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(54) **DISPLAY DEVICE SUPPORT SYSTEM**

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(57) **ABSTRACT**

A system for supporting video display devices in front of a user. Support system includes a headwear element that is placed over or upon a user's head. A display device, such as a three-dimensional display device is placed in an adjustable support structure that is located at the front of the headwear element. Through the adjustable structure the display device can be positioned at the best level for the user's eyes. In some embodiments the headwear element can use a support strap provided towards the rear of the headwear element to helps support the weight of the display device.

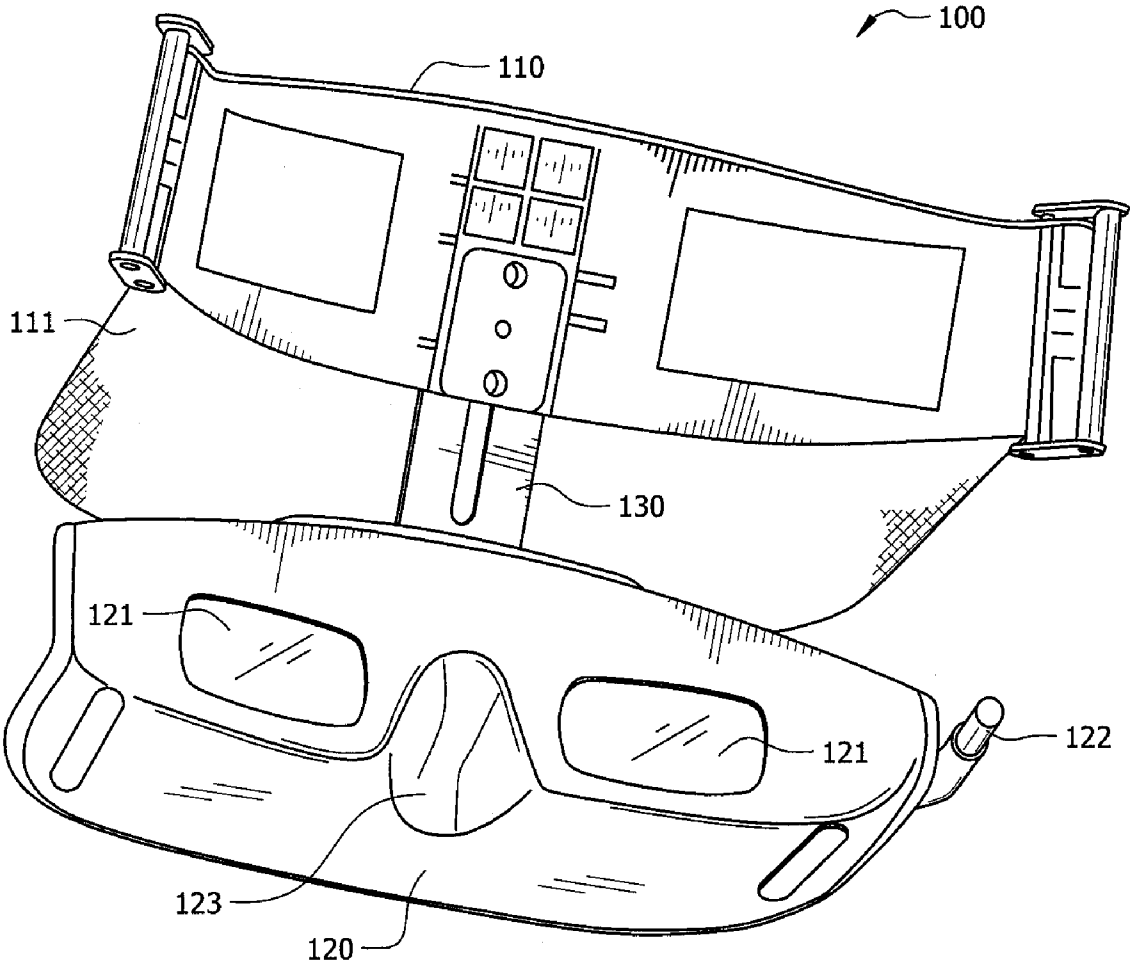


FIG. 1

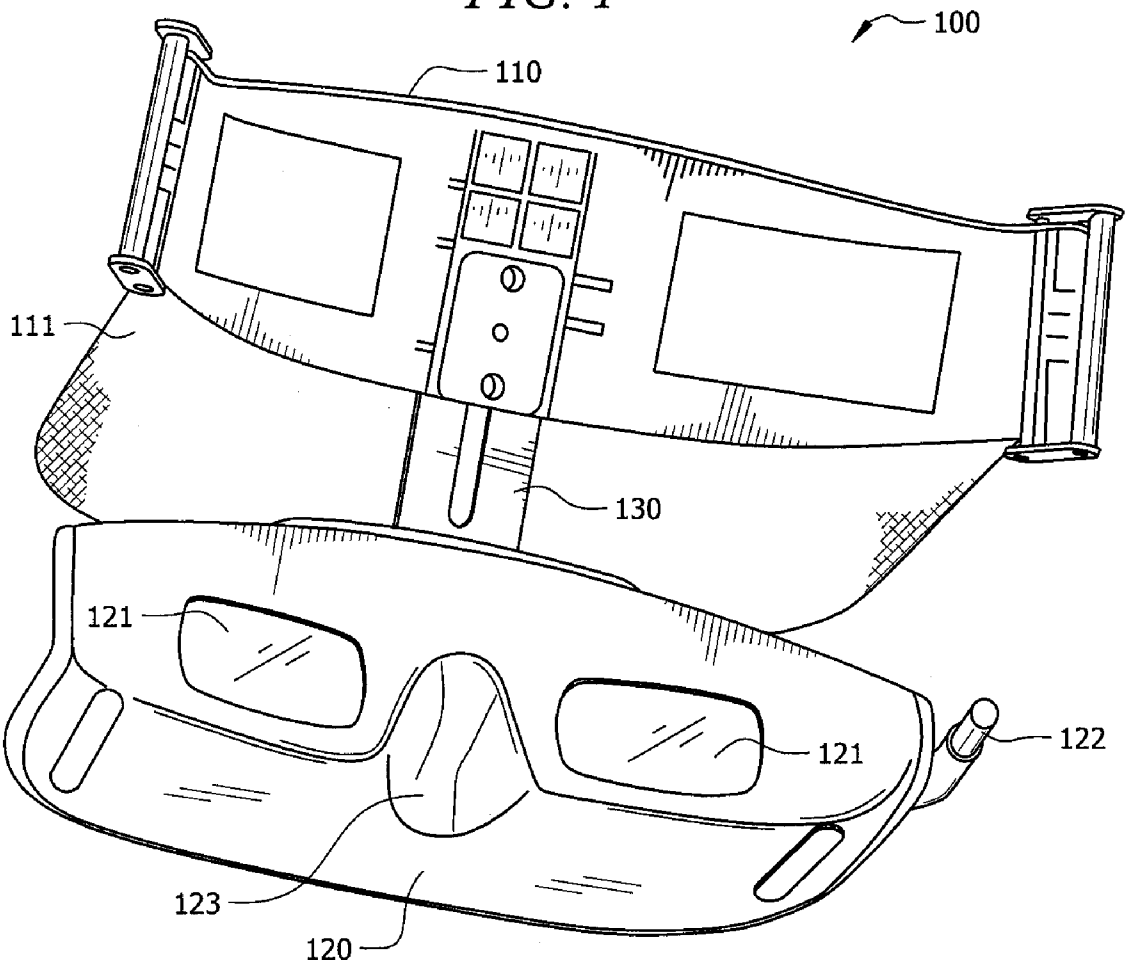
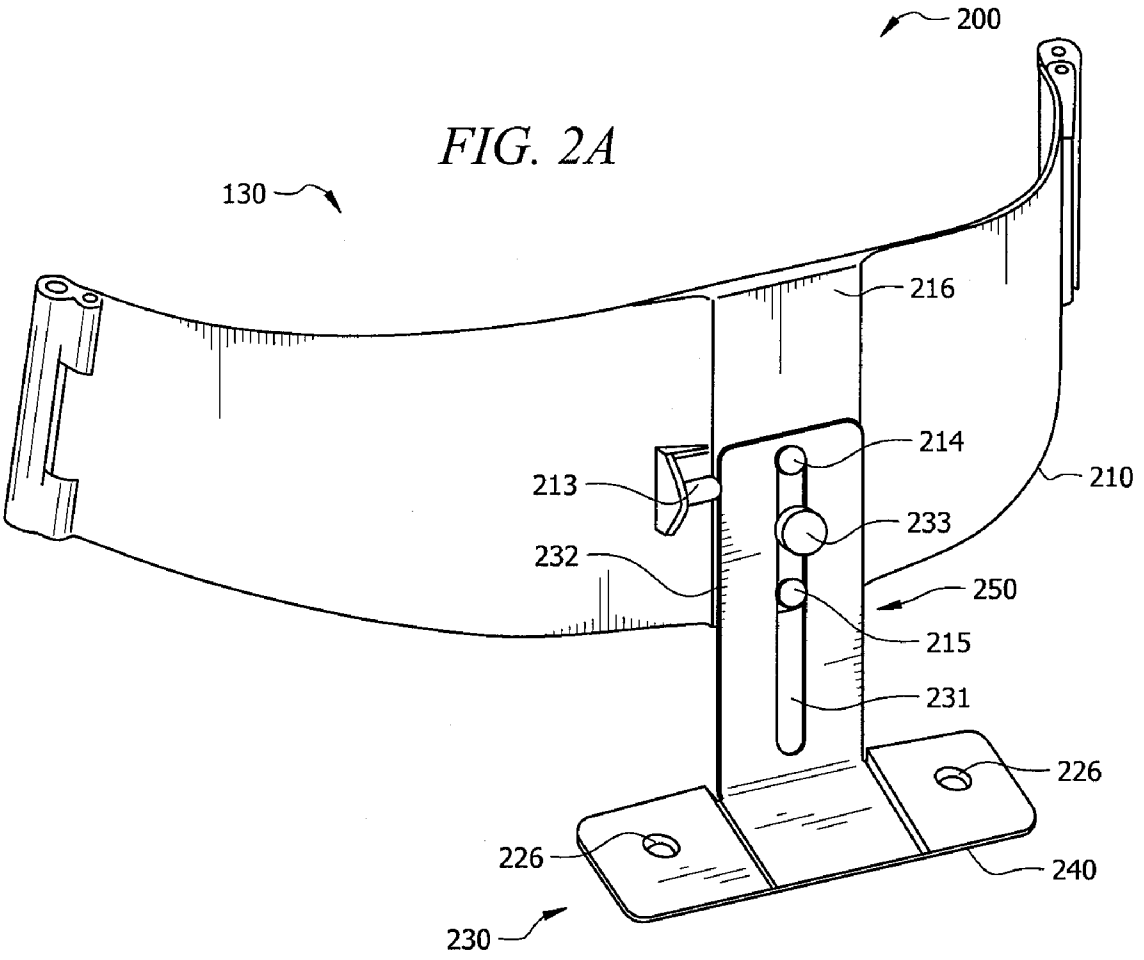


FIG. 2A



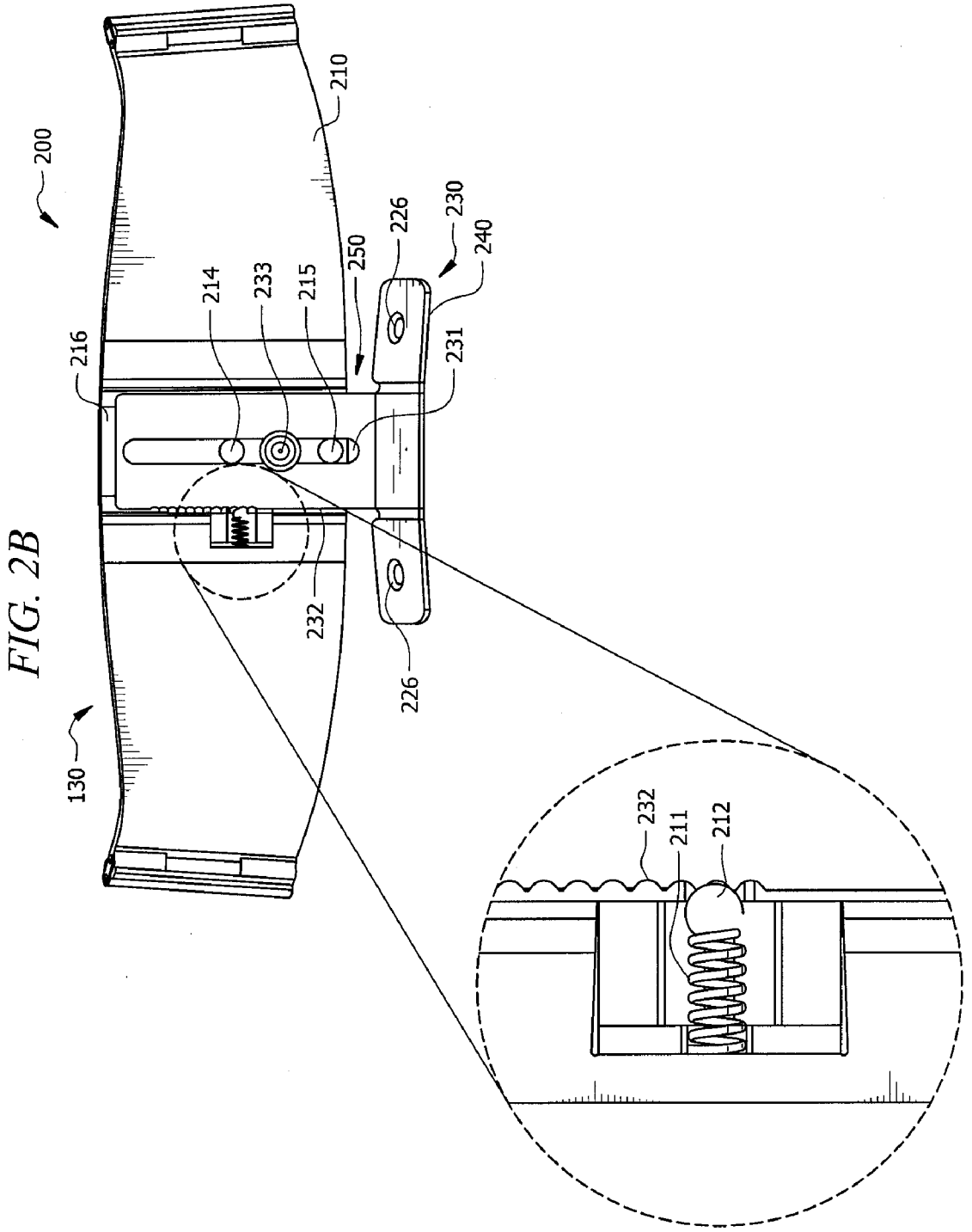

200
210
226
230
240
214
233
215
250
216
231
232
226
130
232
211
212

FIG. 2B

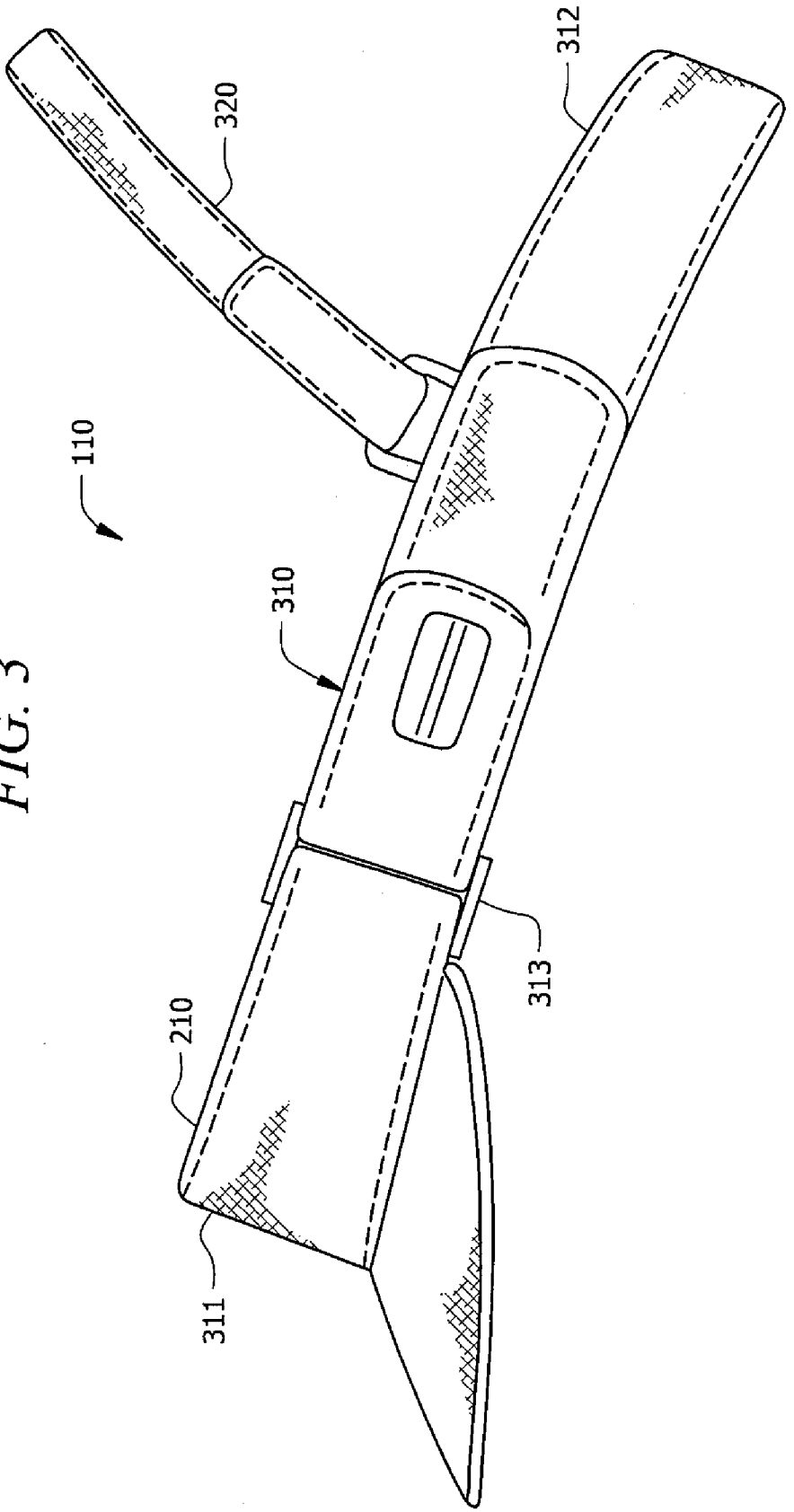
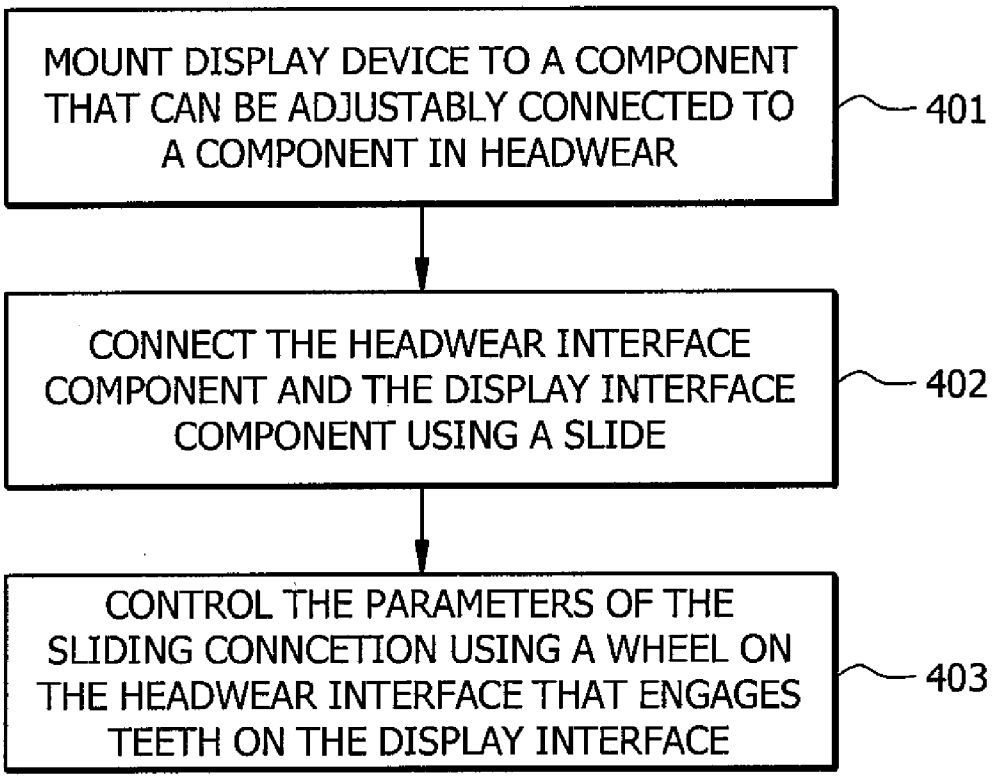


FIG. 3

FIG. 4


MOUNT DISPLAY DEVICE TO A COMPONENT THAT CAN BE ADJUSTABLY CONNECTED TO A COMPONENT IN HEADWEAR
401
CONNECT THE HEADWEAR INTERFACE COMPONENT AND THE DISPLAY INTERFACE COMPONENT USING A SLIDE
402
CONTROL THE PARAMETERS OF THE SLIDING CONNCETION USING A WHEEL ON THE HEADWEAR INTERFACE THAT ENGAGES TEETH ON THE DISPLAY INTERFACE
403

DISPLAY DEVICE SUPPORT SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to display device support systems, more specifically, the present invention is directed to a headwear device supporting a display device in front of a user.

BACKGROUND OF THE INVENTION

[0002] There are a number of video display devices on the market that are designed to place a display in front of the eyes of a user. Often, these devices are modeled after glasses in their general shape and in the manner that they interface with the user's head. Most of the time, these applications are used in conjunction with two-dimensional (2D) image displays. Since 2D image displays can tolerate wider variations in physical parameters, such as in alignment relative to the user's eyes, currently available head mounted display arrangements are capable of producing acceptable results.

[0003] However, applications designed for three-dimensional (3D) viewing often have difficulty utilizing traditional designs. 3D applications often have smaller tolerances for variations in physical parameters. Every human face is different, and devices that use the user's eyes and ears for alignment may not operate to optimally place the display relative to an individual user's eyes.

[0004] Traditional systems may also have difficulty handling the weight of complicated display systems. For example, "glasses" style devices may place an uncomfortable or impractical amount of weight on the user's nose or ears. This combination of weight locations can become extremely uncomfortable, especially after extended periods of wear, and may be unsuitable for assuring the consistent viewing geometry (3D) systems typically need. These problems can become exacerbated when the traditional 2D display system is replaced with a heavier 3D system.

BRIEF SUMMARY OF THE INVENTION

[0005] The present invention is directed to a system for supporting display devices in front of a user. Example embodiments of the system incorporate the support structures into a headwear element that is placed over or upon a user's head. A display device, such as a three-dimensional (3D) display device is placed in a support structure that is located at the front of the headwear, and allows the display device to be vertically adjustable in relation to the headwear. Example headwear embodiments may also use a support strap provided towards the rear portion of the headwear that helps support the weight of the display device.

[0006] In some example embodiments, the support structure is comprised of removable components. The first component is a headwear interface component, shaped to conform to the shape of a users forehead. The second component is a display interface component that mounts the display device. Connection of the two components can be accomplished by slideably inserting a teeth bearing top portion of the display device interface component into a groove or other receptacle on the headwear interface component, and holding it there using a retarding mechanism that interfaces with said teeth.

[0007] Other example embodiments allows the display device to be removed and worn as a hat or visor. The support structure may utilize a series of clips, screws or other means for holding the 3D display device at the proper level for the user. In such embodiments, this level is typically just above the nose of the wearer. In some embodiments the user can flip the 3D display device out of the way when not in use while still wearing the headwear device. Head phones or other sound producing devices can be attached to the structure and linked to the display device.

[0008] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawing, in which:

[0010] FIG. **1** is a perspective view of a display device support system according to one embodiment;

[0011] FIG. **2** is a front perspective view of a support structure according to one embodiment;

[0012] FIG. **3** is a side view of a headwear element according to one embodiment;

[0013] FIG. **4** is a flow diagram illustrating a process according to one embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0014] FIG. **1** is a perspective view of a portion of display device support system **100** according to one illustrative embodiment. Support system **100** includes headwear interface component **110** and display device interface component **130**, which allow display device **120** to be suspended in front of user's eyes.

[0015] In many embodiments, the support system is an attachable portion of a headwear apparatus, such as a hat, a visor or other apparatus that can be placed on the user's head. In other embodiments, headwear interface component **110** is simply the front portion of the hat, visor or other apparatus. In these embodiments, the support system **100** may be attached to the user's head by any acceptable method, for example, double sided tape or by attaching additional support elements to headwear interface component **110**. Headwear interface component **110** may include brim **111** to provide shading and reduces glare to the user.

[0016] In the illustrated embodiments, display device **120** is a device that provides visual information to a wearer. This

visual information can be presented for example, in 2D or in 3D viewing. Display device **120** can be connected to a video or other device (not illustrated) that provides images (e.g., prerecorded or otherwise generated or stored remotely to the device through the use of, for example, wires or cables **122**. Wires **122** may also carry audio or other information to the device.

[0017] In order for the user to properly and comfortably, use the display device, display screens **121** should be placed at normal eye (pupil) level. To assist in the positioning of display device **120**, nose cutout **123** may be provided to allow display device **120** to fit over the user's nose. Due to the variety of human characteristics, a fixed location of display device **120** relative to headwear interface component **110** may not be optimal. In the example embodiments, the support structure allows for the adjustment of display device **120** relative to headwear interface component **110** to permit proper alignment of display screens **121** to the user's eyes.

[0018] FIG. **2** is a perspective view illustrating another example of the present invention shown as support system **200**, as viewed from the front, and shown separated from a headwear apparatus. In the embodiment of FIG. **2**, system **200** includes headwear interface component **210**, and display device interface component **230**.

[0019] Headwear interface component **210** is shaped to conform to a user's forehead. The material used to form hardware interface component **210** can either be flexible or rigid, depending on the desired properties of headwear interface component **210**. The headwear interface component **210** can be surrounded by other material to increase the comfort of the device. According to some embodiments, the outer portion of the headwear interface component **210** includes an adjustment wheel **213**. Adjustment wheel **213** is configured to engage interface teeth **232** on a top portion of device interface component **230** to assist the user in placing display device **120** at the correct level. It should be noted, that embodiments of the present invention are not limited to a wheel. Other embodiments utilize a ball bearing and spring to interface with teeth **232**, and any appropriate detent may be used. of the Also in some embodiments, stops **214** and **215** are provided. Stops **214** and **215** limit the amount of travel permitted of display device **120**. Additionally, channel **216** may be provided to support and control the movement of display device interface component **230** during raising and lowering.

[0020] Display device interface component **230** provides a connection between display device **120** and headwear interface component **210**. Display device interface component **230** includes bottom portion **240** and top portion **250**. In the embodiment illustrated in FIG. **2** bottom portion **240** includes two holes or apertures **226** that are used to affix or attach display device **120** to display device interface component **230**. However, other attachment methods can be used (e.g., clips, snaps, etc.). Top portion **250** includes slot **231** that limits the up and down adjustments of the display device. Slot **231** interfaces with stops **214** and **215** in limiting the range of motion of the support structure. Top portion **250** also includes a set of interface teeth **232** configured to interface with adjustment wheel **213** of headwear interface component **210**. In some embodiments bottom portion **240** includes a hinge or other mechanism placed in a way that permits display device **120** to rotate away from the user's face so that the display device **120** is out of the way when the user periodically needs to view the outside world. Such a hinge or bracket could be placed between top portion **250** and bottom portion **240**, for example, and rotate display device up or rotate display device **120** to the side.

[0021] The system described in the representative embodiments provides a method of suspending and adjusting a display device that is illustrated in FIG. **4**. As shown in step **401**, mount a display device, such as display device **120**, on a component, such as display device interface component **230**, that can be adjustably connected to a component of a headwear apparatus, such as headwear interface component **210**. Adjusting the display device's position, shown in step **402**, can then be accomplished by sliding the device interface component **230** through the connection to the headwear interface component **210**. Display device **120** is illustrated in FIG. **2** as held in place using pressure connector **233**. This applies pressure on device interface component **230** against headwear interface component **210**. The pressure applied by pressure connector **233** retards the movement of display device **120** relative to headwear interface component **210**. To move display device **120** either up or down (i.e., raising/lowering) relative to headwear interface component **210**, as described in step **403** of FIG. **4**, pressure connector **233** is loosened to a point where display device interface component **230** can move. The user then rotates adjustment wheel **213** to move the display device **120**. The rotation of adjustment wheel **213** engages teeth **232** in a method similar to a rack-and-pinion system. Again, it should be noted that the embodiments are not limited to an adjustment wheel, but, rather may use any appropriate mechanism to aide in holding the components in position in relation to each other. For example, other embodiments utilize a ball-bearing or other similar object pressed into the teeth by a spring. Thus, the user is able to adjust the height of display device **120** and display screens **121** relative to the user's eyes. When finished with the adjustment the user retightens pressure connector **233** to prevent additional movement of display device **120**. However, in some embodiments the adjustment wheel **213** can be omitted and display device **120** can be adjusted manually.

[0022] FIG. **3** is a side view of headwear element **110** according to one embodiment of the present invention. Headwear element **110** includes ovoid portion **310** and strap **320**. Ovoid portion **310** is designed to fit around a user's head. Depending on the arrangement and style of headwear element **110**, ovoid portion **310** may be adjustable. Adjustment may be made using any technique for increasing or decreasing the size of ovoid portion **310**.

[0023] Generally, front portion **311** of the ovoid portion **310** is arranged to press or fit against the forehead of the user. In some embodiments, front portion **311** of the ovoid portion **310** has headwear interface component **210** inserted into it. The location of headwear interface component **210** is arranged such that display device **120** can be placed, following adjustment, at the proper location relative to the user's eyes. In other embodiments, ovoid portion **310** is divided into two distinct portions. In yet other embodiments the headwear interface component **210** forms front portion **311** of the ovoid portion **310**. In these embodiments, connection points **313** are provided to connect front portion **311** to back portion **312** to form ovoid portion **310**.

[0024] In some embodiments, a strap **320** is located towards back portion **312** of the ovoid portion **310**. Strap **320** loops over from one side of ovoid portion **310** to the other. When worn by a user, strap **320** typically rests on or near the crown of the user's head. In some embodiments strap **320** is

adjustable to create a better (tighter) fit on the user's head. For example, adjustment can be made using hook-and-eye connectors (such as Velcro®) to properly tighten the strap on the user's head. However, any adjustment method may be used. Strap **320** provides additional support that transfers a portion of the weight associated with display device **120** from the front of the user's head to the back of their head. This results in the user having a more comfortable viewing and wearing experience, and helps to counter the weight of the display device suspended in front of the user.

[0025] Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As one of ordinary skill in the art will readily appreciate from the disclosure of the present invention, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized according to the present invention. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

What is claimed is:

1. A system for supporting a display device in front of a user, comprising:
- a headwear apparatus designed to fit on a head of a user;
- a headwear interface component designed to connect to said headwear apparatus, and formed to a shape of a user's head;
- a display device interface component adjustably connected to said headwear interface apparatus; and
- a display device mounted to the display device interface;
- wherein said display device is suspended in front of said user.

2. The system of claim **1** further comprising:
- a strap coupled to said headwear device, said strap configured to interface across a portion of said user's head, said strap counteracting a force applied by said display device on said headwear device.

3. The system of claim **2** wherein said strap is adjustable.

4. The system of claim **2** wherein said strap is disposed near a back portion of said headwear apparatus and interfaces with a back portion of said user's head.

5. The system of claim **1** wherein said display device interface component is removable from said headwear interface component.

6. The system of claim **1** wherein said headwear interface component is removable from said headwear apparatus.

7. The system of claim **1** further comprising:
- a wheel coupled to said headwear interface component; and
- a plurality of engagement teeth disposed on said display device interface component configured to interact with said wheel to move said display device interface component.

8. The system of claim **1** further comprising:
- a ball-bearing and spring detent connected to said headwear interface component, wherein said ball-bearing is forced to interact with engagement teeth on said display device interface component when said components are slideably connected.

9. The system of claim **8** further comprising:
- a pressure connector that, when engaged, retards movement of said display device interface component relative to said headwear interface component.

10. The system of claim **1** wherein said headwear interface component is attached via set of straps.

11. The system of claim **1** wherein said display device interface includes a rotation means that allows said user to see while keeping said display device connected to said headwear apparatus.

12. The system of claim **1** wherein said headwear apparatus is a visor.

13. A method of putting a display device in front of a user, said method comprising:
- mounting a display device to a display device interface component;
- adjustably connecting said display device component to a headwear interface component; and
- attaching said headwear interface component to a headwear apparatus, wherein said display device is suspended in front of a user.

14. The method of claim **13** further comprising:
- adjusting a position of said display device by vertically sliding said display device interface component relative to said headwear interface component; and
- resisting said sliding with a detent attached to said headwear interface component.

15. The method of claim **14** wherein said adjusting further comprises:
- rotating a wheel on a headwear interface component disposed on said headwear device;
- engaging with said wheel a portion of a display device interface component; and
- raising/lowering said display device interface component in response to said rotating.

16. The method of claim **14** further comprising:
- releasing a restraining component;
- adjusting said display device; and
- reengaging said restraining component.

17. The method of claim **13** further comprising:
- placing a strap coupled to said headwear device for redirecting to the back portion of said users head at least a portion of a weight associated with said display device.

18. A video display system comprising:
- a video display device, said display device having a video display for a right eye and a video display for a left eye;
- a headwear element arranged so as to fit about a wearer's head;
- a connection component coupled to said display device and a front portion of said headwear element, said connection component arranged to couple said video display device to a front portion of said headwear element; and
- a support strap coupled to a rear portion of said headwear element, said support strap transferring at least a portion of a weight associated with said video display device from said front portion to a rear portion of said wear's head.

19. The system of claim **18** wherein said connection component comprises:

a rotatable toothed wheel; and

a toothed rack interfacing with said toothed wheel;

wherein said toothed wheel and toothed rack arranged to adjust a height of said display device relative to said headwear element.

20. The system of claim **19** wherein said connection comprises:

a spring connected to said headwear interface component;

a sphere being pressured by said spring; and

teeth located on said display device interface component, wherein said sphere is pressed into gaps between said teeth when said components are connected.

* * * * *