

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

OURARING INC.
Patent Owner.

Case No. IPR2024-01079
U.S. Patent No. 10,281,953

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,281,953**

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LIST OF EXHIBITS¹

Ex. No.	Description
Ex-1001	U.S. Patent No. 10,281,953 (“the ’953 Patent”)
Ex-1002	Declaration of Dr. Brian W. Anthony
Ex-1003	Curriculum Vitae of Dr. Brian W. Anthony
Ex-1004	Prosecution History of the ’953 Patent (Application No. 15/854,783)
Ex-1005	U.S. Patent Publication No. 20120016245 to Niwa (“Niwa”)
Ex-1006	U.S. Patent No. 8,954,135 to Yuen (“Yuen”)
Ex-1007	U.S. Patent No. 10,303,867 to Schröder (“Schröder”)
Ex-1008	Certified Translation of DE 102013012339.9 to Schröder
Ex-1009	Original DE 102013012339.9 to Schröder
Ex-1010	U.S. Patent Publication No. 20140244009 to Mestas (“Mestas”)
Ex-1011	U.S. Provisional Patent Application No. 61/768,279 to Mestas
Ex-1012	INTENTIONALLY LEFT BLANK
Ex-1013	U.S. Patent Publication No. 20120218184 to Wissmar (“Wissmar”)
Ex-1014	U.S. Patent Publication No. 2010/0219989 to Asami (“Asami”)
Ex-1015	U.S. Patent Publication No. 2011/0080339 to Sun (“Sun”)
Ex-1016	U.S. Patent No. 9,218,058 to Bress (“Bress”)
Ex-1017	U.S. Patent No. 8,031,172 to Kruse (“Kruse”)

¹ Four-digit pin citations that begin with 0 are to the branded numbers added by Samsung in the bottom right corner of the exhibits. All other pin citations are to original page, column, paragraph, or line numbers.

Ex. No.	Description
Ex-1018	INTENTIONALLY LEFT BLANK
Ex-1019	INTENTIONALLY LEFT BLANK
Ex-1020	Claim Mapping Table
Ex-1021	INTENTIONALLY LEFT BLANK
Ex-1022	INTENTIONALLY LEFT BLANK
Ex-1023	INTENTIONALLY LEFT BLANK
Ex-1024	U.S. Patent No. 4,830,014 to Goodman (“Goodman”)
Ex-1025	U.S. Patent No. 6,745,061 to Hicks (“Hicks”)
Ex-1026	U.S. Patent No. 7,190,986 to Hannula (“Hannula”)
Ex-1027	Volker Konig et al., <i>Reflectance Pulse Oximetry – Principles and Obstetric Application in the Zurich System</i> , 14 Journal of Clinical Monitoring (Aug. 1998) (“Konig”)
Ex-1028	U.S. Patent No. 6,608,562 to Kimura (“Kimura”)
Ex-1029	Kevin K. Tremper et al., <i>Pulse Oximetry</i> , 70 Journal of American Society of Anesthesiologists, Inc. (Jan. 1989) (“Tremper”)
Ex-1030	Y. Mendelson et al., <i>A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring</i> , Proceedings of 28 th IEEE EMBS Annual International Conference (Aug. 30-Sept. 3, 2006) (“Mendelson 2006”)
Ex-1031	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part I: Design and Analysis</i> , IEEE (2000) (“Rhee 2000 Part I”)
Ex-1032	Sokwoo Rhee et al., <i>Artifact-Resistant, Power-Efficient Design of Finger-Ring Plethysmographic Sensors Part II: Prototyping and Benchmarking</i> , IEEE Proceedings of 22 nd Annual EMBS Int’l Conference (July 23-28, 2000) (“Rhee 2000 Part II”)

Ex. No.	Description
Ex-1033	Sokwoo Rhee et al., <i>Artifact-Resistant Power-Efficient Design of Finger-Ring Plethysmographic Sensors</i> , 48 IEEE Transactions of Biomedical Engineering (July 2001) (“Rhee 2001”)
Ex-1034	U.S. Patent No. 6,699,199 to Asada (“Asada ’199”)
Ex-1035	Sokwoo Rhee, <i>Design and Analysis of Artifact-Resistive Finger Photoplethysmographic Sensors for Vital Sign Monitoring</i> , MIT (June 2000) (“Rhee Thesis 2000”)
Ex-1036	C.T. Olofson et al., <i>Machining of Titanium Alloys</i> (1965) (“Olofson”)
Ex-1037	H. Harry Asada et al., <i>Mobile Monitoring with Wearable Photoplethysmographic Biosensors</i> , IEEE Engineering in Medicine & Biology Magazine 28 (May-June 2003) (“Asada 2003”)
Ex-1038	Denisse Castaneda et al., <i>A review on wearable photoplethysmography sensors and their potential future applications in health care</i> , Int J Biosens Bioelectron (2018)
Ex-1039	U.S. Patent No. 7,468,036 to Rulkov et al. (“Rulkov”)
Ex-1040	U.S. Patent Publication No. 2006/0211924 to Dalke et al. (“Dalke”)
Ex-1041	<i>Guidelines To Enhancing The Heart-Rate Monitoring Performance Of Biosensing Wearables</i> (2014)
Ex-1042	U.S. Patent No. 4,880,304 to Jaeb et al. (“Jaeb”)
Ex-1043	Tom Lister et al., <i>Optical Properties of human skin</i> , Journal of Biomedical Optics (2012)
Ex-1044	John G. Webster, <i>Design of Pulse Oximeters</i> , CRC Press (1997)
Ex-1045	U.S. Patent Publication No. 20130211291 to Tran (“Tran”)
Ex-1046	WO 2001/017421A1 to Lindberg (“Lindberg”)
Ex-1047	WO 2011/132009 to Nyiradi (“Nyiradi”)

Ex. No.	Description
Ex-1048	U.S. Patent Application Publication No. 2014/0361945 to Misra et al. (“Misra”)
Ex-1049	U.S. Patent Application Publication No. 2014/0361934 to Ely et al. (“Ely”)
Ex-1050	European Patent No. 2281205 (Chen)
Ex-1051	Lawrence K. Au et al., <i>Episodic Sampling: Towards Energy-Efficient Patient Monitoring with Wearable Sensors</i> , Annual International Conference of the IEEE Engineering in Medicine and Biology Society (2009)
Ex-1052	Anastasios Petropoulos et al., <i>Flexible PCB-MEMS flow sensor</i> , Procedia Engineering 47 236-239 (2012) (“Petropoulos”)
Ex-1053	Tianjia Sun et al., <i>Wireless Power Transfer for Medical Microsystems</i> , Springer (2013) (“Sun-Wireless”)
Ex-1054	U.S. Patent Pub. No. 2014/0187160 to Prencipe (“Prencipe”)
Ex-1055	H. Ardebili and Michael G. Pecht, <i>Encapsulation Technologies for Electronic Applications</i> , William Andrew (2009) (“Ardebili”)
Ex-1056	Ciprian Ciofu et al., <i>Injection and Micro Injection of Polymeric Plastics Materials: A Review</i> , Int’l J. Modern Mfg. Techs. 49 (2013)
Ex-1057	Richard J. Ross, <i>LCP Injection Molded Packages—Keys to JEDEC I Performance</i> , IEEE, 2004 Electronic Components and Technology Conference 1807 (2004)
Ex-1058	Tadamoto Sakai, <i>Encapsulation Process for Electronic Devices Using Injection Molding Method</i> , 12 Advances in Polymer Technology 61 (1993)
Ex-1059	N.J. Teh et al., <i>Embedding of Electronics within Thermoplastic Polymers using Injection Moulding Technique</i> , IEEE, 2000 Int’l Electronics Manufacturing Technology Symposium 10 (2000)

Ex. No.	Description
Ex-1060	U.S. Patent No. 6,201,698 to Hunter (“Hunter”)
Ex-1061	U.S. Patent No. 4,012,629 to Simms (“Simms”)
Ex-1062	INTENTIONALLY LEFT BLANK
Ex-1063	INTENTIONALLY LEFT BLANK
Ex-1064	INTENTIONALLY LEFT BLANK
Ex-1065	INTENTIONALLY LEFT BLANK
Ex-1066	INTENTIONALLY LEFT BLANK
Ex-1067	Chao Chen and Carlos Pomalaza-Raez, <i>Monitoring Human Movements at Home Using Wearable Wireless Sensors</i> , Proceedings of ISMICT (2009) (“Chen 2”)
Ex-1068	Christoph Amma et al., <i>Airwriting Recognition Using Wearable Motion Sensors</i> , Proceedings of Augmented Human Conference (2010) (“Amma”)
Ex-1069	Yinghui Zhou et al., <i>Analysis and Selection of Features for Gesture Recognition Based on a Micro Wearable Device</i> , Int’l. J. Adv. Comput. Sci. & Appls., Vol. 3, No. 1 (2012) (“Zhou”)
Ex-1070	Taiwoo Park et al., <i>E-Gesture: A Collaborative Architecture for Energy-efficient Gesture Recognition with Hand-worn Sensor and Mobile Devices</i> , SenSys ’11 (2011) (“Park”)
Ex-1071	Jun Rekimoto, <i>GestureWrist and GesturePad: Unobtrusive Wearable Interaction Devices</i> , Proc. 5th Int’l. Symposium on Wearable Computs. (2001) (“Rekimoto”)
Ex-1072	H. Ying et al., <i>Automatic Step Detection in the Accelerometer Signal</i> , 4th Int’l. Workshop on Wearable and Implantable body Sensor Networks, Springer (2007) (“Ying”)

Ex. No.	Description
Ex-1073	Chun Zhu and Weihua Sheng, <i>Wearable Sensor-Based Hand Gesture and Daily Activity Recognition for Robot-Assisted Living</i> , IEEE Trans. Sys., Man, and Cybernetics, Vol. 41, No. 3 (May 2011) (“Zhu”)
Ex-1074	Jiayang Liu et al., <i>uWave: Accelerometer-based Personalized Gesture Recognition and Its Applications</i> , IEEE Int. Conference on Pervasive Comput. and Commc’ns (2009) (“Liu”)
Ex-1075	Thomas Schlömer et al., <i>Gesture Recognition With a Wii Controller</i> , Proceedings 2d Int’l. Conf. Tangible & Embedded Interaction (2008) (“Schlömer”)
Ex-1076	Kevin P. Murphy, <i>Machine Learning: A Probabilistic Perspective</i> , The MIT Press (2012) (“Murphy”)
Ex-1077	Paulo Trigueiros et al., <i>A Comparison of Machine Learning Algorithms Applied to Hand Gesture Recognition</i> , 7th Iberian Conf. Inf. Syst. & Techs. (2012) (“Trigueiros”)

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) request *inter partes* review (“IPR”) of Claims 16-18, 20-21, 23-24, 30-35, and 37 of U.S. Patent No. 10,281,953 (“the ’953 Patent”) (Ex-1001), currently assigned to Ouraring Inc. (“PO”).

II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8

Real Parties-in-Interest: Petitioner identifies the following real parties-in-interest: Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Related Matters: PO has not asserted the ’953 Patent.

For the Board’s convenience, Petitioner notes that Petitioner is challenging the following ten patents, all directed to wearable electronic devices—U.S. Patent Nos. 11,868,178, 11,868,179, 11,599,147, 9,582,034, 10,893,833, 10,139,859, 11,874,701, 11,874,702, 10,281,953, and 10,842,429. The ’833 Patent claims substantially the same subject matter as the ’147 Patent. The ’953 Patent is from the same family as the ’178, ’179, ’147, ’034, ’859, ’701, and ’702 Patents. The ’429 Patent is directed to software used to determine the readiness of a user of a wearable electronic device.

Petitioner is also filing concurrently herewith a petition for *inter partes* review challenging other claims of the ’953 Patent.

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III. FEE AUTHORIZATION

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. LA500639.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '953 Patent is available for review, and Petitioner is not barred or estopped from requesting review.

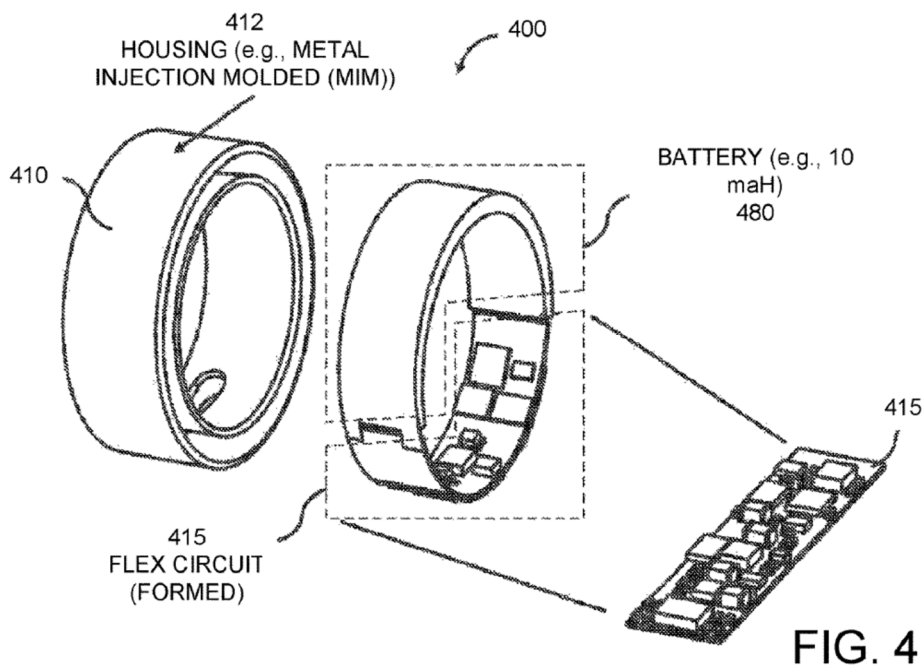
V. PRECISE RELIEF REQUESTED

Petitioner requests review and cancellation of Claims 16-18, 20-21, 23-24, 30-35, and 37 as unpatentable based on the following grounds, supported by a declaration from Dr. Brian W. Anthony. Ex-1002; Ex-1003.

Ground	Summary
1	Claims 16-18, 20-21, 23-24, 30-35, and 37 are obvious over Sun (Ex-1015)
2	Claims 16-18, 20-21, 23-24, 30-35, and 37 are obvious over Sun in view of Bress (Ex-1016)
3	Claims 16-18, 20-21, 23-24, 30-35, and 37 are obvious over Sun in view of Asami (Ex-1014)
4	Claims 16-18, 20-21, 23-24, 30-35, and 37 are obvious over Sun in view of Asami and further in view of Bress
5	Claims 16-18, 20-21, 23-24, and 30-35 are obvious over Asami in view of Bress

VI. THE CHALLENGED PATENT

The '953 Patent is generally directed to a wearable computing device, an example of which is shown in Figure 4, reproduced below.



The claims challenged in this Petition are directed to a gesture recognition method and computer readable medium storing instructions for the wearable device to detect the motion of the user's finger or hand, compare that motion with a predetermined pattern, and send a signal to an external device if the motion matches the pattern. Ex-1001, Cls. 16, 30. Further, the claims recite that the wearable device is "in the form factor of a ring for being worn around the finger of a user." *Id.* An example of using the device to communicate with and control an external device through predetermined gestures with the finger-worn device is shown in Fig. 25, reproduced annotated² below.

² Throughout, emphasis and annotations are added unless otherwise specified.

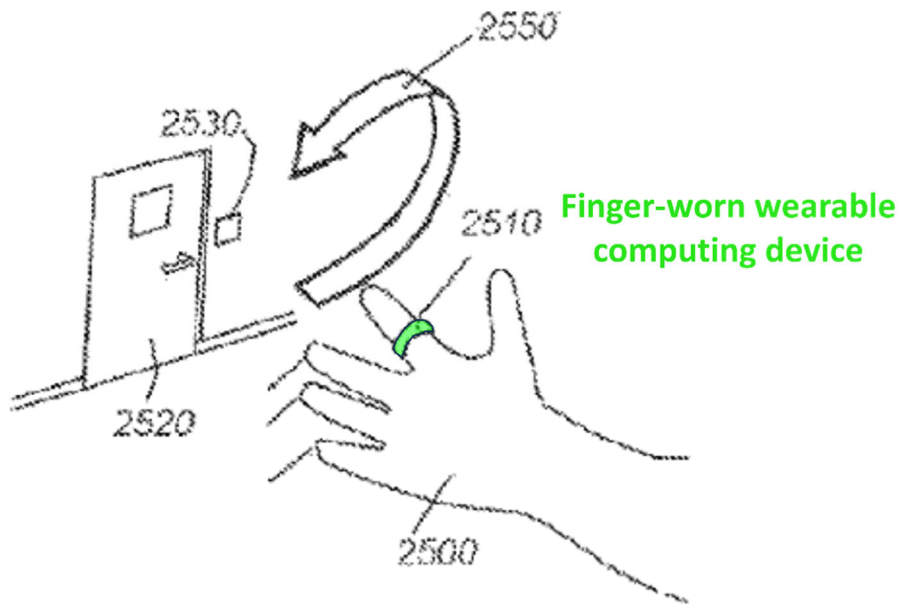


FIG. 25

The '953 Patent specification states that “many current wearable electronics are bulky and can be intrusive,” and describes the patent’s purported innovation as “overcom[ing] the disadvantages of the prior art by providing a wearable computing device (WCD) in the shape of a ring.” *Id.*, 2:33-43. The device components include a processor module, sensor modules, power module, communication module, and memory. *Id.*, 7:43-46. The device sensors may include, e.g., “accelerometers...or other suitable sensors (e.g., for gesture recognition).” *Id.*, 9:14-19.

As explained in detail below, the '953 Patent claims are obvious in view of the prior art. Ex-1002 ¶¶174-373.

VII. PROSECUTION HISTORY OF THE '953 PATENT

The '953 Patent application, No. 15/854,783, was filed December 27, 2017. It claims priority through a continuation-in-part and a continuation to Application No. 14/556,062, filed November 28, 2014, now U.S. Pat. No. 9,582,034. Ex-1001 at 1-2. The '953 Patent further claims priority to Provisional Application Nos. 62/006,835, filed June 2, 2014, and 61/910,201, filed November 29, 2013. *Id* at 2.

This Petition presents new arguments and prior art not considered during prosecution, and nothing precludes considering them in the first instance under 35 U.S.C. §325(d). All challenged claims are invalid as obvious in view of prior art. Ex-1002 ¶¶174-373.

VIII. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the relevant time (“POSITA”) would have had at least a four-year degree in electrical engineering, mechanical engineering, biomedical engineering, optical engineering, or related field of study, or equivalent experience, and at least two years’ experience in academia or industry studying or developing physiological monitoring devices such as non-invasive biosensors. A POSITA would have also been familiar with, e.g., sensor system design, including inertial and other motion sensor system design, signal processing, and human-machine interfaces. A higher level of education or skill might make up for less experience, and vice versa. Ex-1002 ¶29.

IX. PRIORITY DATE

For purposes of this proceeding only, Petitioner applies the earliest alleged priority date of the '953 Patent, November 29, 2013.³ Accordingly, AIA 35 U.S.C. §102 applies.

X. CLAIM CONSTRUCTION

Petitioner interprets the claims according to *Phillips*. 37 C.F.R. §42.100(b). To resolve this Petition, Petitioner does not believe that any term requires express construction.⁴ CTPG, 44; Ex-1002 ¶142.

XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART

A. Sun (Ex-1015)

Sun (U.S. Pat. Pub. No. 2011/0080339) was filed October 7, 2009, and published April 7, 2011. Sun qualifies as prior art to the '953 patent under 35 U.S.C. §102(a)(1), (2). Petitioner is unaware of any facts supporting a §102(b) exception.

³ Petitioner respectfully reserves the right to challenge the priority date in other proceedings.

⁴ There is currently no pending district court litigation against Petitioner involving the '953 Patent. Petitioner respectfully reserves all rights to raise claim construction and other arguments in district court. Additionally, if an action is filed, Petitioner will request leave to submit the claim construction as soon as it becomes available. Moreover, should PO raise express or implied claim construction arguments in its Preliminary Response, Petitioner will respectfully seek leave to file a Preliminary Reply. CTPG, 44-45 (permitting petitioner to respond to claim construction raised by patent owner).

Sun teaches a wrist/finger mouse and expressly teaches that the device can be configured for mounting on a finger, which a POSITA would understand to disclose that the device is in a finger ring form factor. Ex-1002 ¶29; Ex-1015, Fig. 2.

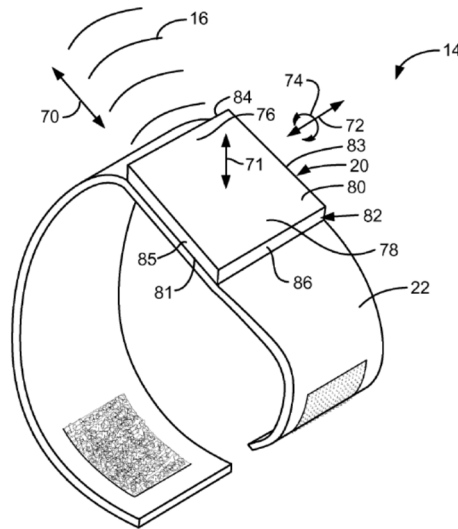


Fig. 2

Sun's device has motion sensors and other electronics inside. Ex-1015 ¶24. Sun's finger mouse detects the motion of the user's finger using an acceleration sensor (*id.* ¶¶24, 36) and compares it to predetermined gestures (*id.* ¶¶19, 44, Fig. 5). If there is a match, a respective command is transmitted by radio signal to an external computer (*id.* ¶¶19, 44). Sun's Figure 5, reproduced below, is a flow chart summarizing the operation sequence for Sun's finger mouse.

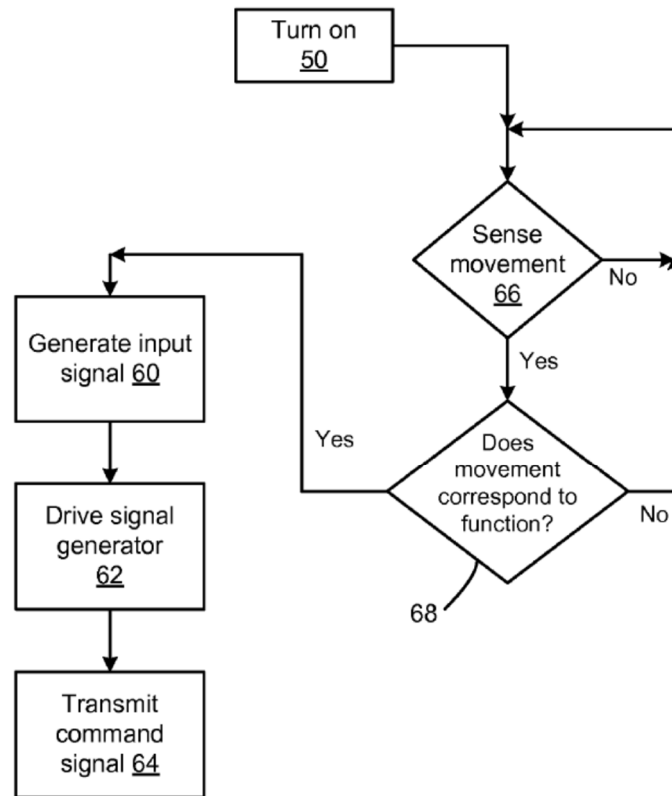
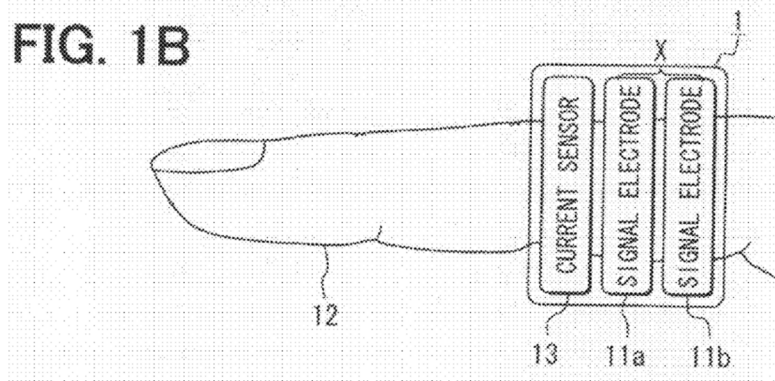


Fig. 5

B. Asami (Ex-1014)

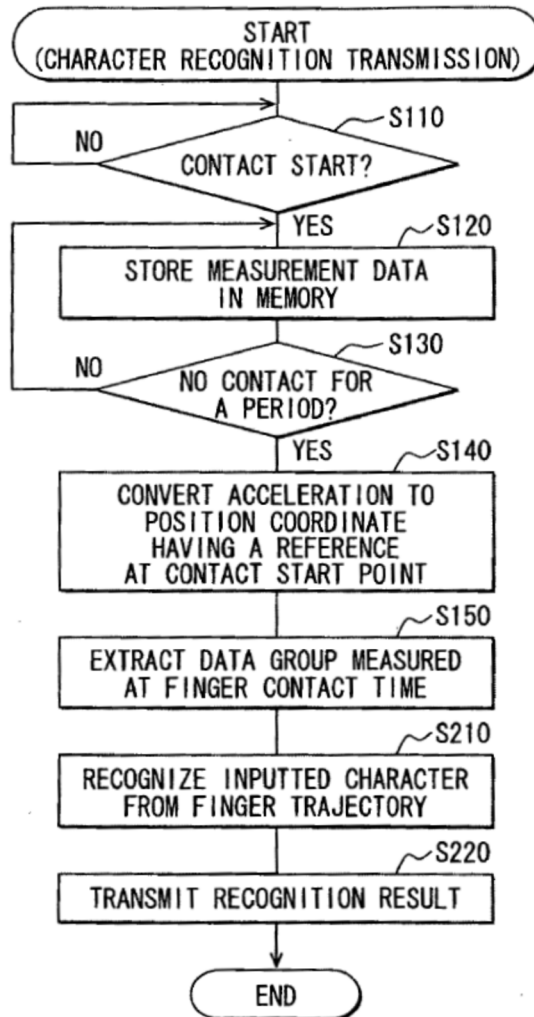
Asami (U.S. Pat. Pub. No. 2010/0219989) was filed February 12, 2010, and published September 2, 2010. Asami qualifies as prior art to the '953 Patent under 35 U.S.C. §102(a)(1), (2). Petitioner is unaware of any facts supporting a §102(b) exception.

Asami teaches a finger ring, depicted in Figure 1B, having motion sensors and other electronics inside. Ex-1014 ¶44, Fig. 1B.



Asami detects the motion of the user's finger using an acceleration sensor inside the ring (Ex-1014 ¶73), calculates the trajectory of the finger, and compares the trajectory to pre-stored character patterns (*id.* ¶96). If the character recognition results in a match, the result is sent using a radio transmitter to an external device (*id.* ¶¶97, 99). Asami also determines other characteristics of the motion, for example detecting whether the user's finger was in contact or not with another body part during its motion (*id.* ¶83). *See also id.*, Figs. 8, 9A (flowcharts showing the sequence of character recognition operations in Asami's device).

FIG. 8



C. Bress (Ex-1016)

Bress (U.S. Pat. No. 9,218,058) was filed May 15, 2012 and issued December 22, 2015. Bress qualifies as prior art to the '953 Patent under 35 U.S.C. §102(a)(2). Petitioner is unaware of any facts supporting a §102(b) exception.

Bress teaches a “wearable input device, referred to as Imagine” that is “able to recognize complex gestures.” Ex-1016, Abstract. Bress’s device “may include a plurality of motion sensors affixed to a user’s fingers.” *Id.* In one embodiment Bress’s “device’s finger sensors are in rings.” *Id.*, 6:13-16. Bress’s Imagine device has “onboard gesture recognition capability” (*id.*, 12:28-38) and can be used to transmit commands to a second electronic device, such as a computer. *See id.*, 9:11-13, 9:49-61, 13:43-45. The device has wireless communication capabilities through a Bluetooth or WiFi transceiver. *Id.*, 13:62-64, 16:3-7.

Bress teaches that “[e]nergy management is critical in wireless devices” and that its Imagine device has a low-power or “sleep” mode. Ex-1016, 15:61-64. In the “sleep” mode, “many of the subsystems may be shut down,” including “[a]ny and all of the communications channels, such a BlueTooth...and WiFi.” *Id.*, 16:3-7. The processor polls the sensors, including motion sensors and “[s]ensor data during the brief awake times would determine if there is any need to stay awake to verify a change of state, resume sleep, or fully wake up.” *Id.*, 16:8-14.

XII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

A. Ground 1: Claims 16-18, 20-21, 23-24, 30-35, and 37 Are Obvious Over Sun

1. Independent Claims 16 and 30

- a. Element 16[pre(1)]: A method, adapted to a wearable computing device in the form factor of a ring for being worn around the finger of a user, / Element 30[pre(1)]: A non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of a wearable computing device, the wearable computing device being in the form factor of a ring for being worn around the finger of a user and**

To the extent the preamble is limiting, Sun teaches⁵ Elements 16[pre(1)]/30[pre(1)]. Ex-1002 ¶¶174-177.

Sun teaches a method adapted to a wearable computing device. *E.g.*, Ex-1015, Abstract. Sun further teaches flash memory “to store...application programs [and]...application logic...in support of the gesture interpretation...processes” and “ROM memory 41 for storing instructions,” which a POSITA would have understood constitute a non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of the device. *Id.*

⁵ Petitioner uses the term “teaches” throughout this Petition as including both express teachings and those fairly suggested to a POSITA. *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is...what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (citations omitted)).

¶43; Ex-1002 ¶175. As discussed in more detail below, Sun teaches a “microcontroller unit MCU 35,” which POSITA would have understood comprises a processor. Ex-1015 ¶43; Ex-1002 ¶175.

Sun teaches that its wearable device is a wrist or “finger-mouse” that can be worn, e.g., on the user’s wrist or finger. Ex-1015 ¶17 (“Wrist/finger mouse 14 could also be configured for mounting to different parts of a user's hand, typically a finger.”); ¶40 (discussing “wrist/*finger mouse* 14 is attached on human wrist *or finger*.”); Fig. 2.

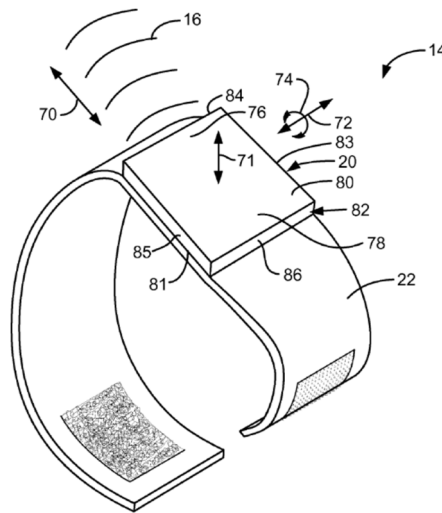


Fig. 2

A POSITA would have understood based on these disclosures that Sun’s device is “in the form factor of a ring for being worn around the finger.” Ex-1002 ¶177. A POSITA would have further understood that a user would have worn Sun’s device on a finger as a ring. *Id.*

- b. Element 16[pre(2)]: the wearable computing device comprising at least one sensor module having at least one sensor, at least one processor, and at least one transceiver; the method comprising / Element 30[pre(2)]: including a sensor module having a sensor and a transceiver, which instructions, when executed by the processor, causes the processor to perform operations comprising**

Sun teaches Elements 16[pre(2)]/30[pre(2)], to the extent they are limiting.

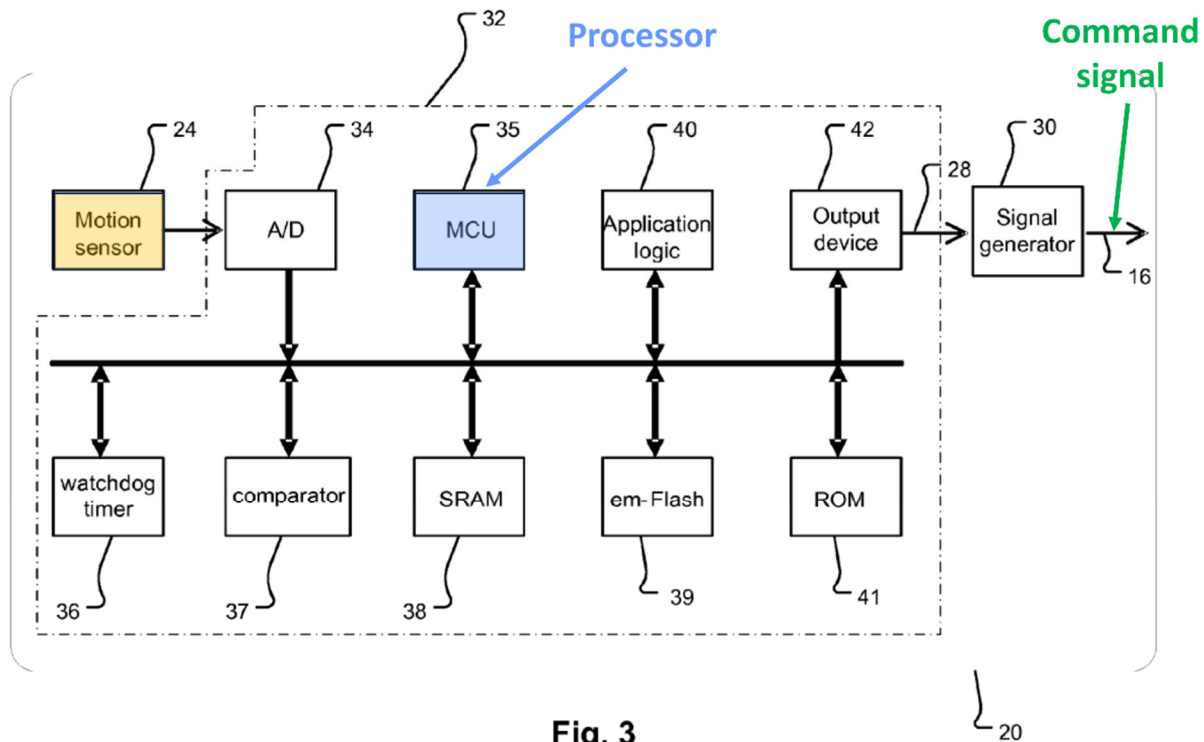
Ex-1002 ¶¶178-183.

Sun's device includes a sensor module, in the form of "*[m]otion sensor 24*," which "preferably includes very small microelectromechanical systems (MEMS) sensors." Ex-1015 ¶18, Fig. 3 (annotated below). As Sun further explains, "a MEMS sensor" in its device can "include accelerometers, gyroscopes, etc." which acquire "gesture data." *Id.* ¶¶24, 26. Sun further explains that "[r]epresentative motion sensors 24 include inertial sensors and gyroscopes," and a POSITA would have understood that this sensor or collection of sensors forms a sensor module⁶ in Sun's device. Ex-1015 ¶21; Ex-1002 ¶179.

Sun's finger mouse also includes "motion sensitive circuitry 32," which includes one or more processors. Ex-1002 ¶180; Ex-1015, Fig. 3. As Sun explains, circuitry 32 includes "data processing resources" (Ex-1015 ¶26), such as "*microcontroller unit MCU 35*," for "*executing system firmware and coordinating*

⁶ Both Claim 16 and 30 recite that the sensor module could have a single sensor.

processing with application logic.” Ex-1015 ¶43, Fig. 3 (annotated below). A POSITA would have understood that the microcontroller unit (“MCU”) is a processor (of the one or more processors). Ex-1002 ¶180.



As also shown in Figure 3, Sun’s finger mouse also has a signal generator that produces a “command signal” that is transmitted to an external device, e.g., a computer. Ex-1015 ¶17; Ex-1002 ¶181. To perform this transmission Sun’s finger mouse also includes “a communication port” (Ex-1015 ¶24) and supports “communication protocols, such as *wi-fi*, *Bluetooth* or *Zigbee*, may be used.” Ex-1015 ¶18; Ex-1002 ¶181. A POSITA would have understood that Sun’s teachings correspond to and would require a transceiver in order to perform this

communication, and that in particular wi-fi, Bluetooth, and Zigbee are bi-directional wireless protocols that require transceivers to communicate. Ex-1002 ¶181.

As discussed at Elements 16[pre(1)]/30[pre(1)], Sun’s device has transitory memory such as flash memory that contains instructions that are executed by a processor to perform operations. §XII.A.1.a; Ex-1002 ¶182.

c. Elements 16[a]/30[a]: obtaining, by the sensor of the sensor module, sensor data indicating a motion of the finger or a hand adjoined to the finger wearing the wearable computing device;

Sun teaches Elements 16[a]/30[a]. Ex-1002 ¶¶184-187.

Sun teaches that its device detects the motion of the user’s finger using motion sensors including an acceleration sensor and a gyroscope. Ex-1015 ¶¶24, 36. As Sun explains, its device has “sensors that *describe motion of the sensor in space*, including providing gesture data concerning up to 6 degrees of freedom, including 3 degrees of freedom in translation in linear space provided by an accelerometer and 3 degrees of freedom provided in rotation in angular space by a gyroscope.” *Id.* ¶36. These motion sensors are configured to sense motion of the hand or finger (which may be broken down into “displacement, velocity, and acceleration” components (*id.* ¶21)) occurring when a user wearing the finger mouse performs a given “gesture” (e.g., “tapping the chosen hand of the user on a surface”). *Id.* ¶8; *see also id.* Fig. 5 (Step 66).

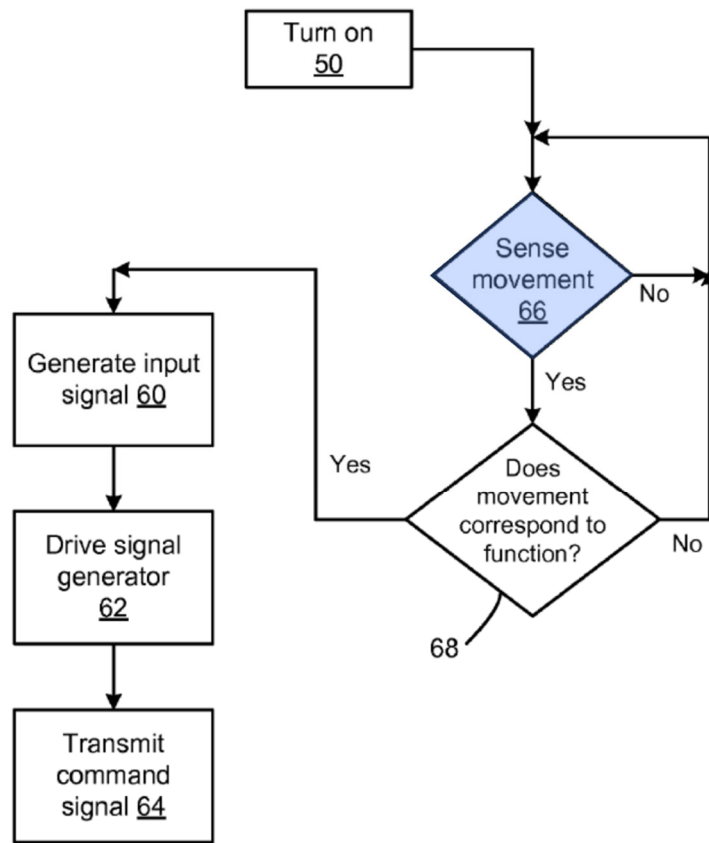


Fig. 5

As shown in the next element 16[b]/30[b], a number of gestures are defined using wrist movements (*id.* ¶42), but Sun teaches these are applicable to the finger mouse movements as well (*id.* ¶17 (“For ease of nomenclature, wrist/finger mouse 14 will typically be referred to as wrist mouse 14.”)).

d. Elements 16[b]/[30[b]]: comparing, by [one of the at least one] processor[s], the obtained sensor data to a predetermined pattern of motion;

Sun teaches Elements 16[b]/30[b]. Ex-1002 ¶¶188-189.

Sun teaches that “[m]otion sensitive circuitry 32 comprises data processing resources which provide for interpretation of the gesture data received from motion sensor 24.” Ex-1015 ¶26. Sun further teaches that the motion sensitive circuitry within its device includes “comparator logic 37, for *comparing input sequences of data indicating gestures or component motions of gestures* that include a sequence of component motions, *with stored sequences of data specifying the unique signatures for memorized gestures* for component motions.” Ex-1015 ¶43; *see also id.*, Fig. 5 (Step 68). Sun’s exemplary predetermined patterns of motion are illustrated in the annotated excerpt below (blue). *Id.* ¶¶41-42.

GESTURE NUMBER	COMMAND GESTURE NAME	MAPS TO PRESENTATION COMMAND	MOTION DETECTION PROCESS
1.	Left and back movement	Left click	Motion to the left and back exceeding one or both of a threshold velocity or a threshold acceleration
2.	Right and back movement	Right-click	Motion to the right and back exceeding one or both of a threshold velocity or a threshold acceleration
3.	Left and back movement, then right and forward movement, then left and back movement	Double click	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration
4.	Back movement, then right and forward movement, then forward movement	Begin drawing with cursor	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration



**Predetermined
pattern**

- e. Elements 16[c]/[30[c]]: determining, by [one of the at least one] processor[s], whether the obtained sensor data matches a predetermined pattern;**

Sun teaches Elements 16[c]/30[c]. Ex-1002 ¶¶190-193.

As shown in Figure 5 at step 68, Sun's device "*determines if the sensed movement corresponds to a predetermined function.*" Ex-1015 ¶44. Sun further teaches that "comparator logic 37" within motion sensitive circuitry 32 compares the motion sensor data "with stored sequences of data specifying the unique signatures for memorized gestures for component motions", to determine *whether the detected gesture matches a memorized gesture, stored in the library* (the claimed "predetermined pattern"). *Id.* ¶44; *see also id.* ¶19, Fig. 5.

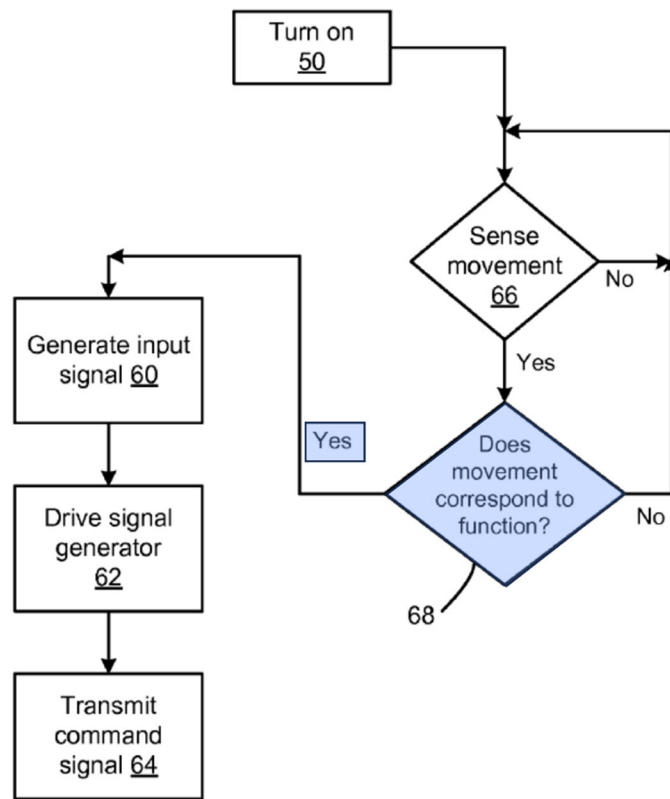


Fig. 5

Sun's finger mouse thus determines whether the obtained motion sensor data matches a predetermined pattern stored in its "library of command []motions," as shown below. Ex-1015 ¶¶31, 41-42; Ex-1002 ¶192.

GESTURE NUMBER	COMMAND GESTURE NAME	MAPS TO PRESENTATION COMMAND	MOTION DETECTION PROCESS
1.	Left and back movement	Left click	Motion to the left and back exceeding one or both of a threshold velocity or a threshold acceleration
2.	Right and black movement	Right-click	Motion to the right and back exceeding one or both of a threshold velocity or a threshold acceleration
3.	Left and back movement, then right and forward movement, then left and back movement	Double click	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration
4.	Back movement, then right and forward movement, then forward movement	Begin drawing with cursor	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration



Corresponding
command



Predetermined
pattern

As the second specific example above from Sun's gesture library shows, "a pre-specified gesture in the database can be defined as a movement of wrist mouse 14 back and to the right; this gesture can be associated with the right click function." Ex-1015 ¶31. Once the detected motion is determined to match the pattern, the

command shown in the middle column of the excerpt above is issued. *See id.*; Ex-1002 ¶193.

- f. Elements 16[d]/[30[d]]: determining, by [one of the at least one] processor[s], a characteristic of an activity of the user of the wearable computing device when the obtained sensor data matches the predetermined pattern; and**

Sun teaches Elements 16[d]/30[d]. Ex-1002 ¶¶194-197.

While the '953 Patent specification does not define the term “characteristic of an activity of the user,” the specification states that the wearable computing device “can determine current activity of a user according to measurements taken by one or more sensors in the sensor module, such as accelerometer, gyroscope, magnetometer or digital compass.” Ex-1001, 42:64-67. A POSITA would have understood the plain and ordinary meaning of “characteristic of an activity of the user” to cover any property of the user’s motion or other activity. Ex-1002 ¶195.

Sun teaches determining an activity of the user, such as “a particular motion corresponding to a particular command.” Ex-1015 ¶19; *see also id.* ¶42 (listing several motions of the user that are determined when the sensor data matches the predetermined pattern, including translational (e.g., “Motion to the left and back...”) and rotational movements (e.g., “Rotate hand and wrist to the right...”) and tapping (e.g., “Sets of taps/pauses...”)); Ex-1002 ¶196. As discussed above, these motions

are measured by one or more sensors in Sun's sensor module, such as the accelerometer and/or gyroscope. Ex-1015 ¶¶21, 24.

Sun further teaches that “[t]he gestures can be further defined by, for example, *smooth movements, short jerky movements* and accelerating-to-a-stop movements. Other types of or directions of movement can also be used.” Ex-1015 ¶26. Thus, Sun's device has the ability to determine characteristics of a user's motion, i.e., the claimed activity, including characteristics—such as whether the motion is smooth or jerky—in addition to just determining whether that particular motion, as defined by the sensor data, matches the predetermined pattern. Ex-1002 ¶197. A POSITA would have understood that these are characteristics of activities as described in the '953 patent specification, e.g., the “current activity of a user according to measurements taken by one or more sensors in the sensor module, such as accelerometer.” Ex-1001, 42:64-66; Ex-1002 ¶197.

g. Element 16[e]/30[e]: activating the at least one transceiver to transmit a first data packet and/or receive a second data packet in response to a confirmation of the sensor data matching the predetermined pattern.

Sun teaches Elements 16[e]/30[e]. Ex-1002 ¶¶198-203.

Sun teaches that the match between the sensed data and the predetermined pattern leads to a command signal to transmit the data to a remote device. Ex-1015 ¶19 (“Receipt of the ‘left click’ signal causes signal generator 30 create a ‘left click’

command signal 16 for transmission to the signal receiver of computer 18.”). See also id. ¶44 (if there is a match, “motion sensitive circuitry 32 generates input signal 28 at 60 for driving signal generator 30 at 62. Signal generator 30 then transmits a command signal 16 to the signal receiver of computer 18 as at 64.”); Fig. 5 (Steps 60, 62, 64).

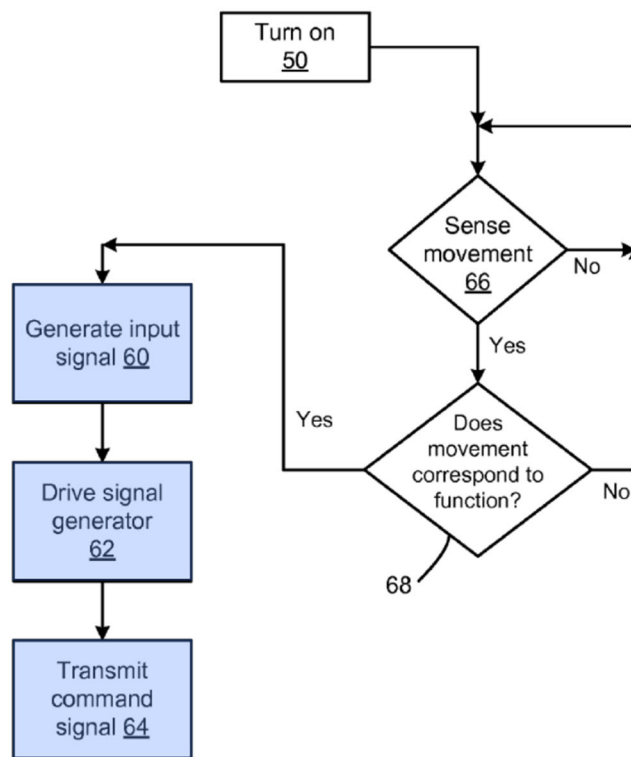


Fig. 5

The transmission of the command signal in Sun’s finger mouse is done through “a communication port” (*id.* ¶24) that supports “communication protocols, such as wi-fi, Bluetooth or Zigbee, may be used.” *Id.* ¶18; Ex-1002 ¶200. Sun further teaches that “[c]ommand signals 16 can be any of a variety of wireless

signals, and are typically RF command signals.” Ex-1015 ¶18. A POSITA would have understood that Sun’s teachings correspond to and would require a transceiver in order to perform the transmission of the command signal to the external computer, and that in particular wi-fi, Bluetooth, and Zigbee are bi-directional communication protocols that require transceivers to communicate. Ex-1002 ¶200. A POSITA would have further understood that data transmitted under WiFi, Bluetooth, and Zigbee protocols is transmitted in data packets. *Id.*

A POSITA would have also understood that Sun teaches activating the transceiver to transmit the command signal. Ex-1002 ¶201. For example, Sun teaches at least one gesture – Gesture #9 (“Rotate right”) – that causes the device to turn on, as shown in the excerpt annotated below. Ex-1015 ¶42.

-continued

GESTURE NUMBER	COMMAND GESTURE NAME	MAPS TO PRESENTATION COMMAND	MOTION DETECTION PROCESS
9.	Rotate right	Turns on wrist mouse	Rotate hand and wrist to the right (clockwise)
10.	Rotate left	Turns off wrist mouse	Rotate hand and wrist to the left (counterclockwise)



Further, Sun teaches that the device can have “a suspension mode, sometimes referred to as ‘go to sleep.’” *Id.* ¶37; *see also id.* ¶42 (disclosing Gesture #6, “Single tap on top side 80,” as corresponding to the “Go to sleep” command). A POSITA would have understood these disclosures to mean that a user could activate Sun’s device, including its transceiver to send or receive data, based on a gesture matching a predetermined pattern, such as Gesture #9 in Sun’s library. Ex-1002 ¶202.

- 2. Dependent Claims 17/[31]: The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising]: determining that the sensor data matches the predetermined pattern based at least in part on a completion of the activity.**

Sun teaches Claims 17 and 31. Ex-1002 ¶¶204-207.

Sun teaches that its device’s gesture recognition is partly based on the completion of the user’s motion, i.e., the claimed activity. Ex-1015 ¶19; Ex-1012 ¶205.

As shown in example gesture 2 in Sun, the motion sensor data matched with the predetermined “right and back movement” involves “[m]otion to the right and back...” Ex-1015 ¶42.

GESTURE NUMBER	COMMAND GESTURE NAME	MAPS TO PRESENTATION COMMAND	MOTION DETECTION PROCESS
1.	Left and back movement	Left click	Motion to the left and back exceeding one or both of a threshold velocity or a threshold acceleration
2.	Right and black movement	Right-click	Motion to the right and back exceeding one or both of a threshold velocity or a threshold acceleration
3.	Left and back movement, then right and forward movement, then left and back movement	Double click	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration
4.	Back movement, then right and forward movement, then forward movement	Begin drawing with cursor	Motion along each leg exceeding one or both of a first threshold velocity or a first threshold acceleration and below one or both of a second threshold velocity or a second threshold acceleration

↑
**Predetermined
pattern**

A POSITA would have understood Sun's disclosure to mean that the matching with a predetermined pattern is based at least on the completion of the user's motion,

i.e., completing the “and back” portion of the user’s finger movement. Ex-1002 ¶207.

3. **Dependent Claims 18/[32]: The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising:] determining that the sensor data matches the predetermined pattern based at least in part on a start of the activity.**

Sun teaches Claims 18 and 32. Ex-1002 ¶¶208-210.

Sun teaches that its device’s gesture recognition is partly based on the start of the user’s motion, i.e., the claimed activity. Ex-1015 ¶19; Ex-1012 ¶209.

Further referencing the example shown as Gesture 2 in Sun, the motion sensor data matched with the predetermined “right and back movement” involves “[m]otion to the right and back...” Ex-1015 ¶42. A POSITA would have understood Sun’s disclosure to mean that the matching with a predetermined pattern is based at least on the start of the user’s motion, i.e., starting the “right” portion of the user’s finger movement. Ex-1002 ¶210.

4. **Dependent Claim 20: The method of claim 16, wherein the sensor data further comprises an axial rotation measurement.**

Sun teaches Claim 20. Ex-1002 ¶¶211-212.

Sun teaches that the gesture data in its device includes data in “3 degrees of freedom provided in rotation in angular space by a gyroscope,” which a POSITA would understand is an axial rotation measurement. Ex-1015 ¶36; *see also id.* ¶5

(“In some examples, the motion sensor comprises a translational, rotational, and vibrational movement motion sensor”); ¶21 (disclosing that the motion sensors are “capable of sensing up to 6 degrees of motion, including translation on the x-, y- and z-axes, and rotation on the x-, y- and z-axes.”). A POSITA would have understood this sensed rotational movement is used to identify rotational gestures based on wrist “turns.” Ex-1015 ¶42 (gesture number 9 and 10); Ex-1002 ¶212.

5. **Dependent Claims 21/[33]: The method of claim 16/[The non-transitory computer readable storage medium of claim 30], wherein the [at least one] sensor module comprises one or more of a light sensor, a gyroscope, and/or a magnetometer, and the sensor data further comprises a measurement from one or more of the light sensor, a gyroscope, and/or a magnetometer.**

Sun teaches Claims 21 and 33. Ex-1002 ¶¶213-216.

Sun teaches that its motion “sensors 24 include inertial sensors and gyroscopes capable of sensing up to 6 degrees of motion, including translation on the x-, y- and z-axes, and rotation on the x-, y-, and z-axes.” Ex-1015 ¶21. *See also id.* ¶36 (teaching that the “gesture data” includes data “in linear space provide by an accelerometer” and “in rotation in angular space by *a gyroscope*”).

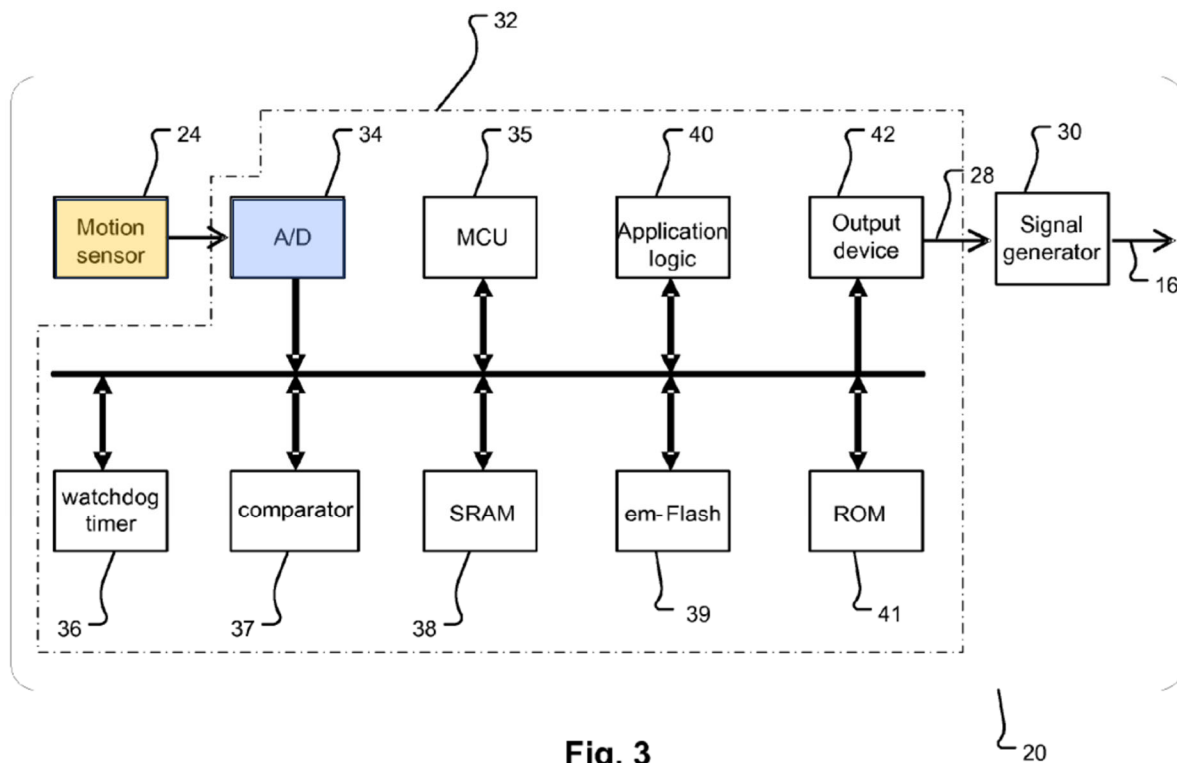
6. Dependent Claim 23 and 34

- a. Elements 23[pre/a]/[34[pre/a]]: The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising]: converting the sensor data into a series of samples;**

Sun teaches Elements 23[pre/a] and 34[pre/a]. Ex-1002 ¶¶217-220.

Sun teaches that its gesture data is obtained as data sequences. Specifically, Sun teaches that its device “compar[es] input *sequences of data* indicating gestures or component motions of gestures that include a *sequence of component motions*.” Ex-1015 ¶43.

Sun’s device also includes an “analog-to-digital converter” (ADC) (denoted as “A/D” in Fig. 3). Ex-1015 ¶24, Fig. 3 (annotated below).



A POSITA would have understood that an ADC samples the analog signal from the motion sensor and converts the data into a series of digital samples, and that the data acquisition and processing in Sun is performed through a series of samples. Ex-1002 ¶220.

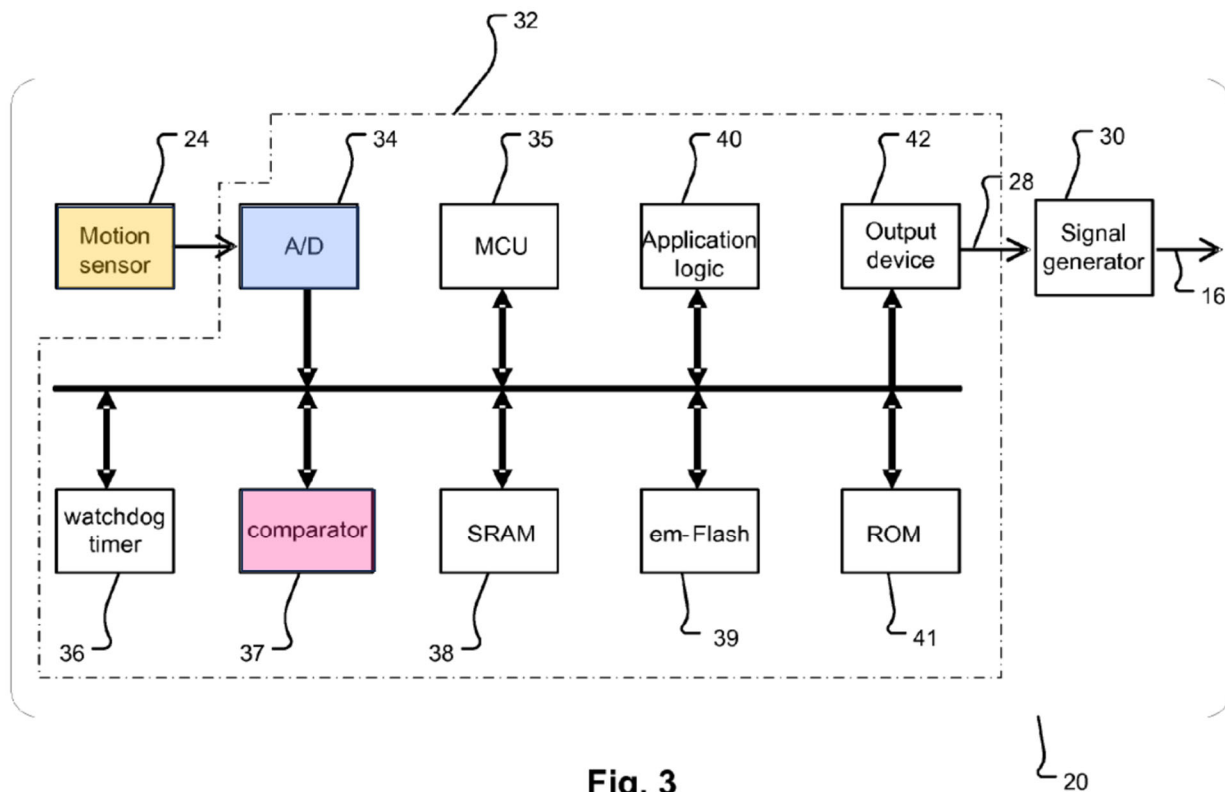
b. Elements 23[b]/34[b]: comparing the series of samples to the predetermined pattern; and

Sun teaches Elements 23[b]/34[b]. Ex-1002 ¶¶221-224.

Sun teaches that its gesture data is obtained as data sequences and those data sequences are compared with “stored sequences of data specifying the unique signatures for memorized gestures.” Ex-1015 ¶43. As Sun teaches, its device “compar[es] input *sequences of data* indicating gestures or component motions of

gestures that include a *sequence of component motions*, with *stored sequences of data* specifying the unique signatures for memorized gestures for component motions.” *Id.*; Ex-1002 ¶222.

The comparison of samples with the predetermined pattern is done through comparator 37 of the Sun device, shown in Figure 3 below (annotated).



As Sun explains, “comparator logic 37 [is] for comparing input sequences of data indicating gestures or component motions of gestures that include a sequence of component motions, with stored sequences of data specifying the unique signatures for memorized gestures for component motions.” Ex-1015 ¶43; Ex-1002 ¶224. A POSITA would have understood that because the data from Sun’s analog-

to-digital converter is a series of samples, the comparison is done on the series of samples. *Id.*

c. Elements 23[c]/34[c]: determining that the sensor data matches the predetermined pattern if the series of samples matches the predetermined pattern.

Sun teaches Elements 23[c]/34[c]. Ex-1002 ¶¶225-226.

Sun teaches that once there is a match with the predetermined pattern of sequences (“samples”), a signal is sent to a remote device, e.g., a computer. Ex-1015 ¶19 (“motion sensor 24 causes motion sensitive circuitry 32 to create a ‘left click’ input signal 28 to signal generator 30. Receipt of the ‘left click’ signal causes signal generator 30 create a ‘left click’ command signal 16 for transmission to the signal receiver of computer 18.”). A POSITA would have understood that Sun’s comparator logic 37 determines that the sensor data matched the predetermined pattern if the series of samples compared matched the predetermined pattern. Ex-1002 ¶226.

7. Dependent Claims 24/[35]: The method of claim 23, wherein/[The non-transitory computer readable storage medium of claim 34, wherein the processor further executes an operation comprising:] the comparing between the series of samples and the predetermined pattern is determined by a recognition technique.

Sun teaches Claims 24 and 35. Ex-1002 ¶¶227-229.

Sun teaches that its device includes “*comparator logic* 37, for comparing input sequences of data indicating gestures,” which a POSITA would have

understood teaches performing a recognition technique. Ex-1015 ¶43; Ex-1002 ¶228. Sun further teaches “application logic 40...in support of the gesture interpretation,” which would have bolstered a POSITA’s understanding that Sun teaches a recognition technique. Ex-1015 ¶43; Ex-1002 ¶228.

8. Dependent Claim 37

- a. Elements 37[pre/a]: The non-transitory computer readable storage medium of claim 30, wherein the processor further executes operations comprising: converting the sensor data into at least one direction vector;**

Sun teaches Elements 37[pre/a]. Ex-1002 ¶¶230-231.

Sun teaches that its motion sensors are “capable of sensing up to 6 degrees of motion, including translation on the x-, y- and z-axes, and rotation on the x-, y- and z-axes.” Ex-1015 ¶21. Sun further teaches that the device can “sense up and down direction” and may also determine “right and left lateral directions.” Ex-1015 ¶30. It further teaches that “[o]ther schemes for determining orientation and movements may also be used.” *Id.* A POSITA would have understood these teachings to disclose converting the sensor data into at least one direction vector. Ex-1002 ¶231.

b. Element 37[b]: detecting a characteristic of an orientation changes of the wearable computing device based at least in part on the at least one direction vector;

Sun teaches Element 37[b]. Ex-1002 ¶¶232-233.

Sun teaches that its device can detect changes in orientation, such as rotation. *See* Ex-1015 ¶27 (describing “[r]otation of the user’s hand to the right,” a “clockwise roll or longitudinal or x-axis clockwise rotation.”); ¶42 (disclosing “Rotate right” and “Rotate left” gestures). A POSITA would have understood that these rotations would involve orientation changes based at least on one direction vector. Ex-1002 ¶233. These rotation-based orientation changes disclosed by Sun are similar to the orientation changes described in the ’953 patent specification as arising from the rotation of a direction vector tied to the finger ring around its center axis. *See* Ex-1001, 45:24-46; Ex-1002 ¶233.

c. Element 37[c]: comparing the characteristics of the detected orientation changes to the predetermined pattern; and

Sun teaches Element 37[c]. Ex-1002 ¶¶234-235.

Sun teaches that the characteristics of the detected orientation changes are compared to the predetermined pattern. Ex-1015 ¶42 (see excerpt annotated below, describing “Rotate right” and “Rotate left” command gesture names as corresponding to two predetermined gestures involving rotation, and which a

POSITA would have understood involve comparing orientation changes); Ex-1002 ¶235.

-continued

GESTURE NUMBER	COMMAND GESTURE NAME	MAPS TO PRESENTATION COMMAND	MOTION DETECTION PROCESS
9.	Rotate right	Turns on wrist mouse	Rotate hand and wrist to the right (clockwise)
10.	Rotate left	Turns off wrist mouse	Rotate hand and wrist to the left (counterclockwise)
11.	Move forward	Causes image on display of computer to zoom in	Move wrist mouse away from the user generally parallel to longitudinal movement line 72
12.	Move backward	Causes image on the display of computer to zoom out	Move wrist mouse towards the user generally parallel to longitudinal movement line 72


**Predetermined
pattern**

d. Element 37[d]: determining whether the sensor data matches the predetermined pattern.

Sun teaches Element 37[d]. Ex-1002 ¶¶236-237.

Sun teaches that its device determines whether the sensor data matches predetermined pattern. Ex-1015 ¶42 (describing “Rotate right” and “Rotate left” command gestures as corresponding to two predetermined patterns that detected motion sensor data is compared against); ¶44 (describing “determin[ing] if the

sensed movement corresponds to a predetermined function as at 68.”); Fig. 5; Ex-1002 ¶237.

B. Ground 2: Claims 16-18, 20-21, 23-24, 30-35, and 37 Are Obvious Over Sun in View of Bress

1. A POSITA would have been motivated to combine Sun’s and Bress’s teachings and would have had a reasonable expectation of success

A POSITA would have been motivated to combine Sun’s and Bress’s teachings and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶238-241. Sun and Bress are both directed to wearable biometric sensing devices for gesture recognition, and their devices are both worn on the finger and include similar components, such as motion sensors and processors. Ex-1015 ¶18 (motion sensor), ¶43 (processor); Ex-1016, Abstract, 6:13-16 (motion sensor), 14:45-65 (processor). Further, both Sun’s and Bress’s devices have a “sleep mode.” Ex-1015 ¶37; Ex-1016, 15:62-64.

A POSITA would have been motivated to implement Bress’s particular “sleep” mode functionality—including activating the transceiver when certain gestures are detected—in Sun’s device because a POSITA would have recognized the energy savings this functionality would bring, as described in Bress. Ex-1002 ¶239; *see DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art). A POSITA would

have recognized that transceivers are high power components, which ideally should operate only when needed, rather than constantly being on. Ex-1002 ¶239. The ability to wake up the transceiver from the “sleep” mode by using a gesture as disclosed in Bress—would significantly extend the battery life of the Sun device while maintaining convenience, making it more practical for everyday use without the need for frequent recharging. *Id.* This is particularly important for wearable technology, especially of small form factors, where the battery is small and battery life is a critical factor in user satisfaction and device usability. *Id.* The addition of a sleep mode where high power components are deactivated and could be activated by particular gestures would have served as an important, differentiating feature in a crowded market, providing a competitive edge by addressing one of the common pain points of wearable devices—battery life. *Id.*

And while a POSITA would have understood that Sun’s finger mouse is “in the form factor of a ring for being worn around the finger,” Bress explicitly teaches that its “device’s finger sensors are in rings.” Ex-1016, 6:13-16; *see also id.*, 7:57-58 (“FIG. 1 depicts a user wearing an Imagine where the finger sensors are contained in solid rings.”), Fig. 1. A POSITA would have been motivated to implement Bress’s finger ring design with Sun’s finger mouse device, as a POSITA would have realized several benefits of a finger ring, including longer-term wearability and minimal interference with the user’s daily activities as well as the less bulky, more

natural profile, and more fashionable design of a finger ring. Ex-1002 ¶240. A POSITA would also have realized that integrating new functionalities that are not traditionally associated with jewelry, such as electronic device control, into a finger ring would have led a POSITA to explore the use of a finger ring, as disclosed in Bress, as a versatile and modern alternative to Sun's finger mouse. *Id.* Thus, design incentives and market forces would have motivated a POSITA to apply Bress's teachings to Sun's finger mouse device. *Id.*

A POSITA would have had a reasonable expectation of success in combining Sun and Bress, which are analogous prior art as they both involve finger-worn biometric sensing devices with gesture recognition capabilities having similar structural components. Ex-1002 ¶241. A POSITA would have understood that the electronic components of Sun's and Bress's gesture recognition devices are similar such that they are programmable using standard processors and are interchangeable. *Id.* A POSITA would have understood that these references disclose interrelated teachings based on routine technologies amenable to various well-understood and predictable combinations to provide more features and enhance user interest. *Id.*

2. Independent Claims 16 and 30

- a. Element 16[pre(1)]: A method, adapted to a wearable computing device in the form factor of a ring for being worn around the finger of a user, / Element 30[pre(1)]: A non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of a wearable computing device, the wearable computing device being in the form factor of a ring for being worn around the finger of a user and**

Sun-Bress teaches Elements 16[pre(1)]/30[pre(1)], to the extent they are limiting. Ex-1002 ¶¶242-245.

As discussed at Ground 1, Sun teaches a method adapted to a wearable computing device and a non-transitory readable storage medium storing instructing for implementation by a processor of such a device. *Supra* §XII.A.1.a.

While a POSITA would have understood, as discussed at Ground 1 (§XII.A.1.a), that Sun's finger mouse is "in the form factor of a ring for being worn around the finger," Bress explicitly teaches that its "device's finger sensors are in rings." Ex-1016, 6:13-16; *see also id.*, 7:57-58 ("FIG. 1 depicts a user wearing an Imagine where the finger sensors are contained in solid rings."), Fig. 1.

A POSITA would have been motivated to combine Sun's and Bress's teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.B.1; Ex-1002 ¶245.

b. Elements 16[pre(2)]/30[pre(2)]

Sun-Bress teaches Elements 16[pre(2)]/30[pre(2)], to the extent they are limiting, at least because Sun teaches them, as discussed at Ground 1. *Supra* §XII.A.1.b; Ex-1002 ¶246.

c. Elements 16[a]/30[a]

Sun-Bress teaches Elements 16[a]/30[a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.c; Ex-1002 ¶247.

d. Elements 16[b]/[30[b]]

Sun-Bress teaches Elements 16[b]/30[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.d; Ex-1002 ¶248.

e. Elements 16[c]/[30[c]]

Sun-Bress teaches Elements 16[c]/30[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.e; Ex-1002 ¶249.

f. Elements 16[d]/[30[d]]

Sun-Bress teaches Elements 16[d]/30[d] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.f; Ex-1002 ¶250.

g. Elements 16[e]/30[e]: activating the at least one transceiver to transmit a first data packet and/or receive a second data packet in response to a confirmation of the sensor data matching the predetermined pattern.

Sun-Bress teaches Elements 16[e]/30[e] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.g; Ex-1002 ¶251.

In addition to Sun’s disclosures discussed at Ground 1, Bress expressly teaches a transceiver, including a “WiFi transceiver 406” and a “Bluetooth Transceiver 405.” Ex-1016, 13:65-66, 14:3-5. Bress further teaches activating the transceiver to transmit a data packet in response to a confirmation of the sensor data matching the predetermined pattern. Ex-1002 ¶252. Bress further teaches that “[e]nergy management is critical in wireless devices” and that its device has a low-power or “sleep” mode. Ex-1016, 15:61-64. In the “sleep” mode, “many of the subsystems may be shut down,” including “[a]ny and all of the communications channels, such as BlueTooth...and WiFi.” *Id.*, 16:3-7. The processor polls the sensors, including motion sensors and “[s]ensor data during the brief awake times would determine if there is any need to stay awake to verify a change of state, resume sleep, or fully wake up.” *Id.*, 16:8-14. A POSITA would have been motivated to use the ability to wake up from “sleep” mode as taught by Bress in Sun’s device to conserve energy by keeping transceiver operations to a minimum. Ex-1002 ¶252. A POSITA would have understood that the processor could poll motion sensor data in the “sleep” mode and wake up or “activate” the transceiver to transmit a data packet to the external device, e.g., a command corresponding to a particular gesture, if the sensor data matched a predetermined pattern. *Id.* ¶252.

A POSITA would have been motivated to combine Sun's teachings with Bress's teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.B.1; Ex-1002 ¶¶253-254.

3. Dependent Claims 17/31

Sun-Bress teaches Claims 17 and 31 at least because Sun teaches them, as discussed at Ground 1. §XII.A.2; Ex-1002 ¶255.

4. Dependent Claims 18/32

Sun-Bress teaches Claims 18 and 32 at least because Sun teaches them, as discussed at Ground 1. §XII.A.3; Ex-1002 ¶256.

5. Dependent Claim 20

Sun-Bress teaches Claim 20 at least because Sun teaches it, as discussed at Ground 1. §XII.A.4; Ex-1002 ¶257.

6. Dependent Claims 21/33

Sun-Bress teaches Claims 21 and 33 at least because Sun teaches them, as discussed at Ground 1. §XII.A.5; Ex-1002 ¶258.

7. Dependent Claim 23 and 34

a. Elements 23[pre/a]/34[pre/a]

Sun-Bress teaches Elements 23[pre/a] and 34[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.a; Ex-1002 ¶259.

b. Elements 23[b]/34[b]

Sun-Bress teaches Elements 23[b]/34[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.b; Ex-1002 ¶260.

c. Elements 23[c]/34[c]

Sun-Bress teaches Elements 23[c]/34[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.c; Ex-1002 ¶261.

8. Dependent Claims 24 / 35

Sun-Bress teaches Claims 24 and 35 at least because Sun teaches them, as discussed at Ground 1. §XII.A.7; Ex-1002 ¶262.

9. Dependent Claim 37

a. Elements 37[pre/a]

Sun-Bress teaches Elements 37[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.8.a; Ex-1002 ¶263.

b. Element 37[b]

Sun-Bress teaches Element 37[b] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.b; Ex-1002 ¶264.

c. Element 37[c]

Sun-Bress teaches Element 37[c] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.c; Ex-1002 ¶265.

d. Element 37[d]

Sun-Bress teaches Element 37[d] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.d; Ex-1002 ¶266.

C. Ground 3: Claims 16-18, 20-21, 23-24, 30-35, and 37 Are Obvious Over Sun in View of Asami

1. A POSITA would have been motivated to combine Sun’s and Asami’s teachings and would have had a reasonable expectation of success

A POSITA would have been motivated to combine Sun’s and Asami’s teachings and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶267-270. Sun and Asami are both directed to finger-worn wearable biometric sensing devices for gesture recognition, have finger ring form factors, and include similar components, such as motion sensors and processors. Ex-1015 ¶24 (accelerometer), ¶43 (processor); Ex-1014 ¶73 (motion sensor), ¶65 (processor).

While a POSITA would have understood that Sun’s finger mouse is “in the form factor of a ring for being worn around the finger,” Asami explicitly teaches that the components of its device are “provided in *a finger ring body 10* made of resin as an annular body,” forming “the [] wearable input device 1.” Ex-1014 ¶44; Ex-1002 ¶268.

A POSITA would have been motivated to implement Asami’s finger ring design with Sun’s finger mouse device, as a POSITA would have realized several

benefits of a finger ring, including longer-term wearability and minimal interference with the user's daily activities as well as the less bulky, more natural profile, and more fashionable design of a finger ring. Ex-1002 ¶269. A POSITA would also have realized that integrating new functionalities that are not traditionally associated with jewelry, such as electronic device control, into a finger ring would have led a POSITA to explore the use of Asami's finger ring as a versatile and modern alternative to Sun's finger mouse. *Id.*

A POSITA would have had a reasonable expectation of success in combining Sun and Asami, which are analogous prior art as they both involve finger-worn biometric sensing devices with gesture recognition capabilities having similar structural components. Ex-1002 ¶270. A POSITA would have understood that the electronic components of Sun's and Asami's gesture recognition devices are similar such that they are programmable using standard processors and are interchangeable. *Id.* A POSITA would have understood that these references disclose interrelated teachings based on routine technologies amenable to various well-understood and predictable combinations to provide more features and enhance user interest. *Id.*

2. Independent Claims 16 and 30

- a. Element 16[pre(1)]: A method, adapted to a wearable computing device in the form factor of a ring for being worn around the finger of a user, / Element 30[pre(1)]: A non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of a wearable computing device, the wearable computing device being in the form factor of a ring for being worn around the finger of a user and**

Sun-Asami teaches Elements 16[pre(1)]/30[pre(1)], to the extent they are limiting. Ex-1002 ¶¶271-274.

As discussed at Ground 1, Sun teaches a method adapted to a wearable computing device and a non-transitory readable storage medium storing instructing for implementation by a processor of such a device. *Supra* §XII.A.1.a.

While a POSITA would have understood, as discussed at Ground 1 (§XII.A.1.a), that Sun’s finger mouse is “in the form factor of a ring for being worn around the finger,” Asami expressly teaches its device is a finger ring. In particular, Asami teaches that its device includes electronic components “provided in *a finger ring body 10* made of resin as an annular body,” forming “the [] wearable input device 1.” Ex-1014 ¶44, Fig. 1B.

A POSITA would have been motivated to combine Sun’s and Asami’s teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.C.1; Ex-1002 ¶274.

b. Elements 16[pre(2)]/30[pre(2)]:

Sun-Asami teaches Elements 16[pre(2)]/30[pre(2)], to the extent they are limiting, at least because Sun teaches them, as discussed at Ground 1. *Supra* §XII.A.1.b; Ex-1002 ¶275.

c. Elements 16[a]/30[a]

Sun-Asami teaches Elements 16[a]/30[a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.c; Ex-1002 ¶276.

d. Elements 16[b]/30[b]

Sun-Asami teaches Elements 16[b]/30[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.d; Ex-1002 ¶277.

e. Elements 16[c]/30[c]

Sun-Asami teaches Elements 16[c]/30[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.e; Ex-1002 ¶278.

f. Elements 16[d]/30[d]

Sun-Asami teaches Elements 16[d]/30[d] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.f; Ex-1002 ¶279.

g. Elements 16[e]/30[e]

Sun-Asami teaches Elements 16[e]/30[e] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.g; Ex-1002 ¶280.

3. Dependent Claims 17/31

Sun-Asami teaches Claims 17 and 31 at least because Sun teaches them, as discussed at Ground 1. §XII.A.2; Ex-1002 ¶281.

4. Dependent Claims 18/32

Sun-Asami teaches Claims 18 and 32 at least because Sun teaches them, as discussed at Ground 1. §XII.A.3; Ex-1002 ¶282.

5. Dependent Claim 20

Sun-Asami teaches Claim 20 at least because Sun teaches it, as discussed at Ground 1. §XII.A.4; Ex-1002 ¶283.

6. Dependent Claims 21/33

Sun-Asami teaches Claims 21 and 33 at least because Sun teaches them, as discussed at Ground 1. §XII.A.5; Ex-1002 ¶284.

7. Dependent Claim 23 and 34

a. Elements 23[pre/a]/34[pre/a]

Sun-Asami teaches Elements 23[pre/a] and 34[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.a; Ex-1002 ¶285.

b. Elements 23[b]/34[b]

Sun-Asami teaches Elements 23[b]/34[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.b; Ex-1002 ¶286.

c. Elements 23[c]/34[c]

Sun-Asami teaches Elements 23[c]/34[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.c; Ex-1002 ¶287.

8. Dependent Claims 24/35

Sun-Asami teaches Claims 24 and 35 at least because Sun teaches them, as discussed at Ground 1. §XII.A.7; Ex-1002 ¶288.

9. Dependent Claim 37

a. Elements 37[pre/a]

Sun-Asami teaches Elements 37[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.8.a; Ex-1002 ¶289.

b. Element 37[b]

Sun-Asami teaches Element 37[b] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.b; Ex-1002 ¶290.

c. Element 37[c]

Sun-Asami teaches Element 37[c] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.c; Ex-1002 ¶291.

d. Element 37[d]

Sun-Asami teaches Element 37[d] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.d; Ex-1002 ¶292.

D. Ground 4: Claims 16-18, 20-21, 23-24, 30-35, and 37 Are Obvious Over Sun in View of Asami and Further in View of Bress

1. A POSITA would have been motivated to combine Sun-Asami's teachings with Bress's teachings and would have had a reasonable expectation of success

A POSITA would have been motivated to combine Sun-Asami's teachings with Bress's teachings and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶293-295. Sun, Asami, and Bress are all directed to wearable biometric sensing devices for gesture recognition, have finger ring form factors, and include similar components, such as motion sensors and processors. Ex-1015 ¶23 (accelerometer), ¶43 (processor); Ex-1014 ¶73 (motion sensor), ¶65 (processor); Ex-1016, Abstract, 6:13-16 (motion sensor), 14:45-65 (processor). Further, both Sun's and Bress's devices have a "sleep mode." Ex-1015 ¶37; Ex-1016, 15:62-64.

A POSITA would have been motivated to implement Bress's "sleep" mode functionality to Sun-Asami's device because a POSITA would have recognized the energy savings that the "sleep" mode would bring, as described in Bress. Ex-1002 ¶294; *see DyStar*, 464 F.3d at 1368 (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art). The inclusion of a "sleep" mode—and the ability to wake up from the "sleep" mode by using a gesture as disclosed in Bress—would significantly extend the battery life of the Sun-Asami device while maintaining convenience, making it

more practical for everyday use without the need for frequent recharging. Ex-1002 ¶294. This is particularly important for wearable technology, especially of small form factors, where the battery is small and battery life is a critical factor in user satisfaction and device usability. *Id.* The addition of a sleep mode would have served as an important, differentiating feature in a crowded market, providing a competitive edge by addressing one of the common pain points of wearable devices—battery life. *Id.* Thus, design incentives and market forces would have motivated a POSITA to apply Bress’s teachings to the Sun-Asami device. *Id.*

A POSITA would have had a reasonable expectation of success in combining Sun-Asami and Bress, which are analogous prior art as they both involve biometric sensing devices with gesture recognition capabilities having similar structural components. Ex-1002 ¶295. A POSITA would have understood that the electronic components of Sun-Asami’s and Bress’s gesture recognition devices are similar such that they are programmable using standard processors and are interchangeable. *Id.* A POSITA would have understood that these references disclose interrelated teachings based on routine technologies amenable to various well-understood and predictable combinations to provide more features and enhance user interest. *Id.*

2. Independent Claims 16 and 30

- a. Element 16[pre(1)]: A method, adapted to a wearable computing device in the form factor of a ring for being worn around the finger of a user, / Element 30[pre(1)]: A non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of a wearable computing device, the wearable computing device being in the form factor of a ring for being worn around the finger of a user and**

Sun-Asami-Bress teaches Elements 16[pre(1)]/30[pre(1)], to the extent they are limiting. Ex-1002 ¶296-299.

As discussed at Ground 1, Sun teaches a method adapted to a wearable computing device and a non-transitory readable storage medium storing instructing for implementation by a processor of such a device. *Supra* §XII.A.1.a.

While a POSITA would have understood, as discussed at Ground 1 (§XII.A.1.a), that Sun’s finger mouse is “in the form factor of a ring for being worn around the finger,” Asami expressly teaches that its device includes electronic components “provided in *a finger ring body 10* made of resin as an annular body,” forming “the [] wearable input device 1.” Ex-1014 ¶44, Fig. 1B. Bress also explicitly teaches that its “device’s finger sensors are in rings.” Ex-1016, 6:13-16; *see also id.*, 7:57-58 (“FIG. 1 depicts a user wearing an Imagine where the finger sensors are contained in solid rings.”), Fig. 1.

A POSITA would have been motivated to combine Sun's, Asami's, and Bress's teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.D.1; Ex-1002 ¶299.

b. Element 16[pre(2)]/30[pre(2)]:

Sun-Asami-Bress teaches Elements 16[pre(2)]/30[pre(2)], to the extent they are limiting, at least because Sun teaches them, as discussed at Ground 1. *Supra* §XII.A.1.b; Ex-1002 ¶300.

c. Elements 16[a]/30[a]

Sun-Asami-Bress teaches Elements 16[a]/30[a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.c; Ex-1002 ¶301.

d. Elements 16[b]/[30[b]]

Sun-Asami-Bress teaches Elements 16[b]/30[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.d; Ex-1002 ¶302.

e. Elements 16[c]/[30[c]]

Sun-Asami-Bress teaches Elements 16[c]/30[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.e; Ex-1002 ¶303.

f. Elements 16[d]/[30[d]]

Sun-Asami-Bress teaches Elements 16[d]/30[d] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.f; Ex-1002 ¶304.

g. Element 16[e]/30[e]: activating the at least one transceiver to transmit a first data packet and/or receive a second data packet in response to a confirmation of the sensor data matching the predetermined pattern.

Sun-Asami-Bress teaches Elements 16[e]/30[e] at least because Sun teaches them, as discussed at Ground 1. §XII.A.1.g; Ex-1002 ¶¶305-307.

In addition to Sun’s disclosures discussed at Ground 1, Bress expressly teaches a transceiver, including a “WiFi transceiver 406” and a “Bluetooth Transceiver 405.” Ex-1016, 13:65-66, 14:3-5. Bress further teaches activating a transceiver to transmit a data packet in response to a confirmation of the sensor data matching the predetermined pattern. Ex-1002 ¶306. Bress teaches that “[e]nergy management is critical in wireless devices” and that its device has a low-power or “sleep” mode. Ex-1016, 15:61-64. In the “sleep” mode, “many of the subsystems may be shut down,” including “[a]ny and all of the communications channels, such as BlueTooth...and WiFi.” *Id.*, 16:3-7. The processor polls the sensors, including motion sensors and “[s]ensor data during the brief awake times would determine if there is any need to stay awake to verify a change of state, resume sleep, or fully wake up.” *Id.*, 16:8-14. A POSITA would have been motivated to use the ability to wake up from “sleep” mode as taught by Bress in the Sun-Asami device to conserve energy by keeping transceiver operations to a minimum. Ex-1002 ¶306. A POSITA would have understood that the processor could poll motion sensor data in the

“sleep” mode and wake up the transceiver to transmit a data packet to the external device, e.g., a command corresponding to a particular gesture, if the sensor data matched a predetermined pattern. *Id.*

A POSITA would have been motivated to combine Sun-Asami’s teachings with Bress’s teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.D.1; Ex-1002 ¶307.

3. Dependent Claims 17/31

Sun-Asami-Bress teaches Claims 17 and 31 at least because Sun teaches them, as discussed at Ground 1. §XII.A.2; Ex-1002 ¶308.

4. Dependent Claims 18/32

Sun-Asami-Bress teaches Claims 18 and 32 at least because Sun teaches them, as discussed at Ground 1. §XII.A.3; Ex-1002 ¶309.

5. Dependent Claim 20

Sun-Asami-Bress teaches Claim 20 at least because Sun teaches it, as discussed at Ground 1. §XII.A.4; Ex-1002 ¶310.

6. Dependent Claims 21/33

Sun-Asami-Bress teaches Claims 21 and 33 at least because Sun teaches them, as discussed at Ground 1. §XII.A.5; Ex-1002 ¶311.

7. Dependent Claim 23 and 34

a. Elements 23[pre/a]/34[pre/a]

Sun-Asami-Bress teaches Elements 23[pre/a] and 34[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.a; Ex-1002 ¶312.

b. Elements 23[b]/34[b]

Sun-Asami-Bress teaches Elements 23[b]/34[b] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.b; Ex-1002 ¶313.

c. Elements 23[c]/34[c]

Sun-Asami-Bress teaches Elements 23[c]/34[c] at least because Sun teaches them, as discussed at Ground 1. §XII.A.6.c; Ex-1002 ¶314.

8. Dependent Claims 24/35

Sun-Asami-Bress teaches Claims 24 and 35 at least because Sun teaches them, as discussed at Ground 1. §XII.A.7; Ex-1002 ¶315.

9. Dependent Claim 37

a. Elements 37[pre/a]

Sun-Asami-Bress teaches Elements 37[pre/a] at least because Sun teaches them, as discussed at Ground 1. §XII.A.8.a; Ex-1002 ¶316.

b. Element 37[b]

Sun-Asami-Bress teaches Element 37[b] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.b; Ex-1002 ¶317.

c. Element 37[c]

Sun-Asami-Bress teaches Element 37[c] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.c; Ex-1002 ¶318.

d. Element 37[d]

Sun-Asami-Bress teaches Element 37[d] at least because Sun teaches it, as discussed at Ground 1. §XII.A.8.d; Ex-1002 ¶319.

E. Ground 5: Claims 16-18, 23-24, 30-32, and 34-35 Are Obvious Over Asami in View of Bress

1. A POSITA would have been motivated to combine Asami's and Bress's teachings and would have had a reasonable expectation of success

A POSITA would have been motivated to combine Asami's and Bress's teachings and would have had a reasonable expectation of success because each relates to the same well-known technologies. Ex-1002 ¶¶320-322. Asami and Bress are both directed to wearable biometric sensing devices for gesture recognition, have finger ring form factors, and include similar components, such as motion sensors and processors. Ex-1014 ¶44 (finger ring), ¶73 (motion sensor), ¶65 (processor); Ex-1016, Abstract (Motion sensor), 6:13-16 (finger ring), 14:45-65 (processor). And while Asami's device has a "radio transmitter 23" (Ex-1014 ¶65) for sending data to an external device, Bress teaches a transceiver, including a "WiFi transceiver 406" and a "Bluetooth Transceiver 405." Ex-1016, 13:65-66, 14:3-5. In the "sleep"

mode, “many of the subsystems may be shut down,” including “[a]ny and all of the communications channels, such a BlueTooth...and WiFi.” *Id.*, 16:3-7.

A POSITA would have been motivated to implement Bress’s transceiver and “sleep” mode functionality to Asami’s device. Ex-1002 ¶321. A POSITA would have appreciated the additional capability of being able to not only transmit, but also receive data in Asami’s device. *Id.* And a POSITA would have recognized the energy savings that Bress’s “sleep” mode would bring. *Id.*; see *DyStar*, 464 F.3d at 1368 (making things stronger, cheaper, lighter, smaller, more durable, or more efficient are universal motivators to combine/modify prior art). The inclusion of a “sleep” mode would significantly extend the battery life of the Asami device, making it more practical for everyday use without the need for frequent recharging. Ex-1002 ¶321. This is particularly important for wearable technology, especially of small form factors, where the battery is small and battery life is a critical factor in user satisfaction and device usability. *Id.* The addition of a sleep mode would have served as an important, differentiating feature in a crowded market, providing a competitive edge by addressing one of the common pain points of wearable devices—battery life. *Id.* Thus, design incentives and market forces would have motivated a POSITA to apply Bress’s teachings to Asami’s finger ring device. *Id.*

A POSITA would have had a reasonable expectation of success in combining Asami and Bress, which are analogous prior art as they both involve biometric

sensing devices with gesture recognition capabilities having similar structural components. Ex-1002 ¶322. A POSITA would have understood that the electronic components of Asami's and Bress's gesture recognition devices are similar such that they are programmable using standard processors. *Id.* A POSITA would have understood that these references disclose interrelated teachings based on routine technologies amenable to various well-understood and predictable combinations to provide more features and enhance user interest. *Id.*

2. Independent Claims 16 and 30

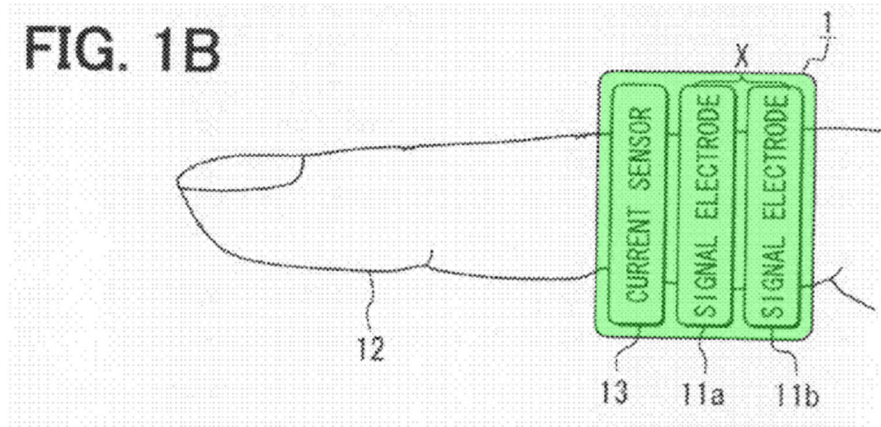
- a. **Element 16[pre(1)]: A method, adapted to a wearable computing device in the form factor of a ring for being worn around the finger of a user, / Element 30[pre(1)]: A non-transitory computer readable storage medium storing computer readable instructions for implementation by a processor of a wearable computing device, the wearable computing device being in the form factor of a ring for being worn around the finger of a user and**

To the extent the preamble is limiting, Asami-Bress teaches Elements 16[pre(1)]/30[pre(1)]. Ex-1002 ¶¶323-325.

Asami teaches a method adapted to a “wearable input device.” *E.g.*, Ex-1014, Abstract. Asami's device includes electronic components “provided in *a finger ring body 10* made of resin as an annular body, which forms the outer shape of the...wearable input device 1.” Ex-1014 ¶44. Asami further teaches that the

electronic components of the device “are integrated...*in the finger ring body 10.*”

Id. ¶44, Fig. 1A, Fig. 1B, reproduced below.



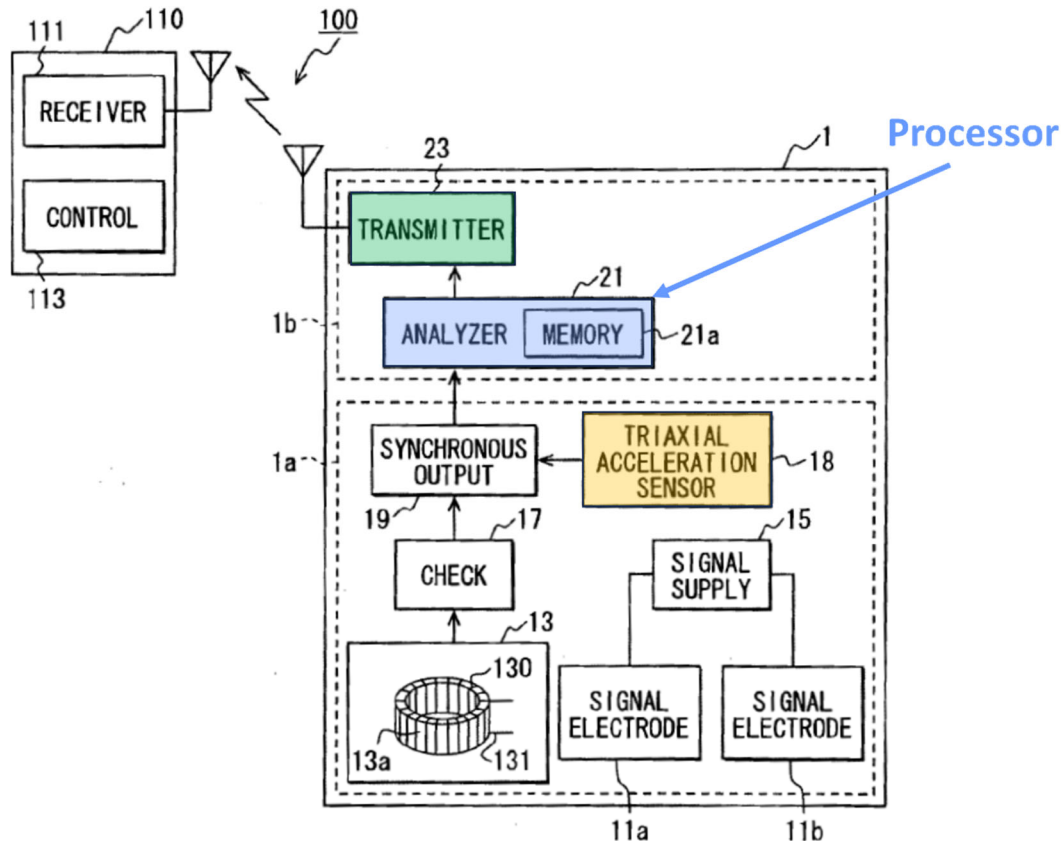
Asami’s “wearable input device” includes “an *analyzer unit 21*,” which has a “*built-in memory 21a*.” *Id.* ¶¶65, 75. As explained more fully below, a POSITA would have understood that Asami’s “analyzer unit” is a processor that performs computer operations (Ex-1014 ¶¶76-77), and that Asami’s “built-in memory” is a non-transitory computer readable storage medium that contains instructions for performing those operations. *Id.* ¶¶75, 107. Ex-1002 ¶325.

- b. Element 16[pre(2)]: the wearable computing device comprising at least one sensor module having at least one sensor, at least one processor, and at least one transceiver; the method comprising / Element 30[pre(2)]: including a sensor module having a sensor and a transceiver, which instructions, when executed by the processor, causes the processor to perform operations comprising:**

To the extent the preamble is limiting, Asami-Bress teaches Elements 16[pre(2)]/30[pre(2)]. Ex-1002 ¶¶326-327.

Asami's "wearable input device" includes "a triaxial *acceleration sensor* 18...an *analyzer unit* 21 and a *radio transmitter unit* 23." Ex-1014 ¶65, Fig. 6A (annotated below).

FIG. 6A



A POSITA would have understood that Asami's "analyzer 21" is a processor that performs computer operations. Ex-1002 ¶328; Ex-1014 ¶94 ("The analyzer unit 21 [is] configured to execute character recognition and transmission *processing* as shown in FIG. 8."); *see also id.* Fig. 8.

As shown in Figure 6A, Asami's triaxial acceleration sensor is part of "measurement data output part 1a," which also includes "current sensor 13." Ex-1014 ¶¶46, 91, Fig. 6A. A POSITA thus would have understood Asami's "measurement data output part 1a" to be a sensor module. Ex-1002 ¶329.

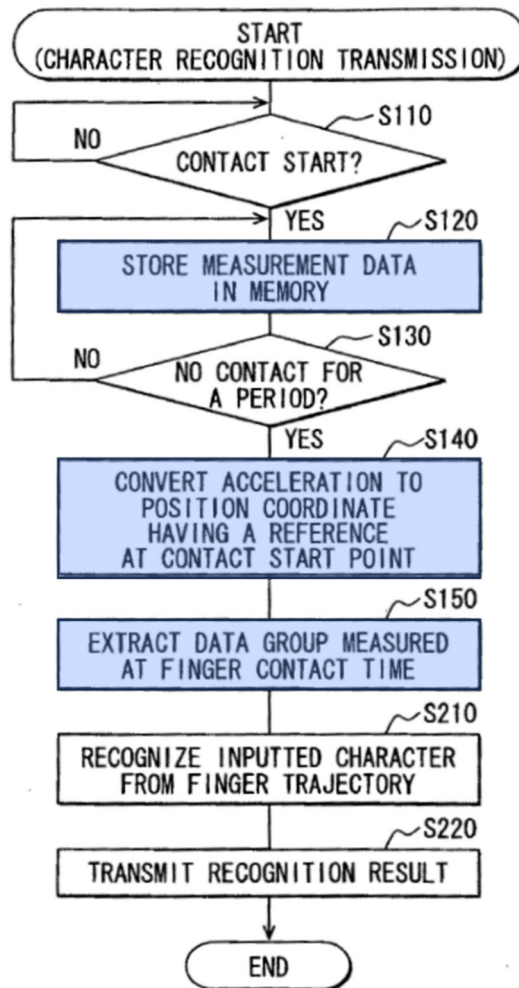
To the extent Asami's disclosure of "radio transmitter [] 23" (Ex-1014 ¶65) not suggest a "transceiver," Bress teaches a transceiver, including a "WiFi transceiver 406" and a "Bluetooth Transceiver 405." Ex-1016, 13:65-66, 14:3-5. A POSITA would have been motivated to use a WiFi or Bluetooth transceiver, as taught by Bress, because these are based on well-known, standard protocols for exchange of packet-based data. Ex-1002 ¶¶330-332.

c. Elements 16[a]/30[a]: obtaining, by the sensor of the sensor module, sensor data indicating a motion of the finger or a hand adjoined to the finger wearing the wearable computing device;

Asami-Bress teaches Elements 16[a]/30[a]. Ex-1002 ¶¶333-335.

Asami teaches that its "triaxial acceleration sensor 18 is configured to *detect motion of the input finger by detecting acceleration*...in the x, y, z axes." Ex-1014 ¶73; *see also id.*, Fig. 8 (Steps S120, S140, S150); Fig. 9A (Steps S120, S140, S150).

FIG. 8



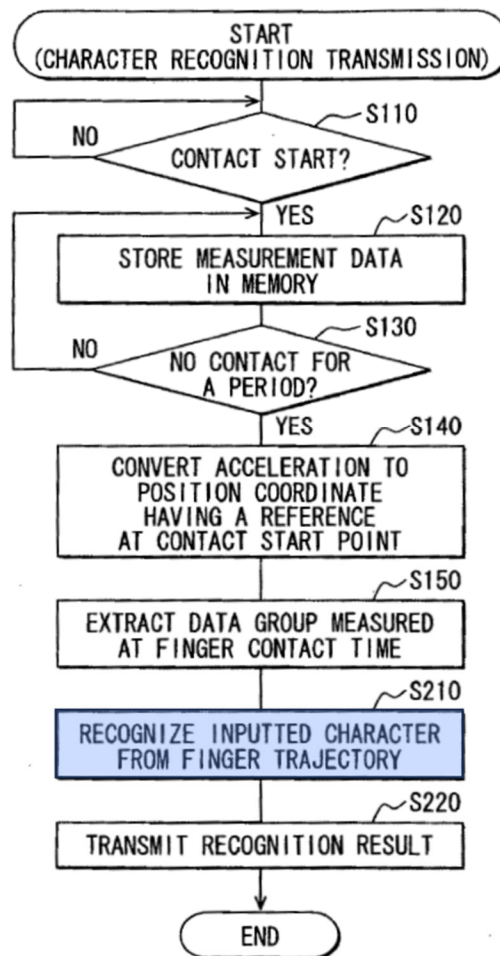
d. Elements 16[b]/[30[b]]: comparing, by [one of the at least one] processor[s], the obtained sensor data to a predetermined pattern of motion;

Asami-Bress teaches Elements 16[b]/30[b]. Ex-1002 ¶¶336-337.

Asami teaches that its analyzer obtains the triaxial accelerometer data from synchronous output unit 19 (Ex-1014 ¶¶72-73) and compares the obtained data to a predetermined pattern of motion (*id.* ¶75 (trajectory data stored in analyzer memory

21a)). Specifically, in Asami's device, the measured acceleration is "converted into the position coordinate of the input finger of each time." Ex-1014 ¶82. The analyzer then recognizes a character "by *evaluating the degree of agreement between the trajectory pattern of the position coordinate indicated by the measurement data group and a pre-stored trajectory pattern* of a subject character." Ex-1014 ¶ 96; *see also id.*, Fig. 8 (Step S210), Fig. 9A (Step 310), ¶105. A POSITA would have understood the stored trajectory pattern to be a "predetermined pattern of motion." Ex-1002 ¶337.

FIG. 8



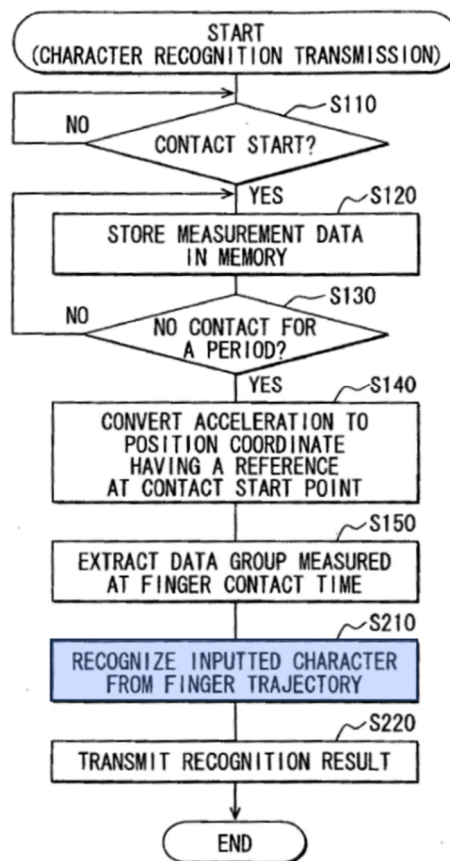
- e. Elements 16[c]/[30[c]]: determining, by [one of the at least one] processor[s], whether the obtained sensor data matches a predetermined pattern;

Asami-Bress teaches Elements 16[c]/30[c]. Ex-1002 ¶¶338-339.

As explained for the previous element (16[b]/30[b]), Asami teaches that its analyzer determines whether the motion data matches a pre-stored character pattern. Asami states that “[a] character *may be recognized* by evaluating the degree of agreement between the trajectory pattern of the position coordinate indicated by the

measurement data group and a pre-stored trajectory pattern of a subject character.”
Ex-1014 ¶96, Fig. 8 (Step 210); *see also id.* ¶99 (the process of determining whether there is a match with the predetermined pattern results in “data representing the recognition result of the character.”); ¶97, Fig. 9A (Step 310), Fig. 9B (showing two predetermined figure patterns), ¶¶105, 107.

FIG. 8



- f. Elements 16[d]/[30[d]]: determining, by [one of the at least one] processor[s], a characteristic of an activity of the user of the wearable computing device when the obtained sensor data matches the predetermined pattern; and**

Asami-Bress teaches Elements 16[d]/30[d] because Asami teaches them. Ex-1002 ¶¶340-342.

While the '953 patent specification does not define the term “characteristic of an activity of the user,” the specification states that the wearable computing device “can determine current activity of a user according to measurements taken by one or more sensors in the sensor module, such as accelerometer, gyroscope, magnetometer or digital compass.” Ex-1001, 42:64-67. A POSITA would have understood the plain and ordinary meaning of “characteristic of an activity of the user” to cover any property of the user’s motion or other activity. Ex-1002 ¶341. Asami teaches that the user of its device can be engaged in activities such as “writ[ing] characters or draw[ing] figures (including pictures, symbols, etc.).” Ex-1014 ¶49. Further, Asami’s device allows not only “measuring a trajectory of movement of the input finger,” but also has “a function of detecting contact or separation (non-contact or out-of-contact) of the top end of the input finger to and from the other body part of the user.” Ex-1014 ¶50. Whether the finger is in or out of contact with another body part is determined by the “current sensor 13.” *Id.* ¶¶62. In other words, Asami’s device allows not only recognizing whether the trajectory of the user’s finger in

contact with another body part matches a predetermined pattern, but also determining when the finger was in and out of contact and what other motions the user was making when out-of-contact—i.e., the claimed characteristic(s) of user activity. Ex-1002 ¶341. These activities correspond to the '953 patent specification's description of "current activity of a user according to measurements taken by one or more sensors in the sensor module." Ex-1001, 42:64-66.

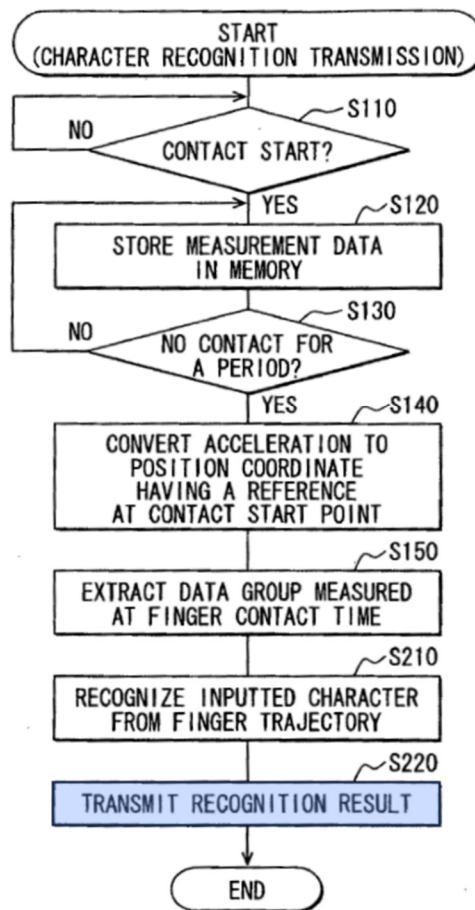
Accordingly, a POSITA would also have understood that a characteristic of the user's activity "includes the condition determination value indicating the contact of the input finger, from measurement data group acquired during a period from the start of contact and the continued separation of the input finger." Ex-1014 ¶83; Ex-1002 ¶342. A POSITA would have further understood that a related characteristic of the user's activity is whether the "character or figure [drawn by the user's finger motion] is a combination of a plurality of discontinuous strokes." Ex-1014 ¶90; Ex-1002 ¶342. Another related characteristic of the user's activity determined by the Asami device processor is "the user action corresponding to contacting or separating a pen to or from a paper." Ex-1014 ¶101; Ex-1002 ¶342. A further characteristic of the user's activity is whether the user is "writ[ing] characters or draw[ing] figures." Ex-1014 ¶49; Ex-1002 ¶342.

g. Elements 16[e]/30[e]: activating the at least one transceiver to transmit a first data packet and/or receive a second data packet in response to a confirmation of the sensor data matching the predetermined pattern.

Asami-Bress teaches Elements 16[e]/30[e]. Ex-1002 ¶¶343-347.

Asami teaches that following the character recognition, its device “analyzer unit 21 transmits data indicating the character recognition result to the external device 110 through the radio transmitter unit 23 at S220.” Ex-1014 ¶97, Fig. 8 (Step S220); *see also id.* ¶106, Fig. 9A (Step 320). Asami further teaches that “if the character recognition is not successful, no data may be transmitted to the external device 110.” *Id.* ¶99; *see also id.* ¶108. When character recognition is successful, data representing the recognized character is transmitted to the external device. *Id.* ¶¶99, 106, 108. A POSITA would have recognized from these teachings that Asami teaches activating the transmitter to transmit data in the form of a data packet, such as an ASCII or Unicode representation of the character in response to a confirmation that the data matches the pattern. Ex-1002 ¶344.

FIG. 8



Bress expressly teaches a transceiver, including a “WiFi transceiver 406” and a “Bluetooth Transceiver 405.” Ex-1016, 13:65-66, 14:3-5. Bress further teaches activating the transceiver to transmit a data packet in response to a confirmation of the sensor data matching the predetermined pattern. Ex-1002 ¶345. A POSITA would have understood that data transmitted under WiFi or Bluetooth protocols is transmitted in data packets. *Id.* Bress further teaches that “[e]nergy management is critical in wireless devices” and that its device has a low-power or “sleep” mode.

Ex-1016, 15:61-64. In the “sleep” mode, “many of the subsystems may be shut down,” including “[a]ny and all of the communications channels, such a BlueTooth...and WiFi.” *Id.*, 16:3-7. The processor polls the sensors, including motion sensors and “[s]ensor data during the brief awake times would determine if there is any need to stay awake to verify a change of state, resume sleep, or fully wake up.” *Id.*, 16:8-14. A POSITA would have been motivated to use Bress’s “sleep” mode in Asami’s device to conserve energy and would have understood that the processor could poll motion sensor data in the “sleep” mode and wake up the transceiver to transmit a data packet to the external device, e.g., a command corresponding to a particular gesture, if the sensor data matched a predetermined pattern. Ex-1002 ¶345.

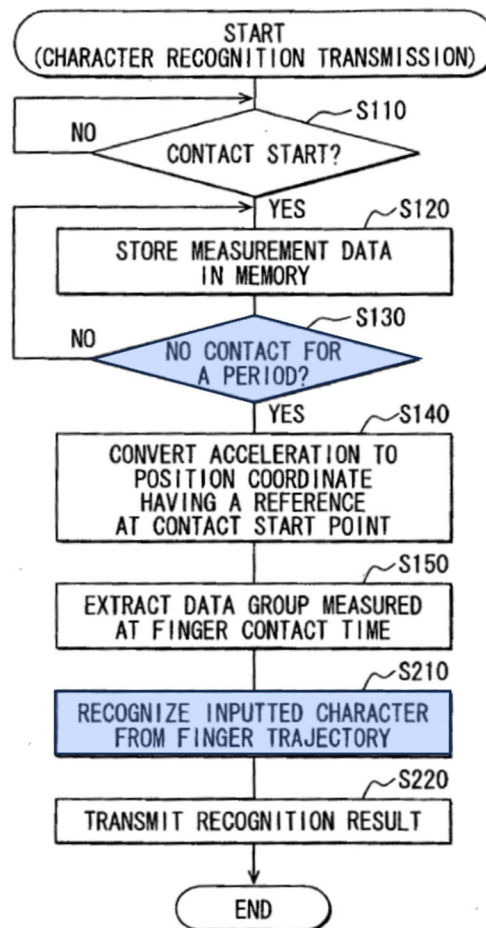
A POSITA would have been motivated to combine Asami’s and Bress’s teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.E.1; Ex-1002 ¶¶346-347.

3. **Dependent Claims 17/[31]: The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising]: determining that the sensor data matches the predetermined pattern based at least in part on a completion of the activity.**

Asami-Bress teaches Claims 17 and 31. Ex-1002 ¶¶348-350.

Asami's device determines that the sensor data matches the pattern based at least in part on the completion of trajectory of the user's finger. Ex-1002 ¶349. Asami teaches that its analyzer "recognizes at S210 a character, which the user expresses with the input finger, *from the trajectory of the position coordinate* indicated by the extracted measurement data group." Ex-1014 ¶96, Figs. 8, 9A.

FIG. 8



As shown in the flowchart in annotated Figure 8 above, Asami's method actively checks at Step 130 whether the user's finger motion has been completed.

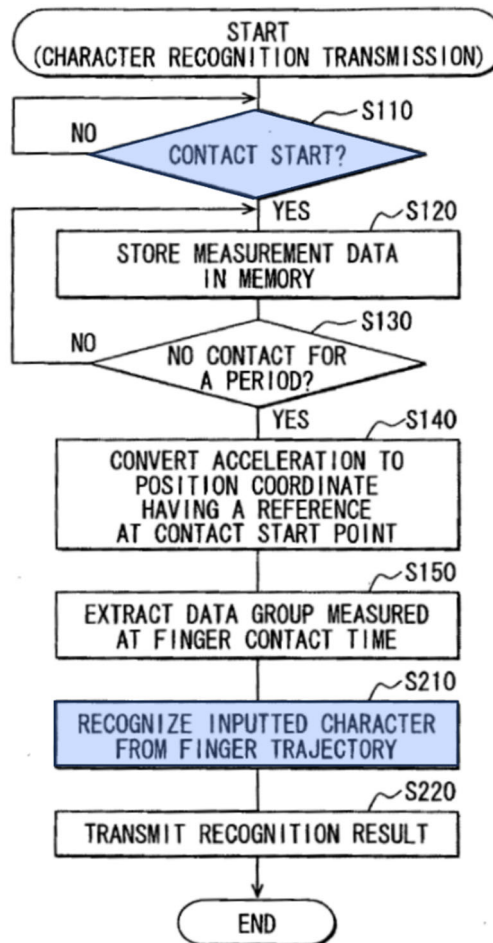
Id., Fig. 8; Ex-1002 ¶350; *see also* Ex-1014, Fig. 7B (showing a completed trajectory of the finger).

4. **Dependent Claims 18/[32]: The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising:] determining that the sensor data matches the predetermined pattern based at least in part on a start of the activity.**

Asami-Bress teaches Claims 18 and 32. Ex-1002 ¶¶351-353.

Asami's device determines that the sensor data matches the pattern based at least in part on the start of the trajectory of the user's finger. Ex-1002 ¶352. Asami teaches that its analyzer "recognizes at S210 a character, which the user expresses with the input finger, *from the trajectory of the position coordinate* indicated by the extracted measurement data group." Ex-1014 ¶96, Figs. 8, 9A.

FIG. 8



As shown in the flowchart in annotated Figure 8 above, Asami's method actively checks at Step 110 whether the user's finger motion has started. *Id.*, Fig. 8; Ex-1002 ¶353. *see also* Ex-1014, Fig. 7B (showing a detected trajectory of the finger, including its start point).

- 5. Dependent Claim 20: The method of claim 16, wherein the sensor data further comprises an axial rotation measurement.**

Asami-Bress teaches Claim 20. Ex-1002 ¶¶354-357.

Bress teaches that the sensor data includes “right and left rotation motion...” Ex-1016, 10:64-65. Bress further teaches that its device includes a “3-axis gyroscope...and [a] 3-axis accelerometer...to generate the motion data.” *Id.*, 14:13-15; Fig. 4 (showing finger-based “3-Axis Gyro” and “3-Axis Accelerometer.”). A POSITA would have understood that a 3-axis gyroscope provides axial rotation measurements. Ex-1002 ¶¶355-356.

A POSITA would have been motivated to combine Asami’s and Bress’s teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.E.1; Ex-1002 ¶357.

6. **Dependent Claims 21/[33]: The method of claim 16/[The non-transitory computer readable storage medium of claim 30], wherein the [at least one] sensor module comprises one or more of a light sensor, a gyroscope, and/or a magnetometer, and the sensor data further comprises a measurement from one or more of the light sensor, a gyroscope, and/or a magnetometer.**

Asami-Bress teaches Claims 21 and 33. Ex-1002 ¶¶358-362.

Bress teaches that its device includes a “**3-axis gyroscope**...and [a] 3-axis accelerometer...to generate the motion data.” Ex-1016, 14:13-15; Fig. 4 (showing finger-based “**3-Axis Gyro**” and “3-Axis Accelerometer.”).

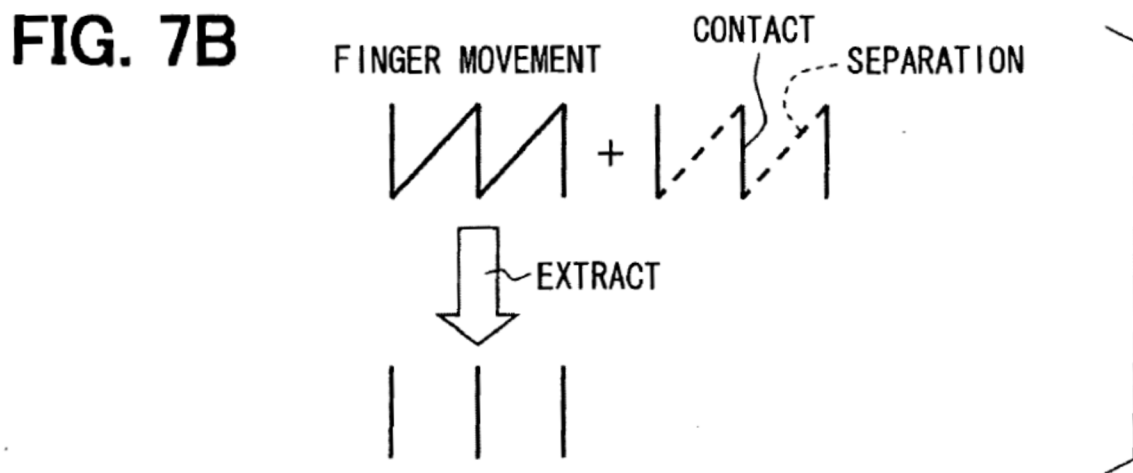
A POSITA would have been motivated to combine Asami’s and Bress’s teachings and would have had a reasonable expectation of success for the reasons discussed in §XII.E.1; Ex-1002 ¶362.

7. **Dependent Claims 23 and 34**

- a. **Elements 23[pre/a]/[34[pre/a]]:** The method of claim 16, further comprising/[The non-transitory computer readable storage medium of claim 30, wherein the processor further executes an operation comprising]: **converting the sensor data into a series of samples;**

Asami-Bress teaches Elements 23[pre/a]/34[pre/a]. Ex-1002 ¶¶363-365.

Asami teaches at “[a]t S140, the analyzer unit 21 converts the acceleration measurement values indicated by a *series of measurement data* stored in the memory 21a into a position coordinate having a reference (point of origin) at a position.” Ex-1014 ¶81. Asami further describes an “extraction operation” that outputs “at S150, the measurement data group indicating the position coordinate of the input finger while the input finger is in contact with the other body part.” *Id.* ¶84, Fig. 7B, reproduced below (showing “at the bottom left part” a series of samples following the extraction); Ex-1002 ¶364.



Further, in Asami method, “*a time-sequence data of the position coordinate* indicated by each measurement data is generated.” *Id.* ¶85. A POSITA would have understood these disclosures to teach converting the sensor data into a series of samples. Ex-1002 ¶365.

b. Elements 23[b]/34[b]: comparing the series of samples to the predetermined pattern; and

Asami-Bress teaches Elements 23[b]/34[b]. Ex-1002 ¶¶366-367.

Asami teaches that the series of samples obtained from the extraction at the previous step are compared to a pre-stored pattern. Ex-1014 ¶96 (“A character may be recognized by evaluating the degree of agreement between the *trajectory pattern of the position coordinate indicated by the measurement data group* and a pre-stored trajectory pattern of a subject character.”).

c. Elements 23[c]/34[c]: determining that the sensor data matches the predetermined pattern if the series of samples matches the predetermined pattern.

Asami-Bress teaches Elements 23[c]/34[c]. Ex-1002 ¶¶368-369.

Asami teaches that with its method a character or a figure is recognized if the series of samples matches the pre-stored pattern. Ex-1014 ¶96 (“A character may be recognized by evaluating the degree of agreement between the *trajectory pattern of the position coordinate indicated by the measurement data group* and a pre-stored trajectory pattern of a subject character.”).

- 8. Dependent Claims 24 and 35: The method of claim 23, wherein/[The non-transitory computer readable storage medium of claim 34, wherein the processor further executes an operation comprising:] the comparing between the series of samples and the predetermined pattern is determined by a recognition technique.**

Asami teaches-Bress Claims 24 and 35. Ex-1002 ¶¶370-372.

Asami teaches that the analyzer unit 21 may be configured to execute character recognition, i.e., performing a recognition technique. Ex-1002 ¶371; Ex-1014 ¶94 (“The analyzer unit 21 may be configured to execute character recognition.”); ¶96 (“A character may be recognized by evaluating the degree of agreement between the *trajectory pattern of the position coordinate indicated by the measurement data group* and a pre-stored trajectory pattern of a subject character.”).

XIII. THE BOARD SHOULD NOT USE ITS DISCRETION TO DENY INSTITUTION UNDER *FINTIV*.

The Board should decline to exercise its discretion to deny institution under 35 U.S.C. §314(a) because there is no pending district court litigation against Petitioner involving the '953 Patent.

XIV. CONCLUSION

Petitioner requests institution of IPR for Claims 16-18, 20-21, 23-24, 30-35, and 37 of the '953 Patent based on each of the Petition grounds.

Respectfully Submitted,

/s/ William M. Fink

William M. Fink (Reg. No. 72,332)

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner certifies that this petition includes 12,285 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

Dated: June 28, 2024

Respectfully submitted,

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CERTIFICATE OF SERVICE (37 C.F.R. §42.6(e)(1))

The undersigned hereby certifies that the above document was served on June 28, 2024, by filing this document through the Patent Trial and Appeal Board P-TACTS System, as well as delivering a copy via express mail upon the following attorneys of record for the Patent Owner:

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