



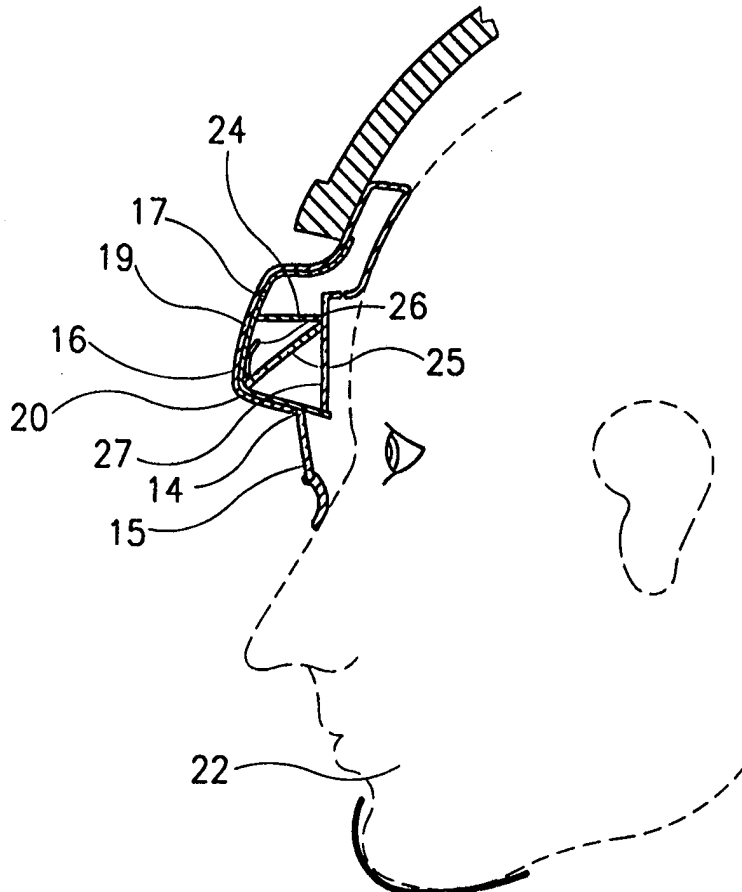
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>G02B 27/01</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 98/29775</b>  (43) International Publication Date: 9 July 1998 (09.07.98)</p>
<p>(21) International Application Number: PCT/IL97/00446 (22) International Filing Date: 31 December 1997 (31.12.97)  (30) Priority Data: 119958 2 January 1997 (02.01.97) IL 122750 25 December 1997 (25.12.97) IL  (71)(72) Applicant and Inventor: KUTZ, Giora [IL/IL]; P.O. Box 653, 45106 Hod Hasharon (IL).  (74) Agent: DR. YITZHAK HESS &amp; PARTNERS; P.O. Box 6451, 61063 Tel Aviv (IL).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: A PERSONAL HEAD MOUNTED DISPLAY DEVICE

(57) Abstract

The present invention relates to a personal head mounted display device ("PHMD") said device consisting of a housing being closed hermetically at all sides, within said housing being located two displays and two sets of optical means; the displays and the optical means being arranged in an angle between 1 and to about 30°, advantageously 15°, above the horizon when the PHMD is worn; the displays and the optical means being connected one to each other in an appropriate manner; the displays being connected to electronic means, which electronic means being in turn connected to an electric power source; and to either a video signal source or to a computer VGA or SVGA output; the desired selection being regulated by a switch. The displays preferably selected among CRT, EL and LCD systems. The electronic means are either an integral part of the device or are located outside the device. In a preferred embodiment the PHMD is a goggle which is tight against dust, sun and wind and is integrated with a display (DSW-HMD); in which the upper part of the housing comprises the two displays and the optical means; and the lower part of the housing comprises an optical visor and the electronic means are located outside the device and are connected to the displays.



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## A PERSONAL HEAD MOUNTED DISPLAY DEVICE

The present invention relates to a personal head mounted display device (hereinafter: "PHMD").

Very often it is desirable to have a display system which can be carried on the head and be used in the open area and which enables the user to look both at its display and at the real out-side world. This is especially required in the following systems:

- a) observation systems;
- b) surveillance systems;
- c) moving map navigation systems; and
- d) Computerized C<sup>4</sup>I (control, command, communication computer and intelligence) systems.

Similar systems are known already as virtual reality systems in the entertainment field of virtual reality. These known systems comprise a printed electronic circuit board, electronic circuits, optical means and a display being either a cathode ray tube (CRT) or a liquid crystal display (LCD). Said known systems are usually opaque and in the level of the eyes, i.e. one cannot see through them. Should they be transparent the light coming from the outside blinds the eyes and one cannot see through them.

The known systems do not enable the user of same to look both at the display and at the real out-side world. Due to the fact that the known systems are, as indicated above, usually opaque and/or are designed to be used at the level of the eyes one cannot see through them i.e the wearer is living in a virtual world which is disconnected from the real world. The known systems are intended to be mainly used and operated in a closed surrounding e.g. a room, a hall, etc.

Moreover, when the known system is not used in a closed surrounding at day time the sun light entering from above, beneath and from the sides of the known system causes blinding the wearer and at night the light is projected from the display onto the user's face and therefore the wearer is lighted and can

be easily identified which is not desired especially in military use. Thus the known system can essentially be used only in a closed surrounding and not in an open area.

There is so far not known any system which can be used in particular in the open area as said known systems cannot resist hard conditions such as shocks, vibrations, impacts, sand and dust harsh conditions, humidity and spray conditions. Moreover, said known system does not enable to be used to look both with both eyes at the system's display and at the real out-side world which is essential for the performance of the above system.

In addition said known devices are not entirely satisfactory in particular for users on the move. Thus, said devices are not sufficiently tight against the entrance of sun, dust, wind, etc. The tight closure is required when the PHMD should serve as sun, dust, wind goggles integrated with a display (hereinafter called "DSW-HMD") which are to be used in vehicular systems, e.g. tanks, armored vehicles, etc. and for soldiers.

It has therefore been desirable to design a system which overcomes the above disadvantages, i.e would be simple to manufacture and use, would not be too expensive and would have the required properties, e.g enable the user to look with both eyes under all conditions both at the display and at the real out-side world and resist the hard weather conditions which often occur.

In addition some of its embodiments should be able to serve as DSW-HMD and would be tight against the entrance of dust, sun, wind (DSW) etc., and could thus serve as DSW goggles and be easily removable from the face without requiring the removal of a helmet, if any.

The present invention thus consists in a personal head mounted display device ("PHMD") said device consisting of a housing being closed hermetically at all sides, within said housing being located:

- a. two displays; and
- b. two sets of optical means;

the displays and the optical means being arranged in an angle between 1 and to about 30° above the horizon when the PHMD is worn; the displays and the optical means being connected one to

each other in an appropriate manner; the displays being connected to electronic means, which electronic means being in turn connected to an electric power source; and to either a video signal source or to a computer VGA or SVGA output; the selection being regulated by a switch.

The housing may have the form of a cover. Said cover may have the form of, e.g. a cap-shade, or the like. The housing or cover may be put directly on the head or strengthened by any suitable means, e.g. straps. Said straps are advantageously, in particular when the device is a DSW-HMD, connected to each side of the housing suitably via grooves, holes, etc.

The preferred angle in which the displays and optical means are arranged above the horizon is 12-20°, advantageously 15°.

In a preferred embodiment of the PHMD according to the present invention the PHMD comprises below the cover a sealing mould and below the optical means a lower shelf.

In a preferred embodiment of the PHMD according to the present invention two valves are present. Said valves enable nitrogen washing in order to avoid internal humidity.

The housing of the PHMD according to the present invention may be made from any suitable opaque material, preferably a rigid and non-corrosive one such as e.g. a plastic material, such as polyethylene, polypropylene, polystyrene, ABS, etc.

The housing is advantageously surrounded by some padding material, e.g. a rubber material, a sponge, etc.

The displays of the PHMD according to the present invention may be selected, for example, among Cathode Ray Tube (CRT) systems, Liquid Crystal Display (LCD) systems, electro luminiscient (EL) systems or the like. Said displays have a resolution of at least 180,000 pixels, and comprise two half-mirrors and two optical concave lenses.

Should the displays be a LCD, the optical means and the displays may comprise, e.g. two fluorescent illumination panels.

When the PHMD according to the present invention serves as DSW-HMD the upper part of the housing comprises the two displays and the optical means; and the lower part of the housing comprises an optical visor. In this case the electronic means are located outside the device.

The optical visor may have any suitable color. It is advantageously made from a laser and ballistic eye safe material.

There may be present in addition in the DSW-HMD, if desired, regular spectacles. Said regular spectacles are advantageously surrounded by the DSW-HMD.

In a preferred embodiment of the DSW-HMD the optical means and the displays are located in a half circled frame, part of which is a lower shelf on which rest the optical means and the displays.

The electronic means may be an integral part of the PHMD and in this case they are located in the housing.

However, as indicated above, when the PHMD is used as DSW-HMD electronic means are located outside the device and are suitably connected to the displays by a cable. In this case they are preferably located in a box in a stationary manner. However, in case that the user has to be mobile the box should be so dimensioned that it can be suitably carried on the back or on any other suitable part of the user.

The electronic means, advantageously comprise electronic circuits which may be located on a printed electronic circuit board, said circuits cause, when the display is a LCD, the lighting of the two fluorescent illumination panels. Said electronic means cause the reception of the input of the video signal and the scanning and the synchronizing of said signal on the display; and alternatively cause to interface and display a signal received from a PC VGA or SVGA output; the desired selection being regulated by a switch.

The electronic means should be connected in case that the PHMD is a DSW-HMD to the displays located in the housing; to a suitable electric power source, to a video signal source output and to a computer VGA output. Either of said output's may be actuated at the desired moment. This may be regulated by a switch causing the actuation of one of said outputs.

The electric power source may be any suitable electric power source, advantageously a DC voltage power source or a battery.

The video signal may be received via a wire or in a wireless manner. Said signal may be received from any kind of camera e.g. video camera, thermal imaging system, etc. which has a video

output.

The signal from the VGA or SVGA output is received via a wire. The computer to be used may be any suitable P.C.

The PHMD is used, for example, as follows:

The user wears the PHMD on his head or in case of a DSW-HMD on his face, in this case the goggles may be worn below the helmet. When the user wants to look at the real out-side world he looks horizontally in front of him. When he wants to look at the displays he has to raise his eyes slightly upwards. The displays being connected to separate electronic circuits are illuminated either by 2 fluorescent illuminating panels (LCD) or by itself (EL). The displays then projects the video image or the graphics of the computer to the half mirrors and from there to the lenses of the optical means and from there to the eyes of the user.

The present invention will now be illustrated with reference to the accompanying drawings, without being limited by them. Identical

parts appearing in several drawings will be marked by the same numerals. In said drawings :

Fig. 1 shows a perspective upper view of the various elements of a PHMD according to the present invention;

Fig. 2 shows a perspective lower view of the various elements of the PHMD shown in Fig. 1;

Fig. 3 shows front views of two options of observation of a PHMD according to the present invention;

Fig. 4 shows a side view of a PHMD according to the present invention;

Fig. 5 shows an upper view of the PHMD shown in Fig. 4;

Fig. 6 shows a perspective view of a DSW-HMD according to the present invention;

Fig. 7 shows the inside of the DSW-HMD shown in Fig. 6;

Fig. 8 shows a side view of a person carrying the DSW-HMD shown in Fig. 6; and

Fig. 9 shows a perspective view of a person and a section of a DSW-HMD carried by said person.

Figs. 1 to 5 show PHMD 1 comprising upper cover 2 sealing mould 3 printed electronic circuit board comprising the electronic circuits and LCD display 4, optical means (i.e. two

mirrors, two prisms and two optical lenses) 5 and lower shelf 6.

Moreover, Fig. 3 shows eyes 7 and 8 wherein eye 7 looks at the real world and eye 8 looks at display 4 in PHMD 1. It is readily understood that in actual used both eyes are in the same level, either looking horizontally to the real out-side world or in a raised angle at the display.

Likewise, Figs. 4 and 5 shows eye 8 and ear 9 in relation to PHMD 1.

Furthermore, in said Figs. grooves 10 for insertion of strap 11 are seen and straps 12 and 13 are visible.

Fig. 6 shows housing 14 at the lower part of which is seen optical visor 15. Upper part 16 of housing 14 comprises half-circled frame 17 in which are located optical means and displays (shown only in Figs. 7 and 9). Housing 14 is connected at its sides to strap(s) 18 (only one side is shown). Said strap(s) 18 are either closed at the back of the head or constitute one strap being connected to housing 14 at both sides.

Fig 7. shows housing 14 and strap(s) 18. Within frame 17 one can see in a perspective schematical view optical means 19 and 19' below which are located shelf 20 being part of frame 17; and optical visor 15. Housing 14 is padded by padding material 21.

Fig. 8 shows face 22 wearing a DSW-HMD according to the present invention showing housing 14, comprising at its lower part optical visor 15 and being connected to strap(s) 18. Upper part 16 comprising frame 17 are also shown. The DSW-HMD is worn below helmet 23.

Fig. 9 shows face 22 and a cross section of a DSW-HMD worn on said face 22. Said DSW-HMD shows housing 14, comprising within frame 17 display 24 and optical means 16 constituted by half mirror 25, concave lens 26 and additional lens 27. Below part 16 are located shelf 20 and optical visor 15.

In Figs. 1, 2, 3, 4, 5, 6 and 8 there are shown valves(s) 28 and 28' (entrance and exit, respectively). Said valves enable nitrogen washing in order to avoid internal humidity.



## Claims:

1. A personal head mounted display device ("PHMD") said device consisting of a housing being closed hermetically at all sides, within said housing being located:
  - a. two displays; and
  - b. two sets of optical means;the displays and the optical means being arranged in an angle between 1 and to about 30° above the horizon when the PHMD is worn; the displays and the optical means being connected one to each other in an appropriate manner; the displays being connected to electronic means, which electronic means being in turn connected to an electric power source; and to either a video signal source or to a computer VGA or SVGA output; the desired selection being regulated by a switch.
2. A PHMD according to Claim 1, wherein the angle in which said displays and optical means is arranged above the horizon is 15°.
3. A PHMD according to Claim 1 or 2, wherein the housing has the form of a cover being a cap-shade.
4. A PHMD according to Claim 3, which comprises below the cover a sealing mould and below the optical means a lower shelf.
5. A PHMD according to any of Claims 1 to 4, wherein the housing is made from an opaque material.
6. A PHMD according to any of Claims 1 to 6, wherein the housing is made from any rigid and non corrosive material.
7. A PHMD according to Claim 5 and 6, wherein the material is a plastic material.
8. A PHMD according to any of Claims 1 to 7, wherein the displays are cathode ray tube (CRT) systems.
9. A PHMD according to any of Claims 1 to 7, wherein the displays are electro luminiscent (EL) systems.
10. A PHMD according to any of Claims 1 to 7, wherein the displays are liquid crystal display (LCD) systems.
11. A PHMD according to Claim 10, wherein the optical means and the display comprise two fluorescent illumination panels.
12. A PHMD according to any of Claims 8 to 11, which have a resolution of at least 180,000 pixels, and comprise two

- half-mirrors and two optical concave lenses.
13. A PHMD according to any of Claims 1 to 12, wherein the electronic means are electronic circuits which are located on a printed electronic circuit board.
  14. A PHMD according to Claim 13, wherein said circuits cause the lighting of the two fluorescent illumination panels.
  15. A PHMD according to any of Claims 1 to 14 wherein the electronic means cause the reception of the input of the video signal, and the scanning and the synchronizing of said signal on the display; and alternatively causes to interface and display a signal received from a PC VGA or SVGA output; the desired selection being regulated by a switch.
  16. A PHMD according to any of Claims 1 to 15, wherein the video signal is received via a wire or in a wireless manner.
  17. A PHMD according to Claim 16, wherein the video signal is received from any kind of camera which has a video output.
  18. A PHMD according to any of Claims 1 to 17, wherein the electric power source is selected among a DC voltage power source and a battery.
  19. A PHMD according to any of Claims 1 to 18, wherein strap(s) are connected to each side of the housing.
  20. A PHMD according to any of Claims 1 to 19, wherein the electronic means are an integral part of the device and are located within the housing.
  21. A PHMD according to any of Claims 1 to 20, which comprises 2 valves for nitrogen washing.
  22. A PHMD according to any of Claims 1 to 2, 5 to 19 and 21, wherein the PHMD is a DSW-HMD, in which the upper part of the housing comprises the two displays and the optical means; and the lower part of the housing comprises an optical visor; and the electronic means are located outside the device.
  23. A DSW-HMD according to Claim 22, wherein the optical visor is made from a laser and ballistic eye safe material.
  24. A DSW-HMD according to Claim 22 or 23, wherein regular spectacles are present which are surrounded by the DSW-HMD.
  25. A DSW-HMD according to any of Claims 22 to 24 in which the

- optical means and the displays are located in a half circled frame, part of which is a lower shelf on which rest the optical means and the displays.
26. A DSW-HMD according to any of Claims 22 to 25, wherein the electronic means are located within a box.
  27. A DSW-HMD according to Claim 26, wherein the electronic means are connected to the displays within the housing; to a video signal source output and to a PC VGA or SVGA signal output; the later ones being connected to a switch which switch regulates the desired selection.
  28. A device as defined in claim 1, substantially as hereinbefore described with reference to the accompanying drawings.
  29. A dust, sun, wind goggle integrated with a display ("DSW-HMD) said device comprising a housing being provided with means which close the device hermetically at all sides, within the upper part of said housing being located:
    - a. two displays; and
    - b. two sets of optical means,the displays and the optical means being arranged in an angle between 1 and to about 30° above the horizon when the DSW-HMD is worn; and being connected one to each other in an appropriate manner; the lower part of the housing comprising an optical visor; said displays being connected to separate electronic means which in turn are connected to an electric power source; and to either a video signal source or to a computer VGA or SVGA output; the housing being provided with means which enable the wearing of the DSW-HMD.

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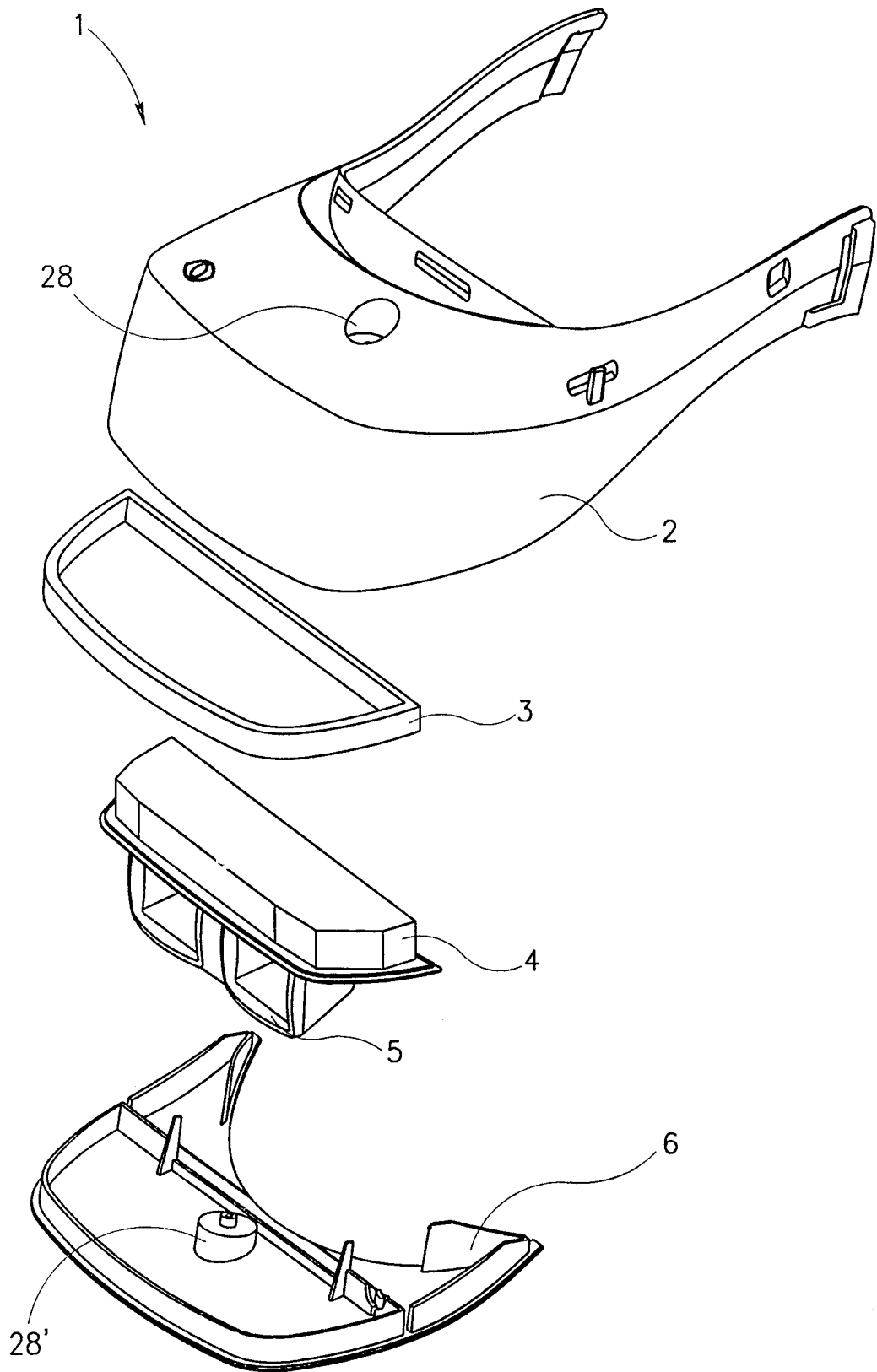


FIG. 1

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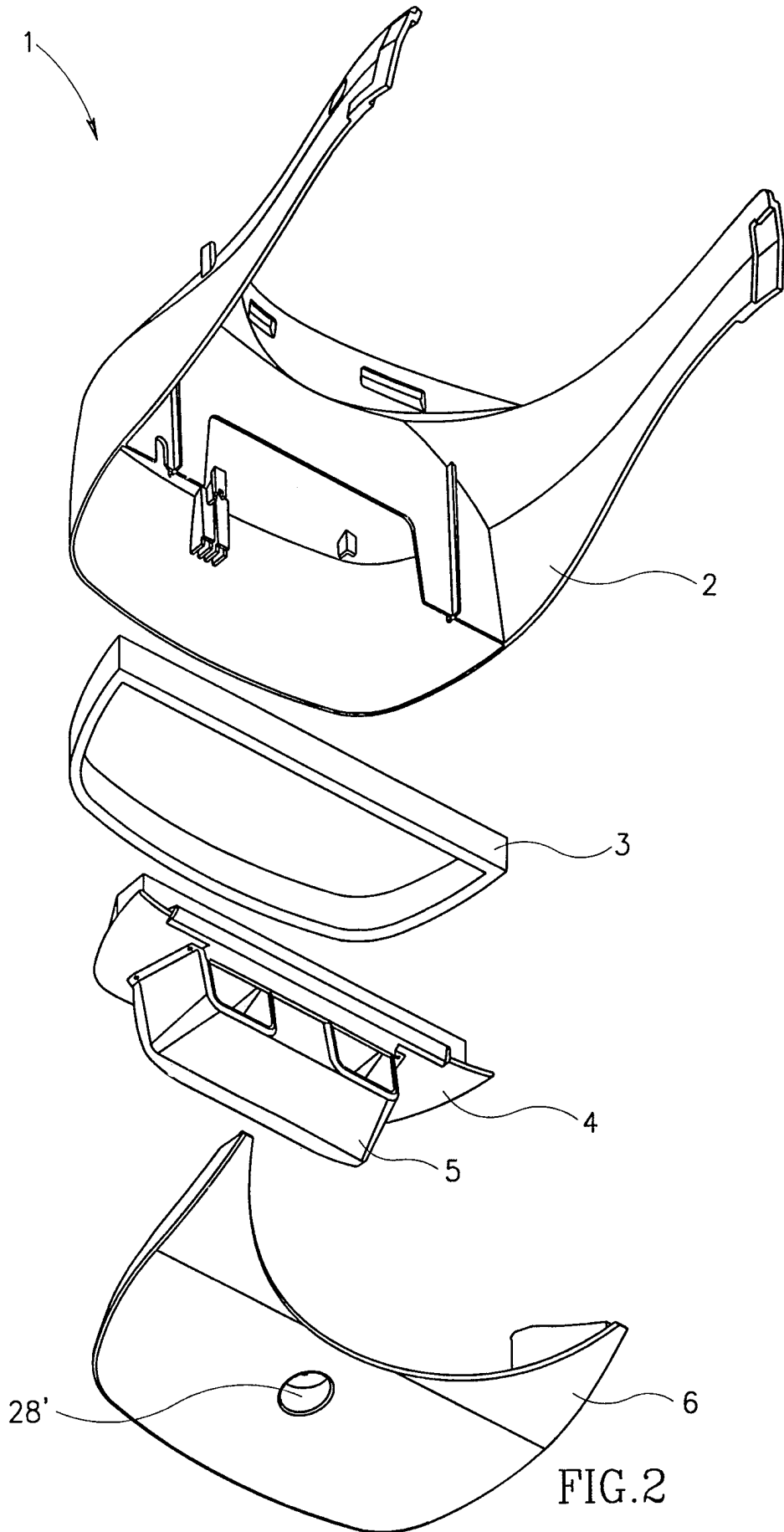


FIG.2

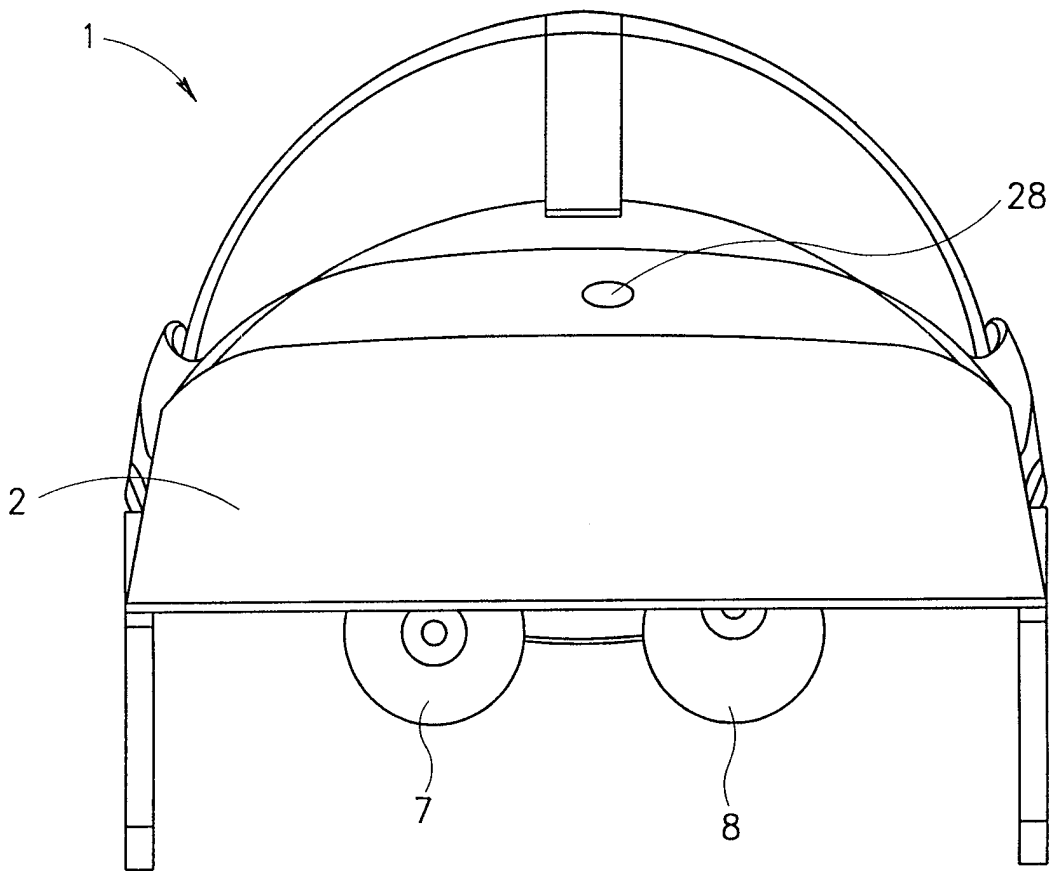


FIG.3

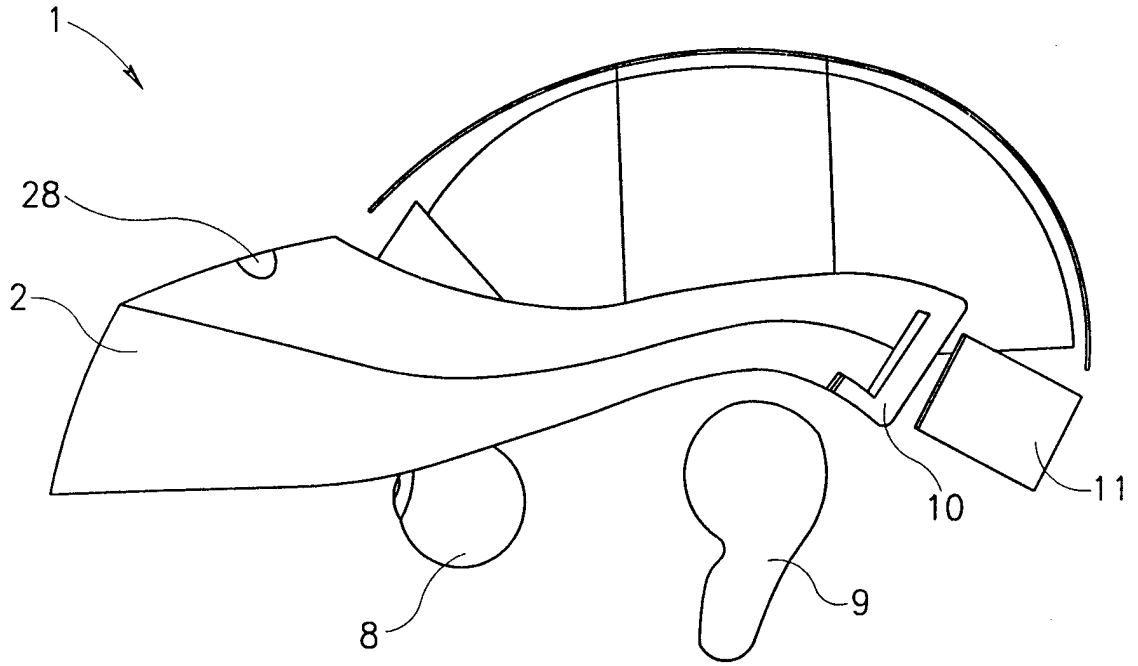


FIG. 4

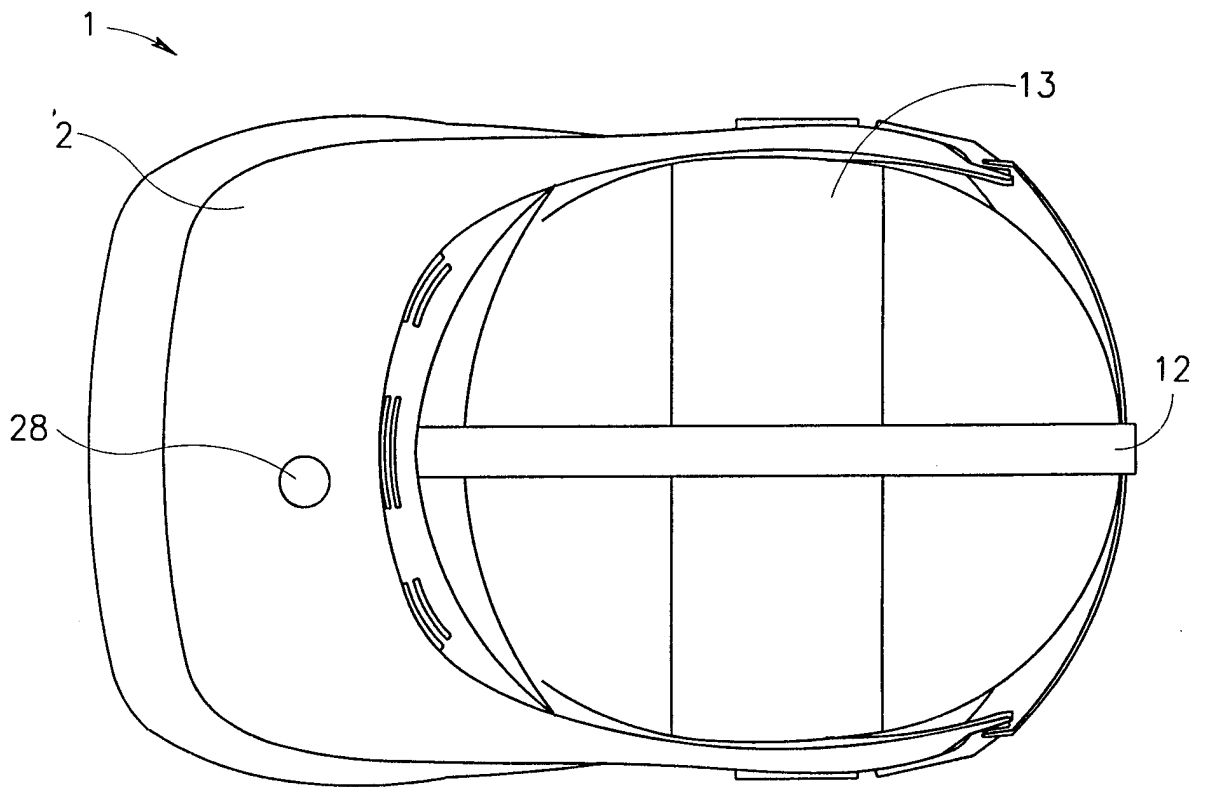


FIG. 5

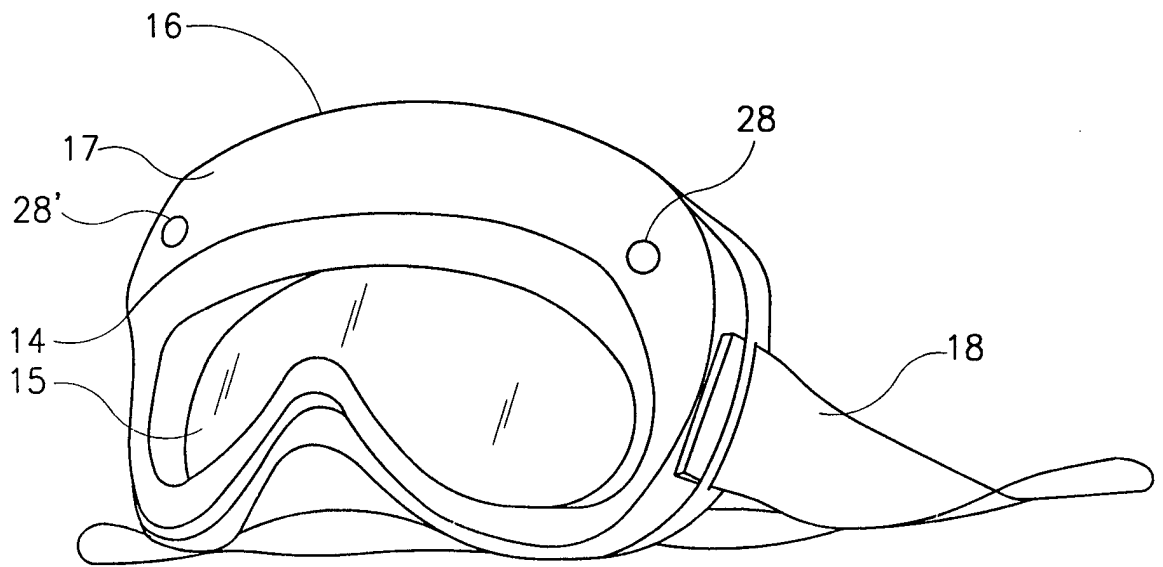


FIG. 6

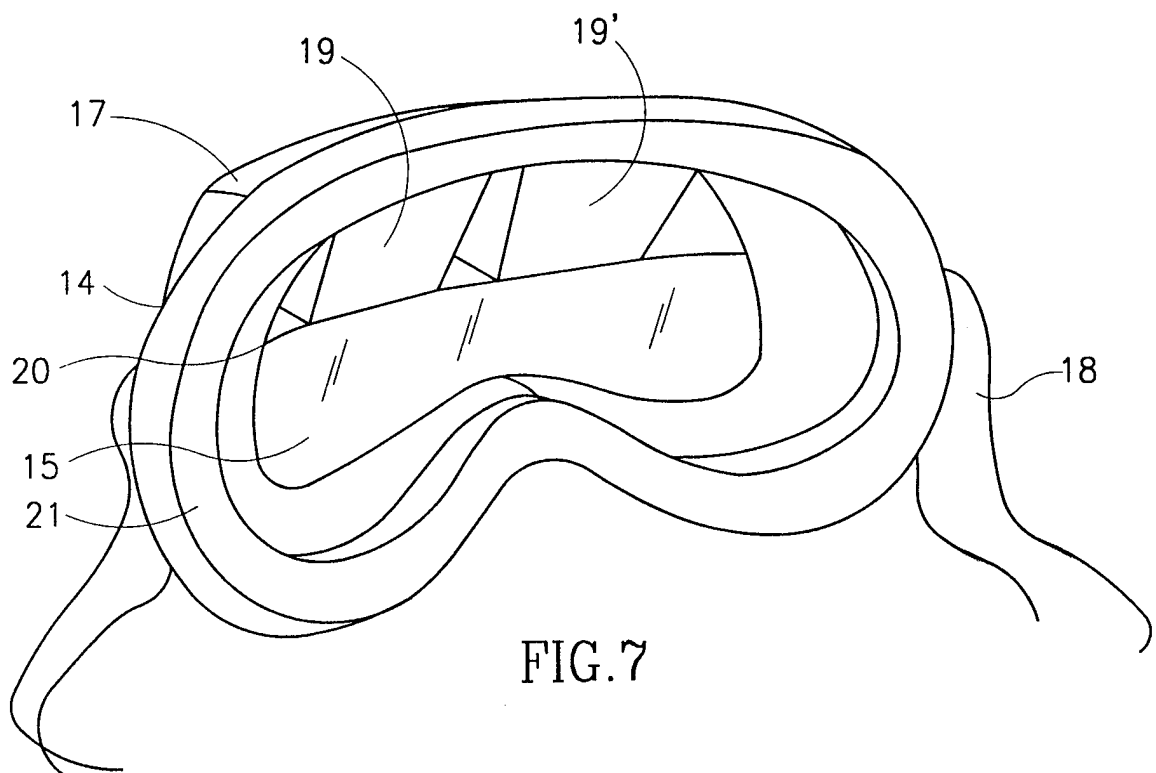


FIG. 7



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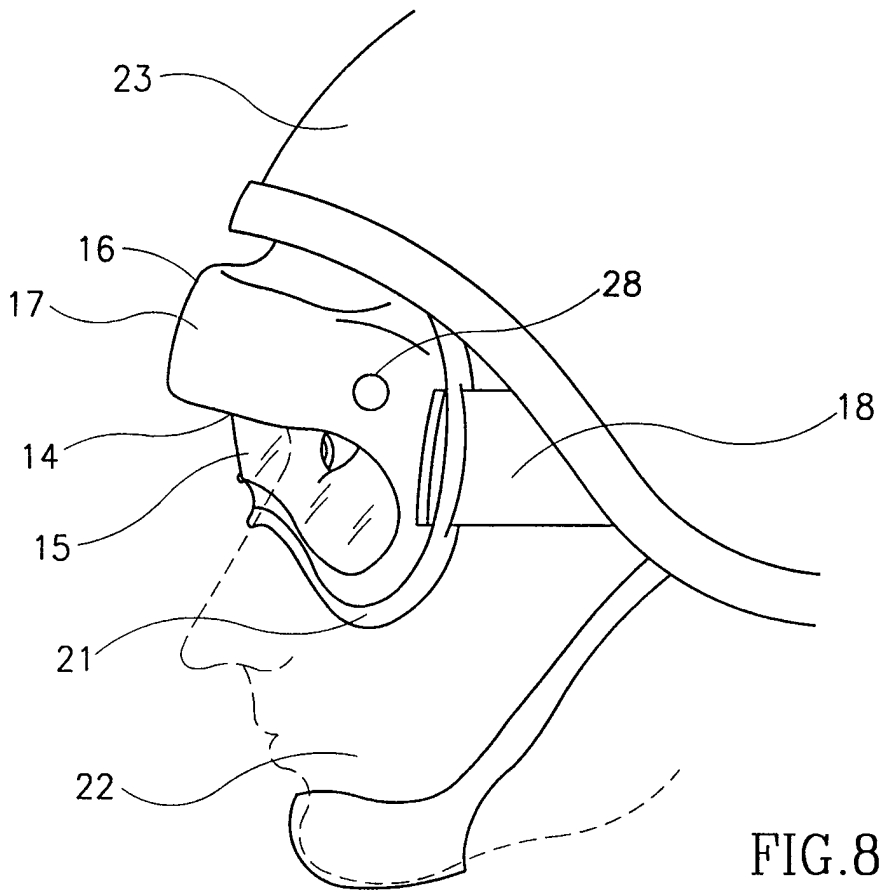


FIG. 8

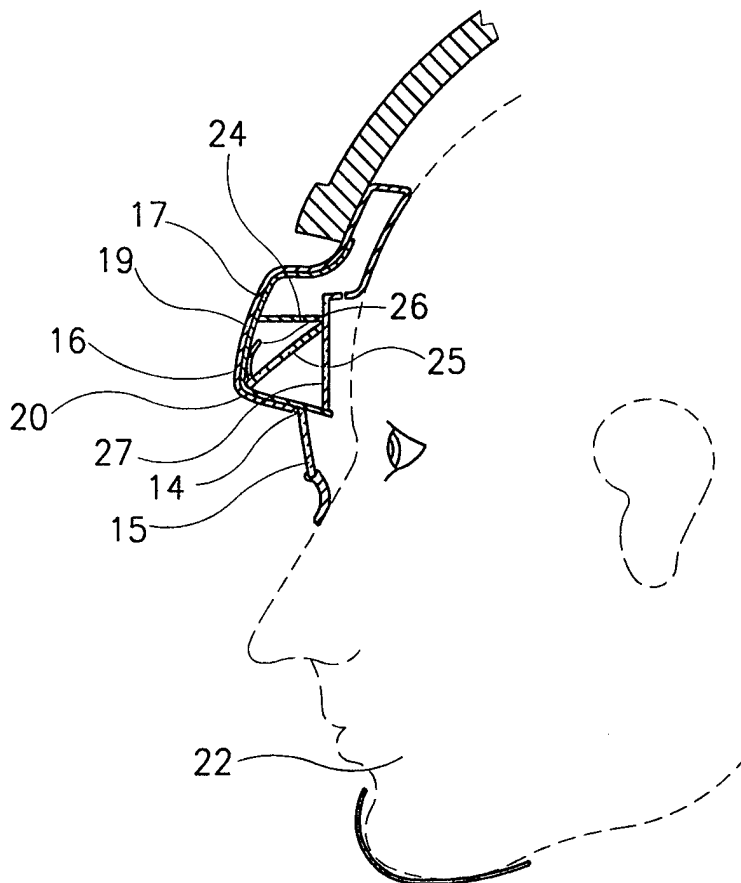


FIG. 9

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IL 97/00446

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 G02B27/01

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)  
 IPC 6 G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 344 881 A (REFLECTION TECHNOLOGY) 6 December 1989  see column 6, line 17 - line 29 see column 7, line 1 - line 39; claims 22,23; figure 2 see column 8, line 34 - line 39; claim 2; figure 7	1,2,5, 15,16, 19,20
A	see page 8, column 51 - column 53; figure 1  ---	22,26, 27,29
X	EP 0 643 314 A (SONY) 15 March 1995 see column 4, line 41 - column 5, line 3; figure 2	29
A	see column 6, line 9 - line 11  ---  -/--	4

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

5 June 1998

Date of mailing of the international search report

15/06/1998

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IL 97/00446

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 305 244 A (NEWMAN) 19 April 1994 see column 3, line 4 - line 7; claim 12; figure 1 ---	1,15,27, 29
A	US 5 566 073 A (MARGOLIN) 15 October 1996 see column 3, line 53 - line 54 see column 6, line 47 - line 50 ---	1,15,27, 29
A	WO 93 01683 A (CAMAIR RESEARCH) 21 January 1993 see abstract see page 15, line 22 - line 27 see page 16, paragraph 3; figure 6 ---	6,7,17, 22,25
A	US 5 072 209 A (HORI) 10 December 1991 see abstract ---	16
A	US 4 290 669 A (BELVA) 22 September 1981 see column 5, line 9 - line 22; figures 1,4 ---	21
A	WO 96 13992 A (INTERTECHNIQUE) 17 May 1996 see page 1, line 17 - page 2, line 17 ---	23
A	BE 1 007 975 A (ZAHN) 28 November 1995 see claim 10 ---	23
A	ROBERT J. WHITCRAFT: "Helmet-Mounted Display for the Night Attack Mission" PROCEEDINGS SPIE, THE INTERNATIONAL SOCIETY FOR OPTICAL ENGINEERING - HELMET MOUNTED DISPLAYS III, 21 - 22 April 1992, ORLANDO, FLORIDA, pages 52-56, XP000347226 see figure 3 -----	24

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IL 97/00446

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
EP 344881	A	06-12-1989	US 5003300 A AU 618986 B AU 2998789 A CA 1331231 A DE 68912828 D DE 68912828 T JP 2063379 A	26-03-1991 16-01-1992 07-12-1989 02-08-1994 17-03-1994 19-05-1994 02-03-1990
EP 643314	A	15-03-1995	JP 7084234 A US 5451976 A	31-03-1995 19-09-1995
US 5305244	A	19-04-1994	AU 661223 A CA 2114336 A CN 1106552 A EP 0670537 A	13-07-1995 28-07-1995 09-08-1995 06-09-1995
US 5566073	A	15-10-1996	NONE	
WO 9301683	A	21-01-1993	US 5189512 A AU 666661 B AU 2307792 A CA 2112745 A EP 0592591 A JP 7508619 T	23-02-1993 22-02-1996 11-02-1993 21-01-1993 20-04-1994 21-09-1995
US 5072209	A	10-12-1991	JP 1955548 C JP 2283584 A JP 6086229 B	28-07-1995 21-11-1990 02-11-1994
US 4290669	A	22-09-1981	NONE	
WO 9613992	A	17-05-1996	FR 2726438 A EP 0738117 A US 5722091 A	10-05-1996 23-10-1996 03-03-1998
BE 1007975	A	28-11-1995	DE 9409463 U AT 1298 U DK 9500207 U FR 2720909 A NL 1000556 C	12-10-1995 25-02-1997 28-07-1995 15-12-1995 13-12-1995

# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/IL 97/00446

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
BE 1007975 A		PT 9181 U	31-01-1996