AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas , @ r sm Chuhr hnrr on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:19-CV-874-ADA	09/09/2019	Western District of Texas , @ r sm Chuhr hnrr

PLAINTIFF	DEFENDANT
NEODRON LTD.,	MICROSOFT CORPORATION,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	9,086,770	7/21/2015	Neodron Ltd.
3	8,946,574	2/3/2015	Neodron Ltd.
4	8,502,547	8/6/2013	Neodron Ltd.
5	10,088,960	10/2/2018	Neodron Ltd

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Attached is the Order of Dismissal with Prejudice signed by Judge Alan D. Albright on January 7, 2021.

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack		January 8, 2021

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

NEODRON LTD.,

Plaintiff,

v.

MICROSOFT CORPORATION,

Defendant.

C.A. No. 1:19-cv-00874-ADA

ORDER OF DISMISSAL WITH PREJUDICE

On this day, Plaintiff Neodron Ltd., ("Plaintiff") and Microsoft Corporation ("Defendant") announced to the Court that they have resolved Plaintiff's claims for relief against Defendant asserted in this case and Defendants' claims and defenses for relief against Plaintiff asserted in this case. Plaintiff and Defendant have therefore requested that the Court dismiss Plaintiff's claims for relief against Defendant with prejudice and Defendants' claims and defenses for relief against Plaintiff with prejudice, and with all attorneys' fees, costs and expenses taxed against the party incurring same. The Court, having considered this request, is of the opinion that their request for dismissal should be granted.

IT IS THEREFORE ORDERED that Plaintiff's claims for relief against Defendant are dismissed with prejudice and Defendants' claims and defenses for relief against Plaintiff are dismissed with prejudice. IT IS FURTHER ORDERED that all attorneys' fees, costs of court and expenses shall be borne by each party incurring the same.

Dated: 1/7/21

ALAN D ALBRIGHT
United States District Judge

A true copy of the original, I certify.
Clerk, U.S. District Court
By: Deputy Clerk

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:19-cv-00819-ADA	8/28/2019	Western District of Texas
PLAINTIFF NEODRON LTD.,		DEFENDANT DELL TECHNOLOGIES, INC.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,102,286	1/24/2012	Neodron Ltd.
2 8,451,237	5/28/2013	Neodron Ltd.
3 8,502,547	8/6/2013	Neodron Ltd.
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,946,574	2/3/2015	Neodron Ltd.
2 10,088,960	10/2/2018	Neodron Ltd.
3 7,821,502	10/26/2010	Neodron Ltd.
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Order of dismissal attached.

CLERK	(BY) DEPUTY CLERK	DATE
JEANNETTE J. CLACK	[signature]	1/7/21

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

NEODRON LTD.,

Plaintiff,

v.

DELL TECHNOLOGIES INC.,

Defendant.

Case No. 1:19-cv-00819-ADA

ORDER OF DISMISSAL WITH PREJUDICE

On this day, Plaintiff Neodron Ltd., ("Plaintiff") and Dell Technologies Inc., ("Defendant") announced to the Court that they have resolved Plaintiff's claims for relief against Defendant asserted in this case and Defendant's claims, defenses and/or counterclaims for relief against Plaintiff asserted in this case. Plaintiff and Defendant have therefore requested that the Court dismiss Plaintiff's claims for relief against Defendant with prejudice and Defendant's claims, defenses and/or counterclaims for relief against Plaintiff with prejudice, and with all attorneys' fees, costs and expenses taxed against the party incurring same. The Court, having considered this request, is of the opinion that their request for dismissal should be granted.

IT IS THEREFORE ORDERED that Plaintiff's claims for relief against Defendant are dismissed with prejudice and Defendant's claims, defenses and/or counterclaims for relief against Plaintiff are dismissed with prejudice. IT IS FURTHER ORDERED that all attorneys' fees, costs of court and expenses shall be borne by each party incurring the same.

Dated: January 7, 2021

ALAN D. ALBRIGHT
United States District Judge

Trials@uspto.gov
571-272-7822

Paper 26
Entered: February 18, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HP INC., MICROSOFT CORPORATION, DELL INC.,
DELL PRODUCTS LP, LENOVO (UNITED STATES) INC., and
MOTOROLA MOBILITY LLC.,
Petitioner,

v.

NEODRON LTD.,
Patent Owner.

IPR2020-00459
Patent 8,946,574 B2

Before MIRIAM L. QUINN, PATRICK M. BOUCHER, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

HOWARD, *Administrative Patent Judge*.

TERMINATION
Due to Settlement After Institution of Trial and
Granting Joint Request to Treat Settlement Agreement as
Business Confidential Information
35 U.S.C. § 317; 37 C.F.R. § 42.74

I. INTRODUCTION

HP Inc., Microsoft Corporation, Dell Inc., Dell Products LP, Lenovo (United States) Inc., and Motorola Mobility LLC., (collectively, "Petitioner") and Neodron Ltd. ("Patent Owner"), (collectively "the Parties"), request that the above-identified *inter partes* review proceeding be terminated pursuant to a settlement. With our authorization, the Parties filed a Joint Motion to Terminate the above-identified proceeding ("Joint Motion"). Paper 24.

The Parties also filed Settlement and License Agreements (Ex. 2011; Ex. 2012; Ex. 2013; Ex. 2014; Ex. 2015, collectively "Settlement Agreements") and a Joint Request to Keep Separate (Paper 25, "Joint Request").

II. DISCUSSION

Under 35 U.S.C. § 317(a), "[a]n inter partes review instituted under this chapter shall be terminated with respect to any petitioner upon the joint request of the petitioner and the patent owner, unless the Office has decided the merits of the proceeding before the request for termination is filed." It is also provided in 35 U.S.C. § 317(a) that if no petitioner remains in the *inter partes* review, the Office may terminate the review.

In the Joint Motion, the Parties represent that they have reached an agreement to jointly seek termination of this *inter partes* review proceeding, that the filed copies of the Settlement Agreements are true copies, and there are no other collateral agreements. Joint Motion 1–3. Further, the Settlement Agreements indicate they are complete agreements. Ex. 2011, 9–10; Ex. 2012, 7; Ex. 2013, 7; Ex. 2014, 9–10; Ex. 2015, 7. The Parties also represent that their Settlement Agreements resolve all currently pending

Patent Office and District Court proceedings between the Parties involving U.S. Patent No. 8,946,574 B2 ("the '574 patent"). Joint Motion 1–3.

We instituted a trial on the above-identified proceeding on September 14, 2020. Paper 17. We have not yet decided the merits of the proceeding, and a final written decision has not been entered. Notwithstanding that the proceeding has moved beyond the preliminary stage, the Parties have adequately shown that the termination of the proceeding is appropriate. Under these circumstances, we determine that good cause exists to terminate the proceeding with respect to the Parties.

The Parties also requested that the Settlement Agreements be treated as business confidential information and be kept separate from the file of the '574 patent. Joint Request 1–2. After reviewing the Settlement Agreements between the Parties, we find that the Settlement Agreements contain confidential business information regarding the terms of settlement. We determine that good cause exists to treat the Settlement Agreements as business confidential information pursuant to 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c).

This Order does not constitute a final written decision pursuant to 35 U.S.C. § 318(a).

III. ORDER

Accordingly, for the reasons discussed above, it is:

ORDERED that the Joint Motion is *granted*, and IPR2020-00459 is *terminated* with respect to Petitioner and Patent Owner, pursuant to 35 U.S.C. § 317(a) and 37 C.F.R. § 42.72; and

FURTHER ORDERED that the Joint Request is *granted*, and the Settlement Agreements shall be kept separate from the file of the '574

patent, and made available only to Federal Government agencies on written request, or to any person on a showing of good cause, pursuant to 35 U.S.C. § 317(b) and 37 C.F.R. § 42.74(c).

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:20-cv-239	7/15/2020	Eastern District of Texas

PLAINTIFF	DEFENDANT
NEODRON LTD.	FUJITSU LIMITED; FUJITSU AMERICA, INC.; FUJITSU COMPONENTS AMERICA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,946,574	2/3/2015	NEODRON LTD.
2	9,823,784	11/21/2017	NEODRON LTD.
3	10,088,960	10/2/2018	NEODRON LTD.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Print Save As... Reset

Trials@uspto.gov
571-272-7822

Paper No. 17
Date: September 14, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HP INC., MICROSOFT CORPORATION, DELL INC.,
DELL PRODUCTS LP, LENOVO (UNITED STATES) INC.,
and MOTOROLA MOBILITY LLC,
Petitioner,

v.

NEODRON LTD.,
Patent Owner.

IPR2020-00459
Patent 8,946,574 B2

Before MIRIAM L. QUINN, PATRICK M. BOUCHER, and SCOTT B. HOWARD, *Administrative Patent Judges.*

HOWARD, *Administrative Patent Judge.*

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

INTRODUCTION

A. Background and Summary

HP Inc. ("HP"), Microsoft Corporation ("Microsoft"), Dell Inc. and Dell Products LP (collectively, "Dell"), Lenovo (United States) Inc. ("Lenovo"), and Motorola Mobility LLC. ("Motorola"), (collectively, "Petitioner") filed a Petition to institute an *inter partes* review of claims 1–4, 6–11, and 13–15 of U.S. Patent No. 8,946,574 B2 (Ex. 1001, "the '574 patent"). Paper 3 ("Pet."). Neodron Ltd. ("Patent Owner") filed a Patent Owner Preliminary Response. Paper 10 ("Prelim. Resp."). Pursuant to our authorization (Paper 11), Petitioner filed a Reply to Patent Owner's Preliminary Response (Paper 13, "Pet. Prelim. Reply") and Patent Owner filed a Sur-Reply (Paper 14, "PO Prelim. Sur-reply").

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). *Inter partes* review may not be instituted unless "the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). A decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the Petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018).

For the reasons set forth below, upon considering the Petition and the evidence of record, we determine that the information presented in the Petition establishes a reasonable likelihood that Petitioner will prevail with respect to at least one of the challenged claims. Accordingly, we institute

inter partes review on all of the challenged claims based on all of the grounds identified in the Petition.

B. Real Parties in Interest

Petitioner identifies the following real parties in interest: HP Inc., Microsoft Corporation, Dell Inc., Dell Products LP, Lenovo (United States) Inc., and Motorola Mobility LLC. Pet. 2. Additionally, Petitioner identifies Lenovo Group Ltd. "as a real party-in-interest without admitting that Lenovo Group Ltd. is in fact a real party-in-interest." *Id.*

Patent Owner identifies Neodron Ltd. as the real party in interest. Paper 7, 1 (Patent Owner's Mandatory Notices).

C. Related Matters

The parties identify the following proceedings in which the '574 patent has been asserted: *Neodron Ltd. v. HP Inc.*, No. 1:19-cv-00873-ADA (W.D. Tex.); *Neodron Ltd. v. Microsoft Corp.*, No. 1:19-cv-00874-ADA (W.D. Tex.), *Neodron Ltd. v. Dell Technologies, Inc.*, No. 1:19-cv-00819-ADA (W.D. Tex.) (collectively the "WD Texas Actions"), *Neodron Ltd. v. Lenovo Group Ltd.*, No. 6:19-cv-00398 (W.D. Tex.), which was dismissed and refiled as *Neodron Ltd. v. Lenovo Group Ltd.*[1], No. 3:19-cv-05644 (N.D. Cal.) (the "ND Cal. Action). Pet. 2; Paper 7, 2.

D. The '574 Patent

The '574 patent is titled "Two-Layer Sensor Stack." Ex. 1001, code (54).

According to the '574 patent, "[a] position sensor can detect the presence and location of a touch by a finger or by an object, such as a stylus,

[1] This action names Lenovo (United States) Inc. and Motorola Mobility LLC as co-defendants.

within an area of an external interface of the position sensor" and may enable "direct interaction with information displayed on the screen, rather than indirectly via a mouse or touchpad." Ex. 1001, 1:14–20. The '574 patent further states that "[t]here are a number of different types of position sensors" including a capacitive touch screen which "may include an insulator coated with a transparent conductor in a particular pattern." *Id.* at 1:27–32. "When an object . . . touches the surface of the screen there may be a change in capacitance [that] may be sent to a controller for processing to determine where the touch occurred on the touch screen." *Id.* at 1:32–36. The '574 patent further states that such capacitive touch screens may "an array of conductive drive electrodes or lines and conductive sense electrodes or lines can be used to form a touch screen having capacitive nodes." *Id.* at 1:37–40.

Figure 1 of the '574 patent is reproduced below.

FIG. 1

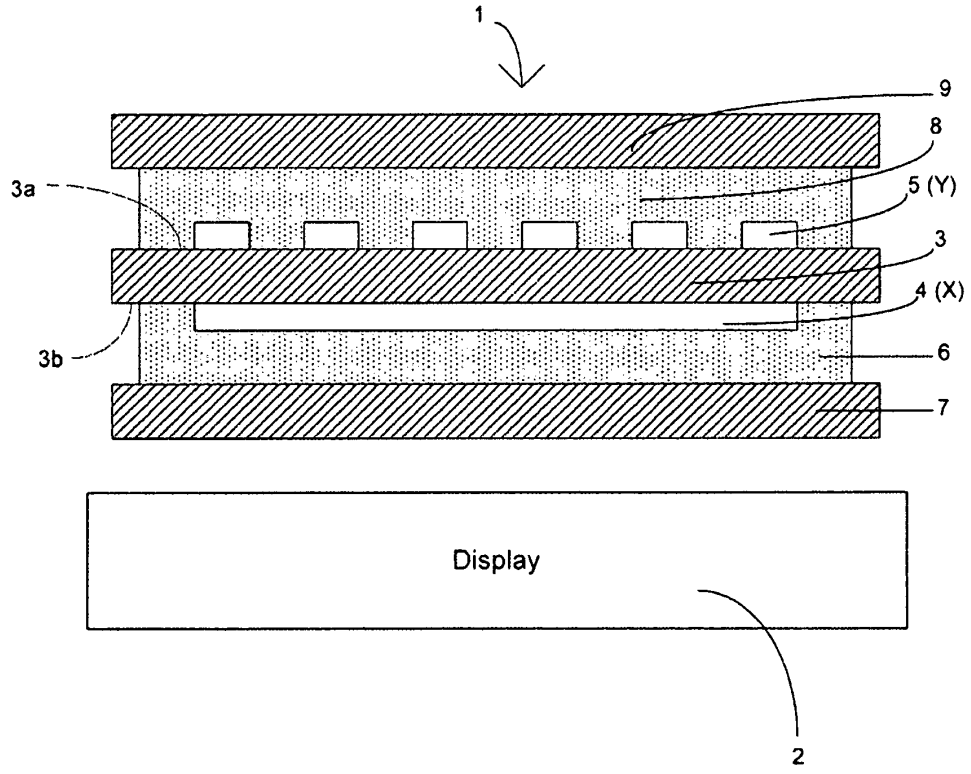

Figure 1 "is a cross-sectional view of an exemplary touch sensitive panel [(1)] and a display [(2)]." Ex. 1001, 2:3–4; *see also id.* at 2:52–53. The panel includes an insulating substrate 3 having two opposing faces, 3a and 3b. *Id.* at 2:53–61. Electrodes 4 (X) and 5 (Y), which may be arranged in different directions, are provided on faces 3b and 3a, respectively. *Id.* at 2:59–64.

The '574 patent goes on to describe the layers shown in Figure 1:

> The substrate 3 may be provided adjacent to the display 2 such that electrodes 4 (X) are arranged between the display 2 and the substrate 3. An adhesive layer 6 of an optically clear adhesive may be between the electrodes 4 (X) and a transparent covering sheet 7. Another adhesive layer 8 of an optically clear adhesive may be between the electrodes 5 (Y) and a transparent covering

> sheet 9. A gap may be formed between the display 2 and the transparent covering sheet 7.

Ex. 1001, 3:1–8. According to the '574 patent, "transparent covering sheet 7 and the adhesive layer 6 of optically clear adhesive may encapsulate the electrodes 4 (X)" and "transparent covering sheet 9 and the adhesive layer 8 of optically clear adhesive may encapsulate the electrodes 5 (Y)." *Id.* at 3:9–15. The '574 patent further states that "[t]he encapsulation of the electrodes 4 (X) and 5 (Y) . . . may provide protection from physical and environmental damage." *Id.* at 3:15–17.

Figure 2a is reproduced below.

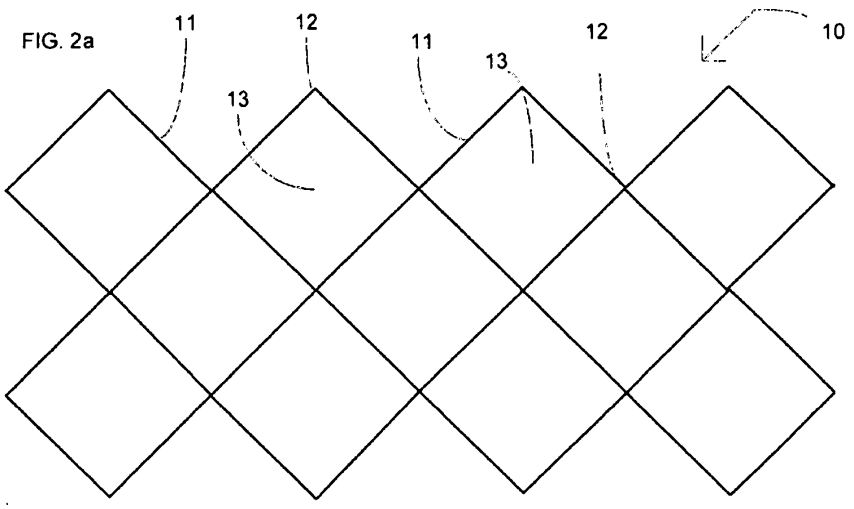

Figure 2a "illustrate[s a] schematically exemplary electrode pattern[] useable in the touch sensitive panel of FIG. 1." Ex. 1001, 2:5–6. According to the '574 patent, the exemplary electrode shown in Figure 2a may be used for either electrode 4 (X) or 5 (Y) and "may be formed by a number of straight conductive lines 11 arranged to interconnect at connection points to define a

conductive grid or mesh pattern made up of an array of square shaped mesh cells 13 arranged in a layer." *Id.* at 3:61–4:1.

E. Illustrative Claims

Claims 1, 8, and 15 are independent claims and claim 1, reproduced below, is illustrative of the subject matter of the challenged claims.

> 1. An apparatus comprising:
>
> a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate;
>
> the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal; and
>
> a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display.

Ex. 1001, 14:46–59.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–4, 6–11, and 13–15 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §[2]	Reference(s)/Basis
1–4, 6–11, 13–15	103(a)	Hsu,[3] Mozdzyn[4]

[2] The Leahy-Smith America Invents Act ("AIA") included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the '301 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

[3] US 7,030,860 B1, issued Apr. 18, 2006 (Ex. 1004).

[4] US 2011/0007011 A1, published Jan. 13, 2011 (Ex. 1005).

Claim(s) Challenged	35 U.S.C. §[2]	Reference(s)/Basis
1–4, 6–11, 13–15	103(a)	Hsu, Philipp[5]
1–3, 7–10, 14, 15	103(a)	Hsu, Chang[6]
4, 6, 11, 13	103(a)	Hsu, Chang, Frey[7]

Petitioner relies on the Declaration of Vivek Subramanian, Ph.D. Ex. 1002.

ANALYSIS

A. Legal Standards

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under 35 U.S.C. § 103 that requires consideration of four factors: (1) the "level of ordinary skill in the pertinent art," (2) the "scope and content of the prior art," (3) the "differences between the prior art and the claims at issue," and (4) "secondary considerations" of non-obviousness such as "commercial success, long-felt but unsolved needs, failure of others, etc." *Id.* at 17–18. "While the sequence of these questions might be reordered in any particular case," the U.S. Court of Appeals for Federal Circuit has "repeatedly emphasized that an obviousness inquiry requires examination of all four *Graham* factors and that an obviousness determination can be made only after consideration of each factor." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007) (first quote); *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1335 (Fed. Cir. 2016), *overruled on other grounds by Aqua Prods., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017) (en banc) (second quote). We note that, with

[5] US 2010/0123670 A1, published May 20, 2010 (Ex. 1010).

[6] US 2009/0002337 A1, published Jan. 1, 2009 (Ex. 1011).

[7] US 2009/0219257 A1, published Sept. 3, 2009 (Ex. 1012).

respect to the fourth *Graham* factor, the parties have not presented argument or evidence directed to secondary considerations of nonobviousness. *See generally* Pet.; Prelim. Resp. The analysis below addresses the first three *Graham* factors.

B. Level of Ordinary Skill in the Art

Factors pertinent to a determination of the level of ordinary skill in the art include "(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field." *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983). "Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case." *Id.*

> Petitioner argues that a person having ordinary skill in the art
>
> would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience in the research, design, development and/or testing of touch sensors, human-machine interaction and interfaces, and/or graphical user interfaces, and related firmware or software, or the equivalent, with additional education substituting for experience and vice-versa.

Pet. 10–11.

Patent Owner does not address the level of ordinary skill in the art in the Preliminary Response. *See generally* Prelim. Resp.

Accordingly, for purposes of institution, we adopt Petitioner's proposed level of ordinary skill in the art, except that we delete the qualifier "at least" to eliminate vagueness as to the amount of practical experience. The qualifier expands the range indefinitely without an upper bound, and

thus precludes a meaningful indication of the level of ordinary skill in the art.[8]

C. Claim Construction

We construe claims "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2020). Specifically, we apply the principles set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). Under that standard, the words of a claim are generally given their "ordinary and customary meaning," which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *Phillips*, 415 F.3d at 1312–13.

Petitioner requests that we construe two claim limitations: "cover sheet" and "mesh." Pet. 15–16.

Patent Owner proposes a construction of the term "cover sheet." PO Resp. 13–14.

Having considered the arguments of the parties, both those directed to claim constructions and the prior art analysis, we determine that for purposes of this Decision the only term in need of explicit construction is "cover sheet." *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy

[8] If Patent Owner proposes a different level of ordinary skill in the art in its Response, the parties are encouraged to address whether there are any material differences between the two proposals and what impact, if any, the different level has on the obviousness analysis.

. . . .'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

Petitioner argues that the term "cover sheet" as recited in the claims of the '574 patent means a "sheet that covers something." Pet. 15–16. According to Petitioner, the Specification does not recite the term "cover sheet" but uses a similar term—covering sheet—"where it is referred to as a 'transparent covering sheet' with no further description." *Id.* at 15 (citing Ex. 1001, 3:3–20). Petitioner further argues that "because limitations from the embodiments in the specification are not to be read into the claims," it is improper to import the purpose of the cover sheet into the claim construction. Pet. Prelim. Reply 5 (citing *Hill-Rom Servs. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014)).

Patent Owner argues the term "cover sheet" means "a sheet designed to serve a particular purpose, i.e., cover elements and provide protection." Prelim. Resp. 14 (citing Ex. 1001, 3:12–17). According to Patent Owner, Petitioner's proposed construction "plainly divorces the term from the field of the patented inventions and is uninformative about what a cover sheet is or does." *Id.* at 13; *see also* PO Prelim. Sur-reply 6 (arguing Petitioner's proposed construction is "overbroad"). Patent Owner further argues that Petitioner's construction "leaves virtually no distinction between it and another claim term, 'a substrate.'" Prelim. Resp. 13 (emphasis omitted).

Both Petitioner and Patent Owner agree that "cover sheet," at a minimum, is a sheet which covers something. *Compare* Pet. 14–15 ("sheet that covers something"), *with* Prelim. Resp. 14 ("a sheet designed to cover . . ."). Based on the current record, we agree with the parties that, at a minimum, the plain and ordinary meaning of "cover sheet" is a sheet that covers something.

Furthermore, based on the current record, we agree with Petitioner that it is improper to read the function of the cover sheet into the claim limitation. "While we read claims in view of the specification, of which they are a part, we do not read limitations from the embodiments in the specification into the claims." *Hill-Rom*, 755 F.3d at 1371. "We depart from the plain and ordinary meaning of claim terms based on the specification in only two instances: lexicography and disavowal." *Id.*

The standards for finding lexicography and disavowal are exacting. "To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning" and must "'clearly express an intent' to redefine the term." *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citing *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1381 (Fed. Cir. 2008)). If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). Disavowal requires that "the specification makes clear that the invention does not include a particular feature," *SciMed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001), or is clearly limited to a particular form of the invention, *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1330 (Fed. Cir. 2009) ("[W]hen the preferred embodiment is described in the specification as the invention itself, the claims are not necessarily entitled to a scope broader than that embodiment." (quoting *Chimie v. PPG Indus. Inc.*, 402 F.3d 1371, 1379 (Fed. Cir. 2005))).

The section of the Specification Patent Owner directs us to is neither a disavowal nor the applicant acting as a lexicographer. Instead, the applicant

is simply describing what the *covering sheet and adhesive layer*—not the covering sheet alone—*may* do:

> The *transparent covering sheet 9 and the adhesive layer 8* of optically clear adhesive *may* encapsulate the electrodes 5 (Y), and any other conductive tracks formed on face 3a of the substrate 3. The encapsulation of the electrodes 4 (X) and 5 (Y), and any other conductive tracks, *may* provide protection from physical and environmental damage.

Ex. 1001, 3:12–17 (emphases added). Specifically, the '574 patent does not state that transparent covering sheet 9 provides the benefits. Instead, the '574 patent states that it is the combination of "transparent cover sheet 9 and the adhesive layer 8" that may encapsulate and protect. *Id.* at 3:12–17. Where the written description states that the combination of two elements provides an advantage, the written description is not making clear and unambiguous disclaimer about one of the components.

Moreover, as the emphasized language above makes clear, the '574 patent is describing an optional feature that *may* be present. Specifically, the '574 patent describes that the covering sheet and adhesive layer "may" encapsulate and, if they encapsulate, they "may" provide protection. Ex. 1001, 3:12–17. But neither encapsulation nor protection is required. *Id.* The use of the term "may" is not a clear disavowal of claim scope nor does it reflect the applicant being a lexicographer.[9]

Accordingly, for the reasons given above and based on the current record, we construe the term "cover sheet" as "a sheet that covers something."

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[9] We address Patent Owner's argument that Petitioner's proposed construction eliminates the distinction between the terms "substrate" and "cover sheet" in the recited claims in subsection D.b.2, *infra*.

D. Hsu and Mozdzyn

Petitioner argues that claims 1–4, 6–11, and 13–15 would have been obvious over Hsu and Mozdzyn. Based on the current record and for the reasons that follow, we are persuaded that Petitioner has established a reasonable likelihood of prevailing with respect to claims 1–4, 6–11, and 13–15.

1. Hsu

Hsu is titled "Flexible Transparent Touch Sensing System for Electronic Devices" and is directed "to flexible and transparent object position recognition devices useful in applications such as cursor movement and user input for computing devices and other applications." Ex. 1004, code (54), 1:9–12.

Hsu Figure 7 is reproduced below.

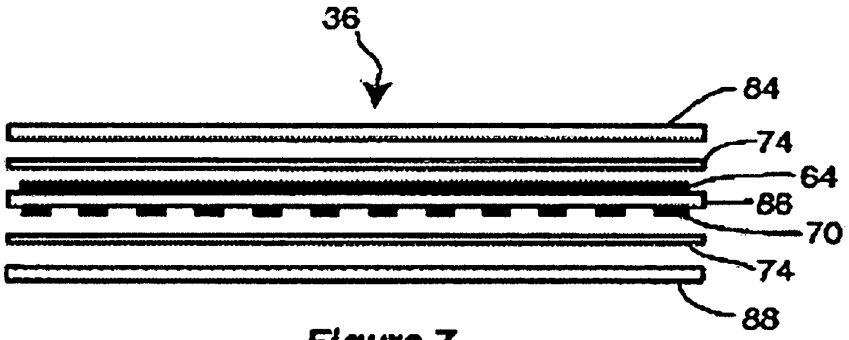


Figure 7

Hsu Figure 7 "is a cross sectional view of an . . . embodiment of the two-dimensional sensor transducer of the invention." Ex. 1004, 3:56–58. More specifically, Hsu Figure 7

> shows a two-dimensional transparent capacitive sensor 36. Transparent substrate 84 is adhered using transparent insulator 74 to transparent conductor layer 64. Transparent conductor 64 contains the X trace pattern as shown in FIG. 5A and is coated onto transparent substrate 86. On the other surface of transparent

> substrate 86, transparent conductor layer 70 contains Y trace array shown FIG. 5B. Finally, transparent substrate 88 is adhered to transparent conductor 70 with transparent insulator 74. This particular embodiment, with substrate 86 coated on both sides with transparent conductor layers may allow for less error when aligning diamonds in the X trace array and the Y trace array.

Id. at 8:1–13.

Hsu Figures 5A and 5B are reproduced below.

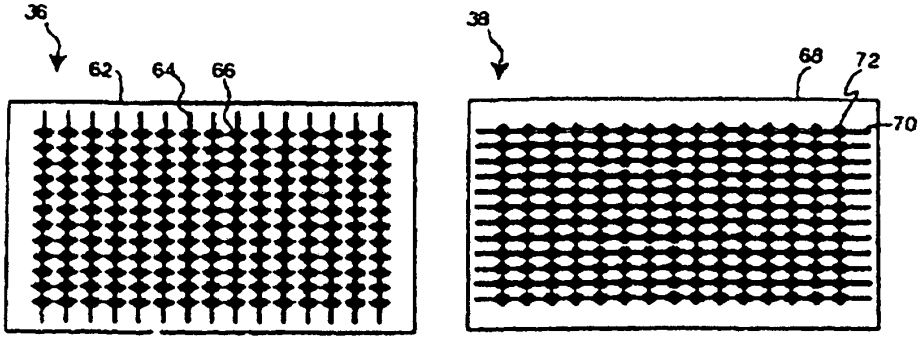


Figure 5A Figure 5B

Hsu Figures 5A and 5B show, respectively, "a top view of the X sensor array" and "a top view of the Y sensor array." Ex. 1004, 3:43–46.

2. Mozdzyn

Mozdzyn is titled "Capacitive Touch Screen with a Mesh Electrode" and is directed to "touch screens having low resistance mesh electrodes to improve the electrical characteristics of the touch screen without compromising the optical characteristics." Ex. 1005, code (54), ¶ 2. According to Mozdzyn, "[t]he electrodes on the touch screen are made of a mesh of conductors to reduce the overall electrode resistance thereby increasing the electrical performance without sacrificing optical quality." *Id.* ¶ 6. Mozdzyn further states that "[t]he mesh electrodes comprise a mesh pattern of conductive material with each conductor comprising the mesh

having a very small width such that the conductors are essentially invisible to the user of the touch screen." *Id.*

Mozdzyn Figures 3 and 6 are reproduced below.

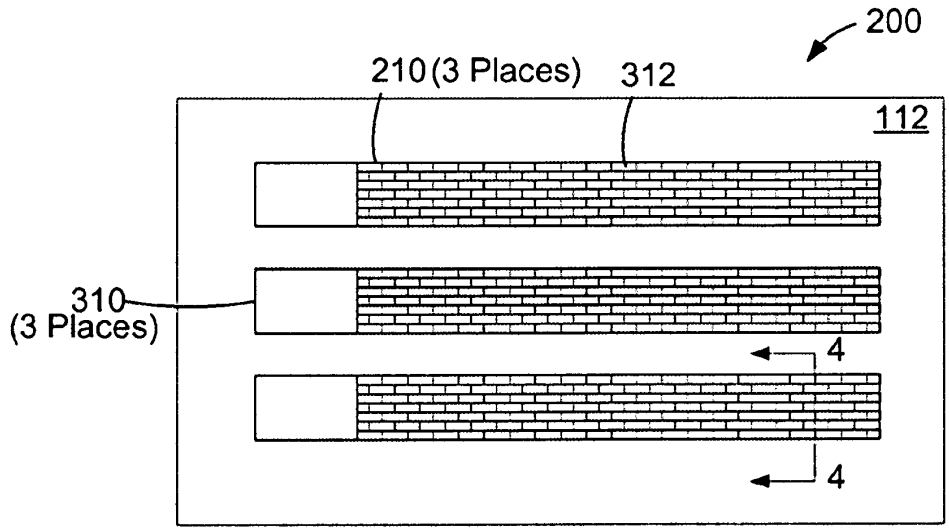


FIG. 3

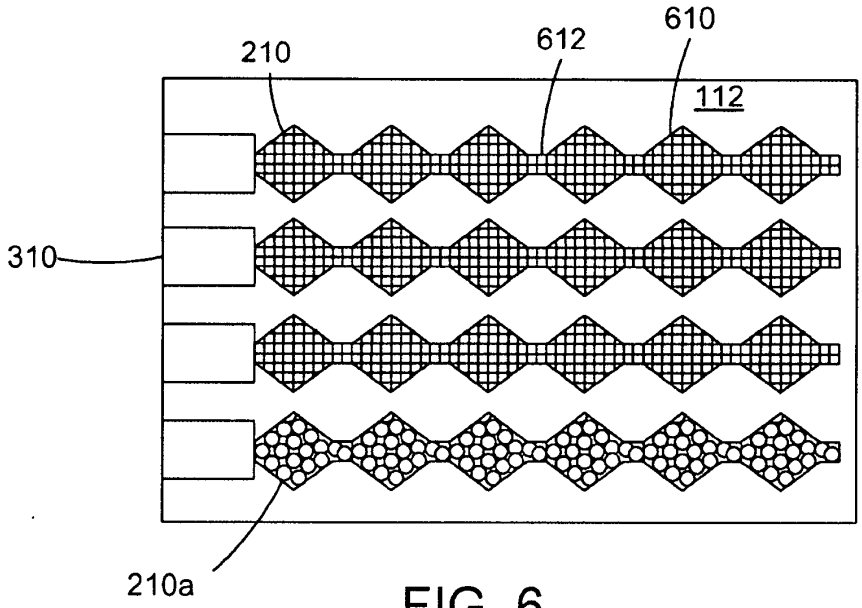


FIG. 6

Mozdzyn Figure 3 "shows a top view of mesh electrodes on a portion of the bottom glass of the touch screen" and Mozdzyn Figure 6 shows "an example of mesh electrodes with a diamond shape pattern." Ex. 1005 ¶¶ 12 (first quote), 15 (second quote).

3. Analysis of Claim 1

a) "An Apparatus"

Petitioner argues Hsu teaches an "apparatus" as recited in claim 1. Pet. 19 (citing Ex. 1002 ¶ 45).

After reviewing Petitioner's arguments and evidence regarding the recitation identified above, including the Subramanian Declaration, which are not addressed by Patent Owner at this stage (*see generally* Prelim.

Resp.), we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, that Hsu teaches an apparatus.[10]

b) "A First Optically Clear Adhesive (OCA) Layer Between a First Cover Sheet and a Substrate"

(1) The Parties' Arguments

Petitioner argues that Hsu teaches "that the 'transparent substrate 84 [i.e., the top-most layer in Fig. 7,] is adhered using transparent insulator 74 to transparent conductor layer 64.'" Pet. 21 (citing Ex. 1004, 8:2–4) (alteration in original). Petitioner further argues that insulator layer 74 acts both as an adhesive and an insulator. *Id.* (citing Ex. 1002 ¶ 47). Specifically, Petitioner argues that a person having ordinary skill in the art would have used 3M adhesive #8142—which is used in a different embodiment—for insulator layer 74. *Id.* at 21–22.

A version of Hsu Figure 7, annotated by Petitioner, is reproduced below.

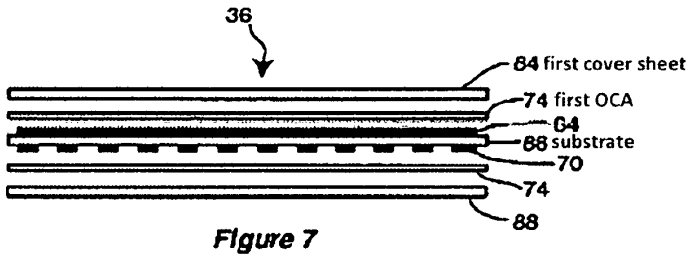


Figure 7

Pet. 21. Hsu Figure 7 is a cross sectional view of a two-dimensional sensor transducer which has been annotated by Petitioner to show what Petitioner

[10] Neither Petitioner nor Patent Owner address whether the preamble is limiting. Because Petitioner has shown that the recitation in the preamble is satisfied by the prior art, there is no need to determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

argues is the first cover sheet (transparent substrate 84), the first OCA (transparent insulator 74) and the substrate (transparent substrate 86). *Id.*; Ex. 1004, Fig. 7, 8:1–6.

Patent Owner argues that substrate 84 is not a first cover sheet. Prelim. Resp. 14–15. Specifically, Patent Owner argues, "Hsu never characterizes the substrate 84 as a cover sheet or a sheet designed to cover or protect anything." *Id.* at 14. According to Patent Owner, substrate 84 is made of the same material as substrate 86 and they both serve the same function—"to provide the surface upon which elements (such as conductors) are deposited." *Id.* at 14–15. Patent Owner further argues that it is "insufficient" to map "one generic element to two different claim terms." PO Prelim. Sur-reply 6.

Patent Owner also argues that "Hsu's covering sheet does not meet the correct construction because it is not a sheet 'designed to' cover elements and provide protection." PO Prelim. Sur-reply 6. According to Patent Owner, a "cover sheet must be specifically designed to intend[] to provide cover and protection, not merely capable of" doing so. *Id.* (citing *Aspex Eyewear v. Marchon Eyewear*, 672 F.3d 1335, 1349 (Fed. Cir. 2012)). Patent Owner further argues that there is no need for protection because Hsu describes the electronics as "rugged." Prelim. Resp. 15 (citing Ex. 1004, 3:1–14, 8:42–57).

(2) Our Analysis

After reviewing Petitioner's arguments and evidence regarding the "first optically clear adhesive (OCA) layer . . . and a substrate," including the Subramanian Declaration, which are not addressed by Patent Owner at this stage (*see generally* Prelim. Resp.), we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, that Hsu teaches "a

first optically clear adhesive (OCA) layer between [Hsu's transparent conductor 84] and a substrate" as recited in claim 1.

Based on the current record, we further agree with Petitioner that Hsu's transparent conductor 84 is a "first cover sheet" as that term is used in claim 1 of the '574 patent. Specifically, Petitioner has sufficiently shown for purposes of institution that Hsu's transparent conductor 84 covers substrate 86. *See* Ex. 1004, Fig. 7; Ex. 1002 ¶¶ 46–48.

Patent Owner's argument that Hsu's transparent substrate 84 does not protect is premised on a claim construction that we have preliminarily rejected. Because the argument is not commensurate with the scope of the claim, it is unpersuasive. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982).

We also do not agree with Patent Owner's argument. Patent Owner's argument is factually incorrect as Petitioner maps Hsu's transparent substrate 86 to the "first cover sheet" recited in claim 1 while mapping the separate transparent substrate 84 to the "substrate" recited in claim 1. In this context, Patent Owner's argument also ignores the ability of an item—such as a transparent substrate—to perform different functions depending on where it is placed in an apparatus. That is, a transparent substrate can cover when placed on the top of a structure while performing a different function—an item upon which electrodes are disposed—when placed in a different location. Therefore, it is unpersuasive to argue at this juncture that Hsu does not describe the "transparent substrate" as a "cover sheet."

Accordingly, based on the current record, Petitioner has sufficiently shown that Hsu teaches "a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate" as recited in claim 1.

c) "The Substrate, with Drive or Sense Electrodes of a Touch Sensor Disposed on a First Surface and a Second Surface of

the Substrate, the First Surface Being Opposite the Second Surface, the Drive or Sense Electrodes Being Made of a Conductive Mesh Conductive Material Comprising Metal"

(1) The Parties' Arguments

Petitioner argues that the combination of Hsu and Mozdzyn teaches a "substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal" as recited in claim 1. *See* Pet. 23–33. Specifically, Petitioner argues that Hsu teaches a transparent substrate (86) upon which transparent conducting layers of an X pattern (64) and a Y pattern (70) have been coated. *Id.* at 23 (citing Ex. 1004, 8:3–21, Fig. 7). According to Petitioner, the X and Y patterns are shown in Hsu's Figure 5A and 5B, respectively, and are "formed using a photolithography process from indium tin oxide (ITO), gold or silver." *Id.* at 23–24 (citing Ex. 1004, 6:22–7:22, 8:3–21). Petitioner further argues that a person having ordinary skill in the art would have understood that conductor layers 64 and 70 include drive and sense electrodes. *Id.* at 24–29.

Petitioner also argues that Mozdzyn teaches mesh electrodes. Pet. 30–31. Mozdzyn Figure 6 is reproduced below.

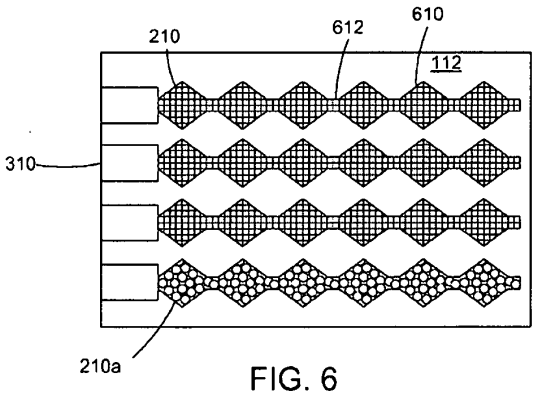
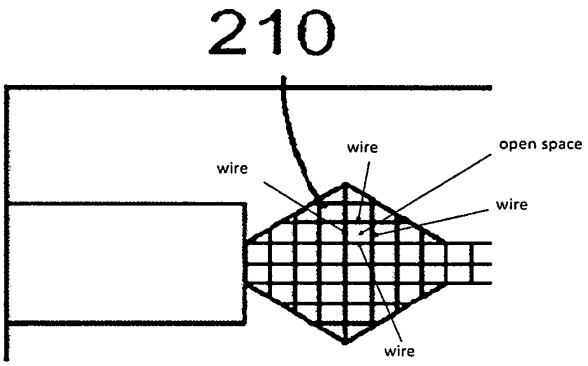


FIG. 6

Mozdzyn Figure 6 "shows an example of mesh electrodes with a diamond shape pattern." Ex. 1005 ¶ 15. According to Petitioner, "[i]n each of Mozdzyn's electrodes 210, each square open space is surrounded by parts of 4 wires are part of the network of wires that form the electrode as shown in the annotated portion of" Mozdzyn's Figure 6, which is reproduced below.



Pet. 30–31. The portion of Mozdzyn's Figure 6 reproduced above has been annotated by Petitioner to identify "wires" and "open space." *Id.* Petitioner argues "that the conductors may be formed from metals including nickel, copper, gold, silver, tin, aluminum and alloys and combinations of these materials," and that the electrodes "can be dedicated drive electrodes and dedicated sense electrodes." *Id.* at 31–32 (citing Ex. 1005 ¶¶ 21, 23; Ex. 1002 ¶ 60).

Petitioner also argues that a person having ordinary skill in the art "would have been motivated to substitute the metal mesh electrodes with diamond shapes as taught by Mozdzyn for the ITO electrodes with diamond shapes as taught by Hsu . . . in order to obtain the benefit of improved electrical performance without sacrificing optical quality." Pet. 32 (citing Ex. 1005 ¶¶ 2, 6; Ex. 1002 ¶ 62). Petitioner also argues that a person having ordinary skill in the art "would have had a reasonable expectation of success

in doing so given the similarities in the capacitive touch screens of Hsu and Mozdzyn and the express teachings of Mozdzyn regarding improved electrical performance without sacrifice of optical quality." *Id.* at 32.

Patent Owner argues that Hsu "encourages optimizing for maximum transparency and optical quality—not resistivity." Prelim. Resp. 15. Patent Owner further argues that "[b]y disparaging approaches that potentially decrease transparency and optical quality, Hsu teaches away from" references such as Mozdzyn "which potentially compromise the transparency and optical quality that Hsu's embodiments are designed to optimize, in the service of reduced resistivity." *Id.*; *see also* PO Prelim. Sur-reply 7 (arguing "Hsu teaches *maximized* transparency (*see* EX1004 at 2:42–43), whereas Mozdzyn teaches that special care must be taken to *reduce* visibility of its metal mesh electrodes (EX1005 at [0023]).").

More specifically, Patent Owner argues that Hsu "discourages the use of opaque metal mesh electrodes." Prelim. Resp. 16. According to Patent Owner, Hsu is designed to "maximize transparency" and teaches "that it is beneficial to ***increase*** the resistivity of the touch sensors, i.e. to degrade their electrical performance, in order to obtain better transparency." *Id.* at 16–17 (citing Ex. 1004, 2:42–53, 4:53–5:5). Patent Owner further argues that Mozdzyn "specifically teaches that it is important to provide reduced resistance even at the cost of lower transparency." *Id.* at 18 (citing Ex. 1005 ¶ 20); *see also id.* at 19 ("Mozdzyn specifically teaches that the mesh electrodes are designed to reduce resistance, not to improve optical quality." (citing Ex. 1005 ¶ 21)).

Petitioner disputes Patent Owner's characterizations. First, Petitioner argues Hsu simply teaches that "ITO was sufficiently transparent and conductive to achieve the desired sensing system." Pet. Prelim. Reply 6.

Petitioner further argues that "[u]sing mesh electrodes would not have compromised transparency or optical quality." *Id.* at 7 (citing Ex. 1002 ¶¶ 43, 60, 62, 77, 86, 88, 89).

Second, Petitioner argues Patent Owner mischaracterizes Mozdzyn as not teaching improvements in transparency. Pet. Prelim. Reply 7. According to Petitioner, Mozdzyn teaches "both reduced resistance and increased transparency: 'reduce the resistance,' 'low resistance,' 'substantially invisible to the user,' 'essentially transparent,' and 'essentially invisible to the naked eye.'" *Id.* (citing Ex. 1005 ¶¶ 5, 23, 25).

(2) Our Analysis

Based on the current record, Petitioner has sufficiently shown that the combination of Hsu and Mozdzyn teaches a substrate "with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal," as recited in claim 1.

Specifically, based on the current record, Hsu teaches a substrate "with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface." As shown in Hsu Figure 7, transparent conductor layer 64 is on a first surface (upper) of substrate 84 and transparent conductor layer 70 is on a second surface (lower) of the substrate. *See* Ex. 1004, 8:2–10, Fig. 7. Moreover, a person having ordinary skill in the art would recognize that conductor layers 64 and 70 include drive and sense electrodes. *See* Ex. 1002 ¶¶ 53–59.

Additionally, based on the current record, Mozdzyn teaches "drive or sense electrodes being made of a conductive mesh conductive material

comprising metal." Specifically, Mozdzyn teaches "mesh electrodes with a diamond shape pattern." Ex. 1005 ¶ 15; *see also id.* ¶ 27, Fig. 6. Mozdzyn further teaches that the electrodes can be made from metals such as "nickel, copper, gold, silver, tin, aluminum and alloys and combinations of these metals." *Id.* ¶ 23. Mozdzyn also describes various electrodes that are used with capacitive touch panels as sense electrodes and drive electrodes. *Id.* ¶ 21; *see also* Ex. 1002 ¶ 61 ("Mozdzyn further discloses that these electrodes can be dedicated drive electrodes and dedicated sense electrodes.").

Based on the current record, Petitioner has sufficiently shown that a person having ordinary skill in the art would have substituted Mozdzyn's mesh electrodes for Hsu's ITO electrodes. Mozdzyn teaches using its "low resistance mesh electrodes to improve the electrical characteristics of the touch screen without compromising the optical characteristics." Ex. 1005 ¶ 2; *see also id.* ¶ 6 ("The electrodes on the touch screen are made of a mesh of conductors to reduce the overall electrode resistance thereby increasing the electrical performance without sacrificing optical quality."). A person having ordinary skill in the art would have made the substitution in order to take advantage of the improved electrical characteristics. *See* Ex. 1002 ¶ 62. And, Petitioner has sufficiently shown that a person having ordinary skill in the art "would have had a reasonable expectation of success in doing so given the similarities in the capacitive touch screens of Hsu and Mozdzyn and the express teachings of Mozdzyn regarding improved electrical performance without sacrifice of optical quality." *Id.*

Based on the current record, we do not agree with Patent Owner that Hsu teaches away from using Mozdzyn's mesh electrodes. "A reference may be said to teach away when a person of ordinary skill, upon reading the

reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *Ricoh Co., Ltd. v. Quanta Computer Inc.*, 550 F.3d 1325, 1332 (Fed. Cir. 2008)). "A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not 'criticize, discredit, or otherwise discourage' investigation into the invention claimed." *Id.* (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)).

Based on the current record, Hsu recites that "the resistivity of transparent conductor layer 56 can be relatively high and still be usable with such a sensing system. A high resistivity such as, but not limited to, 300 Ω/square increases transparency of the substantially transparent conductor layer 56." Ex. 1004, 5:1–5. Although Hsu states a preference for high resistivity materials of 300 Ω/square, it does not state that lower resistivity cannot be used. Instead, Hsu simply requires sufficient transparency. *See id.* at 2:42–53 (discussing maximizing transparency), 4:53–5:1 (discussing improving transparency). Because Hsu teaches transparency improvement without a high impedance, a person having ordinary skill in the art would have recognized the benefit of using Mozdzyn's electrodes with Hsu's system notwithstanding the lower impedance. *See Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n. 8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.").

Furthermore, Hsu does not state that a high resistivity is the only way to achieve increased transparency. Rather, Hsu teaches two methods of increasing transparency: (1) choosing substrates and adhesives with "similar indices of refraction" *or* (2) employing high impedance output drivers. *See* Ex. 1003, 4:53–5:5. "[T]he teaching away inquiry does not focus on whether a person of ordinary skill in the art would have merely favored one disclosed option over another disclosed option." *Bayer Pharma AG v. Watson Labs., Inc.*, 874 F.3d 1316, 1327 (Fed. Cir. 2017). Based on the current record, because there are two options recited in Hsu, Hsu does not teach away from not following the high impedance driver option.

Moreover, based on the current record, if Hsu did teach away from something, based on the language discussed above, it teaches away from using materials that lower optical transparency. *See* Ex. 1004, 4:59–62 (describing the need to improve transparency). However, that teaching would not have prevented a person having ordinary skill in the art from considering Mozdzyn's mesh electrodes. According to Mozdzyn, its mesh electrodes provide improvements "without compromising the optical characteristics." Ex. 1005 ¶ 2; *see also id.* ¶ 6 (Mozdzyn proves for an "improved touch screen with enhanced electrical performance and *optical quality*." (emphasis added)). Because Mozdzyn teaches improved optical characteristics, it is consistent with Hsu's teaching of increasing transparency. Thus, based on the current record, Hsu does not discourage a person having ordinary skill in the art from using Mozdzyn's mesh electrodes with Hsu's touch sensing system.

d) *"A Display Separated from the Second Surface of the Substrate by a Second OCA and a Second Cover Sheet Such That at Least a Portion of the Second Cover Sheet is Positioned Between the Second Surface of the Substrate and the Display"*

Petitioner argues that Hsu teaches "a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display" as recited in claim 1. *See* Pet. 33–35. Specifically, Petitioner argues that Hsu's Figure 7 embodiment "includes a second cover sheet in the form of transparent substrate 88, which is separated from the substrate 86 by a second layer 74," and that a person having ordinary skill in the art would have used the same optically clear adhesive for the second layer as she did for the first layer. *Id.* at 33 (citing Ex. 1004, 8:8–10, Fig. 7; Ex. 1002 ¶ 63). Petitioner further argues that Hsu teaches "that its multi-layer capacitive touch devices can be used above a display" and shows that a display can be placed beneath other embodiments. *Id.* at 34–35 (citing Ex. 1004, 1:27–31, 5:6–15, Fig. 5D). According to Petitioner, if a display was placed beneath the Figure 7 embodiment, "the second cover sheet of Fig. 7, transparent substrate 88, would be positioned between the underlying display 60 and the second, lower surface of substrate 86" and "LCD screen 60 would be separated from the second, lower surface of substrate 86 by layer 74 (a second OCA layer) and transparent substrate 88 (the second cover sheet)." *Id.* at 35 (citing Ex. 1002 ¶ 65).

After reviewing Petitioner's arguments and evidence regarding the limitation identified above, including the Subramanian Declaration, which are not addressed by Patent Owner at this stage (*see generally* Prelim.

Resp.), we are persuaded that Petitioner sufficiently demonstrates, for purposes of this Decision, that Hsu teaches "a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display" as recited in claim 1.

e) Conclusion Regarding Claim 1

After reviewing the arguments and evidence cited in the Petition and the Preliminary Response, for purposes of this Decision we are persuaded that Petitioner sufficiently demonstrates how the combination of Hsu and Mozdzyn teaches each of the limitations recited in claim 1 and that a person of ordinary skill in the art would have combined the teachings of the references with a reasonable expectation of success of achieving the claimed invention. Accordingly, Petitioner has demonstrated, on this record, a reasonable likelihood of prevailing on its assertion that claim 1 is unpatentable over Hsu and Mozdzyn.

4. Analysis of Claims 2–4, 6–11, and 13–15

Because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '574 patent is unpatentable, we institute on all grounds and all claims raised in the Petition. *See PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (indicating that a decision whether to institute an *inter partes* review "require[s] a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); Patent Trial and Appeal Board Consolidated Trial Practice Guide November 2019 ("CTPG"), 5[11] ("In instituting a trial, the Board will either (1) institute as to all claims

[11] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

challenged in the petition and on all grounds in the petition, or (2) institute on no claims and deny institution. The Board will not institute on fewer than all claims or all challenges in a petition."). Therefore, at this stage of the proceeding, it is not necessary for us to provide a detailed assessment of every challenge raised by Petitioner. Rather, emphasizing that our claim constructions and fact findings are not final and are based on a preliminary record, we only address Patent Owner's arguments in this and subsequent sections of this Decision.

Patent Owner has not presented any responsive argument regarding the additional limitation recited in claims 2–4, 6–11, and 13–15. *See generally* Prelim. Resp. Nevertheless, we note that Petitioner provides detailed explanations supported by the testimony of Dr. Subramanian, and specific citations to Hsu and Mozdzyn indicating where in the references Petitioner argues the limitation of claims 2–4, 6–11, and 13–15 is disclosed. Pet. 19–42. Accordingly, at this stage of the proceeding, we are persuaded the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail with respect to claims 2–4, 6–11, and 13–15.

E. Other Grounds

As noted above, because Petitioner has demonstrated a reasonable likelihood of success in proving that at least one claim of the '157 patent is unpatentable, we institute on all grounds and all claims raised in the Petition. Therefore, at this stage of the proceeding, it is not necessary for us to provide a detailed assessment of every ground raised by Petitioner, especially as Patent Owner has not presented any new responsive argument.

Specifically, Patent Owner relies on the same arguments set forth above regarding Hsu and Mozdzyn to (1) Hsu and Philipp and (2) Hsu and

Chang. For the same reasons as discussed above in subsections D.3.b.2 and D.3.c.2, supra, we do not find those arguments persuasive.

With regard to Patent Owner's teaching away argument, Philipp teaches capacitive touch screen electrode layers that are "highly conductive" and allow the film to be "highly transparent." Ex. 1010 ¶ 7; *see also id.* ¶ 8 ("As a result, a mesh of fine metal lines of about 10 μm width can be applied to a substrate such as PET film, which is 98% clear, better than ITO. The metal lines are so narrow as to be optically invisible."). Similarly, Chang teaches "having a dimension that permits the fine line-shaped conductor to be substantially not visible to the naked eye." Ex. 1011 ¶ 29. Because Philipp and Chang teach using structures that are not optically visible, Hsu does not teach away from using them.

Additionally, we note that Petitioner provides detailed explanations supported by the testimony of Dr. Subramanian, and specific citations to the relevant references indicating where in the reference Petitioner argues the limitations of the claims are taught and why a person having ordinary skill in the art would have combined the relevant teachings of the references. *See* Pet. 44–77. Accordingly, at this stage of the proceeding, we are persuaded the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail with respect to (1) claims 1–4, 6–11, and 13–15 based on the combination of Hsu and Philipp, (2) claims 1–3, 7–10, 14, and 15 based on the combination of Hsu and Chang, and (2) claims 4, 6, 11, and 13 based on the combination of Hsu, Chang, and Frey.

F. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner argues that we should exercise our discretion and deny institution based on a trial scheduled for June 28, 2021[12] in the WD Texas Actions. *See generally* Prelim. Resp.; PO Prelim. Sur-reply.

Under § 314(a), the Director has discretion to deny institution of an *inter partes* review. *See* 37 C.F.R. § 42.4(a) ("The Board institutes the trial on behalf of the Director."); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2140 (2016) ("[T]he agency's decision to deny a petition is a matter committed to the Patent Office's discretion."); *SAS*, 138 S. Ct. at 1356 ("[Section] 314(a) invests the Director with discretion on the question whether to institute review . . . ." (emphasis omitted)); *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016) ("[T]he PTO is permitted, but never compelled, to institute an IPR proceeding.").

In *NHK*, the Board denied institution relying, in part, on § 314(a) because the parallel district court proceeding was scheduled to finish before the Board reached a final decision. *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 (PTAB Sept. 12, 2018) (precedential) (Decision on Institution). "*NHK* applies to the situation where the district court has set a trial date to occur earlier than the Board's deadline to issue a final written decision in an instituted proceeding." *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 3 (PTAB Mar. 20, 2020) (precedential) (Order) ("*Fintiv I*"). When determining whether to exercise discretion to deny

[12] The trial was originally set for March 2021, but the trial date was recently reset. *Compare* Ex. 2008 (noting March 2021 trial date), *with Neodron Ltd. v. Dell Techs., Inc.*, Case No. 1:19-cv-00819-ADA, Dkt. 94 (W.D. Tex. June 30, 2020) (Order Resetting Trial).

institution under *NHK* due to an earlier trial date, we consider the following factors ("*Fintiv* factors"):

> 1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
>
> 2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
>
> 3. investment in the parallel proceeding by the court and the parties;
>
> 4. overlap between issues raised in the petition and in the parallel proceeding;
>
> 5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
>
> 6. other circumstances that impact the Board's exercise of discretion, including the merits.

Id. at 6. "These factors relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding." *Id.* In evaluating these factors, we take "a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review." *Id.* (citing CTPG, 58). We address the *Fintiv* factors below.

1. Factual Background

On June 28, 2019, Patent Owner filed complaints in the United States District Court for the Western District of Texas alleging, *inter alia*, infringement of the '574 patent against HP, Microsoft, Dell, Lenovo, and Motorola. Prelim Resp. 1. Each party was served on July 3, 2019. *Id.* The actions against Lenovo and Motorola were dismissed and refiled in the United States District Court for the Northern District of California. *Id.*

On December 11, 2019, Patent Owner filed infringement contentions relating to the '574 patent in the WD Texas Actions. Prelim Resp. 1. On

December 27, 2019, Patent Owner filed infringement contentions relating to the '574 patent against Lenovo.[13] *Id.* Invalidity contentions were served on February 28, 2020. *See id.* at 2; *see also* Exs. 2001–2004 (excerpts of invalidity contentions).

The Petition was filed on February 14, 2020, a little over seven months after Petitioner was served with the complaints and approximately two months after being served with infringement contentions. *See* Paper 3.

Since the filing of the Petition, the parties completed claim construction briefing and a *Markman* hearing was held in both the WD Texas and the ND Cal. Actions. PO Prelim. Sur-reply 2–3. *Markman* orders were issued in the respective district court proceedings. *Neodron Ltd. v. Dell Techs., Inc.*, Case No. 1:19-cv-00819-ADA, Dkt. 100 (W.D. Tex. July 28, 2020) (Claim Construction Order); *Neodron, Ltd. v. Lenovo Grp., Ltd.*, Case No. 19-cv-05644-SI, Dkt. 97 (N.D. Cal. July 14, 2020) (Order re Claim Construction and Motion to Strike). Three consecutive trials are scheduled for the WD Texas actions, starting on June 28, 2021. *Id.* at 2. A trial has not yet been scheduled for the ND Cal. action and the proceeding has been stayed pending *inter partes* review. Pet. Prelim. Reply 2; Ex. 1029.

Fact discovery opened on July 5, 2020 in the WD Texas Actions and is scheduled to close on December 11. Ex. 2005, 4. Final infringement and invalidity contentions are due on August 21, 2020 in the WD Texas Actions. *Id.*

[13] Based on the record, it is unclear whether Lenovo's co-defendant, Motorola, was also served with infringement contentions.

2. Analysis of Factors

a) Factor 1: Whether a Stay Exists or Is Likely to Be Granted if a Proceeding Is Instituted

No party has requested a stay in the WD Texas Actions pending *inter partes* review. The district court in the ND Cal. action stayed the action pending completion of *inter partes* review. Ex. 1029.

Patent Owner argues that the WD Texas Actions are before Judge Albright, who is unlikely to grant a stay pending IPR after the *Markman* hearing has been held. Prelim Resp. 4 (citing Ex. 2009 (article on Judge Albright's claims of quickness)). Patent Owner further argues that any argument regarding a stay in the ND Cal. Action is "speculative, wrong, and irrelevant." PO Prelim. Sur-reply 1. According to Patent Owner, the ND Cal. Action also includes patents that are not subject to an IPR proceeding, and even if the action was stayed, the IPR is still duplicative of the trial in the WD Texas Actions. *Id.* at 1–2.

Petitioner argues that Lenovo and Motorola are considering filing a motion to stay[14] and that Judge Illston, the judge presiding over the ND Cal. Action, has granted stays based on similar requests. Pet. Prelim. Reply 1–2.

"A judge determines whether to grant a stay based on the facts of each specific case as presented in the briefs by the parties." *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (PTAB May 13, 2020) (informative) (Institution Decision) ("*Fintiv II*"). We do not speculate on how Judge Albright would rule on a motion based on actions taken in different cases with different facts or extrajudicial interviews. Rather, we only consider the

[14] As noted in the Factual Background, after filing the Petitioner Preliminary Reply, Petitioner filed a motion to stay pending *inter partes* review. That motion has since been granted. Ex. 1029

facts set forth in the record, not speculation on what might happen in the future.

We disagree with Patent Owner that we should only consider the status of the WD Texas Actions. Our concern when evaluating this factor is "inefficiency and duplication of efforts." *See Fintiv I* at 6. Because Patent Owner has not argued that the outcome of the WD Texas Actions will be binding on Lenovo and Motorola, we must consider the potential inefficiencies and duplication in all venues—the PTAB, the Western District of Texas, and the Northern District of Texas.

The granting of a stay pending *inter partes* review has strongly weighed against exercising the authority to deny institution under *NHK*. *Fintiv I*, at 6. However, where the district court has not ruled on a motion for a stay, this factor is neutral. *See Fintiv II*, Paper 15 at 12. Because only the ND California Action has been stayed, this factor weighs somewhat against denying institution under 35 U.S.C. § 314(a).

b) Factor 2: Proximity of the Court's Trial Date to the Board's Projected Statutory Deadline and
Factor 5: Whether the Petitioner and the Defendant in the Parallel Proceeding Are the Same Party

Because Petitioner comprises multiple entities with different trial dates, the analysis of Factors 2 and 5 are interrelated. Accordingly, we address them together.

It is undisputed that the trials in the WD Texas Actions are currently set to take place consecutively starting June 28, 2021. *See* PO Prelim. Sur-reply 2; Ex. 3002 (Petitioner's notification of schedule change). It is similarly undisputed that no trial has been set for ND Cal. Action. Pet. Prelim. Reply 2; PO Prelim. Sur-reply 2.

Petitioner argues that the original March 2021[15] trial date for the WD Texas Actions might not hold due to multiple trials scheduled for the same date. *See* Pet. Prelim. Reply 2–3. Petitioner further argues that the trial date may also need to be delayed due to COVID-19, which, at the time of the briefing, was reported to be spiking in Texas. *Id.* at 3.

Petitioner also argues that Patent Owner ignores the differences between the WD Texas Actions and the ND Cal. Action. Pet. Prelim. Reply 4–5. According to Petitioner, although the parties to the ND Cal. Action will not be bound by a validity determination in the WD Texas Action, a final written decision will estop Petitioner in the parallel cases. *Id.* at 4. Petitioner further argues that the WD Texas Actions could settle prior to any trial.

Patent Owner argues that "[t]here is no reason to believe June 2021 trial date will not hold and Petitioners' contentions about the effects of COVID-19 in 2021 are pure speculation." PO Prelim. Sur-reply 2. Patent Owner further argues that because "[t]he relevant inquiry is not how many trials might be after the FWD date (maybe one) but rather how many [ ] trials are scheduled to occur before (three)," the trial date for the ND Cal. Action is irrelevant. *Id.* Patent Owner also argues that "[t]his factor weighs against institution because all Petitioners here are identical or closely related to defendants in district court cases." Prelim. Resp. 11; *see also* PO Prelim. Sur-reply 5 ("Petitioners and defendants are the same parties, so Factor 5 weighs against institution.").

[15] According to Petitioner, the trial date was reset to June 28, 2021, after it submitted Petitioner's Preliminary Reply. Ex. 3002.

"We generally take courts' trial schedules at face value absent some strong evidence to the contrary." *Fintiv II*, Paper 15 at 13. Based on the scheduled trial dates, trials will have been completed in the WD Texas Actions against three of the petitioners (HP, Microsoft, and Dell) prior to our deadline to issue a final decision. Petitioner's argument to the contrary—including the possibility of settlement—are based on speculation, which we do not consider. Because the trials in the WD Texas Actions are scheduled to begin approximately two months before the statutory deadline, this factor would normally weigh somewhat in favor of discretionary denial in this case. *See Fintiv II*, Paper 15 at 12–13.

But we recognize that trials are not scheduled in the ND Cal. Action against Motorola and Lenovo. Contrary to Patent Owner's arguments, this is relevant to our analysis. Although Patent Owner argues that "all Petitioners here are identical or closely related to defendants in district court cases," (Prelim. Resp. 11), Patent Owner has not argued—let alone shown—that Motorola and Lenovo are related to any of the defendants in the WD Texas Actions. "If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion to deny institution under *NHK*." *Fintiv I*, Paper 11 at 13–14. Because no trial is scheduled in the ND Cal. Action, this weighs against exercising our discretion to deny institution. *See Google LLC v. Uniloc 2017 LLC*, IPR2020-00441, Paper 13 at 35 (PTAB July 17, 2020) (Institution Decision) ("The fact that no trial date has been set weighs significantly against exercising our discretion to deny institution of the proceeding.").

Considering both the WD Texas Actions and the ND Cal. Action, Factors 2 and 5, when considered collectively, are neutral in this case.

c) Factor 3: Investment in the Parallel Proceeding by the Court and Parties

Patent Owner argues that *Markman* hearings have been conducted in both the ND Cal. and WD Texas Actions and that *Markman* orders are expected shortly. PO Prelim. Sur-reply 2–3. Patent Owner further argues that fact discovery is "well underway" and that the proper date for assessing this factor is the date of the institution decision, at which time "the WDTex cases will be in similar procedural posture as the *Apple v. Fintiv* case, where the Board found that Factor 3 'weighs somewhat in favor of discretionary denial.'" *Id.* at 3–4 (quoting *Fintiv II*, Paper 15 at 14[16]).

Petitioner argues that "it is not clear when either forum will issue a detailed *Markman* order of the type discussed in [*Fintiv II*]." Pet. Prelim. Reply 3. Patent Owner further argues that "[a]part from preliminary contentions and minimal discovery, not a single deposition has been scheduled in any of these cases." *Id.* Patent Owner further argues that the ND Cal. Action does not have a schedule beyond the date of the *Markman* hearing. *Id.*

Based on the current record, the district court proceedings are not as advanced as those in *Fintiv*. Although the district courts have conducted *Makman* hearings and issued *Markman* orders, neither of the district courts construed any of the claim terms of the '574 patent. *See Neodron Ltd. v. Dell Techs., Inc.*, Case No. 1:19-cv-00819-ADA, Dkt. 100 (W.D. Tex. July 28, 2020) (Claim Construction Order); *Neodron, Ltd. v. Lenovo Grp., Ltd.*, Case No. 19-cv-05644-SI, Dkt. 97 (N.D. Cal. July 14, 2020) (Order re Claim

[16] Patent Owner identifies page 4 in its brief. We have corrected the typographical error.

Construction and Motion to Strike). Additionally, fact discovery is in its infancy in the WD Texas Actions—with minimal discovery and no depositions—and has not yet begun in the ND Cal. Action. *See* Pet. Prelim. Reply 3. Moreover, Patent Owner has not shown that any of the discovery in the district court proceedings has any relationship to the issues that will be decided here if we institute trial. *See Kavo Dental Tech., LLC v. Osseso Imaging LLC*, IPR2020-00671, Paper 10 at 22–23 (PTAB July 1, 2020) (Institution Decision) (considering whether the investment by the district court related to the issues before the Board). Thus, while some work has been completed by the parties and the courts, much remains to be done before the district court proceedings are completed.

Additionally, as part of our holistic analysis, we also consider the speed in which Petitioner acted. *See Apple Inc. v. Seven Networks, LLC*, IPR2020-00156, Paper 10 at 11–12 (PTAB June 15, 2020) (Institution Decision). Based on the evidence submitted by the parties, Petitioner acted diligently in filing the Petition on February 14, 2020, more than five months in advance of the statutory bar date under 35 U.S.C. § 315(b), approximately two months after Patent Owner served its preliminary infringement contentions in the WD Texas Actions, and two weeks prior to Petitioner serving preliminary invalidity contentions. *See* Prelim. Resp. 1–2. Because Petitioner acted diligently and without much delay, this mitigates against the investment of the parties in the WD Texas and ND Cal. Actions. *See Seven Networks*, Paper 10 at 11–12. As *Fintiv I* states, "[i]f the evidence shows that the petitioner filed the petition expeditiously, such as promptly after becoming aware of the claims being asserted, this fact has weighed against exercising the authority to deny institution under *NHK*." *Fintiv I*, Paper 11 at 11.

Accordingly, this factor this factor weighs somewhat against denying institution under 35 U.S.C. § 314(a)..

d) Factor 4: Overlap Between Issues Raised in the Petition and in the Parallel Proceeding

Petitioner argues that in order to "eliminate any potential inefficiencies or overlap," Petitioner "stipulated to Patent Owner ('PO') that, if the IPR is instituted, they will not pursue the same grounds in either district court litigation." Pet. Prelim. Reply 3 (citing Ex. 1028, 1).

Petitioner also argues that it is seeking *inter partes* review of two additional claims that are not asserted in the district court proceedings and the term "cover sheet" is not an issue in the district court proceedings. Pet. Prelim. Reply 4. According to Petitioner, the Board's opinion may be of particular value. *Id.*

Patent Owner argues the stipulation is not sufficient. PO Prelim. Sur-reply 4–5. Specifically, Patent Owner argues that although the stipulation covers the specific combinations asserted in the Petition, it does not prevent Petitioner from using either Hsu (the primary reference) or any of the secondary references in a different combination. Patent Owner argues, because of the limits on the stipulation, "there [is] likely to be substantial overlapping issues, creating the risk of inconsistent results." *Id.* at 4. Instead, Patent Owner argues, Petitioner should have stipulated not to raise any grounds under section 102 or 103 on the basis of prior art patents or printed publications. *Id.* at 5.

Petitioner's stipulation in the instant case is similar to the one the petitioner made in *Sand Revolution II, LLC, Continental Intermodal Grp. – Trucking LLC,* IPR2019-01393, Paper 24 at 11–12 (PTAB June 16, 2020)

(informative) (Rehearing Decision). We agree with the reasoning in *Sand Revolution II* and determine that the stipulation "mitigates to some degree the concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions." *Id.* at 12. We further agree with the reasoning in *Sand Revolution II* that a broader stipulation "might have tipped this factor more conclusively in its favor." *Id.* at 12 n.5.

We give no weight to the unasserted claims that are challenged in this Petition. Petitioner has not argued that it would be prejudiced if the invalidity challenges against those claims are not addressed. *See PayPal, Inc. v. IOENGINE, LLC*, IPR2019-00886, Paper 21 at 12, 18–19 (PTAB Oct. 3, 2019) (Institution Decision) (denying institution of petition that challenges overlapping claims challenged in another petition when petitioner has not identified any prejudice associated with not instituting trial on the non-overlapping claims). Under the facts of this case, in the absence of prejudice, the challenge to the unasserted claims in the Petition does not affect how we exercise our discretion.

Accordingly, we find that this factor weighs somewhat against denying institution under 35 U.S.C. § 314(a).

e) Factor 6: Other Circumstances that Impact the Board's Exercise of Discretion, Including the Merits

Patent Owner argues that because "Petitioners' arguments on the merits suffer from several weaknesses," this factor weighs against instituting trial. Prelim. Resp. 12–21; Prelim. Sur-reply 6–7.

We do not agree. As discussed above, Petitioner has met its burden of demonstrating a reasonable likelihood that it would prevail in showing that challenged claims of the '574 patent are unpatentable. At this preliminary

stage of the proceeding and on the record before us, Petitioner's case appears strong on the challenged claims. *See Fintiv I,* Paper 11 at 14–15 ("[I]f the merits of a ground raised in the petition seem particularly strong on the preliminary record, this fact has favored institution."); *Sand Revolution II*, Paper 24 at 13 (holding that when the Petition sets forth a strong case, "this factor weighs in favor of not exercising discretion to deny institution under 35 U.S.C. § 314(a)."). Although we recognize the record can change during trial, Petitioner has made a sufficiently persuasive showing, on the record presently before us, that the prior art references cited in the Petition teach or suggest all limitations of most challenged claims.

In light of the strong showing on the merits,this factor weighs strongly against denying institution under 35 U.S.C. § 314(a).

f) Balancing the Fintiv *Factors*

We have considered the circumstances and facts before us in view of the *Fintiv* factors. Because our analysis is fact driven, no single factor is determinative of whether we exercise our discretion to deny institution under § 314(a). For the reasons discussed above, the *Fintiv* factors weigh against invoking our discretion to deny institution. Considering the *Fintiv* factors as part of a holistic analysis, we are not persuaded that the interests of the efficiency and integrity of the system would be best served by invoking our authority under 35 U.S.C. § 314(a) to deny institution of a potentially meritorious Petition.

CONCLUSION

Our review of the Petition under 35 U.S.C. § 314 is to determine whether the totality of the information presented at this stage shows that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the claims challenged in the Petition. For the reasons

expressed above, we determine that Petitioner has established the requisite reasonable likelihood of prevailing as to at least claims 1–4, 6–11, and 13–15 of the '574 patent.

Our factual findings, conclusions of law, and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far. This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, an *inter partes* review of all challenged claims of the '574 patent is instituted with respect to all grounds set forth in the Petition (*see* Section I.F, *supra*); and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '574 patent is hereby instituted commencing on the entry date of this Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

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AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Austin Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:19-CV-874-ADA	09/09/2019	Western District of Texas - Austin Division

PLAINTIFF	DEFENDANT
NEODRON LTD.,	MICROSOFT CORPORATION,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	9,086,770	7/21/2015	Neodron Ltd.
3	8,946,574	2/3/2015	Neodron Ltd.
4	8,502,547	8/6/2013	Neodron Ltd.
5	10,088,960	10/2/2018	Neodron Ltd

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack		Sept 9, 2019

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:19-cv-399	6/28/2019	Western District of Texas

PLAINTIFF	DEFENDANT
NEODRON LTD.,	MICROSOFT CORPORATION,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	9,086,770	7/21/2015	Neodron Ltd.
3	8,946,574	2/3/2015	Neodron Ltd.
4	8,502,547	8/6/2013	Neodron Ltd.
5	10,088,960	10/2/2018	Neodron Ltd

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DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

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Jeannette J. Clack	LDiaz	7/1/19

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:19-cv-00398-ADA	8/29/2019	Western District of Texas

PLAINTIFF	DEFENDANT
NEODRON LTD.,	LENOVO GROUP LTD.; LENOVO (UNITED STATES) INC.; and MOTOROLA MOBILITY LLC,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	8,451,237	5/28/2013	Neodron Ltd.
3	8,502,547	8/6/2013	Neodron Ltd.
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,946,574	2/3/2015	Neodron Ltd.
2 9,086,770	7/21/2015	Neodron Ltd.
3 10,088,960	10/2/2018	Neodron Ltd.
4 7,821,502	10/26/2010	Neodron Ltd.
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	L Diaz	8/30/19

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:19-cv-00819-ADA	8/28/2019	Western District of Texas

PLAINTIFF	DEFENDANT
NEODRON LTD.,	DELL TECHNOLOGIES, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	8,451,237	5/28/2013	Neodron Ltd.
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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INCLUDED BY ☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading

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In the above—entitled case, the following decision has been rendered or judgement issued:

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JEANNETTE J. CLACK		8/29/19

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Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:19-cv-00397-ADA	8/27/2019	Western District of Texas

PLAINTIFF	DEFENDANT
NEODRON LTD.,	HP INC.,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,102,286	1/24/2012	Neodron Ltd.
2	8,847,898	9/30/2014	Neodron Ltd.
3	8,451,237	5/28/2013	Neodron Ltd.
4	8,502,547	8/6/2013	Neodron Ltd.
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,946,574	2/3/2015	Neodron Ltd.
2	9,086,770	7/21/2015	Neodron Ltd.
3	10,088,960	10/2/2018	Neodron Ltd.
4	7,821,502	10/26/2010	Neodron Ltd.
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
Jeannette J. Clack	L. Diaz	8/28/19

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	02/03/2015	8946574	080900.1371	6025

12323 7590 01/14/2015

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

David Brent Guard, Hampshire, UNITED KINGDOM;
Esat Yilmaz, Santa Cruz, CA;
Tsung-Ching Wu, Saratoga, CA;

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

12323 7590 11/21/2014
Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

TITLE OF INVENTION: TWO-LAYER SENSOR STACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	02/23/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
SAEED, AHMED M	2833	200-181000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Baker Botts LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Atmel Corporation

(B) RESIDENCE: (CITY and STATE OR COUNTRY): San Jose, CA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 020384 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date 12/18/14
Typed or printed name Chad P. Terrell Registration No. 52,279

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	David Brent Guard, et al.
Serial No.:	13/312,405
Filed:	December 6, 2011
Group No.:	2833
Examiner:	Ahmed M. Saeed
Notice of Allowance Mailed:	November 21, 2014
Confirmation No.:	6025
Title:	Two-Layer Sensor Stack

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Applicants appreciate the Examiner's allowance of Claims 1, 4-10 and 13-19. Pursuant to 37 C.F.R. § 1.104, Applicants respectfully issue a statement commenting on the Examiner's reasons for allowance. Applicants respectfully disagree with the Examiner's reasons for allowance to the extent that they are inconsistent with applicable case law, statutes, and regulations. Furthermore, Applicants do not admit to any characterization or limitation of the claims or to any characterization of a reference by the Examiner, particularly any that are inconsistent with the language of the claims considered in their entirety and including all of their constituent limitations.

Respectfully submitted,
BAKER BOTTS L.L.P.
Attorneys for Applicants

Chad D. Terrell
Registration No. 52,279

Date: 12/18/14
CUSTOMER NO. 12323

Active 17526125.1

Electronic Patent Application Fee Transmittal

Application Number:	13312405
Filing Date:	06-Dec-2011
Title of Invention:	TWO-LAYER SENSOR STACK
First Named Inventor/Applicant Name:	David Brent Guard
Filer:	Vernon E. Evans/mary johnson
Attorney Docket Number:	080900.1371

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**960**

Electronic Acknowledgement Receipt	
EFS ID:	21007945
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	TWO-LAYER SENSOR STACK
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Vernon E. Evans/mary johnson
Filer Authorized By:	Vernon E. Evans
Attorney Docket Number:	080900.1371
Receipt Date:	18-DEC-2014
Filing Date:	06-DEC-2011
Time Stamp:	16:34:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$960
RAM confirmation Number	4042
Deposit Account	020384
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	0809001371issuefee.PDF	98915 a020ff9d1991d8fd640cd7c532d993b7377291f6	no	1
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	0809001371comments.PDF	43999 27212562fa249fd70d538e97d973881f6fd73ad1	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30814 1e8a56f6e2b0643a67d83bc29589281d64e5bd3d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	173728		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

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U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

Courtesy Reminder for
Application Serial No: 13/312,405

Attorney Docket No: 080900.1371
Customer Number: 12323
Date of Electronic Notification: 11/21/2014

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

12323 7590 11/21/2014

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

EXAMINER
SAEED, AHMED M

ART UNIT	PAPER NUMBER
2833	

DATE MAILED: 11/21/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

TITLE OF INVENTION: TWO-LAYER SENSOR STACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	02/23/2015

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

12323 7590 11/21/2014
Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

TITLE OF INVENTION: TWO-LAYER SENSOR STACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	02/23/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
SAEED, AHMED M	2833	200-181000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

12323 7590 11/21/2014

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

EXAMINER	
SAEED, AHMED M	
ART UNIT	PAPER NUMBER
2833	

DATE MAILED: 11/21/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/312,405	Applicant(s) GUARD ET AL.	
	Examiner AHMED SAEED	Art Unit 2833	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *RCE filed 9/5/14*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,4-10 and 13-19*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   Certified copies:
   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/5/2014 has been entered.

Allowable Subject Matter

Claims 1, 4-10, 13-18 and 19 allowed.

Regarding claims 1, 10 and 19, the prior art fails to teach or show, alone or in combination, the claimed switch device comprising a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AHMED SAEED whose telephone number is (571)270-7976. The examiner can normally be reached on M-F (8:30-5:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Renee Luebke can be reached on 571-272-2009.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AHMED SAEED/
Examiner, Art Unit 2833

/renee luebke/

Renee Luebke
Supervisory Patent Examiner
AU 2833

PTO/SB/08a (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	13312405
Filing Date	2011-12-06
First Named Inventor	David B. Guard
Art Unit	2833
Examiner Name	Ahmed M. Saeed
Attorney Docket Number	080900.1371

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7864503		2011-01-14	Yu-Huel Chang	
	2	8217902		2012-07-10	Ching-Yang Chang	
	3	8355006		2013-01-15	PARK ET AL.	
	4	8456444		2013-06-04	Ishizaki et al.	
	5	8797285		2014-08-05	Guard et al.	
	6	8723824		2014-05-13	Scott A. Myers	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13312405
	Filing Date	2011-12-06
	First Named Inventor	David B. Guard
	Art Unit	2833
	Examiner Name	Ahmed M. Saeed
	Attorney Docket Number	080900.1371

	1	20080309635		2008-12-18	Mitsumi Matsuo	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Guard et al., USSN 13/312,405 Notice of Allowance dated March 27, 2014 (Atty Docket 080900.1208).	☐
	2	Guard et al., USSN 13/312,405 Issue Notification dated July 16, 2014 (Atty Docket 080900.1208).	☐
	3	Guard et al., USSN 13/331,022 Final Office Action dated April 15, 2014 (Atty Docket 080900.1370).	☐
	4	Guard et al., USSN 13/331,022 Request for Continued Examination dated July 15, 2014 (Atty Docket 080900.1370).	☐
	5	Guard et al., USSN 13/347,859 Appeal Brief dated March 28, 2014 (Atty Docket 080900.1424).	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13312405
	Filing Date	2011-12-06
	First Named Inventor	David B. Guard
	Art Unit	2833
	Examiner Name	Ahmed M. Saeed
	Attorney Docket Number	080900.1371

	6	Guard et al., USSN 13/347,859 Examiner's Answer dated July 17, 2014 (Atty Docket 080900.1424).	☐
	7	Guard et al., USSN 13/413,306 Final Office Action dated April 11, 2014 (Atty Docket 080900.1425).	☐
	8	Guard et al., USSN 13/413,306 Request for Continued Examination dated July 11, 2014 (Atty Docket 080900.1425).	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Ahmed Saeed/	Date Considered	11/13/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

EFS Web 2.1.16

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

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BIB DATA SHEET

CONFIRMATION NO. 6025

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/312,405	12/06/2011 RULE	200	2833	080900.1371

APPLICANTS

INVENTORS

David Brent Guard, Hampshire, UNITED KINGDOM;
Esat Yilmaz, Santa Cruz, CA;
Tsung-Ching Wu, Saratoga, CA;

**** CONTINUING DATA ***************************

This application is a CON of 13/089,061 04/18/2011 PAT 8797285

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

12/16/2011

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
❑ Yes ☑ No	❑ Yes ☑ No	/AHMED M SAEED/ Examiner's Signature	❑ Initials	UNITED KINGDOM	9	20	3

ADDRESS

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201
UNITED STATES

TITLE

Two-Layer Sensor Stack

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1250	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	❑ All Fees ❑ 1.16 Fees (Filing) ❑ 1.17 Fees (Processing Ext. of time) ❑ 1.18 Fees (Issue) ❑ Other _____ ❑ Credit

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	**Art Unit**
	AHMED SAEED	2833

CPC						
Symbol					**Type**	**Version**
G06F		3	/	044	F	2013-01-01
G06F		2203	/	04103	A	2013-01-01
G06F		2203	/	04112	A	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

/AHMED SAEED/ Examiner.Art Unit 2833	11/13/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	15	
/renee luebke/ SPE - AU 2833	11/17/14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	**Art Unit**
	AHMED SAEED	2833

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION						
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED	
200	181	H	0	3	K	17 / 96 (2006.0)		

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
345	172				

/AHMED SAEED/ Examiner.Art Unit 2833	11/13/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	15	
/renee luebke/ SPE - AU 2833	11/17/14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	**Art Unit**
	AHMED SAEED	2833

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	13	17												
-	2	14	18												
-	3	15	19												
2	4	-	20												
3	5														
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5	7														
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8	10														
-	11														
-	12														
9	13														
10	14														
11	15														
12	16														

/AHMED SAEED/ Examiner.Art Unit 2833	11/13/2014	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	15	
/renee luebke/ SPE - AU 2833	11/17/14	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	Art Unit
	AHMED SAEED	2833

CPC- SEARCHED		
Symbol	Date	Examiner
H01H13/702 OR H01H2239/006	11/13/2014	AS

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor name search	11/13/2014	AS
consult with Renee Luebke	11/13/2014	AS
EAST text search with subclasses (200/512, 345/173, 428, 361)	11/13/2014	AS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
see EAST search		11/13/2014	AS

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	1	"13312405"	US-PGPUB; USPAT; DERWENT	ADJ	ON	2014/11/13 17:41
L4	1901	((H01H13/702 OR H01H2239/006).CPC.)	US-PGPUB; USPAT; DERWENT	ADJ	ON	2014/11/13 17:47
S19	1309	atmel corporation.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:36
S20	24	atmel corporation.as. and adhes$3 (layer or sheet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:36
S22	10146	first (surface or face) same substrate and electrode and adhes$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:45
S23	3134	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:46
S24	1799	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:46
S25	69	first (surface or face) near substrate and electrode and second adhes$3 and second (surface or face) near substrate	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:47
S35	705	(display or panel) near substrate with dielectric layer	US-PGPUB; USPAT;	ADJ	ON	2013/07/03 17:31

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S36	594	(display or panel) near substrate with dielectric layer and electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 17:32
S41	222	(optical or clear or trasparent) adhesive layer and (display or screen) and substrate and (cover or case)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 10:44
S42	29	(optical or clear or trasparent) adhesive layer and (display or screen) and substrate and (cover or case) and dielectric (layer or sheet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 10:45
S43	3235	345/174.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:22
S44	14517	345/173.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:23
S45	3624	345/173.ccls. and (micromillimeter or m)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:25
S46	0	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate and micromillimeter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:25
S47	216	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate and micrometer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:29

S48	2	2009/0153507	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:57
S50	140	345/173.ccls. and (micromillimeter or m) and sinusoidal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 12:10
S51	0	2011/0310033	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:25
S52	2	"20110310033"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:25
S53	41	("7920129" | "20120242588" | "8040326" | "20020167619" | "20060097991" | "7663607" | "8031174" | "8049732" | "20100302201" | "20090315854" | "20110310037" | "20100045632" | "20120242592" | "20120243151" | "8179381" | "20130076612" | "8031094" | "20110310033" | "20120243719" | "7875814" | "20110007020").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:30
S54	16	("20090315854" | "20120242588" | "20120242592" | "20120243151" | "20120243719" | "7875814" | "8040326" | "8179381").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:42
S55	0	345/173.ccls. and conductive mesh and S43 (percent or 5%)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 15:09
S56	10	345/173.ccls. and conductive mesh and (S43 percent or 5%)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 15:09
S57	1091	200/512.ccls.	US-PGPUB; USPAT;	ADJ	ON	2013/07/08 17:11

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S58	41	("7920129" | "20120242588" | "8040326" | "20020167619" | "20060097991" | "7663607" | "8031174" | "8049732" | "20100302201" | "20090315854" | "20110310037" | "20100045632" | "20120242592" | "20120243151" | "8179381" | "20130076612" | "8031094" | "20110310033" | "20120243719" | "7875814" | "20110007020").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/11 17:20
S59	16	2008/0158183	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/11 17:23
S60	3	"7920129".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/11 17:32
S61	97	("20030231168" | "20060026521" | "20060084852" | "20060092142" | "20060097991" | "20060197753" | "20080088595" | "5483261" | "5488204" | "5825352" | "5835079" | "5869791" | "5880411" | "5942733" | "6188391" | "6310610" | "6323846" | "6690387" | "6970160" | "7015894" | "7184064" | "7382139" | "7511702" | "7532205" | "7663607").PN. OR ("7920129").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 16:27
S62	65	("7920129" | "8040326" | "20120242588" | "20060281297" | "20080170819" | "20090217518" | "6555762" | "20060115983" | "20120013544" | "20120113014" | "20060169485" | "4967314" | "6009620" | "6889433" | "20100038778" | "20060220245" | "20080105456" | "5972482" | "6337037" | "6534723" | "7772118" | "20080186288" | "20120127079" | "7663607" | "8031174" | "8049732" | "20090315854" | "20090145651" | "20020045394" | "20060272850" | "5117069" | "20090236151" | "20090237365" | "20110049646" | "20110210935" | "20120062472" | "8179381" | "20120242592" | "20120243151" | "20060284300" | "6211487" | "6584682" | "8031094" | "7875814" | "20120243719" | "20070026196" | "20100183920" | "4383363" | "5638598" | "6570102" | "20070178279" |	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 16:30

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S63	22	("7920129" | "8040326" | "20110215914" | "20120242588" | "20110193819" | "20090273573" | "20100156845" | "7663607" | "8031174" | "8049732" | "20090315854" | "20110141052" | "20080158178" | "8179381" | "20100123677" | "20120242592" | "20120243151" | "8031094" | "7875814" | "20120243719" | "20060158433" | "20110273396").PN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 16:46
S64	1	second cover same (OCA or optical$2 clear adhes$3) and substrate	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 16:48
S65	383	cover same (OCA or optical$2 clear adhes$3) and substrate	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 16:49
S66	1	"13347859"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:49
S67	1	"20110310033"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:50
S68	1	"13331022"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:53
S69	1	"13312405"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:54
S70	1	"13413306"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:57
S71	1	"13347859"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:57
S72	3	"13089061"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 19:59
S73	938	200/512.ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/12 20:01
S74	4	345/174.ccls. and second cover	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/12 20:03
S75	0	345/174.ccls. and s(econd or upper or lower) cover	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2014/02/12 20:06

			DERWENT; IBM_TDB			
S76	23	345/174.ccls. and (second or upper or lower) cover	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/12 20:06
S77	18	("20130063393" | "20090073085" | "20130033452" | "20100136265" | "20110001720" | "20110151201").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/12 20:08
S78	1	"428".clas. and second (OCA or optical$2 clear adhes$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 10:20
S79	155	"428".clas. and (OCA or optical$2 clear adhes$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 10:22
S80	475	"428".clas. and second (cover)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 10:37
S81	15	"428".clas. and second (cover) same (display or screen)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 10:38
S82	41	("20020145801" | "20020192397" | "20030096093" | "20030214715" | "20030215581" | "20030215582" | "20030215583" | "20030215608" | "20030215621" | "20030215658" | "20050249932" | "20050249944" | "20050249962" | "20060108065" | "20060110549" | "20060144514" | "20060187548" | "20060225827" | "20060225831" | "20060234035" | "20070272354" | "2524286" | "4626304" | "4735854" | "5219510" | "5753140" | "5976297" | "6068794" | "6245382" | "6693746" | "6746732" | "6840635" | "6913820" | "7252733" | "7279060" | "7399376").PN. OR ("7662456").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 10:51
S83	117	(LCD or touch panel or touch screen or	US-PGPUB;	ADJ	ON	2014/02/24

		Liquid Crystal Displays) and second cover same (display or screen) and adhes$3	USPAT; USOCR			11:29
S84	52	(LCD or touch panel or touch screen or Liquid Crystal Displays) and second cover same (display or screen) and adhes$3 and substrate	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 11:30
S85	1	"6924789".pn.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 11:55
S86	29	("20120242588" | "8040326" | "20040239650" | "20120262412" | "20080158183" | "6924789" | "20020167619" | "20060097991" | "20090205879" | "20090273570" | "20120075238" | "20130234974" | "7382139" | "20100045614" | "20100302201" | "20110310037" | "20120262382" | "20120242592" | "20120243151" | "8179381" | "20130076612" | "20100045632" | "20130127772" | "20090135854" | "20120243719" | "7875814" | "20090219257" | "20110310033" | "20100045615").PN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 11:56
S87	40	((DAVID) near2 (GUARD)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 12:45
S89	71	"361".clas. and (optical$2 clear adhes$2 or OCA)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:05
S90	346	"345".clas. and (optical$2 clear adhes$2 or OCA)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:21
S91	216	"345".clas. and (optical$2 clear adhes$2 or OCA) same (display or screen or LCD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:21
S92	2	"345".clas. and second (optical$2 clear adhes$2 or OCA) same (display or screen or LCD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:21
S93	106	second (cover or coat or protect$3 or flim or layer or sheet) near5 (display or screen or LCD) same (optical$2 clear adhes$2 or OCA)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2014/02/24 14:38

			DERWENT; IBM_TDB			
S94	119	second (cover or coat or protect$3 or flim or layer or sheet) same (display or screen or LCD) same (optical$2 clear adhes$2 or OCA)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:41
S95	13	S94 not S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 14:42
S96	44	("20010046081" | "20040041967" | "20040108193" | "5675361" | "5887995" | "5988902" | "6224278" | "6288707" | "6498600" | "6680731").PN. OR ("6924789").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/02/24 14:57
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S99	7436	(optical$2 clear adhes$2 or OCA) and (display or screen or OCA)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/02/24 15:02
S103	1	"13312405"	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/11/07 12:57
S104	48	((David) near2 (Guard)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/11/07 13:00
S109	53	second (optical$2 clear adhes$2 or OCA) same (display or screen or LCD)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2014/11/07 15:38
S110	496	(LCD or display) near4 (dielectric or	US-PGPUB;	ADJ	ON	2014/11/10

		cover) and (OCA or clear adhes$3)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			12:19

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	1734	((H01H13/702 OR H01H2239/006).CPC.)	US-PGPUB; USPAT; UPAD	ADJ	ON	2014/11/13 18:05
L8	267	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate and micrometer	US-PGPUB; USPAT; UPAD	ADJ	ON	2014/11/13 18:05
L9	458	(LCD or display) near4 (dielectric or cover) and (OCA or clear adhes$3)	US-PGPUB; USPAT; UPAD	ADJ	ON	2014/11/13 18:06
L10	452	"345".clas. and (optical$2 clear adhes$2 or OCA)	US-PGPUB; USPAT; UPAD	ADJ	ON	2014/11/13 18:06
L11	140	(200/181.ccls. or 345/172-174.ccls.) and (optical or clear or transparent) near4 substrate same (first and second) surface	US-PGPUB; USPAT; UPAD	ADJ	ON	2014/11/13 18:08

11/13/2014 6:09:45 PM
C:\Users\asaeed\Documents\EAST\Workspaces\13312405.wsp

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833 **Confirmation #** 6025	**Filing Date:** December 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A			
	B			
	C			
	D			
	E			
	F			
	G			

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	H	Guard et al., USSN 13/347,859, Notice of Appeal (Attorney's Docket 080900.1424).	01/31/2014
	I	Guard et al., USSN 13/347,859, Applicant-Initiated Interview Summary (Attorney's Docket 080900.1424).	02/06/2014
	J	Guard et al., USSN 13/347,859, Applicant Summary of Interview with Examiner (Attorney's Docket 080900.1424).	03/10/2014
	R		

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A			
	B			
	C			
	D			
	E			
	F			
	G			
	H			
	I			

EXAMINER	DATE CONSIDERED
/Ahmed Saeed/	11/13/2014

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

PTO/SB/08a (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	13312405
Filing Date	2011-12-06
First Named Inventor	David B. Guard
Art Unit	2833
Examiner Name	Ahmed M. Saeed
Attorney Docket Number	080900.1371

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7864503		2011-01-14	Yu-Huel Chang	
	2	8217902		2012-07-10	Ching-Yang Chang	
	3	8355006		2013-01-15	PARK ET AL.	
	4	8456444		2013-06-04	Ishizaki et al.	
	5	8797285		2014-08-05	Guard et al.	
	6	8723824		2014-05-13	Scott A. Myers	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13312405
	Filing Date	2011-12-06
	First Named Inventor	David B. Guard
	Art Unit	2833
	Examiner Name	Ahmed M. Saeed
	Attorney Docket Number	080900.1371

	1	20080309635		2008-12-18	Mitsumi Matsuo	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Guard et al., USSN 13/312,405 Notice of Allowance dated March 27, 2014 (Atty Docket 080900.1208).	☐
	2	Guard et al., USSN 13/312,405 Issue Notification dated July 16, 2014 (Atty Docket 080900.1208).	☐
	3	Guard et al., USSN 13/331,022 Final Office Action dated April 15, 2014 (Atty Docket 080900.1370).	☐
	4	Guard et al., USSN 13/331,022 Request for Continued Examination dated July 15, 2014 (Atty Docket 080900.1370).	☐
	5	Guard et al., USSN 13/347,859 Appeal Brief dated March 28, 2014 (Atty Docket 080900.1424).	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13312405
	Filing Date	2011-12-06
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	Art Unit	2833
	Examiner Name	Ahmed M. Saeed
	Attorney Docket Number	080900.1371

	6	Guard et al., USSN 13/347,859 Examiner's Answer dated July 17, 2014 (Atty Docket 080900.1424).	☐
	7	Guard et al., USSN 13/413,306 Final Office Action dated April 11, 2014 (Atty Docket 080900.1425).	☐
	8	Guard et al., USSN 13/413,306 Request for Continued Examination dated July 11, 2014 (Atty Docket 080900.1425).	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Electronic Patent Application Fee Transmittal

Application Number:	13312405
Filing Date:	06-Dec-2011
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Filer:	Chad D Terrell/Esmarie Garland
Attorney Docket Number:	080900.1371

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	1253	1	1400	1400

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for Continued Examination	1801	1	1200	1200
		Total in USD ($)		**2600**

Electronic Acknowledgement Receipt	
EFS ID:	20065071
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Chad D Terrell/Esmarie Garland
Filer Authorized By:	Chad D Terrell
Attorney Docket Number:	080900.1371
Receipt Date:	05-SEP-2014
Filing Date:	06-DEC-2011
Time Stamp:	18:32:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2600
RAM confirmation Number	5718
Deposit Account	020384
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	0809001371RCETransmittal.PDF	102817 9d54e6df76265ef3417d691e661a9a8c60bb7f67	no	1

Warnings:

This is not a USPTO supplied RCE SB30 form.

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

2		0809001371Response.PDF	485742 41ca6ea6614366da2d00795be7255b04b2e13d8f	yes	10

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	4
Applicant Arguments/Remarks Made in an Amendment	5	10

Warnings:

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Information:

3		0809001371IDS.PDF	221124 0c3215f79584e1c94c4fa472ad02bfb23debb08b	yes	5

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	2
Information Disclosure Statement (IDS) Form (SB08)	3	5

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Information:

4	Other Reference-Patent/App/Search documents	Atmel1208NoticeOfAllow27March14.pdf	526110 7376e927aa01407587f542e877af61cdc4aa4c33	no	10
Warnings:					
Information:					
5	Other Reference-Patent/App/Search documents	Atmel1208IssueNotif16July14.pdf	54509 f3cc074ca0de1e7d2e88bddd258a1bfc5e11d913	no	1
Warnings:					
Information:					
6	Other Reference-Patent/App/Search documents	Atmel1370FinalOA15April14.pdf	483699 7518ffc7cad1aa4ee5a06ba5162ea257c56fb45c	no	15
Warnings:					
Information:					
7	Other Reference-Patent/App/Search documents	Atmel1370RCE15July14.pdf	584814 533d32e412fef6924c290b2f5303bf34d09caafb	no	12
Warnings:					
Information:					
8	Other Reference-Patent/App/Search documents	Atmel1424AppBrief28March14.pdf	1422521 e9910c596cd50981def30ee69479b4b88fdfa7cf	no	29
Warnings:					
Information:					
9	Other Reference-Patent/App/Search documents	Atmel1424ExAnsAppBrf17July14.pdf	268792 10f38a6a7d143f8972bb72356dc3f3cb18608b54	no	9
Warnings:					
Information:					
10	Other Reference-Patent/App/Search documents	Atmel1425FinalOA11April14.pdf	504674 b86e7eec10f5c0debed993bdba81b304048d4a75	no	17
Warnings:					
Information:					
11	Other Reference-Patent/App/Search documents	Atmel1425RCE11July14.pdf	687565 119befdd93f1e2565f73527d321b94f2765168b6	no	14
Warnings:					
Information:					
12	Fee Worksheet (SB06)	fee-info.pdf	31963 687f7c358d16f27017774466b293218e4a0353c1	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	5374330

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/30 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	13/312,405
Filing Date	December 6, 2011
First Named Inventor	David B. Guard
Art Unit	2833; confirmation #6025
Examiner Name	Ahmed M. Saeed
Attorney Docket Number	080900.1371

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☑ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☑ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 02-0384.

      i. ☑ RCE fee required under 37 CFR 1.17(e)

      ii. ☑ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature		Date	September 5, 2014
Name (Print/Type)	Chad D. Terrell	Registration No.	52,279

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Brent David Guard
Serial No.:	13/312,405
Filing Date:	December 11, 2011
Art Unit:	2833
Confirmation No.:	6025
Examiner:	Ahmed M Saeed
Title:	***Two-Layer Sensor Stack***

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Response under 37 C.F.R. § 1.114

In response to the Final Office Action dated March 6, 2014, Applicant respectfully request the Examiner to reconsider the rejections of the claims in view of the following amendments and remarks, filed with a Request for Continued Examination (RCE). Please amend the Application as follows.

In the Claims:

1. (Currently amended) An apparatus comprising:

a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate;

the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal; and

a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display.

2-3. (Canceled)

4. (Original) The apparatus of Claim 1, wherein the conductive material is copper, silver, gold, aluminum, or tin.

5. (Original) The apparatus of Claim 1, wherein the conductive mesh comprises a plurality of mesh segments, each of the mesh segments having a width of approximately 10 μm.

6. (Original) The apparatus of Claim 5, wherein approximately 5% of an active area of the touch sensor is covered by the one or more mesh segments.

7. (Original) The apparatus of Claim 5, wherein each of the mesh segments is substantially sinusoidal.

8. (Original) The apparatus of Claim 1, wherein the conductive meshes have an optical transmissivity of approximately 90%.

9. (Original) The apparatus of Claim 1, wherein the sense electrodes being disposed on the first surface of the substrate and the drive electrodes being disposed on the second surface of the substrate.

10. (Currently amended) A device comprising:

a first cover sheet;

a first optically clear adhesive layer (OCA) between the first cover sheet and a substrate;

the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal;

a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

11-12. (Canceled)

13. (Original) The device of Claim 10, wherein the conductive material is copper, silver, gold, aluminum, or tin.

14. (Original) The device of Claim 10, wherein the conductive mesh comprises a plurality of mesh segments, each of the mesh segments having a width of approximately 10 μm.

15. (Original) The device of Claim 14, wherein approximately 5% of an active area of the touch sensor is covered by the mesh segments.

16. (Original) The device of Claim 14, wherein each of the mesh segments is substantially sinusoidal.

17. (Original) The device of Claim 10, wherein the conductive meshes have an optical transmissivity of approximately 90%.

18. (Original) The device of Claim 10, wherein the sense electrodes being disposed on the first surface of the substrate and the drive electrodes being disposed on the second surface of the substrate.

19. (Currently amended) An apparatus comprising:

a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate;

the substrate, with sense electrodes of a touch sensor disposed on a first surface and drive electrodes of the touch sensor disposed on a second surface of the substrate, the first surface being opposite the second surface, the drive and sense electrodes being made of a conductive mesh of conductive material comprising metal; and

a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display.

20. (Canceled)

Remarks

This Application has been reviewed carefully in light of the Final Office Action dated March 6, 2014. Applicant appreciates the Examiner's consideration of the Application. Although Applicant believes all claims are allowable without amendment, to advance prosecution Applicant has made clarifying amendments to Claims 1, 10, and 19. At least certain of these amendments are not considered narrowing, and none are considered necessary for patentability. Additionally, Applicant does not admit that these amendments are made in response to or necessitated by any cited reference or combination of cited references. Applicant respectfully requests reconsideration and allowance of all pending claims.

Request for Interview

If the Examiner intends to issue a new Action in response to this submission, in the interest of compact and efficient prosecution, Applicant respectfully requests that the Examiner contact Applicant's attorney prior to issuing the new Action to discuss a possible resolution to any outstanding issues.

The Claims are Allowable over the Proposed *Hotelling-Bick* Combination

The Office Action rejects Claims 1, 4, 9-10, 13, and 18-19 under pre-AIA 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*") in view of U.S. Patent No. 6,924,789 ("*Bick*"). Applicant respectfully traverses these rejections and discusses independent Claim 1 as an example.

At a minimum, the cited portions of the proposed *Hotelling-Bick* combination do not disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in Claim 1 even prior to the present amendments, let alone "a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display," as recited in amended Claim 1. The Office Action states that "Hotelling does not teach the display being separated by a second cover." *Office Action* at 2. However, the Office Action alleges that "Bick teaches a display 4 separated from the second surface of the substrate 20 by dielectric

layer 27 (Bick fig 3, col. 2, lines 38-50)." *Id.* Even assuming for the sake of argument only that first sensing plate 20, dielectric layer 27, and display 4 could be equated to the claimed "substrate," "second cover sheet," and "display," respectively, which Applicant does not concede, Applicant respectfully submits that *Bick* still fails to make up for at least the acknowledged deficiencies of *Hotelling*.

Figure 1 of *Bick* shows a "mobile telephone handset 1" that includes a "liquid crystal display (LCD) panel 4" and a "keypad 7." As shown below, LCD panel 4 occupies a different area of mobile handset 1 than keypad 7:

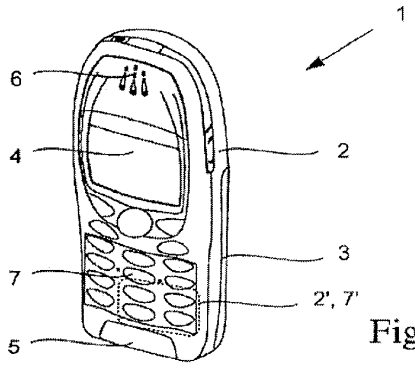

Figure 1

Bick at Fig. 1. Figure 3 of *Bick* illustrates an exploded view of keypad 7, and particularly cutaway portion keypad 7'. *See Bick* at Fig. 3. Figure 3 illustrates the cited substrate 20 and dielectric layer 27. Figure 3 does not illustrate display 4, and certainly does not illustrate that display 4 is separated from a second surface of a substrate (first sensing plate 20, according to the Office Action's apparent equations) by a second OCA and a second cover sheet (dielectric layer 27, according to the Office Action's apparent equations), let alone such that at least a portion of a second cover sheet (dielectric layer 27, according to the Office Action's apparent equations) is positioned between a second surface of a substrate (first sensing plate 20, according to the Office Action's apparent equations) and display 4. In fact, Figure 1 shows that display 4 is in a different area of mobile telephone handset 1 than keypad 7 (a portion of which is detailed in cited Figure 3), which explains why display 4 would not be included in Figure 3.

Thus, even assuming for the sake of argument only that first sensing plate 20, dielectric layer 27, and display 4 could be equated to the claimed "substrate," "second cover sheet," and "display," respectively, which Applicant does not concede, *Bick* still fails to disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in Claim 1 even before the present amendments, let alone "a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display," as recited in amended Claim 1.

Furthermore, Applicant also respectfully submits that the proposed *Hotelling-Bick* combination does not disclose, teach, or suggest at least these features of Claim 1. As discussed above, neither cited reference actually discloses "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in Claim 1 even before the present amendments, let alone "a display separated from the second surface of the substrate by a second OCA and a second cover sheet such that at least a portion of the second cover sheet is positioned between the second surface of the substrate and the display," as recited in amended Claim 1. Thus, even assuming for the sake of argument only that dielectric layer 27 of *Bick* could be equated to the claimed second cover sheet and further that it would have been obvious to modify *Hotelling* to include dielectric layer 27 of *Bick* somewhere in the device of *Hotelling* (neither of which Applicant concedes), that proposed combination still would not disclose, teach, or suggest at least the above-identified features of Claim 1.

Therefore, the proposed *Hotelling-Bick* combination does not disclose, teach, or suggest each and every feature of Claim 1, both before and after the amendments to Claim 1.

Additionally, Applicant does not admit that the proposed *Hotelling-Bick* combination is possible or that the Office Action provides an adequate reason for combining or modifying these references in the proposed manner. To avoid burdening the record and in view of the allowability of independent Claim 1 for at least the above-discussed reasons, Applicant does

not discuss this issue in this submission. However, Applicant reserves the right to discuss this issue in a future submission, if appropriate.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 1 and its dependent claims. For at least certain analogous reasons, Applicant respectfully requests reconsideration and allowance of independent Claims 10 and 19 and their dependent claims.

Claims 5-8 and 14-17 are Allowable over the Proposed *Hotelling-Bick-Frey* Combination

The Office Action rejects Claims 5-8 and 14-17 under 35 U.S.C. § 103(a) as being unpatentable over *Hotelling* and *Bick* and further in view of U.S. Patent Application Publication No. 2009/0219257 ("*Frey*"). Applicant respectfully traverses these rejections. Claims 5-8 and 14-17 depend from independent Claims 1 and 10, respectively, shown above to be allowable over the proposed *Hotelling-Bick* combination. The cited portions of *Frey* do not appear to make up for at least the above-discussed deficiencies of the proposed *Hotelling-Bick* combination. Thus, dependent Claims 5-8 and 14-17 are allowable at least because they depend from allowable independent claims. Furthermore, dependent Claims 5-8 and 14-17 recited further patentable features. To avoid burdening the record and in view of the allowability of the independent claims, Applicant does not discuss these features in this submission. Applicant, however, reserves the right to discuss these features in a future submission, if appropriate. Moreover, Applicant does not admit that the proposed *Hotelling-Bick-Frey* combination is possible or that the Office Action provides an adequate reason for combining or modifying the references in the manner proposed in the Office Action. For at least these reasons, Applicant respectfully requests reconsideration and allowance of Claims 5-8 and 14-17.

Request for Evidentiary Support

Should a rejection based on any of the above asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. For example, if the Examiner is relying upon alleged "common knowledge," alleged "well known" principles, Official Notice, or other information within the Examiner's personal knowledge to establish

the rejection, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit. *See* M.P.E.P. § 2144.03 and 37 C.F.R. § 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made in the Office Action, Applicant does not acquiesce to the additional statements.

Conclusion

Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact Chad D. Terrell, Attorney for Applicant, at (214) 953-6813, at the Examiner's convenience.

The Commissioner is authorized to charge the appropriate fees for a first RCE and a three-month extension of time to Deposit Account No. 02-0384 of Baker Botts L.L.P. Although Applicant believes no other fee is due, the Commissioner is authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicants

Chad D. Terrell
Reg. No. 52,279

Date: September 5, 2014

Correspondence Address:

Customer No. **12323**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	David B. Guard
Application No.:	13/312,405
Filing Date:	December 6, 2011
Art Unit:	2833
Confirmation No.:	6025
Examiner:	Ahmed M. Saeed
Title:	*Two-Layer Sensor Sack*

Commissioner of Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Supplemental Information Disclosure Statement (IDS)

Applicant respectfully requests, pursuant to 37 C.F.R. §§1.56, 1.97, and 1.98, that the documents listed on the attached PTO/SB/08 form be considered and cited in the examination of the above-identified patent application. Applicant makes no representation that a search has been made, that these documents are material to patentability of the present application, or that these documents qualify as prior art. *See* 37 C.F.R. § § 1.97(g) and (h).

Copies of U.S. patents and U.S. patent application publications have not been provided. To the extent applicable, references other than U.S. patents and U.S. patent application publications are enclosed for the convenience of the Examiner.

This IDS is being submitted concurrently with the filing of a Request for Continued Examination, and thus before the mailing of a first Office Action after the filing of an RCE. Therefore, Applicant believes no fee is due. *See* 37 C.F.R. § 1.97(b). However, the Commissioner is authorized to charge any necessary fees and credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,
BAKER BOTTS L.L.P.
Attorneys for Applicant

Chad D. Terrell
Reg. No. 52,279

Date: 9/5/14

Correspondence Address:
Customer No. **12323**

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/312,405	Filing Date 12/06/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	09/05/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/LAJUAN HICKSON/

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833 **Confirmation #** 6025	**Filing Date:** December 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A			
	B			
	C			
	D			
	E			
	F			
	G			

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	H	Guard et al., USSN 13/347,859, Notice of Appeal (Attorney's Docket 080900.1424).	01/31/2014
	I	Guard et al., USSN 13/347,859, Applicant-Initiated Interview Summary (Attorney's Docket 080900.1424).	02/06/2014
	J	Guard et al., USSN 13/347,859, Applicant Summary of Interview with Examiner (Attorney's Docket 080900.1424).	03/10/2014
	R		

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A			
	B			
	C			
	D			
	E			
	F			
	G			
	H			
	I			

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

U.S. PATENT AND TRADEMARK OFFICE

Active 15269279

Electronic Patent Application Fee Transmittal	
Application Number:	13312405
Filing Date:	06-Dec-2011
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Filer:	Stanton Aaron Lewis/Esmarie Garland
Attorney Docket Number:	080900.1371
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt	
EFS ID:	18528669
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Stanton Aaron Lewis/Esmarie Garland
Filer Authorized By:	Stanton Aaron Lewis
Attorney Docket Number:	080900.1371
Receipt Date:	19-MAR-2014
Filing Date:	06-DEC-2011
Time Stamp:	18:25:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	5083
Deposit Account	020384
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees) Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	**Document Description**	**File Name**	**File Size(Bytes)/ Message Digest**	**Multi Part /.zip**	**Pages (if appl.)**
1		0809001371SuppIDS19Mar14.PDF	134197 5e3756be69f108ba6255f2cca9d04df97607c5fa	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
2	Other Reference-Patent/App/Search documents	Atmel1424NotOfApp31Jan14.pdf	45558 e10c508f6803f53a9fc5a93f3c5350350f26786d	no	2
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	Atmel1424AppInitIntervSum06Feb14.pdf	262864 a2c1499cf97a5117eb9befb8f1cdc222737b9ea6	no	6
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	Atmel1424AppSumIntervEx10March14.pdf	33985 43358c3233a54b5260ea5a5d007be90031ea9514	no	1
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	29901 1184f335dc3924cf39f23e7b7ce3e023bef9e9fa	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	506505		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	David Brent Guard
Application No.:	13/312,405
Filed:	December 6, 2011
Art Unit:	2833
Confirmation No.:	6025
Examiner:	Ahmed M. Saeed
Title:	*Two-Layer Sensor Sack*

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Supplemental Information Disclosure Statement (IDS)

Applicant respectfully requests, pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98, that the documents listed on the attached PTO/SB/08 Form be considered and cited in the examination of the above-identified patent application. Pursuant to 37 C.F.R. §§ 1.97(g) and (h), Applicant makes no representation that a search has been made, that these documents are material to patentability of the present application, or that these documents qualify as prior art.

Copies of U.S. patents and U.S. patent application publications have not been provided. To the extent applicable, documents other than U.S. patents and U.S. patent application publications are enclosed for the convenience of the Examiner.

No item of information contained in this IDS was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this IDS was known to any individual designated in § 1.56(c) more than three months prior to the filing of this IDS.

The Commissioner is authorized to charge the amount of $180.00 under 37 C.F.R. § 1.97(d). Although no other fees are believed to be due, the Commissioner is hereby authorized to charge any additional necessary fees and credit any overpayments to Deposit Account 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

Brice S. Dumais
Reg. No. 65,800

Date: 3/19/14

CORRESPONDENCE ADDRESS:

at Customer No. **12323**

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

12323 7590 03/06/2014

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

EXAMINER	
SAEED, AHMED M	
ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
03/06/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/312,405	Applicant(s) GUARD ET AL.	
	Examiner AHMED SAEED	Art Unit 2833	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *amendment filed 12/18/2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1,4-10 and 13-19* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1, 4-10, and 13-19* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *12/26/2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 4, 9, 10, 13, 18 and 19 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hotelling (US 2008/0158183) in view of Bick (US 6,924,789).

Regarding claim 1, Hotelling teaches an apparatus comprising: a first optically clear adhesive (OCA) layer 412 between a first cover sheet 408 and a substrate 402; the substrate, with drive or sense electrodes (404 and 406) of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50) and a display 410 separated from the second surface of the substrate by a second OCA 412. Hotelling does not teach the display being separated by a second cover. However, Bick teaches a display 4 separated from the second surface of the substrate 20 by dielectric layer 27 (Bick fig 3, col. 2, lines 38-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Bick in the touch panel of Hotelling to provide a dielectric barrier between the substrate and the display screen.

Regarding claim 10, Hotelling teaches an apparatus comprising: a first cover sheet 408; a first optically clear adhesive (OCA) layer 412 between the first cover sheet and a substrate 402; and the substrate, with drive or sense electrodes (404 and 406) of

a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50) and a display 410 separated from the second surface of the substrate by a second OCA 412, and one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor. Hotelling does not teach the display being separated by a second cover. However, Bick teaches a display 4 separated from the second surface of the substrate 20 by dielectric layer 27 (Bick fig 3, col. 2, lines 38-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Bick in the touch panel of Hotelling to provide a dielectric barrier between the substrate and the display screen.

Regarding claim 19, Hotelling teaches an apparatus comprising: a first optically clear adhesive (OCA) layer 412 between a first cover sheet 408 and a substrate 402; and the substrate, with drive or sense electrodes (404 and 406) of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50), and a display 410 separated from the second surface of the substrate by a second OCA 412, and one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor. Hotelling does not teach the display being separated by a second cover. However, Bick teaches

a display 4 separated from the second surface of the substrate 20 by dielectric layer 27 (Bick fig 3, col. 2, lines 38-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Bick in the touch panel of Hotelling to provide a dielectric barrier between the substrate and the display screen.

The features of dependent **claims 4, 9, 13 and 18** are taught by Hotelling, as discussed in the previous Office action, and have not been separately argued by applicant.

Claims 5-8 and 14-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hotelling and Bick, as applied to claims 1 and 10 above, and further in view of Frey (US 2009/0219257).

The features of dependent **claims 5-8 and 14-17** are taught by Hotelling and Frey, as discussed in the previous Office action, and have not been separately argued by applicant.

Response to Arguments

Applicant's arguments filed 12/18/2013 have been fully considered but they are not persuasive.

Applicant argues on page 2 that Hotelling or Bick do not teach the second cover and the second clear adhesive. However, Hotelling does teach a display or LCD 410 separated from a bottom surface of the substrate 402 by an optically clear adhesive

412, and Bick teaches a display or LCD 4 which is separated from a substrate by a cover 17 and a clear adhesive 27. The combination would yield a first OCA 412 attaching the first cover sheet 408 to the substrate 402 and a second OCA 412 attaching the second cover sheet 14 to the substrate 402, and the second cover sheet separating the display 410 from the substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Bick in the touch panel of Hotelling for the purpose of protecting the substrate and to provide a dielectric barrier between the substrate and the display screen.

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AHMED SAEED whose telephone number is (571)270-7976. The examiner can normally be reached on M-F (8:30-5:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Renee Luebke can be reached on 571-272-2009.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AHMED SAEED/
Examiner, Art Unit 2833

/renee luebke/

Renee Luebke
Supervisory Patent examiner
AU 2833

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** Dec. 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS

		DOCUMENT NUMBER	PUBLICATION OR ISSUE DATE	FIRST NAMED INVENTOR
	A	2002/0167619	11/2002	Bietsch et al.
	B	2004/0239650	12/2004	B. L. Mackey
	C	2006/0097991	05/2006	Hotelling et al.
	D	2009/0205879	08/2009	Halsey IV et al.
	E	2009/0273570	11/2009	Degner et al.
	F	2010/0045614	02/2010	Gray et al.
	G	2010/0045615	02/2010	Gray et al.
	H	2010/0045632	02/2010	Yilmaz et al.
	I	2010/0302201	12/2010	Ritter et al.
	J	2011/0007020	01/2011	Hong et al.
	K	2011/0310033	12/2011	Liu et al.
	L	2011/0310037	12/2011	Moran et al.
	M	2012/0075238	03/2012	Minami et al.
	N	2012/0262382	10/2012	David B. Guard et al.
	O	2012/0262412	10/2012	David B. Guard et al.
	P	2013/0127772	05/2013	David B. Guard et al.
	Q	2013/0234974	09/2013	David B. Guard
	R	7,382,139	06/2008	B. L. Mackey
	S			

NON-PATENT LITERATURE (NPL)

		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	DATE
	T	Guard et al., USSN 13/089,061, Non-final Office Action (Attorney Docket 080900.1208)	23 Nov. 2012
	U	Guard et al., USSN 13/089,061, Response to Non-final Office Action (Attorney Docket 080900.1208)	25 Mar 2013
	V	Guard et al., USSN 13/089,061, Non-final Office Action (Attorney Docket 080900.1208)	20 June 2013
	W	Guard et al., USSN 13/089,061, Response to Non-final Office Action (Attorney Docket 080900.1208)	17 Dec. 2013
	X	Guard et al., USSN 13/331,022, Non-final Office Action (Attorney's Docket 080900.1370).	07 Oct 2013
	Y	Guard et al., USSN 13/331,022, Response to Non-final Office Action (Attorney's Docket 080900.1370).	07 Jan 2014
	Z	Guard et al., USSN 13/347,859, Non-final Office Action (Attorney's Docket 080900.1424).	02 Nov 2012

Active 14999400 EXAMINER	DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

U.S. PATENT AND TRADEMARK OFFICE

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** Dec. 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A			
	B			
	C			
	D			
	E			
	F			
	G			
	H			
	I			
	J			
	K			

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	L	Guard et al., USSN 13/347,859, Response to Non-final Office Action (Attorney's Docket 080900.1424).	04 Mar. 2013
	M	Guard et al., USSN 13/347,859, Final Office Action (Attorney's Docket 080900.1424).	21 May 2013
	N	Guard et al., USSN 13/347,859, RCE and Response (Attorney's Docket 080900.1424).	20 Sept. 2013
	O	Guard et al., USSN 13/347,859, Non-Final Office Action (Attorney's Docket 080900.1424).	01 Nov. 2013
	P	Guard, USSN 13/413,306, Non-final Office Action (Attorney's Docket 080900.1425).	08 Oct 2013
	Q	Guard, USSN 13/413,306, Response to Non-final Office Action (Attorney's Docket 080900.1425).	08 Jan 2014
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	R		

Active 14999400 EXAMINER /Ahmed Saeed/	DATE CONSIDERED 02/24/2014
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.	

U.S. PATENT AND TRADEMARK OFFICE

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	Art Unit
	AHMED SAEED	2833

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor name search	7/8/2013	AS
consulted with Renee Luebke	7/8/2013	AS
EAST text search with subclasses (200/512, 345/173, 428, 361)	2/24/2014	AS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** Dec. 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	2002/0167619	11/2002	Bietsch et al.
	B	2004/0239650	12/2004	B. L. Mackey
	C	2006/0097991	05/2006	Hotelling et al.
	D	2009/0205879	08/2009	Halsey IV et al.
	E	2009/0273570	11/2009	Degner et al.
	F	2010/0045614	02/2010	Gray et al.
	G	2010/0045615	02/2010	Gray et al.
	H	2010/0045632	02/2010	Yilmaz et al.
	I	2010/0302201	12/2010	Ritter et al.
	J	2011/0007020	01/2011	Hong et al.
	K	2011/0310033	12/2011	Liu et al.
	L	2011/0310037	12/2011	Moran et al.
	M	2012/0075238	03/2012	Minami et al.
	N	2012/0262382	10/2012	David B. Guard et al.
	O	2012/0262412	10/2012	David B. Guard et al.
	P	2013/0127772	05/2013	David B. Guard et al.
	Q	2013/0234974	09/2013	David B. Guard
	R	7,382,139	06/2008	B. L. Mackey
	S			

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	T	Guard et al., USSN 13/089,061, Non-final Office Action (Attorney Docket 080900.1208)	23 Nov. 2012
	U	Guard et al., USSN 13/089,061, Response to Non-final Office Action (Attorney Docket 080900.1208)	25 Mar 2013
	V	Guard et al., USSN 13/089,061, Non-final Office Action (Attorney Docket 080900.1208)	20 June 2013
	W	Guard et al., USSN 13/089,061, Response to Non-final Office Action (Attorney Docket 080900.1208)	17 Dec. 2013
	X	Guard et al., USSN 13/331,022, Non-final Office Action (Attorney's Docket 080900.1370).	07 Oct 2013
	Y	Guard et al., USSN 13/331,022, Response to Non-final Office Action (Attorney's Docket 080900.1370).	07 Jan 2014
	Z	Guard et al., USSN 13/347,859, Non-final Office Action (Attorney's Docket 080900.1424).	02 Nov 2012

Active 14999400 EXAMINER	DATE CONSIDERED
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U.S. PATENT AND TRADEMARK OFFICE

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312,405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** Dec. 6, 2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
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	M	Guard et al., USSN 13/347,859, Final Office Action (Attorney's Docket 080900.1424).	21 May 2013
	N	Guard et al., USSN 13/347,859, RCE and Response (Attorney's Docket 080900.1424).	20 Sept. 2013
	O	Guard et al., USSN 13/347,859, Non-Final Office Action (Attorney's Docket 080900.1424).	01 Nov. 2013
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Electronic Patent Application Fee Transmittal	
Application Number:	13312405
Filing Date:	06-Dec-2011
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Filer:	Stanton Aaron Lewis/Esmarie Garland
Attorney Docket Number:	080900.1371
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt	
EFS ID:	18129213
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Stanton Aaron Lewis/Esmarie Garland
Filer Authorized By:	Stanton Aaron Lewis
Attorney Docket Number:	080900.1371
Receipt Date:	06-FEB-2014
Filing Date:	06-DEC-2011
Time Stamp:	11:06:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	7200
Deposit Account	020384
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees) Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	**Document Description**	**File Name**	**File Size(Bytes)/ Message Digest**	**Multi Part /.zip**	**Pages (if appl.)**
1		0809001371SuppIDS.PDF	218748 12c23250a904adfbb2ed8354c9b85e2d9d9e5f7f	yes	4
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	4	
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
2	Other Reference-Patent/App/Search documents	Atmel1208NFOA23Nov12.pdf	712360 7eeac276254ba2f2a9db4629c7005eeeaf492e3a	no	22
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	Atmel1208Response25Mar13.pdf	687039 7bf5a89e50e52725982463 3c38ce3b60f20d776d	no	14
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	Atmel1208NFOA20June13.pdf	608024 9513987463dd107af94cbf59b0c0da09cdaec756	no	19
Warnings:					
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5	Other Reference-Patent/App/Search documents	Atmel1208Response17Dec13.pdf	548917 4a4ff4f3fa1ec64d5d66fea44fe72f4c15b08a21	no	13
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6	Other Reference-Patent/App/Search documents	Atmel1370NFOA07Oct13.pdf	485361 017f8c69e085fb75a5396180452bcd8848e7e485	no	16
Warnings:					
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7	Other Reference-Patent/App/Search documents	Atmel1370Response07Jan14.pdf	402976 bbb64532cfc14f61288ca36645c34abdfbbb85fe	no	10
Warnings:					
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8	Other Reference-Patent/App/Search documents	Atmel1424NFOA02Nov12.pdf	431474 7a7e207b9e98f30b06c483d103f1afbab95e4456	no	14
Warnings:					
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9	Other Reference-Patent/App/Search documents	Atmel1424Response04March13.pdf	517364 6d130dd4adfb40e24ad47a5c19f928ae4fc057a4	no	12
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10	Other Reference-Patent/App/Search documents	Atmel1424FOA21May13.pdf	435390 261a9dac2f2e5454c4e3ad10b14a6a504c3dc66e	no	13
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11	Other Reference-Patent/App/Search documents	Atmel1424RCEandAmendment20Sept13.pdf	615691 9da628a26d8bfda4edbdf65578ccb34d7fecc145	no	13
Warnings:					
Information:					
12	Other Reference-Patent/App/Search documents	Atmel1424NFOA01Nov13.pdf	416058 293bf7028e231ade0000267cdb1f360a36ef7f3b	no	13
Warnings:					
Information:					
13	Other Reference-Patent/App/Search documents	Atmel1425NFOA08Oct13.pdf	550868 65d48fcd6ac7ab9619a4f5b04feaca9447d821c0	no	17
Warnings:					
Information:					
14	Other Reference-Patent/App/Search documents	Atmel1425Response08Jan14.pdf	499790 52d6e17968d84d6e798a45f643f3399dc71cf39e	no	13
Warnings:					
Information:					
15	Fee Worksheet (SB06)	fee-info.pdf	29901 bf4ec4a3ef412e74ceea8bc04233fbf54a1e8551	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	7159961

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	David Brent Guard
Serial No.:	13/312,405
Filing Date:	December 6, 2011
Art Unit:	2833
Confirmation No.:	6025
Examiner:	Ahmed M. Saeed
Title:	***Two-Layer Sensor Stack***

Commissioner of Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Supplemental Information Disclosure Statement (IDS)

Applicant respectfully requests, pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98, that the documents listed on the attached PTO SB/08 form be considered and cited in the examination of the above-identified patent application. Pursuant to 37 C.F.R. §§ 1.97 (g) and (h), Applicant makes no representation that a search has been made, that these documents are material to patentability of the present application, or that these documents qualify as prior art.

Copies of U.S. patents and U.S. patent application publications have not been provided. To the extent applicable, documents other than the U.S. patents and U.S. patent application publications are enclosed for the convenience of the Examiner.

This Supplemental IDS is being submitted after the mailing of a first Office Action. Thus, the Commissioner is authorized to charge the amount of $180.00 to Deposit Account No. 02-0384 of Baker Botts L.L.P. Although no additional fees are believed to be due for this Supplemental IDS, the Commissioner is authorized to charge any additional necessary fees and credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

Brice S. Dumais
Reg. No. 65,800

Date: 2/5/14

Correspondence Address:
Customer No. 12323

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Brent David Guard
Serial No.:	13/312,405
Filing Date:	December 11, 2011
Art Unit:	2833
Confirmation No.:	6025
Examiner:	Ahmed M Saeed
Title:	***Two-Layer Sensor Stack***

Response Under 37 C.F.R. § 1.111

In response to the Non-Final Office Action dated July 19, 2013, Applicants respectfully request the Examiner to reconsider the rejections of the claims in view of the following amendments and remarks. Please amend the Application as follows.

In the Claims:

1. (Currently Amended) An apparatus comprising:

[[an]]a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate; ~~and~~

the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal; and

a display separated from the second surface of the substrate by a second OCA and a second cover sheet.

2-3. (Canceled)

4. (Original) The apparatus of Claim 1, wherein the conductive material is copper, silver, gold, aluminum, or tin.

5. (Original) The apparatus of Claim 1, wherein the conductive mesh comprises a plurality of mesh segments, each of the mesh segments having a width of approximately 10 μm.

6. (Original) The apparatus of Claim 5, wherein approximately 5% of an active area of the touch sensor is covered by the one or more mesh segments.

7. (Original) The apparatus of Claim 5, wherein each of the mesh segments is substantially sinusoidal.

8. (Original) The apparatus of Claim 1, wherein the conductive meshes have an optical transmissivity of approximately 90%.

9. (Original) The apparatus of Claim 1, wherein the sense electrodes being disposed on the first surface of the substrate and the drive electrodes being disposed on the second surface of the substrate.

10. (Currently Amended) [[An]] A device comprising:

a first cover sheet;

[[an]]a first optically clear adhesive layer (OCA) between the first cover sheet and a substrate;

the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal;

a display separated from the second surface of the substrate by a second OCA and a second cover sheet; and

one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor.

11-12. (Canceled)

13. (Original) The device of Claim 10, wherein the conductive material is copper, silver, gold, aluminum, or tin.

14. (Original) The device of Claim 10, wherein the conductive mesh comprises a plurality of mesh segments, each of the mesh segments having a width of approximately 10 μm.

15. (Original) The device of Claim 14, wherein approximately 5% of an active area of the touch sensor is covered by the mesh segments.

16. (Original) The device of Claim 14, wherein each of the mesh segments is substantially sinusoidal.

17. (Original) The device of Claim 10, wherein the conductive meshes have an optical transmissivity of approximately 90%.

18. (Original) The device of Claim 10, wherein the sense electrodes being disposed on the first surface of the substrate and the drive electrodes being disposed on the second surface of the substrate.

19. (Currently Amended) An apparatus comprising:

[[an]]a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate; ~~and~~

the substrate, with sense electrodes of a touch sensor disposed on a first surface and drive electrodes of the touch sensor disposed on a second surface of the substrate, the first surface being opposite the second surface, the drive and sense electrodes being made of a conductive mesh of conductive material comprising metal; and

a display separated from the second surface of the substrate by a second OCA and a second cover sheet.

20. (Canceled)

Remarks

This Application has been reviewed carefully in light of the Non-Final Office Action dated July 19, 2013. Applicant appreciates the Examiner's consideration of the Application. Although Applicant believes all claims are allowable without amendment, to advance prosecution Applicant has made clarifying amendments to Claims 1, 10, and 19. Claims 2-3, 11-12, and 20 have been cancelled without prejudice or disclaimer. At least certain of these amendments are not considered narrowing, and none are considered necessary for patentability. Additionally, Applicant does not admit that these amendments are made in response to or necessitated by any cited reference or combination of cited references. Applicant respectfully requests reconsideration and allowance of all pending claims.

The Claims are Allowable over *Hotelling* and the Proposed *Hotelling-Bick* Combination

The Office Action rejects Claims 1, 4, 9-10, and 18-19 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application Publication No. 2008/0158183 ("*Hotelling*"). The Office Action rejects Claims 2-3, 11-12, and 20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,924,789 ("*Bick*"). Applicant respectfully traverses these rejections and discusses independent Claim 1 as an example.

Amended independent Claim 1, which has been amended to include at least certain limitations analogous to those recited in previously pending Claims 2 and 3, recites the following:

> An apparatus comprising:
> a first optically clear adhesive (OCA) layer between a first cover sheet and a substrate;
> the substrate, with drive or sense electrodes of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface, the drive or sense electrodes being made of a conductive mesh conductive material comprising metal; and
> a display separated from the second surface of the substrate by a second OCA and a second cover sheet.

The cited portions of *Hotelling* do not appear to disclose, teach, or suggest various limitations recited in independent Claim 1.

For example, at a minimum, *Hotelling* does not appear to disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in amended Claim 1. At best, the cited portions of *Hotelling* appear to disclose a touch sensor panel that uses a transparent adhesive between a substrate and a display. *See Hotelling* in Fig. 4, elements 402, 410, and 412 and at col. 8, ll 34-46. However, even assuming for the sake of argument only that the transparent adhesive in *Hotelling* could be equated to the claimed second OCA (which Applicant does not concede), the cited portions of *Hotelling* still would not disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in amended independent Claim 1.

Additionally, to the extent the Office would point to *Bick* as allegedly making up for at least these deficiencies of *Hotelling*, Applicants submit that *Bick* fails to make up for at least the above-discussed deficiencies of *Hotelling*. For example, at a minimum, *Bick* does not appear to disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in amended Claim 1. *Bick* appears to disclose a mobile telephone handset with a liquid crystal display (LCD) and a separate keypad. *See, e.g., Bick* in Figure 1, elements 4 and 7 and at col. 2, ll 36-41. Moreover, *Bick* appears to disclose that the keypad includes an optical adhesive layer bonding a sensor to the keymat. *See, e.g., Bick* in Figure 3, elements 17, 19, and 27 and at col. 2, ll 63-65. However, even assuming for the sake of argument only that the keypad in *Bick* could be equated to the second cover sheet (which the Office alleges, but Applicant does not concede), the cited portions of *Bick* still would not disclose, teach, or suggest "a display separated from the second surface of the substrate by a second OCA and a second cover sheet," as recited in amended independent Claim 1.

Additionally, Applicant does not admit that the proposed *Hotelling-Bick* combination is possible or that the Office Action provides an adequate reason for combining or modifying these references in the proposed manner. To avoid burdening the record and in view of the allowability of independent Claim 1 for at least the above-discussed reasons, Applicant does not discuss this issue in this submission. However, Applicant reserves the right to discuss this issue in a future submission, if appropriate.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of independent Claim 1 and its dependent claims. For at least certain analogous reasons, Applicant respectfully requests reconsideration and allowance of independent Claims 10 and 19 and their dependent claims.

Claims 5-8 and 14-17 are Allowable over the Proposed *Hotelling-Frey* Combination

The Office Action rejects Claims 5-8 and 14-17 under 35 U.S.C. § 103(a) as being unpatentable over *Hotelling* in view of U.S. Patent Application Publication No. 2009/0219257 ("*Frey*"). Applicant respectfully traverses these rejections. Claims 5-8 and 14-17 depend from independent Claims 1 and 10, respectively, shown above to be allowable over *Hotelling* and the proposed *Hotelling-Bick* combination. The cited portions of *Frey* do not appear to make up for at least the above-discussed deficiencies of *Hotelling* and the proposed *Hotelling-Bick* combination. Thus, dependent Claims 5-8 and 14-17 are allowable at least because they depend from allowable independent claims. Furthermore, dependent Claims 5-8 and 14-17 recited further patentable features. To avoid burdening the record and in view of the allowability of the independent claims, Applicant does not discuss these features in this submission. Applicant, however, reserves the right to discuss these features in a future submission, if appropriate. Moreover, Applicant does not admit that the proposed *Hotelling-Frey* combination (or a potential *Hotelling-Bick-Frey* combination) is possible or that the Office Action provides an adequate reason for combining or modifying the references in the manner proposed in the Office Action. For at least these reasons, Applicant respectfully requests reconsideration and allowance of Claims 5-8 and 14-17.

Request for Evidentiary Support

Should a rejection based on any of the above-asserted rejections be maintained, Applicant respectfully requests appropriate evidentiary support. Additionally, if the Examiner is relying upon "common knowledge" or "well known" principles to establish the rejection, Applicant requests that a reference be provided in support of this position pursuant to M.P.E.P. § 2144.03. Furthermore, to the extent that the Examiner maintains any rejection based on an "Official Notice" or other information within the Examiner's personal knowledge, Applicant respectfully requests that the Examiner cite a reference as documentary evidence in support of this position or provide an affidavit in accordance with M.P.E.P. § 2144.03 and 37 C.F.R. 1.104(d)(2).

No Waiver

Applicant's arguments and amendments are made without prejudice or disclaimer. Additionally, Applicant has merely discussed example distinctions from the cited references. Other distinctions may exist, and Applicant reserves the right to discuss these additional distinctions in a later submission, if appropriate. By not responding to additional statements made by the Office Action, Applicant does not acquiesce to those additional statements.

Conclusion

Applicant has made an earnest attempt to place this Application in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this Application in any way, the Examiner is invited to contact Chad D. Terrell, Attorney for Applicant, at (214) 953-6813, at the Examiner's convenience.

Please charge $600.00 for a two-month extension of time fee to Deposit Account No. 02-0384 of Baker Botts L.L.P. Applicant believes no other fee is due; however, the Commissioner is authorized to charge any necessary additional fees and credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicants

/Chad Terrell/

Chad D. Terrell
Reg. No. 52,279

Date: December 18, 2013

Correspondence Address:

Customer No. **12323**

Electronic Patent Application Fee Transmittal

Application Number:	13312405
Filing Date:	06-Dec-2011
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Filer:	Russell Clayton Gee/Nancy Pizzo
Attorney Docket Number:	080900.1371

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 2 months with $0 paid	1252	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt	
EFS ID:	17693990
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Russell Clayton Gee/Nancy Pizzo
Filer Authorized By:	Russell Clayton Gee
Attorney Docket Number:	080900.1371
Receipt Date:	18-DEC-2013
Filing Date:	06-DEC-2011
Time Stamp:	13:08:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$600
RAM confirmation Number	11977
Deposit Account	020384
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees) Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	**Document Description**	**File Name**	**File Size(Bytes)/ Message Digest**	**Multi Part /.zip**	**Pages (if appl.)**
1		080900_1371_ROA_18Dec13.pdf	42738 0e7270f96517a79568813b0a6a5c002368b5b1a1	yes	9
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	4	
	Applicant Arguments/Remarks Made in an Amendment		5	9	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30362 8e7029997073b51ee3f0491af8415cec6e8bddec	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	73100		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/312,405	Filing Date 12/06/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/18/2013	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/SHOWANE SMITH/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/312,405	12/06/2011	David Brent Guard	080900.1371	6025

12323 7590 07/19/2013

Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

EXAMINER	
SAEED, AHMED M	
ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
07/19/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptomail1@bakerbotts.com
ptomail2@bakerbotts.com

Office Action Summary	Application No. 13/312,405	Applicant(s) GUARD ET AL.	
	Examiner AHMED SAEED	Art Unit 2833	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *16 December 2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4, 9, 10, 18 and 19 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Hotelling (US 2008/0158183).

Regarding claim 1, Hotelling teaches an apparatus comprising: an optically clear adhesive (OCA) layer 412 between the cover sheet 410 and a substrate 402; and the substrate, with drive or sense electrodes (404 and 406) of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50).

Regarding claim 10, Hotelling teaches an apparatus comprising: a cover 410; an optically clear adhesive (OCA) layer 412 between the cover sheet 410 and a substrate 402; and the substrate, with drive or sense electrodes (404 and 406) of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50).

Regarding claim 19, Hotelling teaches an apparatus comprising: an optically clear adhesive (OCA) layer 412 between the cover sheet 410 and a substrate 402; and the substrate, with drive or sense electrodes (404 and 406) of a touch sensor disposed on a first surface and a second surface of the substrate, the first surface being opposite the second surface (col. 9, lines 35-45), the drive or sense electrodes being made of a conductive mesh of conductive material comprising metal (fig 4 and col. 2, lines 49-50).

Regarding claim 4, Hotelling teaches an apparatus wherein the conductive material is copper (col. 1, lines 57-58).

Regarding claims 9 and 18, Hotelling teaches an apparatus wherein the sense electrodes 404 being disposed on the first surface (top surface) of the substrate 402 and the drive electrodes 406 being disposed on the second surface (bottom surface) of the substrate (fig 4).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 11, 12, 20 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hotelling (US 2008/0158183) in view of Bick (US 6,924,789).

Regarding claims 2, 11 and 20, Hotelling teaches an apparatus further comprising a display 410 separated from the second surface of the substrate 402 by an adhesive layer 412 (fig 4). Hotelling does not teach the display being separated by a dielectric layer. However, Bick teaches a display 4 separated from the second surface of the substrate 20 by dielectric layer (17, 27) (Bick fig 3, col. 2, lines 38-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Bick in the touch panel of Hotelling to provide a dielectric barrier between the substrate and the display screen.

Regarding claims 3 and 12, Hotelling as modified by Bick teaches an apparatus wherein the dielectric layer comprises an OCA 27 and cover sheet layer 17 (Bick fig 3 and col. 2, lines 61-65).

Claims 5-8 and 14-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hotelling, as applied to claims 1 and 10 above, and further in view of Frey (US 2009/0219257).

Regarding claims 5 and 14, Hotelling does not teach the mesh segments having a width of approximately 10 micrometers. However, Frey teaches mesh segments (fig 11) having a width of approximately less than 6 micrometers (paragraph 6). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the teachings of Frey in the touch panel of Hotelling to reduce the size of the touch panel.

Regarding claims 6 and 15, Hotelling as modified by Frey teaches an apparatus which one or more mesh segments or conductive micropattern covering approximately 5% of an active area or regions of the touch sensor (Frey paragraph 74).

Regarding claims 7 and 16, Hotelling as modified by Frey teaches an apparatus wherein each of the mesh segments is substantially sinusoidal (Frey, fig 23 and paragraph 158).

Regarding claims 8 and 17, Hotelling as modified by Frey teaches an apparatus wherein the conductive meshes have an optical transmissivity of approximately 90% (Frey, paragraph 8).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AHMED SAEED whose telephone number is (571)270-7976. The examiner can normally be reached on M-F (7:30-5:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Renee Luebke can be reached on 571-272-2009.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AHMED SAEED/
Examiner, Art Unit 2833

/renee luebke/

Renee Luebke
Supervisory Patent Examiner
AU 2833

Notice of References Cited	Application/Control No. 13/312,405	Applicant(s)/Patent Under Reexamination GUARD ET AL.	
	Examiner AHMED SAEED	Art Unit 2833	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2008/0158183	07-2008	Hotelling et al.	345/173
*	B	US-2009/0219257	09-2009	FREY et al.	345/173
*	C	US-6,924,789	08-2005	Bick, Andrew Raymond	345/168
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13312405	GUARD ET AL.
	Examiner	Art Unit
	AHMED SAEED	2833

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor name search	7/8/2013	AS
consulted with Renee Luebke	7/8/2013	AS
EAST text search with subclasses (200/512, 345/173)	7/8/2013	AS

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** Unassigned		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** Unassigned	**Filing Date:** Herewith

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	7,663,607	02-16-2010	Hotelling
	B	7,920,129	04-05-2011	Hotelling
	C	8,031,094	10-04-2011	Hotelling
	D	8,031,174	10-04-2011	Hamblin
	E	8,049,732	11-01-2011	Hotelling
UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
	F			
	G			
	H			
	I			

FOREIGN PATENT DOCUMENTS					
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**COUNTRY**	**TRANSLATION (YES OR NO)**
	J				
	K				

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	L		
	M		
	N		
	O		
	P		
	Q		

EXAMINER /Ahmed Saeed/	DATE CONSIDERED 07/08/2013
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.	

U.S. PATENT AND TRADEMARK OFFICE

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** 12-06-2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	7,875,814	25 January 2011	Chen
	B	8,040,326	18 October 2011	Hotelling
	C	8,179,381	15 May 2012	Frey
	D	2009/0315854	24 December 2009	Matsuo
	E	2012/0242588	27 September 2012	Myers
	F	2012/0242592	27 September 2012	Rothkopf
	G	2012/0243151	27 September 2012	Lynch
	H	2012/0243719	27 September 2012	Franklin

UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
	I	61/454936	21 March 2011	Myers
	J	61/454950	21 March 2011	Lynch
	K	61/454894	21 March 2011	Rothkopf

FOREIGN PATENT DOCUMENTS					
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**COUNTRY**	**TRANSLATION (YES OR NO)**
	L	WO 2012/129247	27 September 2012	PCT	
	M				

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	N		
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	P		
	Q		
	R		

EXAMINER	DATE CONSIDERED
/Ahmed Saeed/	07/08/2013

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

U.S. PATENT AND TRADEMARK OFFICE

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** 12-06-2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	2013/0076612	28 March 2013	Myers
	B			
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UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
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FOREIGN PATENT DOCUMENTS					
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**COUNTRY**	**TRANSLATION (YES OR NO)**
	R				
	S				

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	T		
	U		

EXAMINER /Ahmed Saeed/	DATE CONSIDERED 07/08/2013

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

U.S. PATENT AND TRADEMARK OFFICE

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.S./

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	222	(optical or clear or trasparent) adhesive layer and (display or screen) and substrate and (cover or case)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 10:44
L3	29	(optical or clear or trasparent) adhesive layer and (display or screen) and substrate and (cover or case) and dielectric (layer or sheet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 10:45
L5	3235	345/174.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:22
L6	14517	345/173.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:23
L7	3624	345/173.ccls. and (micromillimeter or m)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:25
L8	0	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate and micromillimeter	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:25
L9	216	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate and micrometer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 11:29
L10	2	2009/0153507	US-PGPUB;	ADJ	ON	2013/07/08

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:57
L12	140	345/173.ccls. and (micromillimeter or m) and sinusoidal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 12:10
L13	0	2011/0310033	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:25
L14	2	"20110310033"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:25
L15	41	("7920129" | "20120242588" | "8040326" | "20020167619" | "20060097991" | "7663607" | "8031174" | "8049732" | "20100302201" | "20090315854" | "20110310037" | "20100045632" | "20120242592" | "20120243151" | "8179381" | "20130076612" | "8031094" | "20110310033" | "20120243719" | "7875814" | "20110007020").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 14:30
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L17	0	345/173.ccls. and conductive mesh and 5 (percent or 5%)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 15:09
L18	10	345/173.ccls. and conductive mesh and (5 percent or 5%)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/08 15:09
L19	1091	200/512.ccls.	US-PGPUB; USPAT; USOCR;	ADJ	ON	2013/07/08 17:11

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S19	1309	atmel corporation.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:36
S20	24	atmel corporation.as. and adhes$3 (layer or sheet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:36
S22	10146	first (surface or face) same substrate and electrode and adhes$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:45
S23	3134	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:46
S24	1799	first (surface or face) near substrate and electrode and adhes$3 and second (surface or face) near substrate	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:46
S25	69	first (surface or face) near substrate and electrode and second adhes$3 and second (surface or face) near substrate	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 13:47
S35	705	(display or panel) near substrate with dielectric layer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 17:31
S36	594	(display or panel) near substrate with dielectric layer and electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2013/07/03 17:32

EAST Search History (Interference)

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7/8/2013 5:23:38 PM
C:\Users\asaeed\Documents\EAST\Workspaces\13312405.wsp

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** 12-06-2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	2013/0076612	28 March 2013	Myers
	B			
	C			
	D			
	E			
	F			
	G			
	H			
	I			
	J			
	K			
	L			
	M			
	N			

UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
	O			
	P			
	Q			

FOREIGN PATENT DOCUMENTS					
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**COUNTRY**	**TRANSLATION (YES OR NO)**
	R				
	S				

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
	T		
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EXAMINER	DATE CONSIDERED

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U.S. PATENT AND TRADEMARK OFFICE

Electronic Acknowledgement Receipt	
EFS ID:	15587577
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Russell Clayton Gee/Paula Hurley
Filer Authorized By:	Russell Clayton Gee
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Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IDS_080900_1371.pdf	64765 91ff694d2f8ede27dbc90c20e28c47f92e3e23f9	no	1
Warnings:					
Information:					

2	Information Disclosure Statement (IDS) Form (SB08)	SB08_080900_1371.pdf	75068 cd208501d60d569e1e07fce9ecbe77109fad905a	no	1

Warnings:	
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Total Files Size (in bytes):	139833

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	David Brent Guard
Application No.:	13/312405
Filing Date:	6 December 2011
Art Unit:	2833
Confirmation No.:	6025
Title:	Two-Layer Sensor Stack

Information Disclosure Statement

Applicant submits this Information Disclosure Statement (IDS) under 37 C.F.R. § 1.97(b)(3). Applicant respectfully requests the Examiner to consider and cite in the examination of this Application the documents listed in the attached Form PTO/SB/08. Under 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not provided copies of U.S. patents or U.S. patent application publications.

Under 37 C.F.R. § 1.97(g), the filing of this IDS shall not be construed as a representation that a search has been made. Moreover, under 37 C.F.R. § 1.97(h), the filing of this IDS shall not be construed to be an admission that the information cited in this IDS is or is considered to be material to patentability as defined by 37 C.F.R. §1.56(b). Furthermore, the filing of this IDS shall not be construed to be an admission that any information cited in this IDS is or is considered to be prior art under 35 U.S.C. §§ 102-103.

The Commissioner may charge any fee due and credit any overpayment in this Patent Application to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

/Russell C. Gee/

Russell C. Gee
Reg. No. 62,178

Date: 23 April 2013

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** 13/312405		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** 2833	**Filing Date:** 12-06-2011

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	7,875,814	25 January 2011	Chen
	B	8,040,326	18 October 2011	Hotelling
	C	8,179,381	15 May 2012	Frey
	D	2009/0315854	24 December 2009	Matsuo
	E	2012/0242588	27 September 2012	Myers
	F	2012/0242592	27 September 2012	Rothkopf
	G	2012/0243151	27 September 2012	Lynch
	H	2012/0243719	27 September 2012	Franklin

UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
	I	61/454936	21 March 2011	Myers
	J	61/454950	21 March 2011	Lynch
	K	61/454894	21 March 2011	Rothkopf

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	L	WO 2012/129247	27 September 2012	PCT	
	M				

NON-PATENT LITERATURE (NPL)			
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	N		
	O		
	P		
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EXAMINER	DATE CONSIDERED

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13/171,295	28 June 2011 (28.06.2011)	US
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13/422,724	16 March 2012 (16.03.2012)	US

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[Continued on next page]

(54) Title: ELECTRONIC DEVICES WITH FLEXIBLE DISPLAYS

(57) Abstract: Electronic devices may be provided that contain flexible displays and internal components. An internal component may be positioned under the flexible display. The internal component may be an output device such as a speaker that transmits sound through the flexible display or an actuator that deforms the display in a way that is sensed by a user. The internal component may also be a microphone or pressure sensor that receives sound or pressure information through the flexible display. Structural components may be used to permanently or temporarily deform the flexible display to provide tactile feedback to a user of the device. Electronic devices may be provided with concave displays or convex displays formed from one or more flexible layers including a flexible display layer. Portions of the flexible display may be used as speaker membranes for display-based speaker structures.

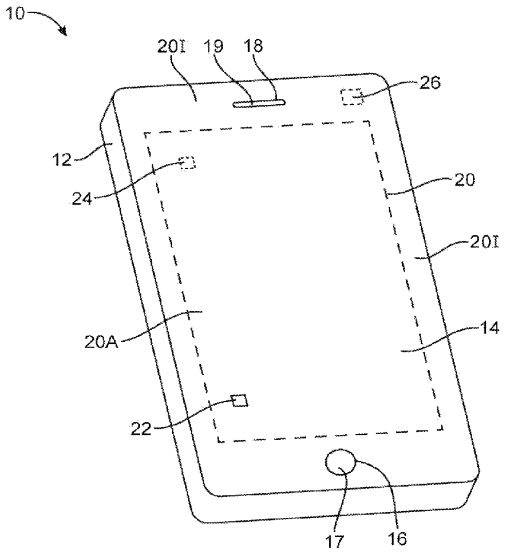

FIG. 1

WO 2012/129247 A2

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Electronic Devices With Flexible Displays

This application claims priority to United States patent application No. 13/171,295, filed June 28, 2011, United States patent application No. 13/108,256, filed May 16, 2011, United States patent application No. 13/184,303, filed July 15, 2011, United States patent application No. 13/422,724, filed March 16, 2012, provisional patent application No. 61/454,894, filed March 21, 2011, provisional patent application No. 61/454,936, filed, March 21, 2011, and provisional patent application No. 61/454,950, filed March 21, 2011 which are hereby incorporated by reference herein in their entirety.

Background

This relates generally to flexible displays, and more particularly, to electronic devices with flexible displays.

Electronic devices such as portable computers and cellular telephones are often provided with rigid displays made from rigid display structures. For example, a liquid crystal display (LCD) may be formed from a stack of rigid display structures such as a thin-film transistor layer with display pixels for providing visual feedback to a user, a color filter layer for providing the display

pixels with color, a touch screen panel for gathering touch input from a user, and a cover glass layer for protecting the display and internal components.

Conventional devices may also have input-output components such as buttons, microphones, speakers, and other components. Openings are commonly formed in the housing of a conventional device to accommodate operation of these input-output components. For example, openings may be formed in a device housing to accommodate speaker and microphone ports and openings may be formed in a display cover glass layer to accommodate a speaker port and menu button.

The inclusion of these openings to accommodate input-output components may not be desirable. For example, the presence of openings may be aesthetically unappealing, may raise the risk of damage from environmental exposure, and may reduce the amount of active display area that is available to display images for a user.

There is often very little real estate available for mounting these input-output components. For example, input-output components are often mounted under an inactive portion of a display or within the sidewalls of an electronic device housing.

The size and number of input-output components such as speakers may be limited by the amount of space available in these locations. For example, a conventional device may have a single speaker mounted under an inactive portion of a display. The size and quality of such a speaker may be limited by a lack of space in the inactive portion of the display. Additionally, mounting a speaker in the inactive portion of a display may add undesirable width to the inactive portion of the display.

Devices with planar cover glass layers may be prone

to scratches and damage when dropped on a surface. Users can minimize scratches and damage from drop events using a protective case. Protective cases may not, however, be convenient or aesthetically appealing for many users.

It is often desirable to produce portable devices of minimal size. Users of portable electronic devices may find a thinner device more desirable than a thicker device. Compact portable devices are sometimes provided with convex housing shapes. A convex housing shape may increase the internal volume of a device while preserving a sleek, thin look that is aesthetically pleasing to a user.

A portable compact device with a convex housing may have a display. In conventional arrangements, the display is flat, so only the portions of the device other than the display have a convex shape. This may limit the internal volume of the device and may detract from its appearance.

It would therefore be desirable to be able to provide improved electronic devices.

Summary

Electronic devices may be provided with flexible displays. The flexible displays may be composed of one or more flexible layers and may be mounted on top of or under a cover layer. For example, a flexible display may be mounted on top of a rigid support member or may be mounted on the underside of a rigid cover layer.

Electronic devices may also be provided with user interface components (input-output components) such as buttons, microphones, speakers, piezoelectric actuators (for receiving electrical input from a user or tactile feedback to users), or other actuators such as vibrators, pressure sensors, and other components. These components

may be mounted under portions of a flexible display.

During operation of the electronic device, the flexibility of the display may allow a user to interact with the component through the display. For example, sound waves from a speaker or localized vibrations from an actuator in an electronic device may pass through the flexible display. The flexible display may also allow an internal microphone, pressure sensor, or force sensor (or other internal components) to receive external input. For example, a user may deflect a flexible display using a finger or other external object, barometric pressure may be monitored through the flexible display, or sound waves may be received through the flexible display.

Components may receive input or may supply output through a physically deformed portion of the flexible display (e.g., a deformation that occurs when a user presses on the display to compress the component). In some configurations, a portion of the flexible display may serve as a membrane that forms part of a microphone, speaker, pressure sensor, or other electronic component.

The ability of a user to compress a component such as a button switch by deforming the flexible display may allow the area of a device available for visual display to be enlarged. For example, the active area of a flexible display may overlap a component such as a button or speaker.

If desired, a flexible display may be deformed by an internal component to provide audio or tactile feedback to a user. For example, structures inside an electronic device may be pressed against portions of a flexible display to temporarily create an outline for a virtual on-screen button or to temporarily create a grid of ridges that serve to delineate the locations of keys in a keyboard (keypad).

Electronic devices may be provided with concave displays. Peripheral edge portions of a concave display may be raised relative to depressed central portions of the concave display. This helps reduce scratches and other damage due to contact with the central portion of the display.

Concave displays may include one or more flexible display layers and may be mounted on top of or under a cover layer. For example, a flexible display layer may be mounted on top of a rigid support member or may be mounted on the underside of a rigid cover layer

Concave displays may also include touch-sensitive capabilities by stacking a touch sensor array layer on top of or under flexible display layers. Rigid concave displays may be formed from a flexible display layer, a touch-sensitive layer, and a rigid cover layer or rigid support structure.

Devices having concave displays formed from curved flexible display layers may help maximize the use of the internal volume of an electronic device.

Electronic devices may be provided with convex displays. The convex displays may include one or more flexible display layers and may be mounted on top of or under a cover layer with a curved shape. For example, a flexible display layer may be mounted on top of a rigid support member having a convex surface or may be mounted on the concave underside of a rigid convex display cover layer.

Convex displays may be provided with touch-sensitive capabilities by stacking a touch sensor array on top of or under flexible display layers. Rigid convex displays may be formed from a flexible display layer, a touch-sensitive layer, and a rigid cover layer or support structure.

Devices having convex displays formed from curved flexible display layers may help maximize the use of the internal volume of an electronic device.

A display cover such as a cover glass layer may be mounted over a flexible display. The flexible display may be an organic light-emitting diode display having a flexible substrate formed from one or more sheets of polymer. The flexible display may include a touch sensor layer having an array of capacitive touch sensor electrodes.

There may be one or more display-based speaker structures in the electronic device. The display-based speaker structures may be mounted under the flexible display. Portions of the flexible display may be used as speaker membranes for the display-based speaker structures.

The flexible display may have an active area that is configured to display images to a user. Speaker membranes may be formed from the active portion of the flexible display. The display-based speaker structures may be driven by transducers that receive an electrical audio signal input from circuitry in the electronic device. Piezoelectric transducers or transducers formed from coils and magnets may be used to drive the display-based speaker structures.

A stiffening structure may be used to stiffen a portion of a flexible display that is used as a speaker membrane. The stiffening structure may be formed from a layer of foam interposed between sheets of stiffening material. The stiffening structure may form a stiff and lightweight support structure that allows the speaker membrane to respond accurately to the transducer.

A suspension structure may be used to attach a display-based speaker structure to surrounding housing

structures. The suspension structure may form a pliant interface between the speaker structure and the surrounding housing structures. The suspension structure may allow the speaker structure to vibrate during speaker operation while inhibiting lateral motion of the speaker structure.

Speaker structures may be configured to achieve a desired frequency response. The electronic device housing in which a speaker structure is mounted may be provided with an acoustic port to tune speaker frequency response. The type of transducer that is used in a speaker may be selected to tune speaker frequency response. The size and placement of internal device components that affect speaker volume and speaker mass may also be selected to tune speaker frequency response.

An electronic device may be provided with an array of display-based speaker structures. The speaker membrane for each speaker structure may be stiffened with an associated stiffening structure. Each stiffened speaker membrane may be surrounded by a ring of flexible display that is configured to absorb lateral vibrations and thus prevent interference between neighboring speakers.

Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and the following detailed description of the preferred embodiments.

Brief Description of the Drawings

FIG. 1 is a perspective view of an illustrative electronic device with a flexible display and internal components in accordance with an embodiment of the present invention.

FIG. 2 is a diagram of an illustrative set of

display layers that may be used to form a flexible display in accordance with an embodiment of the present invention.

FIG. 3 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of an internal user interface component in accordance with an embodiment of the present invention.

FIG. 4 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of a button in accordance with an embodiment of the present invention.

FIG. 5 is a cross-sectional side view of another embodiment of a portion of an illustrative electronic device in the vicinity of a button in accordance with an embodiment of the present invention.

FIG. 6 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of an audio component in accordance with an embodiment of the present invention.

FIG. 7 is a cross-sectional side view of another embodiment of a portion of an illustrative electronic device in the vicinity of an audio component in accordance with an embodiment of the present invention.

FIG. 8 is a cross-sectional side view of yet another embodiment of a portion of an illustrative electronic device in the vicinity of an audio component in accordance with an embodiment of the present invention.

FIG. 9 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of an actuator such as a piezoelectric actuator in accordance with an embodiment of the present invention.

FIG. 10 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of an internal structural component in accordance with an embodiment of the present invention.

FIG. 11 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of a combined internal interface component in accordance with an embodiment of the present invention.

FIG. 12 is a perspective view of a portion of an illustrative electronic device with a flexible display and a combined internal interface component in accordance with an embodiment of the present invention.

FIG. 13 is a perspective view of a portion of an illustrative electronic device with a flexible display and a combined internal interface component mounted to actuator stage in accordance with an embodiment of the present invention.

FIG. 14 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of an internal structural component mounted to an actuator stage in accordance with an embodiment of the present invention.

FIG. 15 is a cross-sectional side view of a portion of an illustrative electronic device with a cover and an internal structural component mounted to an actuator in accordance with an embodiment of the present invention.

FIG. 16 is a cross-sectional side view of a portion of an illustrative electronic device in the vicinity of a pressure sensor in accordance with an embodiment of the present invention.

FIG. 17 is a perspective view of an illustrative electronic device with a concave display and a bezel in accordance with an embodiment of the present invention.

FIG. 18 is a cross-sectional side view of an illustrative electronic device having a concave display with a flexible display layer that conforms to the concave shape of a support structure in accordance with an

embodiment of the present invention.

FIG. 19 is a cross-sectional side view of a portion of an illustrative electronic device having a cover layer and a flexible display layer joined by an adhesive layer in accordance with an embodiment of the present invention.

FIG. 20 is a cross-sectional side view of a portion of an illustrative electronic device having a flexible display layer, a flexible touch-sensitive layer, and a cover layer joined by adhesive layers in accordance with an embodiment of the present invention.

FIG. 21 is a cross-sectional side view of an illustrative electronic device having a concave display with a radius of curvature chosen to protect the device from a drop surface in accordance with an embodiment of the present invention.

FIG. 22 is a perspective view of an illustrative electronic device with a convex display and a bezel formed from a housing structure in accordance with an embodiment of the present invention.

FIG. 23 is a cross-sectional side view of an illustrative electronic device with a convex display and internal components in accordance with an embodiment of the present invention.

FIG. 24 is a cross-sectional side view of a portion of an illustrative electronic device having a convex display with a flexible display layer that conforms to a support structure in accordance with an embodiment of the present invention.

FIG. 25 is a cross-sectional side view of a portion of an illustrative electronic device having a convex cover layer and a flexible display layer joined by an adhesive layer in accordance with an embodiment of the present invention.

FIG. 26 is a cross-sectional side view of a portion of an illustrative electronic device having a flexible display layer, a touch-sensitive layer and a convex cover layer joined by adhesive layers in accordance with an embodiment of the present invention.

FIG. 27 is a cross-sectional perspective view of an illustrative electronic device having a convex display and a connector port arranged to use the internal volume of the device in accordance with an embodiment of the present invention.

FIG. 28 is a cross-sectional perspective view of an illustrative electronic device having a convex display and internal components in accordance with an embodiment of the present invention.

FIG. 29 is a cross-sectional side view of an illustrative electronic device substantially surrounded by a convex display in accordance with an embodiment of the present invention.

FIG. 30 is a diagram of an illustrative electronic device such as a portable computer having a display and one or more speaker structures in accordance with an embodiment of the present invention.

FIG. 31 is a diagram of an illustrative electronic device such as a cellular telephone or other handheld device having a display and one or more speaker structures in accordance with an embodiment of the present invention.

FIG. 32 is a diagram of an illustrative electronic device such as a tablet computer having a display and one or more speaker structures in accordance with an embodiment of the present invention.

FIG. 33 is a diagram of an illustrative electronic device such as a computer monitor with a built-in computer having a display and one or more speaker

structures in accordance with an embodiment of the present invention.

FIG. 34 is a diagram of an illustrative set of display layers that may be used to form a flexible display in accordance with an embodiment of the present invention.

FIG. 35 is a diagram of an illustrative set of layers that may be used to form an organic light-emitting diode display in accordance with an embodiment of the present invention.

FIG. 36 is a cross-sectional side view of a portion of an illustrative electronic device in which a flexible display forms part of a speaker structure in accordance with an embodiment of the present invention.

FIG. 37 is a cross-sectional side view of a portion of an illustrative electronic device in which a flexible display forms part of a speaker structure in accordance with an embodiment of the present invention.

FIG. 38 is a cross-sectional side view of a portion of an illustrative electronic device in which a flexible display forms part of a speaker structure in accordance with an embodiment of the present invention.

FIG. 39 is a perspective view of an illustrative electronic device of the type shown in FIG. 38 having a cover layer with speaker openings in accordance with an embodiment of the present invention.

FIG. 40 is a cross-sectional side view of a portion of an illustrative electronic device in which a flexible display is stiffened with a support structure in accordance with an embodiment of the present invention.

FIG. 41 is a cross-sectional side view of a portion of an illustrative electronic device having a curved flexible display with a curved support structure in accordance with an embodiment of the present invention.

FIG. 42 is a cross-sectional side view of a

portion of an illustrative electronic device in which a flexible display forms part of a single speaker structure in accordance with an embodiment of the present invention.

FIG. 43 is a cross-sectional side view of a portion of an illustrative electronic device in which a flexible display forms part of an array of speaker structures in accordance with an embodiment of the present invention.

FIG. 44 is a bottom view of an illustrative electronic device of the type shown in FIG. 43 having a flexible display that forms part of an array of speaker structures in accordance with an embodiment of the present invention.

Detailed Description

Electronic devices may be provided with flexible displays. A flexible display may include one or more flexible layers. If desired, the flexible display may include a display cover layer such as a flexible or rigid display cover layer.

In some configurations, an electronic device may be provided with a flexible display and user interface components that are positioned behind, abutted against or integrated into the flexible display. FIGS. 1-16 show examples of configurations in which user interface components may be positioned behind, abutted against or integrated into the flexible display.

In some configurations, an electronic device may be provided with a concave display having one or more flexible display layers. FIGS. 1, 2, and 17-21 show examples of configurations in which an electronic device may be provided with a concave display having one or more flexible display layers.

In some configurations, an electronic device may

be provided with a convex display having one or more flexible display layers. FIGS. 1, 2, and 22-29 show examples of configurations in which an electronic device may be provided with a convex display having one or more flexible display layers.

In some configurations, a portion of the flexible display may form a membrane structure of an electronic component such as a speaker, a microphone, a laser microphone or a pressure sensor. FIGS. 30-44 show examples of configurations in which a portion of the flexible display may form a membrane structure of an electronic component.

As shown in the examples of FIGS. 1-16, an electronic device may be provided with a flexible display and user interface components. User interface components may include buttons, switches, microphones, actuators such as solenoids, motors, and piezoelectric actuators, connector ports, touch screens, proximity sensors and other components for accepting input from, or transmitting information to, a user or the surrounding environment.

Flexible displays may be formed from flexible layers such as a flexible display layer (e.g., a flexible organic light-emitting diode array), a flexible touch-sensitive layer (e.g., a sheet of polymer with an array of transparent capacitor electrodes for a capacitive touch sensor), a flexible substrate layer, etc. These flexible layers may, if desired, be covered by a flexible or rigid cover layer (sometimes referred to as a cover glass) or may be supported by a support structure (e.g., a rigid support structure on the underside of the flexible layers). In electronic devices with flexible displays that are covered by rigid cover layers, the cover layers may be provided with openings that provide access to the flexible layers of the display in the vicinity of a user

interface device. For example, a cover glass layer may have an opening that allows a button member to move relative to the cover glass layer. As the button member moves within the opening, underlying portions of the flexible display may be deformed (e.g., to allow actuation of an associated switch).

To maximize the area of the portion of the flexible display that is available for displaying visual information to the user, user interface components may be positioned behind, abutted against or integrated into the flexible display. The deformable nature of the flexible display may allow a user to interact with the user interface components (input-output components) by moving the display into contact with the user interface components or by otherwise allowing the display to locally flex (e.g., to allow sound to pass through the flexible display or to allow a barometric pressure measurements of the exterior environment to be made by an internal pressure sensor). If desired, a portion of the flexible display may form a membrane portion of an electrical component. Components that may be provided with a membrane that is formed from a portion of a flexible display include microphones, laser microphones, pressure sensors, speakers, etc.

An illustrative electronic device of the type that may be provided with a flexible display is shown in FIG. 1.

Electronic device 10 may be a portable electronic device or other suitable electronic device. For example, electronic device 10 may be a laptop computer, a tablet computer, a somewhat smaller device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, etc.

Device 10 may include a housing such as housing

12. Housing 12, which may sometimes be referred to as a case, may be formed of plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other suitable materials, or a combination of these materials. In some situations, parts of housing 12 may be formed from dielectric or other low-conductivity material. In other situations, housing 12 or at least some of the structures that make up housing 12 may be formed from metal elements.

Device 10 may have a flexible display such as flexible display 14. Flexible display 14 may be formed from multiple layers of material. These layers may include a touch sensor layer such as a layer on which a pattern of indium tin oxide (ITO) electrodes or other suitable transparent electrodes have been deposited to form a capacitive touch sensor array. These layers may also include a layer that contains an array of display pixels. The touch sensor layer and the display layer may be formed using flexible sheets of polymer or other substrates having thicknesses of 10 microns to 0.5 mm or other suitable thicknesses (as an example).

The display pixel array may be, for example, an organic light-emitting diode (OLED) array. Other types of flexible display pixel arrays may also be formed (e.g., electronic ink displays, etc.). The use of OLED technology to form flexible display 14 is sometimes described herein as an example. This is, however, merely illustrative. Flexible display 14 may be formed using any suitable flexible display technology. The use of flexible displays that are based on OLED technology is merely illustrative.

In addition to these functional display layers (i.e., the OLED array and the optional touch sensor array), display 14 may include one or more structural

layers. For example, display 14 may be covered with a flexible or rigid cover layer and/or may be mounted on a support structure (e.g., a rigid support). Layers of adhesive may be used in attaching flexible display layers to each other and may be used in mounting flexible display layers to rigid and flexible structural layers.

In configurations for display 14 in which the cover layer for display 14 is flexible, input-output components that rely on the presence of flexible layers may be mounted at any suitable location under the display (e.g., along peripheral portions of the display, in a central portion of the display, etc.). In configurations for display 14 in which the flexible layers are covered by a rigid cover glass layer or other rigid cover layer, the rigid layer may be provided with one or more openings and the electronic components may be mounted under the openings. For example, a rigid cover layer may have openings such as a circular opening 16 for button 17 and a speaker port opening such as speaker port opening 18 (e.g., for an ear speaker for a user). Device 10 may also have other openings (e.g., openings in display 14 and/or housing 12 for accommodating volume buttons, ringer buttons, sleep buttons, and other buttons, openings for an audio jack, data port connectors, removable media slots, etc.).

In some embodiments, portions of flexible display 14 such as peripheral regions 20I may be inactive and portions of display 14 such as rectangular central portion 20A (bounded by dashed line 20) may correspond to the active part of display 14. In active display region 20A, an array of image pixels may be used to present text and images to a user of device 10. In active region 20A, display 14 may include touch sensitive components for input and interaction with a user of device 10. If

desired, regions such as regions 20I and 20A in FIG. 1 may both be provided with display pixels (i.e., all or substantially all of the entire front planar surface of a device such as device 10 may be covered with display pixels).

Device 10 may, if desired, have internal user interface components such as buttons 17 or speaker component 19 that occupy openings such as openings 16 and 18 respectively in an optional rigid cover layer of flexible display 14. Buttons 17 may be based on dome switches or other switch circuitry. Buttons 17 may include button members that form push buttons (e.g., momentary buttons), slider switches, rocker switches, etc. Device 10 may include internal structural components such as structural component 22 that add a raised structure to a portion of flexible display 14. Device 10 may include components such as interface components 24 and 26 that may be fully internal to device 10, but that receive input from the user or from the surrounding environment through physical interaction with flexible display 14. Interface components 22, 24, and 26 may be positioned in active region 20A or inactive region 20I of flexible display 14. Interface components 22, 24, and 26 may be positioned separately from one another or may be commonly located to form a combined component with structural and internal features. Interface components 24 and 26 may be positioned underneath flexible display 14 so that flexible display 14 must be deformed in order to contact components 24 or 26 or, if desired may be positioned to remain in constant contact with flexible display 14.

An exploded perspective view of an illustrative display is shown in FIG. 2. As shown in FIG. 2, flexible display 14 may be formed by stacking multiple layers including flexible display layer 14A, touch-sensitive

layer 14B, and cover layer 14C. Flexible display 14 may also include other layers of material such as adhesive layers, optical films, or other suitable layers. Flexible display layer 14 may include image pixels formed form light-emitting diodes (LEDs), organic LEDs (OLEDs), plasma cells, electronic ink elements, liquid crystal display (LCD) components, or other suitable image pixel structures compatible with flexible displays.

Touch-sensitive layer 14B may incorporate capacitive touch electrodes such as horizontal transparent electrodes 32 and vertical transparent electrodes 34. Touch-sensitive layer 14B may, in general, be configured to detect the location of one or more touches or near touches on touch-sensitive layer 14B based on capacitive, resistive, optical, acoustic, inductive, or mechanical measurements, or any phenomena that can be measured with respect to the occurrences of the one or more touches or near touches in proximity to touch sensitive layer 14B.

Software and/or hardware may be used to process the measurements of the detected touches to identify and track one or more gestures. A gesture may correspond to stationary or non-stationary, single or multiple, touches or near touches on touch-sensitive layer 14B. A gesture may be performed by moving one or more fingers or other objects in a particular manner on touch-sensitive layer 14B such as tapping, pressing, rocking, scrubbing, twisting, changing orientation, pressing with varying pressure and the like at essentially the same time, contiguously, or consecutively. A gesture may be characterized by, but is not limited to a pinching, sliding, swiping, rotating, flexing, dragging, or tapping motion between or with any other finger or fingers. A single gesture may be performed with one or more hands, by one or more users, or any combination thereof.

Cover layer 14C may be formed from plastic or glass (sometimes referred to as display cover glass) and may be flexible or rigid. If desired, the interior surface of peripheral inactive portions 20I of cover layer 14C may be provided with an opaque masking layer on such as black ink.

Touch-sensitive flexible display section 14AB may be formed from display pixel array layer 14A and optional touch sensor layer 14B.

FIG. 3 is a cross-sectional side view of a portion of flexible display 14 in the vicinity of internal user interface component 24. Flexible display 14 may be deformed away from its natural shape under pressure. For example, flexible display 14 may be deflected by pressure exerted by a user or by other external forces in direction 40. As shown in FIG. 3, pressure in direction 40 may cause flexible display 40 to deform as indicated by dashed lines 44. Internal component 24 may be configured to receive input due to deformation of flexible display 14. Internal component 24 may also provide a temporary return (restoring) pressure in direction 42.

Pressure in direction 42 may cause flexible display 14 to temporarily deform outward of device 10 as indicated by dashed lines 46. Pressure in direction 42 may, if desired, be formed by an internal actuator that deforms display 14 to provide a desired tactile sensation on the surface of display 14 to a user of device 10. Flexible display 14 may have a natural resiliency that, following deformation as indicated by dashed lines 44, causes flexible display to temporarily deform outward of device 10 as indicated by dashed lines 46 before returning to its natural shape. Internal component 24 may be a button, an actuator such as a motor, solenoid, vibrator, or piezoelectric actuator, a pressure sensor, an audio

component such as a microphone or speaker, or other component. Because display 14 is flexible, these components may operate effectively, even when covered by display 14. For example, audio components such as microphones and speakers may receive and transmit sound through flexible display 14. A barometric pressure sensor or a force sensor may also receive input through flexible display 14. Components such as actuators may be used to temporarily create raised ridges or other external features on the surface of the flexible display (e.g., to indicate to a user where an on-screen button or group of buttons is located). The portion of display 14 under which components 24 are mounted may be active (i.e., a portion of the display that contains OLED pixels or other display pixels) or inactive (i.e., a peripheral portion of the display outside of the active region).

FIG. 4 is a cross-sectional side view of a portion of device 10 in the vicinity of button 17 of device 10. As shown in FIG. 4, button 17 may have a button member such as button member 52 that reciprocates within opening 16 of cover layer 14C. When a user presses the exterior of button member 52 in direction 58, button member 52 may press against touch-sensitive flexible display section (layer) 14AB. Touch-sensitive flexible display section 14AB may be deformed to depress a dome switch such as dome switch 56 or other switch mechanism, thereby activating the switch (e.g., shorting internal switch terminals together to close the switch). Dome switches such as dome switch 56 may, if desired, be mounted to printed circuits such as printed circuit 54. Dome switch 56 may have a dome-shaped biasing member that pushes touch-sensitive flexible display section 14AB outward in direction 60 when the user releases pressure from button member 52. Dome switch 54 and printed circuit

54 may be recessed in a support structure such as support structure 50 behind flexible display 14. Other types of switches may used if desired, such as switches with spring-based biasing members or other biasing structures that bias button members such as button member 52. The use of a dome switch with a dome-shaped biasing structure is merely illustrative.

FIG. 5 is a cross-sectional side view of a portion of device 10 in the vicinity of button 17 of device 10. The illustrative embodiment of FIG. 5 differs from the illustrative embodiment of FIG. 4 in that cover layer 14C of flexible display 14 is not a rigid cover layer, but a flexible cover layer. In an embodiment in which flexible display 14 contains a flexible cover layer 14C, button 17 includes dome switch 56 and printed circuit 54. In the embodiment of FIG. 5, a user may press the exterior of flexible display 14 in direction 58. Flexible display 14 may be deformed to depress dome switch 56 or other switch mechanism, thereby activating the switch. As in FIG. 4, dome switches such as dome switch 56 may, if desired, be mounted to printed circuits such as printed circuit 54. Dome switch 56 may have a dome-shaped biasing member that pushes flexible display 14 outward in direction 60 when the user releases pressure from button member 52. Dome switch 54 and printed circuit 54 may be mounted in support structures 50 behind flexible display 14. Other types of switches may use spring-based biasing members or other biasing structures to bias button members such as button member 52. The use of a dome switch with a dome-shaped biasing structure is merely illustrative.

Providing device 10 with flexible display 14 without the need for an opening in flexible display 14 to access button 17 allows flexible display 14 to extend over button 17 without disruption. In both the FIG. 4 and FIG.

configurations, the portion of the flexible display that overlaps the button may be an active display portion or an inactive display portion. When an active display portion is configured so as to overlap buttons and other components, there is generally more area available for the active display portion. The presence of flexible display 14 over button 17 (or other components) may also reduce the risk of moisture or dirt entering into the interior of device 10.

FIG. 6 is a cross-sectional side view of a portion of device 10 in the vicinity of audio component 19. Audio component 19 may be recessed in a chassis 50 behind flexible display 14. Audio component 19 may be a speaker for providing sound to a user of device 10 or a microphone for receiving input from a user or the external environment. In the embodiment shown in FIG. 6, sound may be transmitted through flexible display 14 to a microphone or from a speaker. The portion of flexible display 14 that overlaps audio component 19 may be active or inactive. Arrangements in which component 19 is covered with part of the active area of display 14 may allow the size of active region 20A of flexible display 14 to be increased. The presence of flexible display 14 over audio component 19 may also reduce the risk of moisture or dirt entering into the interior of device 10.

FIG. 7 is a cross-sectional side view of a portion of device 10 in the vicinity of another embodiment of audio component 19. In the illustrative embodiment of FIG. 7, audio component 19 may be a speaker or microphone that contains a diaphragm such as diaphragm 70. Diaphragm 70 may be formed from a separate structure that is attached to the underside of flexible display 14 or may be formed from a part of flexible display 14. As in the embodiment shown in FIG. 6, audio component 19 may be

mounted within support structures 50. Audio component 19 may include a magnet such as magnet 74 and a coil such as coil 72 in which current may flow. If audio component 19 is a speaker, current may be driven through coil 72 to induce motion in diaphragm 70 and thereby emit sound through flexible display 14. If audio component 19 is a microphone, sound waves originating from the exterior of device 10 may induce vibrations in flexible display 14 which are transmitted to diaphragm 70 and ultimately to coil 72 in which current may be induced. The current produced in coil 72 may be used to transmit sound information to device 10. Diaphragm 70 may be a separate member in contact with flexible display 14 or may be an integral part of flexible display 14.

FIG. 8 is a cross-sectional side view of a portion of device 10 in the vicinity of another possible embodiment of audio component 19. As shown in FIG. 8, audio component 19 may be a laser microphone which uses vibrations in flexible display 14 induced by sound originating external to device 10 to produce an signal to be transmitted to device 10. As shown in FIG. 8, audio component 19 may be recessed in support structures 50. Audio component 19 may include a light emitting component such as laser component 80. Laser component 80 may emit a laser beam such as laser beam 84 in the direction of flexible display 14. Laser beam 84 may reflect off of flexible display 14 and a reflected laser beam such as reflected laser beam 86 may be absorbed by a laser absorbing component 82.

Laser beam 84 and reflected laser beam 86 may be used in combination with laser 80 and photosensitive element 82 to monitor variations in distance 88 from flexible display 14 to component 80 and component 82. Sound waves originating external to device 10 may induce

vibrations in flexible display 14 causing distance 88 to oscillate. The oscillations in distance 88 may be converted into sound-related information by device 10.

FIG. 9 is a cross-sectional side view of a portion of device 10 in the vicinity of a component such as component 22 of FIG. 1. In the embodiment shown in FIG. 9, component 22 may contain an actuator such as a piezoelectric (actuator 90). Piezoelectric actuators such as piezoelectric actuator 90 may vary in shape (e.g., thickness) in response to applied control voltages and may produce an output voltage when compressed (i.e., the piezoelectric element in actuator 90 may serve as a force sensor in addition to serving as a controllable actuator). A user of device 10 may exert force on flexible display 14 in direction 92. Flexible display 14 may be deformed to exert a mechanical pressure on piezoelectric element 90 or other force sensor, inducing a voltage which may be transmitted to device 10. Conversely, piezoelectric actuator 90 may be used to provide tactile feedback to a user of device 10. A voltage difference applied to the surfaces of piezoelectric actuator 90 may induce an expansion of piezoelectric actuator 90. Piezoelectric actuator 90 may then deform flexible display 90 in direction 94 providing tactile feedback to a user of device 10.

FIG. 10 is a cross-sectional side view of a portion of device 10 in the vicinity of structural component 22 of device 10. Structural component 22 may cause a permanent deformation such as deformation 102 in flexible display 14 to indicate the location of portion 101 of touch-sensitive layer 14B in display 14 to the user of device 10. Portion 101 may be, for example, a letter key or other button in a virtual keypad (keyboard) displayed on flexible display 14. A touch sensor array

associated with display 14 may be used to gather user input (i.e., the touch sensor array may be used to determine when a user has pressed the virtual key associated with portion 101). The location of portion 101 may also be indicated visually using associated display pixels in flexible display 14. At times, a user may desire to be able to locate portion 101 without having to look at flexible display 14. Deforming flexible display 14 in the vicinity of portion 101 using structural component 22 may allow a user to locate portion 101 without visual aid. Structural component 22 may be an isolated component indicating the location of a single portion 101 of touch-sensitive layer 14B or may be one of an array of components 22 indicating the locations of an array of portions 101 (e.g., the array of letter, number, and symbol keys in a virtual keypad displayed on display 14). Structural component 10 may be a separate component mounted to support structures 50 or may be an integral part of support structures 50.

FIG. 11 is a cross-sectional side view of a portion of device 10 in the vicinity of a hybrid component such as component 100. Component 100 may include both an internal interface component such as internal component 24 and a structural component such as structural component 22. Structural component 22 may cause a permanent deformation such as deformation 102 in flexible display 14 in the vicinity of internal component 24 to indicate the location of internal component 22 to the user of device 10. The presence of flexible display 14 between the user of device 10 and internal component 24 may obscure the location of internal interface component 24. The location of interface component 24 may be indicated visually using display pixels in flexible display 14. The deformation of flexible display 14 in the vicinity of interface component

24 using structural component 22 may also allow the user to locate interface component 24 without visual aid. Component 100 may be an isolated component indicating the location of a single interface component 24 of touch-sensitive layer 14B or may be one of an array of components 100 indicating the locations of an array of interface components 24.

FIG. 12 is a perspective view of an embodiment of device 10 in which internal component 24 is a button such as button 17. In the embodiment of FIG. 12, as in FIG. 11, component 100 includes internal component 24 and structural component 22 (shown in FIG. 11). As shown in FIG. 12, a ridge or other deformation such as deformation 102 in flexible display 14 may be used to indicate the location of button 17.

FIG. 13 is a cross-sectional side view of a portion of device 10 in the vicinity of another illustrative embodiment of a hybrid component such as component 100 which includes an internal interface component such as internal component 24 and a structural component such as structural component 22 mounted to an actuator such as actuator stage 110. Component 100 may be recessed in chassis 50. Actuator stage 110 may be electrically or mechanically raised in direction 112 to temporarily produce deformations such as deformations 102 in flexible display 14. Deformations 102 in flexible display 14 may indicate the location of internal interface device 24 to a user of device 10. Actuator stage 110 may be electrically or mechanically lowered in direction 114 to remove deformations 102 in flexible display 14 returning flexible display 14 to its original shape. Component 100 may be an isolated component indicating the location of a single interface component 24 of touch-sensitive layer 14B or may be one of an array of

components 100 indicating the locations of an array of respective interface components 24.

FIG. 14 is a cross-sectional side view of a portion of device 10 in the vicinity of another illustrative embodiment of a component such as structural component 22. In the arrangement of FIG. 14, structural component 22 is mounted an actuator such as actuator stage 110. Some modes of operating device 10 may require visual interaction with a user of device 10 (e.g., a mode involving the display of images or video). In these visual modes, the location of portion 101 of touch-sensitive layer 14B of flexible display 14 may be indicated visually using display pixels in flexible display 14.

In other modes of operation of device 10, a user of device 10 may wish to determine the location of portion 101 without visual aid. In the embodiment shown in FIG. 14, component 22 may be recessed in support structures 50. Actuator stage 110 may be electrically or mechanically raised in direction 112 to move structural component 22 into contact with flexible display 14 to temporarily produce deformations such as deformations 102 in flexible display 14. Deformations 102 may indicate the location of portion 101 to a user of device 10. When no longer needed for tactile interaction (e.g., upon switching to a video display mode), actuator 110 may be electrically or mechanically moved in direction 114 to lower structural component 22 and remove deformations 102 in flexible display 14.

FIG. 15 is a cross-sectional side view of an embodiment of device 10 in which device 10 includes housing 12 and cover member 122. Cover member 122 may be formed of plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other

suitable materials, or a combination of these materials. Cover member 122 may be a single structure or may include multiple cover structures. In order to facilitate lifting of cover 122 by a user of device 10, structural component 22 may be coupled to an actuator 130 which may be used to lift structural component 122 in direction 134. When lifted, structural component 134 may cause a deformation such as deformation 102 in flexible display 14. Flexible display 14 may exert a pressure on cover member 122, lifting cover member 122 in direction 134 allowing the user to grip cover member 122 in order to lift cover member 122 to an open position such as open position 140. Actuator 130 may then be used to lower structural component 22 in direction 132 in order to allow flexible display 14 to return to its original shape. Actuator 130 may be activated in response to a control signal produced by the user using actuator switch 124 or by a control signal from other suitable control circuitry.

FIG. 16 is a cross-sectional side view of a portion of device 10 in the vicinity of another illustrative embodiment of internal interface component 24. In the embodiment shown in FIG. 16, interface component 24 may be a pressure sensor that includes a pressure sensing module 140. Pressure sensing module 140 may be coupled between a contact member such as contact member 142 (which is in contact with flexible display 14) and electrical contacts 144. Pressure may be exerted on flexible display 14 (e.g., by a user of device 10 or due to atmospheric pressure changes in the surrounding environment of device 10). Pressure exerted on flexible display 14 may be transmitted to pressure sensing module 140 by contact member 142. Pressure information may be transmitted to device 10 through electrical contacts 144. Pressure sensing module 140 may sense pressure changes

using piezoelectric, capacitive, inductive, resistive, optical or other mechanisms. Providing device 10 with flexible display 14 allows flexible display 14 to extend over interface component 24, increasing the area of active region 20A of flexible display 14. The presence of flexible display 14 over interface component 24 may also reduce the risk of moisture or dirt entering into the interior of device 10.

In accordance with an embodiment, an electronic device is provided that includes a flexible display and an internal component, where the flexible display may be deformed by an action external to the device and deformation of the flexible display creates a response from the internal component.

In accordance with another embodiment, the flexible display includes a flexible display layer and a touch-sensitive layer.

In accordance with another embodiment, the flexible display layer of the flexible display includes an active display region and the internal component is covered with a portion of the active display region of the flexible display.

In accordance with another embodiment, the internal component includes a button and deformation of the flexible display compresses the button.

In accordance with another embodiment, the flexible display further includes a rigid cover layer having at least one opening.

In accordance with another embodiment, the opening includes a hole in the rigid cover layer, the button further includes a button member in the opening, the button member moves within the hole in the rigid cover layer, and the movement of the button member in the opening causes deformation of the flexible display.

In accordance with another embodiment, the internal component includes a pressure sensor and deformation of the flexible display exerts a mechanical pressure on the pressure sensor.

In accordance with another embodiment, the pressure sensor includes a piezoelectric actuator and the mechanical pressure induces a voltage on the piezoelectric actuator.

In accordance with another embodiment, the internal component includes a laser microphone for detecting a sound originating external to the electronic device and detecting the sound includes, with a laser, detecting deformation of the flexible display.

In accordance with an embodiment, an electronic device is provided that includes a flexible display and an audio component that transmits or receives sound through the flexible display.

In accordance with another embodiment, the flexible display includes an active display region and the audio component is mounted behind the active display region of the flexible display.

In accordance with another embodiment, the flexible display includes a flexible display layer and a touch-sensitive layer.

In accordance with another embodiment, the audio component includes a diaphragm and the diaphragm is mounted in contact with the flexible display.

In accordance with another embodiment, an electronic device is provides that includes a housing, a flexible display mounted on the housing, and a first internal component mounted under a portion of the flexible display, where the first internal component is configured to deform the portion of the flexible display.

In accordance with another embodiment, the first

internal component includes a piezoelectric actuator, where a voltage applied to the piezoelectric actuator causes an expansion of the piezoelectric actuator and the portion of the flexible display deforms in response to the expansion of the piezoelectric actuator.

In accordance with another embodiment, the first internal component includes a structural component, where the portion of the flexible display deforms in response to physical contact with the structural component and deformation of the portion of the flexible display causes the portion of the flexible display to conform to a surface of the structural component.

In accordance with another embodiment, the electronic device further includes a second internal component mounted under the portion of the flexible display, where the portion of the flexible display that conforms to the surface of the structural component indicates the location of the second internal component.

In accordance with another embodiment, the second internal component includes a button, where the portion of the flexible display is configured to be further deformed by an action external to the electronic device and further deformation of the portion of the flexible display compresses the button.

In accordance with another embodiment, the first internal component further includes an actuator, where the structural component is mounted on the actuator, where raising the actuator moves the structural component into contact with the portion of the flexible display, and where lowering the actuator moves the structural component out of contact with the flexible display.

In accordance with another embodiment, the flexible display includes a touch-sensitive layer, where deformation of the portion of the flexible display

conforming to the surface of the structural component indicates the location of a portion of the touch-sensitive layer of the flexible display.

In accordance with another embodiment, the electronic device further includes a second internal component mounted on the actuator and deformation of the portion of the flexible display conforming to the surface of the structural component indicates the location of the second internal component.

In accordance with another embodiment, the electronic device further includes a cover member and an actuator switch coupled to the actuator, where deformation of the flexible display exerts a pressure on the cover member and the pressure on the cover member lifts the cover member.

The foregoing is merely illustrative of the principles of this invention and various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention.

As shown in the examples of FIGS. 1, 2 and 17-21, an electronic device may be provided with a concave display. The concave display may include a flexible display layer that has been bent to curve the display.

Concave displays may be formed from flexible layers such as a flexible display layer (e.g., a flexible organic light-emitting diode array), a flexible touch-sensitive layer (e.g., a sheet of polymer with an array of transparent capacitor electrodes for a capacitive touch sensor), a flexible substrate layer, etc. These flexible layers may, if desired, be covered by a flexible or rigid cover layer (sometimes referred to as a cover glass) or may be supported by a support structure (e.g., a rigid support structure on the underside of the flexible layers). In electronic devices with concave displays that

are covered by rigid cover layers, the cover layers may be provided with openings that provide access to the flexible layers of the display. For example, a cover glass layer may have an opening that allows a button member to move relative to the cover glass layer. As the button member moves within the opening, underlying portions of the flexible display may be deformed (e.g., to allow actuation of an associated switch).

Electronic devices may also be provided with user interface components (input-output components) such as buttons, microphones, speakers, piezoelectric actuators or (for receiving electrical input from a user or tactile feedback to users), other actuators such as vibrators, pressure sensors, and other components. These components may be mounted under portions of a flexible display.

User interface components may be mounted under the flexible display or may be integrated into the flexible display. The deformable nature of the flexible display may allow a user to interact with the user interface components (input-output components) by moving the display into contact with the user interface components or by otherwise allowing the display to locally flex (e.g., to allow sound to pass through the flexible display or to allow barometric pressure measurements of the exterior environment to be made by an internal pressure sensor). If desired, a portion of the flexible display may form a membrane portion of an electrical component. Components that may be provided with a membrane that is formed from a portion of a flexible display include microphones, laser microphones, pressure sensors, speakers, etc.

Concave displays formed from flexible and rigid layers that all have concave shapes (i.e., displays formed from a collection of layers in which no layer of the

display is planar) may provide reduced vulnerability to damage during a drop event in which an electronic device strikes the ground or other external objects while maximizing the internal volume of the device that is available to hold electrical and mechanical device components.

An illustrative electronic device of the type that may be provided with a concave display is shown in FIG. 1. Electronic device 10 may be a portable electronic device or other suitable electronic device. For example, electronic device 10 may be a laptop computer, a tablet computer, a somewhat smaller device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, etc.

Device 10 may include a housing such as housing 12. Housing 12, which may sometimes be referred to as a case, may be formed of plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other suitable materials, or a combination of these materials. In some situations, parts of housing 12 may be formed from dielectric or other low-conductivity material. In other situations, housing 12 or at least some of the structures that make up housing 12 may be formed from metal elements.

Device 10 may have a concave display such as concave display 14. Concave display 14 may be formed from multiple layers of material. These layers may include a touch sensor layer such as a layer on which a pattern of indium tin oxide (ITO) electrodes or other suitable transparent electrodes have been deposited to form a capacitive touch sensor array or a touch sensor layer formed using other touch technologies (e.g., resistive touch, acoustic touch, optical touch, etc.). These layers may also include a layer that contains an array of display

pixels. The touch sensor layer and the display layer may be formed using flexible sheets of polymer or other substrates having thicknesses of 10 microns to 0.5 mm or other suitable thicknesses (as an example).

The display pixel array may be, for example, an organic light-emitting diode (OLED) array containing rows and columns of OLED display pixels. Other types of flexible display pixel arrays may also be formed (e.g., electronic ink displays, etc.). The use of OLED technology to form flexible display 14 is sometimes described herein as an example. This is, however, merely illustrative. Flexible display 14 may be formed using any suitable flexible display technology. The use of flexible displays that are based on OLED technology is merely illustrative.

In addition to these functional display layers (i.e., the OLED array and the optional touch sensor array), display 14 may include one or more structural layers. For example, display 14 may be covered with a flexible or rigid cover layer and/or may be mounted on a support structure (e.g., a rigid support). Layers of adhesive may be used in attaching flexible display layers to each other and may be used in mounting flexible display layers to rigid and flexible structural layers.

In configurations for display 14 in which the cover layer for display 14 is flexible, input-output components that rely on the presence of flexible layers may be mounted at any suitable location under the display (e.g., along peripheral portions of the display, in a central portion of the display, etc.). In configurations for display 14 in which the flexible layers are covered by a rigid cover glass layer or other rigid cover layer, the rigid layer may be provided with one or more openings and the electronic components may be mounted under the

openings. For example, a rigid cover layer may have openings such as a circular opening 16 for button 17 and a speaker port opening such as speaker port opening 18 (e.g., for an ear speaker for a user). Device 10 may also have other openings (e.g., openings in display 14 and/or housing 12 for accommodating volume buttons, ringer buttons, sleep buttons, and other buttons, openings for an audio jack, data port connectors, removable media slots, etc.).

In some embodiments, portions of concave display 14 such as peripheral regions 20I may be inactive and portions of display 14 such as rectangular central portion 20A (bounded by dashed line 20) may correspond to the active part of display 14. In active display region 20A, an array of image pixels may be used to present text and images to a user of device 10. In active region 20A, display 14 may include touch sensitive components for input and interaction with a user of device 10. If desired, regions such as regions 20I and 20A in FIG. 1 may both be provided with display pixels (i.e., all or substantially all of the entire front planar surface of a device such as device 10 may be covered with display pixels).

Device 10 may, if desired, have internal user interface components such as buttons 17 or speaker component 19 that occupy openings such as openings 16 and 18 respectively in an optional rigid cover layer of concave display 14. Buttons 17 may be based on dome switches or other switch circuitry. Buttons 17 may include button members that form push buttons (e.g., momentary buttons), slider switches, rocker switches, etc. Device 10 may include internal structural components such as structural component 22 that add a raised structure to a portion of concave display 14. Device 10 may include

components such as interface components 24 and 26 that may be fully internal to device 10, but that receive input from the user or from the surrounding environment through physical interaction with concave display 14. Interface components 22, 24, and 26 may be positioned in active region 20A or inactive region 20I of concave display 14. Interface components 22, 24, and 26 may be positioned separately from one another or may be commonly located to form a combined component with structural and internal features. Interface components 24 and 26 may be positioned underneath concave display 14 so that concave display 14 must be deformed in order to contact components 24 or 26 or, if desired may be positioned to remain in constant contact with concave display 14.

An exploded perspective view of an illustrative display is shown in FIG. 2. As shown in FIG. 2, concave display 14 may be formed by stacking multiple layers including flexible display layer 14A, touch-sensitive layer 14B, and cover layer 14C. Display 14 may also include other layers of material such as adhesive layers, optical films, or other suitable layers. Flexible display layer 14 may include image pixels formed form light-emitting diodes (LEDs), organic LEDs (OLEDs), plasma cells, electronic ink elements, liquid crystal display (LCD) components, or other suitable image pixel structures compatible with flexible displays.

Touch-sensitive layer 14B may incorporate capacitive touch electrodes such as horizontal transparent electrodes 32 and vertical transparent electrodes 34. Touch-sensitive layer 14B may, in general, be configured to detect the location of one or more touches or near touches on touch-sensitive layer 14B based on capacitive sensors, resistive sensors, optical sensors, acoustic sensors, inductive sensors, or force sensors.

Software and/or hardware may be used to process the measurements of the detected touches to identify and track one or more gestures. A gesture may correspond to stationary or non-stationary, single or multiple, touches or near touches on touch-sensitive layer 14B. A gesture may be performed by moving one or more fingers or other objects in a particular manner on touch-sensitive layer 14B such as tapping, pressing, rocking, scrubbing, twisting, changing orientation, pressing with varying pressure and the like at essentially the same time, contiguously, or consecutively. A gesture may be characterized by, but is not limited to a pinching, sliding, swiping, rotating, flexing, dragging, or tapping motion between or with any other finger or fingers. A single gesture may be performed with one or more hands, by one or more users, or any combination thereof.

Cover layer 14C may be formed from plastic or glass (sometimes referred to as display cover glass) and may be flexible or rigid. If desired, the interior surface of peripheral inactive portions 20I of cover layer 14C may be provided with an opaque masking layer on such as black ink.

Touch-sensitive flexible display section 14AB may be formed from display pixel array layer 14A and optional touch sensor layer 14B.

FIG. 17 is perspective view of an illustrative embodiment of device 10 with concave display 14 in which device 10 is provided with a bezel such as bezel 200 surrounding the periphery of concave display 14. In the illustrative embodiment shown in FIG. 17, housing 12 of device 10 has an opening 204 that may provide access to a data port. The surface of bezel 200 may be formed in-plane with the surface of display 14 (i.e., so that bezel 200 and display 14 form a single smooth surface) or may be

formed at a right angle to the walls of housing 12 (as examples). Bezel 200 may be a separate bezel member or may be formed as a portion of housing 12. As shown in FIG. 17, top and bottom portions 202 of bezel 200 may have a concave (curved) shape that matches the cross-sectional curved shape of concave display 14.

FIG. 18 is a cross-sectional side view of an illustrative embodiment of device 10 in which concave display 14 is formed by mounting flexible display layer 14A to a concave support structure such as support structure 210 (e.g., a rigid support structure having at least a concave external surface such as a metal, glass, or plastic support structure) using a layer of adhesive material such as adhesive layer 212. As shown in FIG. 18, the internal volume of device 10, defined by housing 12, bezel 202 and concave display 14 may include volume 216 above a plane (indicated by dashed line 214) defined by the deepest point in the curvature of display 14. This is because the inner surface of support structure 210 is convex (in the FIG. 18 example). Volume 216 provides space in addition to rectangular volume 218 in which internal components such as component 220 (e.g., printed circuit boards, antennas or other components) may be positioned. The ability to bend flexible display 14 into the concave shape of FIG. 18 may therefore help maximize the interior space that is available within device 10 to mount device components.

FIG. 19 is a cross-sectional side view of a portion of device 10. In the illustrative embodiment of FIG. 19, concave display 14 is formed from flexible display layer 14A, adhesive layer 212, and rigid cover layer 14C (e.g., a layer of rigid plastic or a layer of rigid cover glass having a concave external surface and a convex inner surface to which flexible display layer 14A

conforms). Concave display 14 may be formed adjacent to bezel portion 200 of housing 12 or may be joined to housing 12 by an additional mounting member. The concave shape of cover layer 14C of display 14 may provide reduced susceptibility to damage if device 10 is dropped. Forming flexible display layer 14A in a shape that matches the concave shape of cover layer 14C (i.e., so that layer 14A conforms to the convex inner surface of layer 14C) may provide additional internal volume 216 to device 10.

FIG. 20 is a cross-sectional side view of a portion of another embodiment of device 10. In the illustrative embodiment of FIG. 20, concave display 14 is formed from flexible display layer 14A attached to optional touch-sensitive layer 14B by adhesive layer 212. Touch-sensitive layer 14B may further be attached to rigid cover layer 14C (e.g., a glass or plastic layer) using adhesive layer 230 such that all layers (212, 14B, 230, and 14C) of display 14 conform to the concave shape of cover layer 14C. Concave display 14 may be directly adjacent to bezel portion 200 of housing 12 or may be joined to housing 212 by an additional mounting member. The concave shape of all layers (14A, 212, 14B, 230, and 14C) of display 14 may provide reduced susceptibility to damage in the event that device 10 is dropped and may provide additional internal volume 216.

FIG. 21 is a cross-sectional side view of device 10 and a common drop surface such as drop surface 240 (e.g., sidewalk concrete, asphalt, tile, or any other surface) on which device 10 may be dropped. Drop surface 240 may have a surface roughness due to surface features such as surface features 242. Surface features 242 may have a characteristic height such as height 244 (e.g., 1-2 mm for a concrete surface). As shown in FIG. 21, device 10 may be provided with concave display 14. Concave

display 14 may be provided with a curvature defined by maximum depth 248 defined by the distance from the outermost surface of device 10, indicated by dashed line 246 and the deepest point in the curvature of display 14 (indicated by dashed line 214). The outermost surface of device 10 may be defined by bezel 200, or, in the absence of bezel 200, may be defined by juncture point 250 at which the peripheral edges of display 14 meet housing 12.

Maximum depth 248 may be chosen to be larger than characteristic size 244 of surface features 242 of common drop surface 240. Providing device 10 with a concave display having curvature chosen to provide a maximum depth (depth 248) that is larger than characteristic height 244 may significantly reduce the risk of damage (e.g., scratches or other damage) to device 10 during a drop event.

Providing concave display 14 with flexible display layer 14A capable of conforming to the shape of cover layer 14C allows all layers of display 14 to be conformed to same concave shape. Providing device 10 with concave display 14 in which all layers of concave display 14 conform to the same concave shape may reduce the susceptibility of device 10 to damage when dropped on common drop surface 240 while providing additional internal volume 216 in which internal components may be positioned.

Electronic devices may be provided with concave displays that reduce the risk of damage in the event of a drop while maximizing the internal volume of the device. Concave displays may be formed from one or more flexible layers including a flexible display layer. The flexible display layer may be mounted to a rigid support structure or a rigid cover layer. Flexible display layers that conform to the curved shape of a rigid cover structure

provide additional internal volume in which internal components of the device may be positioned.

In accordance with an embodiment, an electronic device is provided that includes a housing and a concave display mounted in the housing, where the concave display has a rigid internal support structure having a concave surface and a flexible display layer attached to the rigid internal support structure that conforms to the concave surface of the rigid support structure.

In accordance with another embodiment, the concave display further includes a first adhesive layer and the first adhesive layer attaches the flexible display layer to the concave surface of the rigid internal support structure.

In accordance with another embodiment, the concave display further includes a touch-sensitive layer.

In accordance with another embodiment, the concave display further includes first and second adhesive layers, where the first adhesive layer attaches the flexible display layer to the touch-sensitive layer and where the second adhesive layer attaches the flexible display layer to the rigid internal support structure.

In accordance with another embodiment, the housing includes a bezel and the bezel surrounds a periphery of the concave display.

In accordance with another embodiment, the rigid internal support structure has a convex inner surface and the electronic device further includes at least one internal component mounted adjacent to the convex inner surface.

In accordance with another embodiment, the rigid internal support structure has at least one opening.

In accordance with another embodiment, the at least one opening includes a hole in the rigid internal

support structure and the at least one internal component is mounted in the hole in the rigid internal support structure.

In accordance with another embodiment, an electronic device is provided that includes a housing and a concave display mounted in the housing, where the concave display includes a rigid cover layer having at least one concave outer surface and at least one corresponding convex inner surface and includes a flexible display layer, where the flexible display layer conforms to the convex inner surface of the rigid cover layer.

In accordance with another embodiment, the flexible display layer includes image pixels formed from organic light-emitting diodes.

In accordance with another embodiment, the concave display further includes a first adhesive layer, where the first adhesive layer attaches the flexible display layer to the convex inner surface of the rigid cover layer.

In accordance with another embodiment, the rigid cover layer has at least one opening, where the electronic device further includes an internal component and where the internal component is mounted adjacent to the flexible display layer under the at least one opening in the rigid cover layer.

In accordance with another embodiment, the internal component includes a speaker and the speaker transmits sound through the flexible display layer.

In accordance with another embodiment, the internal component includes a button, where the electronic device further includes a button member in the at least one opening in the rigid cover layer, where the button member moves within the at least one opening in the rigid cover layer, and where the movement of the button member

compresses the button.

In accordance with another embodiment, an electronic device is provided that includes an electronic device housing and a concave display mounted in the electronic device housing, where the concave display includes a rigid cover layer having a concave outer surface and a convex inner surface, a flexible display layer, and a touch-sensitive layer, where the flexible display layer and the touch-sensitive layer each conform to the convex inner surface of the rigid cover layer.

In accordance with another embodiment, the concave display further includes first and second adhesive layers, where the flexible display layer is attached to the touch-sensitive layer with the first adhesive layer and where the touch-sensitive layer is attached to the convex inner surface of the rigid cover layer with the second adhesive layer.

In accordance with another embodiment, the electronic device further includes at least one internal component mounted adjacent to the flexible display layer of the concave display.

In accordance with another embodiment, the rigid cover layer of the convex display has at least one opening, where the at least one internal component is an audio component, and where the audio component is mounted under the at least one opening in the rigid cover layer.

In accordance with another embodiment, the concave outer surface of the concave display has a curvature and peripheral edges, where the curvature has a deepest point, where the deepest point and at least some of the peripheral edges define a maximum depth associated with the curvature of the concave display and where the maximum depth of the concave display is between 0.5 millimeter and 20 millimeters.

In accordance with another embodiment, the electronic device further includes an internal component, where the internal component is mounted at a distance from the peripheral edges of the concave outer surface, and where the distance is smaller than the maximum depth.

The foregoing is merely illustrative of the principles of this invention and various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention.

As shown in the examples of FIGS. 1, 2 and 22-29, an electronic device may be provided with a convex display. The convex display may include a flexible display layer that has been bent to form a curved surface.

Convex displays may be formed from flexible layers such as a flexible display layer (e.g., a flexible organic light-emitting diode array), a flexible touch-sensitive layer (e.g., a sheet of polymer with an array of transparent capacitor electrodes for a capacitive touch sensor), a flexible substrate layer, etc. These flexible layers may, if desired, be covered by a flexible or rigid cover layer (sometimes referred to as a cover glass) or may be supported by a support structure (e.g., a rigid support structure on the underside of the flexible layers). In electronic devices with convex displays partially covered by rigid cover layers, the cover layers may be provided with openings that provide access to the flexible layers of the display. For example, a cover glass layer may have an opening that allows a button member to move relative to the cover glass layer. As the button member moves within the opening, underlying portions of the flexible display may be deformed (e.g., to allow actuation of an associated switch).

Electronic devices may also be provided with user interface components (input-output components) such

as buttons, microphones, speakers, piezoelectric actuators or (for receiving electrical input from a user or tactile feedback to users), other actuators such as vibrators, pressure sensors, and other components. These components may be mounted under portions of a flexible display.

User interface components may be mounted under the flexible display or may be integrated into the flexible display. The deformable nature of the flexible display may allow a user to interact with the user interface components (input-output components) by moving the display into contact with the user interface components or by otherwise allowing the display to locally flex (e.g., to allow sound to pass through the flexible display or to allow a barometric pressure measurements of the exterior environment to be made by an internal pressure sensor). If desired, a portion of the flexible display may form a membrane portion of an electrical component. Components that may be provided with a membrane that is formed from a portion of a flexible display include microphones, laser microphones, pressure sensors, speakers, etc.

Convex displays formed from flexible and rigid layers that all have convex shapes i.e., displays formed from a collection of layers in which no layer of the display is planar) may provide an aesthetically desirable external appearance while maximizing the internal volume of the device that is available to hold electrical and mechanical device components.

An illustrative electronic device of the type that may be provided with a convex display is shown in FIG. 1.

Electronic device 10 may be a portable electronic device or other suitable electronic device. For example, electronic device 10 may be a laptop computer, a tablet

computer, a somewhat smaller device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, etc.

Device 10 may include a housing such as housing 12. Housing 12, which may sometimes be referred to as a case, may be formed of plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other suitable materials, or a combination of these materials. In some situations, parts of housing 12 may be formed from dielectric or other low-conductivity material. In other situations, housing 12 or at least some of the structures that make up housing 12 may be formed from metal elements.

Device 10 may have a convex display such as convex display 14. Convex display 14 may be formed from multiple layers of material. These layers may include a touch sensor layer such as a layer on which a pattern of indium tin oxide (ITO) electrodes or other suitable transparent electrodes have been deposited to form a capacitive touch sensor array or a touch sensor layer formed using other touch technologies (e.g., resistive touch, acoustic touch, optical touch, etc.). These layers may also include layer that contains an array of display pixels. The touch sensor layer and the display layer may be formed using flexible sheets of polymer or other substrates having thicknesses of 10 microns to 0.5 mm or other suitable thicknesses (as an example).

The display pixel array may be, for example, an organic light-emitting diode (OLED) array containing rows and columns of OLED display pixels. Other types of flexible display pixel arrays may also be formed (e.g., electronic ink displays, etc.). The use of OLED technology to form flexible display 14 is sometimes described herein as an example. This is, however, merely

illustrative. Flexible display 14 may be formed using any suitable flexible display technology. The use of flexible displays that are based on OLED technology is merely illustrative.

In addition to these functional display layers (i.e., the OLED array and the optional touch sensor array), display 14 may include one or more structural layers. For example, display 14 may be covered with a flexible or rigid cover layer and/or may be mounted on a support structure (e.g., a rigid support). Layers of adhesive may be used in attaching flexible display layers to each other and may be used in mounting flexible display layers to rigid and flexible structural layers.

In configurations for display 14 in which the cover layer for display 14 is flexible, input-output components that rely on the presence of flexible layers may be mounted at any suitable location under the display (e.g., along peripheral portions of the display, in a central portion of the display, etc.). In configurations for display 14 in which the flexible layers are covered by a rigid cover glass layer or other rigid cover layer, the rigid layer may be provided with one or more openings and the electronic components may be mounted under the openings. For example, a rigid cover layer may have openings such as a circular opening 16 for button 17 and a speaker port opening such as speaker port opening 18 (e.g., for an ear speaker for a user). Device 10 may also have other openings (e.g., openings in display 14 and/or housing 12 for accommodating volume buttons, ringer buttons, sleep buttons, and other buttons, openings for an audio jack, data port connectors, removable media slots, etc.).

In some embodiments, portions of convex display 14 such as peripheral regions 20I may be inactive and

portions of display 14 such as rectangular central portion 20A (bounded by dashed line 20) may correspond to the active part of display 14. In active display region 20A, an array of image pixels may be used to present text and images to a user of device 10. In active region 20A, display 14 may include touch sensitive components for input and interaction with a user of device 10. If desired, regions such as regions 20I and 20A in FIG. 1 may both be provided with display pixels (i.e., all or substantially all of the entire front planar surface of a device such as device 10 may be covered with display pixels).

Device 10 may, if desired, have internal user interface components such as buttons 17 or speaker component 19 that occupy openings such as openings 16 and 18 respectively in an optional rigid cover layer of convex display 14. Buttons 17 may be based on dome switches or other switch circuitry. Buttons 17 may include button members that form push buttons (e.g., momentary buttons), slider switches, rocker switches, etc. Device 10 may include internal structural components such as structural component 22 that add a raised structure to a portion of convex display 14. Device 10 may include components such as interface components 24 and 26 that may be fully internal to device 10, but that receive input from the user or from the surrounding environment through physical interaction with convex display 14. Interface components 22, 24, and 26 may be positioned in active region 20A or inactive region 20I of convex display 14. Interface components 22, 24, and 26 may be positioned separately from one another or may be commonly located to form a combined component with structural and internal features. Interface components 24 and 26 may be positioned underneath convex display 14 so that convex display 14

must be deformed in order to contact components 24 or 26 or, if desired may be positioned to remain in constant contact with convex display 14.

An exploded perspective view of an illustrative display is shown in FIG. 2. As shown in FIG. 2, convex display 14 may be formed by stacking multiple layers including flexible display layer 14A, touch-sensitive layer 14B, and cover layer 14C. Display 14 may also include other layers of material such as adhesive layers, optical films, or other suitable layers. Flexible display layer 14 may include image pixels formed form light-emitting diodes (LEDs), organic LEDs (OLEDs), plasma cells, electronic ink elements, liquid crystal display (LCD) components, or other suitable image pixel structures compatible with flexible displays.

Touch-sensitive layer 14B may incorporate capacitive touch electrodes such as horizontal transparent electrodes 32 and vertical transparent electrodes 34. Touch-sensitive layer 14B may, in general, be configured to detect the location of one or more touches or near touches on touch-sensitive layer 14B based on capacitive sensors, resistive sensors, optical sensors, acoustic sensors, inductive sensors, or force sensors.

Software and/or hardware may be used to process the measurements of the detected touches to identify and track one or more gestures. A gesture may correspond to stationary or non-stationary, single or multiple, touches or near touches on touch-sensitive layer 14B. A gesture may be performed by moving one or more fingers or other objects in a particular manner on touch-sensitive layer 14B such as tapping, pressing, rocking, scrubbing, twisting, changing orientation, pressing with varying pressure and the like at essentially the same time, contiguously, or consecutively. A gesture may be

characterized by, but is not limited to a pinching, sliding, swiping, rotating, flexing, dragging, or tapping motion between or with any other finger or fingers. A single gesture may be performed with one or more hands, by one or more users, or any combination thereof.

Cover layer 14C may be formed from plastic or glass (sometimes referred to as display cover glass) and may be flexible or rigid. If desired, the interior surface of peripheral inactive portions 20I of cover layer 14C may be provided with an opaque masking layer on such as black ink.

Touch-sensitive flexible display section 14AB may be formed from display pixel array layer 14A and optional touch sensor layer 14B.

FIG. 22 is perspective view of an exemplary embodiment of device 10 with convex display 14 and convex housing 12 in which housing 12 has an opening 300 that may provide access to, e.g., an audio port. A portion of housing 12 may form a bezel such as bezel 304. Bezel 304 may be formed so that bezel 304 and display 14 form a common smooth surface or may be formed raised above or depressed below the outer surface of display 14. Bezel 304 may be a separate bezel member or may be formed as a portion of housing 12. As shown in FIG. 22, top and bottom portions 306 of bezel 200 may have a convex (curved) shape that matches the cross-sectional curved shape of convex display 14.

FIG. 23 is a cross-sectional side view of an illustrative embodiment of device 10 taken along line 302 of FIG. 22 and viewed in direction 303. As shown in FIG. 23, device 10 has a convex shape formed by convex housing 12 and convex display 14. Device 10 may also include internal components such as battery 310 and components 312. The convex shape of housing 12 and display 14 of

device 10 may provide device 10 with a thin appearance while providing an interior space that is able to accommodate internal components such as battery 310.

FIG. 24 is a cross-sectional side view of an illustrative embodiment of device 10 in which convex display 14 is formed by mounting flexible display layer 14A to a convex support structure such as support structure 320 (e.g., a rigid support structure having at least a convex external surface such as a metal, glass, or plastic support structure) using a layer of adhesive material such as adhesive layer 322. As shown in FIG. 24, the internal volume of device 10, defined by housing 12 and convex display 14 may include volume 326 above plane 324 (defined by inner edges 328 of display 14) and below inner surface 330 of display 14. This is because inner surface 330 of support structure 320 is concave (in the FIG. 24 example). Volume 326 provides space which may be used for placement of internal components such as component 332 (e.g., printed circuit boards, antennas or other components). The ability to bend flexible display layer 14A into the convex shape of FIG. 24 that matches the convex outer surface of support structure 320 may therefore help maximize the interior space that is available within device 10 to mount device components.

FIG. 25 is a cross-sectional side view of a portion of device 10. In the illustrative embodiment of FIG. 25, convex display 14 is formed from flexible display layer 14A, adhesive layer 322, and rigid cover layer 14C (e.g., a layer of rigid plastic or a layer of rigid cover glass having a convex external surface and a concave inner surface to which flexible display layer 14A conforms). Convex display 14 may be formed adjacent to bezel portion housing 12 or may be joined to housing 12 by an additional mounting member. Providing device 10 with a layer such as

flexible display layer 14A that conforms to the convex shape of cover layer 14C (i.e., so that layer 14A conforms to the concave inner surface of layer 14C) may provide additional internal volume 326 between plane 324 (defined by inner edges 328 of display 14) and inner surface 330 of display 14.

FIG. 26 is a cross-sectional side view of a portion of another embodiment of device 10. In the illustrative embodiment of FIG. 26, convex display 14 is formed from flexible display layer 14A attached to optional touch-sensitive layer 14B by adhesive layer 322. Touch-sensitive layer 14B may further be attached to rigid cover layer 14C (e.g., a glass or plastic layer) using adhesive layer 340 such that all layers (322, 14B, 340, and 14C) of display 14 conform to the convex shape of cover layer 14C (i.e., so that layers 14A and 14B conform to the concave inner surface of cover layer 14C). Convex display 14 may be formed adjacent to housing 12 or may be joined to housing 212 by an additional mounting member. The convex shape of all layers (14A, 322, 14B, 340, and 14C) may combine with convex housing 12 to provide a thin appearance for device 10 and may provide additional internal volume 326 between plane 324 (defined by inner edges 328 of display 14) and inner surface 330 of display 14.

FIG. 27 is a cross-sectional perspective view of an illustrative electronic device 10 in the vicinity of a connecting structure such as connecting structure 350 (e.g. an audio port or other female connector). As shown in FIG. 27, audio port 350 may have electrical contacts 352 for mating with contacts 356 of a connector such as mating connector 354 (e.g., a mating audio plug or other male connector). In the embodiment of FIG. 27, a portion of audio port 350 may occupy a portion of internal volume

326 above plane 324 (defined by inner edges 328 of display 14). The convex shape of display 14 of device 10 may provide a thin appearance and may provide additional internal volume 326 between plane 324 (defined by inner edges 328 of display 14) and inner surface 330 of display 14 in which a portion of mating connectors such as connector 350 may be mounted.

FIG. 28 is a cross-sectional side view of an illustrative electronic device 10 in the vicinity of a stack of components 360 such as printed circuit boards (PCBs), sensors, switches, connectors, battery structures, or other electronic components. In the embodiment shown in FIG. 28, some components 360 may be mounted partially or completely in a portion of internal volume 326 above plane 324 (defined by inner edges 328 of display 14). The convex shape of display 14 of device 10 may provide a thin appearance and may provide additional internal volume 326 between plane 324 (defined by inner edges 328 of display 14) and inner surface 330 of display 14 in which PCBs and other components 360 may be mounted. The example of FIG. 29 in which components 360 are mounted in volume 326 is merely illustrative. Other components or structures may occupy volume 326, if desired.

FIG. 29 is a cross-sectional side view of an illustrative electronic device in which display 14 of device 10 completely surrounds device 10. As shown in FIG. 29, device 10 may have convex front (upper) and rear (lower) surfaces that are joined along curved sidewalls. Display 14 may cover the front, rear, and sidewall surfaces of device 10 so as to completely surround electrical components 360 (e.g., printed circuit boards, integrated circuits, switches, sensors, etc.). Edges 372 may be joined by a joining member such as joining member 370. Member 370 may be a separate member formed of

plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other suitable materials, or a combination of these materials, or may be formed from an adhesive material.

In the example of FIG. 29, display 14 may be formed by stacking multiple layers including flexible display layer 14A, touch-sensitive layer 14B, and cover layer 14C. Display 14 may also include other layers of material such as adhesive layers, optical films, or other suitable layers. As an example, display 14 may be formed by mounting flexible display layer 14A to a rigid convex support structure having one or more convex outer surfaces and one or more associated concave inner surfaces that completely surrounds device 10. In another configuration, display 14 may be formed from flexible display layer 14A, adhesive layer 322, and rigid cover layer 14C (e.g., a rigid cover layer with one or more convex outer surfaces and one or more associated concave inner surfaces). In another possible configuration, convex display 14 may be formed by attaching flexible display layer 14A to optional touch-sensitive layer 14B using adhesive layer 322. Touch-sensitive layer 14B may further be attached to rigid cover layer 14C (e.g., a glass or plastic layer) using adhesive layer 340 so that all layers (322, 14B, 340, and 14C) of display 14 conform to the convex shape of cover layer 14C. These examples are merely illustrative and other configurations of display 14 may be used.

The convex shape of display 14 of device 10 may provide a thin appearance for device 10 and may help to maximize the internal volume of the device in which components such as battery 310, PCBs 360 or other components such as component 312 may be mounted. Surrounding device 10 completely with convex display 14 may allow the area of a device available for visual

display to be enlarged.

The foregoing is merely illustrative of the principles of this invention and various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention.

Electronic devices may be provided with convex displays. A convex display may be used to maximize the internal volume of a device. Convex displays may be formed from one or more flexible layers. A flexible display layer may be mounted to a rigid support structure or a rigid cover layer. Flexible display layers that conform to the curved shape of a rigid structure may provide additional internal volume in which internal components of the device may be positioned.

In accordance with another embodiment, an electronic device is provided including a housing and a display mounted in the housing, where the display has a flexible display layer that conforms to a convex outer surface of a rigid support structure.

In accordance with another embodiment, the display further includes an adhesive layer and the adhesive layer attaches the flexible display layer to the convex outer surface of the rigid support structure.

In accordance with another embodiment, the display further includes a touch-sensitive layer.

In accordance with another embodiment, the display further includes first and second adhesive layers, where the first adhesive layer attaches the flexible display layer to the touch-sensitive layer and the second adhesive layer attaches the flexible display layer to the convex outer surface of the rigid support structure.

In accordance with another embodiment, the flexible display layer includes image pixels formed from organic light-emitting diodes.

In accordance with another embodiment, the housing has at least one opening, where the opening is associated with a connector port and the electronic device further includes a connector structure mounted in the connector port.

In accordance with another embodiment, an electronic device is provided that includes a housing and a display mounted in the housing, where the display includes a rigid cover layer having at least one convex outer surface and having at least one associated concave inner surface and includes a flexible display layer that conforms to the concave inner surface.

In accordance with another embodiment, the display further includes an adhesive layer and the adhesive layer bonds the flexible display layer to the concave inner surface of the rigid cover layer.

In accordance with another embodiment, the rigid cover layer includes glass.

In accordance with another embodiment, the flexible display layer includes image pixels formed from organic light-emitting diodes.

In accordance with another embodiment, the flexible display layer includes image pixels formed from organic light-emitting diodes.

In accordance with another embodiment, the display further includes a touch sensor layer that conforms to the concave inner surface.

In accordance with another embodiment, the concave display further includes first and second adhesive layers, where the first adhesive layer attaches the flexible display layer to the touch sensor layer and the second adhesive layer attaches the touch sensor layer to the concave inner surface of the display.

In accordance with another embodiment, the touch

sensor layer includes indium-tin-oxide electrodes.

In accordance with another embodiment, the electronic device further includes an internal component, where the concave inner surface of the display provides an additional internal volume for the electronic device and where the internal component is mounted at least partially in the additional internal volume.

In accordance with another embodiment, an electronic device is provided having at least a front surface and a rear surface and including electronic components interposed between the front and rear surfaces and a display that substantially covers at least the front and rear surfaces and that surrounds the electronic components, where the display includes a rigid cover layer having at least one inner surface and a flexible display layer that is bent to conform to the inner surface.

In accordance with another embodiment, the display further includes a touch-sensitive layer attached to at least a portion of the flexible display layer.

In accordance with another embodiment, the inner surface includes a concave inner surface and the electronic device further includes a connector structure and a housing having an opening, where the connector structure is mounted in the opening to form a connector port.

In accordance with another embodiment, the electronic device has at least two sidewall surfaces and the display substantially covers the two sidewall surfaces.

In accordance with another embodiment, the display has at least two edges and the edges of the display are joined by a joining member.

The foregoing is merely illustrative of the principles of this invention and various modifications can

be made by those skilled in the art without departing from the scope and spirit of the invention. The foregoing embodiments may be implemented individually or in any combination.

As shown in the examples of FIGS. 30-44, an electronic device may be provided with a flexible display and other user interface components. The user interface components may include buttons, switches, microphones, actuators such as solenoids, motors, and piezoelectric actuators, connector ports, touch screens, proximity sensors and other components for accepting input from, or transmitting information to, a user of the electronic device.

Flexible displays may be formed from flexible layers such as a flexible display layer (e.g., a flexible organic light-emitting diode array), a flexible touch-sensitive layer (e.g., a sheet of polymer with an array of transparent capacitor electrodes for a capacitive touch sensor), a flexible substrate layer, etc. These flexible layers may, if desired, be covered by a flexible or rigid cover layer (sometimes referred to as a cover glass) or may be supported by a support structure (e.g., a rigid support structure on the underside of the flexible layers). In electronic devices with flexible displays that are covered by rigid cover layers, the cover layers may be provided with openings that provide access to the flexible layers of the display in the vicinity of a user interface device. For example, a cover glass layer may have an opening that allows a button member to move relative to the cover glass layer. As another example, a cover glass layer may have one or more speaker openings through which sound may pass.

To maximize the area of the portion of the flexible display that is available for displaying visual

information to the user, user interface components may be positioned behind, abutted against, or integrated into the flexible display. The deformable nature of the flexible display may allow a user to interact with the user interface components (input-output components) by moving the display into contact with the user interface components or by otherwise allowing the display to locally flex (e.g., to allow sound to pass through the flexible display or to allow barometric pressure measurements of the exterior environment to be made by an internal pressure sensor).

If desired, a portion of the flexible display may form a membrane structure for an electrical component. For example, a portion of the flexible display may form a speaker membrane for a speaker component. Components that may be provided with a membrane structure formed from a portion of a flexible display include speakers, microphones, laser microphones, pressure sensors, etc.

An illustrative electronic device of the type that may be provided with a flexible display is shown in FIG. 30. Electronic device 10 may be a computer such as a computer that is integrated into a display. For example, electronic device 10 may be a computer monitor, a laptop computer, a tablet computer, a somewhat smaller portable device such as a wrist-watch device, pendant device, or other wearable or miniature device, a cellular telephone, a media player, a tablet computer, a gaming device, a speaker device, a navigation device, a computer monitor, a television, or other electronic equipment.

Device 10 may include a housing such as housing 412. Housing 412, which may sometimes be referred to as a case, may be formed of plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, etc.), other suitable materials, or a combination of these

materials. In some situations, parts of housing 412 may be formed from dielectric or other low-conductivity material. In other situations, housing 412 or at least some of the structures that make up housing 412 may be formed from metal elements.

Housing 412 may be formed using a unibody configuration in which some or all of housing 412 is machined or molded as a single structure or may be formed using multiple structures (e.g., an internal frame structure, one or more structures that form exterior housing surfaces, etc.).

As shown in FIG. 30, housing 412 may have multiple parts. For example, housing 412 may have upper portion 412A and lower portion 412B. Upper portion 412A may be coupled to lower portion 412B using a hinge that allows portion 412A to rotate about rotational axis 416 relative to portion 412B. A keyboard such as keyboard 418 and a touch pad such as touch pad 420 may be mounted in housing portion 412B.

Device 10 may have a flexible display such as flexible display 414. Flexible display 414 may be formed from multiple layers of material. These layers may include a touch sensor layer such as a layer on which a pattern of indium tin oxide (ITO) electrodes or other suitable transparent electrodes have been deposited to form a capacitive touch sensor array. These layers may also include a display layer that contains an array of display pixels. The touch sensor layer and the display layer may be formed using flexible sheets of polymer (e.g., polyimide) or other substrates having thicknesses of 10 microns to 0.5 mm, having thicknesses of less than 0.2 mm, or having other suitable thicknesses (as examples).

The display pixel array may be an organic light-

emitting diode (OLED) array, for example. Other types of flexible display pixel arrays may also be formed (e.g., electrowetting displays, electrophoretic displays, flexible liquid crystal displays, flexible electrochromic displays, etc.). The use of OLED technology to form flexible display 414 is sometimes described herein as an example. This is, however, merely illustrative. In general, any suitable type of flexible display technology may be used in forming display 414.

In addition to these functional display layers (i.e., the OLED array and the optional touch sensor array), display 414 may include one or more structural layers. For example, display 414 may be covered with a flexible or rigid cover layer and/or may be mounted on a support structure (e.g., a rigid support). If desired, layers of adhesive may be used to attach flexible display layers to each other and/or to mount flexible display layers to rigid and flexible structural layers.

In some embodiments, display 414 may have an active area such as active area AA and an inactive area such as area IA. In active display region AA, an array of image pixels may be used to present text and images to a user of device 10. In active region AA, display 414 may include touch sensitive components for input and interaction with a user of device 10. If desired, both central portion AA and peripheral portion IA may be provided with display pixels (i.e., all or substantially all of the entire front planar surface of upper housing portion 412A may be provided with display pixels).

In the example of FIG. 31, device 10 has been implemented using a housing that is sufficiently small to fit within a user's hand (e.g., device 10 of FIG. 31 may be a handheld electronic device such as a cellular telephone). As show in FIG. 31, device 10 may include a

display such as display 414 mounted on the front of housing 412. Display 414 may be substantially filled with active display pixels or may have an inactive portion such as inactive portion IA that surrounds an active portion such as active portion AA. Display 414 may have openings (e.g., openings in inactive region IA or active region AA of display 414) such as an opening to accommodate button 422 and an opening to accommodate speaker port 424.

FIG. 32 is a perspective view of electronic device 10 in a configuration in which electronic device 10 has been implemented in the form of a tablet computer. As shown in FIG. 32, display 414 may be mounted on the upper (front) surface of housing 412. An opening may be formed in display 414 to accommodate button 422 (e.g., an opening may be formed in inactive region IA surrounding active region AA).

FIG. 33 is a perspective view of electronic device 10 in a configuration in which electronic device 10 has been implemented in the form of a television or in the form of a computer integrated into a computer monitor. As shown in FIG. 33, display 414 may be mounted on the front surface of housing 412. Stand 426 may be used to support housing 412. Display 414 may include an inactive region such as inactive region IA that surrounds active region AA.

An exploded perspective view of an illustrative display is shown in FIG. 34. As shown in FIG. 34, flexible display 414 may be formed by stacking multiple layers including flexible display layer 414A and touch-sensitive layer 414B. An optional cover layer such as cover layer 462 may be formed over flexible display 414. Cover layer 462 may be a layer of glass, plastic, or other protective display layer.

Flexible display 414 may also include other

layers of material such as adhesive layers, optical films, sealant layers, or other suitable layers. Flexible display layer 414A may include image pixels formed from light-emitting diodes (LEDs), organic LEDs (OLEDs), plasma cells, electrowetting display elements, electrophoretic display elements, liquid crystal display (LCD) components, or other suitable image pixel structures compatible with flexible displays.

Touch-sensitive layer 414B may incorporate capacitive touch electrodes such as horizontal transparent electrodes 432 and vertical transparent electrodes 434. Touch-sensitive layer 414B may, in general, be configured to detect the location of one or more touches or near touches on touch-sensitive layer 414B based on capacitive, resistive, optical, acoustic, inductive, or mechanical measurements, or any phenomena that can be measured with respect to the occurrences of the one or more touches or near touches in proximity to touch sensitive layer 414B.

Flexible display 414 may be formed from display pixel array layer 414A and optional touch sensor layer 414B. In the example of FIG. 34, touch-sensitive layer 414B is interposed between cover layer 462 and flexible display layer 414A. This arrangement is merely illustrative. If desired, flexible display layer 414A may be interposed between cover layer 462 and touch-sensitive layer 414B (e.g., flexible display layer 414A may be arranged on top of touch-sensitive layer 414B). If desired, touch-sensitive layer 414B and flexible display layer 414A may be integrated as a single layer. For example, capacitive touch electrodes such as electrodes 432 and 434 and display pixels such as display pixels 430 may be formed on a common substrate, if desired.

FIG. 35 is a cross-sectional side view of a

portion of flexible display layer 414A. As shown in FIG. 35, flexible display layer 414A may contain multiple sublayers. For example, display layer 414A may include a substrate layer such as substrate layer 415. Substrate layer 415 may be formed from a flexible or rigid dielectric such as glass, ceramic, or plastic. As an example, substrate layer 415 may be formed from one or more flexible sheets of polymer (e.g., polyimide). Substrate layer 415 may have a thickness of 10 microns to 0.5 mm, may have a thickness of less than 0.2 mm, or may have other suitable thickness (as examples).

A thin-film transistor (TFT) layer such as TFT layer 417 may include a layer of thin-film transistor structures (e.g., polysilicon transistors and/or amorphous silicon transistors) formed on substrate layer 415.

An organic emissive layer such as OLED layer 419 may be formed over TFT layer 417. OLED layer 419 may include a light-emitting material such as an array of organic light-emitting diode structures that are used to form display pixels such as display pixels 430 of FIG. 34.

A sealant layer such as sealant layer 421 may be formed over OLED layer 419 to protect the structures of OLED layer 419 and TFT layer 417. Sealant layer 421 may be formed from one or more layers of polymer (e.g., one or more layers of polymer that are deposited onto OLED layer 419), metal foil (e.g., a layer of metal foil that is laminated, sputtered, evaporated, or otherwise applied onto OLED layer 419), or other suitable coating or conformal covering.

Electronic device 10 may be provided with one or more speaker structures for providing sound to a user of electronic device 10. FIG. 36 is a cross-sectional side view of a portion of electronic device 10 in the vicinity of a speaker structure such as speaker structure 448.

Sound produced by speaker structure 448 may be transmitted through flexible display 414 to the exterior of device 10. Flexible display 414 may be used as a speaker membrane structure for speaker 448. Portions such as portion 414M that serve as a speaker membrane for speaker 448 may be located in an active or inactive portion of display 414. Arrangements in which speaker membrane 414M forms an active display area may allow the size of the active region of flexible display 414 to be increased relative to its inactive region.

As shown in FIG. 36, speaker structure 448 may be driven by a transducer such as transducer 450. Transducer 450 may be configured to receive electrical audio signal input from circuitry in device 10 and to convert the electrical signal into sound. In the example of FIG. 36, transducer 450 is formed from a magnet such as magnet 440 surrounded by coils such as coils 442. Magnet 440 may be a permanent magnet formed from ferrite material, ceramic material, iron alloy material, rare earth material, other suitable material, or a combination of these materials. Coils 442 may be formed from copper, aluminum, silver, other suitable materials, etc. If desired, there may be one or more sets of coils surrounding magnet 440.

When current passes through coils 442, a magnetic field is produced. This allows coils 442 to act as a variable electromagnet with a magnetic field that interacts with the constant magnetic field produced by permanent magnet 440. For example, the negative pole of the electromagnet may be repelled by the negative pole of permanent magnet 440. The magnetic force created by this repulsion will force magnet 440 away from coils 442. When the current flowing through coils 442 changes direction, the polarity of the variable electromagnet reverses.

Magnet 440 may be pushed back and forth rapidly (along the z-axis) as the current in coils 442 alternates directions.

Portions of flexible display 414 such as portion 414M may form a speaker membrane for speaker 448. As magnet 440 moves back and forth along the z-axis, attached speaker membrane 414M will in turn vibrate the air in front of speaker membrane 414M, creating sound waves.

In some arrangements, an optional support structure such as support structure 446 (sometimes referred to as a stiffening structure or stiffener) may be interposed between transducer 450 and speaker membrane 414M. Support structure 446 may be used to stiffen speaker membrane portion 414M of display 414. Support structure 446 may be formed from a metal plate, from specialized composite structures (e.g., a layer of foam interposed between layers of stiffener, etc.), from other support materials or stiffening structures, or from a combination of these materials. Using a support structure such as support structure 446 may allow speaker membrane 414M to respond more accurately to the movement of magnet 440. In arrangements where optional support structure 446 is not used, magnet 440 may be configured to stiffen portion 414M of display 414 that serves as a speaker membrane structure.

There may be one or more speaker structures 448 in device 10. Some or all of speaker structures 448 in device 10 may have speaker membranes that are formed from flexible display 414. If desired, some, all, or substantially all of flexible display 414 may be used as a speaker membrane for one speaker, for two speakers, for three speakers, or for more than three speakers.

A suspension structure such as suspension structure 454 may be used to attach portions of flexible display 414 to a rigid support structure such as housing

412. Suspension structure 454 may prevent speaker membrane 414M from moving laterally along the x-axis and/or the y-axis, but may allow free motion of speaker membrane 414M along the z-axis as speaker 448 produces sound. Suspension structure 454 may be formed from an elastomeric material, foam material, resin coated material, other suitable materials, or a combination of these materials. As shown in the example of FIG. 36, suspension structure 454 may form a pliant interface between speaker membrane 414M and housing sidewalls 412S. This is merely illustrative. If desired, suspension structure 454 may form a pliant interface between speaker membrane 414M and any suitable surrounding housing structure or any suitable rigid support structure.

If desired, other suspension structures may be incorporated into speaker structure 448. For example, there may be one or more suspension structures attached to magnet 440. This type of suspension structure may provide a restoring force that returns magnet 440 to an equilibrium position after being displaced by magnetic forces.

The desired range of frequencies produced by speaker 448 may depend on several factors. For example, the desired range of frequencies produced by speaker 448 may depend on the type of electronic device in which speaker 448 is implemented, may depend on the location of speaker 448 in device 10, may depend on the other speaker structures that are being used in combination with speaker structure 448, etc. Design choices may be made to obtain a desired frequency response from speaker 448. For example, materials used in forming speaker 448 may be selected based on the desired frequency response.

The type of enclosure that surrounds speaker 448 may also be selected based on the desired frequency

response. For example, the enclosure that surrounds the speaker may be ported. As shown in FIG. 36, housing 412 may optionally be provided with an opening or port such as acoustic port 452 (sometimes referred to as a funnel, horn, vent, hole, etc.). Port 452 may be used to equalize the pressure between the inside of housing 412 and the outside of housing 412. This may in turn augment the sound waves produced by speaker 448. A ported enclosure such as the ported enclosure shown in the example of FIG. 36 may increase the magnitude of low-frequency sound waves produced by speaker 448 (e.g., a speaker with a ported enclosure may have a higher bass output than a speaker with a sealed enclosure).

As shown in FIG. 36, port 452 may have a portion such as portion 452P that protrudes into the enclosure. The size and shape of protruding portion 452P may be customized to obtain a desired frequency response. For example, protruding portion 452P of port 452 may have a "horn" shape, in which the diameter of opening 452 varies along the length of portion 452P. Protruding portion 452P may have a curved shape, if desired. In general, protruding portion 452P may have any suitable shape, and opening 452 may have any suitable size. The characteristics of port 452 will depend on the desired frequency response of speaker 448, the structure of device 10, etc., and may be modified accordingly. The example shown in FIG. 36 is merely illustrative.

If desired, speaker 448 may be provided with a sealed enclosure that does not have a port. The example of FIG. 36 in which housing 412 is provided with port 452 is merely illustrative. The type of enclosure into which speaker 448 is implemented (e.g., a sealed enclosure, a ported enclosure, etc.) will depend on the desired frequency response of speaker 448, the structure of device

10, etc., and may be modified accordingly.

Electronic device 10 may have internal components or structures such as internal component 456. Internal components such as internal component 456 may optionally be used to tune the resonant frequency of speaker 448. Internal component 456 may be a battery or other internal structure. If desired, optional component 456 may be omitted or may otherwise not be used to tune the resonant frequency of speaker 448.

If desired, housing 412 may have one or more raised edges such as optional raised portion 412'. Raised portion 412' may have an upper surface that lies above the upper surface of display 414 (e.g., the upper surface of raised portion 412' may protrude above the upper surface of flexible display 414 in vertical dimension z). Optional raised housing 412' may allow a user to hold device 10 in hand without disrupting the speaker functionality of display 414. Raised portion 412' of housing 412 may surround the entire periphery of display 414, or may be located on one side of display 414, on two sides of display 414, on three sides of display 414, or on all four sides of display 414. Raised portion 412' may be formed as an integral part of housing 412 or may be formed as a separate structure in contact with housing 412.

FIG. 37 is a cross-sectional side view of a portion of electronic device 10 in the vicinity of another possible embodiment of speaker structure 448. As shown in FIG. 37, speaker structure 448 may be driven by a transducer such as transducer 450. In the example of FIG. 37, transducer 450 may be formed from one or more central sets of coils 442 surrounded by a magnet such as magnet 440. In some arrangements, inner portion 444 of coils 442 may also contain a magnet structure (e.g., coils 442 may surround a magnet structure). Magnet structures that are

formed within inner portion 444 of coils 442 may be formed as an integral part of outer magnet 440 (e.g., may be joined above and/or below coils 442) or may be a separate magnet structure. If desired, inner portion 444 of coils 442 may be free of magnet structures.

As with the transducer of FIG. 36, transducer 450 of FIG. 37 may be configured to receive electrical audio signal input from circuitry in device 10 and to convert the electrical signal into sound. As current passes through coils 442, a magnetic field is produced. The magnetic field produced by coils 442 interacts with the constant magnetic field produced by permanent magnet 440. The interaction of the electromagnet with the constant magnetic field will create a magnetic force between coils 442 and magnet 440 (e.g., an attractive or repulsive force). When the current flowing through coils 442 changes direction, the polarity of the variable electromagnet (and thus the direction of magnetic force) is reversed. Coils 442 may be pushed back and forth (along the z-axis) by the varying magnetic force as the current in coils 442 alternates directions.

As coils 442 move back and forth, attached speaker membrane 414M will in turn vibrate the air in front of speaker membrane 414M, creating sound waves. Support structure 446 may be used to stiffen speaker membrane 414M so that membrane portion 414M of flexible display 414 responds accurately to the movement of transducer 450.

In the example of FIG. 37, speaker 448 may be provided with a sealed enclosure that does not have a port. This is merely illustrative. Any suitable type of enclosure (e.g., a sealed enclosure, a ported enclosure, etc.) may be used. The type of enclosure into which speaker 448 is implemented will depend on the desired

frequency response of speaker 448, the structure of device 10, etc., and may be modified accordingly.

FIG. 38 is a cross-sectional side view of a portion of device 10 in the vicinity of another possible embodiment of speaker structure 448. In the example of FIG. 38, speaker 448 is supported by a rigid structure within device 10 such as rigid structure 466. Rigid structure 466 may be formed from housing structures or internal components, or may be a dedicated structure used to form a frame (sometimes referred to as a chassis or "basket") or other rigid support structure for speaker 448. Suspension structure 454 may be used to form a pliant interface between speaker 448 and rigid structure 466. As with the suspension structure of FIGS. 7 and 8 (in which suspension structure 454 is attached to housing sidewalls 412S), suspension structure 454 of FIG. 38 may prevent speaker membrane portions 414M of display 414 from moving laterally along the x-axis and/or the y-axis, but may allow free motion of speaker membrane 414M along the z-axis as speaker 448 produces sound. Suspension structure 454 may be attached to any suitable portion of speaker 448 (e.g., support structure 446, magnet 440, speaker membrane portion 414M, etc.)

The type of arrangement shown in FIG. 38 may be beneficial for configurations in which speaker 448 is not in the vicinity of housing sidewalls 412S or in other configurations in which speaker 448 is not attached to housing 412. For example, speaker 448 may be located in the central portion of a large display. In this type of configuration, a rigid structure such as rigid structure 466 of FIG. 38 may be used to support speaker 448, if desired.

There may be one or more speakers 448 in device 10. Multiple speakers 448 may be attached to a common

rigid structure 466 or each speaker 448 may be attached to a separate rigid structure 466.

If desired, a cover layer such as optional cover layer 462 may be formed over flexible display 414. Cover layer 462 may be formed from glass, plastic, or other suitable material. Cover layer 462 may allow a user to hold device 10 in hand without disrupting the speaker functionality of display 414. Cover layer 462 may also serve to protect display 414 and other parts of device 10 while still allowing speaker membrane 414M to move freely along the z-axis as speaker 448 produces sound. Cover layer 462 may be in contact with display 414 or there may be a gap 463 interposed between cover layer 462 and display 414. Gap 463 may be filled with air or may include a layer of material such as a layer of sealant (as an example).

One or more holes such as holes 464 (sometimes referred to as openings or speaker openings) may be formed in cover layer 462 so that sound may pass from speaker 448 to the exterior of device 10.

A perspective view of device 10 showing how holes 464 may be formed in cover layer 462 is shown in FIG. 39. As shown in FIG. 39, holes 464 may be formed in a "speaker grill" fashion in which an array of openings is formed in front of one or more speakers. Holes 464 may be formed in cover layer 462 in any suitable location. For example, holes 464 may be formed in localized areas of cover layer 462 that overlap a speaker structure, or holes 464 may be formed in a uniform array that covers some, all, or substantially all of the front surface of display 414. Holes 464 may have any suitable size. For example, holes 464 may have a diameter between .25 mm and .5 mm, between .5 mm and 1 mm, between 1 mm and 1.5 mm, more than 1.5 mm, less than 1.5 mm, etc. The size, shape, and

number of openings 464 formed in cover layer 462 may depend on the type and number of speakers 448 in device 10.

FIG. 40 is a cross-sectional side view of device 10 in the vicinity of support structure 446. Support structure 446 may be used to stiffen portions of flexible display 414. As discussed in connection with FIG. 36, stiffening structure 446 may be formed from a metal plate, from fiber-based composite materials, from laminated layers of one or more materials, or from other suitable materials. As shown in the example of FIG. 40, stiffening structure 446 may be formed from a layer of foam 474 interposed between first and second stiffening sheets 472. Sheets 472 may be formed from polymer, metal, glass, ceramic, fiber-based composites, or other suitable materials. This type of structure may provide a stiff and lightweight support structure for display 414. If desired, support structure 446 may be used to stiffen speaker membrane portions 414M of display 414, may be used to stiffen other portions of display 414, or may be used to stiffen all or substantially all of display 414.

Support structure 446 may be shaped in any desired fashion. For example, support structure 446 may be curved, may be planar, or may have a combination of curved and planar portions.

FIG. 41 is a cross-sectional side view of device 10 in the vicinity of curved support structure 446. As shown in FIG. 41, flexible display 414 may conform to the shape of stiffening structure 446. In the example of FIG. 41 stiffening structure 446 has a curved shape so that flexible display 414 is concave. This is, however, merely illustrative. In general, stiffening structure 446 and the attached portion of display 414 may have any suitable shape. For example, stiffening structure 446 may have a

curved shape so that flexible display 414 is convex. The example of FIG. 41 in which display 414 has a concave shape may be suitable for configurations in which display 414 forms a speaker membrane for speaker 448. A concave shaped speaker membrane may improve the quality of sound produced by speaker 448. Speakers with convex membranes may also be used.

FIG. 42 is a cross-sectional side view of device 10 in the vicinity of a single speaker structure. As shown in FIG. 42, portion 414M of flexible display 414 may form a speaker membrane for speaker structure 448. Transducer 450 for speaker 448 may be any suitable type of transducer (e.g., one or more sets of coils surrounded by a magnet, one or more sets of coils surrounding a magnet, a piezoelectric transducer, a microphone transducer, a sensor, an actuator, etc.). Speaker 448 may be the only speaker in device 10 or may be one of a plurality of speakers in device 10. Display-based speaker structure 448 may be used in conjunction with speaker structures that are not display-based. For example, there may be other speakers in device 10 which do not use display 414 as a speaker membrane. Speaker structure 448 of FIG. 42 may use all or substantially all of display 414 as a speaker membrane (e.g., the entire front face of device 10 may be occupied by a speaker), or may use only a portion of display 414 as a speaker membrane.

In the example of FIG. 43, an array of transducers 450 may be used to form a plurality of display-based speakers 448. Display-based speaker structures 448 may be used in conjunction with speaker structures that are not display-based. Each display-based speaker 448 may have an associated transducer 450. Each associated transducer 450 may be any suitable type of transducer (e.g., one or more sets of coils surrounded by

a magnet, one or more sets of coils surrounding a magnet, a piezoelectric transducer, a microphone transducer, a sensor, an actuator, etc.). The type of transducer 450 used may be different for each speaker 448 (e.g., the array of speakers 448 in FIG. 43 may include different types of transducers, if desired). Providing speakers 448 with different types of transducers, different structures, and different characteristics may give device 10 the ability to produce sound with a wider range of frequencies.

FIG. 44 is a bottom view of a portion of device 10 showing how an array of display-based speakers such as the array shown in FIG. 43 may be implemented in device 10. In the example of FIG. 44, support structure 446 is formed on the underside of display 414. Support structure 446 may be used to stiffen speaker membrane portions 414M of display 414 (e.g., support structure 446 may be interposed between transducer 450 and display 414). Support structure 446 may also be used to stiffen portions of display 414 between adjacent speakers 448.

Each speaker 448 may be surrounded by a ring 414' of flexible display 414 that is not stiffened by support structure 446. Flexible ring-shaped portions 414' of flexible display 414 may provide a barrier structure around each speaker 448 that prevents interference between adjacent speakers 448. For example, as speaker membrane 414M vibrates, ring 414' (which is surrounded by support structure 446) may absorb vibrations moving laterally in display 414 (e.g., in directions along the x-axis and/or y-axis). This may allow adjacent speakers 448 to operate independently without being disrupted by the vibrations of a neighboring speaker.

If desired, speakers 448 may include a variety of speaker types. Examples of speaker types that may be

used for speakers 448 include subwoofers, woofers, mid-range speakers, tweeters, supertweeters, etc. If desired, different channels of audio input may be routed to each speaker. For example, speakers 448 may include a center channel speaker, a left channel speaker, a right channel speaker, a surround channel speaker, etc. Any suitable characteristic of speakers 448 (e.g., size, type, location, input channel, etc.) may be modified to achieve a desired frequency response and/or to accommodate the structure of device 10.

Electronic devices that contain flexible displays and one or more display-based speaker structures may be provided. The speaker structures may be positioned under the flexible display. Portions of the flexible display may be used as speaker membranes for the speaker structures. The speaker structures may be driven by transducers that convert electrical audio signal input into sound. Piezoelectric transducers or transducers formed from coils and magnets may be used to drive the speaker structures. Speaker membranes may be formed from active display areas of the flexible display. Some, all, or substantially all of the flexible display may be used as a speaker membrane for one or more display-based speaker structures. An optional cover layer may be provided with speaker openings so that sound may pass from the display-based speaker structures to the exterior of the device.

In accordance with another embodiment, an electronic device is provided including a flexible display and a speaker structure having a speaker membrane, where the speaker membrane is formed from a portion of the flexible display.

In accordance with another embodiment, the electronic device further includes a stiffening structure

configured to stiffen the portion of the flexible display that forms the speaker membrane.

In accordance with another embodiment, the stiffening structure includes a layer of foam.

In accordance with another embodiment, the stiffening structure includes first and second stiffening sheets that are attached to opposing first and second sides of the layer of foam.

In accordance with another embodiment, the flexible display includes an active portion configured to display images and the speaker membrane is formed from the active portion of the flexible display.

In accordance with another embodiment, the electronic device further includes a rigid structure and a suspension structure configured to attach portions of the speaker structure to the rigid structure.

In accordance with another embodiment, the electronic device further includes an electronic device housing in which the flexible display is mounted, where the rigid structure is formed at least partly from the electronic device housing.

In accordance with another embodiment, the electronic device further includes a cover layer formed over the flexible display, where the cover layer includes at least one opening formed over the speaker membrane.

In accordance with another embodiment, the electronic device further includes an electronic device housing in which the flexible display is mounted, where the electronic device housing has at least one acoustic port.

In accordance with another embodiment, the flexible display includes an organic light-emitting diode display having a substrate formed from a flexible sheet of polymer.

In accordance with another embodiment an electronic device is provided including a flexible display and a plurality of speaker structures, where portions of the flexible display form speaker membranes for the plurality of speaker structures.

In accordance with another embodiment, the electronic device further includes a plurality of stiffening structures configured to stiffen the portions of the flexible display that form the speaker membranes.

In accordance with another embodiment, the flexible display includes a set of stiffened regions, where each of the stiffened regions in the set of stiffened regions forms part of a respective one of the speaker structures, flexible regions, where each of the flexible regions surrounds a respective one of the stiffened regions in the set of stiffened regions, and a surrounding stiffened region, where each of the flexible regions is surrounded by portions of the surrounding stiffened region.

In accordance with another embodiment, the speaker structures include a left channel speaker and a right channel speaker.

In accordance with another embodiment, the electronic device further includes transducers configured to drive the speaker structures, where each transducer includes coils and a magnet.

In accordance with another embodiment, the electronic device further includes piezoelectric transducers configured to drive the speaker structures.

In accordance with another embodiment, the flexible display includes an organic light-emitting diode display having a substrate formed from a flexible sheet of polymer.

In accordance with another embodiment, a

portable electronic device is provided, including a housing, a flexible organic light-emitting diode display mounted in the housing, where the flexible organic light-emitting diode display has a substrate formed from a flexible sheet of polymer, and at least one speaker having a speaker membrane formed from a portion of the flexible sheet of polymer.

In accordance with another embodiment, the portable electronic device further includes a stiffening structure interposed between the at least one speaker and the speaker membrane, where the stiffening structure includes a composite material.

In accordance with another embodiment, the speaker membrane has a concave shape.

In accordance with another embodiment, the housing includes a rectangular housing with four peripheral edges and the flexible organic light-emitting diode display and the speaker membrane extend between the four peripheral edges.

The foregoing is merely illustrative of the principles of this invention and various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention. The foregoing embodiments may be implemented individually or in any combination.

What is Claimed is:

1. An electronic device, comprising:

a flexible display; and

an internal component, wherein the flexible display may be deformed by an action external to the device, and wherein deformation of the flexible display creates a response from the internal component.

2. The electronic device defined in claim 1 wherein the flexible display comprises:

a flexible display layer; and

a touch-sensitive layer.

3. The electronic device defined in claim 2 wherein the flexible display layer of the flexible display includes an active display region, and wherein the internal component is covered with a portion of the active display region of the flexible display.

4. The electronic device defined in claim 3 wherein the internal component comprises a button, and wherein deformation of the flexible display compresses the button.

5. The electronic device defined in claim 4 wherein the flexible display further comprises a rigid cover layer having at least one opening.

6. The electronic device defined in claim 5 wherein the opening comprises a hole in the rigid cover layer, wherein the button further comprises a button member in the opening, wherein the button member moves within the hole in the rigid cover layer, and wherein the

movement of the button member in the opening causes deformation of the flexible display.

7. The electronic device defined in claim 3 wherein the internal component comprises a pressure sensor, and wherein deformation of the flexible display exerts a mechanical pressure on the pressure sensor.

8. The electronic device defined in claim 7 wherein the pressure sensor comprises a piezoelectric actuator, and wherein the mechanical pressure induces a voltage on the piezoelectric actuator.

9. The electronic device defined in claim 3 wherein the internal component comprises a laser microphone for detecting a sound originating external to the electronic device, and wherein detecting the sound comprises with a laser, detecting deformation of the flexible display.

10. An electronic device, comprising:

a flexible display; and

an audio component that transmits or receives sound through the flexible display.

11. The electronic device defined in claim 10 wherein the flexible display includes an active display region, and wherein the audio component is mounted behind the active display region of the flexible display.

12. The electronic device defined in claim 11 wherein the flexible display comprises:

a flexible display layer; and

a touch-sensitive layer.

13. The electronic device defined in claim 11 wherein the audio component comprises a diaphragm, and wherein the diaphragm is mounted in contact with the flexible display.

14. An electronic device, comprising:

a housing;

a flexible display mounted on the housing; and

a first internal component mounted under a portion of the flexible display, wherein the first internal component is configured to deform the portion of the flexible display.

15. The electronic device defined in claim 14 wherein the first internal component comprises a piezoelectric actuator, wherein a voltage applied to the piezoelectric actuator causes an expansion of the piezoelectric actuator, and wherein the portion of the flexible display deforms in response to the expansion of the piezoelectric actuator.

16. The electronic device defined in claim 14 wherein the first internal component comprises a structural component, wherein the portion of the flexible display deforms in response to physical contact with the structural component, and wherein deformation of the portion of the flexible display causes the portion of the flexible display to conform to a surface of the structural component.

17. The electronic device defined in claim 16 further comprising a second internal component mounted

under the portion of the flexible display, wherein the portion of the flexible display that conforms to the surface of the structural component indicates the location of the second internal component.

18. The electronic device defined in claim 17 wherein the second internal component comprises a button, wherein the portion of the flexible display is configured to be further deformed by an action external to the electronic device, and wherein further deformation of the portion of the flexible display compresses the button.

19. The electronic device defined in claim 16 wherein the first internal component further comprises an actuator, wherein the structural component is mounted on the actuator, wherein raising the actuator moves the structural component into contact with the portion of the flexible display, and wherein lowering the actuator moves the structural component out of contact with the flexible display.

20. The electronic device defined in claim 19 wherein the flexible display comprises a touch-sensitive layer and wherein deformation of the portion of the flexible display conforming to the surface of the structural component indicates the location of a portion of the touch-sensitive layer of the flexible display.

21. The electronic device defined in claim 19 further comprising a second internal component mounted on the actuator, and wherein deformation of the portion of the flexible display conforming to the surface of the structural component indicates the location of the second internal component.

22. The electronic device defined in claim 19 further comprising:

a cover member; and

an actuator switch coupled to the actuator, wherein deformation of the flexible display exerts a pressure on the cover member, and wherein the pressure on the cover member lifts the cover member.

23. An electronic device, comprising:

a housing; and

a concave display mounted in the housing, wherein the concave display has a rigid internal support structure having a concave surface and a flexible display layer attached to the rigid internal support structure that conforms to the concave surface of the rigid support structure.

24. The electronic device defined in claim 23 wherein the concave display further comprises a first adhesive layer, and wherein the first adhesive layer attaches the flexible display layer to the concave surface of the rigid internal support structure.

25. The electronic device defined in claim 23 wherein the concave display further comprises a touch-sensitive layer.

26. The electronic device defined in claim 25 wherein the concave display further comprises first and second adhesive layers, wherein the first adhesive layer attaches the flexible display layer to the touch-sensitive layer, and wherein the second adhesive layer attaches the flexible display layer to the rigid internal support

structure.

27. The electronic device defined in claim 23 wherein the housing comprises a bezel, and wherein the bezel surrounds a periphery of the concave display.

28. The electronic device defined in claim 26 wherein the rigid internal support structure has a convex inner surface and wherein the electronic device further comprises at least one internal component mounted adjacent to the convex inner surface.

29. The electronic device defined in claim 28, wherein the rigid internal support structure has at least one opening.

30. The electronic device defined in claim 29 wherein the at least one opening comprises a hole in the rigid internal support structure, and wherein the at least one internal component is mounted in the hole in the rigid internal support structure.

31. An electronic device, comprising:

a housing; and

a concave display mounted in the housing, wherein the concave display includes a rigid cover layer having at least one concave outer surface and at least one corresponding convex inner surface and includes a flexible display layer, wherein the flexible display layer conforms to the convex inner surface of the rigid cover layer.

32. The electronic device defined in claim 31 wherein the flexible display layer comprises image pixels formed from organic light-emitting diodes.

33. The electronic device defined in claim 31 wherein the concave display further comprises a first adhesive layer, and wherein the first adhesive layer attaches the flexible display layer to the convex inner surface of the rigid cover layer.

34. The electronic device defined in claim 33 wherein the rigid cover layer has at least one opening, wherein the electronic device further comprises an internal component, and wherein the internal component is mounted adjacent to the flexible display layer under the at least one opening in the rigid cover layer.

35. The electronic device defined in claim 34 wherein the internal component comprises a speaker and wherein the speaker transmits sound through the flexible display layer.

36. The electronic device defined in claim 34 wherein the internal component comprises a button, wherein the electronic device further comprises a button member in the at least one opening in the rigid cover layer, wherein the button member moves within the at least one opening in the rigid cover layer, and wherein the movement of the button member compresses the button.

37. An electronic device, comprising:

an electronic device housing; and

a concave display mounted in the electronic device housing, wherein the concave display comprises a rigid cover layer having a concave outer surface and a convex inner surface, a flexible display layer, and a touch-sensitive layer, wherein the flexible display layer

and the touch-sensitive layer each conform to the convex inner surface of the rigid cover layer.

38. The electronic device defined in claim 37 wherein the concave display further comprises first and second adhesive layers, wherein the flexible display layer is attached to the touch-sensitive layer with the first adhesive layer, and wherein the touch-sensitive layer is attached to the convex inner surface of the rigid cover layer with the second adhesive layer.

39. The electronic device defined in claim 38 further comprising at least one internal component mounted adjacent to the flexible display layer of the concave display.

40. The electronic device defined in claim 39 wherein the rigid cover layer of the convex display has at least one opening, wherein the at least one internal component is an audio component, and wherein the audio component is mounted under the at least one opening in the rigid cover layer.

41. The electronic device defined in claim 38 wherein the concave outer surface of the concave display has a curvature and peripheral edges, wherein the curvature has a deepest point, wherein the deepest point and at least some of the peripheral edges define a maximum depth associated with the curvature of the concave display and wherein the maximum depth of the concave display is between 0.5 millimeter and 20 millimeters.

42. The electronic device defined in claim 41 further comprising an internal component, wherein the

internal component is mounted at a distance from the peripheral edges of the concave outer surface, and wherein the distance is smaller than the maximum depth.

43. An electronic device, comprising:

a housing; and

a display mounted in the housing, wherein the display has a flexible display layer that conforms to a convex outer surface of a rigid support structure.

44. The electronic device defined in claim 43 wherein the display further comprises an adhesive layer, and wherein the adhesive layer attaches the flexible display layer to the convex outer surface of the rigid support structure.

45. The electronic device defined in claim 43 wherein the display further comprises a touch-sensitive layer.

46. The electronic device defined in claim 45 wherein the display further comprises first and second adhesive layers, wherein the first adhesive layer attaches the flexible display layer to the touch-sensitive layer, and wherein the second adhesive layer attaches the flexible display layer to the convex outer surface of the rigid support structure.

47. The electronic device defined in claim 46 wherein the flexible display layer comprises image pixels formed from organic light-emitting diodes.

48. The electronic device defined in claim 46, wherein the housing has at least one opening, wherein the

opening is associated with a connector port, the electronic device further comprising a connector structure mounted in the connector port.

49. An electronic device, comprising:

a housing; and

a display mounted in the housing, wherein the display includes a rigid cover layer having at least one convex outer surface and having at least one associated concave inner surface and includes a flexible display layer that conforms to the concave inner surface.

50. The electronic device defined in claim 49 wherein the display further comprises an adhesive layer, and wherein the adhesive layer bonds the flexible display layer to the concave inner surface of the rigid cover layer.

51. The electronic device defined in claim 49 wherein the rigid cover layer comprises glass.

52. The electronic device defined in claim 51 wherein the flexible display layer comprises image pixels formed from organic light-emitting diodes.

53. The electronic device defined in claim 49 wherein the flexible display layer comprises image pixels formed from organic light-emitting diodes.

54. The electronic device defined in claim 49 wherein the display further comprises a touch sensor layer that conforms to the concave inner surface.

55. The electronic device defined in claim 54

wherein the concave display further comprises first and second adhesive layers, wherein the first adhesive layer attaches the flexible display layer to the touch sensor layer, and wherein the second adhesive layer attaches the touch sensor layer to the concave inner surface of the display.

56. The electronic device defined in claim 55 wherein touch sensor layer comprises indium-tin-oxide electrodes.

57. The electronic device defined in claim 49 further comprising an internal component, wherein the concave inner surface of the display provides an additional internal volume for the electronic device, and wherein the internal component is mounted at least partially in the additional internal volume.

58. An electronic device having at least a front surface and a rear surface, comprising:

electronic components interposed between the front and rear surfaces; and

a display that substantially covers at least the front and rear surfaces and that surrounds the electronic components, wherein the display comprises a rigid cover layer having at least one inner surface and a flexible display layer that is bent to conform to the inner surface.

59. The electronic device defined in claim 58 wherein the display further comprises a touch-sensitive layer attached to at least a portion of the flexible display layer.

60. The electronic device defined in claim 58 wherein the inner surface comprises a concave inner surface, the electronic device further comprising a connector structure and a housing having an opening, wherein the connector structure is mounted in the opening to form a connector port.

61. The electronic device defined in claim 58 wherein the electronic device has at least two sidewall surfaces, and wherein the display substantially covers the two sidewall surfaces.

62. The electronic device defined in claim 61 wherein the display has at least two edges, and wherein the edges of the display are joined by a joining member.

63. An electronic device, comprising:

a flexible display; and

a speaker structure having a speaker membrane, wherein the speaker membrane is formed from a portion of the flexible display.

64. The electronic device defined in claim 63, further comprising:

a stiffening structure configured to stiffen the portion of the flexible display that forms the speaker membrane.

65. The electronic device defined in claim 64 wherein the stiffening structure comprises a layer of foam.

66. The electronic device defined in claim 65 wherein the stiffening structure comprises first and

second stiffening sheets that are attached to opposing first and second sides of the layer of foam.

67. The electronic device defined in claim 63 wherein the flexible display comprises an active portion configured to display images and wherein the speaker membrane is formed from the active portion of the flexible display.

68. The electronic device defined in claim 63, further comprising:

a rigid structure; and

a suspension structure configured to attach portions of the speaker structure to the rigid structure.

69. The electronic device defined in claim 68, further comprising:

an electronic device housing in which the flexible display is mounted, wherein the rigid structure is formed at least partly from the electronic device housing.

70. The electronic device defined in claim 63, further comprising:

a cover layer formed over the flexible display, wherein the cover layer comprises at least one opening formed over the speaker membrane.

71. The electronic device defined in claim 63 further comprising an electronic device housing in which the flexible display is mounted, wherein the electronic device housing has at least one acoustic port.

72. The electronic device defined in claim 63

wherein the flexible display comprises an organic light-emitting diode display having a substrate formed from a flexible sheet of polymer.

73. An electronic device, comprising:

a flexible display; and

a plurality of speaker structures, wherein portions of the flexible display form speaker membranes for the plurality of speaker structures.

74. The electronic device defined in claim 73, further comprising:

a plurality of stiffening structures configured to stiffen the portions of the flexible display that form the speaker membranes.

75. The electronic device defined in claim 73 wherein the flexible display comprises:

a set of stiffened regions, wherein each of the stiffened regions in the set of stiffened regions forms part of a respective one of the speaker structures;

flexible regions, wherein each of the flexible regions surrounds a respective one of the stiffened regions in the set of stiffened regions; and

a surrounding stiffened region, wherein each of the flexible regions is surrounded by portions of the surrounding stiffened region.

76. The electronic device defined in claim 73 wherein the speaker structures comprise a left channel speaker and a right channel speaker.

77. The electronic device defined in claim 73, further comprising:

transducers configured to drive the speaker structures, wherein each transducer comprises coils and a magnet.

78. The electronic device defined in claim 73 further comprising piezoelectric transducers configured to drive the speaker structures.

79. The electronic device defined in claim 73 wherein the flexible display comprises an organic light-emitting diode display having a substrate formed from a flexible sheet of polymer.

80. A portable electronic device, comprising:

a housing;

a flexible organic light-emitting diode display mounted in the housing, wherein the flexible organic light-emitting diode display has a substrate formed from a flexible sheet of polymer; and

at least one speaker having a speaker membrane formed from a portion of the flexible sheet of polymer.

81. The portable electronic device defined in claim 80, further comprising:

a stiffening structure interposed between the at least one speaker and the speaker membrane, wherein the stiffening structure comprises a composite material.

82. The portable electronic device defined in claim 80 wherein the speaker membrane has a concave shape.

83. The portable electronic device defined in claim 80 wherein the housing comprises a rectangular

housing with four peripheral edges and wherein the flexible organic light-emitting diode display and the speaker membrane extend between the four peripheral edges.

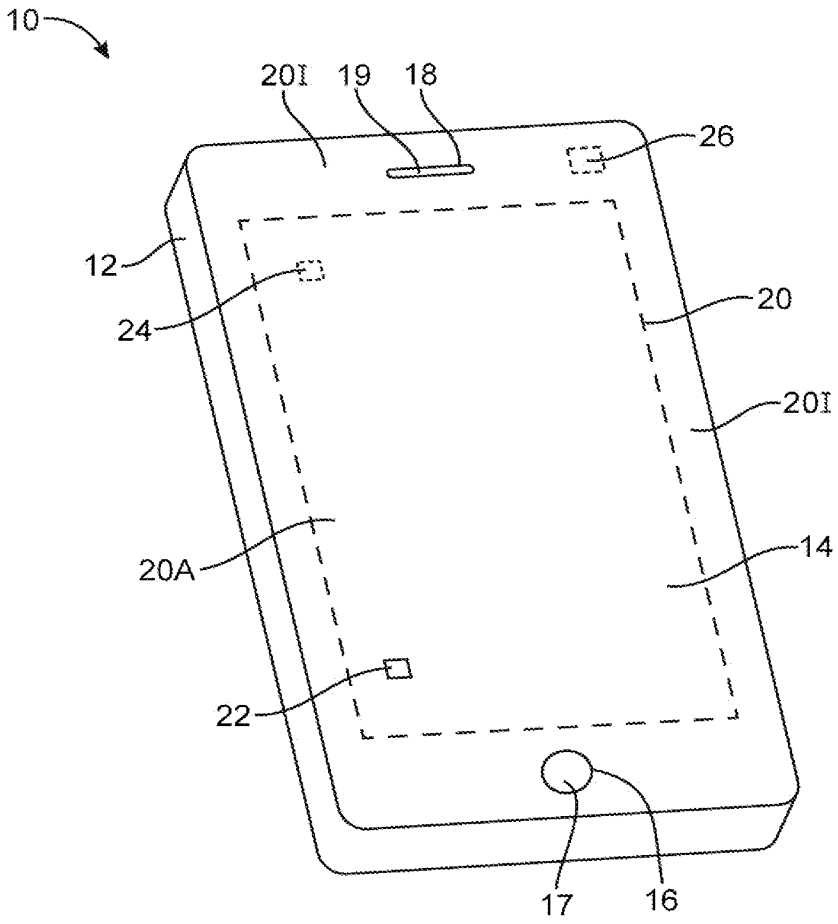

FIG. 1

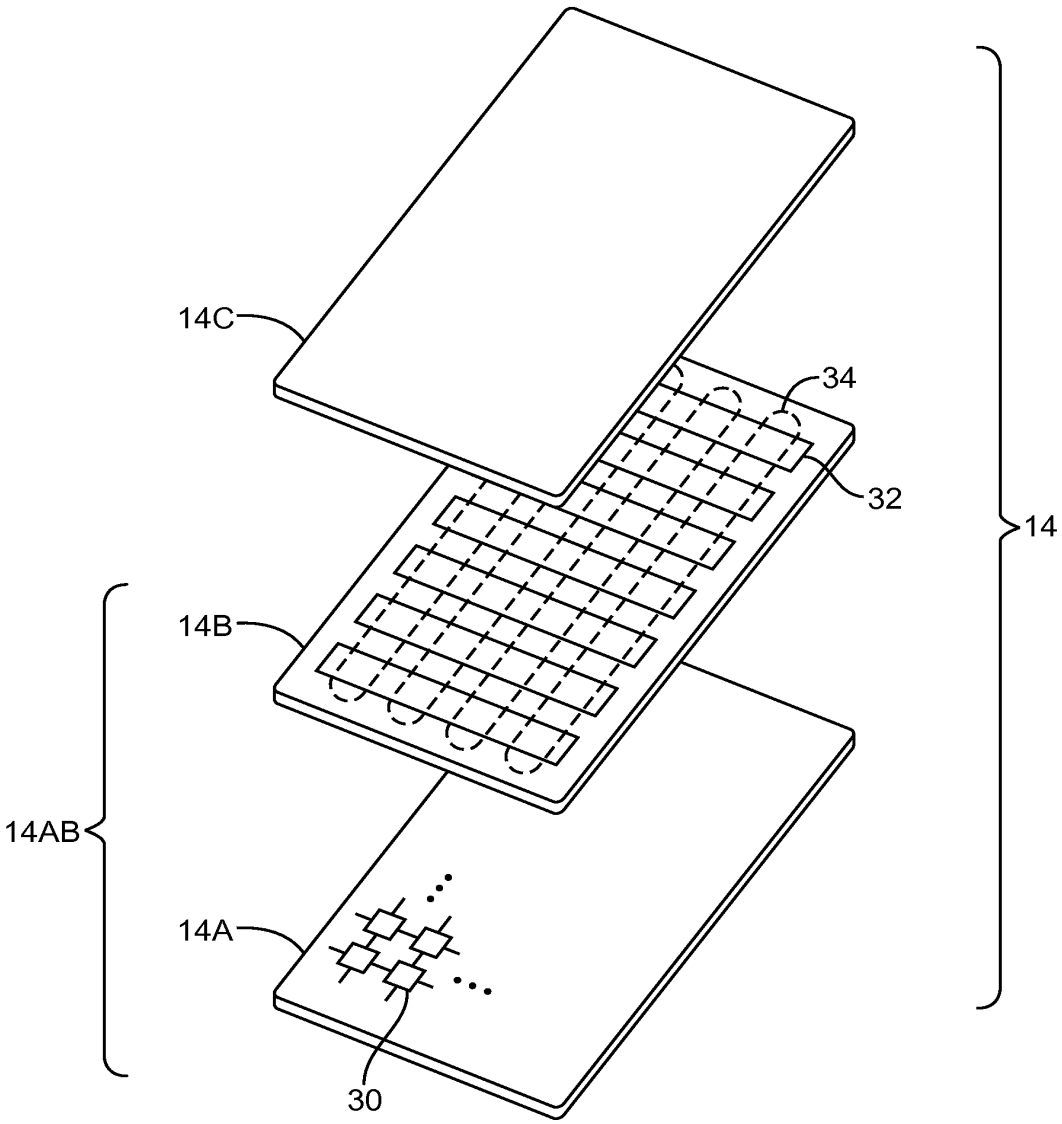

FIG. 2

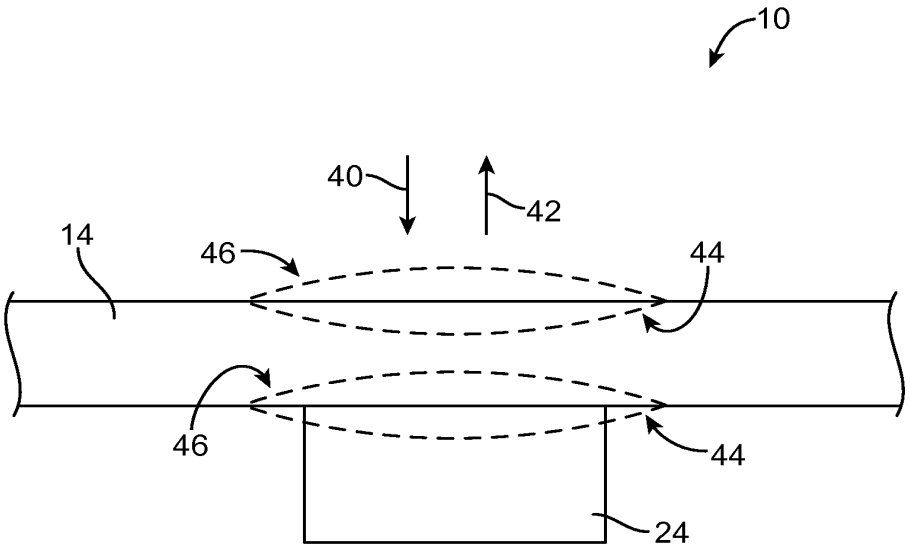

FIG. 3

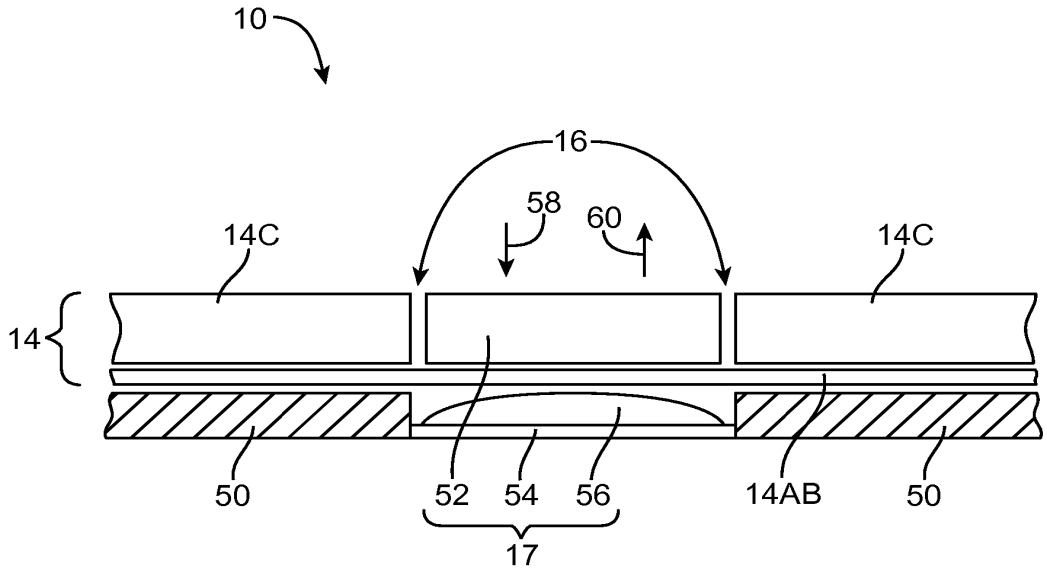

FIG. 4

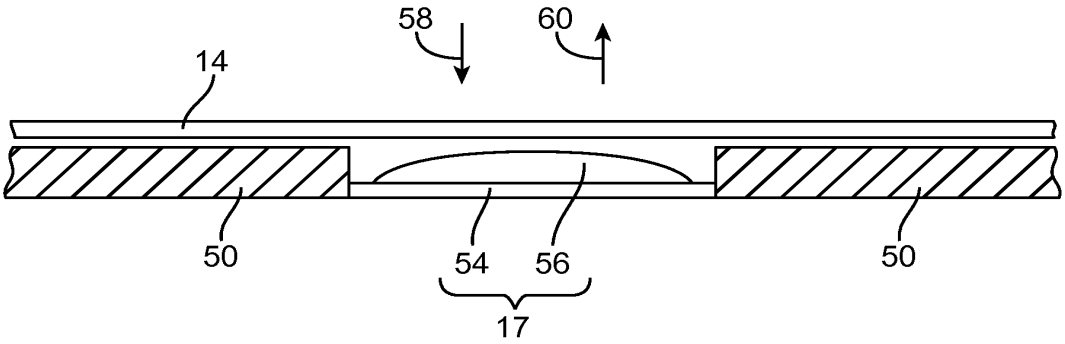

FIG. 5

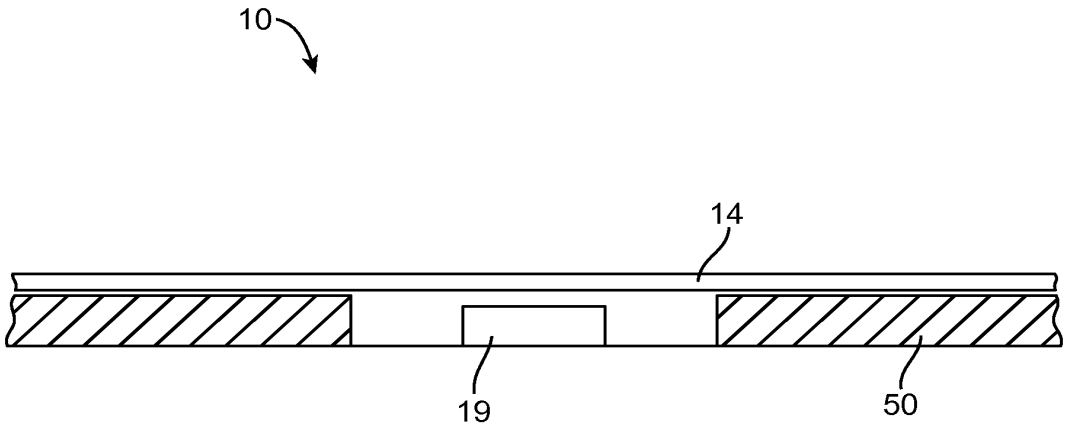

FIG. 6

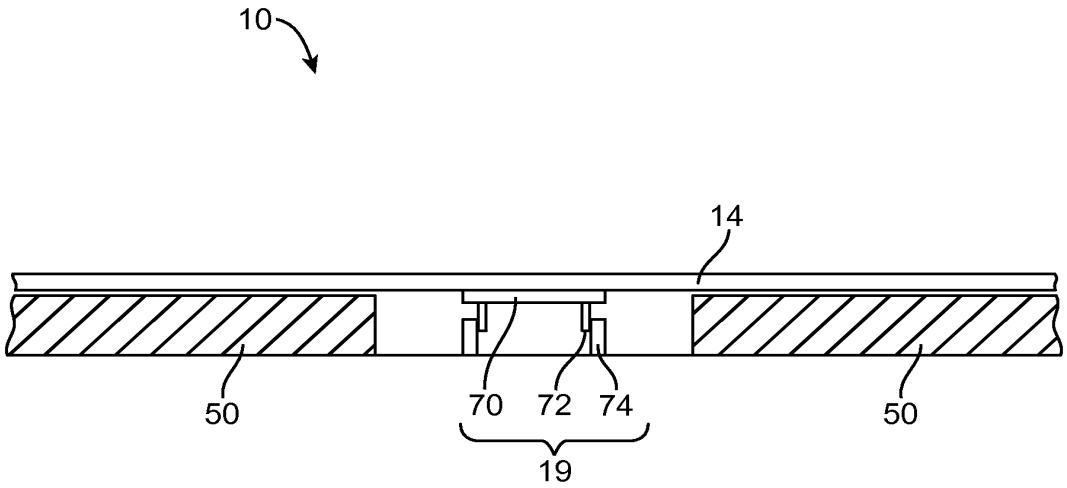

FIG. 7

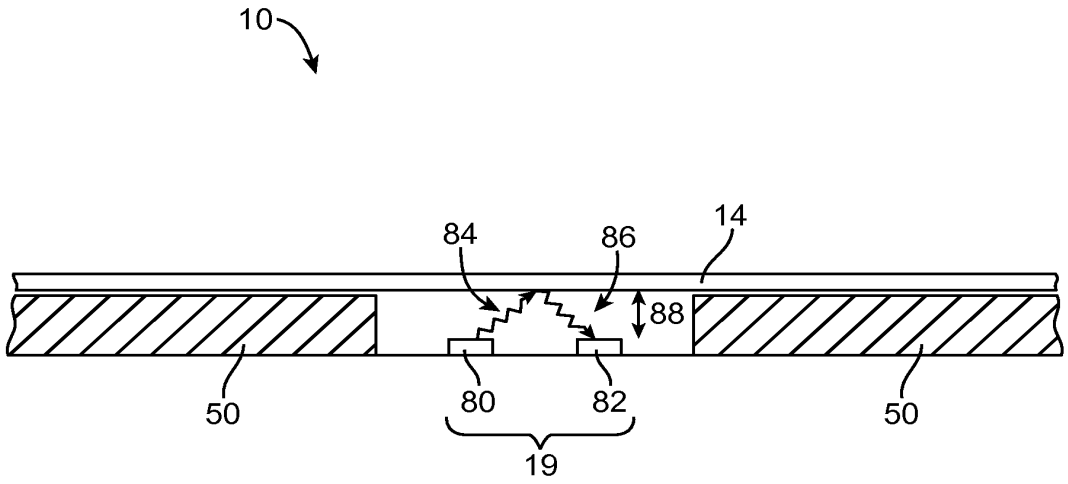

FIG. 8

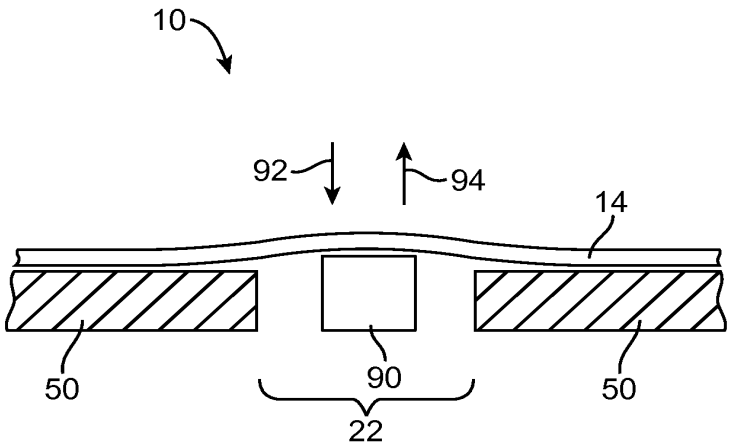

FIG. 9

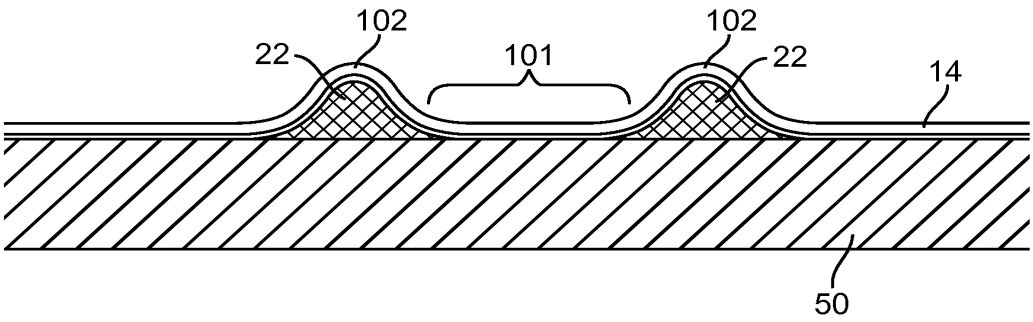

FIG. 10

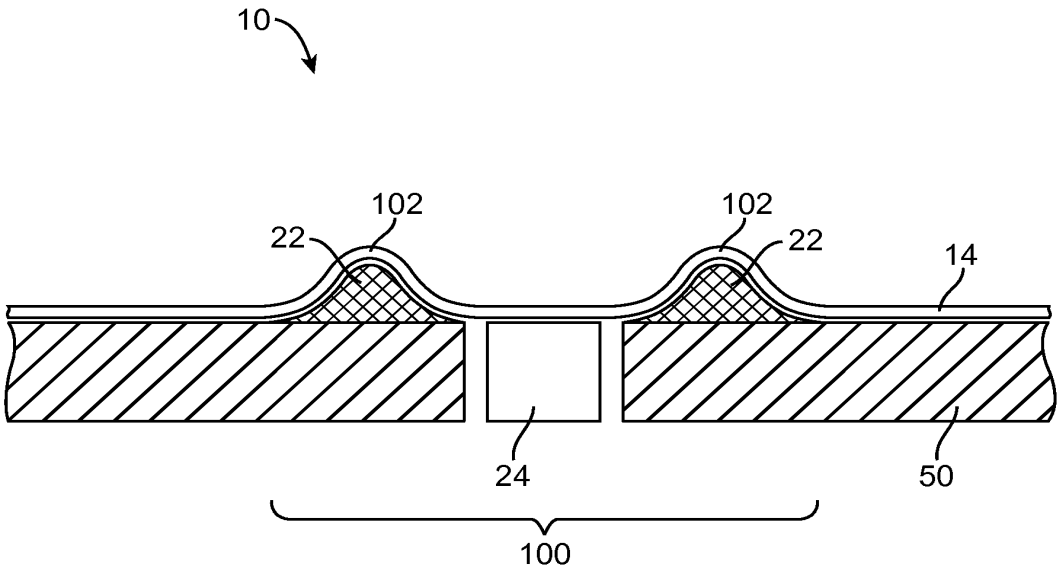

FIG. 11

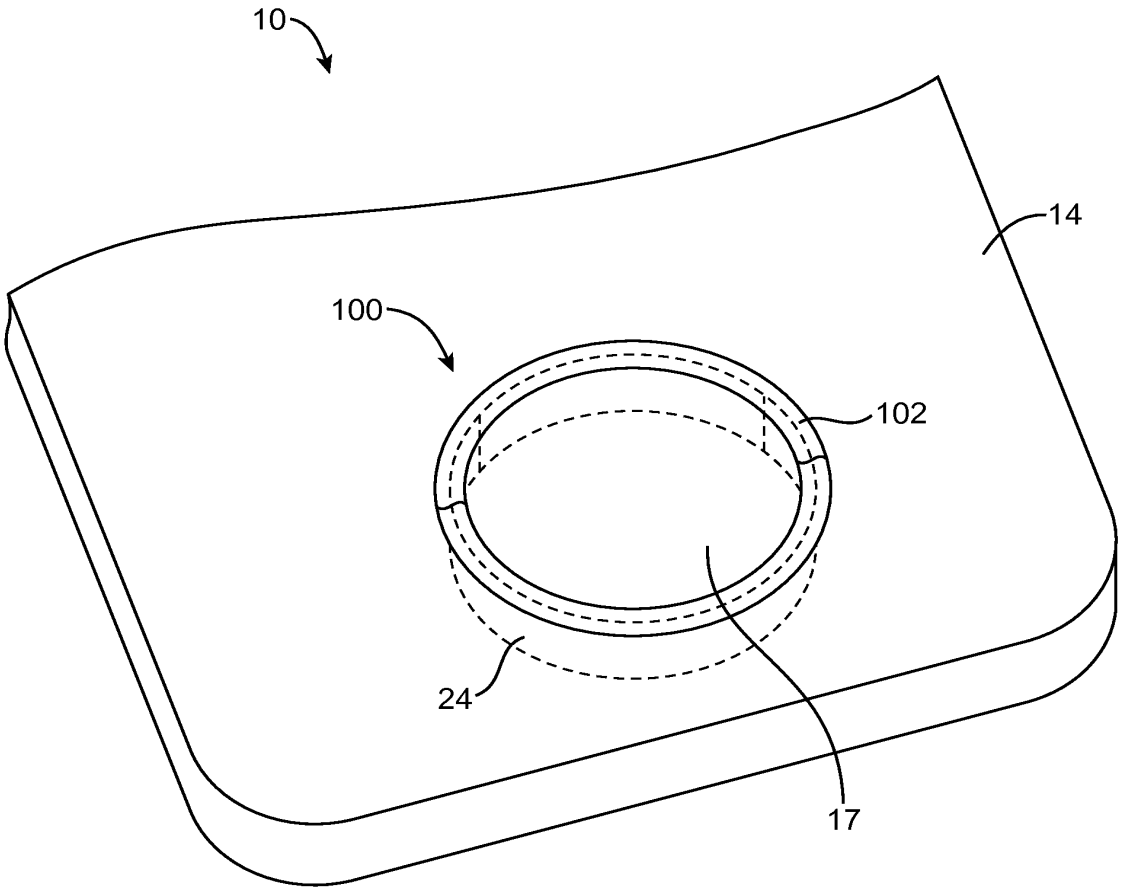

FIG. 12

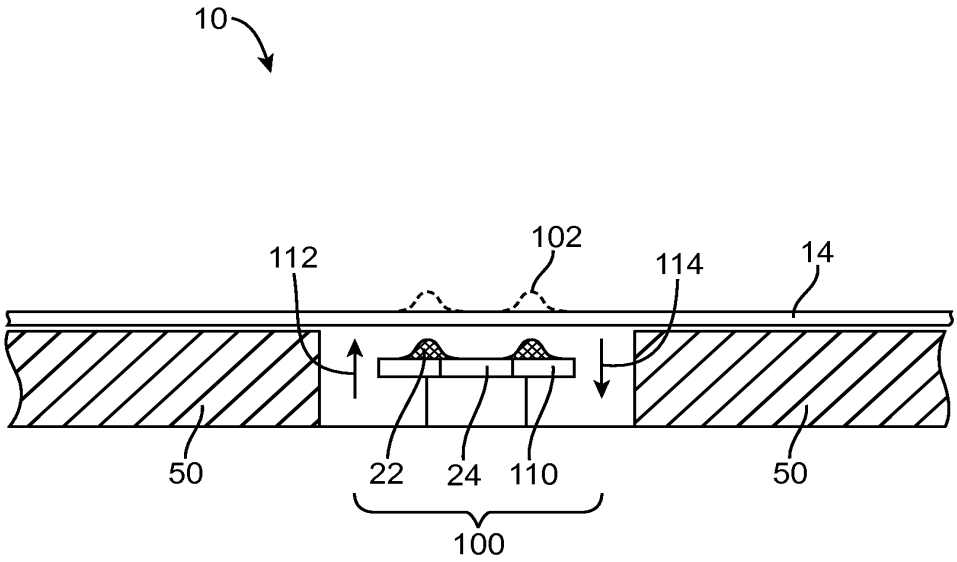

FIG. 13

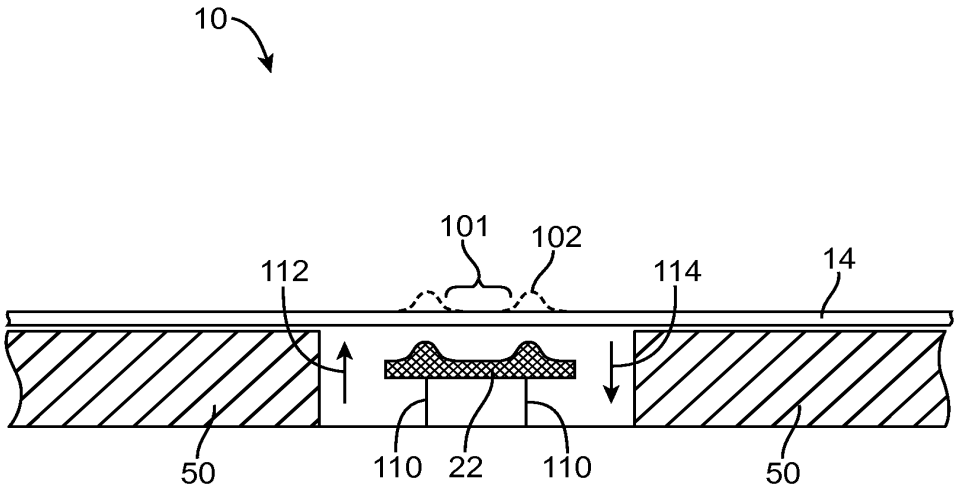

FIG. 14

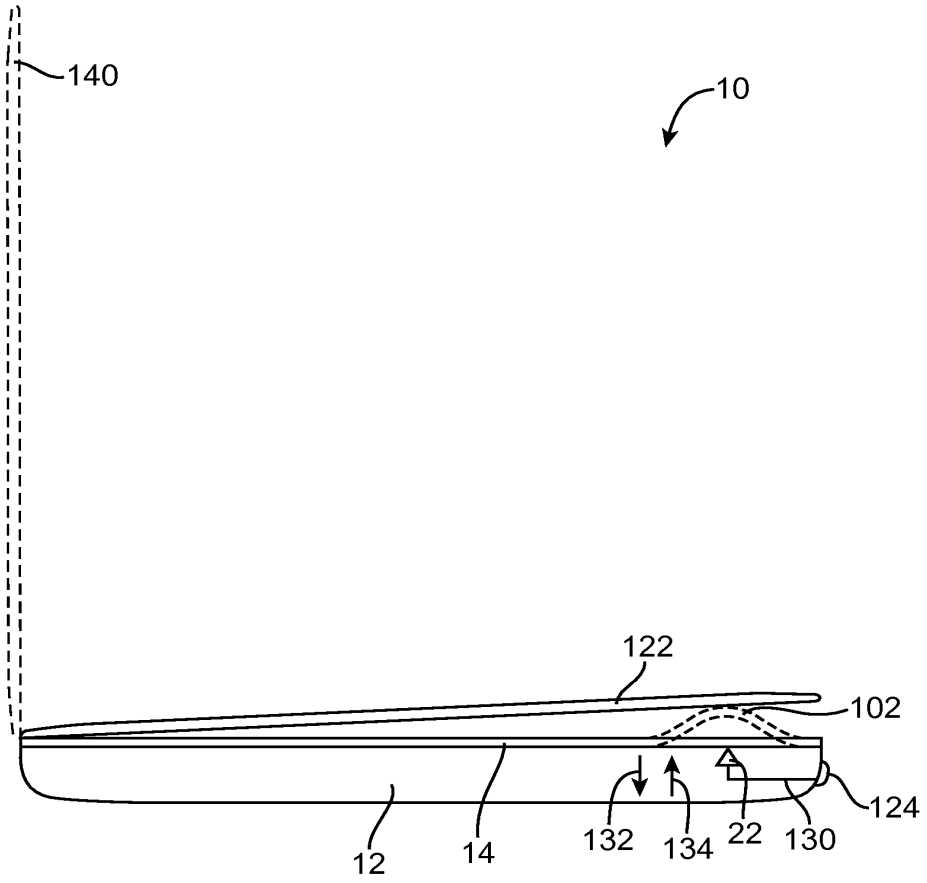

FIG. 15

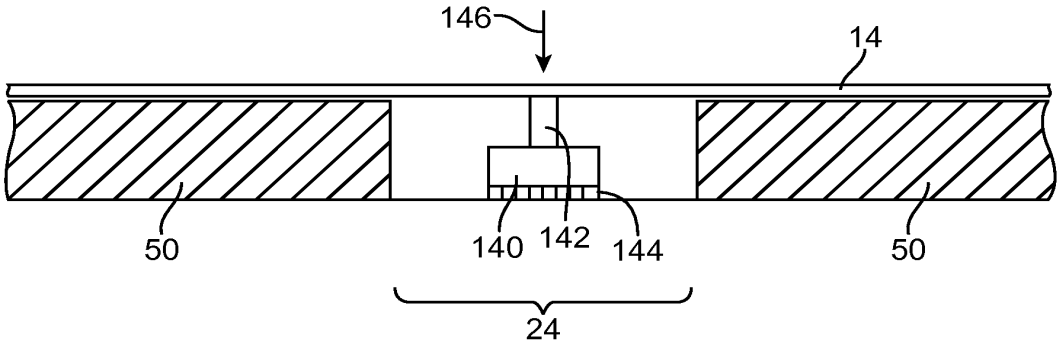

FIG. 16

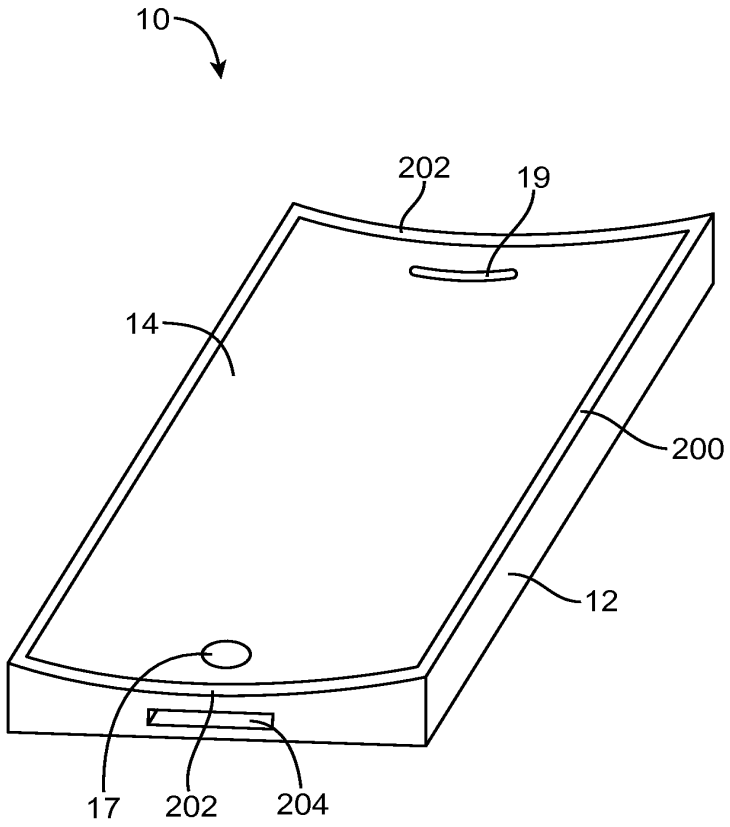

FIG. 17

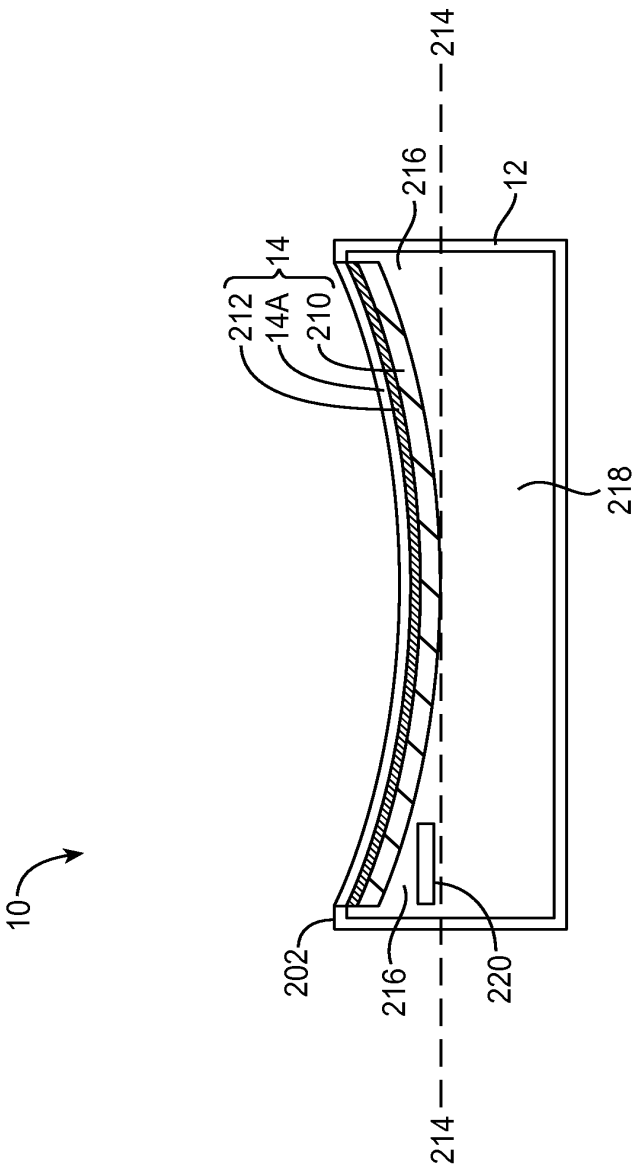

FIG. 18

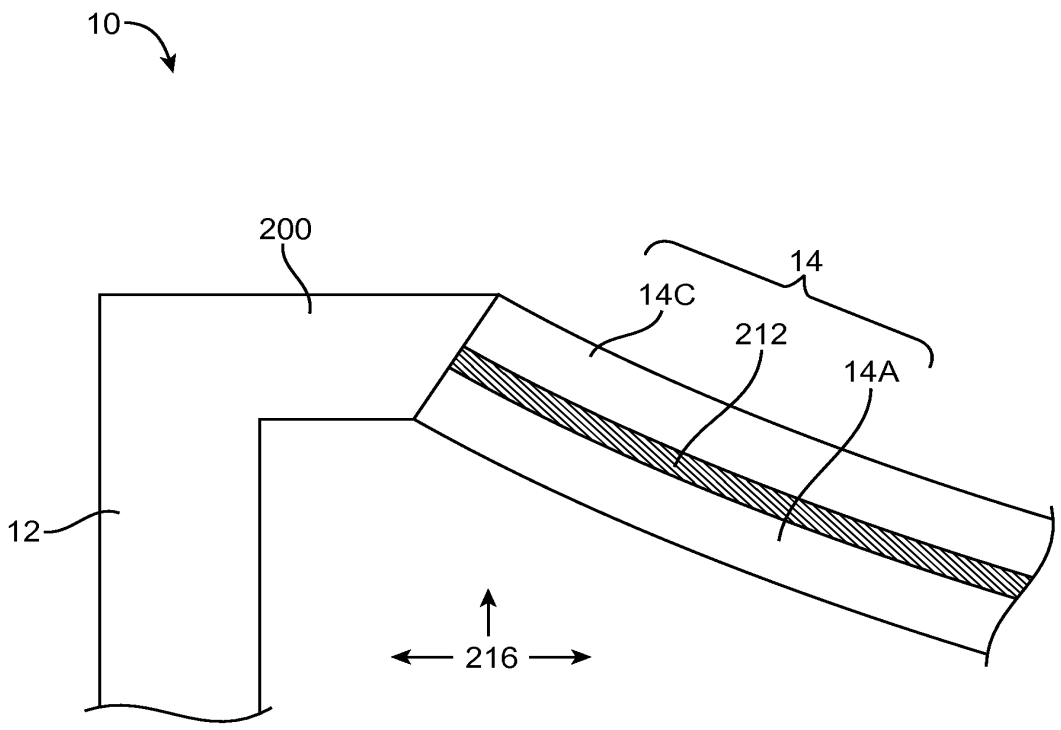

FIG. 19

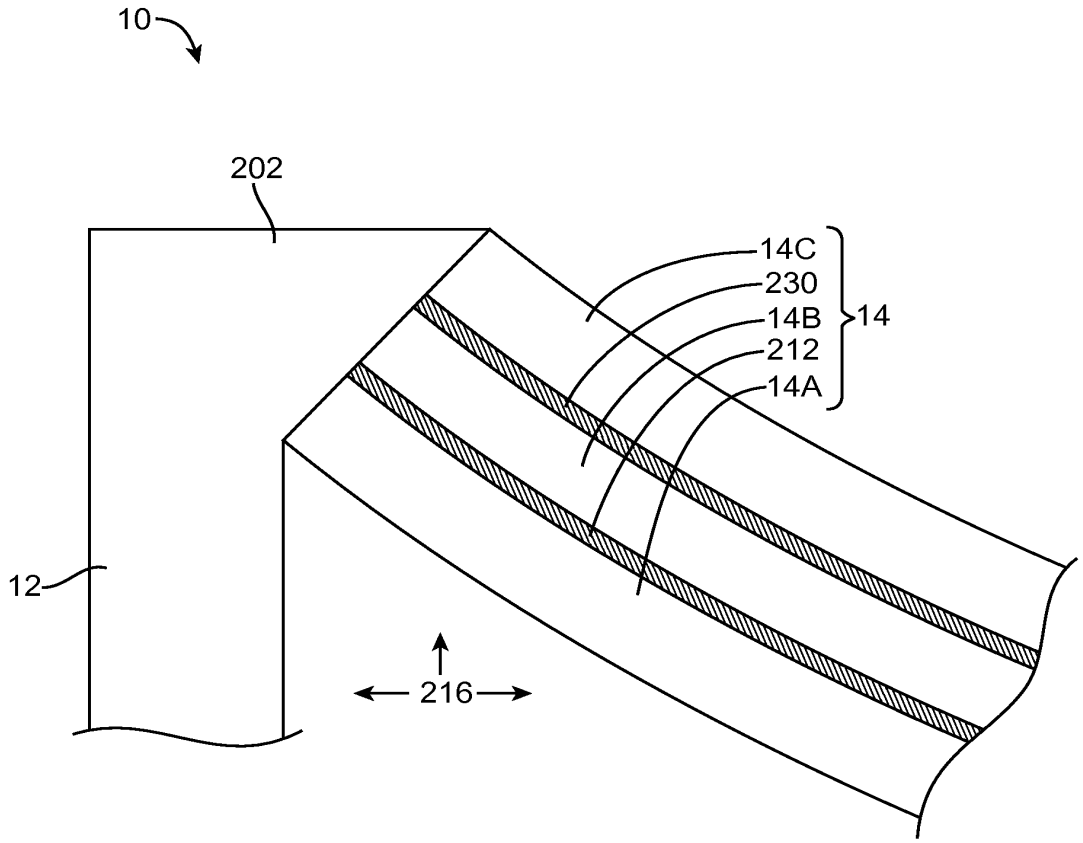

FIG. 20

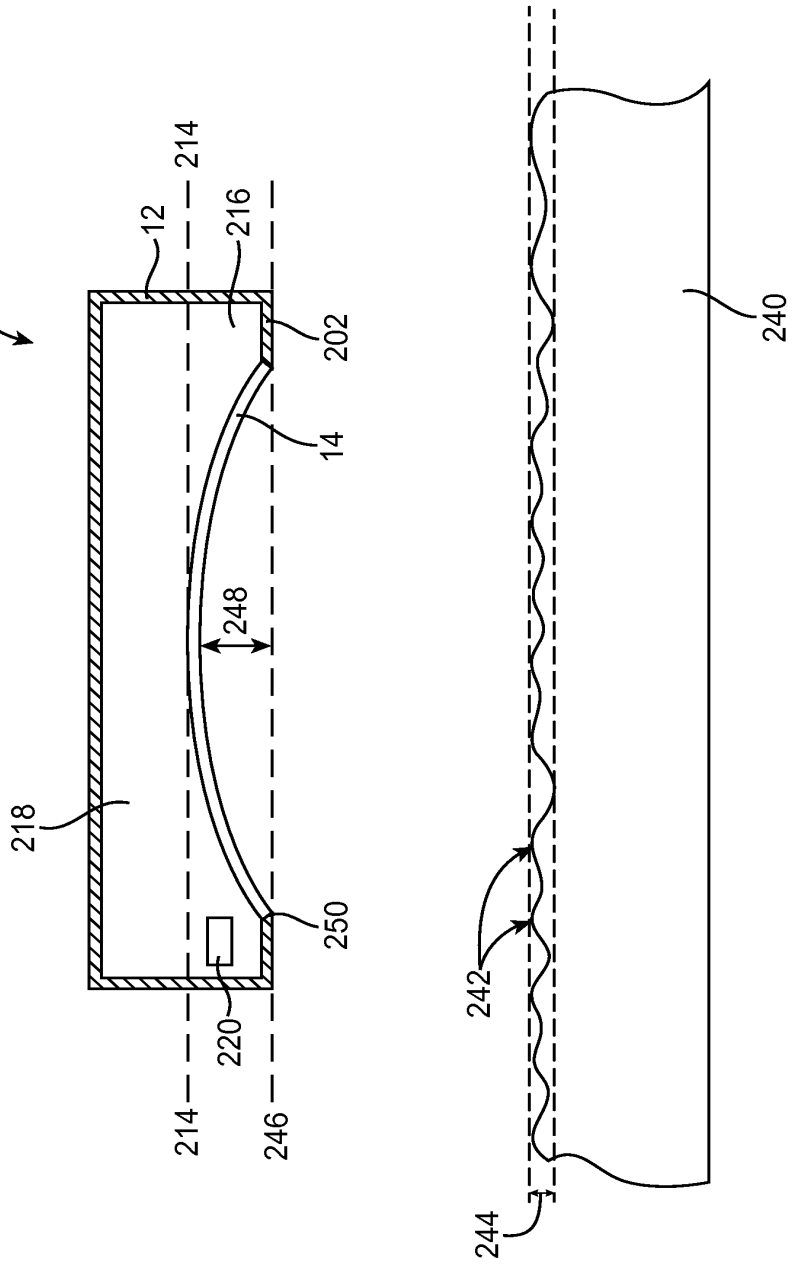

FIG. 21

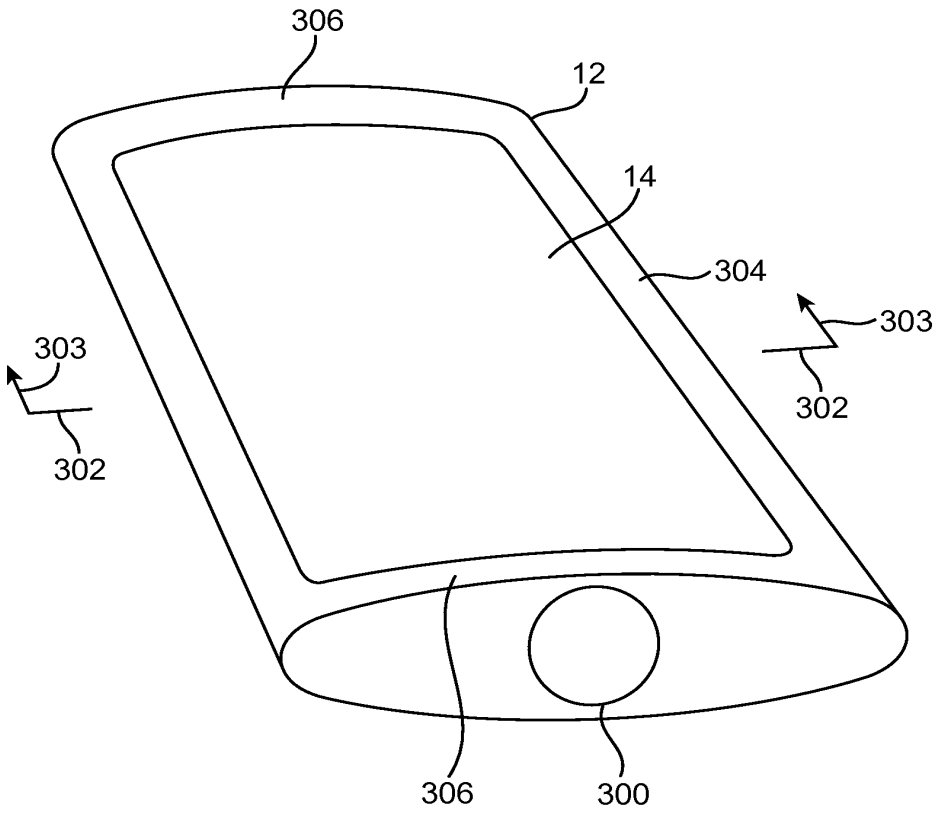

FIG. 22

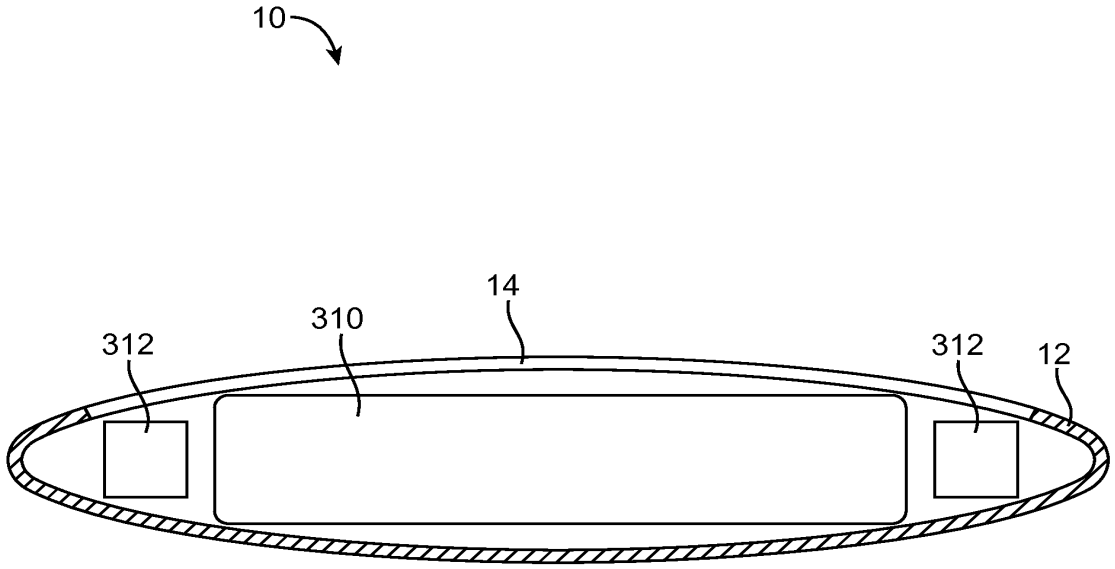

FIG. 23

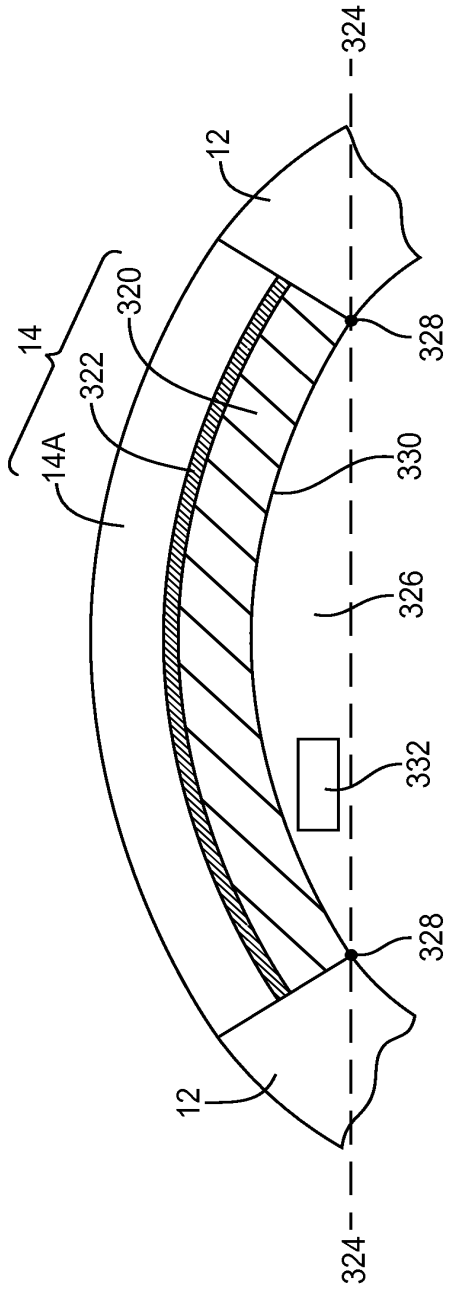

FIG. 24

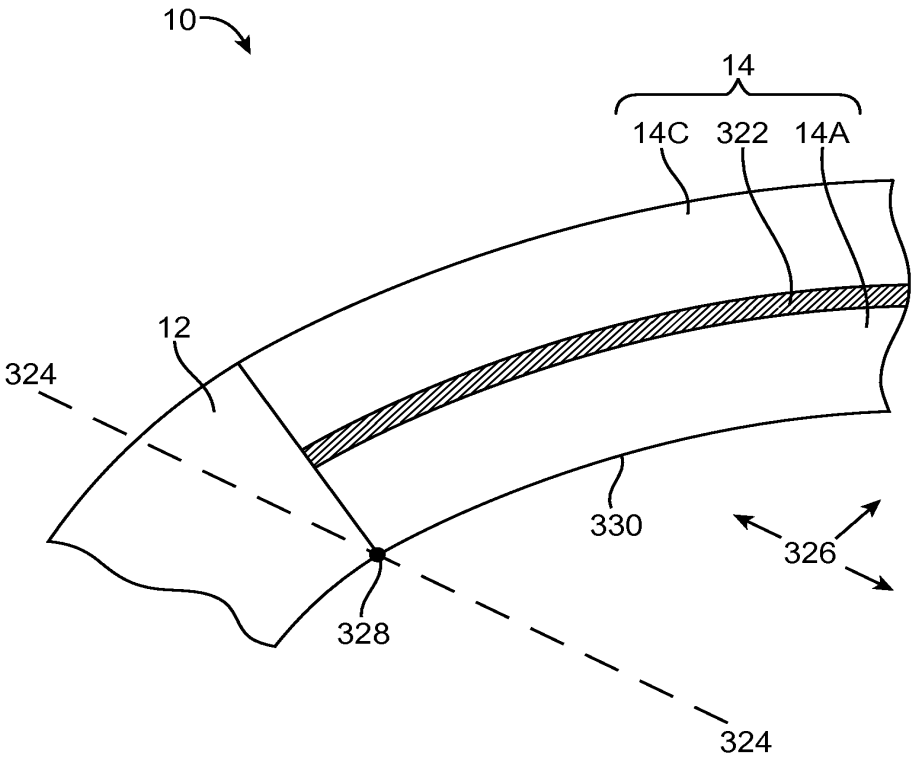

FIG. 25

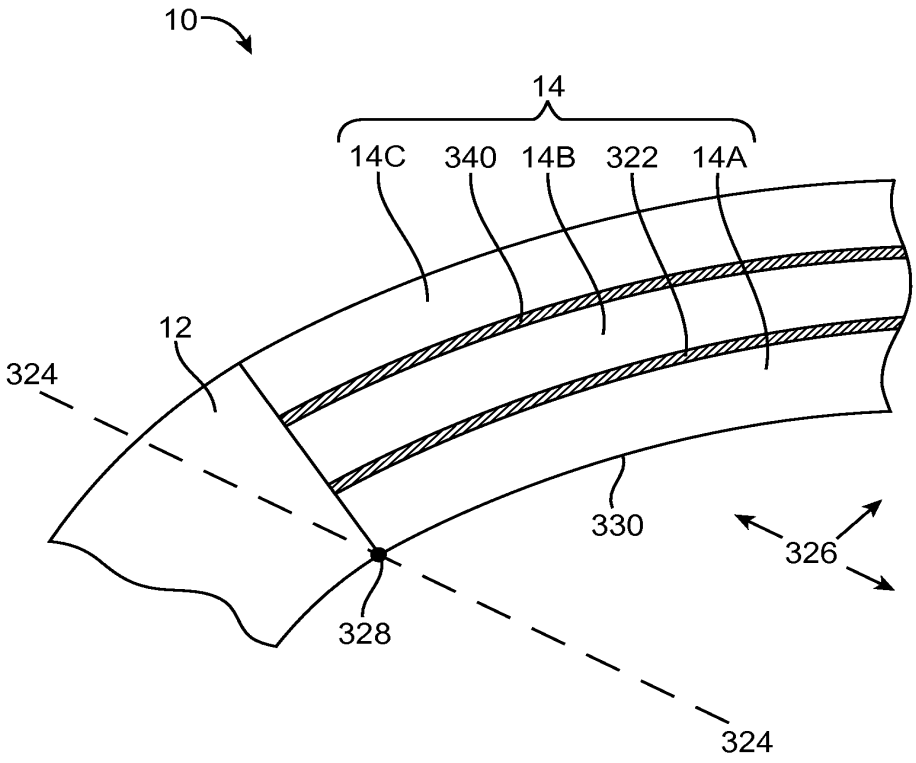

FIG. 26

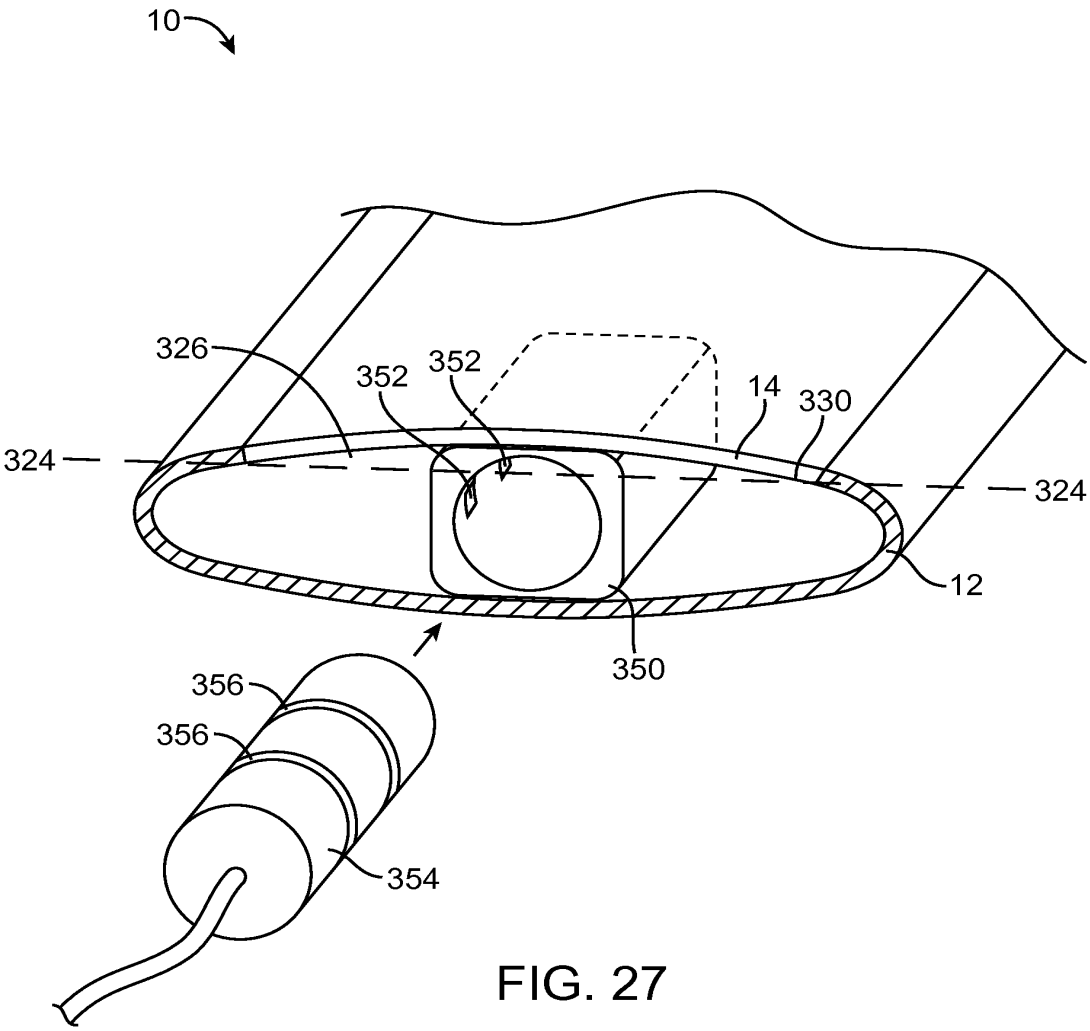

FIG. 27

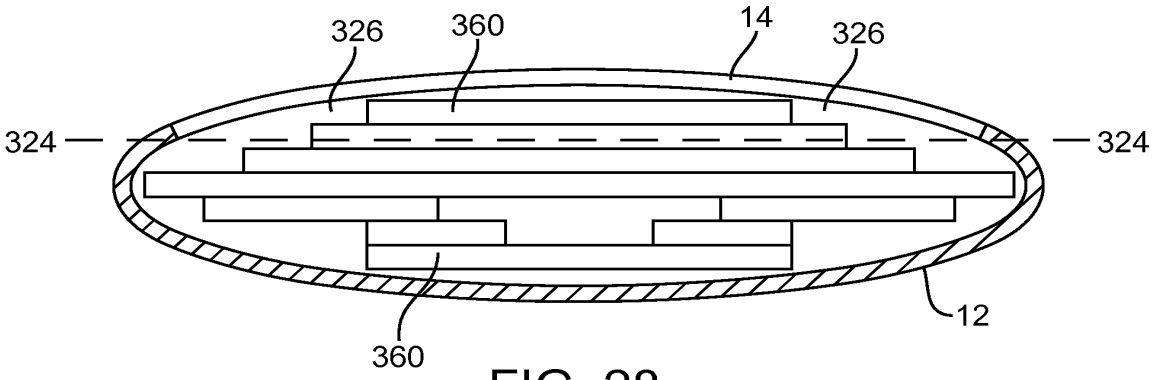

FIG. 28

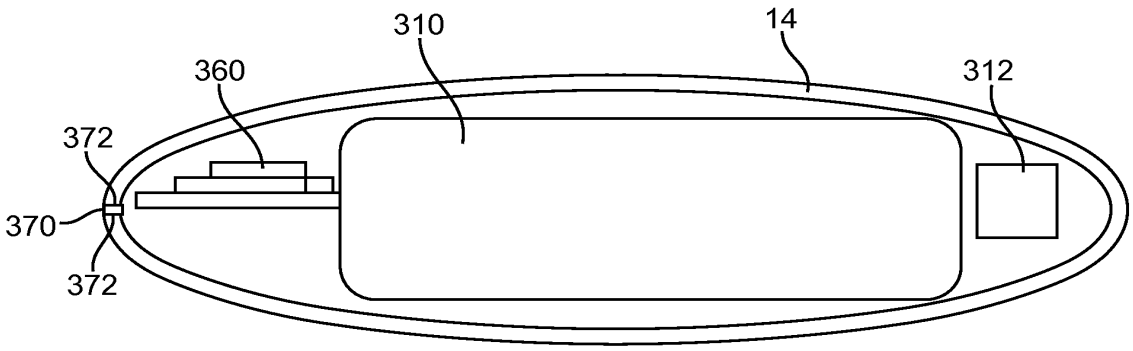

FIG. 29

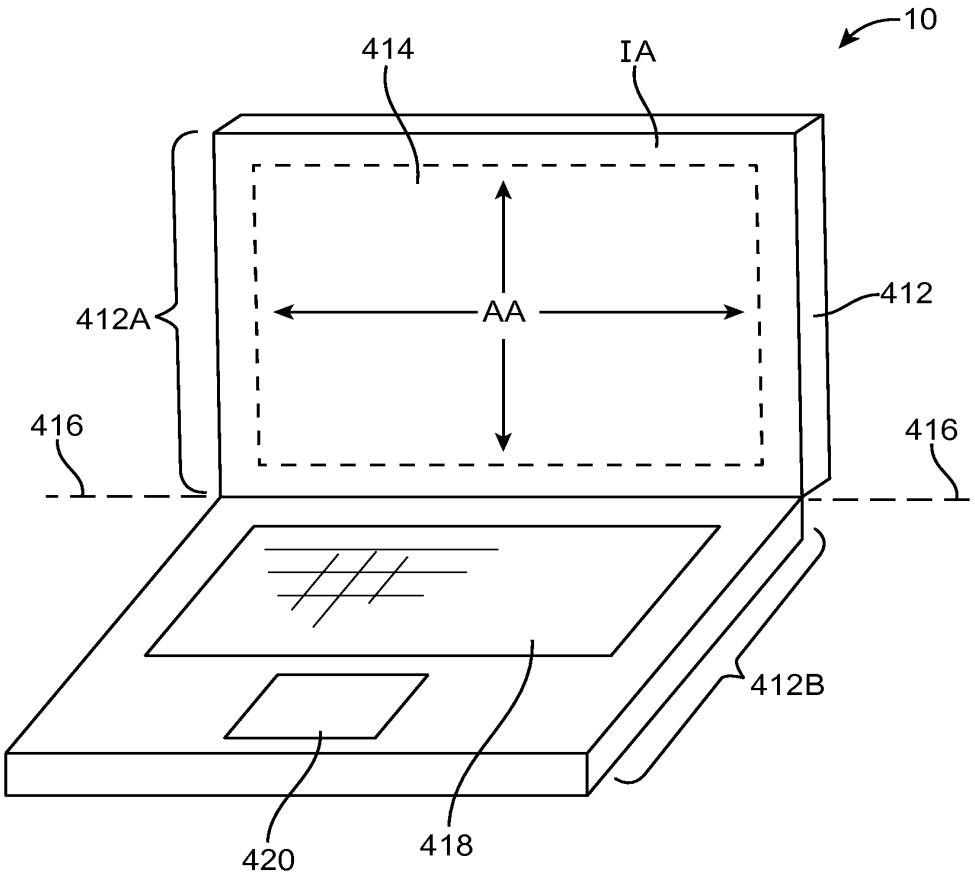

FIG. 30

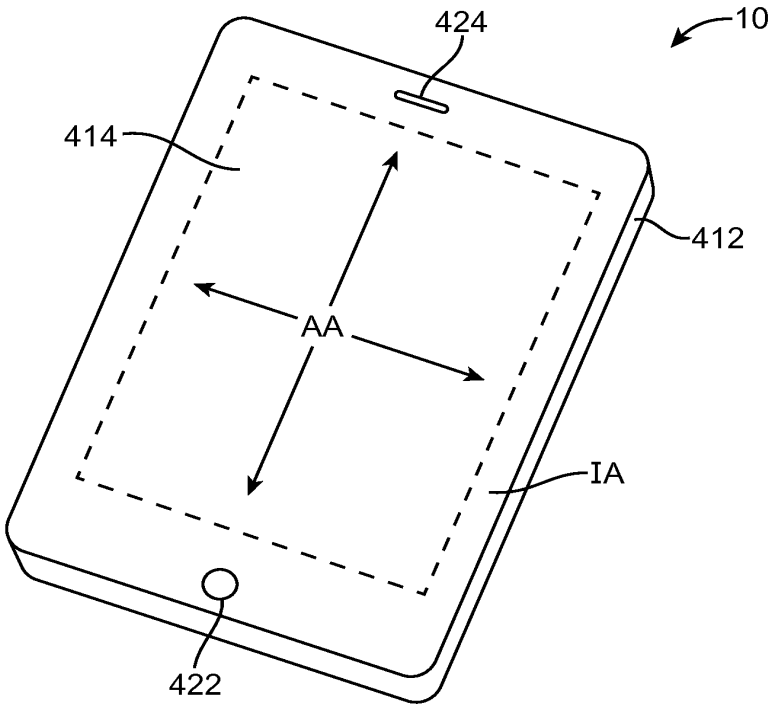

FIG. 31

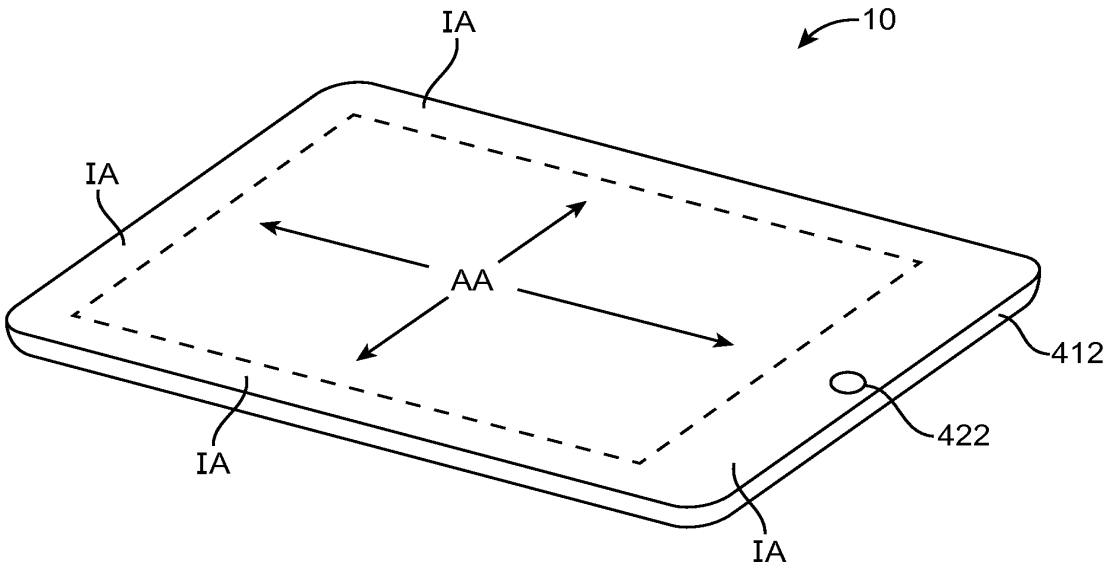

FIG. 32

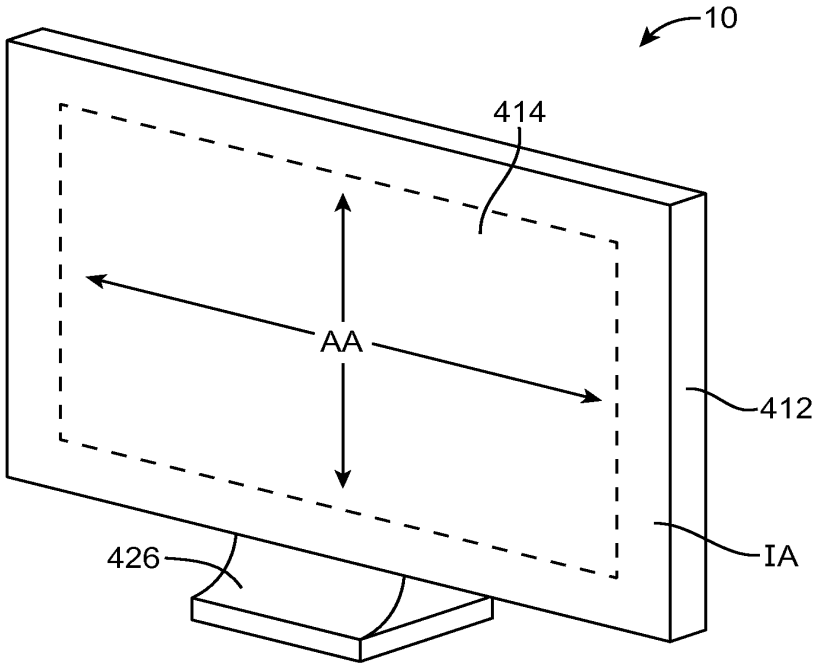

FIG. 33

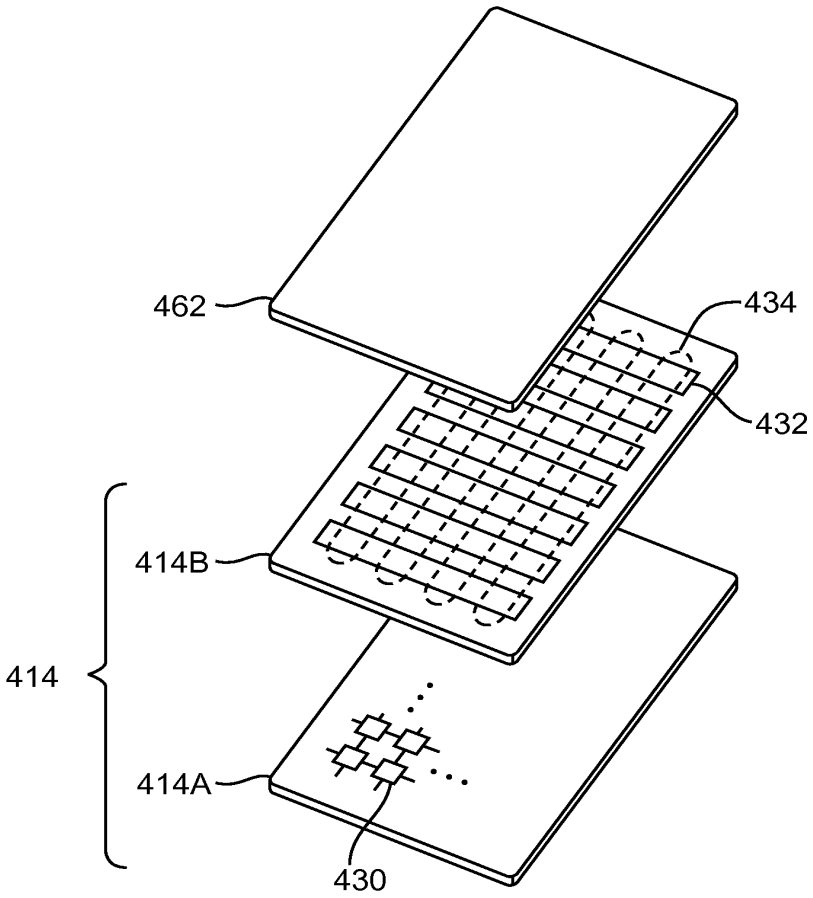

FIG. 34

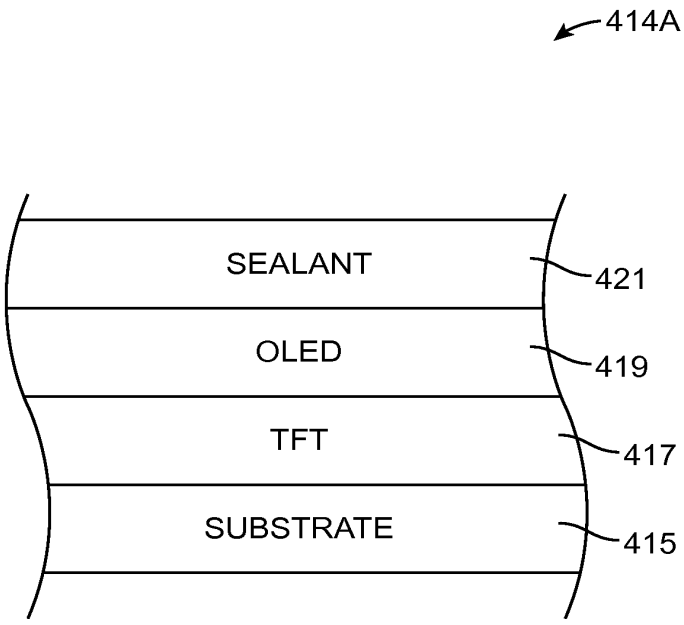

FIG. 35

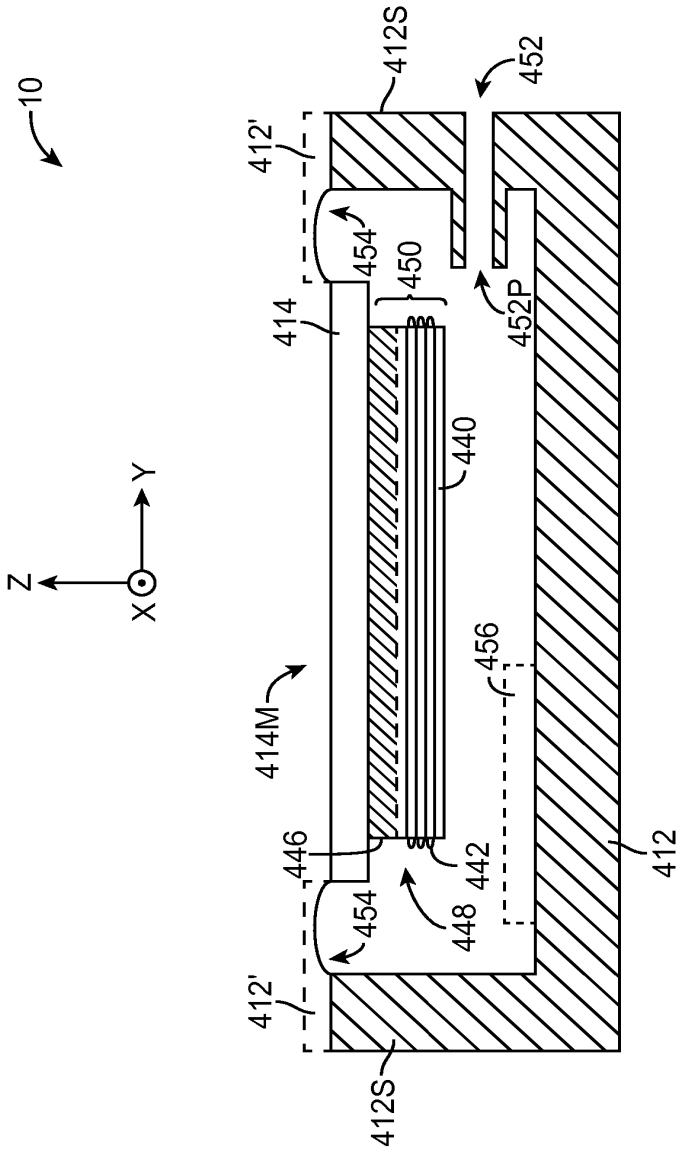
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FIG. 36

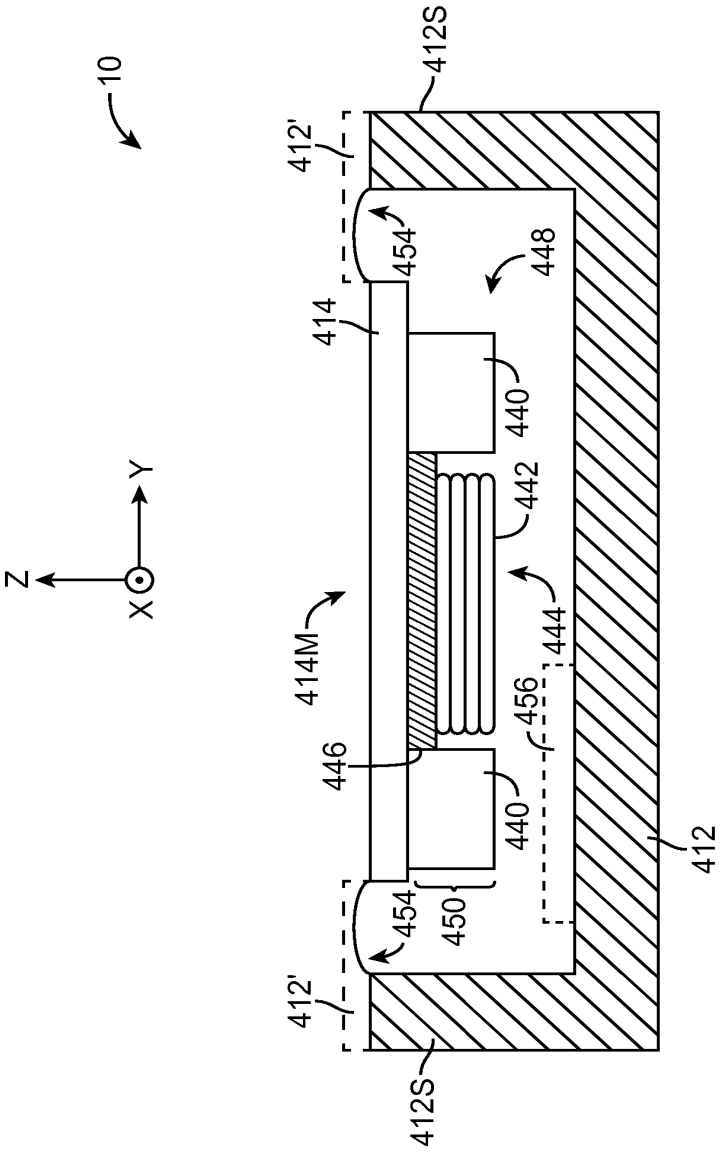
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FIG. 37

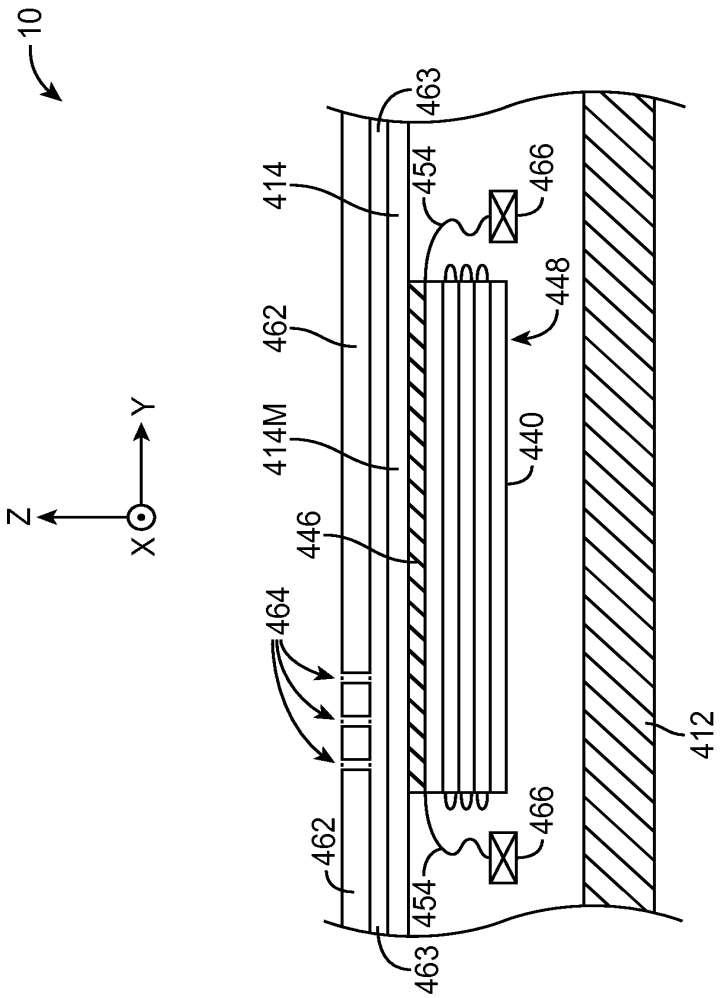
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FIG. 38

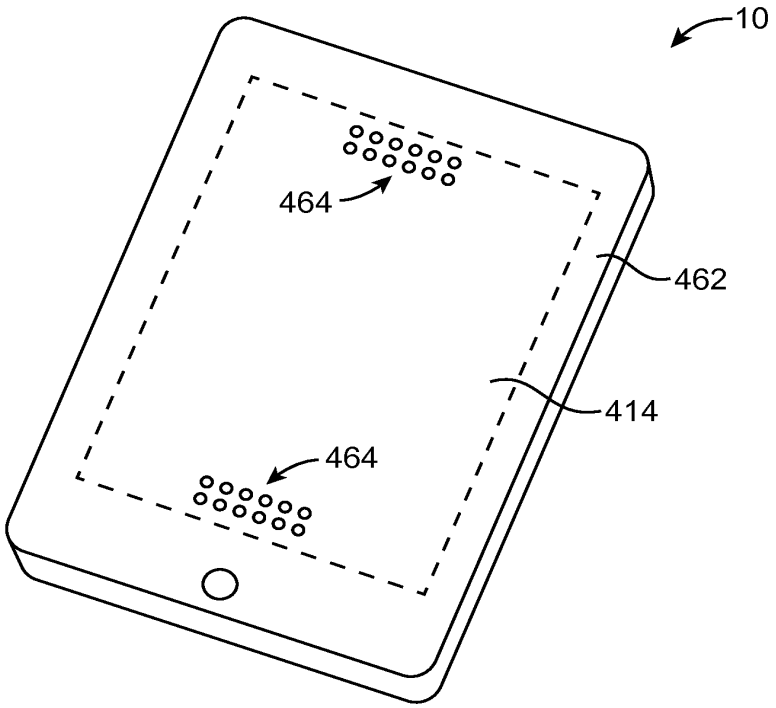

FIG. 39

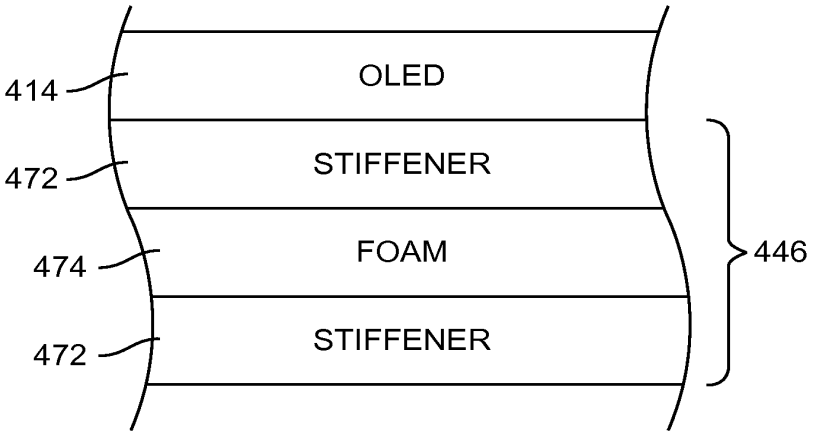

FIG. 40

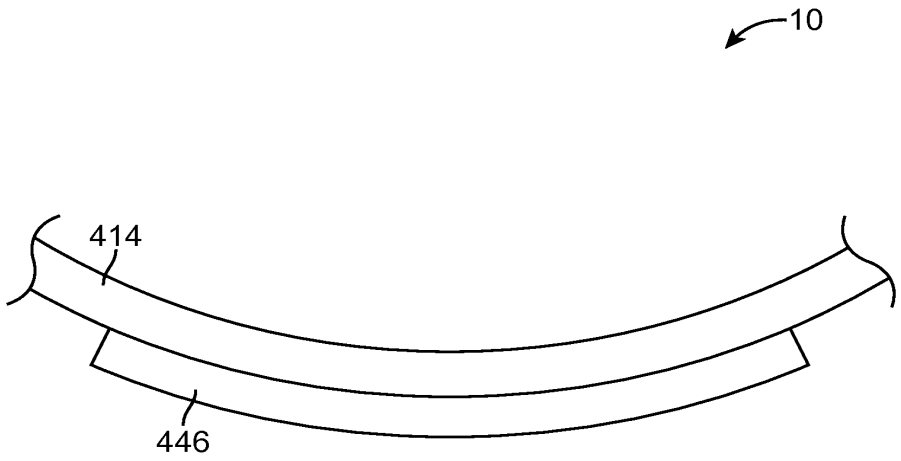

FIG. 41

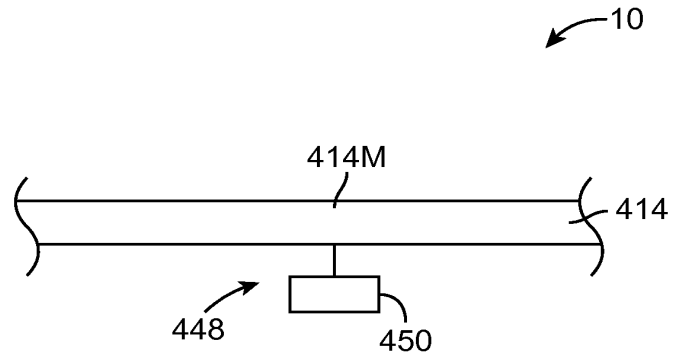

FIG. 42

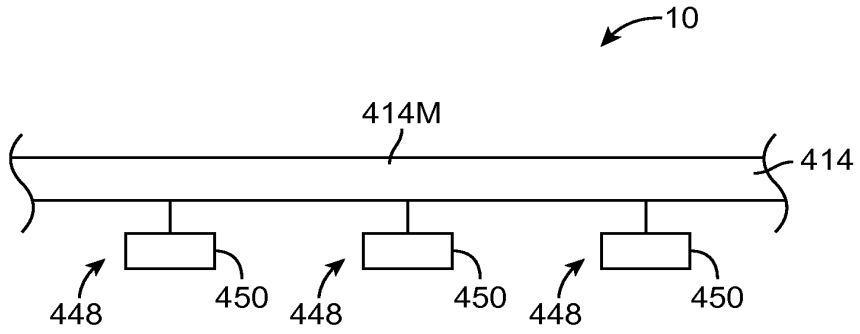

FIG. 43

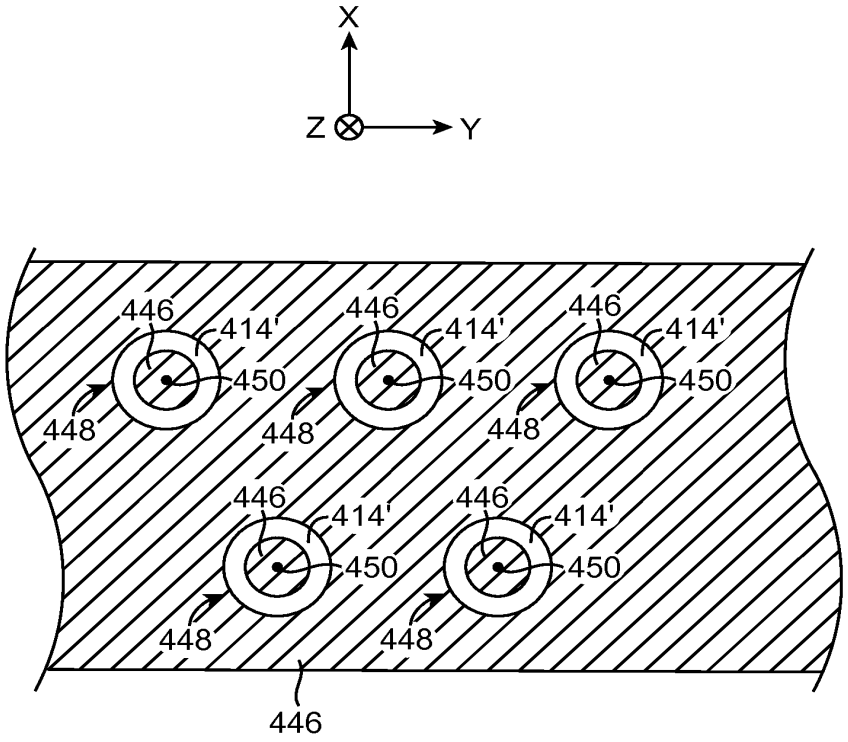
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FIG. 44

Electronic Acknowledgement Receipt	
EFS ID:	15044401
Application Number:	13312405
International Application Number:	
Confirmation Number:	6025
Title of Invention:	Two-Layer Sensor Stack
First Named Inventor/Applicant Name:	David Brent Guard
Customer Number:	12323
Filer:	Russell Clayton Gee/Paula Hurley
Filer Authorized By:	Russell Clayton Gee
Attorney Docket Number:	080900.1371
Receipt Date:	25-FEB-2013
Filing Date:	06-DEC-2011
Time Stamp:	17:45:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IDS_080900_1371.pdf	64755 0db82307a5dbd4e24461f4b45e42c314e67013df	no	1
Warnings:					
Information:					

2	Information Disclosure Statement (IDS) Form (SB08)	SB08_080900_1371.pdf	76764 c35a22892d85c1bda8a4453ee4c7829aeeaae1d8	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO_2012_129247.pdf	4285007 bc72f0894d8245fb68ef787739b6478d1890b4b4	no	142
Warnings:					
Information:					
		Total Files Size (in bytes):	4426526		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	David Brent Guard
Application No.:	13/312405
Filing Date:	6 December 2011
Art Unit:	2833
Confirmation No.:	6025
Title:	Two-Layer Sensor Stack

Information Disclosure Statement

Applicant submits this Information Disclosure Statement (IDS) under 37 C.F.R. § 1.97(b)(3). Applicant respectfully requests the Examiner to consider and cite in the examination of this Application the documents listed in the attached Form PTO/SB/08. Under 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not provided copies of U.S. patents or U.S. patent application publications.

Under 37 C.F.R. § 1.97(g), the filing of this IDS shall not be construed as a representation that a search has been made. Moreover, under 37 C.F.R. § 1.97(h), the filing of this IDS shall not be construed to be an admission that the information cited in this IDS is or is considered to be material to patentability as defined by 37 C.F.R. §1.56(b). Furthermore, the filing of this IDS shall not be construed to be an admission that any information cited in this IDS is or is considered to be prior art under 35 U.S.C. §§ 102-103.

The Commissioner may charge any fee due and credit any overpayment in this Patent Application to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

/Russell C. Gee/

Russell C. Gee
Reg. No. 62,178

Date: 25 February 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/312,405	12/06/2011	David Brent Guard	080900.1371

CONFIRMATION NO. 6025

12323
Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

PUBLICATION NOTICE

OC000000057149933

Title: Two-Layer Sensor Stack

Publication No.US-2012-0261242-A1
Publication Date:10/18/2012

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/312,405	12/06/2011	2629	1250	080900.1371	20	3

CONFIRMATION NO. 6025

12323
Baker Botts L.L.P.
2001 Ross Avenue, 6th Floor
Dallas, TX 75201

FILING RECEIPT

OC000000051535841

Date Mailed: 12/21/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

David Brent Guard, Hampshire, UNITED KINGDOM;
Esat Yilmaz, Santa Cruz, CA;
Tsung-Ching Wu, Saratoga, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 13/089,061 04/18/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 12/16/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/312,405**

Projected Publication Date: 10/18/2012

Non-Publication Request: No

Early Publication Request: No

Title

Two-Layer Sensor Stack

Preliminary Class

345

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/312,405

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE($)	FEE($)		RATE($)	FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	380
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	620
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	250
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 60 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1250

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/SB/08 **INFORMATION DISCLOSURE STATEMENT BY APPLICANT**	**Application Number:** Unassigned		**First Named Inventor:** David Brent Guard
	Attorney Docket No: 080900.1371	**Art Unit:** Unassigned	**Filing Date:** Herewith

ISSUED U.S. PATENTS AND PUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**FIRST NAMED INVENTOR**
	A	7,663,607	02-16-2010	Hotelling
	B	7,920,129	04-05-2011	Hotelling
	C	8,031,094	10-04-2011	Hotelling
	D	8,031,174	10-04-2011	Hamblin
	E	8,049,732	11-01-2011	Hotelling
UNPUBLISHED U.S. APPLICATIONS				
		DOCUMENT NUMBER	**FILING DATE**	**FIRST NAMED INVENTOR**
	F			
	G			
	H			
	I			

FOREIGN PATENT DOCUMENTS					
		DOCUMENT NUMBER	**PUBLICATION OR ISSUE DATE**	**COUNTRY**	**TRANSLATION (YES OR NO)**
	J				
	K				

NON-PATENT LITERATURE (NPL)			
		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)	**DATE**
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EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

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