

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIVECOR, INC.,
Petitioner

v.

APPLE INC.,
Patent Owner

Case No. IPR2023-00949

U.S. Patent No. 10,866,619 B2

**DECLARATION OF RONALD D. BERGER, M.D., Ph.D., F.H.R.S., IN
SUPPORT OF PETITION FOR INTER PARTES REVIEW OF
UNITED STATES PATENT NO. 10,866,619 B2**

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X. CONCLUSION..... 1

I, Ronald D. Berger, M.D., Ph.D., F.H.R.S., declare as follows:

I. INTRODUCTION

1. I have been retained by AliveCor, Inc. (“Petitioner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”) against Apple, Inc. (“Patent Owner”) regarding U.S. Patent No. 10,866,619 B2 (“the ’619 patent”) (Ex-1001).¹ I have been asked to submit this Declaration on behalf of Petitioner.

2. I have been asked to consider whether certain references disclose or render obvious the features recited in claims 11-20 (“the challenged claims”) of the ’619 patent. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art anticipates and/or renders obvious all limitations of the challenged claims, as I discuss in detail below.

3. I am being compensated at a rate of \$800 per hour for my work in this proceeding. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

¹ Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the ’619 patent.

4. All of my opinions stated in this Declaration are based on my own personal knowledge and professional judgment. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

5. I received a Bachelor of Science degree in Electrical Engineering and a Bachelor of Science degree in Computer Science from Massachusetts Institute of Technology in 1981. I received a Master of Science degree and a Ph.D. in Electrical Engineering and Computer Science from Massachusetts Institute of Technology in 1983 and 1987, respectively. I received a Doctor of Medicine from Harvard Medical School in 1987. A copy of my curriculum vitae is attached as Ex. 1021.

6. I am the Nicholas J. Fortuin, M.D. Professor in Cardiology and a Professor of Biomedical Engineering at Johns Hopkins University. I was a Fellow in Cardiology from 1990 to 1993. I joined the faculty at Johns Hopkins University in 1993 as an Assistant Professor of Medicine, and I was promoted to Associate Professor of Medicine in 1998. I also became an Associate Professor of Biomedical Engineering in 2002. In 2005, I was promoted to Professor. I am the Co-Director of Cardiac Electrophysiology, and I have had this role since 1996.

7. I have certifications in Clinical Cardiac Electrophysiology and Cardiovascular Disease from the American Board of Internal Medicine. My research interests include arrhythmia device development and arrhythmia mechanisms

8. As a professor, I have taught a variety of undergraduate and graduate courses that include electrocardiography, human pathophysiology, and skeletal muscle physiology.

9. I have trained seventy-seven Cardiac Electrophysiology Fellows, and I have mentored thirteen Research Fellows. The students whom I trained and mentored have gone on to take positions at a variety of academic institutions as well as leading medical centers and clinics.

10. I maintain a clinical practice, and over the past twenty years my clinical practice has occupied approximately half of my schedule. Patients under my care have a variety of cardiac conditions, including coronary artery disease. My practice involves a combination of in-patient and out-patient management and performing various arrhythmia related interventional procedures. I also instruct the interventional electrophysiology fellows at Johns Hopkins who go on to become the thought leaders in the field, both nationally and internationally.

11. I have authored more than 300 peer-reviewed articles, invited articles, reviews, editorials, and letters in the field of cardiology and related topics. These papers have been published in journals such as IEEE Transactions on Biomedical

Engineering, ESC Heart Failure Journal, the Heart Rhythm Journal, Frontiers in Physiology, the Journal of Cardiovascular Electrophysiology, the American Journal of Cardiology, Journals of the American College of Cardiology, and more.

12. I am a member of and have been actively involved in a number of professional organizations, including the American College of Cardiology, the American Heart Association, the Heart Rhythm Society, and the Institute of Electrical and Electronics Engineers.

13. I have also been appointed to the Editorial Boards of Circulation Research, Circulation Arrhythmia and Electrophysiology, Heart Rhythm, the Journal of Cardiovascular Electrophysiology, the Journal of Interventional Cardiac Electrophysiology, and PACE. I have been certified by the American Board of Internal Medicine, including in Cardiovascular Disease and Clinical Cardiac Electrophysiology, and have participated in numerous clinical trials relating to medical devices.

14. I have received several awards over the course of my career, including:

- Whitaker Health Sciences Fellow (1986-1987);
- A.H.A. Massachusetts Affiliate Research Fellow (1989-1990);
- Johns Hopkins University Solo Cup Clinician Scientist (1996-1998);
- N.I.H. FIRST Award Recipient (1996-2001);
- Cudahy Scholar of the Johns Hopkins University (1997-Present);

- Fellow, American College of Cardiology (1998-Present);
- Frank T. McClure Fellow of the Johns Hopkins Applied Physics Lab (2001-2003);

- Fellow, Heart Rhythm Society (2006-Present);
- Abell Foundation Award for Research Translation (2013);
- National Academy of Inventors, Johns Hopkins University chapter (2015);

and

- Endowed Chair, Nicholas J. Fortuin Professor in Cardiology (2019).

15. In 2021, I was elected a Fellow of the National Academy of Inventors.

III. MATERIALS REVIEWED

16. The opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge.

17. In forming my opinions expressed in this Declaration, I also reviewed the following materials and information:

Exhibit	Description
Ex-1001	U.S. Patent No. 10,866,619 B2 (“the ’619 patent”)
Ex-1002	Prosecution History of U.S. Patent No. 10,866,619 B2
Ex-1004	U.S. Patent No. 10,620,828 (“ <i>Kim</i> ”)
Ex-1005	U.S. Patent Pub. No. 2016/0100499 (“ <i>Jung</i> ”)
Ex-1006	U.S. Patent No. 9,651,513 (“ <i>Dunlap</i> ”)

Exhibit	Description
Ex-1007	U.S. Patent Pub. No. 2015/0071509 (“ <i>Meyers</i> ”)
Ex-1008	U.S. Patent No. 8,694,793 (“ <i>Evans</i> ”)
Ex-1009	U.S. Patent No. 6,131,464 (“ <i>Pare</i> ”)
Ex-1010	U.S. Patent No. 9,740,381 (“ <i>Chaudhri</i> ”)
Ex-1011	U.S. Patent Pub. No. 2015/0245514 (“ <i>Choung</i> ”)
Ex-1012	U.S. Patent No. 8,750,919 (“ <i>Hwang</i> ”)
Ex-1013	U.S. Patent No. 7,535,799 (“ <i>Polany</i> ”)
Ex-1014	U.S. Patent Pub. No. 2017/0099742 (“ <i>Choi</i> ”)
Ex-1015	U.S. Patent No. 10,133,910 (“ <i>Chang</i> ”)
Ex-1016	U.S. Patent No. 8,367,958 (“ <i>Mittleman</i> ”)
Ex-1017	U.S. Patent No. 7,486,517 (“ <i>Aapro</i> ”)
Ex-1018	U.S. Patent No. 9,973,669 (“ <i>Vittu</i> ”)
Ex-1019	U.S. Patent No. 9,973,840 (“ <i>Wagman</i> ”)
Ex-1020	U.S. Patent Pub. No. 2013/0108082 (“ <i>Dave</i> ”)
Ex-1021	Curriculum vitae of Dr. Ronald Berger
Ex-1022	KR 10-2016-0162565 (“ <i>Kim-KR</i> ”)
Ex-1023	KR 10-2018-0062654 (“ <i>Kim-KR-Pub.</i> ”)

18. I also reviewed any other materials I refer to in this Declaration in support of my opinions.

19. My opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would

have understood the state of the art, the prior art, and the claims and the specification of the '619 patent at the time of the alleged invention.

IV. LEGAL STANDARDS

20. AliveCor's attorneys have explained to me the legal standards that apply in this case. My understanding of those standards is described below. I am not an attorney, and I do not have formal training in the law regarding patents. I have used my understanding of the following legal principles set forth in this section in reaching my opinions.

21. I understand that, in this proceeding, AliveCor has the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Anticipation

22. I have been informed that a claim is invalid as anticipated under 35 U.S.C. § 102 (AIA) if a prior art reference discloses, either expressly or inherently, all limitations of a claim as those limitations are arranged in the claim.

23. I have been informed that a limitation is disclosed inherently in a reference if it is necessarily present in the process or product described in the prior art reference. I understand that probabilities or possibilities are insufficient to show that a prior art reference inherently discloses something beyond what it discloses explicitly.

B. Obviousness

24. I have been informed that a claim is invalid as obvious under 35 U.S.C. § 103 (AIA) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the art. I have been informed that the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

25. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

26. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it,

either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, such a variation is likely unpatentable. For the same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

27. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

28. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

29. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. I have been informed that it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I am told that one way that subject matter can be proved obvious is by noting there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

30. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

31. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the

product was likely not accomplished by innovation but by using ordinary skill and common sense. I have been informed that, in such an instance, the fact that the combination was obvious to try may show that the combination was obvious.

32. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

33. I have been informed that, when determining whether a claimed invention is obvious, any “secondary considerations” of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;
- the invention taught away from the technical direction followed by those skilled in the art;
- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;

- the invention achieves results unexpected to those skilled in the art;
- copying of the invention by competitors as distinguished from their independent development
- unsuccessful attempts by those skilled in the art to make the invention;
- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

34. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

C. Claim Construction

35. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill

in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the '619 patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record. I have further been informed that these sources of evidence are often referred to as “intrinsic evidence” or the “intrinsic record” of the patent. I have further been informed that the claims must be read in light of the specification. I have further been informed that extrinsic evidence such as expert or inventor testimony, dictionary definitions, and prior art publications can also be considered but are given less weight than the intrinsic evidence.

36. I have been informed that a patent specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s “lexicography” governs. In other cases, the specification may reveal an intentional disclaimer, or clear disavowal, of claim scope by the inventor. In that instance as well, I have been informed and understand that the inventor has dictated the correct claim scope, and the inventor’s intention, as expressed in the specification, governs.

V. PERSON OF ORDINARY SKILL IN THE ART AND THE TIME OF THE ALLEGED INVENTION

37. I have been asked to assume that the '619 patent is entitled to its earliest alleged priority date of June 19, 2017 (*see* Ex-1001, [22]). Based on my knowledge and experience, I was a person of ordinary skill in the art as of June 19, 2017, and I can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

38. Based on the materials and information I have reviewed, and based on my experience in the technical areas relevant to the '619 patent, a person of ordinary skill in the art at the time of the alleged invention of the '619 patent would have been a person with a working knowledge of physiological monitoring technologies. That person would have had a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information, including but not limited to physiological monitoring technologies. Alternatively, that person could have also had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline. More education can supplement practical experience and vice versa. I myself had these capabilities at the time of the alleged invention of the '619 patent.

VI. TECHNICAL BACKGROUND

39. Below, I present a brief overview of certain technical concepts and features that would have been known to a person of ordinary skill in the art prior to and at the time of the earliest alleged priority date of the '619 patent. The technical concepts and features that I describe in this Technical Background section reflect the state of the art that a person of ordinary skill in the art would have had knowledge of and would have understood prior to and at the time of the alleged invention of the '619 patent. I rely on, and incorporate as applicable (even if not expressly mentioned below in Section VIII.C), the following disclosures to support my opinions in this Declaration, including those opinions relating to how the prior art discloses and/or suggests the challenged claims of the '619 patent and how (and why) a person of ordinary skill in the art would have been motivated to consider and combine the disclosures and suggestions from one or more prior art references.

A. Biometric Sensors

40. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have been very familiar with biometric sensors, which include fingerprint sensors. For example, *Evans* (Ex-1008) is based on an application filed on December 11, 2007 (Ex-1008, Face at Item (22)). *Evans* discloses that “[b]iometric input apparatus and related technology are well known in the art, including those described in U.S. Pat. No. 6,131,464” (Ex-1008, 5:32-34),

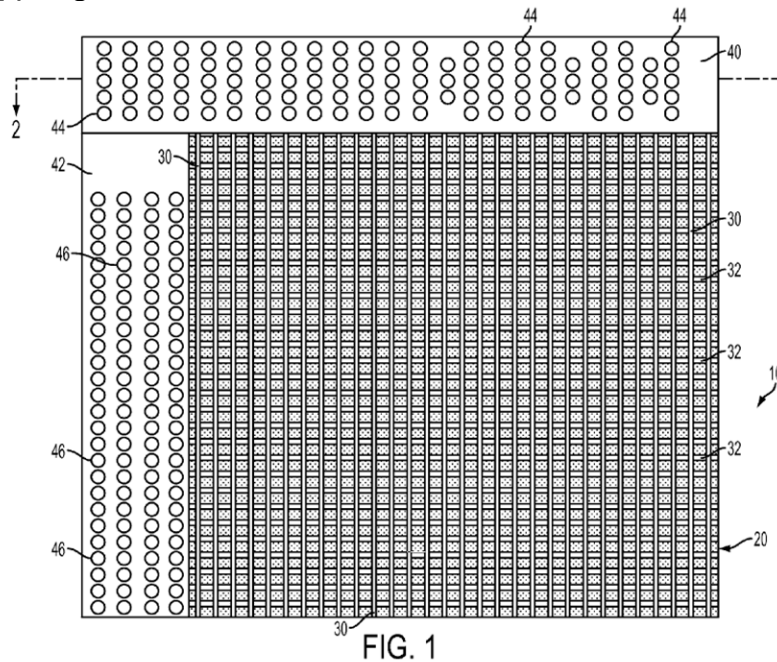
which is the *Pare* patent (Ex-1009). *Pare* further discloses that “[b]iometric scanners and in particular finger image scanners are used to identify an individual from their unique characteristics in order to provide secured access to computer systems, secured areas, electronic communications, and electronic financial transactions” (Ex-1009, 1:5-9). As another example, *Dunlap* (Ex-1006) is based on an application filed on October 9, 2013 (Ex-1006, Face at Item (22)), and it claims priority to applications filed on October 14, 2012 and January 18, 2013 (Ex-1006, Face at Item (60)). *Dunlap* discloses that “Biometric sensors and imagers, including, e.g., fingerprint sensors and imagers like those disclosed in the present application are known in the art . . .” (Ex-1006, 1:16-18). Thus, a person of ordinary skill in the art would have known that biometric sensors would include fingerprint sensors.

41. A person of ordinary skill in the art would also have known that fingerprint sensors detect ridges and grooves of a user’s finger. For example, *Pare* discloses:

In general finger image identification is accomplished by matching a bid finger image against a reference finger image. This is done by creating a ‘template’ of each image by analyzing the ridges and valleys, and then comparing the two templates to determine if they are similar enough to effect either a successful or failed identification of an individual. In a good quality finger image, the majority of the image surface area consists of ridges that appear as dark lines and valleys that appear as lighter areas.

(Ex-1009, 1:10-19.)

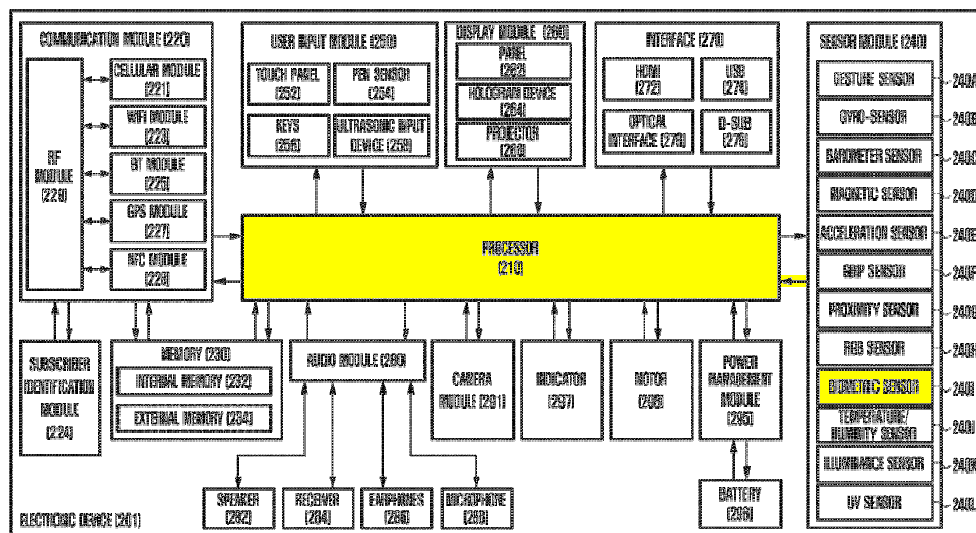
42. Capacitive fingerprint sensors were also known to be implemented with an array of capacitive sensing elements. For example, *Chaudhri* (Ex-1009) is assigned to Apple and is based on an application filed on September 20, 2016 (Ex-1009, Face at Items (73), (22)). *Chaudhri* discloses that a “biometric sensor is a capacitive fingerprint sensor that captures at least one fingerprint when a user’s finger (or fingers) approaches and/or contacts the cover element 222” (Ex-1009, 43:45-49). As another example, *Dunlap*’s Figure 1 (shown below) discloses “an internal portion of a two dimensional (‘2D’) fingerprint sensor array package/housing” (Ex-1006, 4:33-36. “As is *well known* in the art,” the “two dimensional grid array capacitive gap biometric sensor” includes “pixel locations where the presence of the finger creates variations in the receive signal response to the transmitted signal, mostly due to variations in the capacitive coupling of the two through the finger near the top of the sensor 10 due to capacitive differences between the presence of a fingerprint valley or ridge in the vicinity of the given pixel location” (Ex-1006, 2:50-51, 8:36-43 (emphasis added)).

Ex-1006 (Dunlap), Fig. 1

43. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have known that a biometric sensor (e.g., a fingerprint sensor) outputs an electrical signal that should be electrically connected to an integrated circuit or processor. For example, *Dunlap* further discloses that the disclosed "two dimensional grid array capacitive gap biometric sensor" (which was discussed earlier) includes "connection vias in at least the first layer . . . electrically connecting the signal traces [of the fingerprint sensor] . . . to respective circuitry . . . contained in an integrated circuit physically and electrically connected to one of the first layer," (Ex-1006, 2:28-41, 2:50-51). As another example, *Chaudhri* discloses "a first circuit layer 226 [that] includes a biometric sensor 228," where "the first circuit layer 226 can include one or more circuits, signal lines, and/or integrated

circuits” (Ex-1009, 43:39-45). As another example, *Jung* (Ex-1005) is based on an application filed on October 6, 2015, and it claims priority to an application filed on October 6, 2014 (Ex-1005, Face at Items (22), (30)). *Jung*’s Figure 2 (shown below) discloses “a biometric sensor 240I” that “convert[s] the measured or sensed information to an electrical signal” and is electrically connected to a processor (210):

Ex-1005 (Jung), Fig. 2 (annotated)



44. Prior to the ’619 patent’s earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would also know that sensitive electronic components (such as capacitive fingerprint sensors) should be electrically isolated. For example, *Meyers* teaches that a “ground ring 114 can be used to shield electromagnetic effects, with the effect of providing capacitance isolation or other electromagnetic isolation” (Ex-1007, ¶[0044]). Likewise, *Dunlap* teaches:

In configurations where the conductive traces are positioned on the top side of the flex 1136, a protective coating can be applied to the upper surface 1136 of the flex substrate 1132 itself, over the image sensor and velocity sensor to provide electrical isolation and mechanical protection of the sensors. Alternatively, conductive traces of an image sensor can be formed on a bottom-side 1138 of a substrate 1132, wherein the substrate 1132 of the flex circuit 1130 acts as a protective coating and can be further improved with a hard coating applied to the upper surface 1136 of the flex circuit 1130 itself.

(Ex-1006, 12:27-37).

45. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have also known that a common way to electrically connect a biometric sensor (*e.g.*, a fingerprint sensor) and a processor was with a flexible conduit, such as a flexible printed circuit board ("PCB"). For example, *Dunlap* discloses that "the biometric sensor further can comprise a flexible circuit substrate and at least one conductive trace connecting the biometric sensor to the integrated circuit" (Ex-1006, 3:22-24). As another example, *Choung* (Ex-1011) is based on an application filed on February 20, 2015, and it claims priority to an application filed on February 21, 2014 (Ex-1011, Face at Items (22), (30)). *Choung* discloses that a "fingerprint recognition sensor can include a Flexible Printed Circuit Board (hereinafter, referred to as 'FPCB') to be electrically connected to other components of the electronic device" (Ex-1011, [0055]).

46. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have also known that flexible PCBs should be used in mobile devices, which have relatively smaller volume and profile. For example, *Hwang* (Ex-1012) is based on an application filed on June 7, 2010, and it claims priority to an application filed on July 6, 2009 (Ex-1012, Face at Items (22), (30)). *Hwang* discloses that as a "mobile terminal becomes smaller, a Flexible Printed Circuit Board (FPCB) may be used to connect [electrical components] . . . of the mobile terminal and transmit and receive electrical signals including various data therebetween to effectively utilize internal space of the mobile terminal" (Ex-1012, 1:31-37).

B. Sealing of Button Assemblies and Biometric Sensors

47. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have known that a mobile electronic device could include one or more button assemblies in a sidewall. For example, *Polany* (Ex-1013) is based on an application filed on October 27, 2011, and it claims priority to an application filed on September 9, 2005 (Ex-1013, Face at Items (73), (22)). *Polany* discloses "a personal portable audio device" with buttons (1315-1318) along the sidewall of the device (Ex-1013, 4:40, 19:42-20:4, Figs. 13B, 17, 19A, 19B). A person of ordinary skill in the art would also have known that the button assemblies would include input members with input surfaces. For example, *Polany* discloses

that the buttons (1315-1318) along the sidewall of the device included structures and surfaces that could be manually pressed by a user (Ex-1013, 4:40, 19:42-20:4, Figs. 13B, 17, 19A, 19B).

48. Prior to the '619 patent's earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would also have known that button assemblies in mobile electronic devices should be sealed in order to prevent ingress of potentially damaging moisture and dust. For example, *Choi* (Ex-1014) is based on an application filed on September 22, 2016, and it claims priority to applications filed on December 23, 2015 and July 18, 2016 (Ex-1014, Face at Items (22), (30)). *Choi* discloses that a mobile "electronic device may include a seal member disposed therein for a water proof function" (Ex-1014, [0004]). *Choi* further discloses that the "waterproof function is very important, particularly for an electronic device that is miniaturized and universally carried by a user" (Ex-1014, [0004]). As another example, *Chang* (Ex-1015) is based on an application filed on January 20, 2017, and it claims priority to an application filed on January 21, 2016 (Ex-1015, Face at Items (22), (30)). *Chang* discloses that "as users' needs for portable terminals have been gradually diversified, a [home] key [button] used in the portable terminals includes a waterproof structure in order to prevent a fluid from infiltrating into the interior of the portable terminals" (Ex-1015, 1:32-35). As another example, *Choung* discloses that a "waterproof member formed of rubber or silicon through insert injection-

molding can be provided in the [flexible printed circuit board (FPCB)] to waterproof the FPCB” (Ex-1011, [0055]). *Choung* continues, “the FPCB including the waterproof member can be attached and coupled to the case of the electronic device through interference-fitting, and accordingly moisture introduced into the electronic device through the FPCB can be prevented” (Ex-1011, [0055]).

49. Prior to the ’619 patent’s earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would also have known that it was important to seal a fingerprint sensor because fingers can introduce potentially damaging moisture and dust. For example, *Evans* discloses that “[f]ingerprints may be deposited in natural secretions from the eccrine glands present in friction ridge skin (secretions consisting primarily of water) . . .” (Ex-1008, 6:67-7:2). Sealing a fingerprint sensor prevents ingress of contaminants that could potentially damage a fingerprint sensor’s electronic circuitry.

50. Prior to the ’619 patent’s earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would also have known that common techniques to add a seal were to use a rubber gasket and/or a pressure sensitive adhesive (PSA) layer. For example, *Choi* discloses “seal members” that “may include *at least* one of tape, adhesive, waterproof dispensing, silicon, water proof rubber, and urethane,” as well as a “gasket” (Ex-1014, [0086], [0216]) (emphasis added). As another example, *Mittleman* (Ex-1016), which is assigned to Apple, is based on an application filed

on February 17, 2011, and claims priority to an application filed on May 1, 2008 (Ex-1016, Face at Items (73), (22), (63)). *Mittleman* discloses that an “[a]dhesive 126” for use in a mobile device button assembly “may be formed of any suitable adhesive material[,] such as two-sided pressure sensitive adhesive film (double sided tape), an adhesive without film backing, etc.” (Ex-1016, 8:9-12).

51. Prior to the ’619 patent’s earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have known that overmolding refers to a technique in which a one material is molded over a substrate, often by injection. For example, *Aapro* (Ex-1017) is based on an application filed on January 20, 2017, and it claims priority to an application filed on January 21, 2016 (Ex-1017, Face at Items (22), (30)). *Aapro* discloses “a method for manufacturing a hand-held portable electronic device frame assembly” that includes “overmolding a frame member onto the heat spreader in the injection molding device . . .” (Ex-1017, 2:9-19). As another example, *Vittu* (Ex-1018), which is assigned to Apple and is based on an application filed on August 28, 2017 (Ex-1018, Face at Items (73), (22)). *Vittu* discloses “an overmolding or injection molding process in which a mold material (*e.g.*, epoxy resin) is injected around the components and then cured” to create an overmolded component (Ex-1018, 9:43-49). *Vittu* further discloses that the overmolding process occurs when “a mold material 606 (*e.g.* an epoxy resin or the like) is injected, poured or otherwise loaded into the space between mold cope 504/protective film 502 and

carrier 302/adhesive layer 304 such that it surrounds” a component (Ex-1018, 13:3-11; *see also* 7:44-48 (disclosing that the “overmolding or injection molding process” is achieved by injecting a “mold material” into a “mold cope” that encloses a component). *Vittu* further discloses that “[o]nce injected, the mold material 606 may be cured (such as by a heat) so that it forms a hard casing or overmold around” the component (Ex-1018, 13:3-11).

52. A person of ordinary skill in the art would also have known that another common technique to add a seal was to use an overmolding process. For example, *Wagman* (Ex-1019) is assigned to Apple, is based on an application filed on September 22, 2016, and claims priority to applications that were filed on September 30, 2015 and September 6, 2016 (Ex-1019, Face at Items (73), (22), (60)). *Wagman* discloses that components “can be sealed by an overmolded portion 2830 so they are liquid-tight” (Ex-1019, 39:44-46; *see also* 40:26-32 (disclosing components that “can then be overmolded with dielectric overmold portion 2975,” “forming a liquid-tight seal”). As another example, *Dave* (Ex-1020) is assigned to Apple and is based on an application filed on October 27, 2011 (Ex-1020, Face at Items (73), (22)). *Dave* discloses “hard material 46 around a boot of soft material (e.g., overmolded silicon or rubber) . . . that engages or forms a friction seal onto the surface” (Ex-1020, [0052]; *see also* [0048], [0050] (disclosing a “metal ring 40 that is overmolded . . . with soft material 41 that engage[s] or form[s] a friction seal onto the surface)).

As another example, *Polany* discloses that “[o]ne skilled the art would recognize many different methods of fastening a control feature into the housing, such as, but not limited to, screw, bolts, snap fit components, adhesives, press fits, co-molded components, overmolded components, ultrasonically welded components, rotational fits, wedge fits, and other manufacturing means of effecting the assembly of components” (Ex-1013, 21:5-11, 21:31-37).

C. Tactile Dome Switches

53. Prior to the ’619 patent’s earliest alleged priority date of June 19, 2017, a person of ordinary skill in the art would have known that a tactile dome switch operates by transferring pressure from a physical input to an electronic sensor. For example, *Chang* (Ex-1015), teaches that a “dome switch 900 may include an elastic material, and may transfer a pressure” (Ex-1015, 15:40-51). *Chang* explains that “[f]or example, when the button structure 400 receives the pressure from the top side in the outside, [it] may transfer the pressure to the dome switch 900 while coming in contact with the dome switch 900” (Ex-1015, 15:40-51).

54. Likewise, a person of ordinary skill in the art would understand that during operation of a dome switch, “the shape of the dome switch 900 is partially elastically deformed so that the pressure may be transferred to the printed circuit part 901” (Ex-1015, 15:40-51). “[W]hen the shape of the dome switch 900 is partially elastically deformed to transfer the pressure to the printed circuit board 901, an

electric signal corresponding to the pressure may be generated to be transferred to an electronic component within the space” (Ex-1015, 15:64-16:11). “When the pressure transferred from the outside disappears, the dome switch 900 may recover the sound dome shape again” (Ex-1015, 15:40-51).

55. Based on the standard operation of a dome switch, as described above, a person of ordinary skill in the art would understand that a dome switch can operate in one of two ways. Either (1) a surface or structure must contact the dome switch in response to a physical input, and compress the dome switch, or (2) the dome switch itself must move in response to the physical input, and compress against another surface.

VII. SUMMARY OF THE '619 PATENT

A. The '619 Patent's Specification

56. The '619 patent relates generally to an electronic device with a biometric button assembly (*see* Ex-1001, Abstract). According to the specification's “Background” section, many traditional buttons were (1) unable to sense biometric characteristics, and (2) were difficult to seal against liquid and other contaminants (Ex-1001, 1:14-22). The '619 patent purported to solve these problems by describing and claiming “a button with a biometric sensor” having a “flexible conduit” that “cooperates with a seal to restrict ingress of contaminants into the electronic device”

(Ex-1001, 4:18-28). The '619 Patent's Figure 2A (shown below) discloses an embodiment of the purported invention:

Ex-1001, Fig. 2A

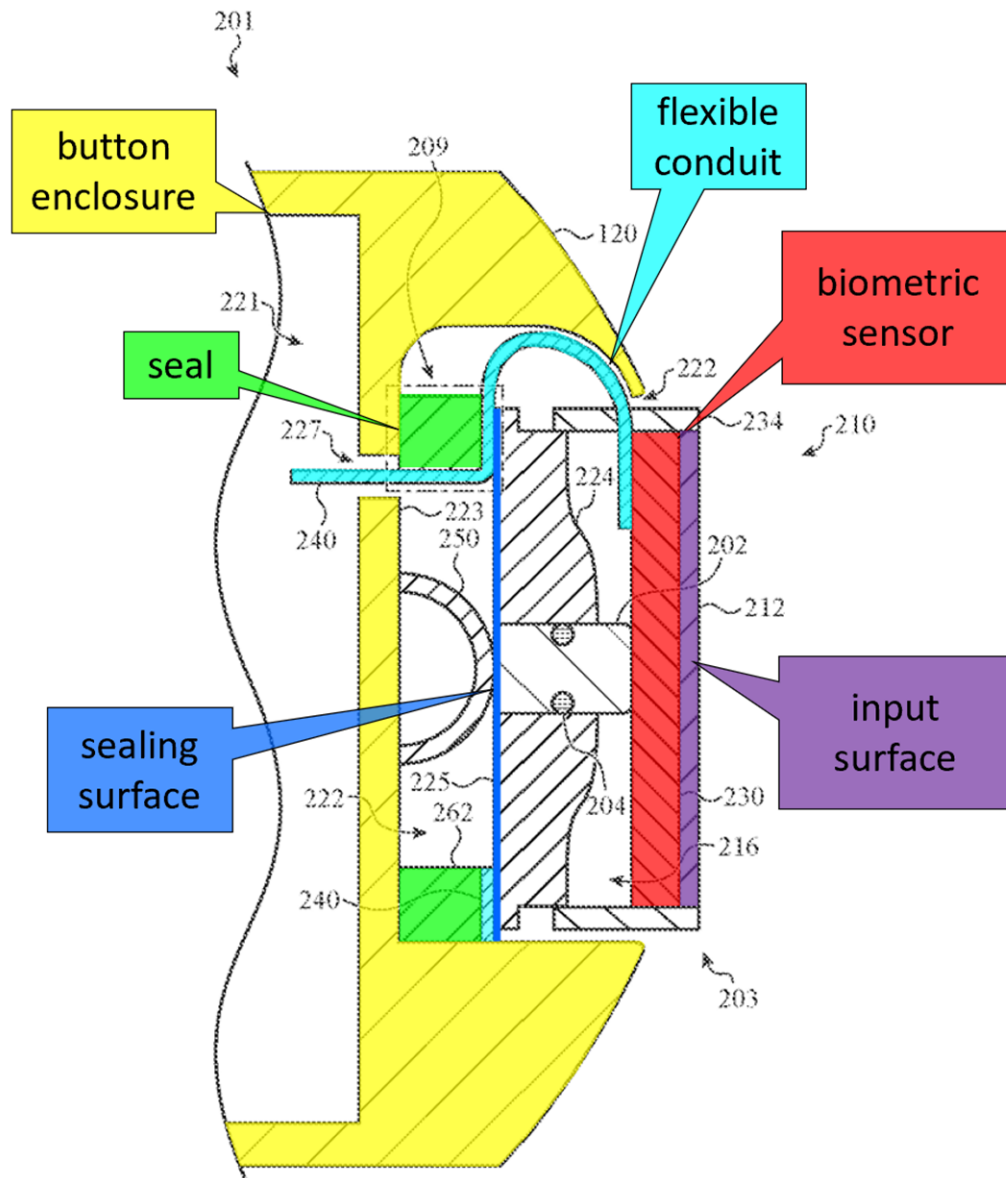


FIG. 2A

57. Figure 2A is a cross-sectional view of “biometric button assembly 210” (Ex-1001, 8:14-23). Figure 2 further discloses that the “biometric button assembly

210 is disposed in an opening of an enclosure 120” (annotated in yellow). In addition, “[t]he biometric button assembly 210 is configured to move or displace in response to an input to the input surface 212, *e.g.*, a user touch to the input surface” (annotated in purple) (Ex-1001, 8:24-34). Behind the “input surface 212” is a “biometric sensor 230” (highlighted in red), for example a fingerprint sensor that “produces an output signal in response to a user input . . . such as a user touch” (Ex-1001, 3:63-4:17). Figure 2A also discloses the “flexible conduit 240” (highlighted in teal) (Ex-1001, 9:11-16). This component “receives the output signal of the biometric sensor 230 and provides the output signal to the processor of the electronic device 100” (Ex-1001, 9:11-16).

58. As explained earlier, the purported invention of the ’619 patent involves using the “flexible conduit” to “form part of a seal that blocks or inhibits the ingress of foreign debris or contaminants into the enclosure” (Ex-1001, 5:53-60). Specifically, Figure 2A discloses that “[t]he flexible conduit 240 portion stacked on top of the seal 262” (highlighted in green) is “disposed below a sealing surface 225” (highlighted in blue) “of the button assembly 210” (Ex-1001, 11:16-31). But “[o]ther configurations of the seal region 209 are possible. For example, a portion of the flexible conduit 240 may be positioned below the seal 262, such that a stack is formed of seal 262 then flexible conduit 240” (Ex-1001, 9:45-57). In this configuration, the “flexible conduit 240” “may form part of a seal that blocks or

inhibits the ingress of foreign debris or contaminants into the enclosure” (Ex-1001, 5:53-60).

59. Furthermore, in “the illustrated embodiment” of Figure 2A, “the electronic device 100 is implemented as a wearable computing device (e.g., an electronic watch)” (Ex-1001, 5:61-6:2). According to the specification, however, “it should be appreciated that any number of electronic devices may incorporate a biometric button assembly, including (but not limited to): computers, personal digital assistants, media players, laptops, other wearable devices, touch-sensitive devices, keypads, keyboards, and so on” (Ex-1001, 8:8-13).

B. The ’619 Patent’s Prosecution History

60. In this Section, I summarize parts of the ’619 patent’s prosecution history. This summary is not intended to address or summarize the ’619 patent’s entire prosecution history; rather, it is intended to summarize the parts that are relevant to my analysis below.

61. U.S. Patent Appl. No. 15/627,336 was filed on June 19, 2017. Ex-1001, Cover. The Examiner initially rejected all pending claims under §§ 102 and 103 in view of U.S. Patent No. 9,972,459 (“*Hill*”) and U.S. Patent Pub. No. 2016/0098016 (“*Ely*”) prior art references (Ex-1002, 144-153). After that, the Applicant and Examiner conducted a telephonic interview (Ex-1002, 162-164). In the summary of that interview, the Examiner stated that “[p]ossible amendments further defining the

relationship between the sealing surface, the flexible conduit and the portion of flexible conduit were discussed” (Ex-1002, 163). In response, the Applicant amended pending claims 1, 11, and 16 to state that a portion of the flexible conduit was “sandwiched” between either (1) the seal and the sealing surface or (2) the seal and the enclosure (Ex-1002, 165-178). As an example, pending claim 1 is reproduced below to illustrate the Applicant’s amendment.

Ex-1002, 168

1. (Currently Amended) An electronic device comprising:
- an enclosure having an enclosed volume and an opening formed in a sidewall;
 - a processor positioned in the enclosed volume;
 - a button assembly within the opening, the button assembly comprising:
 - an input member having an input surface; and
 - a biometric sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a biometric characteristic;
 - a seal positioned between a sealing surface of the button assembly and the enclosure; and
 - a flexible conduit coupled to the biometric sensor and configured to transmit the output signal to the processor; wherein:
 - a portion of the flexible conduit is ~~disposed~~ sandwiched between the seal and the sealing surface or between the seal and the enclosure.

62. The applicant also amended pending claim 16 to incorporate the following limitations from then-pending claims 17 and 18:

- a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor; and

- a seal positioned between the button housing and a surface of the opening.

(Ex-1002, 172-173).

63. Pending claim 16 (as amended) is reproduced below:

Ex-1002, 172

16. (Currently Amended) A watch comprising:

an enclosure defining an enclosed volume and an opening formed in a sidewall;

a processor disposed in the enclosed volume;

a display positioned within the enclosure and operably coupled to the processor;

a watchband attached to the enclosure and configured to couple the watch to a user; and

a button assembly disposed within the opening, the button assembly comprising:

a button housing;

an input member with an input surface;

a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint; ~~and~~

a touch sensor configured to detect the touch;

a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor; and

a seal positioned between the button housing and a surface of the opening;

wherein a portion of the flexible conduit is sandwiched between the seal and the button housing or between the seal and the surface of the opening.

VIII. SUMMARY OF THE PRIOR ART

A. *Kim* (Ex-1004); *Kim-KR* (Ex-1022)

64. United States Patent No. 10,620,828 (“*Kim*”) is titled “Electronic Device Having Combined Button.”

65. I have been informed that I should assume *Kim* is afforded its earliest alleged priority date of Dec. 1, 2016 (Ex-1004, Cover). I have also been informed that I should assume *Kim* is prior art under at least 35 U.S.C. § 102(a) (AIA).

66. *Kim* claims priority to Korean patent application number 10-2016-0162565 (Ex-1022) (“*Kim-KR*”). *Kim-KR* has a filing date of December 1, 2016 (Ex-1022, Cover). A certified translation of *Kim-KR* is also included in Exhibit 1022.² I also understand that in order to claim the benefit of *Kim-KR*, the subject matter relied upon in *Kim* must have been described in *Kim-KR*. Accordingly, I have been asked to provide a table comparing the disclosures of *Kim* that are relied on in the petition with the corresponding disclosures of *Kim-KR*. This table is included below in Appendix A.

² *Kim-KR* was published without substantive edits on June 11, 2018. A copy of the publication (KR 10-2018-0062654), as well as a certified translation thereof is included as Ex-1023 (“*Kim-KR-Pub.*”).

67. Citations to both Kim and the certified translation of *Kim-KR* are also provided throughout my analysis below. Because the disclosure in Kim that I (and Petitioner) rely on were previously described in *Kim-KR*, I understand that *Kim* is entitled to claim the benefit of its Korean parent and qualifies as prior art.

68. Throughout this declaration, where I discuss *Kim* (Ex-1004), I also include parallel citations to *Kim-KR* (Ex-1022). Citations to *Kim-KR* likewise encompass the identical material present in *Kim-KR-Pub*.

69. Moreover, the figures of *Kim* and *Kim-KR* are identical, and are numbered the same. Thus, any reference to a figure of *Kim* should be understood to also refer to the identical figure found in *Kim-KR*.

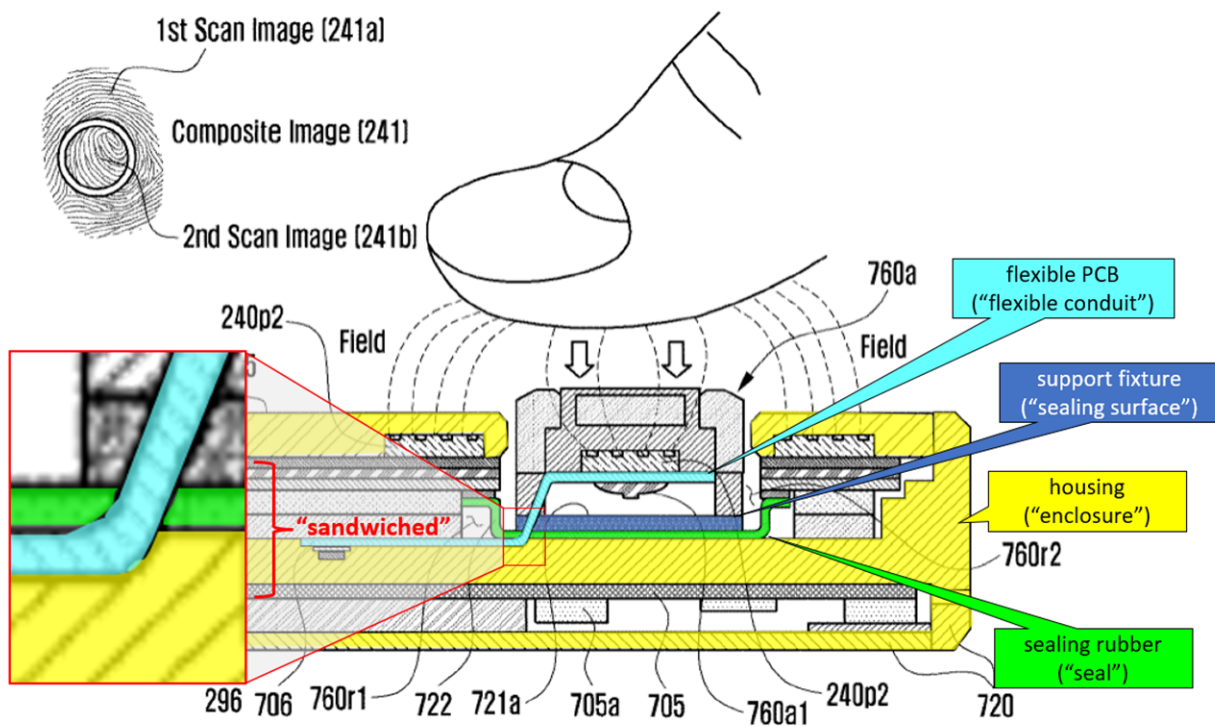
70. *Kim* discloses an electronic device with a housing, a mechanical button located in an opening of the housing, and a processor located within the housing and connected to the mechanical button (Ex-1004, Abstract; Ex-1022, Abstract).

71. With respect to the mechanical (physical) button, *Kim* teaches that “[u]nder a physical button 760a1 of the home button 760-1, a sensor (e.g., a fingerprint sensor) may be disposed. The fingerprint sensor may include an optical fingerprint sensor, a capacitive fingerprint sensor, or an ultrasonic fingerprint sensor” (Ex-1004, 18:28-32; Ex-1022, ¶134). Specifically, “[t]he physical button 760a and the optical fingerprint sensor 240p1 may be separated (or partitioned) from each other by a sealing rubber 722” (Ex-1004, 20:27-37; Ex-1022, ¶156).

72. The biometric sensor disclosed by *Kim* may include “a capacitive fingerprint sensor 240p2 embedded in the physical button 760a. The flexible PCB 706s may be electrically connected to the capacitive fingerprint sensor 240p2” (Ex-1004, 20:56-60; Ex-1022, ¶161).

73. Annotated Figure 10(b), below, shows the flexible PCB sandwiched between the sealing rubber and the housing (Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)).

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



B. *Jung* (Ex-1005)

74. United States Patent Pub. No. 2016/0100499 (“*Jung*”) is titled “Electronic Device Adopting Key-Waterproof Structure and Method for Waterproofing Key Thereof.”

75. I have been informed that I should assume *Jung* is afforded its earliest alleged priority date of Oct. 6, 2014 (Ex-1005, Cover). I have also been informed that I should assume *Jung* is prior art under at least 35 U.S.C. § 102(a) (AIA).³

76. *Jung* discloses an electronic device (Ex-1005, Abstract). “The device includes a body, a display device disposed in the body, a key disposed in the body, and a key-waterproof structure including an insert-injected product that includes an insert-injected sealing area, and a bonding area where a silicon-not-attached portion is formed” (Ex-1005, [0012]). The device also includes a flexible printed circuit board (Ex-1005, [0013]).

77. According to *Jung*, “when the user presses the home-key H, the pressure acting on the home-key H may be applied to ... a dome switch (not shown), or to transfer the pressure to a piezoelectric element (not shown) to come into contact with a contact electrode to generate a predetermined electric signal, and the electric

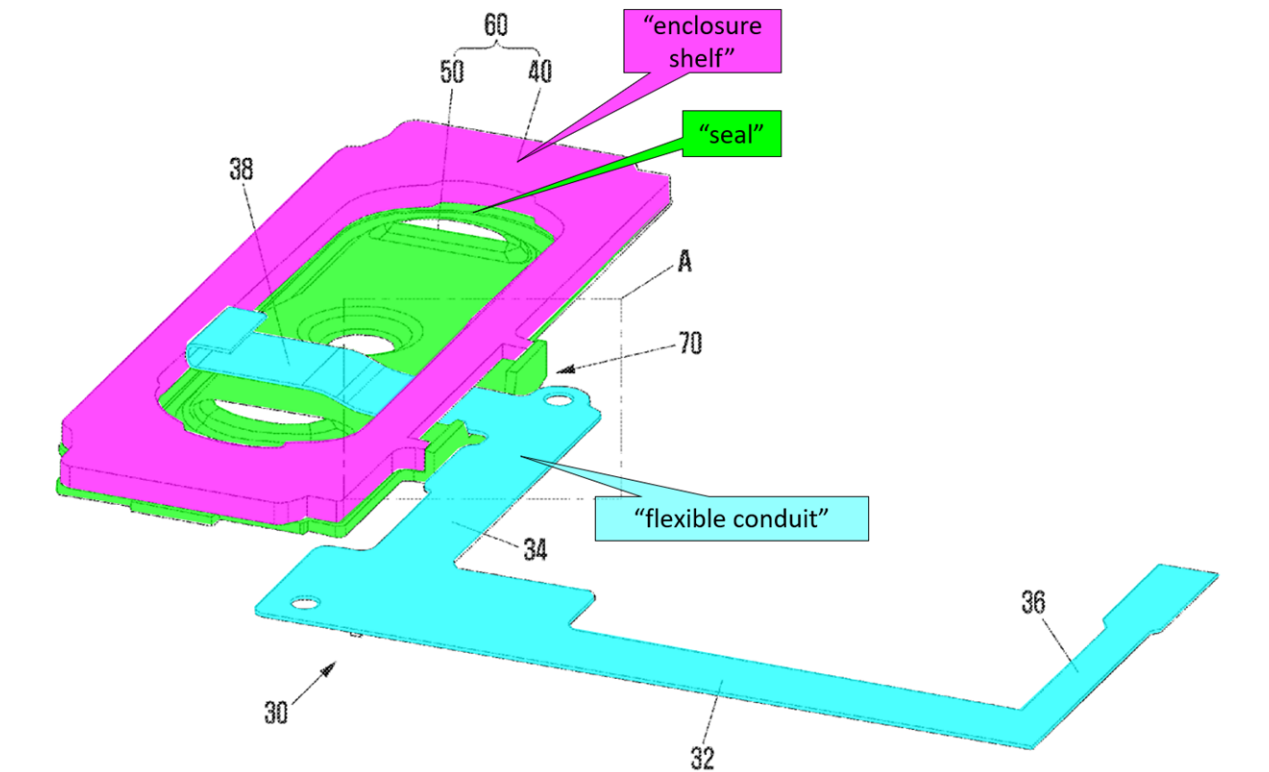
³ *Jung* is still prior art even if afforded its U.S. filing date (Oct. 6, 2015) or U.S. publication date (Apr. 7, 2016).

signal may be transferred to a main circuit board” (Ex-1005, [0100]). “As shown in FIG. 12, the key-waterproof structure 80 set forth above may be assembled to the back surface of the display device 13 of the portable terminal in FIG. 4A in order for the home-key H to be exposed to the front” (Ex-1005, [0119]).

78. *Jung* also teaches a sensor module 240, which may include a biometric sensor 240I (Ex-1005, [0050], [0060]).

79. In response to the home-key press, “[t]he main circuit board may detect a user’s touch by using the generated electric signal, and may perform a predetermined function of the home-key H in response to the electric signal” (Ex-1005, [0101]).

80. Annotated Figure 10, below, shows the flexible conduit (teal) passing through a passageway or opening in the enclosure shelf (pink), and pressed against the seal (green) (Ex-1005, Fig. 10).



81. United States Patent Pub. No. 2015/0071509 (“*Meyers*”) is titled “Biometric sensor stack structure.”⁴

82. I have been informed that I should assume *Meyers* is afforded its publication date of March 12, 2015 (Ex-1007, Cover). I have also been informed that I should assume *Meyers* is prior art under at least 35 U.S.C. § 102(a)(1) (AIA).

83. *Meyers* discloses “[v]arious structures and methods ... for packaging a biometric sensor, such as a capacitive biometric sensor” (Ex-1007, Abstract). Specifically, *Meyers*’ “[e]mbodiments incorporate various placements of the biometric sensor, structure surrounding [the] biometric sensor, [and] connection structures (electrical, physical, or both)” (Ex-1007, Abstract).

84. According to *Meyers*, “a fingerprint or other biometric sensor can be disposed beneath a control button or display element, for fingerprint recognition and authentication while the device is being operated by a user” (Ex-1007, ¶[0011]).

85. Figure 1 of *Meyers* “shows an assembly of parts disposed to form the fingerprint recognition sensor 102 circuit and position the sensor 102 circuit below a push button” (Ex-1007, ¶[0042]).

Ex-1007, Fig. 1

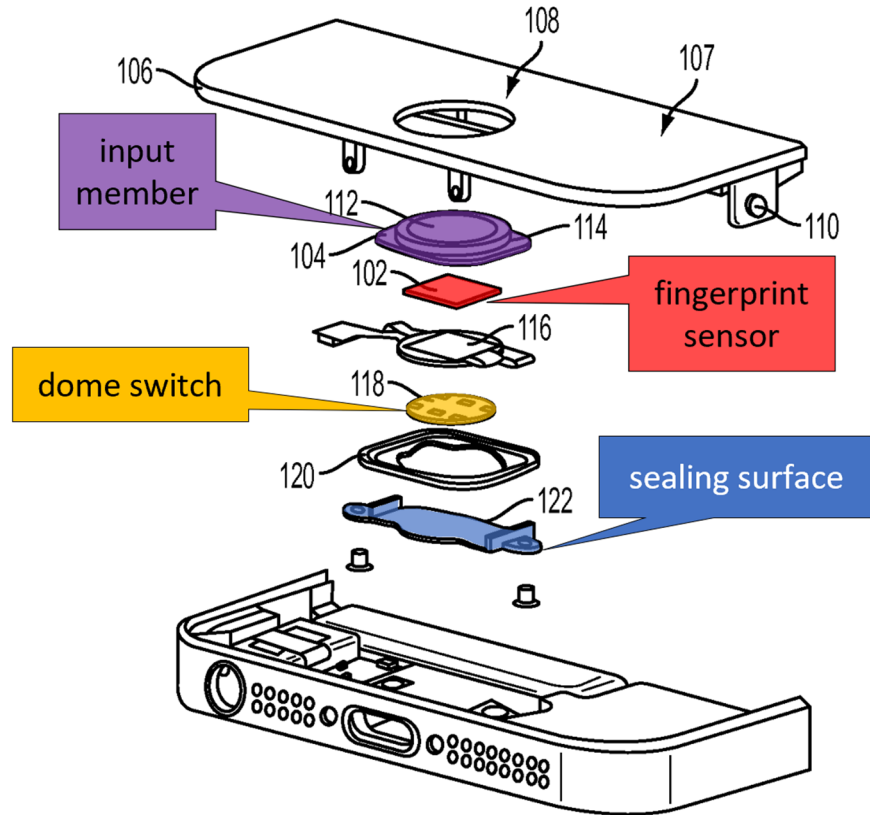


FIG. 1

86. “The button hole 108 in the cover glass frame 106 is disposed to hold a button 104 [(purple)] (which can form a top element of a push button, as described below), as shown in the figure. The button 104 is disposed to fit into the button hole 108. The button 104 includes a lens 112, at least a portion of the lens 112 helping to form a recessed shape, with the effect of guiding the user’s finger onto the button 104” (Ex-1007, ¶[0044]). “The button 104 is disposed above and coupled to a fingerprint recognition sensor 102 circuit” (red) (Ex-1007, ¶[0045]).

87. “The fingerprint recognition circuit is disposed above and coupled to a flexible element 116, the flexible element 116 being disposed both to receive any force imposed by the user’s finger on the button 104, and to transmit that force to a tactile dome switch 118” (orange) (Ex-1007, ¶[0049]). “The tactile dome switch 118 is disposed above and coupled to a switch gasket 120, which holds the tactile dome switch 118, and which is held in place by a button support plate 122 [(blue)]. The button support plate 122 is coupled to the base plate, and held in place by one or more vertical screws” (Ex-1007, ¶[0052]).

D. *Chang* (Ex-1015)

88. United States Patent No. 10,133,910 (“*Chang*”) is titled “Electronic device with key module and method of manufacturing the same.”

89. I have been informed that I should assume *Chang* is afforded its earliest alleged priority date of Jan. 21, 2015 (Ex-1015, Cover). I have also been informed that I should assume *Chang* is prior art under at least 35 U.S.C. § 102(a) (AIA).⁵

90. *Chang* discloses “an electronic device including an input device in which an instable waterproof point is removed and a key click feeling is improved with a simple structure” (Ex-1015, 1:54-57). According to *Chang*, “a key module may include: a fingerprint recognizing member ... an annular structure configured

⁵ *Chang* is still prior art even if afforded its U.S. filing date (Jan. 20, 2017).

to enclose the fingerprint recognizing member ... and a flexible conductive member extending from the circuit region into the space through the opening” (Ex-1015, 2:25-39).

91. “As illustrated in FIGS. 1 to 3, the electronic device 10 of the present disclosure may include a housing 100, a display 200, a first opening 300, and a key module 20. The key module 20 may include a button structure 400, a flexible 30 conductive member 500, sealing members 600, 700, and 1100, an elastic member 800, and a bracket 1000” (Ex-1015, 7:35-40).

92. *Chang* also discloses a “dome switch 900 [which] may be disposed inside the seating portion 151 through the hole 152 of the seating portion 151 (see FIG. 3). The dome switch 900 may be elastically and mechanically deformed by the user’s click to transmit the signal to the inside of the electronic device 10. The above-mentioned concave recess 473 may be disposed to face the dome switch 900” (Ex-1015, 9:38-49).

93. Annotated Figure 3, below, shows the relationship between the key module 20 (and sub-components thereof), and the dome switch 900 (Ex-1015, Fig. 3).

IX. THE PRIOR ART ANTICIPATES AND/OR RENDERS OBVIOUS CLAIMS 11-20 OF THE '619 PATENT

A. Ground 1: *Kim* Anticipates and/or Renders Obvious Claims 11, 14, 16, and 19 of the '619 patent.

94. *Kim* anticipates and/or renders obvious claims 11, 14, 16, and 19 of the '619 patent.

Claim 11, Element [11.pre]: A fingerprint sensing system for a wearable device comprising:

95. To the extent that it is found to be limiting, *Kim* discloses claim element [11.pre]. Specifically, *Kim* discloses a fingerprint sensing system for a wearable device.

96. For example, *Kim* is titled “Electronic Device Having Combined Button” (Ex-1004, Cover; Ex-1022, Cover). As another example, *Kim* teaches that “[a]n electronic device may include a housing, ... a mechanical button, ... a processor located in side the housing, ... and a memory located inside the housing” (Ex-1004, Abstract; Ex-1022, Abstract). As another example, the “technical field” of *Kim* “generally relates to an electronic device having a combined mechanical and virtual button and a method for controlling the combined button” (Ex-1004, 1:14-16; Ex-1011, ¶1]. As another example, *Kim*’s “Summary” section discloses that “an electronic device may comprise a housing, ... a mechanical button, ... a processor, ... and a memory” (Ex-1004, 1:38-55; Ex-1022, ¶5).

97. As another example, *Kim*’s Figure 4 (below) “shows a front view of an electronic device according to an embodiment” (Ex-1004, 2:49-50; Ex-1022, ¶8). Figures 5, 6A, and 6B of *Kim* disclose additional orientations of the electronic device (Ex-1004, Figs. 4-5, 6A, 6B; Ex-1012, Figs. 4-5, 6A, 6B).

FIG. 4



98. While *Kim*'s Figure 4 illustrates a smart phone, Kim contemplates that its teachings are applicable to a variety of electronic devices:

For example, an electronic device may be a smart phone, a tablet personal computer (PC), a mobile phone, a video phone, an e-book reader, a desktop PC, a laptop PC, a netbook computer, a personal digital assistant (PDA), a portable multimedia player (PMP), a Moving Picture Experts Group (MPEG) audio layer 3 (MP3) player, a portable medical device, a digital camera, or ***a wearable device*** (e.g., a head-mounted device (HMD) such as electronic glasses, electronic clothes, an electronic bracelet, an electronic necklace, an electronic 30 appcessory, or a smart watch), or the like, but is not limited thereto.

(Ex-1004, 4:20-31; Ex-1022, ¶¶12-13).⁶

99. *Kim* explicitly discloses that the electronic device described therein can include “a wearable device (*e.g.*, a head-mounted device (HMD) such as electronic glasses, electronic clothes, an electronic bracelet, an electronic necklace, an electronic appcessory, or a smart watch), or the like, but is not limited thereto” (Ex-1004, 4:19-31; Ex-1022, ¶¶12-13).

100. *Kim* also discusses multiple fingerprint sensing systems at length. *Kim*’s Figure 10(b) discloses a “**capacitive fingerprint sensor 240p2** embedded in the physical button 760a” (Ex-1004, 20:57-59, 22:11-12 (emphasis added); *see also* Ex-1004, 21:27-41; Ex-1022, ¶¶161, 167-170, 176). *Kim* then goes on to explain that “[t]he user may input his or her fingerprint through the first fingerprint sensor corresponding to the physical button 760a . . . The electronic device 701 may acquire (or capture) the user fingerprint through the first fingerprint sensor corresponding to the physical button 760a and the second fingerprint sensor corresponding to the virtual button 760b in the home button 760. The electronic device 701 may compose fingerprint images 241a and 241b respectively obtained by the first and second fingerprint sensors into a single fingerprint image 241” (Ex-1004, 21:58-22:3; Ex-1022, ¶¶173-174).

⁶ All emphasis is added unless otherwise noted.

101. Specifically, it teaches that:

Each of the physical button 760a and the virtual button 760b may include a fingerprint sensor. For example, the capacitive fingerprint sensor may be formed equally in each of the physical button 760a and the virtual button 760b. The fingerprint sensor (*e.g.*, the capacitive fingerprint sensor) corresponding to the virtual button 760b may be disposed (or mounted) to surround the fingerprint sensor (*e.g.*, the capacitive fingerprint sensor) corresponding to the physical button 760a. Alternatively, the physical button 760a and the virtual button 760b may include the same or different kinds of fingerprint sensors. For example, the physical button 760a may have the optical fingerprint sensor, and the virtual button 760b may have the capacitive fingerprint sensor or vice versa.

(Ex-1004, 21:27-41; Ex-1022, ¶¶167-170).

102. *Kim* also teaches that the fingerprint sensor discussed above “may compose fingerprint images,” and goes on to explain that:

The user may input his or her fingerprint through the first fingerprint sensor corresponding to the physical button 760a and the second fingerprint sensor corresponding to the virtual button 760b at a time (or together) in the home button 760. The electronic device 701 may acquire (or capture) the user fingerprint through the first fingerprint sensor corresponding to the physical button 760a and the second fingerprint sensor corresponding to the virtual button 760b in the home button 760. The electronic device 701 may compose fingerprint images

241a and 241b respectively obtained by the first and second fingerprint sensors into a single fingerprint image 241.

(Ex-1004, 21:58-22:3; Ex-1022, ¶¶173-174).

103. Furthermore, this limitation would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.A (which is incorporated by reference), a person of ordinary skill in the art would have understood that a fingerprint sensor is a type of biometric sensor that could be applied to an electronic device such as a wearable device. As such, this limitation would have been obvious and well within the skill of a person of ordinary skill in the art.

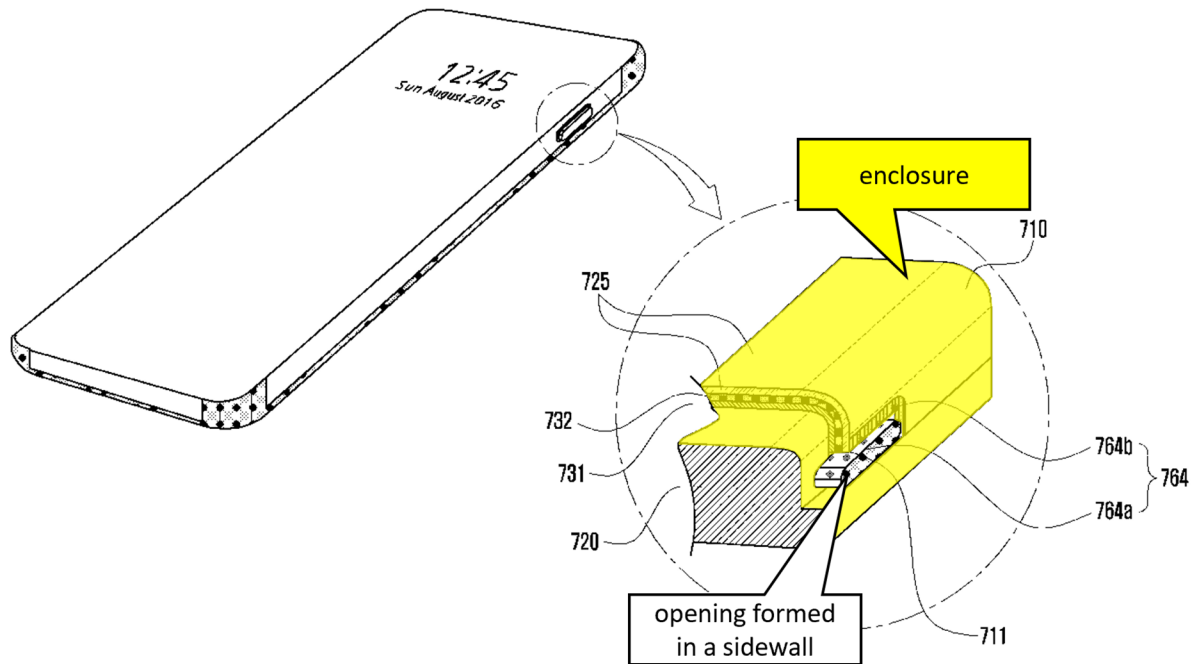
104. Thus, *Kim* discloses claim element [11.pre].

Claim 11, Element [11.a]: an enclosure defining an enclosed volume and an opening along an exterior surface:

105. *Kim* discloses claim element [11.a]. Specifically, *Kim* discloses an enclosure defining an enclosed volume and an opening along an exterior surface.

106. This is illustrated in at least *Kim*'s Figure 18 (annotated below) and is described in further detail as follows.

FIG. 18



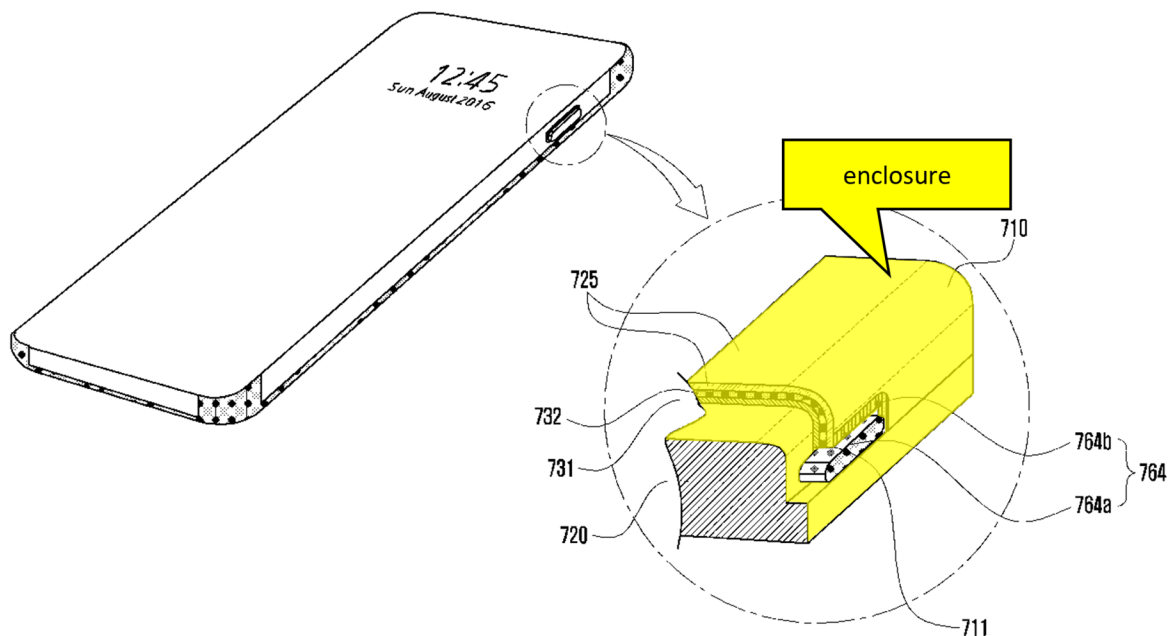
107. First, *Kim* discloses an enclosure having an enclosed volume. For example, *Kim* discloses a “housing 720” and “cover glass 725” (Ex-1004, 22:4-27; Ex-1022, ¶¶175-178), which correspond to the claimed “enclosure defining an enclosed volume” of element [11.pre]. *Kim* discloses “a processor located *inside the housing* and electrically coupled to the touch screen display and the mechanical button; and a memory located *inside the housing* and electrically connected to the processor” (Ex-1004, 2:7-11 (emphasis added); *see also* Ex-1004, Abstract; Ex-1022, ¶6, Abstract). *Kim* also discloses that there are components inside of the “cover

glass,” such as the “display panel” (Ex-1004, 15:1-13; Ex-1022, ¶102). A person of ordinary skill in the art would have known that a “processor,” “memory,” and “display panel” are physical components that occupy space. Because Kim describes these components as “inside” the housing and cover glass, a person of ordinary skill in the art would therefore have understood that Kim’s housing and cover glass would define an enclosed volume.

108. Furthermore, *Kim*’s Figure 18 “shows a perspective view of an electronic device and a partially enlarged view of an area of the electronic device” (Ex-1004, 3:22-24; Ex-1022, ¶18). Consequently, an enclosure defining an enclosed volume is disclosed in at least *Kim*’s Figure 18 (annotated below):

Ex-1004, Fig. 18; Ex-1022, Fig. 18

FIG. 18



109. Indeed, *Kim* discloses “an enclosure defining an enclosed volume” the same way as the ’619 patent’s specification. For example, the ’619 patent discloses that the “enclosure” is a “structure” that may be “constructed from multiple materials” “operably connected together” in order to “define[] an internal volume of the electronic device”:

The enclosure 120 provides a device structure, defines an internal volume of the electronic device 100, and houses device components. In various embodiments, the enclosure 120 may be constructed from any suitable material, including metals (e.g., aluminum, steel, titanium), polymers, ceramics (e.g., zirconia, glass, sapphire), and the like. In one embodiment, the enclosure 120 is constructed from multiple materials. The enclosure 120 can form an outer surface or partial outer surface and protective case for the internal components of the electronic device 100, and may at least partially surround the display 103. The enclosure 120 can be formed of one or more components operably connected together, such as a front piece and a back piece. Alternatively, the enclosure 120 can be formed of a single piece operably connected to the display 103.

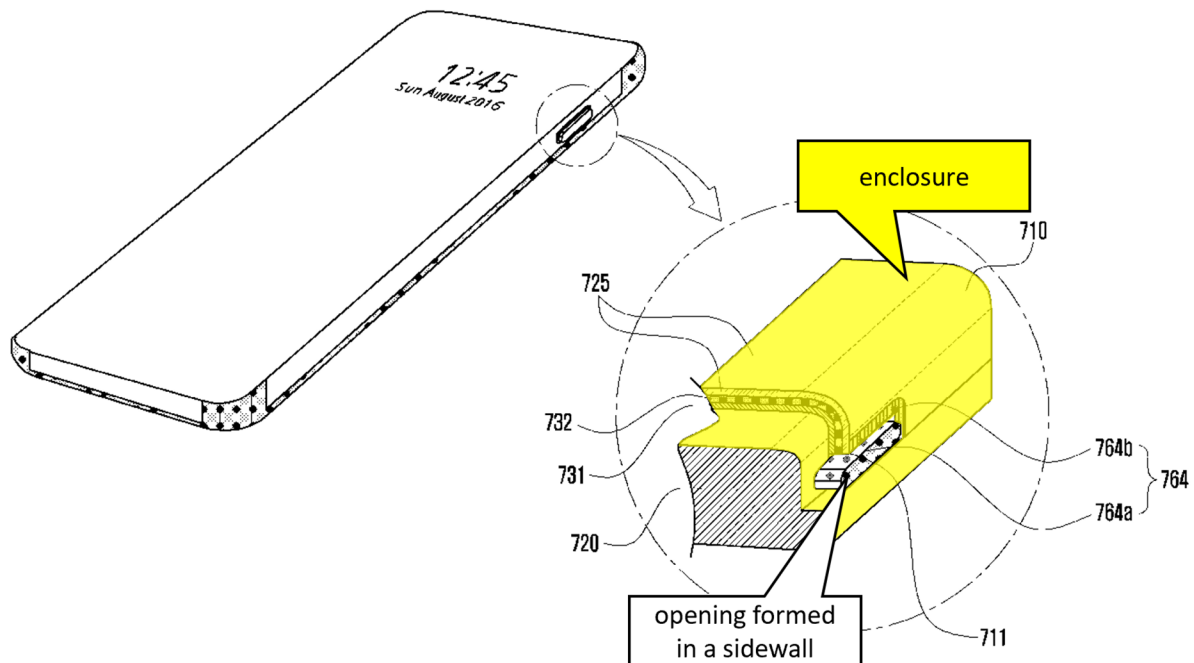
(Ex-1001, 6:3-17).

110. Because *Kim* discloses a “housing 720” and “cover glass 725” operably connected together to form a structure that defines an internal volume of the electronic device, *Kim* discloses “an enclosure defining an enclosed volume” the same way as the ’619 Patent’s specification.

111. Second, *Kim* discloses that the enclosure has an opening along an exterior surface, which could include a sidewall. For example, *Kim* discloses an “opening 711” (Ex-1004, 18:19-24; Ex-1022, ¶132), which corresponds to the claimed “opening” of element [11.a]. *Kim* further discloses that “[i]n the opening 711, a part of the home button 760-1 which is the combined button may be positioned” (Ex-1004, 18:23-24; Ex-1022, ¶132). An enclosure having an enclosed volume and an opening formed in an exterior surface is disclosed in at least *Kim*’s Figure 18 (annotated below):

Ex-1004, Fig. 18; Ex-1022, Fig. 18

FIG. 18



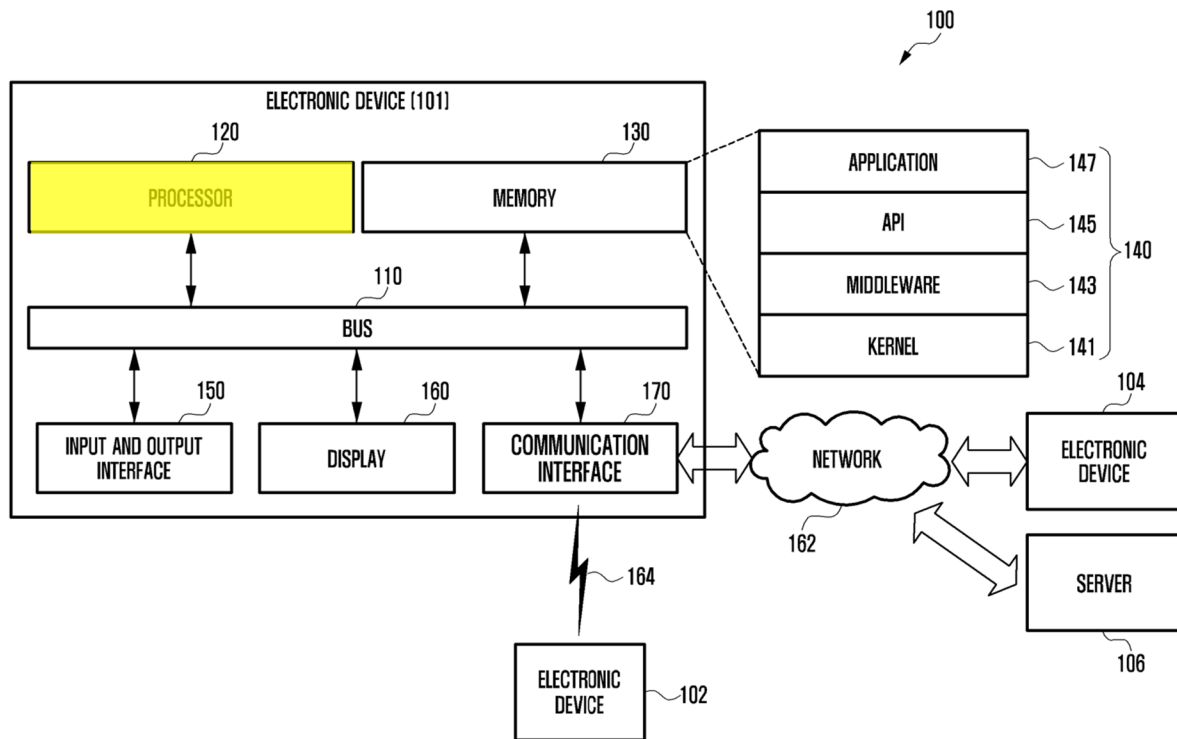
112. Furthermore, element [11.a] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), a person of ordinary skill in the art would have been familiar with electronic devices with sealed and/or insulated button assemblies, and would understand that those assemblies were not limited to the front face of a device. Instead, a person of ordinary skill in the art would understand that a sealed and/or insulated button assembly from one location on a device can be constructed equally on any exterior surface, including a rear or sidewall of the device, as taught by at least *Polany* (Ex-1013). Consequently, “an enclosure defining an enclosed volume and an opening along an exterior surface” would have been obvious and well within the skill of a person of ordinary skill in the art.

113. Thus, *Kim* discloses claim element [11.a].

Claim 11, Element [11.b]: a processor disposed in the enclosed volume;

114. *Kim* discloses claim element [11.b]. Specifically, *Kim* discloses a processor disposed in the enclosed volume. This is illustrated in at least *Kim*’s Figure 1 (annotated below) and is described in further detail as follows.

FIG. 1



115. As explained earlier, *Kim* discloses “a processor located *inside* the housing and electrically coupled to the touch screen display and the mechanical button” (Ex-1004, 2:7-11 (emphasis added); *see also* Ex-1004, Abstract, Figs. 1-3, 1:38-2:38, 5:1-28; Ex-1022, ¶¶5-7, 17-19), and a person of ordinary skill in the art would have known that a “processor” is a physical component that occupies space. Consequently, a person of ordinary skill in the art would have known that in *Kim*’s Figure 1, the “processor 120” would have been positioned in the enclosed volume

provided by *Kim*'s "housing 720" and "cover glass 725" (as explained earlier for element [11.a]).

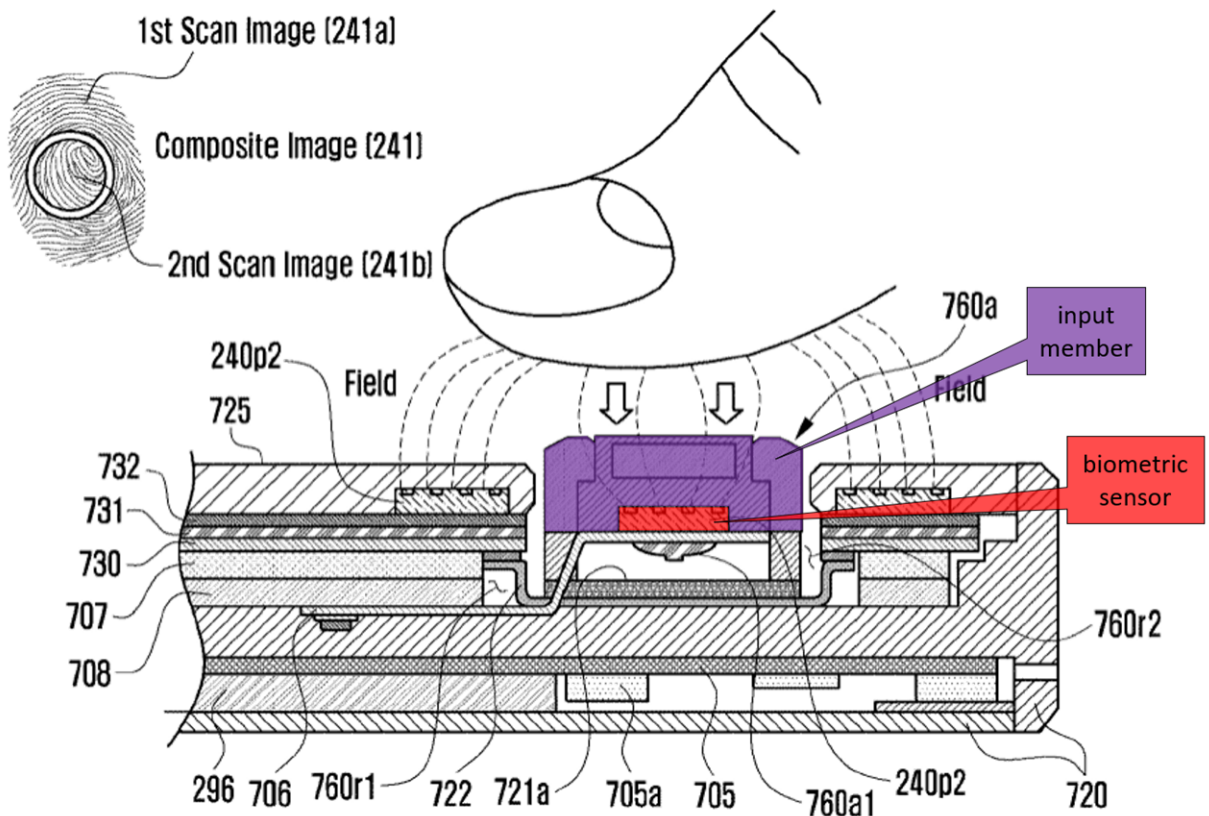
116. Furthermore, element [11.b] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), above, a person of ordinary skill in the art would have understood that the processor disclosed by *Kim* would be disposed in the enclosed volume. A person of ordinary skill in the art would recognize that the enclosed volume exists to protect sensitive electronic components (such as the processor) from debris, impact, and other potentially damaging external stimuli. Consequently, "a processor disposed in the enclosed volume" would have been obvious and well within the skill of a person of ordinary skill in the art.

117. Thus, *Kim* discloses claim element [11.b].

Claim 11, Element [11.c]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface; and a retainer positioned inward from the input surface and defining a sealing surface;

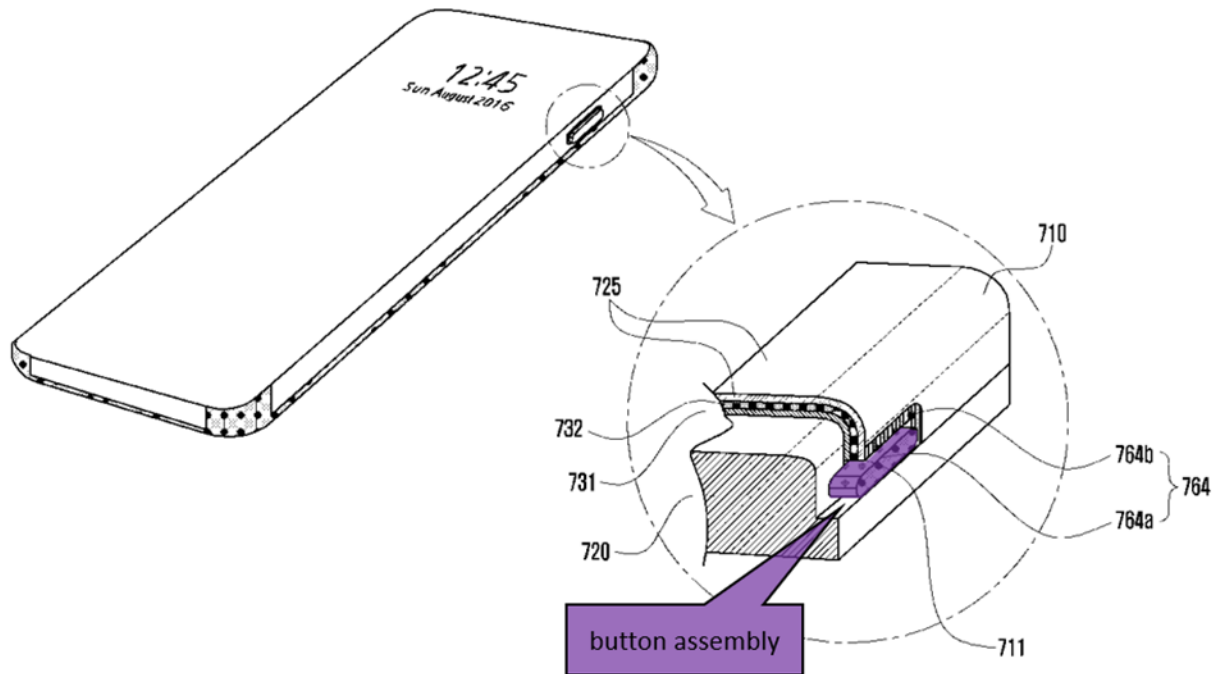
118. *Kim* discloses claim element [11.c]. Specifically, *Kim* discloses a button assembly positioned in the opening and defining an input surface. This is illustrated in at least *Kim*'s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



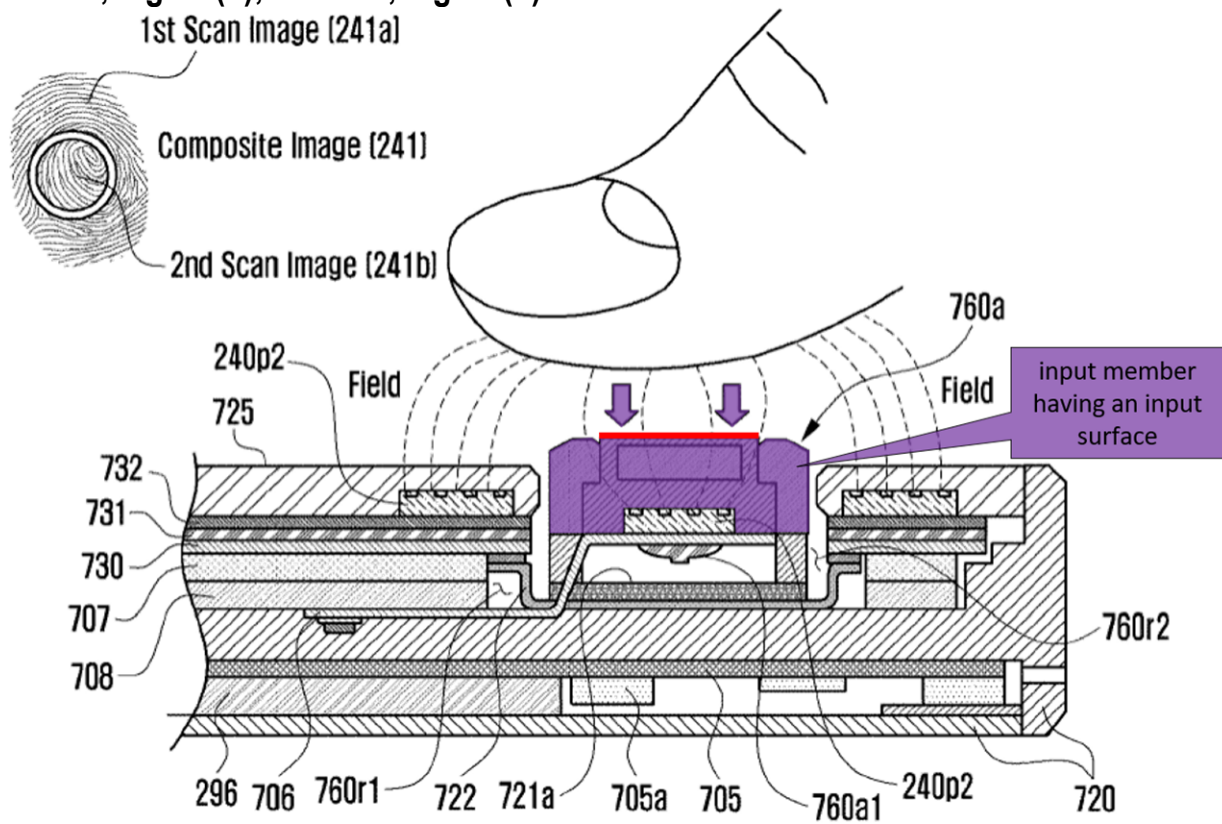
119. For example, *Kim* discloses a “combined button,” which corresponds to the claimed “button assembly positioned in the opening and defining an input surface” of element [1.c]. *Kim*’s Figure 18 (annotated below) “shows a perspective view of an electronic device and a partially enlarged view of an area of the electronic device including a *combined button*” (Ex-1004, 3:22-24 (emphasis added); Ex-1022, ¶8).

FIG. 18



120. Furthermore, *Kim*'s Figure 10(b) (annotated below) shows a “cross-sectional view of [the] **combined button**” (Ex-1004, 21:20-22 (emphasis added); Ex-1022, ¶166). The “combined button” includes a surface that may be touched, pressed, or otherwise interacted with by a user in order to move downward (as indicated by the arrows):

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



121. *Kim* further contemplates that the “combined button” is a button assembly within an opening formed in the enclosure (e.g., in a sidewall of the enclosure). For example, *Kim* discloses that “a power button . . . located on the *lateral [i.e., side] surface* of the electronic device 600 *may also be the combined button*” (Ex-1004, 17:10-12 (emphasis added); Ex-1022, ¶166). As another example, *Kim* discloses that “the *combined buttons may further include a power button (764 in FIG. 18)* and/or a volume button (not shown). Although the home button is described as an example of the combined button in this embodiment, *the*

combined button is not limited to the home button” (Ex-1004, 13:46-53 (emphasis added); Ex-1022, ¶89).

122. Indeed, *Kim* discloses “button assembly positioned in the opening and defining an input surface” the same way as the ’619 patent’s specification. For example, the ’619 patent discloses that “[t]he button assembly 110 includes an input member 112 that may be touched, pressed, or otherwise interacted with by a user. The input member 112 may translate, deflect, bend, or otherwise move a relatively small distance in response to user input” (Ex-1001, 6:49-59). Because *Kim* discloses a “combined button” with a surface that similarly may be touched, pressed, or otherwise interacted with by a user in order to move downward, *Kim* discloses “button assembly positioned in the opening and defining an input surface” the same way as the ’619 patent’s specification (*see also* Ex-1004, 13:42-67, 16:48-17:12; Ex-1022, ¶¶89-92, ¶¶118-120).

123. Thus, *Kim* discloses claim element [11.c].

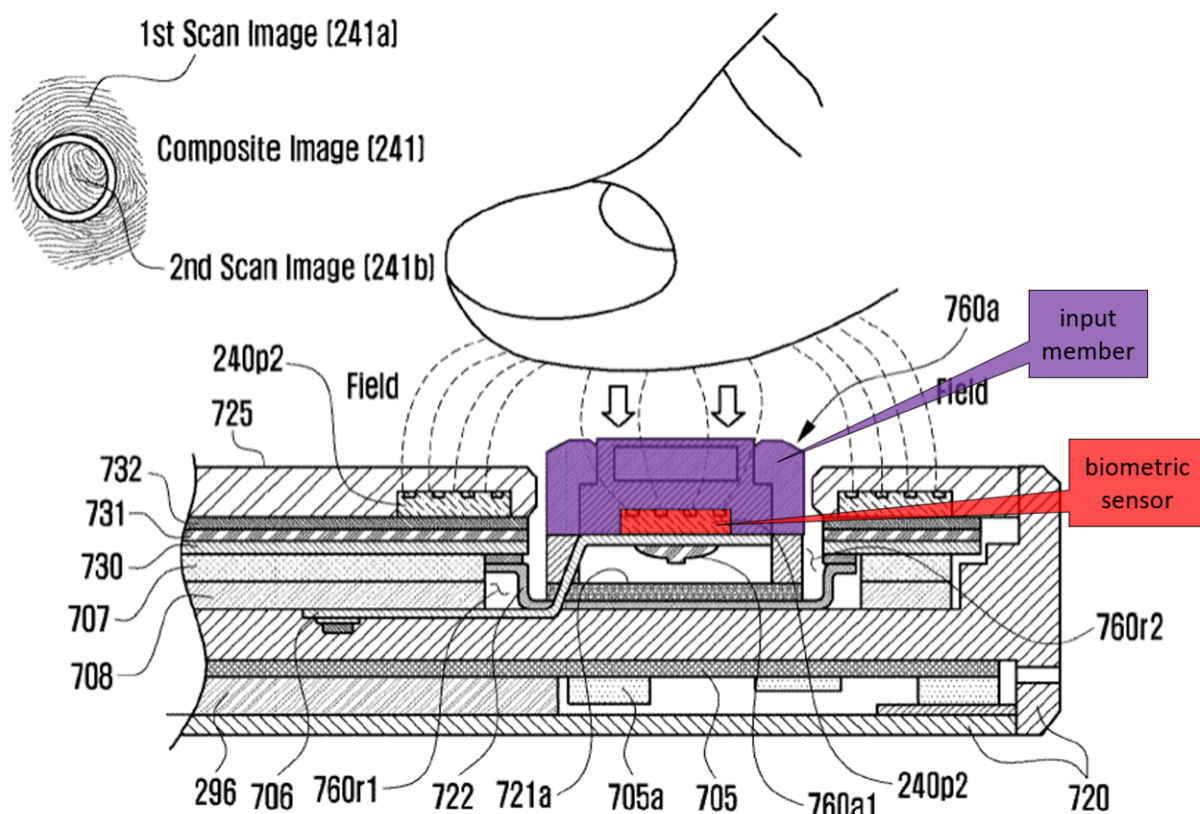
124. Claim element 11.c contains two sub-elements, discussed in turn below.

- (i) **Claim 11, Element [11.c.i]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface;**

125. *Kim* discloses claim element [11.c.i]. Specifically, *Kim* discloses a fingerprint sensor positioned inward from the input surface .

126. As explained earlier for claim element [11.c], *Kim* discloses a “combined button” with an input member. Furthermore, *Kim* discloses that the “combined button” includes a fingerprint sensor positioned below the input member. This is illustrated in at least *Kim*’s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)

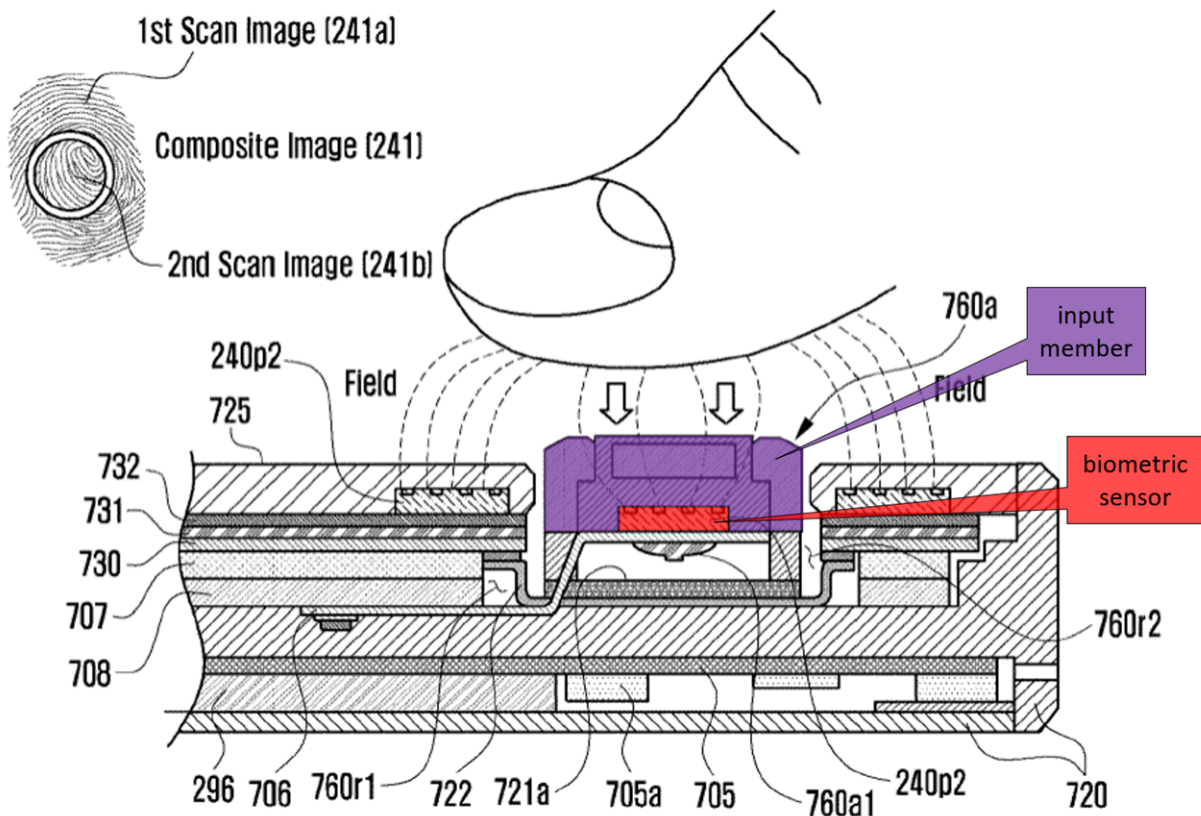


127. First, *Kim* discloses “a fingerprint sensor.” *Kim*’s Figure 10(b) discloses a “*capacitive fingerprint sensor 240p2* embedded in the physical button 760a” (Ex-1004, 20:57-59, 22:11-12 (emphasis added); *see also* Ex-1004, 21:27-41; Ex-1022,

¶161, 167-170, 176). *Kim* then goes on to explain that “[t]he user may input his or her fingerprint through the first fingerprint sensor corresponding to the physical button 760a The electronic device 701 may acquire (or capture) the user fingerprint through the first fingerprint sensor corresponding to the physical button 760a and the second fingerprint sensor corresponding to the virtual button 760b in the home button 760. The electronic device 701 may compose fingerprint images 241a and 241b respectively obtained by the first and second fingerprint sensors into a single fingerprint image 241” (Ex-1004, 21:58-22:3; Ex-1022, ¶¶173-174).

128. Second, *Kim* discloses that the fingerprint sensor is “positioned inward from the input surface.” As illustrated in at least *Kim*’s Figure 10(b) (annotated below), the “capacitive fingerprint sensor 240p2” is positioned inward from the input member that was identified for claim element [1.c]. Moreover, *Kim* explicitly discloses that “the fingerprint sensor . . . 240p2 [is] located ***under*** the physical button 760a” (Ex-1004, 23:7-8; *see also* Ex-1004, 17:3-5, 18:8-13, 18:28-32, 18:47-53, 19:1-2, 19:26-30, 19:47-51, 23:6-10; Ex-1022, ¶¶120, 130, 134, 139, 143, 146, 150, 187).

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



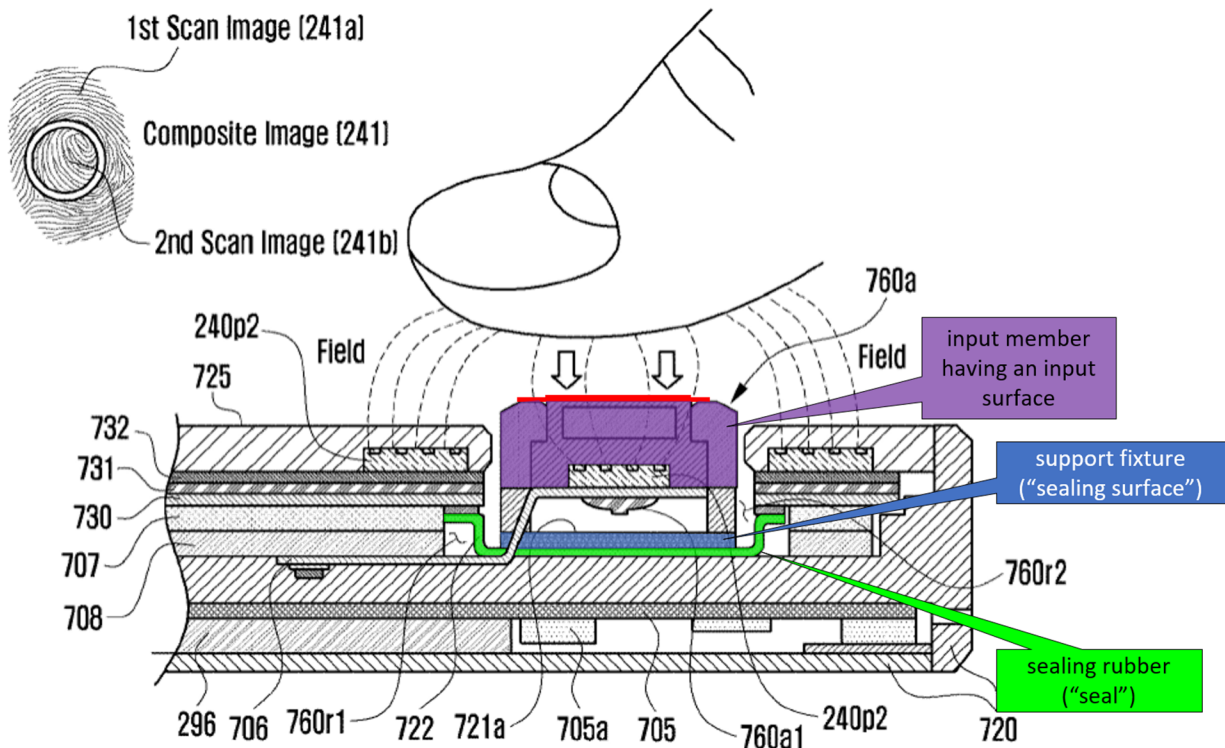
129. Thus, *Kim* discloses claim element [11.c.i].

- (ii) **Claim 11, Element [11.c.ii]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: . . . a retainer positioned inward from the input surface and defining a sealing surface;**

130. *Kim* discloses claim element [11.c.ii]. Specifically, *Kim* discloses a retainer positioned inward from the input surface and defining a sealing surface.

131. This is illustrated in at least *Kim*'s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



132. First, *Kim* discloses a seal. *See* claim element [11.d], below.

133. Second, *Kim* discloses that the seal is positioned adjacent a sealing surface. For example, *Kim* discloses a “support fixture 721a” (Ex-1004, 22:28-34; Ex-1022, ¶179), which includes the claimed “sealing surface” as described in element [11.d]. *Kim*’s Figure 10(b) (annotated above) discloses that “sealing rubber 722” (highlighted in green) is positioned adjacent a sealing surface (highlighted in blue). Likewise, Figure 10(b) shows that the sealing surface is positioned inward from the input surface.

134. The '619 patent teaches that the retainer provides “a stop to displacement of the button housing” and that multiple “configurations of the retainer 224 are possible” (Ex-1001, 16:54-60). Likewise, the '619 patent explains that “[t]he retainer 224 lower surface forms a sealing surface 225 for the button assembly 310” (Ex-1001, 16:54-60). As depicted above, a person of ordinary skill in the art would understand that the support fixture 721a of *Kim* likewise serves as “a stop to the displacement of the button housing” and includes a “lower surface [that] forms a sealing surface ... for the button assembly.” As such, a person of ordinary skill in the art would understand that support fixture 721a constitutes a retainer as envisioned by the '619 patent.

135. Furthermore, element [11.c.ii] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), a person of ordinary skill in the art would have understood that because the support fixture 721a defines an aperture housing the plunger, that retainer should be formed of a rigid, durable material that would withstand repeated user presses on the input surface. A person of ordinary skill in the art would further have understood that a rigid, durable retainer would be one of a limited number of surfaces that could be used as a sealing surface.

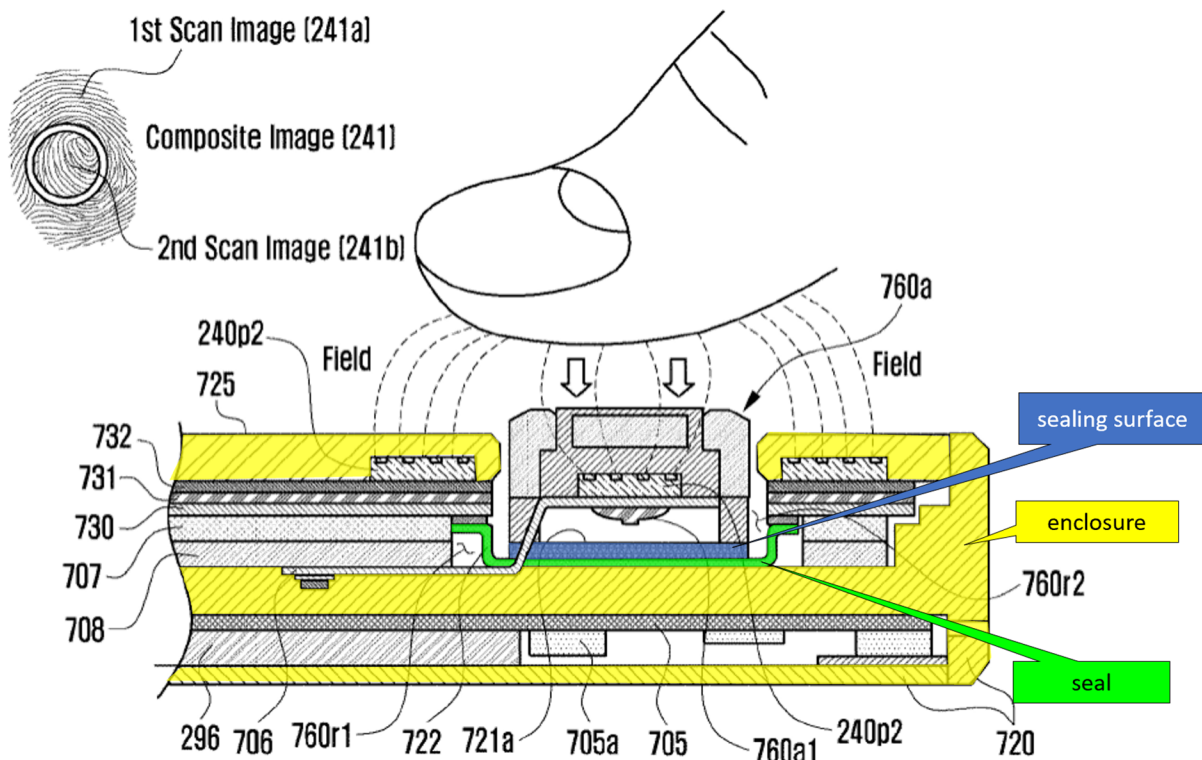
136. Thus, *Kim* renders obvious claim element [11.c.ii].

Claim 11, Element [11.d]: a seal disposed between the sealing surface of the retainer and a surface of the opening;

137. *Kim* discloses claim element [11.d]. Specifically, *Kim* discloses a seal disposed between the sealing surface of the retainer and a surface of the opening.

138. This is illustrated in at least *Kim*'s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1004, Fig. 10(b)



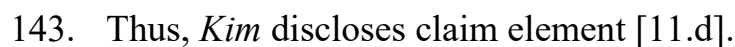
139. First, *Kim* discloses a seal. For example, *Kim* discloses use of “sealing rubber 722” (Ex-1004, 22:35-40; *see also* Ex-1004, 20:27-50, 22:28-42; Ex-1022, ¶¶156-159, 179-181), which creates the claimed “seal” of element [1.d]. As *Kim*

explains, the “sealing rubber 722 may have a sealing and waterproof function” (Ex-1004, 20:47-48; Ex-1022, ¶159).

140. Second, *Kim* discloses that the seal is positioned between a sealing surface of the retainer and a surface of the opening. For example, *Kim* discloses a “support fixture 721a” (Ex-1004, 22:28-34; Ex-1022, ¶179), which includes the claimed “retainer” of element [11.d]. *Kim*’s Figure 10(b) (annotated above) discloses that “sealing rubber 722” (highlighted in green) is positioned between a retainer (highlighted in blue) and the enclosure (i.e., a surface of the opening, highlighted in yellow).

141. Furthermore, element [11.d] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.B (which is incorporated by reference), a person of ordinary skill in the art would have known that button assemblies in mobile electronic devices should be sealed in order to prevent ingress of potentially damaging moisture and dust. A person of ordinary skill in the art would also have known that common techniques to add a seal were to use a rubber gasket or a pressure sensitive adhesive (PSA) layer. Consequently, “a seal disposed between the sealing surface of the retainer and a surface of the opening” would have been obvious and well within the skill of a person of ordinary skill in the art.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



Claim 11, Element [11.e]: a passage extending from the opening to the enclosed volume;

144. *Kim* discloses claim element [11.e]. Specifically, *Kim* discloses a passage extending from the opening to the enclosed volume.

145. As discussed in claim elements [11.c] and [11.d], the opening contains a button assembly which includes electrical components, such as the fingerprint sensor discussed above. However, *Kim* also teaches that the battery for the electronic device is located inside the enclosed volume. For example, *Kim* teaches that “[i]n a cross-sectional view shown in FIG. 10(b), the battery 296 is located on the bottom of the housing 720” (Ex-1004, 22:4-9; Ex-1022, ¶175). Similarly, *Kim* also teaches that the main printed circuit board is located inside of the enclosed volume, stating that “[t]he PCB 705 is disposed between the bottom and intermediate of the housing 720 so as to mount the plurality of electronic elements 705a” (Ex-1004, 22:4-9; Ex-1022, ¶175).

146. Furthermore, element [11.e] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), because *Kim* includes electrical components located in the opening of the enclosure which are separated from a power supply by the enclosure wall, a person of ordinary skill in the art would understand that in order for the electrical components to function, there necessarily needs to be a passage extending from the opening to the enclosed volume. Likewise, a person of ordinary skill in the art would

have known that a biometric sensor (*e.g.*, a fingerprint sensor) outputs an electrical signal that should be electrically connected to an integrated circuit or processor disposed within the enclosed volume, and that requires a power supply to function. In order for these connections to occur, *Kim* discloses a passage between the opening and the enclosed volume.

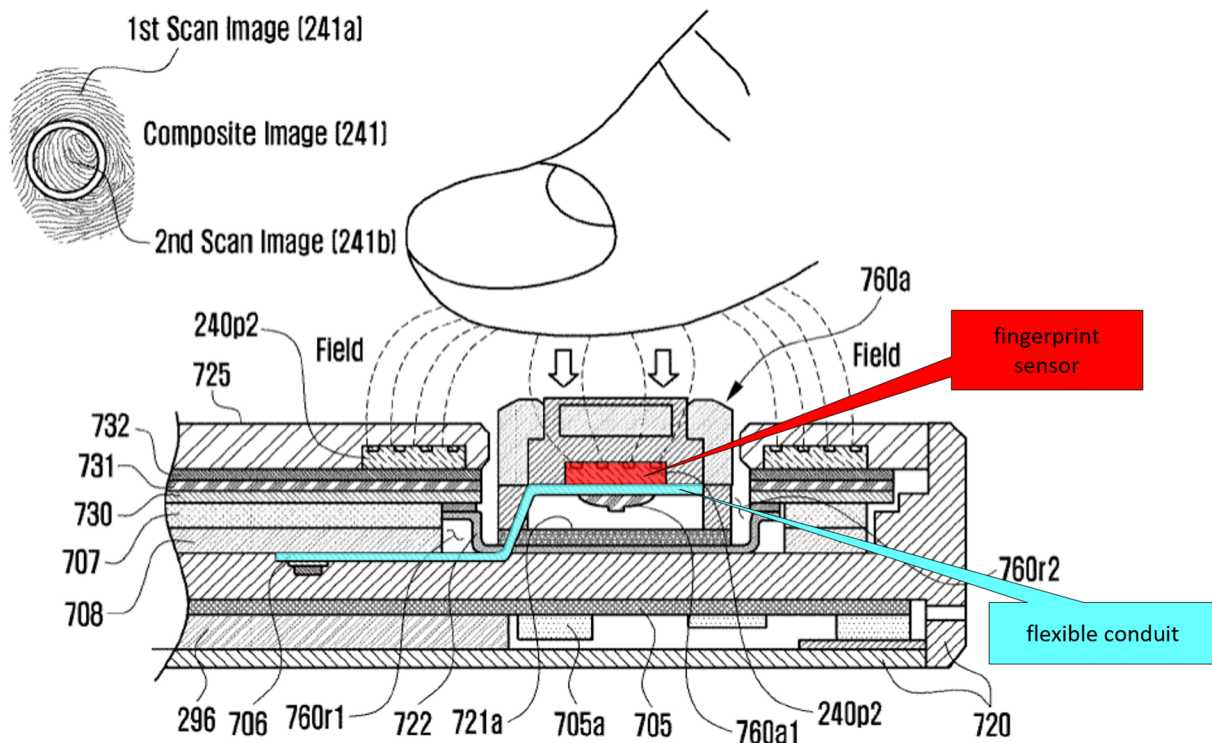
147. Thus, *Kim* discloses claim element [11.e].

Claim 11, Element [11.f]: a flexible conduit electrically connecting the fingerprint sensor to the processor; wherein:

148. *Kim* discloses claim element [11.f]. Specifically, *Kim* discloses a flexible conduit electrically connecting the fingerprint sensor to the processor.

149. *Kim* explains that the fingerprint sensor is connected to a flexible conduit (flexible PCB 706) capable of transmitting output signals. It teaches that “[o]n the intermediate of the housing 720, the flexible PCB 706 may be disposed. The flexible PCB 706 may be electrically connected to the capacitive fingerprint sensor 240p2 embedded in the physical button 760a. The capacitive fingerprint sensor 240p2 embedded in the physical button 760a may be disposed on the flexible PCB 706. Alternatively, the optical fingerprint sensor 240p1 may be disposed on the flexible PCB 706” (Ex-1004, 22:9-17; Ex-1022, ¶¶176-177).

150. And, the fingerprint sensor necessarily transmits fingerprint images via the flexible PCB to the processor. This is illustrated in at least *Kim*’s Figure 10(b) (annotated below) and is described in further detail as follows.

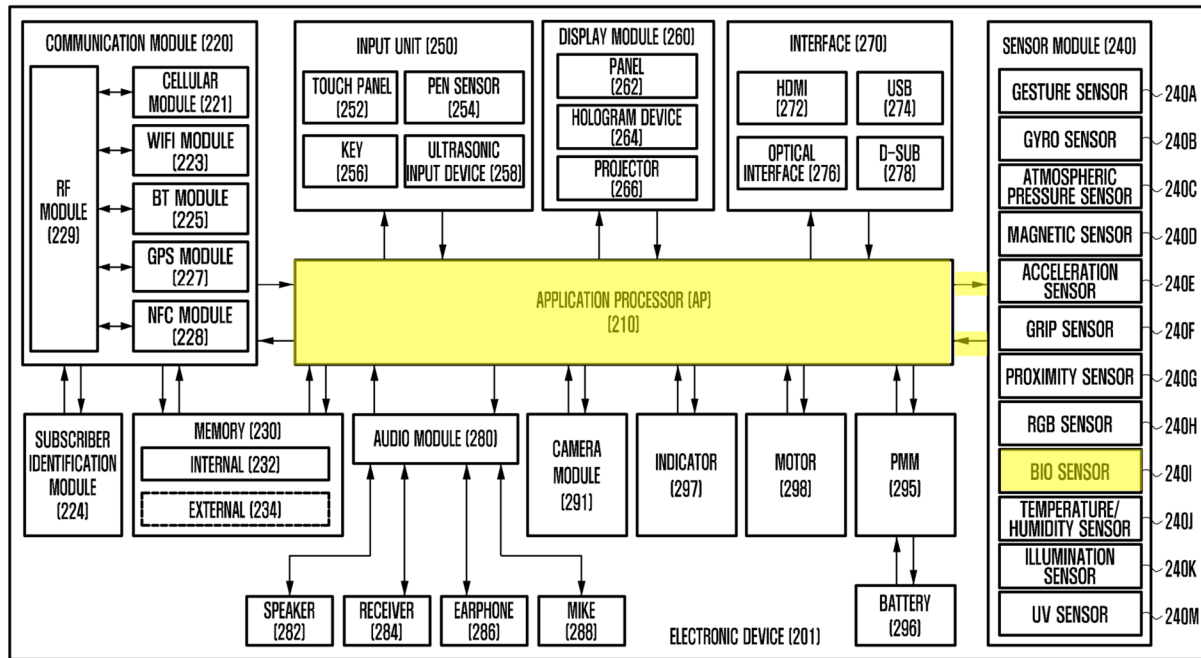


151. First, *Kim* discloses a flexible conduit coupled to the biometric sensor. For example, *Kim* discloses a “flexible PCB 706,” which corresponds to the claimed “flexible conduit” of element [1.e] (Ex-1004, 22:9-27; *see also* Ex-1004, 19:63-20:26, 23:6-21; Ex-1022, ¶¶153-155, 176-178, 187-189). *Kim* further discloses that “flexible PCB 706 may be electrically connected to the capacitive fingerprint sensor 240p2 embedded in the physical button 760a. The capacitive fingerprint sensor 240p2 embedded in the physical button 760a may be disposed on the flexible PCB 706” (Ex-1004, 22:9-17 (emphasis added); Ex-1022, ¶¶176-177). *Kim*’s Figure

10(b) (annotated above) discloses that “flexible PCB 706” (highlighted in teal) is coupled to the biometric sensor (highlighted in red).

152. Second, *Kim* discloses that the flexible conduit is configured to transmit the biometric sensor’s output signal to the processor. For example, *Kim* discloses that the “flexible PCB 706 may be *electrically connected* to the capacitive fingerprint sensor 240p2 embedded in the physical button 760a” (Ex-1004, 22:12-13; *see also* Ex-1004, 20:59-60 (emphasis added); Ex-1022, ¶¶161, 176). This electrical connection is further illustrated in at least *Kim*’s Figure 2 (annotated below), which shows arrows between the “application processor (AP) 210” and the “sensor module 240,” which includes “biometric sensor 240I” (Ex-1004, Fig. 2, 7:33-38, 9:13; Ex-1022, Fig. 2, ¶¶33, 43). A person of ordinary skill in the art would understand that Figure 2 depicts an electrical connection, such that the biometric sensor 240 will transmit an output signal to the application processor 210. Likewise, a person of ordinary skill in the art would understand that this connection is enabled by flexible PCB 706.

FIG. 2



153. A person of ordinary skill in the art would have understood that the purpose of the electrical connection between “flexible conduit 706” and “fingerprint sensor 240p2” was to transmit an output signal from “fingerprint sensor 240p2” to the “application processor (AP) 210.”

154. Furthermore, element [11.f] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.A (which is incorporated by reference), a person of ordinary skill in the art would have known that a common way to electrically connect a biometric sensor (*e.g.*, a fingerprint sensor) and a processor was with a flexible conduit, such as a flexible printed circuit board (PCB). That flexible conduit would have been electrically connected to the

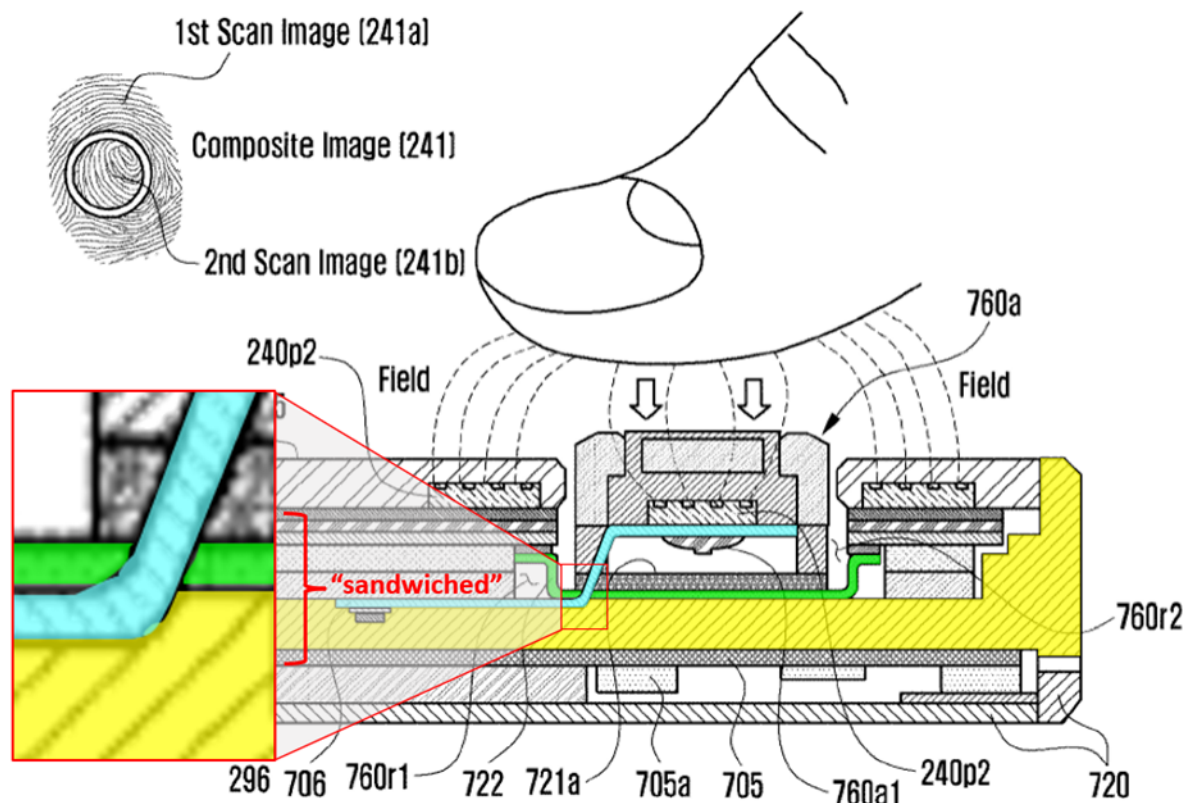
biometric sensor and the processor because the flexible conduit would have been configured to transmit the biometric sensor's output signal to the processor, so that the electronic device may do something with the output from the fingerprint sensor (e.g., use the output or "fingerprint" for biometric authentication). A person of ordinary skill in the art would have also known that flexible PCBs should be used in mobile devices, which have relatively smaller volume and profile. Consequently, "a flexible conduit electrically connecting the fingerprint sensor to the processor" would have been obvious and well within the skill of a person of ordinary skill in the art.

155. Thus, *Kim* discloses claim element [11.f].

Claim 11, Element [11.g]: a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening.

156. *Kim* discloses claim element [11.g]. Specifically, *Kim* discloses a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening. This is illustrated in at least *Kim*'s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)

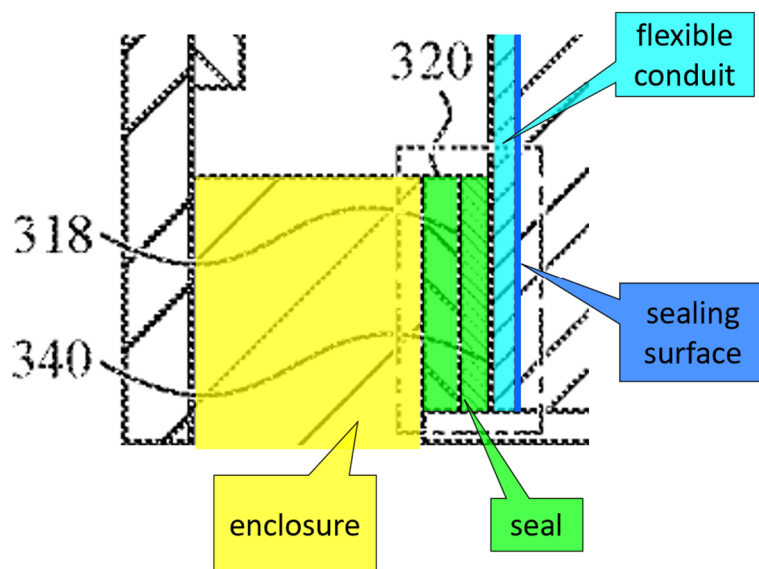


157. As explained earlier with respect to claim elements [11.a], [11.d], and [11.f] (the discussion of which is incorporated herein), *Kim* discloses the claimed “flexible conduit,” “seal,” and “enclosure.” Furthermore, *Kim*’s Figure 10(b) (annotated above) discloses that a portion of the flexible conduit (*i.e.*, *Kim*’s “flexible PCB 706,” highlighted in teal) is sandwiched between the seal (*i.e.*, from *Kim*’s “sealing rubber 722,” highlighted in green) and the enclosure (*i.e.*, *Kim*’s “housing 720” and “cover glass 725,” highlighted in yellow).

158. Indeed, *Kim* discloses “a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the

surface of the opening” the same way as the ’619 patent’s specification. For example, the ’619 patent discloses that “a gasket seal (such as face seal 318) may further be applied below the lower PSA portion, such that *a sandwich . . . is formed of PSA, flexible conduit 340, PSA, and then the gasket seal*” (Ex-1001, 17:35-46). This is illustrated in at least the ’619 patent’s Figure 3A (excerpted annotated below), which illustrates the “sandwiching.” As another example, the ’619 patent discloses that “sandwiching” includes a “stack” of elements (Ex-1001, 23:39-43 (“In one embodiment, the compressible layer 404 is a heat activated (HAF) silicon sandwich. The HAF silicon sandwich is a stack of the following five elements: heat activated film, polyimide (PI), silicon, heat activated film and the flexible conduit 440.”)).

Ex-1001, Fig. 3A (excerpted and annotated)



159. Because *Kim* discloses a “stack” of elements including “a portion of the flexible conduit,” a “seal,” and an “enclosure,” *Kim* discloses “a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening” the same way as the ’619 patent’s specification.

160. Furthermore, element [11.f] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), a person of ordinary skill in the art would have known that a common way to electrically connect a biometric sensor (*e.g.*, a fingerprint sensor) and a processor was with a flexible conduit, such as a flexible printed circuit board (PCB) (*see also* claim element [11.e], above). A person of ordinary skill in the art would also have known that button assemblies and fingerprint sensors in mobile electronic devices would be sealed in order to prevent ingress of potentially damaging moisture and dust. From this, a person of ordinary skill in the art would have been motivated to provide the seal by sandwiching existing, known components, such as the enclosure and flexible conduit, so as to provide additional protection to potential ingress points, such as the pathway between the flexible conduit and delicate electronic components such as the processor. Using these existing, known components would have saved costs and promoted an efficient use of limited space within the mobile device. Consequently, “a portion of the flexible conduit is

sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening” would have been obvious and well within the skill of a person of ordinary skill in the art.

161. Thus, *Kim* discloses claim element [11.g].

Claim 14: The fingerprint sensing system of claim 11, wherein the fingerprint sensor is further configured to detect a touch.

162. *Kim* discloses claim 14. Specifically, *Kim* discloses the fingerprint sensing system of claim 11, wherein the fingerprint sensor is further configured to detect a touch.

163. *Kim* discloses a capacitive fingerprint sensor as a form of biometric sensor. Specifically, it teaches that:

Each of the physical button 760a and the virtual button 760b may include a fingerprint sensor. For example, the capacitive fingerprint sensor may be formed equally in each of the physical button 760a and the virtual button 760b. The fingerprint sensor (*e.g.*, the capacitive fingerprint sensor) corresponding to the virtual button 760b may be disposed (or mounted) to surround the fingerprint sensor (*e.g.*, the capacitive fingerprint sensor) corresponding to the physical button 760a.

(Ex-1004, 21:27-41; Ex-1022, ¶¶167-170).

164. Furthermore, claim 14 would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.A (which is incorporated

by reference), because a person of ordinary skill in the art would have understood that a capacitive fingerprint sensor functions by detecting a touch.

165. Thus, *Kim* discloses claim 14. *See also* claim element [11.c.i].

Claim 16, Element [16.pre]: A watch comprising:

166. To the extent that it is found to be limiting, *Kim* discloses claim element [16.pre]. Specifically, *Kim* discloses a watch.

167. *Kim* explicitly discloses that the electronic device described therein can include “a wearable device (*e.g.*, a head-mounted device (HMD) such as electronic glasses, electronic clothes, an electronic bracelet, an electronic necklace, an electronic appcessory, or *a smart watch*), or the like, but is not limited thereto” (Ex-1004, 4:19-31 (emphasis added); Ex-1022, ¶¶12-13).

168. Thus, *Kim* discloses claim element [16.pre].

Claim 16, Element [16.a]: an enclosure defining an enclosed volume and an opening formed in a sidewall;

169. *Kim* discloses claim element [16.a]. Specifically, *Kim* discloses an enclosure defining an enclosed volume and an opening formed in a sidewall.

170. This element is substantially similar to claim element [11.a] and [11.c]. As such, I incorporate my analysis with respect to claim element [11.a] and [11.c] herein.

171. *Kim* further contemplates that the “combined button” is a button assembly within an opening formed in the enclosure (*e.g.*, in a sidewall of the

enclosure). For example, *Kim* discloses that “a power button . . . located on the *lateral* [*i.e.*, side] *surface* of the electronic device 600 *may also be the combined button*” (Ex-1004, 17:10-12 (emphasis added); Ex-1022, ¶166). As another example, *Kim* discloses that “the *combined buttons may further include a power button (764 in FIG. 18)* and/or a volume button (not shown). Although the home button is described as an example of the combined button in this embodiment, *the combined button is not limited to the home button*” (Ex-1004, 13:46-53 (emphasis added); Ex-1022, ¶89).

172. Thus, *Kim* discloses claim element [16.a].

Claim 16, Element [16.b]: a processor disposed in the enclosed volume;

173. *Kim* discloses claim element [16.b]. Specifically, *Kim* discloses a processor disposed in the enclosed volume.

174. This element is substantially similar to claim element [11.b]. As such, I incorporate my analysis with respect to claim element [11.b] herein.

175. Thus, *Kim* discloses claim element [16.b].

Claim 16, Element [16.c]: a display positioned within the enclosure and operably coupled to the processor;

176. *Kim* discloses claim element [16.c]. Specifically, *Kim* discloses a display positioned within the enclosure and operably coupled to the processor.

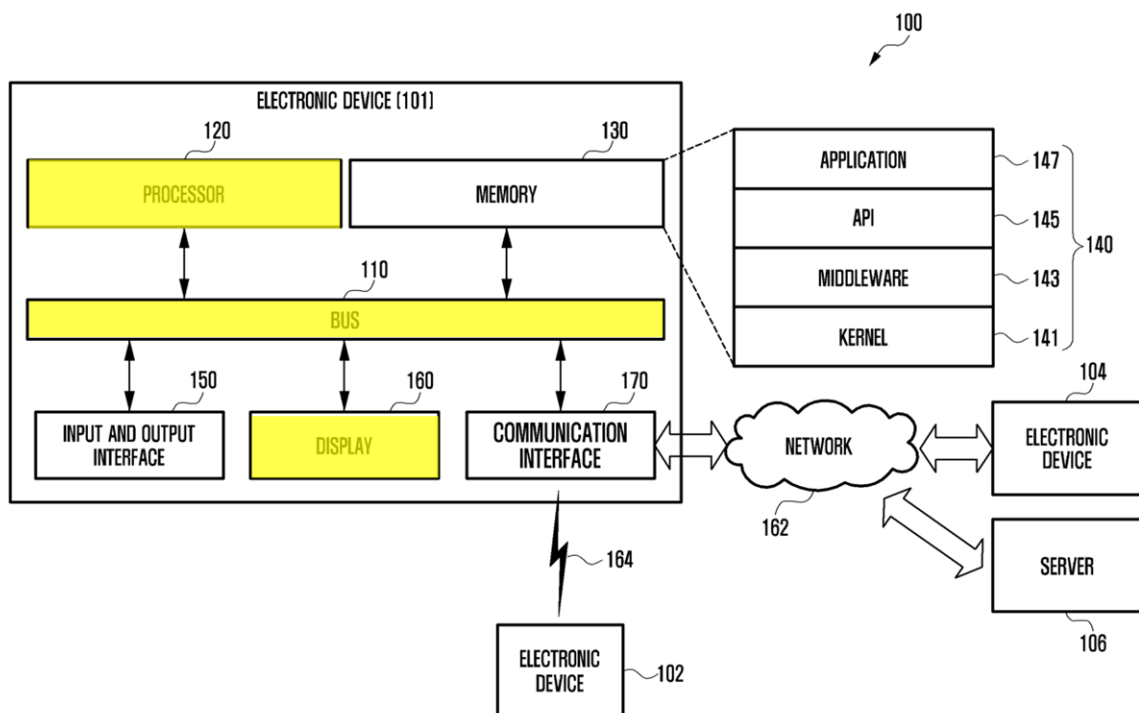
177. *Kim* discloses that “an electronic device may comprise a housing including a first surface facing a first direction and a second surface facing a second

direction, the first direction being opposite that of the second direction, the first surface including a first opening and a second opening; ***a touch screen display being disposed and visible through the first opening***; a mechanical button located at least in part of the second opening and movable in response to a pressure applied thereto” (Ex-1004, 1:38-46 (emphasis added); Ex-1022, ¶5).

178. At least Figure 1 of *Kim* shows that the display is operable connected to the processor:

Ex-1004, Fig. 1; Ex-1022, Fig. 1

FIG. 1



179. Thus, *Kim* discloses claim element [16.c].

Claim 16, Element [16.d]: a watchband attached to the enclosure and configured to couple the watch to a user;

180. *Kim* discloses claim element [16.d]. Specifically, *Kim* discloses a watchband attached to the enclosure and configured to couple the watch to a user.

181. *Kim* discloses an electronic device, wherein the electronic device is a smart watch. *See* claim element [16.pre], above. A person of ordinary skill in the art would understand that a smart watch necessarily includes a watchband attached to the outer surface of the watch (*i.e.*, the “enclosure”) and configured to couple the watch to the user.

182. Moreover, this element would have been obvious based on the knowledge of a person of ordinary skill in the art. A person of ordinary skill in the art would have understood that a watch includes a watchband. Given that the claimed enclosure constitutes the outer surface of the electronic device, it would be obvious to one of ordinary skill in the art to connect the watchband of the disclosed watch to the enclosure of the electronic device. Likewise, a person of ordinary skill in the art would understand that the purpose of a watchband is to couple the watch to the user.

183. Thus, *Kim* discloses claim element [16.d].

Claim 16, Element [16.e]: a button assembly disposed within the opening, the button assembly comprising: a button housing; an input member with an input surface; a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint; a touch sensor configured to detect the touch; a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor; and

184. *Kim* discloses claim element [16.e]. Specifically, *Kim* discloses a button assembly disposed within the opening.

185. This element is substantially similar to claim element [11.c]. As such, I incorporate my analysis with respect to claim element [11.c] herein.

186. Thus, *Kim* discloses claim element [16.e].

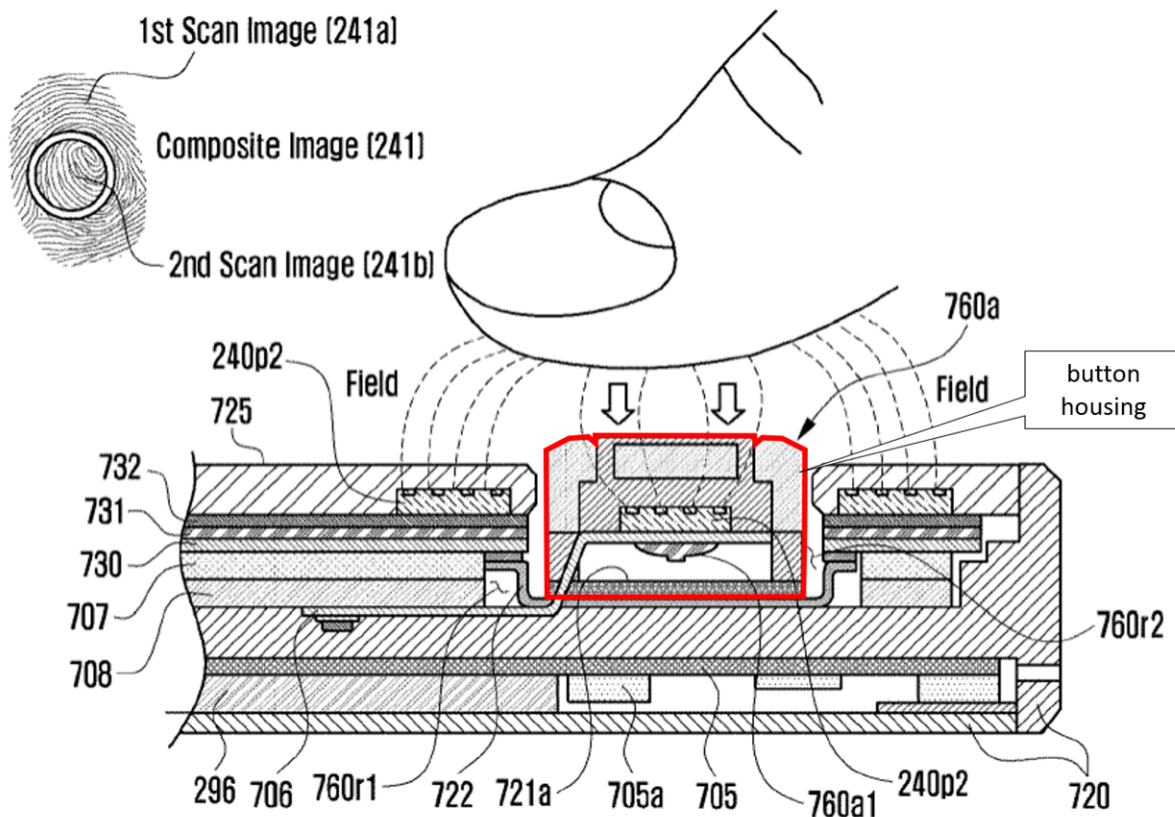
187. Claim element 16.e contains five sub-elements, discussed in turn below.

(i) Claim 16, Element [16.e.i]: a button assembly disposed within the opening, the button assembly comprising: a button housing;

188. *Kim* discloses claim element [16.e.i]. Specifically, *Kim* discloses a button housing.

189. The button housing of *Kim* is depicted below. *See also* claim element [11.c].

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



190. *Kim* discloses that “FIGS. 10(a) and 10(b) show a front view and a cross-sectional view of a combined button of an electronic device according to still another embodiment” (Ex-1004, 21:20-26; Ex-1022, ¶¶166-167). Likewise, *Kim* teaches that “a circular home button 760 including a physical button 760 a and a virtual button 760 b may be implemented as an example of the combined button in the display 710” (Ex-1004, 21:20-26; Ex-1022, ¶¶166-167).

191. Thus, *Kim* discloses claim element [16.e.1].

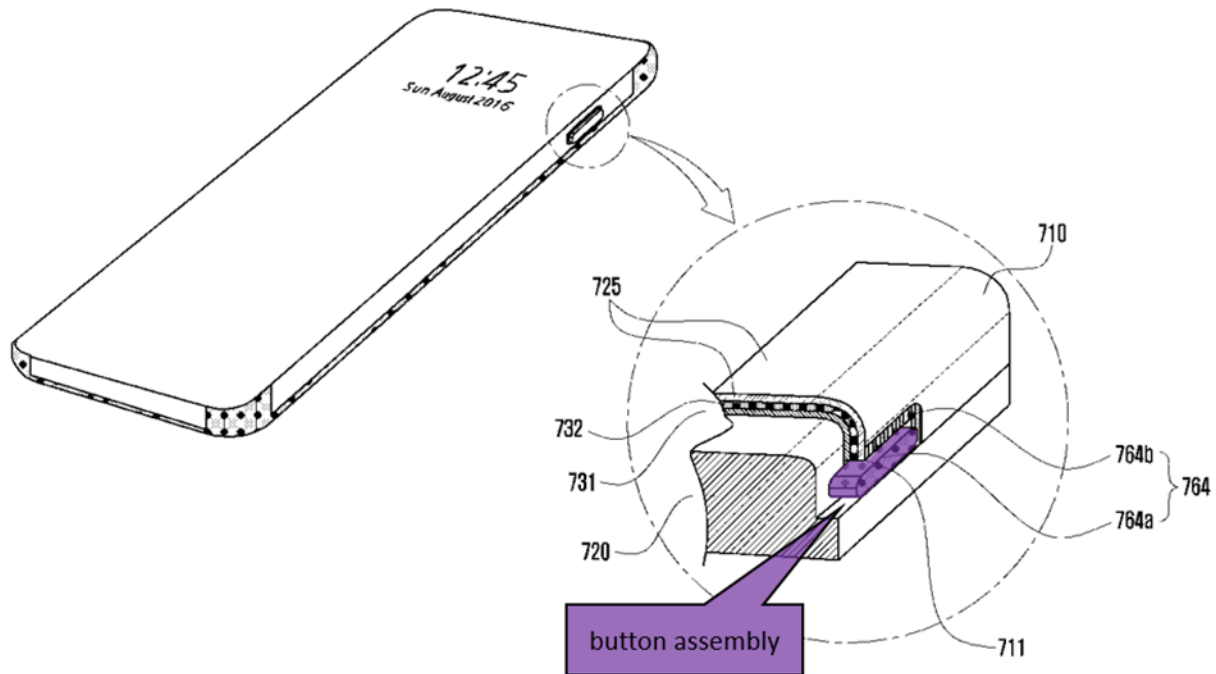
(ii) **Claim 16, Element [16.e.ii]: a button assembly disposed within the opening, the button assembly comprising: . . . an input member with an input surface;**

192. *Kim* discloses claim element [16.e.ii]. Specifically, *Kim* discloses an input member with an input surface.

193. This element is substantially similar to claim element [11.c]. As such, I incorporate my analysis with respect to claim element [11.c] herein.

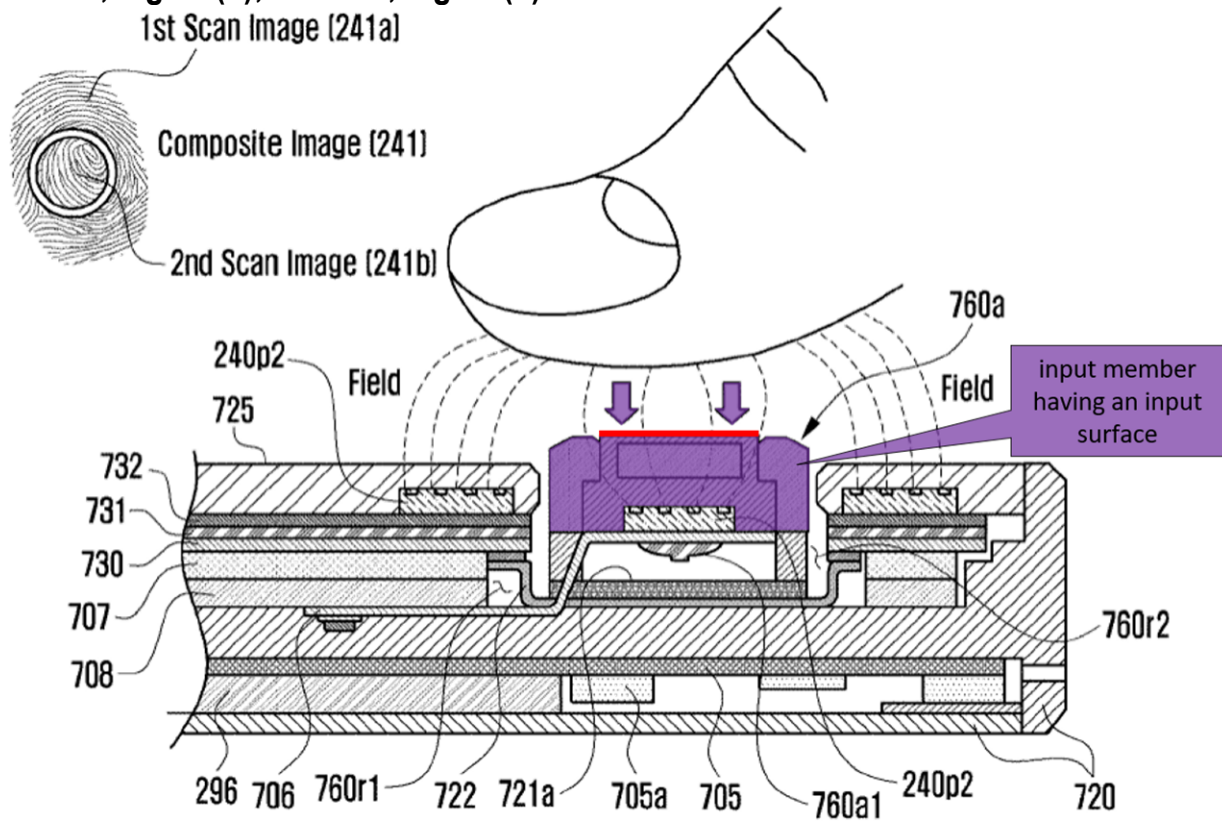
194. Moreover, *Kim* discloses a “combined button,” which corresponds to the claimed “button assembly comprising . . . an input member with an input surface” of element [16.e.ii]. *Kim*’s Figure 18 (annotated below) “shows a perspective view of an electronic device and a partially enlarged view of an area of the electronic device including a *combined button*” (Ex-1004, 3:22-24 (emphasis added); Ex-1022, ¶8).

FIG. 18



195. Furthermore, *Kim*'s Figure 10(b) (annotated below) shows a “cross-sectional view of [the] **combined button**” (Ex-1004, 21:20-22 (emphasis added); Ex-1022, ¶166). The “combined button” includes a surface that may be touched, pressed, or otherwise interacted with by a user in order to move downward (as indicated by the arrows):

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



196. *Kim* further contemplates that the “combined button” is a button assembly within an opening formed in a sidewall. For example, *Kim* discloses that “a power button . . . located on the *lateral* [*i.e.*, side] *surface* of the electronic device 600 *may also be the combined button*” (Ex-1004, 17:10-12 (emphasis added); Ex-1022, ¶166). As another example, *Kim* discloses that “the *combined buttons may further include a power button (764 in FIG. 18)* and/or a volume button (not shown). Although the home button is described as an example of the combined

button in this embodiment, *the combined button is not limited to the home button*” (Ex-1004, 13:46-53 (emphasis added); Ex-1022, ¶¶89).

197. Indeed, *Kim* discloses “button assembly comprising ... an input member with an input surface” the same way as the ’619 patent’s specification. For example, the ’619 patent discloses that “[t]he button assembly 110 includes an input member 112 that may be touched, pressed, or otherwise interacted with by a user. The input member 112 may translate, deflect, bend, or otherwise move a relatively small distance in response to user input” (Ex-1001, 6:49-59). Because *Kim* discloses a “combined button” with a surface that similarly may be touched, pressed, or otherwise interacted with by a user in order to move downward, *Kim* discloses “button assembly comprising ... an input member with an input surface” the same way as the ’619 patent’s specification (*see also* Ex-1004, 13:42-67, 16:48-17:12; Ex-1022, ¶¶89-92, ¶¶118-120).

198. Thus, *Kim* discloses claim element [16.e.ii].

(iii) Claim 16, Element [16.e.iii]: a button assembly disposed within the opening, the button assembly comprising: . . . a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint;

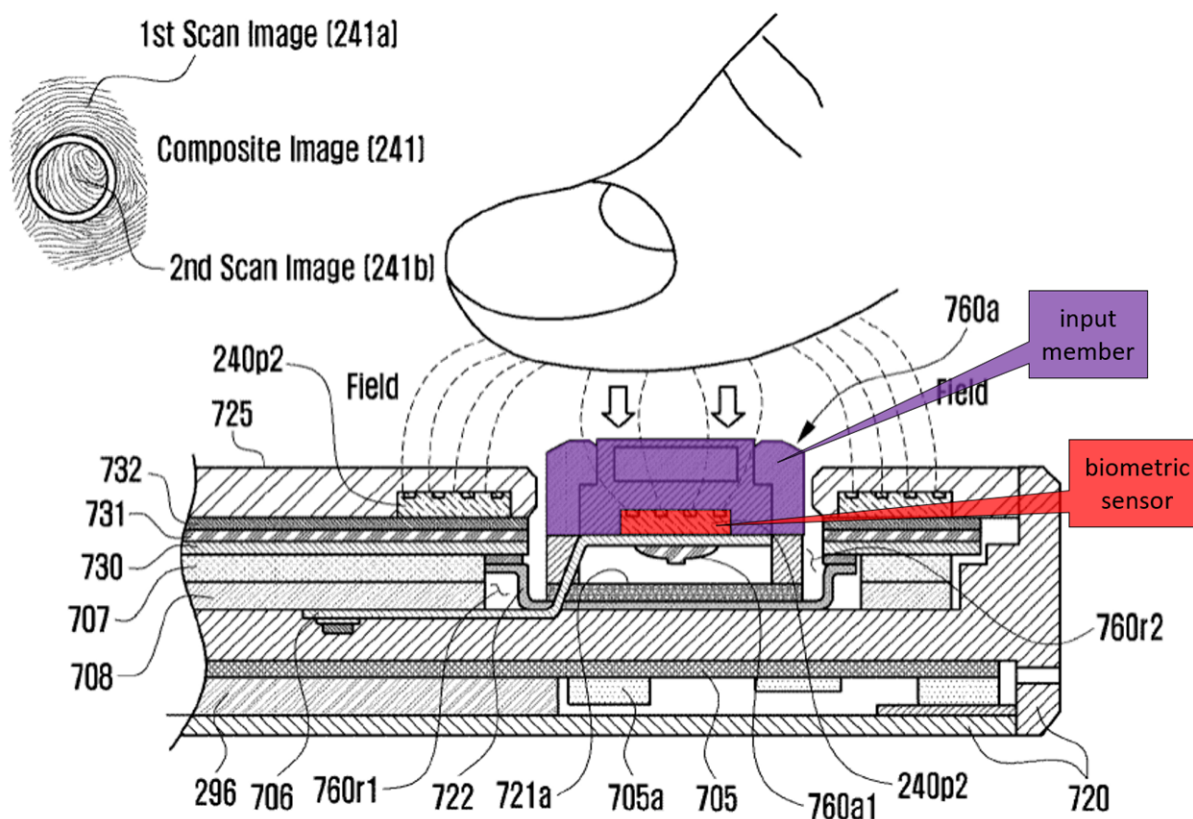
199. *Kim* discloses claim element [16.e.iii]. Specifically, *Kim* discloses a fingerprint sensor positioned below the input member and configured to produce an

output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint.

200. This element is substantially similar to claim elements [11.c.i] and 14. As such, I incorporate my analysis with respect to claim elements [11.c.i] and 14 herein.

201. As explained earlier, *Kim* discloses a “combined button” with an input member. Furthermore, *Kim* discloses that the “combined button” includes a fingerprint sensor positioned below the input member. This is illustrated in at least *Kim*’s Figure 10(b) (annotated below) and is described in further detail as follows.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



202. Furthermore, element [16.e.iii] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.A (which is incorporated by reference), a person of ordinary skill in the art would have been familiar with biometric sensors (*e.g.*, fingerprint sensors), and would understand that the “output signal” from a fingerprint sensor would correspond to a biometric characteristic (*e.g.*, a fingerprint). Likewise, a person of ordinary skill in the art would understand that a fingerprint sensor (and particularly a capacitive fingerprint sensor, as disclosed by *Kim*) functions in response to a touch by a user. Consequently, “a button assembly disposed within the opening, the button assembly comprising: . . . a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint” would have been obvious and well within the skill of a person of ordinary skill in the art.

203. Thus, *Kim* discloses claim element [16.e.iii].

(iv) Claim 16, Element [16.e.iv]: a button assembly disposed within the opening, the button assembly comprising: . . . a touch sensor configured to detect the touch;

204. *Kim* discloses claim element [16.e.iv]. Specifically, *Kim* discloses a touch sensor configured to detect the touch.

205. *Kim* discloses a capacitive fingerprint sensor embedded into the button assembly, wherein the fingerprint sensor is further configured to detect a touch (*see, e.g.,* claim elements [11.c.i], 14, above). As such, I incorporate my analysis with respect to claim elements [11.c.i], 14 herein. As I explained earlier in Section VI.A (which is incorporated by reference), because a capacitive fingerprint sensor functions by detecting minor electrical changes when the ridges of a fingerprint contact the sensor, a person of ordinary skill in the art would understand that the implementation of a capacitive fingerprint sensor necessarily entails a touch sensor configured to detect the touch.

206. Thus, *Kim* discloses claim element [16.e.iv].

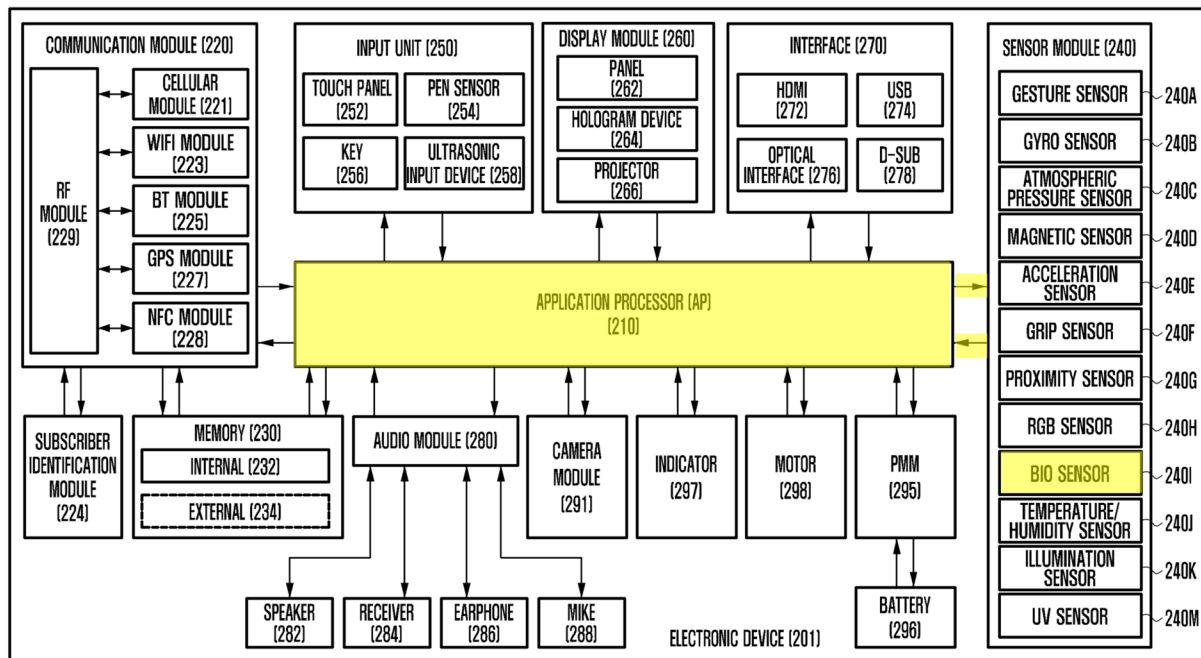
(v) **Claim 16, Element [16.e.v]: a button assembly disposed within the opening, the button assembly comprising: . . . a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor;**

207. *Kim* discloses claim element [16.e.v]. Specifically, *Kim* discloses a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor.

208. This element is substantially similar to claim elements [11.f] and [16.e.iii]. As such, I incorporate my analysis with respect to claim elements [11.f] and [16.e.iii] herein.

209. *Kim* discloses that the flexible conduit is configured to transmit the biometric sensor's output signal to the processor. For example, *Kim* discloses that the “flexible PCB 706 may be *electrically connected* to the capacitive fingerprint sensor 240p2 embedded in the physical button 760a” (Ex-1004, 22:12-13; *see also* Ex-1004, 20:59-60 (emphasis added); Ex-1022, ¶¶161, 176). This electrical connection is further illustrated in at least *Kim*'s Figure 2 (annotated below), which shows arrows between the “application processor (AP) 210” and the “sensor module 240,” which includes “biometric sensor 240I” (Ex-1004, Fig. 2, 7:33-38, 9:13; Ex-1022, Fig. 2, ¶¶33, 43). A person of ordinary skill in the art would understand that Figure 2 depicts an electrical connection, such that the biometric sensor 240 will transmit an output signal to the application processor 210. Likewise, a person of ordinary skill in the art would understand that this connection is enabled by flexible PCB 706.

FIG. 2



210. A person of ordinary skill in the art would have understood that the purpose of the electrical connection between “flexible conduit 706” and “fingerprint sensor 240p2” was to transmit an output signal from “fingerprint sensor 240p2” to the “application processor (AP) 210.”

211. Furthermore, element [16.e.v] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.A (which is incorporated by reference), a person of ordinary skill in the art would have known that a common way to electrically connect a biometric sensor (*e.g.*, a fingerprint sensor) and a processor was with a flexible conduit, such as a flexible printed circuit board (PCB). That flexible conduit would have been electrically connected to the

biometric sensor and the processor because the flexible conduit would have been configured to transmit the biometric sensor's output signal to the processor, so that the electronic device may do something with the output from the fingerprint sensor (e.g., use the output or "fingerprint" for biometric authentication). A person of ordinary skill in the art would have also known that flexible PCBs should be used in mobile devices, which have relatively smaller volume and profile. Consequently, "a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor" would have been obvious and well within the skill of a person of ordinary skill in the art.

212. Thus, *Kim* discloses claim element [16.e.v].

Claim 16, Element [16.f]: a seal positioned between the button housing and a surface of the opening;

213. *Kim* discloses claim element [16.f]. Specifically, *Kim* discloses a seal disposed between the sealing surface of the retainer and a surface of the opening.

214. As discussed above, the "button housing" constitutes the exterior structure of the button assembly discussed in claim element [16.e.i]. Moreover, as described with respect to previous claims, *Kim* explicitly discloses a seal positioned between the button housing, and the portion of the enclosure defining a surface of the opening. *See*, claim elements [11.d]. [16.e.i].

215. Thus, *Kim* discloses claim element [16.f].

Claim 16, Element [16.g]: wherein a portion of the flexible conduit is sandwiched between the seal and the button housing or between the seal and the surface of the opening.

216. *Kim* discloses claim element [16.g]. Specifically, *Kim* discloses wherein a portion of the flexible conduit is sandwiched between the seal and the button housing or between the seal and the surface of the opening.

217. As discussed above, the “button housing” constitutes the exterior structure of the button assembly discussed in claim element [16.e.i]. Moreover, as shown above, *Kim* explicitly discloses a portion of the flexible conduit sandwiched between the seal and the portion of the enclosure defining the opening. *See*, claim element [11.g]. As such, I incorporate my analysis with respect to claim element [11.g] herein.

218. Thus, *Kim* discloses claim element [16.g].

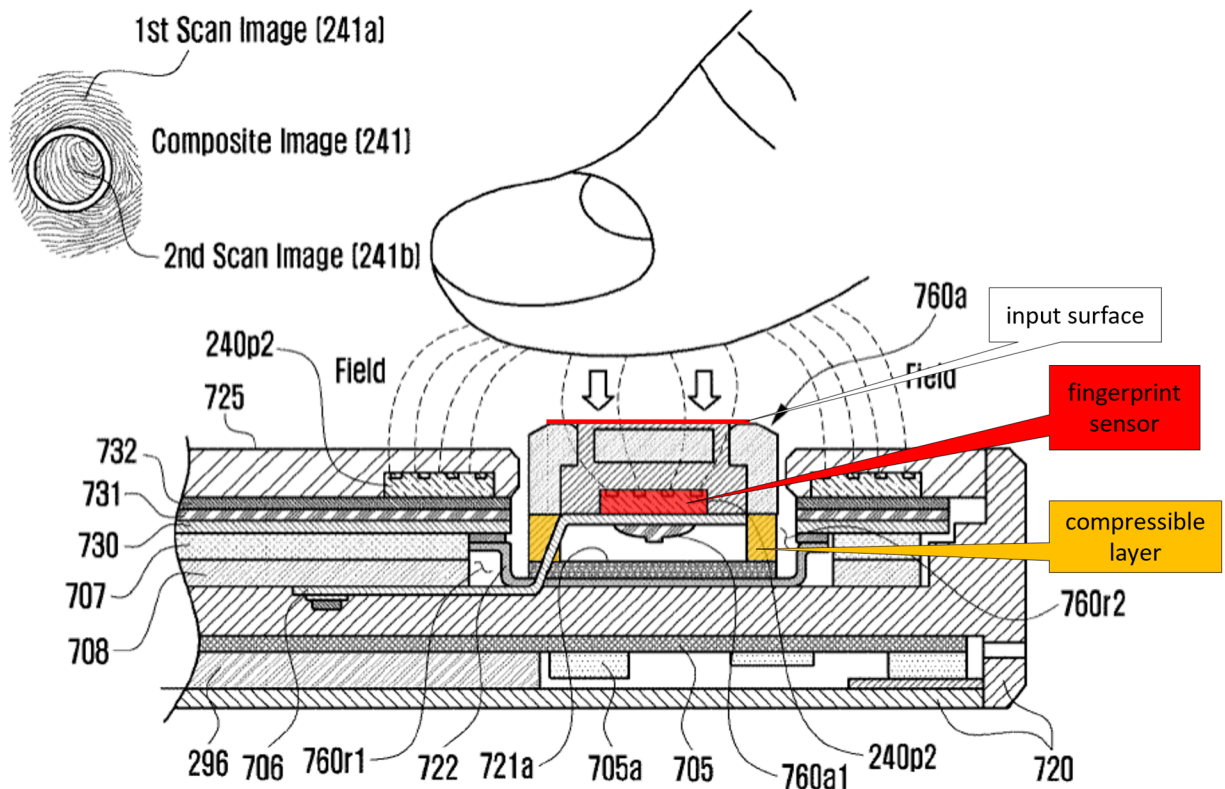
Claim 19: The watch of claim 16, further comprising a compressible layer disposed below the fingerprint sensor, the compressible layer compressing to receive a displacement or a deflection of the input member upon receipt of a user force to the input surface.

219. *Kim* discloses claim 19. Specifically, *Kim* discloses the watch of claim 16, further comprising a compressible layer disposed below the fingerprint sensor, the compressible layer compressing to receive a displacement or a deflection of the input member upon receipt of a user force to the input surface.

220. *Kim* discloses the watch of claim 16. *See* claim 16.

221. The compressible layer is depicted at least in Figure 10(b), below, in orange:

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



222. The compressible layer (orange) is disposed below the fingerprint sensor (red), and compresses following a force on the input surface (red line).

223. Furthermore, claim 19 would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.C (which is incorporated by reference), a person of ordinary skill in the art would have known that tactile dome switches could be implemented, such that the dome switch is configured to

move downward and compress against a solid surface in response to a press on the input surface. This known dome switch configuration is depicted in *Kim* and is one among a finite number of options for implementing a dome switch.

224. However, in order for *any* dome switch to function, either (1) the dome switch itself must move in response to an input, and compress against another surface, or (2) a surface must move into the dome switch in response to an input, and compress the dome switch. In either instance, a person of ordinary skill in the art would understand that compression of the dome switch is required for operation.

225. In Figure 10(a) of *Kim*, above, the only surface that can contact dome switch 760a1 is support fixture 721a. In order for the dome switch to contact support fixture 721a, and therefore operate as designed, a person of ordinary skill in the art would understand that the layer highlighted in orange, above, must necessarily compress to receive a displacement or a deflection of the input member upon receipt of a user force to the input surface.

226. Thus, *Kim* discloses claim 19.

B. Ground 2: *Kim* Renders Obvious Claims 1-14, 16-20 of the '619 patent.

227. *Kim* renders obvious claims 11-14, 16-20 of the '619 patent.

Claim 11, Element [11.pre]: A fingerprint sensing system for a wearable device comprising:

228. To the extent that it is found to be limiting, *Kim* discloses claim element [11.pre]. See Ground 1, claim element [11.pre].

Claim 11, Element [11.a]: an enclosure defining an enclosed volume and an opening along an exterior surface:

229. *Kim* discloses claim element [11.a]. See Ground 1, claim element [11.a].

Claim 11, Element [11.b]: a processor disposed in the enclosed volume;

230. *Kim* discloses claim element [11.b]. See Ground 1, claim element [11.b].

Claim 11, Element [11.c]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface; and a retainer positioned inward from the input surface and defining a sealing surface;

231. *Kim* discloses claim element [11.c]. See Ground 1, claim element [11.c].

(i) ***Claim 11, Element [11.c.i]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface;***

232. *Kim* discloses claim element [11.c.i]. See Ground 1, claim element [11.c.i].

- (ii) **Claim 11, Element [11.c.ii]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: . . . a retainer positioned inward from the input surface and defining a sealing surface;**

233. *Kim* discloses claim element [11.c.ii]. *See* Ground 1, claim element [11.c.i].

Claim 11, Element [11.d]: a seal disposed between the sealing surface of the retainer and a surface of the opening;

234. *Kim* discloses claim element [11.d]. *See* Ground 1, claim element [11.d].

Claim 11, Element [11.e]: a passage extending from the opening to the enclosed volume;

235. *Kim* renders obvious claim element [11.e]. Specifically, *Kim* renders obvious a passage extending from the opening to the enclosed volume.

236. *See also* Ground 1, claim element [11.e].

237. Thus, *Kim* renders obvious claim element [11.e].

Claim 11, Element [11.f]: a flexible conduit electrically connecting the fingerprint sensor to the processor; wherein:

238. *Kim* discloses claim element [11.f]. *See* Ground 1, claim element [11.f].

Claim 11, Element [11.g]: a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening.

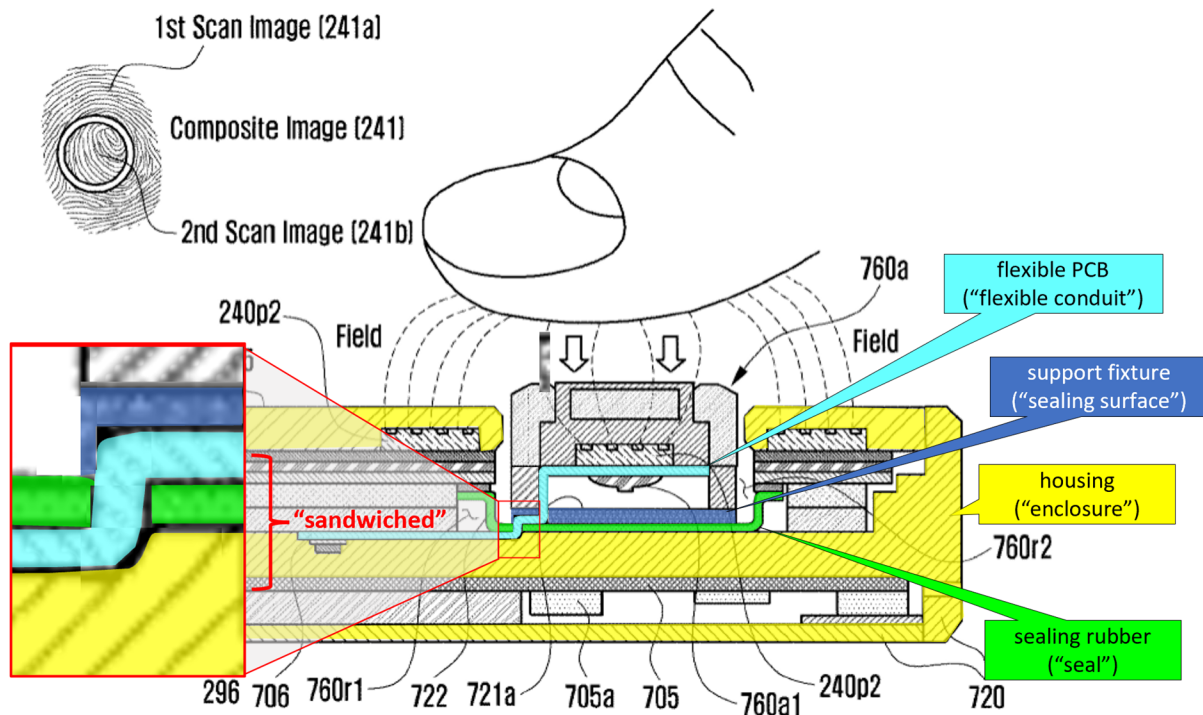
239. *Kim* renders obvious claim element [11.g]. Specifically, *Kim* renders obvious a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening.

240. *Kim* discloses claim element [11.g]. *See* Ground 1, claim element [11.g].

241. Alternatively, a person of ordinary skill in the art would have understood that the flexible printed circuit board could be routed throughout several different pathways in the electronic device, depending on the structure and goals of the device in question, in order to effectively utilize internal space of the mobile terminal. Minor variations in device structure, purpose, and component configuration could lead a designer to choose one pathway over another.

242. For example, based on the factors described above, a person of ordinary skill in the art would understand that the flexible printed circuit board would be routed between the seal (*i.e.*, the gasket) and the retainer (*i.e.*, the support fixture), as depicted in the altered and annotated Figure 10(b), below, in order to avoid interference with moving pieces of the button assembly.

Ex-1004, Fig. 10(b) (altered and annotated); Ex-1022, Fig. 10(b)



243. Furthermore, element [11.g] would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI.B (which is incorporated by reference), a person of ordinary skill in the art would have known that a common way to electrically connect a biometric sensor (*e.g.*, a fingerprint sensor) and a processor was with a flexible conduit, such as a flexible printed circuit board (PCB). A person of ordinary skill in the art would also have known that button assemblies and fingerprint sensors in mobile electronic devices should be sealed in order to prevent ingress of potentially damaging moisture and dust. From this, a person of ordinary skill in the art would have been motivated to provide the seal by sandwiching existing, known components, such as the retainer and flexible conduit.

Using these existing, known components would have saved costs and promoted an efficient use of limited space within the mobile device, while still ensuring that the device is sealed against potentially damaging substances. Consequently, “a portion of the flexible conduit is sandwiched between the seal and the sealing surface of the retainer or between the seal and the surface of the opening” would have been obvious and well within the skill of a person of ordinary skill in the art (*see also* Ex. 1015, 12:12-19; Ex. 1011, [0055]; Ex. 1008, 6:67-7:2).

244. Thus, *Kim* renders obvious claim element [11.g].

Claim 12: The fingerprint sensing system of claim 11, wherein the flexible conduit extends through the passage.

245. *Kim* renders claim 12 obvious. Specifically, *Kim* renders obvious the fingerprint sensing system of claim 11, wherein the flexible conduit extends through the passage.

246. *Kim* discloses a passage extending from the opening to the enclosed volume. *See* claim element [11.e]. As I explained earlier in Section VI.A (which is incorporated by reference), a person of ordinary skill in the art would have known that a biometric sensor (*e.g.*, a fingerprint sensor) outputs an electrical signal that should be electrically connected via the flexible PCB to an integrated circuit or processor disposed within the enclosed volume, and that requires a power supply to function. *See also* claim element [11.f]. In order for these connections to occur, *Kim*

discloses the flexible conduit extends through the passage between the opening and the enclosed volume.

247. Thus, *Kim* renders claim 12 obvious.

Claim 13: The fingerprint sensing system of claim 11, wherein the flexible conduit is coupled to a second flexible conduit that extends through the passage.

248. *Kim* renders claim 13 obvious. Specifically, *Kim* renders obvious the fingerprint sensing system of claim 11, wherein the flexible conduit is coupled to a second flexible conduit that extends through the passage.

249. *Kim* teaches that:

Each of the above-described elements of the electronic device disclosed herein ***may be formed of one or more components***, and the name of each element may vary according to the type of the electronic device. The electronic device disclosed herein may be formed of at least one of the above-discussed elements without some elements or with additional other elements. Some of the elements may be integrated into a single entity that still performs the same functions as the respective functions of such elements before integrated.

(Ex-1004, 10:37-46 (emphasis added); Ex-1022, ¶60).

250. Likewise, *Kim* teaches that “[a]s used herein, the singular forms of terms are intended to include the plural forms as well, unless the context clearly indicates otherwise” (Ex-1004, 4:13-18; Ex-1022, ¶9). *Kim* teaches that the flexible

PCB 706 may have multiple “portions” and that a “portion” of the flexible PCB 706 constitutes a “chip on panel” (Ex-1004, 20:4-13; Ex-1022, ¶154).

251. Thus, a person of ordinary skill in the art would understand that the flexible PCB 706 discussed in claims 11 and 12, above, would include multiple portions, each of which constitutes a separate “chip on panel.” In light of *Kim*’s teachings that an electronic device may be composed of one or more components, a person of ordinary skill in the art would likewise understand that *Kim*’s flexible PCB 706 would be formed of one or more separate and distinct flexible PCBs that are connected together, wherein only one of the flexible PCBs extends through the passage.

252. Thus, *Kim* renders claim 13 obvious.

Claim 14: The fingerprint sensing system of claim 11, wherein the fingerprint sensor is further configured to detect a touch.

253. *Kim* discloses claim 14. See Ground 1, claim 14.

Claim 16, Element [16.pre]: A watch comprising:

254. To the extent that it is found to be limiting, *Kim* discloses claim element [16.pre]. See Ground 1, claim element [16.pre].

Claim 16, Element [16.a]: an enclosure defining an enclosed volume and an opening formed in a sidewall;

255. *Kim* discloses claim element [16.a]. See Ground 1, claim element [16.a].

Claim 16, Element [16.b]: a processor disposed in the enclosed volume;

256. *Kim* discloses claim element [16.b]. See Ground 1, claim element [16.b].

Claim 16, Element [16.c]: a display positioned within the enclosure and operably coupled to the processor;

257. *Kim* discloses claim element [16.c]. See Ground 1, claim element [16.c].

Claim 16, Element [16.d]: a watchband attached to the enclosure and configured to couple the watch to a user;

258. *Kim* discloses claim element [16.d]. See Ground 1, claim element [16.d].

Claim 16, Element [16.e]: a button assembly disposed within the opening, the button assembly comprising: a button housing; an input member with an input surface; a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint; a touch sensor configured to detect the touch; a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor; and

259. *Kim* discloses claim element [16.e]. See Ground 1, claim element [16.e].

(iii) ***Claim 16, Element [16.e.i]: a button assembly disposed within the opening, the button assembly comprising: a button housing;***

260. *Kim* discloses claim element [16.e.i]. See Ground 1, claim element [16.e.i].

- (iv) **Claim 16, Element [16.e.ii]: a button assembly disposed within the opening, the button assembly comprising: . . . an input member with an input surface;**

261. *Kim* discloses claim element [16.e.ii]. *See* Ground 1, claim element [16.e.ii].

- (v) **Claim 16, Element [16.e.iii]: a button assembly disposed within the opening, the button assembly comprising: . . . a fingerprint sensor positioned below the input member and configured to produce an output signal in response to a touch on the input surface, the output signal corresponding to a fingerprint;**

262. *Kim* discloses claim element [16.e.iii]. *See* Ground 1, claim element [16.e.iii].

- (vi) **Claim 16, Element [16.e.iv]: a button assembly disposed within the opening, the button assembly comprising: . . . a touch sensor configured to detect the touch;**

263. *Kim* discloses claim element [16.e.iv]. *See* Ground 1, claim element [16.e.iv].

- (vii) **Claim 16, Element [16.e.v]: a button assembly disposed within the opening, the button assembly comprising: . . . a flexible conduit electrically coupled to the fingerprint sensor and configured to transmit the output signal to the processor;**

264. *Kim* discloses claim element [16.e.v]. *See* Ground 1, claim element [16.e.v].

Claim 16, Element [16.f]: a seal positioned between the button housing and a surface of the opening;

265. *Kim* discloses claim element [16.f]. *See* Ground 1, claim element [16.f].

Claim 16, Element [16.g]: wherein a portion of the flexible conduit is sandwiched between the seal and the button housing or between the seal and the surface of the opening.

266. *Kim* discloses claim element [16.g]. See Ground 1, claim element [16.g].

Claim 17, Element [17.pre]: The watch of claim 16, further comprising:

267. *Kim* discloses claim element [17.pre]. See claim 16.

Claim 17, Element [17.a]: a passage extending from the opening to the enclosed volume; wherein

268. *Kim* renders claim element [17.a] obvious. Specifically, *Kim* renders obvious a passage extending from the opening to the enclosed volume.

269. This element is substantially similar to claim element [11.e]. As such, I incorporate my analysis with respect to claim element [11.e] herein.

270. Thus, *Kim* renders claim element [17.a] obvious.

Claim 17, Element [17.b]: the flexible conduit extends from the opening to the enclosed volume through the passage.

271. *Kim* renders claim element [17.b] obvious. Specifically, *Kim* renders obvious the flexible conduit extends from the opening to the enclosed volume through the passage.

272. This element is substantially similar to claim 12. As such, I incorporate my analysis with respect to claim 12 herein.

273. Thus, *Kim* renders claim element [17.b] obvious.

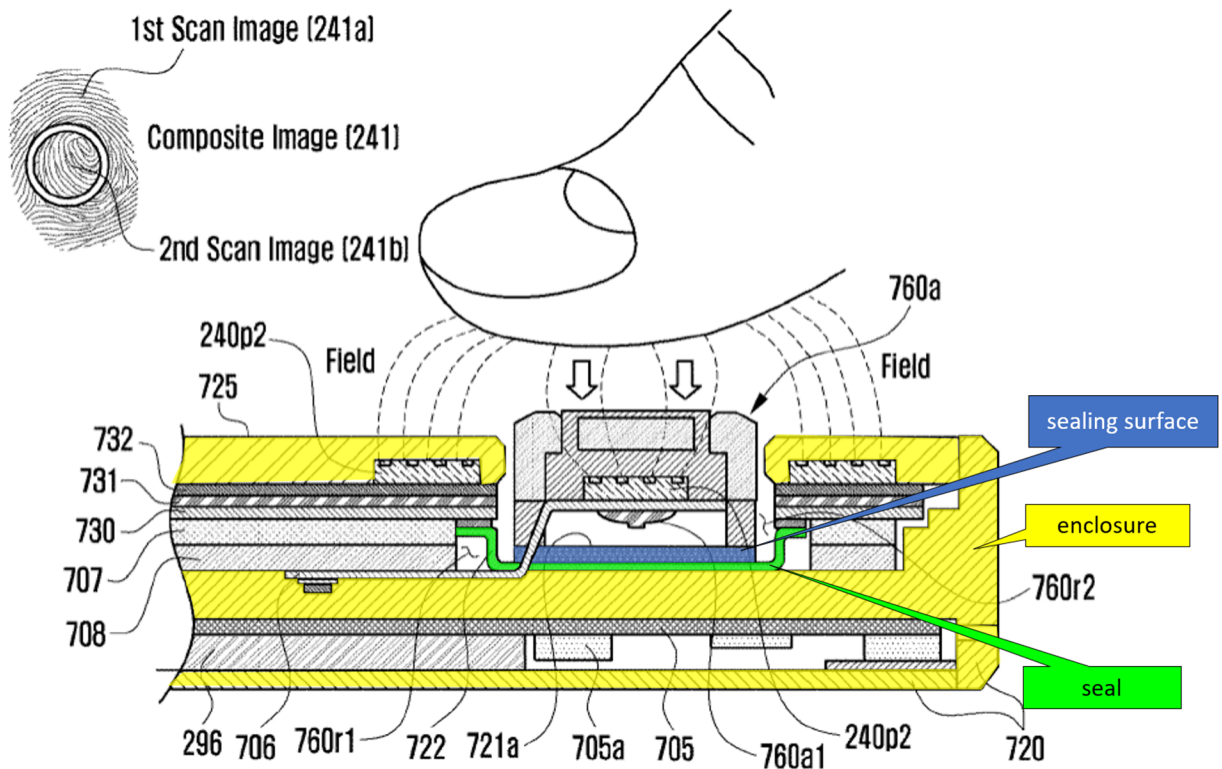
Claim 18: The watch of claim 16, further comprising: a fastener attaching the button housing to the enclosure and placing the seal in compression.

274. *Kim* renders claim 18 obvious. Specifically, *Kim* renders obvious a fastener attaching the button housing to the enclosure and placing the seal in compression.

275. *Kim* discloses claim 16. *See* claim 16, above.

276. As shown in claim 16, *Kim* discloses a button housing that is separated from the enclosure by the seal, *See* claim elements [16.e], [16.f], [16.g]. Figure 10(b), below, depicts this configuration.

Ex-1004, Fig. 10(b); Ex-1022, Fig. 10(b)



277. *Kim* does not explicitly disclose how the button housing is attached to the enclosure. But, a person of ordinary skill in the art would understand that the button housing of *Kim* is attached to the portion of the enclosure underneath the seal, in light of the fact Figure 10(b) does not depict any points of attachment to the side of the button housing. Likewise, a person of ordinary skill in the art would understand that by attaching the button housing to the enclosure through the seal, the button housing would necessarily place the seal in compression.

278. Thus, *Kim* renders claim 18 obvious.

Claim 19: The watch of claim 16, further comprising a compressible layer disposed below the fingerprint sensor, the compressible layer compressing to receive a displacement or a deflection of the input member upon receipt of a user force to the input surface.

279. *Kim* discloses claim 19. *See* Ground 1, claim 19.

Claim 20: The watch of claim 16, further comprising an electrical isolation sheet disposed between the button housing and the enclosure.

280. *Kim* renders claim 20 obvious. Specifically, *Kim* renders obvious the watch of claim 16, further comprising an electrical isolation sheet disposed between the button housing and the enclosure.

281. *Kim* discloses the watch of claim 16. *See* claim 16, above.

282. Furthermore, claim 20 would have been well known to a person of ordinary skill in the art. As I explained earlier in Section VI (which is incorporated by reference), a person of ordinary skill in the art would have understood that use of

electrical isolation techniques are beneficial to prevent interference with the sensitive electronic components disposed in the button assembly of *Kim*, such as capacitive fingerprint sensors. Specifically, it was well known in the art that electrical isolation sheets were needed so that capacitance would be measured “between the user’s finger and the fingerprint recognition sensor, not between any other object and the fingerprint sensor” (*see, e.g.*, Ex. 1007, ¶¶[0079]-[0080]). Therefore a person of ordinary skill in the art would have been motivated to include an electrical isolation sheet disposed between the button housing and the enclosure, to ensure proper operation of the fingerprint sensor.

283. Thus, *Kim* renders obvious claim 20.

C. Ground 3: *Jung* in view of *Meyers* Renders Obvious Claims 11-14, 16-17, 19-20 of the ’619 patent.

284. *Jung* in view of *Meyers* renders obvious claims 11-14, 16-17, 19-20 of the ’619 patent.

Motivation to Combine

285. *Jung* and *Meyers* are generally directed to the same technical field of button structures within mobile devices. *Jung* is directed to “mobile phones” and other “portable device[s],” having “a home-key that implement various functions in a one-touch type to enhance the user’s convenience” (Ex-1005, [0003]-[0007]). And *Meyers* is “directed to fingerprint sensor systems for electronic devices, including, but not limited to, finger print image sensors for smartphones (or smart phones),

tablet computers, media players, personal computers, and other portable electronics and mobile devices,” where “the fingerprint sensor is disposed beneath a control button or display element (Ex-1007, ¶[0036]).

286. In particular, *Jung* discloses “[a]n electronic device and a method of waterproofing a key thereof” (Ex-1005, Abstract). “The device includes a body, a display device disposed in the body, a key disposed in the body, and a key-waterproof structure . . . ” (Ex-1005, [0012]). *Jung* also discloses a “biometric sensor” such as a “fingerprint sensor” (Ex-1005, [0060]). But *Jung* does not expressly disclose the structure of its “fingerprint sensor.” To supply this teaching, a person of ordinary skill in the art would have turned to *Meyers*, which expressly discloses the structure of a “fingerprint sensor” button assembly. Indeed, *Meyers* teaches that its button assembly should be incorporated in devices using biometric recognition (Ex-1007, Abstract, ¶¶[0003], [0011]).

287. A person of ordinary skill in the art would have been motivated to implement *Meyers*’ “fingerprint sensor” button assembly in *Jung*’s “key-waterproof structure” because this would have involved use of known technique to improve similar devices in the same way. As I explained in Section VI.B (which is incorporated herein), a person of ordinary skill in the art would also have known that it was important to seal a fingerprint sensor because fingers can introduce potentially damaging moisture and dust. For example, *Evans* discloses that “[f]ingerprints may

be deposited in natural secretions from the eccrine glands present in friction ridge skin (secretions consisting primarily of water) . . .” (Ex-1008, 6:67-7:2). Sealing a fingerprint sensor prevents ingress of contaminants that could potentially damage a fingerprint sensor’s electronic circuitry. Thus, a person of ordinary skill in the art would have been motivated to waterproof *Meyers*’s “fingerprint sensor” button assembly using *Jung*’s “key-waterproof structure” (*see* Ex-1005, [0007] (emphasis added) (“The home-key, which implements various functions using one touch, *should be provided with a waterproof structure.*”))).

Claim 11, Element [11.pre]: A fingerprint sensing system for a wearable device comprising:

288. To the extent that it is found to be limiting, *Jung* in view of *Meyers* renders obvious claim element [11.pre]. Specifically, *Jung* discloses a fingerprint sensing system for a wearable device.

289. *Jung* teaches that:

An electronic device according to the present disclosure may be a device including a communication function. For example, the device corresponds to a combination of at least one of a smartphone, a tablet personal computer (PC), a mobile phone, a video phone, an e-book reader, a desktop PC, a laptop PC, a netbook computer, a personal digital assistant (PDA), a portable multimedia player (PMP), a digital audio player, a mobile medical device, an electronic bracelet, an electronic necklace, an electronic accessory, a camera, *a wearable device*, an electronic clock, *a wrist watch*, home appliances (for

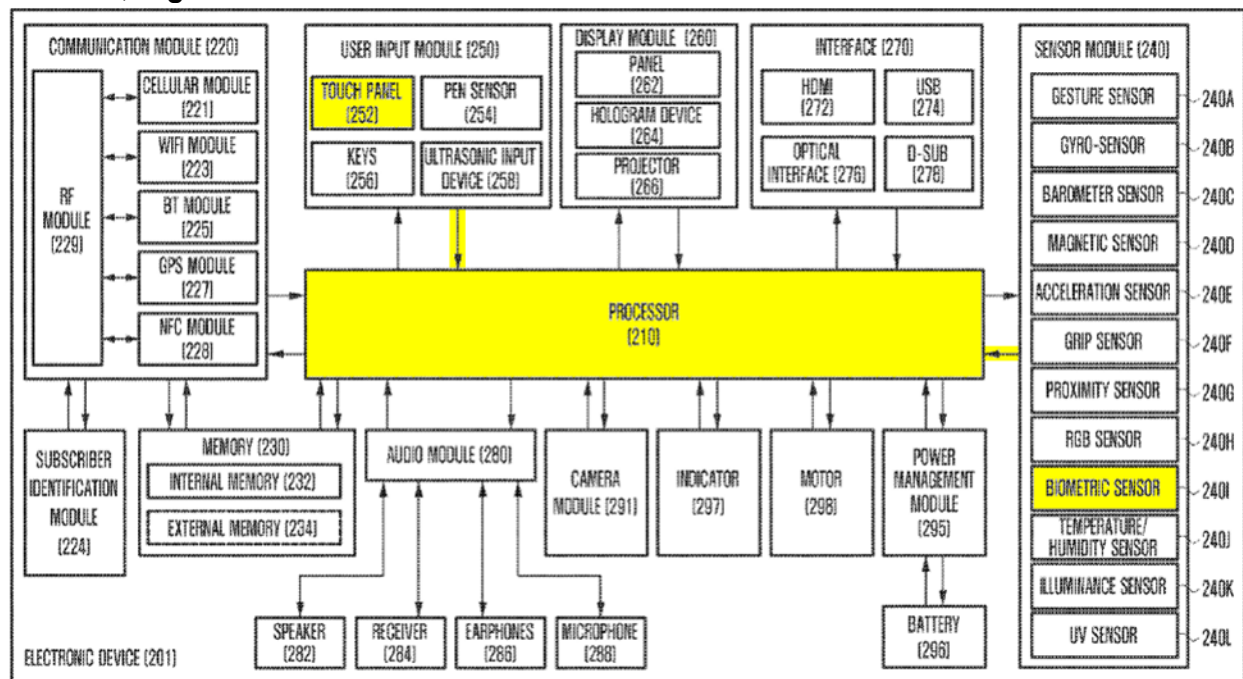
example, an air-conditioner, vacuum, an oven, a microwave, a washing machine, an air cleaner, and the like), an artificial intelligence robot, a television (TV), a digital video disc (DVD) player, an audio device, various medical devices (for example, magnetic resonance angiography (MRA), magnetic resonance imaging (MRI), computed tomography (CT), a scanning machine, a ultrasonic wave device, or the like), a navigation device, a global positioning system (GPS) receiver, an event data recorder (EDR), a flight data recorder (FDR), a set-top box, a TV box (for example, Samsung HomeSync™, Apple TV™, or Google TV™), an electronic dictionary, vehicle infotainment device, an electronic equipment for a ship (for example, navigation equipment for a ship, gyrocompass, or the like), avionics, a security device, ***electronic clothes***, an electronic key, a camcorder, game consoles, a head-mounted display (HMD), a flat panel display device, an electronic frame, an electronic album, furniture or a portion of a building/structure that includes a communication function, an electronic board, an electronic signature receiving device, a projector, and the like. It is obvious to those skilled in the art that the electronic device according to the present disclosure is not limited to the aforementioned devices.

(Ex-1005, [0037]) (emphasis added).

290. *Jung* in view of *Meyers* also discloses a fingerprint sensor.

291. *Jung* discloses a biometric sensor connected to a processor. Specifically, annotated Figure 2, below, shows that the biometric sensor is connected to a processor (Ex-1005, Fig. 2). In turn, it further discloses that user input to the biometric sensor may be provided via a touch panel.

Ex-1005, Fig 2



292. *Jung* explains that:

The sensor module 240 may include, for example, at least one of a gesture sensor 240A, a gyro sensor 240B, a barometer sensor 240C, a magnetic sensor 240D, an acceleration sensor 240E, a grip sensor 240F, a proximity sensor 240G, a red, green and blue (RGB) sensor 240H, a biometric sensor 240I, a temperature/humidity sensor 240J, an illuminance sensor 240K, and a ultra violet (UV) sensor 240L. The sensor module 240 may measure a physical quantity or may sense an operating state of the electronic device 101, and may convert the measured or sensed information to an electrical signal. Additionally/alternatively, the sensor module 240 may include, for example, an E-nose sensor (not illustrated), an electromyography (EMG) sensor (not illustrated), an electroencephalogram (EEG) sensor

(not illustrated), an electrocardiogram (ECG) sensor (not illustrated), *a fingerprint sensor (not illustrated)*, and the like. Additionally or alternatively, the sensor module 240 may include, for example, an E-nose sensor (not illustrated), an EMG sensor (not illustrated), an EEG sensor (not illustrated), an ECG sensor (not illustrated), a fingerprint sensor, and the like. The sensor module 240 may further include a control circuit (not illustrated) for controlling one or more sensors included therein.

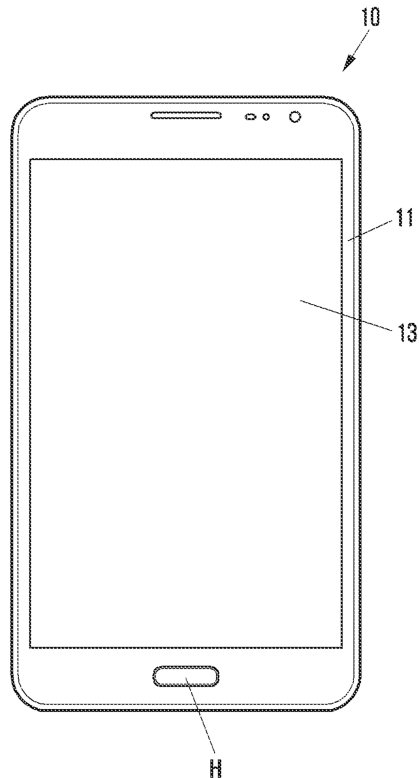
(Ex-1005, [0060]).

293. Thus, *Jung* in view of *Meyers* renders obvious claim element [11.pre].

Claim 11, Element [11.a]: an enclosure defining an enclosed volume and an opening along an exterior surface:

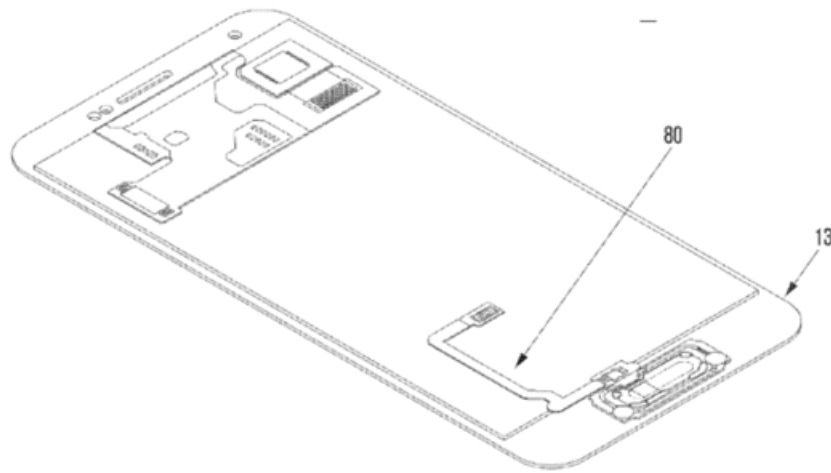
294. *Jung* in view of *Meyers* renders obvious claim element [11.a]. Specifically, *Jung* discloses an enclosure defining an enclosed volume and an opening along an exterior surface.

295. This is illustrated in at least *Jung*'s Figure 4A (shown below) and is described in further detail as follows.

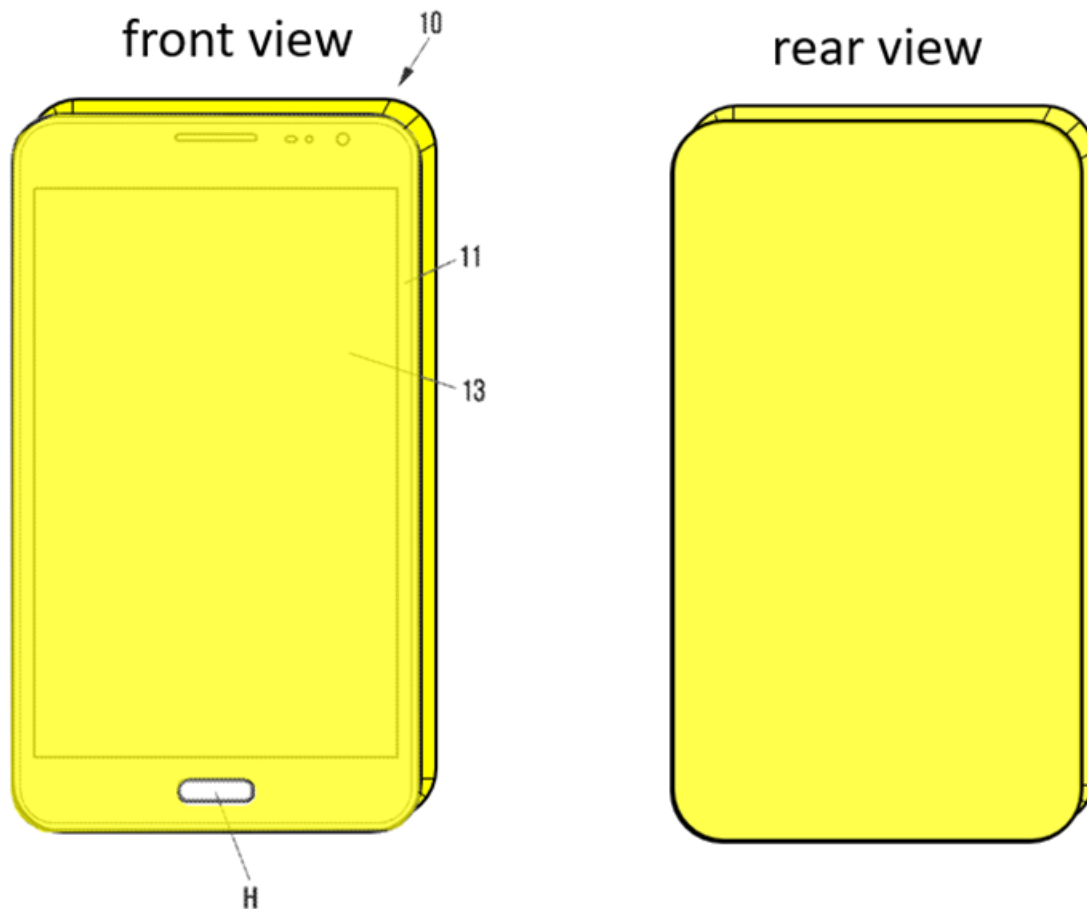


296. First, *Jung* discloses an enclosure defining an enclosed volume. *Jung*’s Figure 4A discloses a “portable terminal[] as example[] of an electronic device” (Ex-1005, [0019]). Furthermore, *Jung*’s Figure 12 “illustrat[es] a key-waterproof structure assembled to the **back surface** of a display device of the portable terminal of FIG. 4A” (Ex-1005, [0028]).

Ex-1005, Fig. 12



297. From this, a person of ordinary skill in the art would have understood that *Jung*'s electronic device is a three-dimensional structure with an enclosed volume, and therefore necessarily has front, side, and rear surfaces. Figure 4A has been edited, below, to depict the side, and rear surfaces in a three-dimensional orientation. The exterior surfaces of the enclosure are depicted in yellow.



298. Indeed, *Jung* discloses “an enclosure defining an enclosed volume” the same way as the ’619 patent’s specification. For example, the ’619 patent discloses that the “enclosure” is a “structure” that may be “constructed from multiple materials” “operably connected together” in order to “define[] an internal volume of the electronic device”:

The enclosure 120 provides a device structure, defines an internal volume of the electronic device 100, and houses device components. In various embodiments, the enclosure 120 may be constructed from any

suitable material, including metals (e.g., aluminum, steel, titanium), polymers, ceramics (e.g., zirconia, glass, sapphire), and the like. In one embodiment, the enclosure 120 is constructed from multiple materials. The enclosure 120 can form an outer surface or partial outer surface and protective case for the internal components of the electronic device 100, and may at least partially surround the display 103. The enclosure 120 can be formed of one or more components operably connected together, such as a front piece and a back piece. Alternatively, the enclosure 120 can be formed of a single piece operably connected to the display 103.

(Ex-1001, 6:3-17).

299. Because *Jung* discloses a “wide display device 13 provided in the center of the front surface of a body 11” that are operably connected together to form a structure that defines an internal volume of the electronic device, *Jung* discloses “an enclosure defining an enclosed volume” the same way as the ’619 patent’s specification.

300. Second, *Jung* renders obvious that the enclosure has an opening along an exterior surface (such as a sidewall). Specifically, *Jung* discloses home key “H” as an example of a key-waterproof structure found in an exterior surface of the enclosure. Although *Jung* includes Figs. 4A and 4B are provided as “examples of an electronic device adopting a key-waterproof structure,” a person of ordinary skill in the art would understand that the key-waterproof structure of *Jung* can be applied to any of the electronic devices disclosed in paragraph [0037], including but not limited

to the smartphones, tablet computers, wearable devices, and wrist watches described therein (Ex-1005, [0019]; *see also* claim element [11.a], above). In light of the various disclosed devices, a person of ordinary skill in the art would understand that the key-waterproof structure can be applied to one or more keys and/or buttons, including keys located in the sidewall of the electronic device.

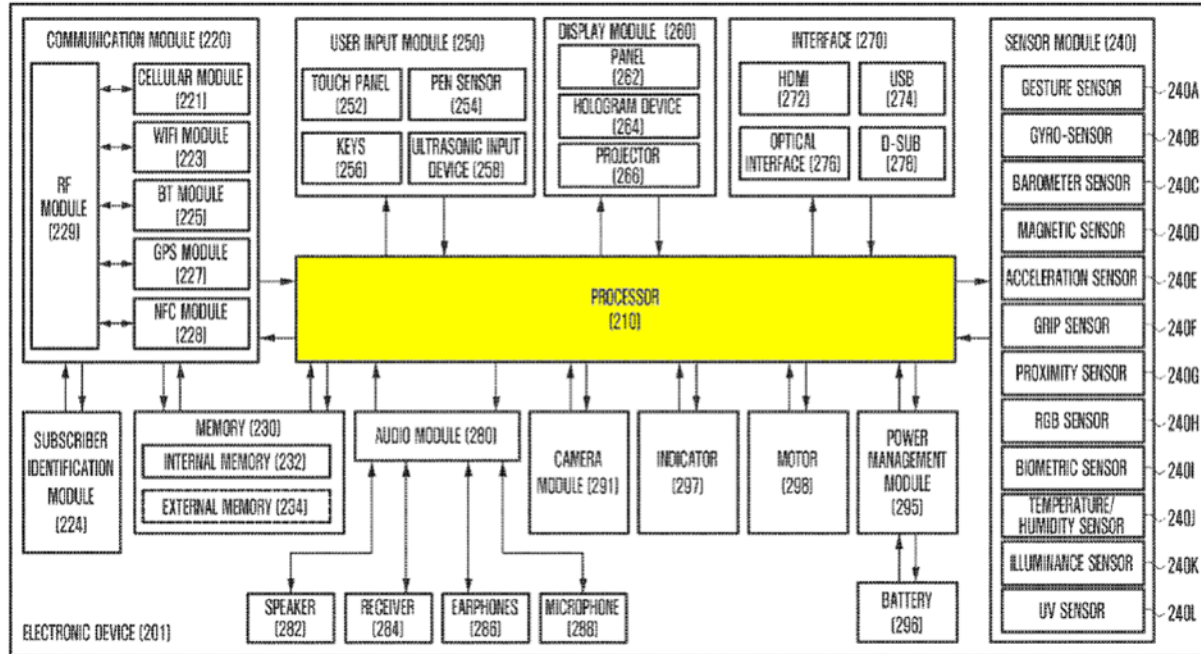
301. *Jung* recognizes this, and explicitly acknowledges that “[a]lthough the description for the key-waterproof structure of the present disclosure is made of the home-key in the specification, ***other keys for performing various functions rather than the home-key may be applied to the key-waterproof structure of the present disclosure***” (Ex-1005, [0123]) (emphasis added).

302. Thus, *Jung* in view of *Meyers* renders obvious claim element [11.a].

Claim 11, Element [11.b]: a processor disposed in the enclosed volume;

303. *Jung* in view of *Meyers* renders obvious claim element [11.b]. Specifically, *Jung* discloses a processor disposed in the enclosed volume. This is illustrated in at least *Jung*’s Figure 2 (annotated below) and is described in further detail as follows.

Ex-1005, Fig. 2



304. Figure 2 of *Jung* discloses a “processor 210” within the electronic device. Because all of the electronic components of *Jung* are depicted as positioned in the enclosed volume, a person of ordinary skill in the art would understand that the processor is positioned in the enclosed volume (Ex-1005, Fig. 4A). Elsewhere, *Jung* defines the relationship between the processor and other components of the electronic device (Ex-1005, Figs. 1-3, [0039], [0041]-[0044], [0050]-[0051]).

305. Thus, *Jung* in view of *Meyers* renders obvious claim element [11.b].

Claim 11, Element [11.c]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface; and a retainer positioned inward from the input surface and defining a sealing surface;

306. *Jung* in view of *Meyers* renders obvious claim element [11.c].

Specifically, *Meyers* discloses a button assembly positioned in the opening and defining an input surface. This is illustrated in at least *Meyers*'s Figure 1 (annotated below) and is described in further detail as follows.

Ex-1007, Fig. 1

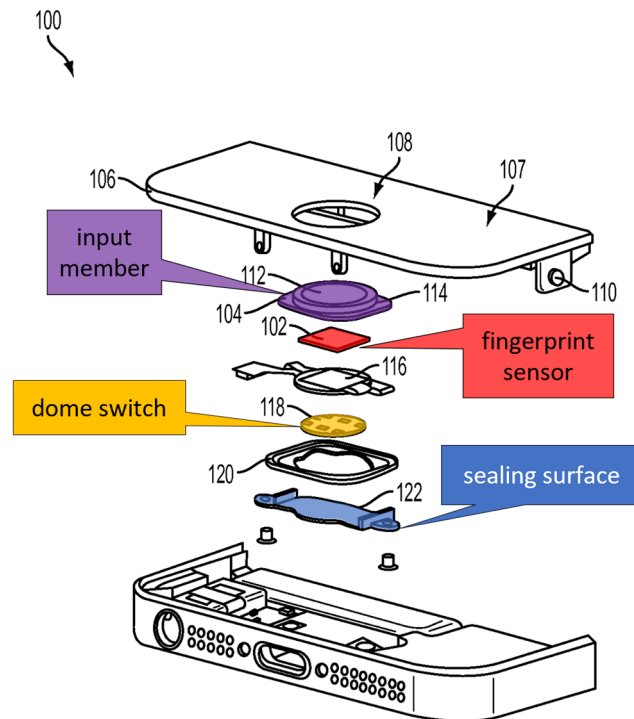


FIG. 1

307. Moreover, *Meyers* discloses an input member having an input surface. The button assembly of *Meyers* includes a button 104 (*i.e.*, an input member) that

includes a lens 112 (*i.e.*, an input surface) that helps to guide the user's finger onto the button 104. The input member having an input surface of *Meyers* is depicted in purple in annotated Figure 1, below.

Ex-1007, Fig. 1

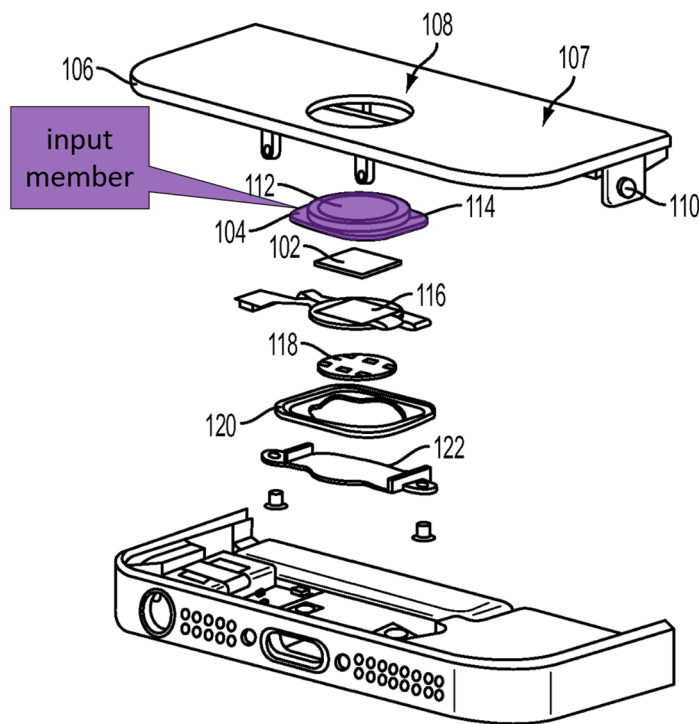


FIG. 1

308. Specifically, Meyers teaches that “[t]he button hole 108 in the cover glass frame 106 is disposed to hold a button 104 (which can form a top element of a push button, as described below), as shown in the figure. The button 104 is disposed to fit into the button hole 108. The button 104 includes a lens 112, at least a portion

of the lens 112 helping to form a recessed shape, with the effect of guiding the user's finger onto the button 104" (Ex-1007, ¶[0044]).

309. Thus, *Jung* in view of *Meyers* renders obvious claim element [11.c].

310. Claim element 11.c contains two sub-elements, discussed in turn below.

- (i) **Claim 11, Element [11.c.i]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: a fingerprint sensor positioned inward from the input surface;**

311. *Jung* in view of *Meyers* renders obvious claim element [11.c.i]. Specifically, *Meyers* discloses an input member having an input surface. Fingerprint recognition sensor 102 is depicted below, in red, and positioned inward from the input surface (purple).

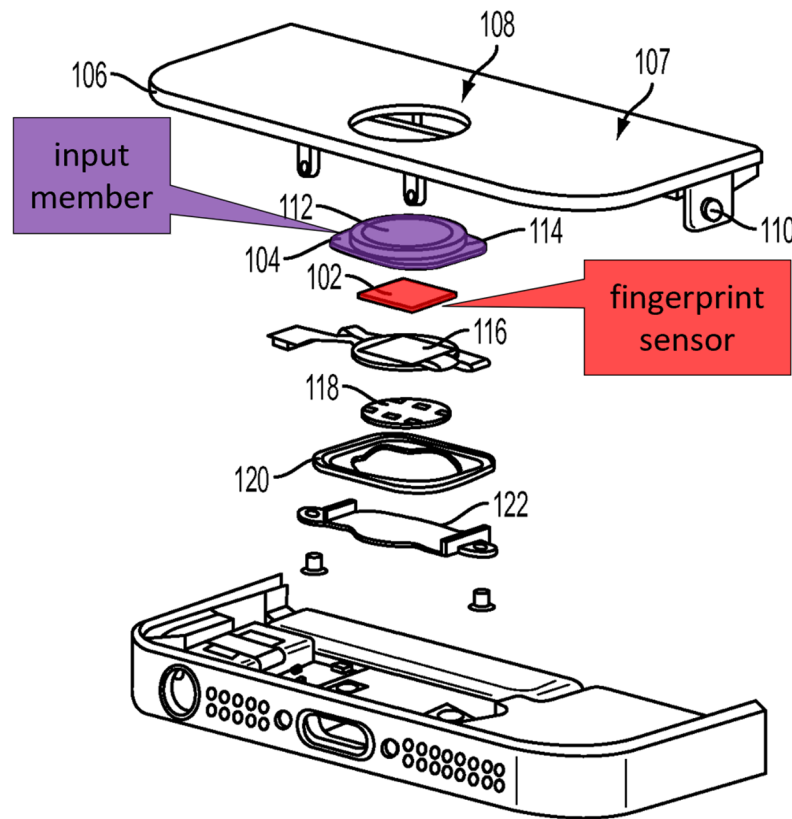


FIG. 1

312. *Meyers* discloses that the biometric sensor is “positioned inward from the input member.” For example, *Meyers* discloses that “[t]he button 104 is ***disposed above*** and coupled to a fingerprint recognition sensor 102 circuit” (Ex-1007, ¶[0045] (emphasis added)). This is further illustrated in *Meyers*’s Figure 1 (above).

313. Thus, *Jung* in view of *Meyers* renders obvious claim element [11.c.i].

- (ii) **Claim 11, Element [11.c.ii]: a button assembly positioned in the opening and defining an input surface, the button assembly comprising: . . . a retainer positioned inward from the input surface and defining a sealing surface;**

314. *Jung* in view of *Meyers* renders obvious claim element [11.c.ii]. Specifically, *Meyers* discloses a retainer positioned inward from the input surface and defining a sealing surface.

315. Figure 1 of *Meyers*, annotated below, depicts both the retainer (*i.e.*, the button support plate 122) in blue, and the input surface (*i.e.*, the lens 112 located on button 104) in purple. *See also* claim element [11.c.i].

Ex-1007, Fig. 1

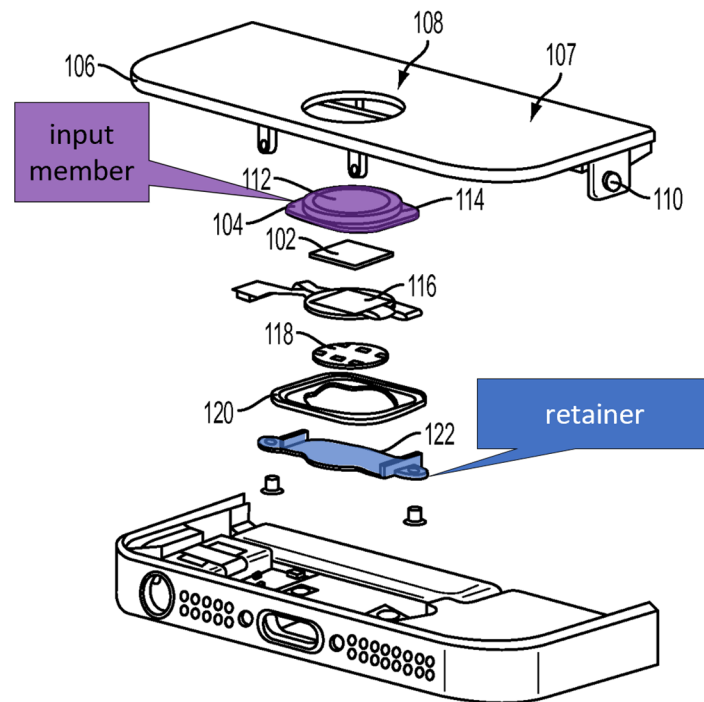


FIG. 1