US009470906B2

(12) **United States Patent**
Kaji et al.

(10) **Patent No.: US 9,470,906 B2**
(45) **Date of Patent: Oct. 18, 2016**

(54) **VIRTUAL OR AUGMENTED REALITY HEADSETS HAVING ADJUSTABLE INTERPUPILLARY DISTANCE**

(71) Applicant: **Magic Leap, Inc.**, Ft. Lauderdale, FL (US)

(72) Inventors: **Masamune Kaji**, Brooklyn, NY (US); **Michael John Slipy**, Oakland Park, FL (US); **Shigeru Natsume**, Brooklyn, NY (US)

(73) Assignee: **Magic Leap, Inc.**, Dania Beach, FL (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.

(21) Appl. No.: **14/516,180**

(22) Filed: **Oct. 16, 2014**

(65) **Prior Publication Data**

US 2015/0103306 A1 Apr. 16, 2015

Related U.S. Application Data

(60) Provisional application No. 61/891,801, filed on Oct. 16, 2013.

(51) **Int. Cl.**

G02C 5/04	(2006.01)
G02B 27/01	(2006.01)
G02C 5/08	(2006.01)
G02B 7/12	(2006.01)

(52) **U.S. Cl.**

CPC ***G02C 5/045*** (2013.01); ***G02B 7/12*** (2013.01); ***G02B 27/0176*** (2013.01); ***G02B 27/0179*** (2013.01); ***G02C 5/04*** (2013.01); ***G02C 5/08*** (2013.01); *G02B 2027/0178* (2013.01); *G02B 2027/0181* (2013.01)

(58) **Field of Classification Search**

CPC G02C 5/02; G02C 5/04; G02C 5/045; G02C 5/06; G02C 5/08; G02C 5/10; G02C 11/10; A61B 3/11; A61B 3/111

USPC 351/124–135, 158, 204

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,276,471	A *	1/1994	Yamauchi	G02B 27/0176 345/8
6,333,814	B1 *	12/2001	Chang	G02B 7/002 351/158
2007/0057867	A1 *	3/2007	Mizuuchi	G02B 27/0176 345/8
2009/0231544	A1	9/2009	Mahloch	
2013/0037578	A1 *	2/2013	Mortazavi	A61M 5/14546 222/326

FOREIGN PATENT DOCUMENTS

JP	2011-100087 A	5/2011
KR	1998-031910 U	8/1998
KR	1998-057554 U	10/1998

OTHER PUBLICATIONS

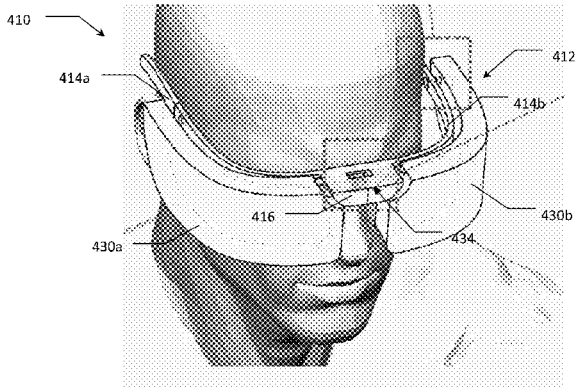
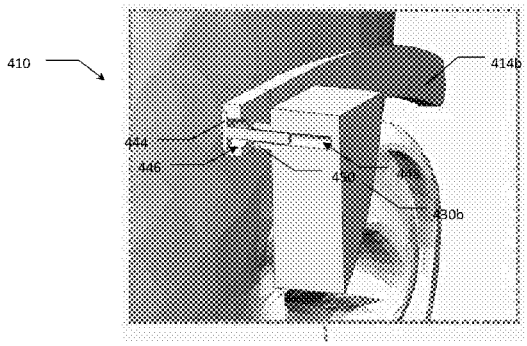
International Search Report and Written Opinion mailed Jan. 8, 2015, for corresponding International Application No. PCT/US2014/060955, 15 pages.

* cited by examiner

Primary Examiner — Huy K Mai

(74) *Attorney, Agent, or Firm* — Seed IP Law Group PLLC

(57) **ABSTRACT**

A virtual or augmented reality headset is provided having a frame, a pair of virtual or augmented reality eyepieces, and an interpupillary distance adjustment mechanism. The frame includes opposing arm members, a bridge positioned intermediate the opposing arm members, and one or more linear rails. The adjustment mechanism is coupled to the virtual or augmented reality eyepieces and operable to simultaneously move the eyepieces in adjustment directions aligned with the plurality of linear rails to adjust the interpupillary distance of the eyepieces.

31 Claims, 14 Drawing Sheets