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(54) **WEARABLE DEVICE WITH INPUT AND OUTPUT STRUCTURES**

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H04N 13/02 (2006.01)
G06F 3/03 (2006.01)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,666,417	A *	5/1987	Hillman	446/267
6,034,653	A *	3/2000	Robertson et al.	345/8
6,057,966	A *	5/2000	Carroll et al.	359/630
6,181,304	B1 *	1/2001	Robinson et al.	345/8
6,234,446	B1 *	5/2001	Patterson	248/694
6,747,611	B1 *	6/2004	Budd et al.	345/7
7,158,096	B1	1/2007	Spitzer	
7,192,069	B1 *	3/2007	Daniel	294/147
7,663,805	B2	2/2010	Zaloum et al.	
7,843,403	B2	11/2010	Spitzer	
8,000,000	B2	8/2011	Greenberg et al.	
D660,341	S *	5/2012	Olsson et al.	D16/300
8,616,422	B2 *	12/2013	Adelman et al.	224/191
2002/0118535	A1 *	8/2002	Nostrant	362/124
2005/0219152	A1 *	10/2005	Budd et al.	345/8

(Continued)

FOREIGN PATENT DOCUMENTS

WO	2010092904	A1	8/2010

OTHER PUBLICATIONS

International Search Report & Written Opinion for Application No. PCT/US2012/050690 dated Feb. 28, 2013.

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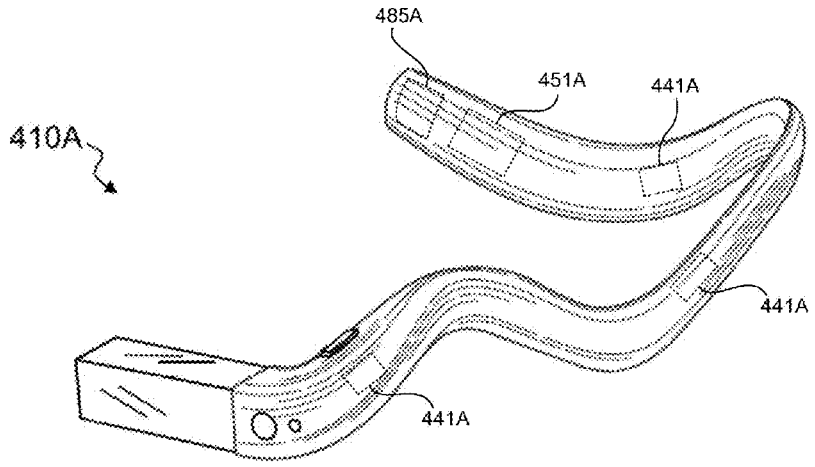
(57) **ABSTRACT**

An electronic device includes a display and a band configured to be worn on the head of a user. The band defines a display end to which the display is affixed and extends from the display end to a free end. The band is adjustable such that it can be configured by a user to contact the head of the user at a first location near a temple, a second location along a portion of the user's ear adjacent the temple, and at a third location along a rear portion of the head of the user. The display end is positionable away from the head such that the display element is suspended over an eye adjacent the temple. The band is further configured to maintain the configuration. The device also includes image generating means within the band for generating an image presentable to the user on the display.

10 Claims, 13 Drawing Sheets