1 2 3 4 5 6 7 8	GARY A. ANGEL, CSB NO. 70006 FREAR STEPHEN SCHMID, CSB NO. 96089 LAW OFFICE OF GARY A. ANGEL 177 POST STREET, SUITE 550 SAN FRANCISCO, CA 94108 TELEPHONE: (415) 788-5935 FACSIMILE: (415) 788-5958 EMAIL: angelgary@aol.com Attorneys for Plaintiff ELECTRONIC SCRIPTING PRODUCTS, INC.				
9	UNITED STATES DISTRICT COURT				
10	NORTHERN DISTRICT OF CALIFORNIA				
11					
12		05806			
13	INC. ) FIRST AMENDED CO	)MPLAINT			
14	Plaintiff ) FOR PATENT INFRI	NGEMENT			
15		,			
16	16 HTC AMERICA, INC., a corporation,				
17	17 Defendant.				
18	18				
19					
20		,			
21		Amended Complaint for patent infringement against defendant HTC AMERICA, INC. (HTC)			
22		and alleges as follows.			
23		<u>CLAIM FOR PATENT INFRINGEMENT</u>			
24					
25		al jurisdiction in this			
26	26 court for patent cases.				
27	27				
28	28				

### **VENUE**

2. Venue is proper in this judicial district pursuant to <u>28 U.S.C.</u> § <u>1391(c)</u> in that defendant is subject to personal jurisdiction in this district as defendant maintains a place of business here, transacts and has transacted business here, including activities infringing ESPI's patent as set forth herein.

# INTRADISTRICT ASSIGNMENT

3. Because this case is an Intellectual Property Action, it is not subject to assignment to a particular location or division of the Court under Local Rule 3-2(c).

### **NATURE OF THE ACTION**

4. Plaintiff brings this action against defendant for its infringement of United States Patent No. 9,235,934 (hereinafter Patent) including specifically, but not limited to, Claims 1, 4, 5, and 6, thereof respectively ("Claims").

### FACTUAL BACKGROUND

### I. THE ASSERTED PATENT

- 5. On January 12, 2016, U.S. Patent 9,235, 934, as duly assigned, was issued to plaintiff. As applicable here, said Patent pertains to virtual reality and/or augmented reality devices/systems as more extensively and precisely described in the Patent, generally wearable articles and associated control instruments/systems for virtual reality and/or augmented reality applications.
- 6. At all times relevant, plaintiff ESPI is and was the owner of the Patent and has and had the rights thereunder. Plaintiff's Patent and its meaning were well known to defendant at all times relevant hereto, plaintiff having given defendant multiple written notices of the Patent and the nature of defendant's infringement thereof prior to filing this lawsuit and prior to this First Amended Complaint. See Exhibits 1 and 2 hereto incorporated herein by reference. In addition, due to the original complaint filed in this action, and the defendant's unsuccessful petition for

Inter Partes Review (IPR) of the Patent defendant became even more intimately knowledgeable of the Patent and the nature and manner of defendant's infringement thereof. Notwithstanding this knowledge, defendant has continued to infringe the Patent with a wanton, deliberate, knowing, willful and calculated intent to infringe the Patent and with the intent of enriching itself and misappropriating plaintiff's property without offering any justification for blatantly and consciously ignoring plaintiff's rights under the Patent. The continued infringement is in bad faith as evident from defendant's refusal to provide any excuse for its unabated infringement, despite plaintiff's repeated requests for justification. Instead of providing any justification, defendant has cavalierly continued its infringement and used its ill-gotten gains therefrom to engage in and finance time consuming and expensive litigation tactics to browbeat plaintiff into surrendering its Patent rights.

# II. <u>DEFENDANT' INFRINGEMENT OF THE PATENT</u>

### A. THE ACCUSED PRODUCTS

7. Commencing in early 2016 in the United States of America, defendant has tested, demonstrated, provided instructions for the operation and use of, provided training for the operation and use of, marketed, made, used, offered to sell, sold, and imported its VIVE devices, a virtual reality product/system. The model names of the defendant' devices that infringe the '934 Patent include, VIVE PRE, VIVE, VIVE PRO, VIVE PRO EYE, and VIVE PRO HMD. Said devices infringing the '934 Patent are herein after referred to as "Devices". For clarity, the Devices claimed herein to be infringing the '934 Patent do not include the VIVE COSMOS. Defendant actively markets and sells its Devices to wholesalers, retailers, entertainment centers and e-sport locations (arcades, malls and similar venues) and end users in the United States.

### B. <u>DEFENDANT'S DIRECT INFRINGEMENT OF THE PATENT</u>

8. Defendant has directly infringed and continues to infringe one or more of the Claims of the Patent under 35 U.S.C. § 271(a), because defendant has used, tested, trained in the use of, provided instructions for the use of, demonstrated, manufactured, imported, promoted, marketed, offered for sale, and/or sold the Devices. In order to have accomplished the foregoing

activities with its Devices, defendant had to and continues to utilize and practice one or more of plaintiff's Claims, as set forth (by way of illustration, but not limitation) in Exhibit 3 hereto, which is incorporated herein by reference. At no point could defendant have implemented and/or operated its Devices without infringing the Patent since in order for defendant's Devices to function and operate the Devices must practice one or more of plaintiff's Claims.

# C. <u>DEFENDANT INDUCED INFRINGEMENT OF THE PATENT</u>

- 9. Defendant is also liable for indirect infringement under <u>35 U.S.C.</u> §271(b), because defendant knowingly induced and continues to induce the direct infringement of one or more of the Claims by end-users and other third parties (i.e. wholesalers, retailers, entertainment operators, e-sports venues and arcade operators) in the United States.
- 10. Said end-users and other third parties have directly infringed one or more of the Claims of the Patent by using or operating the defendant's Devices, in the manner for which such Devices were and are designed and marketed; that is when the Devices are used as defendant intends them to be used, the user and the act of usage thereof necessarily directly infringe the Patent.
- 11. Defendant knowingly took active steps to induce end-users and other third parties in the United States to engage in direct infringement of the Patent since defendant knew that when the Devices are used for their intended purpose by third parties and end users, such third parties and users directly infringe the claims of the Patent. For example, to induce such third parties' and users' infringement, defendant provided, sold, or promoted the Devices to end-users or other third parties along with specific instructions or training regarding the use of those Devices, which instructions or training actively induced said end-users and other third parties to practice one or more of the Claims and said instructions or training caused direct infringement of such Claims. See for example VIVE PRE User Guide found <a href="https://www.htc.com/managed-assets/shared/desktop/vive/Vive\_PRE\_User\_Guide.pdf">https://www.htc.com/managed-assets/shared/desktop/vive/Vive\_PRE\_User\_Guide.pdf</a> and VIVE PRO User Guide found <a href="https://developer.vive.com/resources/wp-content/uploads/sites/8/2018/03/20180320\_VIVE\_Pro\_HMD\_user\_guide\_English.pdf">https://developer.vive.com/resources/wp-content/uploads/sites/8/2018/03/20180320\_VIVE\_Pro\_HMD\_user\_guide\_English.pdf</a>, incorporated herein by reference.

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- 12. Defendant possessed the specific intent to induce direct infringement of the Claims by end-users and other third parties which intent was manifested, *inter alia*, by its instructions and/or training for using the Devices to end users and third parties, and sale of the Devices to end users and third parties, and its knowledge of the Patent and its knowledge that any use of the Devices by end-users and other third parties would necessarily directly infringe one or more of the Claims.
- 13. At all times, including prior to the filing of this litigation and the filing of this First Amended Complaint, defendant had knowledge of the Patent and knowledge that the use of the Devices per its instructions and/or training would unavoidably and necessarily infringe one or more of the Claims. In addition, during said time period, defendant knew or should have known that its actions would and did induce infringement of the Patent by end-users and other thirdparty users as set forth above. Defendant had pre-suit actual knowledge of the Patent, inter alia due to (1) direct written correspondence (Exhibits 1 and 2 hereto) from plaintiff mailed to defendant, (2) defendant's active participation and competition in the virtual reality market, (3) defendant's exercise of due diligence pertaining to intellectual property affecting its Devices, including specifically its contractual relationship with Valve Corporation to co-develop and implement the Device. Valve Corporation was also given written notice of the Patent. See Exhibit 4 hereto, incorporated herein by reference. Because both defendant and Valve were given direct written notice of plaintiff's Patent and because of the business reality and custom and practice that before entering into a product development contract, each party to such a contract will fully disclose its relative knowledge, including intellectual property aspects of the proposed product, then therefore the subject Patent was necessarily mutually disclosed as between Valve and defendant. Such disclosure was specifically to individuals within their respective corporate hierarchies with the knowledge, expertise and skill to understand the subject Patent and understand that the ultimately developed Devices did in fact infringe the Patent. despite such letters and other sources of knowledge, defendant never contacted plaintiff and has never provided any good faith reason as to why it contends it does not infringe the Patent. On information and belief, both Valve and defendant (both of which are large and sophisticated

companies) as a matter of general corporate practice, commensurate with general corporate practices prior to development and introduction of a product in the American market, prior to this lawsuit and prior to its development and introduction of the Devices onto the market in the U.S., did undertake a "clearing search" and a "freedom to operate search". These searches would have disclosed plaintiff's Patent to HTC in addition to the pre-suit knowledge defendant received from other sources. For defendant not to have known of the Patent and to have not recognized the Devices infringement thereof would have required defendant to be intentional and deliberately in denial of the Patent and intentionally and deliberately blinding itself to the Devices' infringement thereof. In addition to the foregoing knowledge of the Patent, the bases for the claims of infringement were repeatedly given in writing to defendant's in-house counsel and its current attorneys of record prior to the filing of this First Amended Complaint. despite said knowledge of the Patent and the reasons for infringement, defendant with full knowledge thereof has continued to infringe with deliberate and contemptuous disregard of plaintiff's patent rights. At the very least, as noted above in paragraph 6, defendant has acted with cavalier disregard of the objectively high likelihood that the Devices infringe the Patent.

- 14. Defendant knew or should have known that testing, demonstrating, marketing, making, using, offering to sell, selling, and/or importing the Devices constituted infringement of one or more of the Claims of the Patent, based on, among other things, the reasons alleged in the foregoing paragraph.
- 15. Defendant has knowingly taken active steps to induce end-users and other third parties to engage in direct infringement of one or more of the Claims and has done so with an affirmative intent to cause such direct infringement and/or with purposeful, culpable expression and conduct to encourage such direct infringement. Defendant's specific intent to induce infringement is evidenced by, among other things, its providing of specific instructions and/or training to end-users and/or other third parties knowing that its acts would induce end-users and other third parties to use its Devices and by such usage to directly infringe the Patent.
- 16. As a result of defendant's infringement of plaintiff's Patent as set forth above, plaintiff is entitled to damages in an amount according to proof. Further, based upon the facts as

П						
	set forth above, defendant's infringement of the Patent was and continues to be willful, deliberate					
	and in bad faith, with knowing, flagrant and conscious disregard of plaintiff's Patent rights,					
	plaintiff is entitled to treble damages under 35 U.S.C. § 284 and to attorney's fees and costs					
	incurred in prosecuting this action under <u>35 U.S.C.</u> § 285.					
	WHEREFORE plaintiff demands judgment against defendant as follows:					
	1. That defendant render an accounting for all profits defendant received by					
	infringing said patent;					
	2. For damages against defendant sufficient to compensate plaintiff pursuant to <u>35</u>					
	U.S.C. § 284, in an amount according to proof, but in excess of \$45,000,000.00;					
	3. For treble damages;					
	4. For costs and reasonable attorney fees of the subject litigation and interest as					
	allowable by law; and					
	5. For such other and further relief as the court may deem just and proper.					
	DATED: Oc	ctober 10, 2019	LAW OFFICES OF GARY A. ANGEL			
			/s/ Frear Stephen Schmid Frear Stephen Schmid, Attorneys for Plaintiff Electronic Scripting Products, Inc.			
	DEMAND FOR JURY TRIAL					
		Plaintiff hereby demands a jury trial pursuant to Federal Rules of Civil Procedure				
	38.					
	DATED: O	ctober 10, 2019	LAW OFFICES OF GARY A. ANGEL			
			/s/ Frear Stephen Schmid Frear Stephen Schmid, Attorneys for Plaintiff Electronic Scripting Products			
L	1					

# **EXHIBIT 1**

# Electronic Scripting Products, inc

555 Bryant Street #142 • Palo Alto • California • 94301 • (650) 862-1085 • www.naviscribe.com

March 11th, 2016

Jianq Chyun Intellectual Property Office 7th Floor-1, No. 100 Roosevelt Road, Section 2 Taipei, 1●0 TAIWAN Attn.: Joseph Su

Re: Prior Art, IDS duties and licensing opportunities for your client HTC Corporation

Dear Sir,

I am contacting you because of a licensing opportunity and prior art reviews for your client, HTC Corporation. Although your client and/or you may have received our communication(s) in the past, the market timing then may have dissuaded you/your client from starting a conversation. Electronic Scripting Products, Inc. (ESPi), the developer of inside-out optical position and orientation tracking devices and algorithms called NaviScribe, believes that the time to sit down and talk has finally arrived. This is due to the acceleration in Augmented Reality (AR) and Virtual Reality (VR) markets.

Let us address the prior art concerns first. I am sure that we all realize that the constantly changing technology landscape makes finding relevant prior art references in patent prosecutions and post-grant procedures a formidable task. At ESPi we take the public interest and our duty of candor to the U.S. PTO very seriously (37 CFR §1.56). We comply by promptly filing appropriate Information Disclosure Statements (37 CFR §1.97 & §1.98). Moreover, ESPi continuously monitors prior art publications. To satisfy U.S. PTO post-grant duties we will make submissions in accordance with applicable rules (e.g., 37 CFR §1.501).

We note that you and your firm's name and address are registered with the U.S. PTO (prescribed by 37 CFR  $\S1.33$ ) as the correct party for communications regarding HTC's intellectual property in this technical field. Should you no longer be overseeing this client's patent prosecutions, then please forward this letter to a responsible party including the new representative, inventor(s) (37 CFR 1.56(c)(1)) and/or other individuals (37 CFR 1.56(d)).

Now then, in the spirit of openness and a great desire to serve the public good we would like to alert you in your capacity as legal representative or person substantively involved (37 CFR 1.56(c)(2)&(3)) of ESPi's patents and patent applications. It appears evident to us that your client and ESPi are on similar paths of discovery. We have arrived at this conclusion during our prior art searches and reviews of many printed publications that your client appears to have supported and/or authored.

In view of the above, here is a sample of the most recent ESPi publications that we believe are relevant and should be reviewed by you and your client:

- U.S. Patent No. 7,729,515 "Optical Navigation Apparatus using Fixed Beacons and a Centroid Sensing Device"
- U.S. Patent No. 7,826,641 "Apparatus and Method for Determining an Absolute Position of a Manipulated ..."
- U.S. Patent No. 7,961,909 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8 542,219 "Processing Pose Data derived from the Pose of an Elongate Object"
- U.S. Patent No. 8,553,935 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8,897,494 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8,970,709 "Reduced Homography for Recovery of Pose Parameters of an Optical ..."

- U.S. Patent No. 9,189,856 "Reduced Homography for Recovery of Pose Parameters of an Optical ..."
- U.S. Patent No. 9,229,540 "Deriving Input from Six Degrees of Freedom Interfaces"
- U.S. Patent No. 9,235,934 "Computer Interface Employing a Wearable Article with Absolute Pose ..."
- U.S. Pub. No. 2016/0063706 "Reduced Homography based on Structural Redundancy of Conditioned Motion"

In addition to relying on the U.S. PTO Publications Division, we have been diligently updating links to the published portion of our IP portfolio since 2007 on our website. The name of our technology is NaviScribe and the links are located at: naviscribe.com. You can visit us there and click on the "Patents" page listed in the black top bar for an up-to-date listing. For your convenience, you can click on links to the U.S. PTO website. Additionally, there are links to YouTube videos on the "About" page that illustrate some aspects of NaviScribe technology as actually reduced to practice by our engineering staff. You may wish to bookmark our web page and return there in the future to find newly published applications as we continue our IP portfolio expansion.

We believe that reaching out and letting you know of our existence and intellectual property is of mutual benefit. Our communication provides you with another opportunity to review your client's issued and pending cases in this field. Depending on your findings, you can then act to discharge of your and your client's legal obligations. These may include disclosure to the U.S. PTO per above-cited IDS rules and/or any additional corrective steps as prescribed in view of ESPi's references. In pending cases, this may involve preliminary amendments (37 CFR §1.115) or regular amendments (37 CFR §1.121). In the case of grants, appropriate post-grant procedures can be deployed. Exemplary proceedings are outlined by 35 USC \$251; \$301&302; 37 CFR 1.510(e) along with amendment guidelines in accordance with 37 CFR §1.530 and/or other procedures appropriate under the circumstances (for more detailed information see also relevant portions of the MPEP).

Surely, your client, in wanting to maintain a high quality IP portfolio and being mindful of the public good on which the law is predicated will choose appropriate corrective actions if and as necessary. Meanwhile, we would be delighted to start a conversation that may lead to your client's licensing of our patents or to helping your client better understand their IP position in the augmented reality and virtual reality areas. To help get acquainted with the challenges and how ESPi technologies could provide a competitive edge in solving them we include herewith a Technology Presentation for your client.

Finally, in the same spirit of openness and desire to serve the public good, we would greatly appreciate any insight that you/your client could provide to Specifically, please let me know if you and/or your client are aware of prior art that we should evaluate in conjunction with any of our own cases.

Sincerely, Marek Alboszta,

President and CEO

U.S. PTO Reg. No. 39,894

Jonathan Blau (Gorman&Miller) cc:

> Michael J. Mandella (ESPi - CTO) Lyudmila Aronova (ESPi - CFO)

Att. (41 pgs) Technology Presentation for Client Review and Consideration

# **EXHIBIT 2**

### Case 3:17-cv-05806-RS Document 74 Filed 10/10/19 Page 12 of 27

From: Frear Stephen Schmid <frearschmid@aol.com>

To: MBernstein < MBernstein@perkinscoie.com >; EDay < EDay@perkinscoie.com >

Cc: angelgary <angelgary@aol.com>

Bcc: marek alboszta <marek alboszta@4espi.com>

Subject: Electronic Scripting Products, Inc. v HTC America, Inc., et.al., United States District Court Case No.: 3:17-cv-05806-RS

Date: Wed, Sep 25, 2019 6:38 pm

Attachments: HTC-Vive\_Goggles-HMD-PEN-122-CON\_EducationalComparison.vwx.pdf (935K)

### Gentlemen:

It has been months now since the PTAB rejected numerous attempts to institute an IPR of the '934 patent. Your client, HTC America, Inc., has previously been advised that its VIVE virtual reality product infringes the '934 patent. ESPi has previously provided your client in detail how HTC infringes the '934 patent.

ESPi previously requested on various occasions an explanation as to any basis upon which your client denies infringement. HTC has never provided any substantive response. In addition to it losing the IPR attack on the '934 patent, your client HTC lost its *Alice* motion. Moreover, as a result of the IPR process, your client cannot disavow knowledge and understanding of the '934 patent.

As you know, ESPi will be filing an amended complaint once the stay is lifted in this matter. This email again serves notice of your client's continuing willful infringement of the '934 patent. ESPi again provides your client a claim chart mapping your client's infringement, see attached. Thus, due to your client's unabated wanton, calculated, and willful infringement our client will be seeking treble damages in the amended complaint.

Very truly yours,

Frear Stephen Schmid Law Office of Gary A. Angel 177 Post Street, 5th Floor San Francisco, CA 94108

+++++++++++++++++

This e-mail and any attachments thereto is intended only for use by the addressee(s) named herein and may contain legally privileged and/or confidential information. If you are not the intended recipient of this e-mail, you are hereby notified that any dissemination, distribution or copying of this e-mail, and any attachments thereto, is strictly prohibited. If you receive this e-mail in error please notify us immediately either by return e-mail or by telephone at 415-788-5957 and permanently delete the original, any copy of any e-mail, and any printout thereof.

HTC-Vive HMD units:

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

### COMPUTER INTERFACE EMPLOYING A WEARABLE ARTICLE WITH AN ABSOLUTE POSE DETECTION COMPONENT

(12) United States Patent

Mandella et al.

- Applicant: Electronic Scripting Products, Inc., Palo Alto, CA (US)
- Inventors: Michael J. Mandella, Palo Alto, CA (US): Hector H. Gonzalez-Banos.

Mountain View, CA (US); Marek Alboszta, Montara, CA (US)

(73) Assignee: Electronic Scripting Products, Inc.,

Palo Alto, CA (US)

Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-

claimer.

- (21) Appl. No.: 14/551,367
- Filed: Nov. 24, 2014
- (65)Prior Publication Data

US 2015/0170421 A1 Jun. 18, 2015

### Related U.S. Application Data

(60) Continuation of application No. 13/889,748, filed on May 8, 2013, now Pat. No. 8,897,494, and a division of application No. 13/134,006, filed on May 25, 2011, now Pat. No. 8,553,935, and a division of application

(Continued)

(51) Int. Cl.

G06K 9/00 (2006.01)G06T 19/00 (2011.01)

(Continued)

(52) U.S. Cl.

CPC ...... G06T 19/006 (2013.01); G01B 21/04 (2013.01); G02B 27/0172 (2013.01); G06F (10) Patent No.:

US 9,235,934 B2

(45) Date of Patent:

3/01 (2013.01); G06F 3/017 (2013.01); G06F 3/0325 (2013.01); G06F 3/0346 (2013.01); (Continued)

(58) Field of Classification Search

CPC combination set(s) only. See application file for complete search history.

References Cited

### U.S. PATENT DOCUMENTS

3.028,500 A 4/1962 Wallmark 3,209,201 A 9/1965 Anger (Continued)

### FOREIGN PATENT DOCUMENTS

EP 0649549 B1 2/1997 EP 1128319 A1 8/2001 (Continued)

OTHER PUBLICATIONS Ait-Aider, O. et al., "Adaption of Lowe's Camera Pose Recovery Algorithm to Mobile Robot Self-Localisation", Robotica 2002.

(Continued)

Primary Examiner — Anand Bhatnagar (74) Attorney, Agent, or Firm — Christopher P. Maiorana, РC

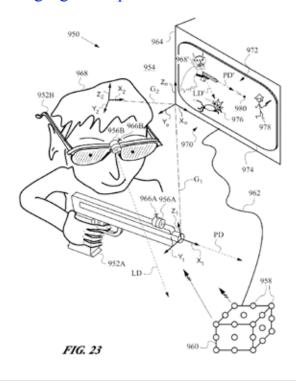
### (57)ABSTRACT

A wearable article, such as glasses for a virtual reality program or glasses for an augmented reality application, using light sources and a photodetector that detects their light and outputs data indicative of the detected light. The wearable article uses one or more controllers to determine its position and/or orientation in the environment based on the data output by the photodetector. Data from one or more auxiliary motion sensing devices, e.g., a relative motion sensor such as an inertial device or other auxiliary motion device relying on acoustics, optics or electromagnetic waves within or outside the visible spectrum, can be used to supplement the position and/or orientation data from the photodetector.

### 12 Claims, 29 Drawing Sheets

- 1. A wearable article cooperating with a first plurality of \*Jan. 12, 2016 predetermined light sources disposed in a known pattern, said wearable article comprising:
  - a) a photodetector configured to detect said first plurality of predetermined light sources and generate photodetector data representative of the positions of said first plurality of predetermined light sources; and
  - b) a controller configured to identify a derivative pattern of said first plurality of predetermined light sources from said photodetector data, wherein said derivative pattern is indicative of the position of said photodetector.

# drawing figure of particular interest:



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page: 1

# page: 2

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

### **Sources:**

- 1) Hellstrom, Jeremy, "Learn about the tech in Vive's Lighthouse", PCPER: https://www.pcper.com/category/tags/lighthouse (accessed 2017-02-21)
- 2) Benchoff Brian, "Using the Vive's Lighthouse with DIY Electronics", Hackaday, 2016-07-06 found at: http://hackaday.com/2016/07/06/using-the-vives-lighthouse-with-diy-electronics// (accessed 2017-02-21)
- 3) Malventano, Allyn, "SteamVR HTC Vive In-depth Lighthouse Tracking System Dissected and Explored", PCPER: https://www.pcper.com/reviews/General-Tech/SteamVR-HTC-Vive-depth-Lighthouse-Tracking-System-Dissected -%20%20%20%20and-Explored/SteamV (accessed 2017-02-21)
- 4) Valve Corporation Partner Site: How It Works; https://partner.steamgames.com/vrtracking/ (accessed on 2017-02-23)
- 5) HTC Vive Teardown, ifixit, April 26, 2016 (accessed 2017-02-26) www.ifixit.com/Teardown/HTC+Vive+Teardown/62213 (accessed 2017-02-26)
- 6) Wikipedia Definition of "ASIC" (obtained on 2017-02-22)
- IMPORTANT NOTE: NO MATERIAL PRESENTED HEREIN HAS BEEN OBTAINED THROUGH ACTS OF REVERSE ENGINEERING, TEAR-DOWN OR OTHER SUCH PROCEDURES INTENDED TO ACCESS ANY ASPECTS NOT INTENDED BY THE MANUFACTURER TO BE ACCESSED BY THE USER

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

### Claim 1 - U.S. Pat. No. '934

 A wearable article cooperating with a first plurality of predetermined light sources disposed in a known pattern, said wearable article comprising:

# teachings: col. 40, lns. 3-12

Object 952B is a wearable article, in this case a pair of glasses worn by military trainee 968. The reference point of object 952B is not a point on object 952B, but rather an estimated position of the center of the trainee's head. Thus, the orientation portion (φ,θ,ψ) of the absolute pose of object 952B as optically inferred by arrangement 956B is also an indication of the attitude of the trainee's head. Specifically, trainee's looking direction LD can thus be automatically inferred and tracked. The Euler rotated object coordinates

# teachings: col. 6, lns. 9-15

In accordance with another system of the invention, a first group of light sources are disposed in an asymmetric and generally linear pattern. A photodetector of the system is configured to detect the light sources and generate photodetector data representative of the detected light sources. The

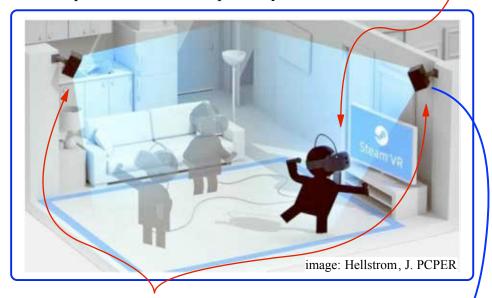
# teachings: col. 32, lns. 12-17

structure. For example, light 614 can be a structured light projected in some pattern 622. Pattern 622 can be a time-invariant grid pattern or it can be a time-varying pattern.

These options are well known to those skilled in the art of optical scanners with constant and time-varying scan patterns.

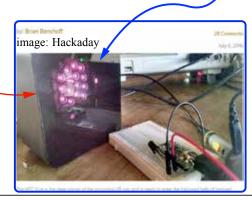
# HTC-Vive Headset - HMD

A wearable article is embodied by the headset/glasses (HMD) that cooperates with a first plurality of



predetermined light sources disposed in a known pattern —

that is a spatial pattern (where the base stations with IR LEDs and lasers are placed in the room) and a temporal pattern (how the light is scanned)



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**EXHIBIT 2, page 5** 

page: 3

# page: 4

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

# Claim 1 - U.S. Pat. No. '934

 a) a photodetector configured to detect said first plurality of predetermined light sources and generate photodetector data representative of the positions of said first plurality of predetermined light sources; and

teachings: col. 21, lns. 43-45

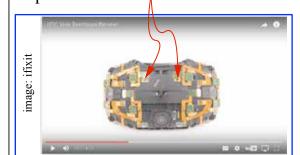
Optical sensor 212 of absolute motion detection component 208 is a photosensor designed for sensing light 222 from IR LEDs B1-Bn. In fact, rather than being a sensor with an 45

# teachings: col. 15, lns. 13-23

A number of invariant features B1-B7 are placed at known locations in real three-dimensional environment 108 delimited by room 110. Vectors R1-R7 define the locations of 15 corresponding invariant features B1-B7. Following standard convention, vectors R1-R7 extend from world origin (0,0,0) to the centers of the corresponding invariant features B1-B7. All seven invariant features B1-B7 are high optical contrast features. More precisely, invariant features B1-B7 are light sources such as light-emitting diodes that emit electromagnetic radiation or light 112. Preferably, light 112 is in the infrared wavelength range of the electromagnetic spectrum.

### HTC-Vive Headset - HMD

the wearable article, called a tracked object and including the controller(s), trackers and the VR goggles or the HMD have not just one but a number of photodetectors



Lightweight, low power, low cost ASIC sensors
 Up to 32 sensors per object for full 360° coverage
 Software toolkit to calculate optimal senso placement

 Built-in 1000Hz IMU for low latency, high resolution tracking
 Wireless communication with host for cable-free peripherials



video: Malventano, A. PCPER

text & image: Valve Corp. Partner Site



the photodetectors are configured to detect said first plurality of predetermined light sources generating the scanning laser beam and the flashes and mounted in the base stations (see also pg. 3)

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

# Claim 1 - U.S. Pat. No. '934

 a) a photodetector configured to detect said first plurality of predetermined light sources and generate photodetector data representative of the positions of said first plurality of predetermined light sources; and

teachings: col. 49, ln. 65 - col. 50, ln. 12

In this embodiment, controller 1030 of system 1010 is 65 configured to identify a derivative pattern of light sources 1022 from photodetector data 1028. The derivative pattern is

indicative of the asymmetric and generally linear patterns of groups 1022A-D of IR LEDs 1022 along edges 1020A-D. As the absolute pose of photodetector 1026 in wand 1012 changes, the asymmetric and generally linear patterns undergo a well-understood transformation. Such transformation is described by perspective distortion plus any optical aberrations introduced by imaging lenses and/or other optics elements cooperating with photodetector 1026. Knowledge of this transformation enables one to correlate the asymmetric and generally linear pattern to the derivative pattern and obtain information about the pose of photodetector 1026 and

### HTC-Vive Headset - HMD

the photodetectors generate photodetector data - here at shown

at two successive times during a scan



the data is representative of the positions of said first plurality of predetermined light sources (more strictly of the

relative location where each input signal was sourced - i.e., the location of the corresponding Base Station, each of which has a number of light sources, as already explained, e.g., on pg. 3)

### The SteamVR Lighthouse Tracking System

text: Malventano, A. PCPER

page: 5

### Principles of Operation

Enter the Lighthouse tracking system. Pioneered by Alan Yates of Valve, this system uses Beacons (a.k.a. Base Station) to emit precisely timed IR pulses (blinks) and X/Y axis IR laser sweeps. Instead of cameras or IR LEDs mounted to the HMD and controllers, Lighthouse embeds an array of IR-filtered photodiodes within all items that require tracking. As the X and Y 'plane' of IR laser light sweeps past the various sensors embedded within the controllers and HMD, those diodes' outputs are amplified and passed onto an internal ASIC, which is programmed with the relative location where each input signal was sourced. Provided there are enough inputs (sensors that have a direct line of sight to one or both Base Stations), the ASIC can then work out its own location and orientation within the room.

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

Claim 1 - U.S. Pat. No. '934

 b) a controller configured to identify a derivative pattern of said first plurality of predetermined light sources from said photodetector data, wherein said derivative pattern is indicative of the position of said photodetector.

teachings: col. 49, lns. 6-14

1118. During operation object 1110 provides optical data to a controller residing in electronic device 1102 or even on-board. The controller determines the absolute pose of object 1110 and uses any subset of the absolute pose parameters to generate input for application 1084. As described above, the controller may also use relative motion data from relative motion detection component 1122. For example, controller tracks the absolute position of a reference point on object 1110, or the orientation of object 1110. Controller may also

teachings: col. 49, ln. 65 - col. 50, ln. 8

In this embodiment, controller 1030 of system 1010 is 65 configured to identify a derivative pattern of light sources 1022 from photodetector data 1028. The derivative pattern is

indicative of the asymmetric and generally linear patterns of groups 1022A-D of IR LEDs 1022 along edges 1020A-D. As the absolute pose of photodetector 1026 in wand 1012 changes, the asymmetric and generally linear patterns undergo a well-understood transformation. Such transformation is described by perspective distortion plus any optical aberrations introduced by imaging lenses and/or other optics elements cooperating with photodetector 1026. Knowledge

HTC-Vive Headset - HMD

the controller here is embodied by an ASIC that is called internal ASIC

An application-specific integrated circuit (ASIC) /esstk/, is an integrated circuit (IC) customized for a particular use, rather than intended for general-purpose use. For example, a chip designed to run in a digital voice recorder or a high-efficiency Bitcoin miner is an ASIC. Application-specific standard products (ASSPs) are intermediate between ASICs and industry standard integrated circuits like the 7400 or the 4000 series.

the various sensors embedded within the controllers and HMD, those diodes' outputs are amplified and passed onto an internal ASIC, which is programmed with the relative location where each input signal was sourced. Provided there are enough inputs (sensors that have a direct line of sight to one or both Base Stations), the ASIC can then work out its own location and orientation within the room.

text: Malventano, A. PCPER

page: 6

the internal ASIC indentifies a derivative pattern of the light sources - this pattern corresponds to the diodes' outputs that are amplified and passed onto the internal ASIC in time pattern/sequence as identified in the

photodetector data with time-stamps, time periods and spatial information



# engineering analysis of HTC-Vive Headset - HMD [for educational use only]

# Claim 1 - U.S. Pat. No. '934

b) a controller configured to identify a derivative pattern of said first plurality of predetermined light sources from said photodetector data, wherein said derivative pattern is indicative of the position of said photodetector.

# teachings: col. 11, lns. 57-60

Optical measuring arrangement 22 infers the absolute pose of pointer 14 during motion 40 at measurement times  $t_i$  and processor 26 prepares the corresponding absolute pose data 12.

# teachings: col. 9, lns. 55-61

A number of optical measurement methods using optical 55 measuring arrangement 22 to infer the relative or absolute pose of pointer 14 can be employed. In any of these methods, arrangement 22 uses one or more on-board components to obtain pose data 12 in accordance with any well-known absolute pose recovery technique including geometric invariance, 60 triangulation, ranging, path integration and motion analysis.

# teachings: col. 50, lns. 8-12

elements cooperating with photodetector 1026. Knowledge of this transformation enables one to correlate the asymmetric and generally linear pattern to the derivative pattern and obtain information about the pose of photodetector 1026 and

# HTC-Vive Headset - HMD

the controller or processor, here embodied by the internal ASIC, uses the derivative pattern that it obtains from a sufficient number of inputs (sensors that are not occluded/have direct line of sight to one or both Base Stations)

### text: Malventano, A. PCPER

page: 7

the various sensors embedded within the controllers and HMD, those diodes' outputs are amplified and passed onto an internal ASIC, which is programmed with the relative location where each input signal was sourced. Provided there are enough inputs (sensors that have a direct line of sight to one or both Base Stations), the ASIC can then work out its own location and orientation within the room.

the ASIC compares the derivative pattern to the original pattern with which it was programmed and which tells it the relative location where each input signal was sourced. From the comparison the ASIC works out its own location and orientation within the room. In other words, the derivative pattern is indicative of the position of the photodetector(s) mounted on the HMD.

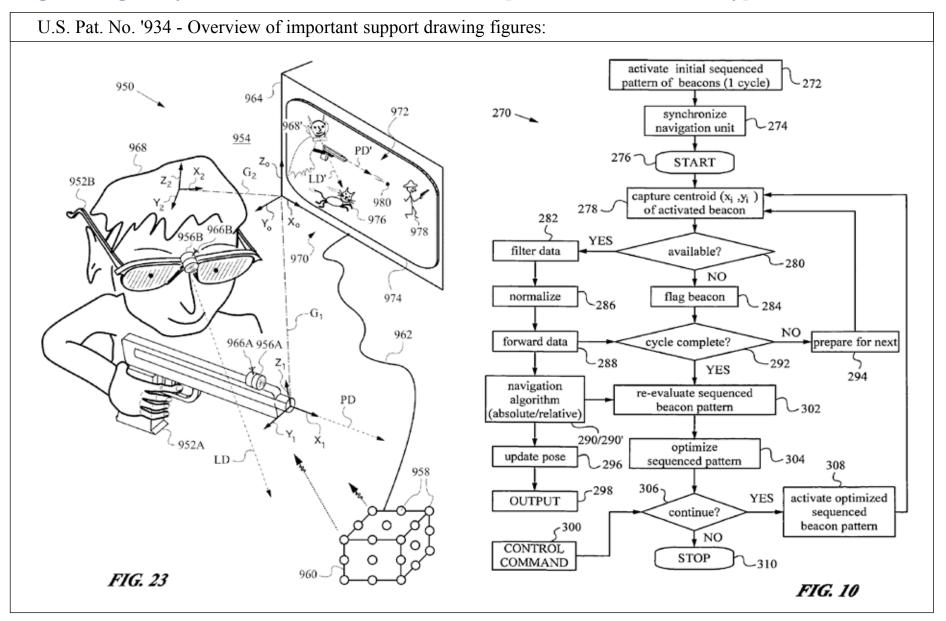
text & image: Valve Corp. Partner Site

embodied here by HMD

# How It Works The SteamVR Tracking Basestations sweep-the room with multiple sync pulsas and laser-lines, reaching out to about 5 meters. By keeping careful track of the timings between pulses and sweeps, the SteamVR Tracking system uses simple trigonometry to find the location of each sensor to within a fraction of a millimeter. By combining multiple sensors, 2 basestations, as well as adding a high spend MRU (Inertial measurement unit), steamVR spend MRU (Inertial measurement unit), steam

# page: 8

# engineering analysis of HTC-Vive Headset - HMD [for educational use only]



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# **EXHIBIT 3**

Claims 1, 4, 5, 6 of Mandella Pat. No. 9,235,934	HTC Vive Virtual Reality System
1. A <u>wearable article</u>	1. A Vive Head Mounted Display (HMD) is a wearable article provided with the Vive Virtual Reality System and is worn by the user in a VR room where the Vive Virtual Reality System has been installed.
cooperating with a first plurality of predetermined light sources disposed in a known pattern,	Two Vive Base Stations are provided with the Vive Virtual Reality System and each Base Station provides a plurality of infrared light sources including light from an array of infrared LEDs and two infrared laser beams emanating into the room from two separate laser apertures located in the front face of each Base Station.  The infrared LEDs and the laser apertures are disposed in a known pattern that is set at the factory where the unit is manufactured.
said wearable article comprising:	The Vive HMD is a wearable article that includes each of the following two primary elements:
a) a <u>photodetector</u> configured to detect said first plurality of predetermined light sources and	a) Photodetector: There are multiple photodetectors mounted in known locations around the outside surface of the Vive HMD, which are configured to receive infrared light emanating from the plurality of predetermined light sources provided by the Vive Base Stations located in the VR room.
generate <u>photodetector data</u> representative of the positions of said first plurality of predetermined light sources; and	Each photodetector of the Vive HMD generates an electrical signal that represents the photodetector data.
b) a controller configured to identify a derivative pattern of said first plurality of predetermined light sources from said photodetector data,	b) An internal ASIC mounted onboard the Vive HMD is a controller that is configured to process the generated photodetector data from a particular photodetector on the Vive HMD and identifies a derivative pattern of the relative vertical and horizontal angular positions of the multiple laser apertures located in each Base Station being used.
wherein said derivative pattern is indicative of the position of said photodetector.	The derivative pattern identified by the ASIC is indicative of a positional mapping of the laser apertures from the viewpoint of a particular photodetector and is indicative of the vertical and horizontal angular position of the photodetector relative to the Base Station.

# Case 3:17-cv-05806-RS Document 74 Filed 10/10/19 Page 24 of 27

Claims 1, 4, 5, 6 of Mandella Pat. No. 9,235,934	HTC Vive Virtual Reality System
4. The wearable article of claim 1 deployed in a virtual reality program.	4. The Vive HMD is a wearable article and is deployed within a virtual reality program that is provided by the Vive Virtual Reality System.
5. The wearable article of claim 4, wherein said wearable article comprises glasses.	5. The Vive HMD is a wearable article that comprises lenses placed in front of the user's eyes, thus providing glasses for viewing the virtual reality program.
6. The wearable article of claim 1, further comprising an auxiliary motion detection component.	6. The Vive HMD is a wearable article comprising an Inertial Measurement Unit (IMU), which is a Micro-Electro-Mechanical (MEMS) component located inside the Vive HMD and which provides auxiliary motion detection.

# **EXHIBIT 4**

# Electronic Scripting Products, inc

555 Bryant Street #142 • Palo Alto • California • 94301 • (650) 862-1085 • www.naviscribe.com

March 14<sup>th</sup>, 2016

Barcelo, Harrison & Walker LLP 2901 W. Coast Hwy., Suite 200 Newport Beach, CA 92663 Attn.: David B. Walker

Re: Prior Art, IDS duties and licensing opportunities for your client Valve Corporation

Dear Sir,

I am contacting you because of a licensing opportunity and prior art reviews for your client, Valve Corporation. Although your client and/or you may have received our communication(s) in the past, the market timing then may have dissuaded you/your client from starting a conversation. Electronic Scripting Products, Inc. (ESPi), the developer of inside-out optical position and orientation tracking devices and algorithms called NaviScribe, believes that the time to sit down and talk has finally arrived. This is due to the acceleration in Augmented Reality (AR) and Virtual Reality (VR) markets.

Let us address the prior art concerns first. I am sure that we all realize that the constantly changing technology landscape makes finding relevant prior art references in patent prosecutions and post-grant procedures a formidable task. At ESPi we take the public interest and our duty of candor to the U.S. PTO very seriously (37 CFR §1.56). We comply by promptly filing appropriate Information Disclosure Statements (37 CFR §1.97 & §1.98). Moreover, ESPi continuously monitors prior art publications. To satisfy U.S. PTO post-grant duties we will make submissions in accordance with applicable rules (e.g., 37 CFR §1.501).

We note that you and your firm's name and address are registered with the U.S. PTO (prescribed by 37 CFR \$1.33) as the correct party for communications regarding **Valve's** intellectual property in this technical field. Should you no longer be overseeing this client's patent prosecutions, then please forward this letter to a responsible party including the new representative, inventor(s) (37 CFR 1.56(c)(1)) and/or other individuals (37 CFR 1.56(d)).

Now then, in the spirit of openness and a great desire to serve the public good we would like to alert you in your capacity as legal representative or person substantively involved (37 CFR 1.56(c)(2)&(3)) of ESPi's patents and patent applications. It appears evident to us that your client and ESPi are on similar paths of discovery. We have arrived at this conclusion during our prior art searches and reviews of many printed publications that your client appears to have supported and/or authored.

In view of the above, here is a sample of the most recent ESPi publications that we believe are relevant and should be reviewed by you and your client:

- U.S. Patent No. 7,729,515 "Optical Navigation Apparatus using Fixed Beacons and a Centroid Sensing Device"
- U.S. Patent No. 7,826,641 "Apparatus and Method for Determining an Absolute Position of a Manipulated ..."
- U.S. Patent No. 7,961,909 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8,542,219 "Processing Pose Data derived from the Pose of an Elongate Object"
- U.S. Patent No. 8,553,935 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8,897,494 "Computer Interface Employing a Manipulated Object with Absolute Pose ..."
- U.S. Patent No. 8,970,709 "Reduced Homography for Recovery of Pose Parameters of an Optical ..."

- U.S. Patent No. 9,189,856 "Reduced Homography for Recovery of Pose Parameters of an Optical ..."
- U.S. Patent No. 9,229,540 "Deriving Input from Six Degrees of Freedom Interfaces"
- U.S. Patent No. 9,235,934 "Computer Interface Employing a Wearable Article with Absolute Pose ..."
- U.S. Pub. No. 2016/0063706 "Reduced Homography based on Structural Redundancy of Conditioned Motion"

In addition to relying on the U.S. PTO Publications Division, we have been diligently updating links to the published portion of our IP portfolio since 2007 on our website. The name of our technology is NaviScribe and the links are located at: <a href="naviscribe.com">naviscribe.com</a>. You can visit us there and click on the "Patents" page listed in the black top bar for an up-to-date listing. For your convenience, you can click on links to the U.S. PTO website. Additionally, there are links to YouTube videos on the "About" page that illustrate some aspects of NaviScribe technology as actually reduced to practice by our engineering staff. You may wish to bookmark our web page and return there in the future to find newly published applications as we continue our IP portfolio expansion.

We believe that reaching out and letting you know of our existence and intellectual property is of mutual benefit. Our communication provides you with another opportunity to review your client's issued and pending cases in this field. Depending on your findings, you can then act to discharge of your and your client's legal obligations. These may include disclosure to the U.S. PTO per above-cited IDS rules and/or any additional corrective steps as prescribed in view of ESPi's references. In pending cases, this may involve preliminary amendments (37 CFR §1.115) or regular amendments (37 CFR §1.121). In the case of grants, appropriate post-grant procedures can be deployed. Exemplary proceedings are outlined by 35 USC §251; §301&302; 37 CFR 1.510(e) along with amendment guidelines in accordance with 37 CFR §1.530 and/or other procedures appropriate under the circumstances (for more detailed information see also relevant portions of the MPEP).

Surely, your client, in wanting to maintain a high quality IP portfolio and being mindful of the public good on which the law is predicated will choose appropriate corrective actions if and as necessary. Meanwhile, we would be delighted to start a conversation that may lead to your client's licensing of our patents or to helping your client better understand their IP position in the augmented reality and virtual reality areas. To help get acquainted with the challenges and how ESPi technologies could provide a competitive edge in solving them we include herewith a Technology Presentation for your client.

Finally, in the same spirit of openness and desire to serve the public good, we would greatly appreciate any insight that you/your client could provide to us. Specifically, please let me know if you and/or your client are aware of prior art that we should evaluate in conjunction with any of our own cases.

Marek Alboszta,
President and CEO

Sincerely,

cc:

U.S. PTO Reg. No. 39,894

Jonathan Blau (Gorman&Miller)
Michael J. Mandella (ESPi - CTO)
Lyudmila Aronova (ESPi - CFO)

Att. (41 pgs): Technology Presentation for Client Review and Consideration