . to determine whether the user is attentive to the computer" but concedes that Horvitz does not explicitly describe sensors. *Id*. (citing Ex. 1014, 7:4–67). Samsung argues, however, that an ordinarily skilled artisan would have understood that such sensors were needed to detect gaze. Pet. 45 (citing Ex. 1003 ¶ 65). To fill the gap in Horvitz's description of sensors, Samsung argues that an ordinarily skilled artisan would have been motivated to look for references that describe sensors for detecting eye gaze and that Tognazzini describes the type of sensor that an ordinarily skilled artisan would have incorporated into Horvitz. Pet. 45–46.

Queen's responds that "Horvitz and Tognazzini do not teach or suggest the claimed processor that processes the sensor signal and produces a user state signal that is indicative of user attention toward a screen of the device." PO Resp. 35 (citing Ex. 2028 ¶¶ 119–21). Queen's argues:

> Samsung relies on, but never explains why Horvitz's P(ATTENTION) is a measure of attention toward the device. Petition, p. 51. Horvitz merely teaches two potential outputs from its system: (1) general user-availability probability and (2) a probability distribution over a user's focus of attention. Ex. 1014, 2:30–34, 7:4–15. Neither is clearly a measure of a user's attention toward a device. Ex. 2028, ¶¶ 121–122. However, because these outputs are probabilistic, neither is based on a measure of a user's attention specifically toward a device. *Id.* In order to meet this claimed feature, the prior art must at least have a processor that (1) processes a signal from a sensor that senses attention toward a device, and (2) produces a user state signal that is indicative of user attention toward a screen of the device. *Id.* at ¶ 119–122. Hence, producing a

> generalized measure of the user's attention, status, or availability is not sufficient. *Id.* at ¶ 119–122. Producing a *focus* of attention that does not include a measure or index of the user's attention toward the device is likewise deficient. *Id.* at ¶¶ 119–122. Yet, Samsung alleges and evinces no more.

Id. at 35–36.

Queen's acknowledges the disclosure that "gaze 318 can be used to determine whether the user is attentive to the computer, or whether the user is looking at a book, has his or her head turned to one side, etc." PO Resp. 36 (citing Ex. 1014, 7:62–65). But Queen's argues that "even if the determination of whether the user is attentive to the computer was considered a measure or index of the user's attention, Horvitz does not disclose" outputting that determination. *Id.* at 36–37 (citing Ex. 2028 ¶ 124). In that regard, Queen's additionally argues:

> First, the determination may be used by the Bayesian model within the attentional status module, but not output. [Ex. 2028 ¶ 124.] For example, a probability that the user is "receptive to receiving an alert or is actively seeking the peripheral information associated with one or more alerts" is *not* a measure or index of user's attention specifically toward *any device*. Ex. 1014, 7:10–12; Ex. 2028, ¶ 124.
>
> Second, Horvitz's system may modulate some other device (i.e., not the computer) based on the determination, as demonstrated by Horvitz's various examples. *Id.* For example, [the] system may "check[] to see if the user is around or not at the desktop system before making a decision that the only way to reach the user is to 'render' the notification via the cell phone." Ex. 1014, 13:43–46. This check is not based on gaze. Ex. 2028, ¶ 124.

PO Resp. 37.

Upon consideration of the competing arguments, we agree with Samsung that the combination of Horvitz and Tognazzini teaches or

suggests the subject matter of claims 1 and 34. We are persuaded, for example, that Horvitz and Tognazzini teach or suggest: (1) a hardware sensor coupled to a device for sensing gaze (attention of the user specifically toward the device); (2) a processor that processes the signal from the hardware sensor and outputting an availability probability to the device; and (3) controlling operation of the device on the basis of the availability probability. Horwitz teaches that the availability probability is "indicative of user attention toward a screen of the device" as required by claims 1 and 34. This is clear, for example, from the disclosure that notification decision-making module 206 uses the availability probability from attentional status module 204 to determine the manner by which the user should be alerted at the computer, for example, in a visual and/or an audio manner, and when the user should be alerted. *See, e.g.*, Ex. 1014, 9:29–38; Reply 20 (arguing that "a receptiveness to receiving an alert necessarily involves a receptiveness to receiving an alert at the single computer and attention is necessarily measured toward the single computer").

Queen's also challenges Samsung's rationale for combining Horvitz and Tognazzini. PO Resp. 37–39. Queen's argues that "given Horvitz's central, intended purpose of minimizing distractions, a POSA would not have looked to a system requiring an elaborate calibration procedure, such as Tognazzini's gaze-tracker, as it would have rendered Horvitz [unsuitable for] its intended purpose." *Id.* at 39. Queen's further argues:

> Tognazzini's gaze-tracking required user calibration (i.e., mapping of coordinates of eye gaze to a display coordinate system) for each user each time the system is used. Ex. 1015, 7:57–8:16. Such an elaborate calibration procedure would have constrained and distracted the user—precisely contrary to

> Horvitz's goal. *See* Ex. 2028, ¶¶ 125; Ex. 2008, ¶¶ 17, 24–25, 43–44; Ex. 2107, p. 16.

PO Resp. 39.

We are persuaded, however, that Samsung has provided a sufficient rationale for the combination. Horvitz teaches using gaze 318 to determine whether the user is attentive to the computer. Ex. 1014, 7:62–65. As Samsung argues, combining Tognazzini's teachings with respect to gaze tracking with Horvitz's teaching with respect to gaze 318 would have amounted to nothing more than the use of a known technique to improve a similar device in the same way. *See* Pet. 45. Queen's argument challenging the combination fails to give sufficient weight to Horvitz's teaching with respect to the advantage of using gaze 318 to determine whether the user is attentive to the computer. We find the advantages of incorporating Tognazzini's gaze-tracking technique in Horvitz outweigh the disadvantages cited by Queen's. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine.") (citation omitted).

Furthermore, we are not persuaded that Tognazzini requires a calibration procedure that would have constrained and distracted the user to the degree asserted by Queen's, or rendered Horvitz unsuitable for its intended purpose. *See* PO Resp. 39 (citing Ex. 2008 ¶¶ 17, 24–25, 43–44; Ex. 2028 ¶ 125; Ex. 2107, 16). Queen's citations to Exhibits 2028, 2008, and 2107 do not pertain specifically to Tognazzini. To the extent Queen's argues that *any* prior art *eye-tracking* device would have suffered from the same or similar disadvantages, Queen's has failed to show that a POSA would have used a different gaze-detection technique to implement

Horvitz's teachings with respect to gaze 318. Also, Queen's fails to reconcile or explain the facial inconsistency between its undue constraint-and-distraction argument and Tognazzini's teaching that a gaze-tracking device can be used to assist the computer user in being more productive in the face of interruptions and distractions. *See* Ex. 1015, 8:23–27, 49–54.

d) Dependent Claims 3, 10, 17, 19–21, 23–33, and 36–42

Samsung also argues that dependent claims 3, 10, 17, 19–21, 23–33, and 36–42 would have been obvious over the combination of Horvitz and Tognazzini. Pet. 50–56, 60. Queen's relies on its arguments relating to independent claims 1 and 34 with respect to the patentability of the dependent claims. PO Resp. 35–39. Based on our review of the record before us and for the reasons stated in Part II.C.4.c) above and the reasons stated in Samsung's Petition, which we adopt, we determine that Samsung has demonstrated by a preponderance of evidence that the combination of Horvitz and Tognazzini renders claims 3, 10, 17, 19–21, 23–33, and 36–42 unpatentable as obvious.

e) Summary

For the reasons given above, as well as those discussed in Part II.C.5 below with respect to objective indicia of non-obviousness, we determine that Petitioner has shown by a preponderance of the evidence that the combination of Horvitz and Tognazzini renders claims 1, 3, 10, 17, 19–21, 23–34, and 36–42 are unpatentable as obvious under 35 U.S.C. § 103(a).

5. Objective Indicia of Nonobviousness

"For objective evidence . . . to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention." *Rambus, Inc. v. Rea*, 731 F.3d 1248, 1256 (Fed. Cir.

2013) (quoting *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (quoting *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010)) (emphasis omitted) (internal quotation marks omitted)). "While objective evidence of nonobviousness lacks a nexus if it exclusively relates to a feature that was 'known in the prior art,' the obviousness inquiry centers on whether 'the claimed invention as a whole' would have been obvious." *Rambus*, 731 F.3d at 1257–58 (citation omitted). Thus, "[w]here the allegedly obvious patent claim is a combination of prior art elements, . . . the patent owner can show that it is the claimed combination as a whole that serves as a nexus for the objective evidence." *WBIP, LLC v. Kohler Co.*, Nos. 2015-1038 and 2015-1044, 2016 WL 3902668, at *7 (citing *Rambus*, 731 F.3d at 1258). "[T]here is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product "is the invention disclosed and claimed in the patent." *WBIP*, 2016 WL 3902668, at *6.

Further, objective evidence of nonobviousness "must be reasonably commensurate with the scope of the claims." *In re Kao*, 639 F.3d at 1068 (citations omitted); *accord S. Ala. Med. Sci. Found. v. Gnosis S.p.A.*, 808 F.3d 823, 827 (Fed. Cir. 2015). This does not mean that the proponent of the evidence must test every embodiment within the scope of the claims. *Id.* Rather, for the objective evidence of nonobviousness to be reasonably commensurate with the scope of the claims, the requirement is that "an adequate basis [exists] to support the conclusion that other embodiments falling within the claim will behave in the same manner." *Id.*

Queen's proffers objective evidence to show the nonobviousness of claims 1 and 34. *See* PO Resp. 42–57. Queen's argues that "[e]vidence

such as long-felt but unmet need, failure of others, copying, and praise of others collectively demonstrate[s] that the inventions of claims 1 and 34 were not obvious." *Id.* at 42. For the reasons discussed below, we agree with Samsung that the evidence of objective indicia of nonobviousness is insufficient to overcome the other evidence that claims 1 and 34 would have been obvious. *See* Reply 22–25.[6]

Queen's asserts that "[c]laim 1 of the '482 patent solved a long-felt but unmet need—a need for a *non-intrusive, fully integrated* attention-sensing device that was reliable and able to intelligently modulate operations on the basis of a user's attention toward the device." PO Resp. 45 (citing Ex. 2112, 87–98) (emphasis added). The prior art (represented by the Goldstein and/or Ho references), however, discloses the combination of features recited in claims 1 and 34. *See supra* Parts II.C.1.b) (regarding Goldstein and claim 1) and II.C.3.b) (regarding Ho and claims 1 and 34). Accordingly, Queen's evidence does not establish that the claimed combination, rather than the prior art, provided the asserted solution to the asserted long-felt but unmet need. *See WBIP*, 2016 WL 3902668, at *7.

Further, to the extent Queen's evidence relates to embodiments that use an *eye contact* hardware sensor, the evidence is not reasonably commensurate with the scope of claim 1. For example, Queen's citesExhibit

[6] Although Samsung also challenges dependent claims 3, 10, 17, 19–21, 23–33, and 35–42 as obvious in view of Horvitz and Tognazzini and dependent claims 4, 5, 7, 10, 11, 13, 14, 23, and 26 as obvious in view of Goldstein and Cohen-solal, Queen's does not argue any feature introduced by those claims as being the basis of its assertion that objective indicia justify a finding of nonobviousness. Therefore, we determine that the features introduced by dependent claims 3–5, 7, 10, 11, 13, 14, 17, 19–21, 23–33, and 35–42 are not relevant to our analysis of objective indicia of nonobviousness.

2013 as evidence that "[t]he '482 patent's technology provided a reliable solution" to the long-felt problem of intrusive and disruptive computer devices. *See* PO Resp. 45 (citing Ex. 2013, 189–90). The cited portion ofExhibit 2013 refers specifically to a gaze detection technique using "an eye contact sensor" as opposed to a gaze tracking sensor. Ex. 2013, 189–90 ("There is no intention here to track the user's gaze position; the idea is simply to detect whether or not the person has looked at the sensor."). Claims 1 and 34 of the '482 patent are not limited, however, to embodiments that use an eye *contact* sensor. Rather, the scope of claims 1 and 34 includes embodiments that use other types of hardware sensors, for example, an *eye tracking* hardware sensor. Queen's has not provided an adequate basis to support the conclusion that other embodiments falling within claim 1 or claim 28, such as embodiments that use an eye tracking hardware sensor, will behave in the same manner as the asserted embodiment that uses an eye contact hardware sensor. To the contrary, Queen's argues that embodiments using eye tracking hardware sensors failed to meet the asserted long-felt need. PO Resp. 46–48, 50–52. Accordingly, Queen's evidence relating to embodiments that use an eye contact hardware sensor is not reasonably commensurate with the scope of claims 1 and 34.

Queen's asserts that claims 1 and 34 "directly provided the reliable solution that users and the computing industry had been searching for years before the '482 patent." PO Resp. 51–52. As discussed above, however, the prior art discloses all limitations of claims 1 and 34. *See, e.g.*, *supra* Parts II.C.1.b) (regarding Goldstein and claim 1) and II.C.3.b) (regarding Ho and claims 1 and 34). Accordingly, Queen's argument that claims 1 and 34 provided a solution to the asserted problem is not persuasive.

Queen's further argues:

> Prior to the work performed by Dr. Vertegaal [a named '482 patent inventor], no one was able to create a device that: (i) performed device-initiated operations; *and* (ii) included an integrated sensor capable of measuring a user's attention toward the device, such that operations were controlled based on a user state signal indicative of the user's attention.

PO Resp. 46. As discussed above, however, the prior art (for example, Goldstein and/or Ho) discloses this combination of features (as recited in claims 1 and 34 of the '482 patent). *See*, *e.g.*, *supra* Parts II.C.1.b) (regarding Goldstein and claim 1) and II.C.3.b) (regarding Ho and claims 1 and 34).

Further, Queen's cites Exhibit 2010 (the Smart Bailando Master's Thesis) as proof of a long-felt need for the claimed invention. *See* PO Resp. 45–46. As discussed above, however, the Smart Bailando prototype constitutes a working model of the invention defined by claims 1 and 34 of the '482 patent. *See* Part II.C.1.c)(2)(e) above; Ex. 1085 ¶ 105. Thus, contrary to Queen's arguments, the Smart Bailando prototype is not evidence of a long-felt need for the invention of claims 1 and 34.

Queen's evidence and arguments relating to failure of others are unpersuasive for the same reasons as discussed above with respect to Queen's arguments and evidence with respect to long-felt but unmet need. *See* PO Resp. 50–52. The Smart Bailando prototype, in particular, is fatal to Queen's arguments. As discussed above, it constitutes a successful implementation of the invention of claims 1 and 34 prior to the Critical Date. *See* Part II.C.1.c)(2)(e) above; Ex. 1085 ¶¶ 62, 105.

With respect to copying, Queen's argues that "there is direct evidence that Samsung had access to Dr. Vertegaal's patented technology," and

"[t]hereafter, Samsung made extensive efforts to replicate the claimed technology, culminating in the release of Samsung's SmartPause™ feature." PO Resp. 52. Queen's asserts that:

> Samsung devices have a sensor (i.e. camera) in the device that senses attention of the user specifically toward the device (detect user looking away and looking back) and uses a signal indicative of a user's attention toward a screen of the device, as a basis for controlling the device's operations (pause/resume playback of the video)—making the SmartPause™ feature a direct copy and embodiment of claims 1 and 34.

Id. at 53.

Samsung does not dispute having access to the patented technology in late 2003 and early 2004 in the course of direct interactions with Queen's relating to Samsung's "Attentive Home Theatre" project. *See* Reply 24–25. Nor does Samsung dispute that its SmartPause™ feature is an embodiment of claims 1 and 34 of the '482 patent. Instead, Samsung argues that any presumption of copying is "simply not credible" because the SmartPause™ feature was "unveiled" in a 2013 cellular phone, almost a decade after Samsung learned about Queen's technology. *Id.* at 24. Samsung also argues that Queen's evidence fails to establish that Queen's ever developed a specific *product* or that Samsung replicated any such product. *Id.*

> [C]opying requires evidence of efforts to replicate a specific product, which may be demonstrated through internal company documents, direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a replica, or access to the patented product combined with substantial similarity to the patented product.

Wyers v. Master Lock Co., 616 F.3d 1231, 1246 (Fed. Cir. 2010). That the SmartPause™ feature of Samsung's cellular phones falls within the scope of claims 1 and 34 is not enough to establish copying. *See* PO Resp. 52–54;

Wyers, 616 F.3d at 1246 ("Not every competing product that arguably falls within the scope of a patent is evidence of copying; otherwise, 'every infringement suit would automatically confirm the nonobviousness of the patent.'") (quoting *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004)).

Queen's has not directed us to SmartPause™ features indicative of copying the claimed invention as opposed to using technology in the public domain. *See* PO Resp. 52–54; *Windsurfing Int'l, Inc. v. AMF, Inc.*, 782 F.2d 995, 1000 (Fed. Cir. 1986) ("[C]opying the claimed invention, rather than one within the public domain, is indicative of non-obviousness."). Goldstein and the Smart Bailando prototype each disclose the specific SmartPause™ features on which Queen's relies, including "looking away and looking back" and "pause/resume playback of video." *See* PO Resp. 53; Ex. 1005 ¶ 8, Abstract; Ex. 1085 ¶¶ 54-56 (citing Ex. 1067, Abstract, 4); Ex. 1067, 3; Ex. 2010, 8). For this reason, we are not persuaded that Queen's evidence establishes copying.

Finally, Queen's argues that the technology of claims 1 and 34 of the '482 patent has received significant praise in the industry. PO Resp. 54–56. Again, however, the prior art discloses the claimed technology. *See, e.g.*, *supra* Parts II.C.1.b) (regarding Goldstein and claim 1) and II.C.3.b) (regarding Ho and claims 1 and 34). Accordingly, Queen's evidence does not establish that the claimed technology, rather than the prior art, should receive credit for the asserted praise.

Moreover, Queen's evidence of industry praise is largely based on praise of the SmartPause™ feature of Samsung's cellular phone, or praise of Queen's made by Samsung. *See* PO Resp. 55–56. We are not persuaded

that praise of the SmartPause™ feature of Samsung's cellular phone is "equivalent" to praise of claims 1 and 34 of the '482 patent as Queen's contends. *See id.* at 57; Reply 25. Claims 1 and 34 are not limited to mobile devices, such as Samsung's cellular phone. Rather, the scope of claims 1 and 34 includes stationary devices, for example, a standard desktop personal computer ("PC").

Queen's argues, for example, that "[o]ut of all the features Samsung debuted with its [cellular phone] device, it was the SmartPause™ technology that was identified as being 'the most interesting' and providing 'efficacy' for the industry." PO Resp. 55 (quoting Ex. 2066, 1). The article on which Queen's relies, however, focuses on "mobile video." Ex. 2066, 1. There is no mention of interest or efficacy in the context of stationary devices. As another example, Queen's argues that "users were intrigued by the SmartPause™ technology." *Id*. at 56 (citing Exs. 2057, 2063–2067). The cited evidence, however, praises the technology for use on mobile devices, not stationary devices. *See* Ex. 2057 (watching videos in bed); Ex. 2063 ("smartphones"); Ex. 2064 (smartphones); Ex. 2065 ("mobile devices"); Ex. 2066 (mobile video); Ex. 2067 (mobile video).

Queen's has not provided an adequate basis to support the conclusion that the asserted praise for the SmartPause™ feature of Samsung's cellular phone extends to other embodiments within the scope of claims 1 and 34, such as stationary devices. Accordingly, Queen's evidence based on praise for the SmartPause™ feature of Samsung's cellular phone is not reasonably commensurate with the scope of claims 1 and 34.

With respect to asserted praise of Queen's made by Samsung, we agree with Samsung that, after showing initial interest in Queen's

technology, Samsung subsequently communicated concerns over the technology. *See* Reply 25 (citing Ex. 2077, 2); *compare* Ex. 2090, Ex. 2092, Ex. 2095, *with* Ex. 2077, 2.[7] Accordingly, Queen's evidence is insufficient to show industry praise for the claimed invention.

For these reasons, we agree with Samsung that the evidence of objective indicia of nonobviousness does not overcome the strong evidence that claims 1, 3, 10, 17, 19–21, 23–34, and 36–42 would have been obvious over Horvitz and Tognazzini or that claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 would have been obvious in view of Goldstein and Cohen-solal. *See* Reply 25.

III. QUEEN'S MOTION TO STRIKE SAMSUNG'S REPLY

In Queen's Motion to Strike Petitioner's Reply, Queen's argued that Samsung's Reply "exceeds its rebuttal function by shifting the original alleged grounds of anticipation to obviousness, providing a new theory of anticipation, submitting new evidence which could have been presented earlier, and circumventing the page limits through improper incorporation of expert testimony." Paper 31, 2. Queen's sought an order striking the entirety of Samsung's Reply or, in the alternative, authorizing Queen's to submit "a surreply and expert testimony on the issue of whether the prior art enables the claimed invention." *Id.* at 8. Samsung filed an Opposition responding to each of Queen's arguments. Paper 34, 1–10. After considering the competing arguments, we denied Queen's Motion to Strike Petitioner's Reply, but authorized Queen's to file a Surreply addressing the Goldstein enablement issue. Paper 36.

[7] Exhibits 2077, 2090, 2092, and 2095 are sealed protective order materials.

At the oral hearing, Queen's re-argued its Motion to Strike Petitioner's Reply. Tr. 62:23–67:20 (asserting "12 things that we think that the [R]eply went beyond"). Upon considering Patent Owner's arguments at the oral hearing, we affirm our denial of Queen's Motion to Strike Petitioner's Reply, because Samsung's arguments and the evidence submitted with the Reply, including the arguments and evidence addressing the Goldstein enablement issue, fall within the proper scope of a reply.

IV. MOTIONS TO EXCLUDE

We have reviewed Samsung's Motion to Exclude (Paper 37), Queen's Opposition to the Motion (Paper 44), and Samsung's Reply to Queen's Opposition (Paper 48). We also have reviewed Queen's Motion to Exclude (Paper 40), Samsung's Opposition to the Motion (Paper 46), and Queen's Reply to Samsung's Opposition (Paper 47).

A. Queen's Motion

Queen's first moves to exclude Exhibits 1020, 1021, 1023–1039, 1041, 1060, and 1061 as irrelevant, because they are not cited in Samsung's Reply or in Dr. Essa's Declaration. Paper 40, 1–2. Samsung responds, and we agree, that Exhibits 1020, 1021, 1023, 1024, 1026, 1028, 1032, 1034, 1037, 1039, 1041, 1060, and 1061 are relevant because they were discussed during Dr. Balakrishnan's deposition. Paper 46, 1–2. Accordingly, we deny Queen's request to exclude those exhibits. Samsung has withdrawn Exhibits 1025, 1027, 1029–1031, 1033, 1035, 1036, and 1038, and, thus, Queen's Motion is moot as to those exhibits. *See id.* at 3–4.

Queen's also moves to exclude Exhibits 1062 and 1067 as irrelevant. Paper 40, 2–7. Queen's argues that those exhibits constitute "new evidence" and, additionally, that their admission would be unfairly prejudicial to

Queen's. *Id.* Dr. Essa, however, relies on each of those exhibits to rebut the testimony of Dr. Balakrishnan and Dr. Pelz with respect to the Goldstein enablement issue. *E.g.*, Ex. 1085 ¶¶ 35–41, 54–64, 100, 102–107. We agree with Samsung's argument that those exhibits are relevant and that Queen's is not unfairly prejudiced by their admission (*see* Paper 46, 4–8), and we deny Queen's Motion as to those exhibits.

Finally, Queen's moves to exclude Exhibits 1074, 1075, and 1077–1084 as inadmissible hearsay. Paper 40, 7–8. Queen's argues that "Dr. Essa asserts the statements in each of these Exhibits for its truth—as alleged evidence of the state of the art at the time of the invention." *Id.* Samsung responds that

> none of these exhibits should be excluded because, under [Rule 703 of the Federal Rules of Evidence], it is proper for Dr. Essa to rely on otherwise inadmissible facts or data so long as experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject.

Paper 46, 8. We agree, and deny Queen's Motion as to those exhibits.

B. Samsung's Motion

Samsung moves to exclude all or portions of Exhibits 2008–2019, 2021–2028, 2057–2069, 2071–2086, 2088, 2099–2101, 2106–2108, 2112, 2116, and 2117 for reasons that track Queen's objections to Samsung's evidence, discussed above. Paper 37, 2 ("[Samsung] . . . advances this motion to exclude to ensure that any exclusion of [Samsung's] evidence should find comparable exclusion in [Queen's] evidence for reasons advanced by [Queen's]."). We deny Samsung's Motion for the reasons that we deny Queen's Motion, discussed above.

V. CONCLUSION

For the reasons expressed above, we determine that Samsung has shown by a preponderance of the evidence that:

1. claims 1, 3, 17, 19–21, 24, and 28–33 of the ’482 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Goldstein;
2. claims 4, 5, 7, 10, 11, 13, 14, 16, 23, and 26 of the ’482 patent are unpatentable under 35 U.S.C. § 103 in view of the combination of Goldstein and Cohen-solal;
3. claims 1–4, 10, 17, 19–21, 23, 24, and 26–42 of the ’482 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by Ho; and
4. claims 1, 3, 10, 17, 19–21, 23–34, and 36–42 of the ’482 patent are unpatentable under 35 U.S.C. § 103 in view of the combination of Horvitz and Tognazzini.

This Final Written Decision discusses or cites information that is the subject of motions to seal. *See, e.g.*, Part II.C.5 above. Accordingly, we have entered this Decision in the Board’s E2E system as “Board and Parties Only.” If either Party believes that any portion of this Decision should be maintained under seal, the Party must file, within five (5) business days from the entry of the Decision, a motion to seal portions of the Decision. The motion must include a proposed redacted version of the Decision, accompanied by an explanation as to why good cause exists to maintain under seal each redacted portion. In the absence of a motion to seal by the specified deadline, the full version of this Decision will become public. Any

opposition to a motion must be filed within three (3) business days from the date of entry of the motion; no reply to an opposition is authorized.

VI. ORDER

For the reasons given, it is:

ORDERED that claims 1–5, 7, 10, 11, 13, 14, 16, 17, 19–21, and 23–42 of the ’482 patent are held *unpatentable*;

FURTHER ORDERED that each of the parties is authorized to file, within five (5) business days from the date of entry of this Final Written Decision, a motion to seal portions of the Decision that includes a proposed redacted version of the Decision and an explanation as to why good cause exists to maintain under seal each redacted portion;

FURTHER ORDERED that any opposition to a motion to seal portions of the Decision must be filed within three (3) business days from the date of entry of the motion;

FURTHER ORDERED that no reply to an opposition is authorized; and

FURTHER ORDERED that, because this is a Final Written Decision pursuant to 35 U.S.C. § 318(a), 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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