

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 May 2008 (08.05.2008)

PCT

(10) International Publication Number
WO 2008/055262 A3

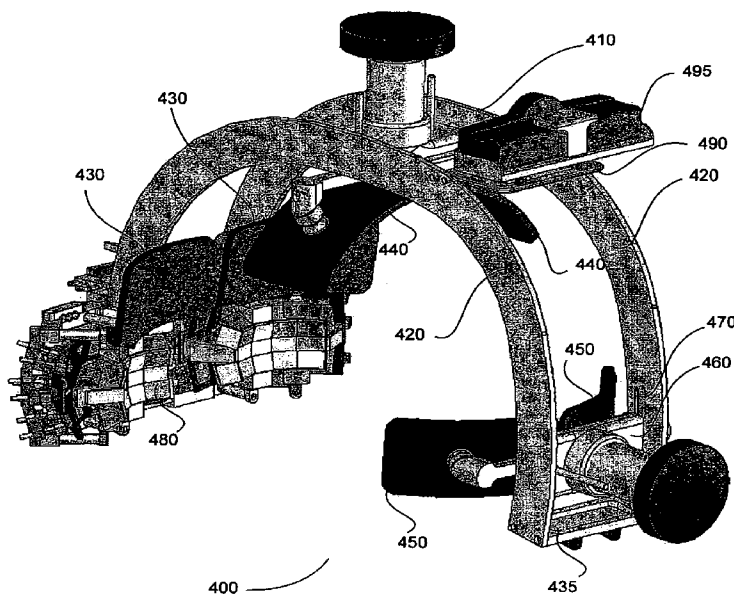
- (51) International Patent Classification:
G05B 11/01 (2006.01) G09G 5/00 (2006.01)
- (21) International Application Number:
PCT/US2007/083500
- (22) International Filing Date:
2 November 2007 (02.11.2007)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/856,021 2 November 2006 (02.11.2006) US
60/944,853 19 June 2007 (19.06.2007) US
- (71) Applicant (for all designated States except US): **SENSICS, INC.** [US/US]; 2400 Boston St., Suite 350, Baltimore, Maryland 20850 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **BROWN, Lawrence G.** [US/US]; 314 Lennox Ave., Towson, Maryland 21286 (US). **BOGER, Yuval S.** [IL/US]; 3112 Lightfoot Dr., Pikesville, Maryland 21208 (US). **SHAPIRO, Marc D.** [US/US]; 2952 Manns Ave., Parkville, Maryland 21234 (US).
- (74) Agent: **KASHA, John R.**; Kasha Law PLLC, 1750 Tysons Blvd. - 4th Floor, McLean, Virginia 22102 (US).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

- Published:**
- with international search report
 - before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR A HEAD-MOUNTED DISPLAY



(57) Abstract: A head-mounted display with an upgradeable field of view includes for at least one eye an existing lens, an existing display, an added lens, and added display. The existing lens and the added lens are positioned relative to one another as though each of the lenses is tangent to a surface of a first sphere having a center that is located substantially at a center of rotation of the eye. The existing display and the added display are positioned relative to one another as though each of the displays is tangent to a surface of a second sphere having a radius larger than the first sphere's radius and having a center that is located at the center of rotation of the eye. A head mount for the head-mounted display includes two parallel rails, brow pads, top pads, and back pads.

WO 2008/055262 A3



— *with information concerning one or more priority claims considered void* (88) **Date of publication of the international search report:**
30 October 2008

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 07/83500

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G05B 11/01; G09G 5/00 (2008.04) USPC - 700/17; 345/8 According to International Patent Classification (IPC) or to both national classification and IPC																				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) USPC: 700/17; 345/8 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 700/1, 17, 90, 94; 345/7, 8, 9; 349/1, 11, 17 (view text search terms below) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST(PGPB,USPT,EPAB,JPAB; PLUR=YES); DialogPRO(Engineering); Google Scholar Search Terms Used: head, mount, display, upgradeable, field, of, view, lens, display, added, lens, added, display, existing, lens, added, installed, time, manufacture, tangent, surface, sphere, center, rotation, eye, existing, display, added, etc																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top; padding: 2px;"> X --- Y </td> <td style="vertical-align: top; padding: 2px;"> US 2005/0078378 A1 (GEIST) 14 April 2005 (14.04.2005) entire document, especially Abstract, FIGS.5-7 and para [0011], [0015], [0023]-[0024], [0035], [0040]-[0044], [0052], [0059], [0068], [0070]-[0071], [0073], [0075], [0081]-[0082], [0084]-[0086], [0088], [0144], [0152], [0154], [0161], [0171]-[0172] and [0273] </td> <td style="vertical-align: top; padding: 2px;"> 1-22 ----- 26 </td> </tr> <tr> <td style="vertical-align: top; padding: 2px;"> X --- Y </td> <td style="vertical-align: top; padding: 2px;"> US 2002/0181115 A1 (MASSOF et al.) 05 December 2002 (05.12.2002) entire document, especially Abstract, FIG.1, Claim 18 and para [0007], [0010], [0014], [0020], [0022], [0049], [0074], [0082], [0087]-[0088] and [0099] </td> <td style="vertical-align: top; padding: 2px;"> 23-25 and 27 ----- 26 and 28 </td> </tr> <tr> <td style="vertical-align: top; padding: 2px;"> Y </td> <td style="vertical-align: top; padding: 2px;"> US 5,796,426 A (GULLICHSEN et al.) 18 August 1998 (18.08.1998) entire document, especially Abstract and col 2, ln 5-18 and 36-46, and col 4, ln 37-61 </td> <td style="vertical-align: top; padding: 2px;"> 28 </td> </tr> <tr> <td style="vertical-align: top; padding: 2px;"> A </td> <td style="vertical-align: top; padding: 2px;"> MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.spawar.navy.mil/sti/publications/reprints/robotics/rr18.pdf > </td> <td style="vertical-align: top; padding: 2px;"> 1-28 </td> </tr> <tr> <td style="vertical-align: top; padding: 2px;"> A </td> <td style="vertical-align: top; padding: 2px;"> Citation containing publication date for: MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.stormingmedia.us/87/8742/A874224.html > </td> <td style="vertical-align: top; padding: 2px;"> 1-28 </td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X --- Y	US 2005/0078378 A1 (GEIST) 14 April 2005 (14.04.2005) entire document, especially Abstract, FIGS.5-7 and para [0011], [0015], [0023]-[0024], [0035], [0040]-[0044], [0052], [0059], [0068], [0070]-[0071], [0073], [0075], [0081]-[0082], [0084]-[0086], [0088], [0144], [0152], [0154], [0161], [0171]-[0172] and [0273]	1-22 ----- 26	X --- Y	US 2002/0181115 A1 (MASSOF et al.) 05 December 2002 (05.12.2002) entire document, especially Abstract, FIG.1, Claim 18 and para [0007], [0010], [0014], [0020], [0022], [0049], [0074], [0082], [0087]-[0088] and [0099]	23-25 and 27 ----- 26 and 28	Y	US 5,796,426 A (GULLICHSEN et al.) 18 August 1998 (18.08.1998) entire document, especially Abstract and col 2, ln 5-18 and 36-46, and col 4, ln 37-61	28	A	MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.spawar.navy.mil/sti/publications/reprints/robotics/rr18.pdf >	1-28	A	Citation containing publication date for: MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.stormingmedia.us/87/8742/A874224.html >	1-28	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
X --- Y	US 2005/0078378 A1 (GEIST) 14 April 2005 (14.04.2005) entire document, especially Abstract, FIGS.5-7 and para [0011], [0015], [0023]-[0024], [0035], [0040]-[0044], [0052], [0059], [0068], [0070]-[0071], [0073], [0075], [0081]-[0082], [0084]-[0086], [0088], [0144], [0152], [0154], [0161], [0171]-[0172] and [0273]	1-22 ----- 26																		
X --- Y	US 2002/0181115 A1 (MASSOF et al.) 05 December 2002 (05.12.2002) entire document, especially Abstract, FIG.1, Claim 18 and para [0007], [0010], [0014], [0020], [0022], [0049], [0074], [0082], [0087]-[0088] and [0099]	23-25 and 27 ----- 26 and 28																		
Y	US 5,796,426 A (GULLICHSEN et al.) 18 August 1998 (18.08.1998) entire document, especially Abstract and col 2, ln 5-18 and 36-46, and col 4, ln 37-61	28																		
A	MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.spawar.navy.mil/sti/publications/reprints/robotics/rr18.pdf >	1-28																		
A	Citation containing publication date for: MURPHY et al. 'MSSMP: No Place to Hide'. Report: Naval Command Control and Ocean Surveillance Center. Published June, 1997. [retrieved on 2008-08-11]. Retrieved from the Internet: <URL: http://www.stormingmedia.us/87/8742/A874224.html >	1-28																		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; border: none;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family																
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family																			
Date of the actual completion of the international search 11 August 2008 (11.08.2008)	Date of mailing of the international search report <div style="text-align: center; font-size: 1.2em; font-weight: bold;">18 AUG 2008</div>																			
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: <div style="text-align: center;">Lee W. Young</div> PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																			

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 07/83500

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
(See Extra Sheet)

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 07/83500

Continuation of:

Box No. III --- Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-12 and 23-28, drawn to a display with lenses positioned relative to one another as though each of the lenses is tangent to a surface of a sphere.

Group II: Claims 13-22, drawn to a display comprising two curved parallel rails forming a support structure for the head mount and one or more brow pads connected to the two curved parallel rails.

The inventions listed as Groups I - II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I contains the special technical feature of a display wherein lenses are positioned relative to one another as though each of the lenses is tangent to a surface of a sphere having a center that is located substantially at a center of rotation of the eye; the Group II claims lack this special technical feature.

Group II contains the special technical features of two curved parallel rails forming a support structure from the head mount extending from near a brow, and one or more brow pads connected to the two curved parallel rails; the Group I claims lack this special technical feature.

Therefore, unity of invention is lacking under PCT Rule 13 because the groups do not share a same or corresponding special technical feature.