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(56) Documents Cited:
GB 2516242 A **WO 2017/192996 A2**
WO 2005/067602 A3 **WO 1997/033270 A1**
WO 1996/033270 A1 **WO 1996/007947 A1**
CN 207216151 U **CN 206532041 U**
CN 106343888 A **US 20170337737 A1**
US 20020118506 A1

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(54) Title of the Invention: **Virtual reality or augmented reality headset**
Abstract Title: **Virtual or augmented reality headset**

(57) In a first embodiment, a virtual reality or augmented reality headset 10 comprises a display 101 for displaying an image to a user 20 connected via a connector 105 adapted to rest on the top of the user's head to a counterweight 107. The counterweight may comprise a control unit for generating the image on the display wherein a cable connecting the control unit and display is by a cable in a recess in the connector. The connector and counterweight may be padded. In a second embodiment, the display is connected to the headset such that in in use the display pivots relative to the headset about an axis that intersects the centre of both user's eyes. . The pivot may be formed by a hinge or by a friction joint. The second embodiment may further include a counterweight to balance the display element as in the first embodiment

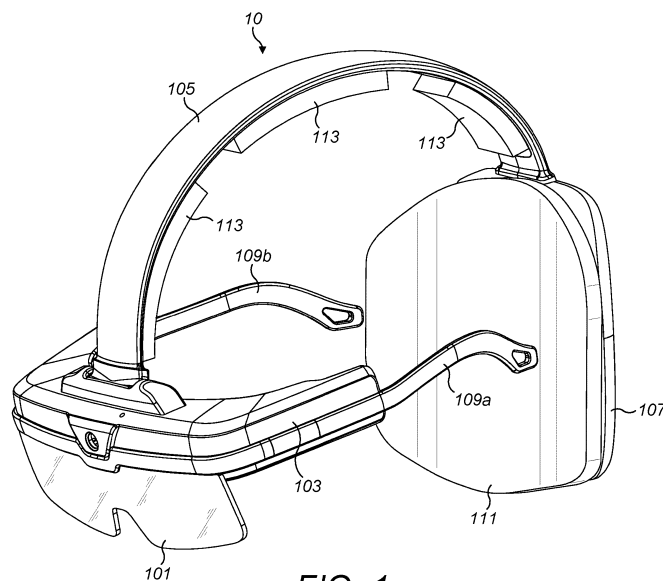
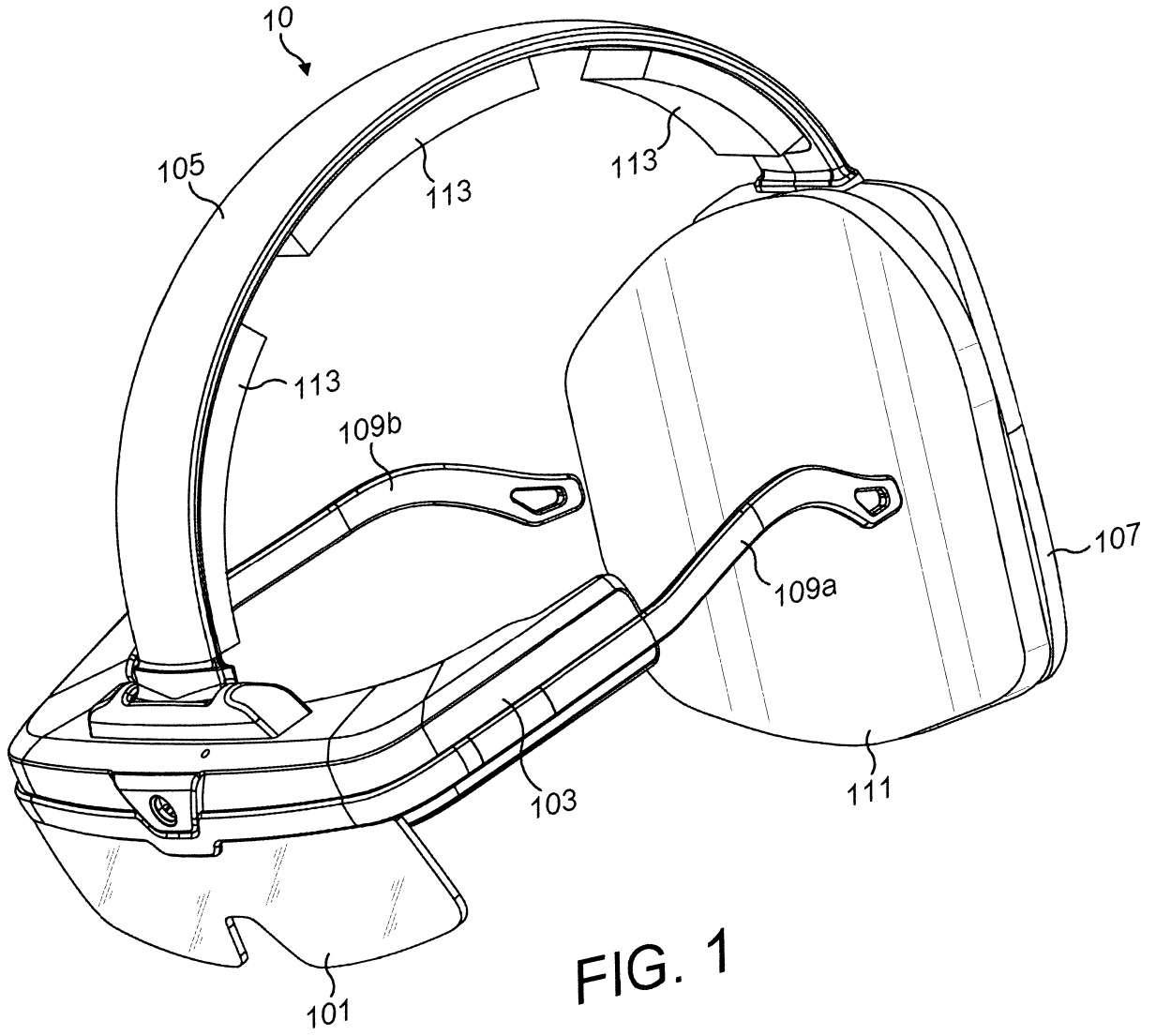


FIG. 1



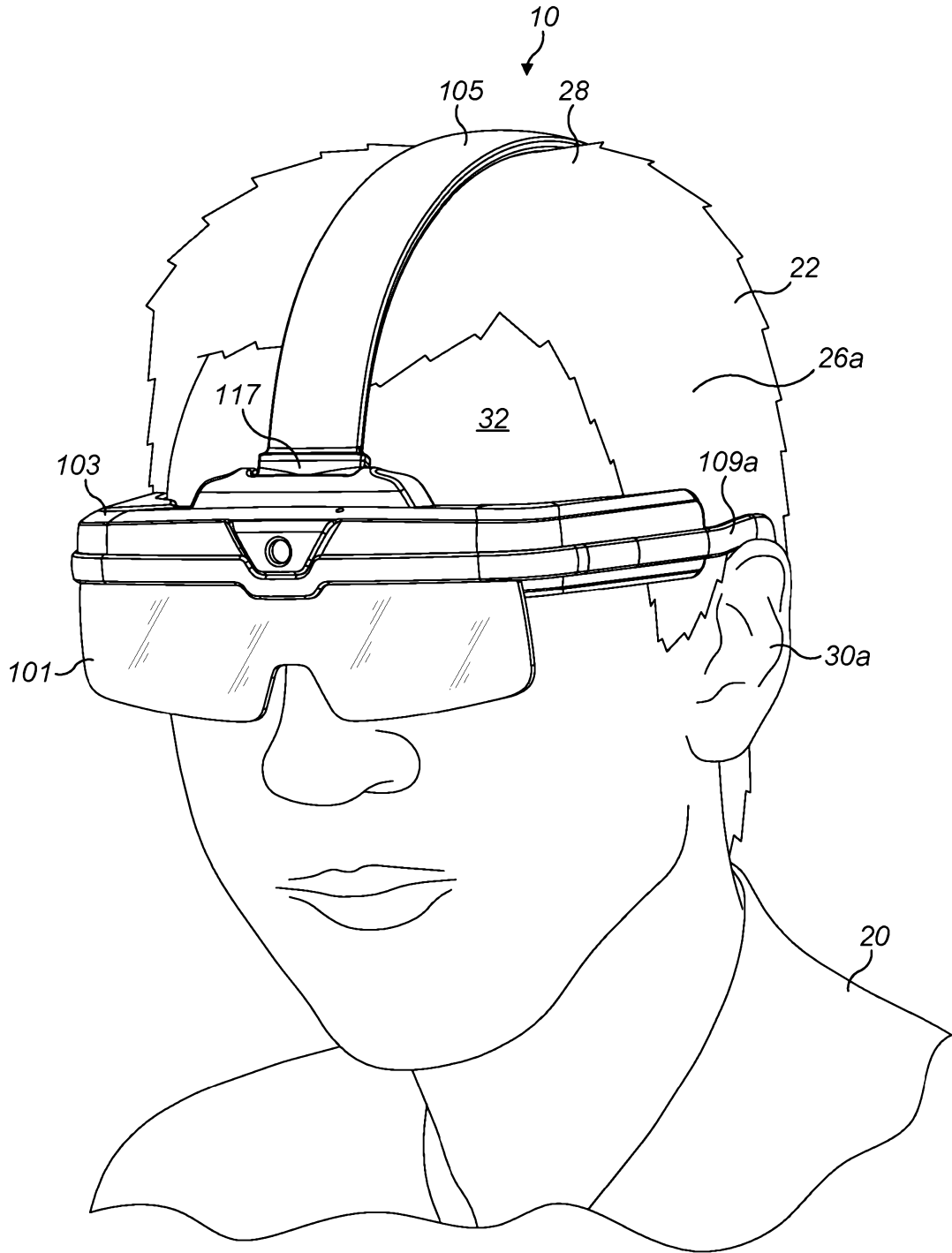


FIG. 2

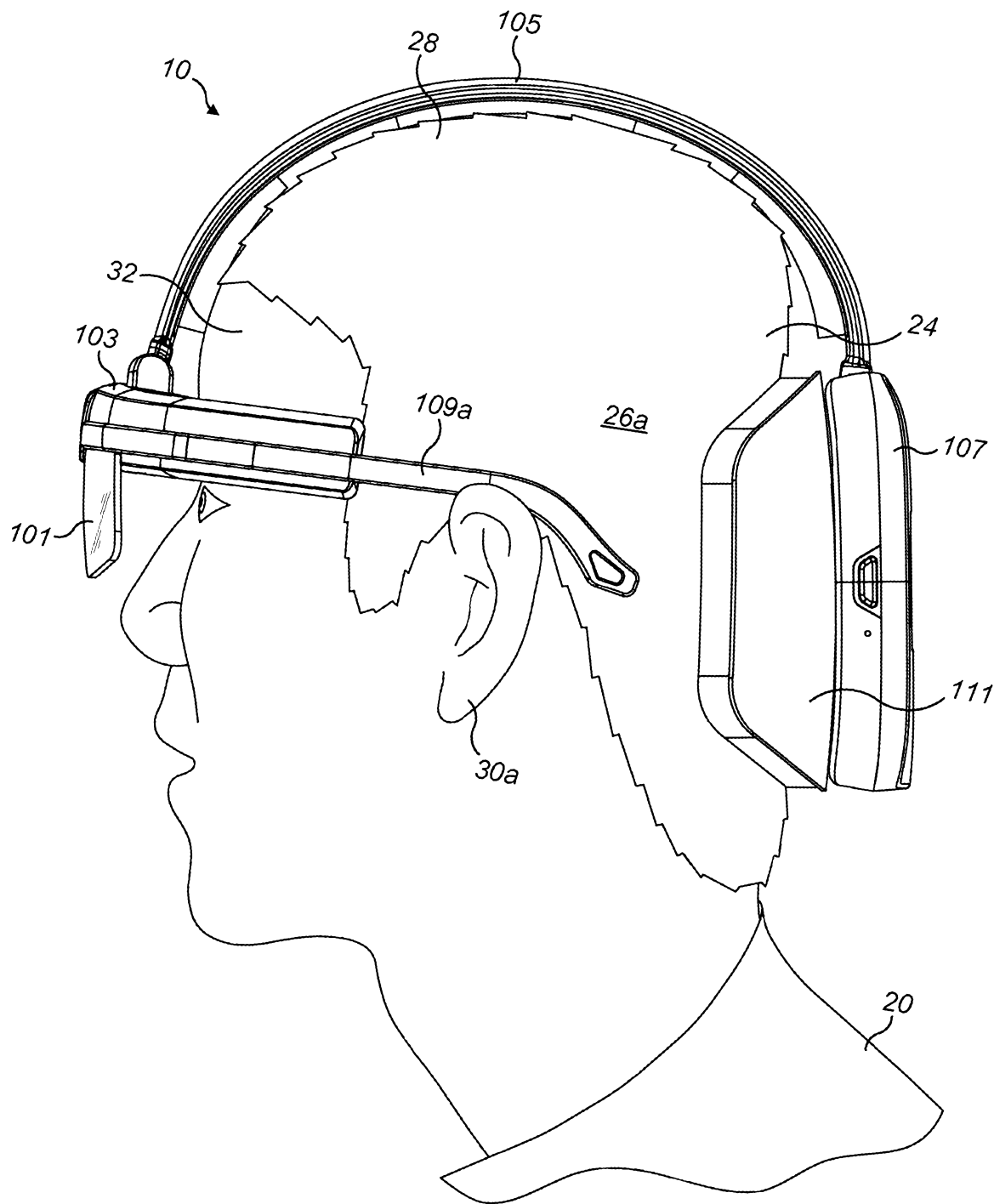


FIG. 3

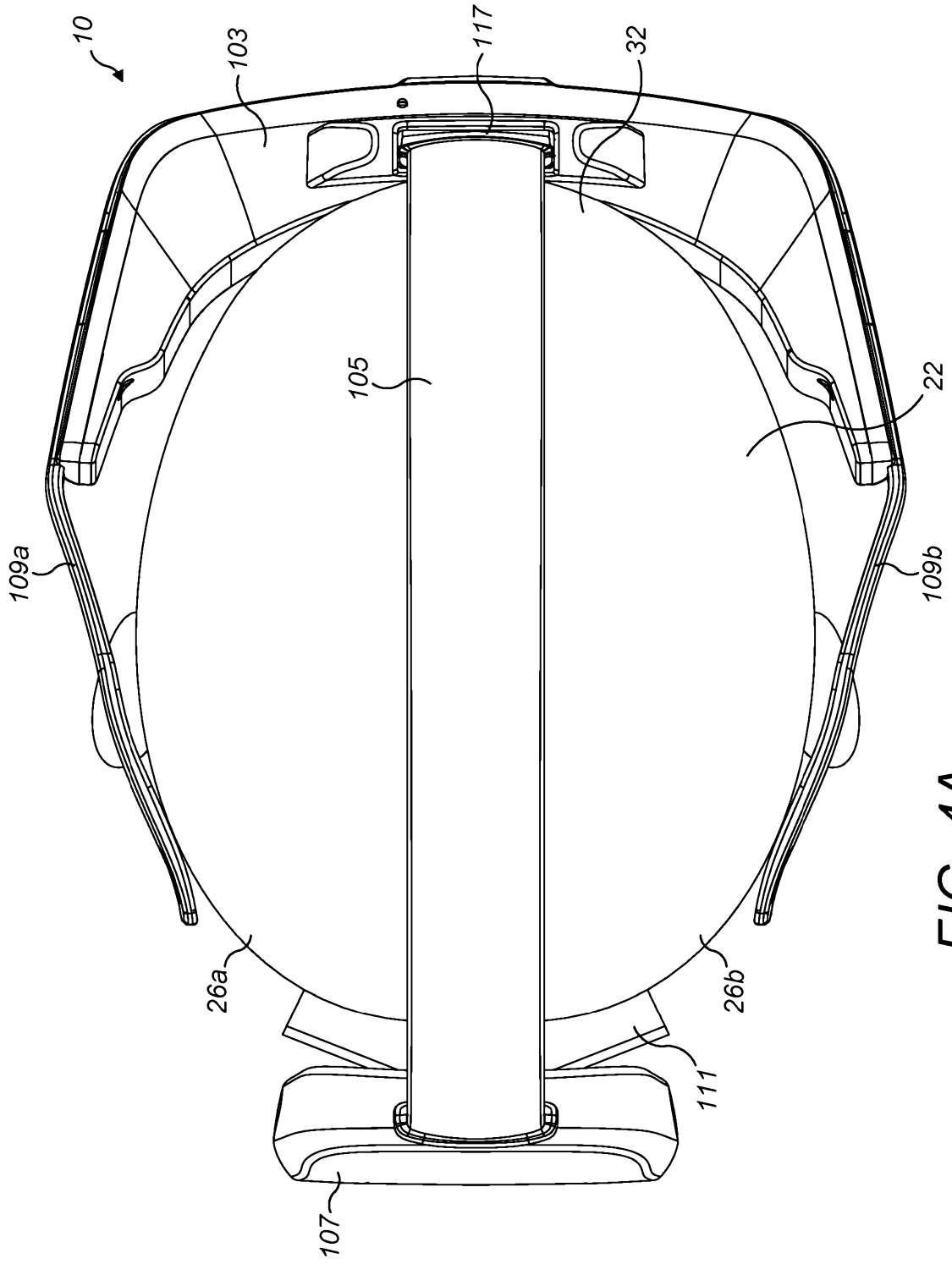
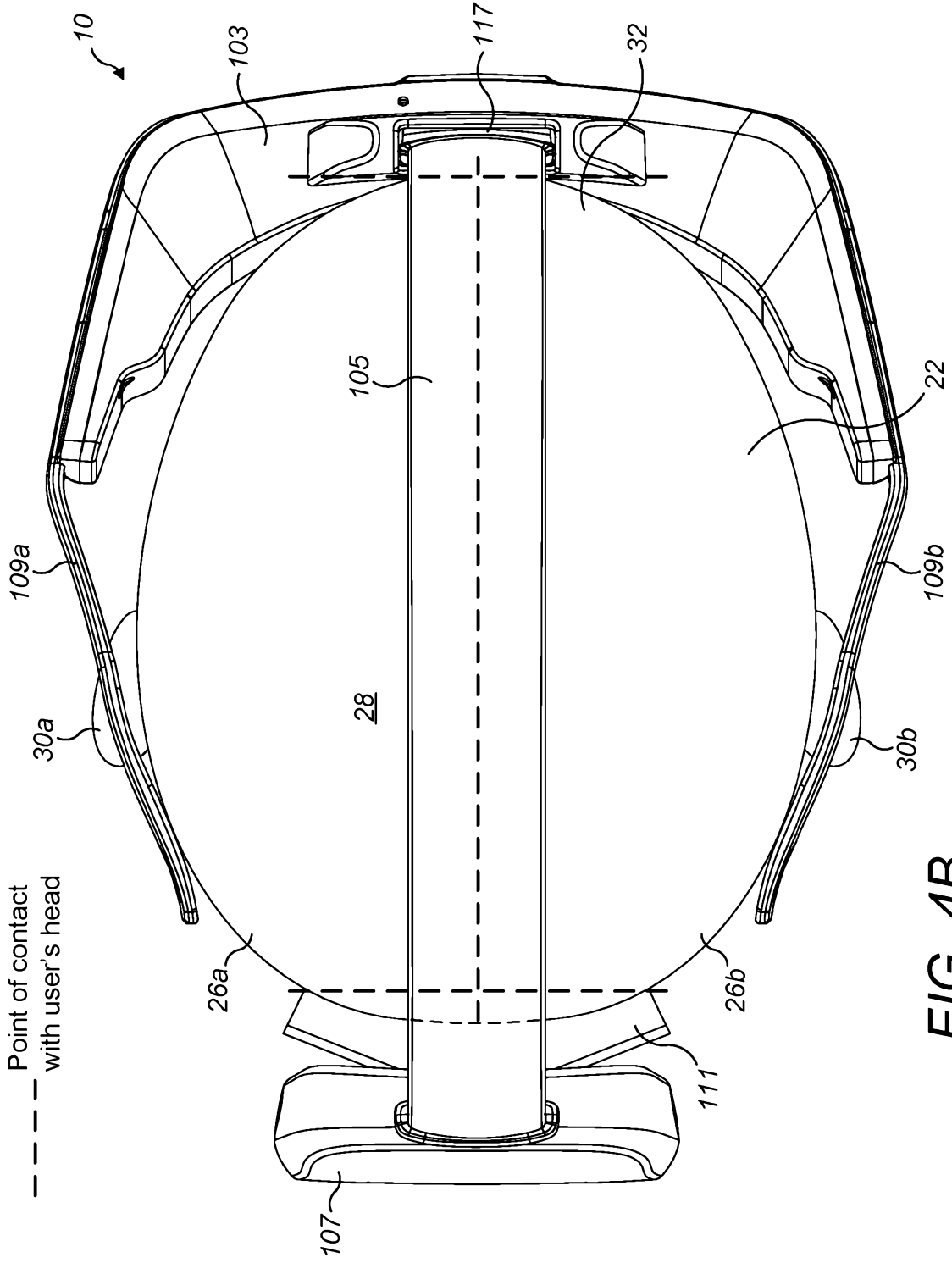


FIG. 4A



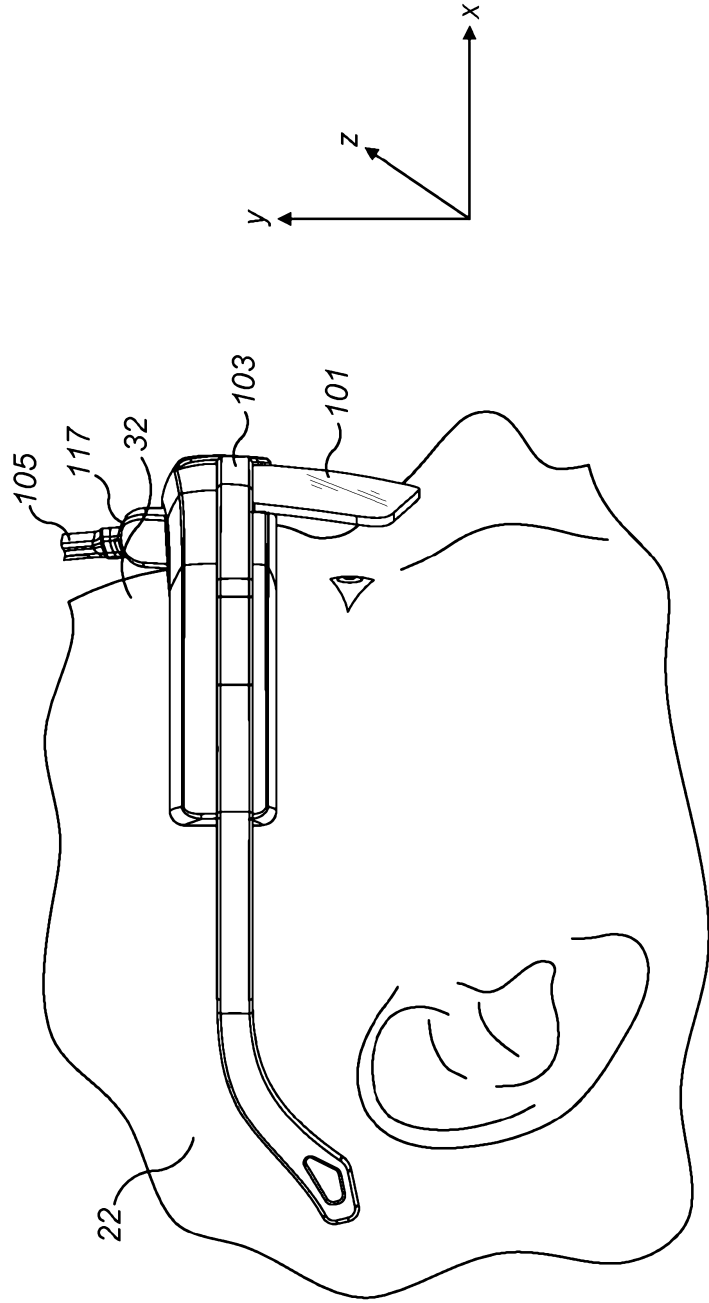


FIG. 5A

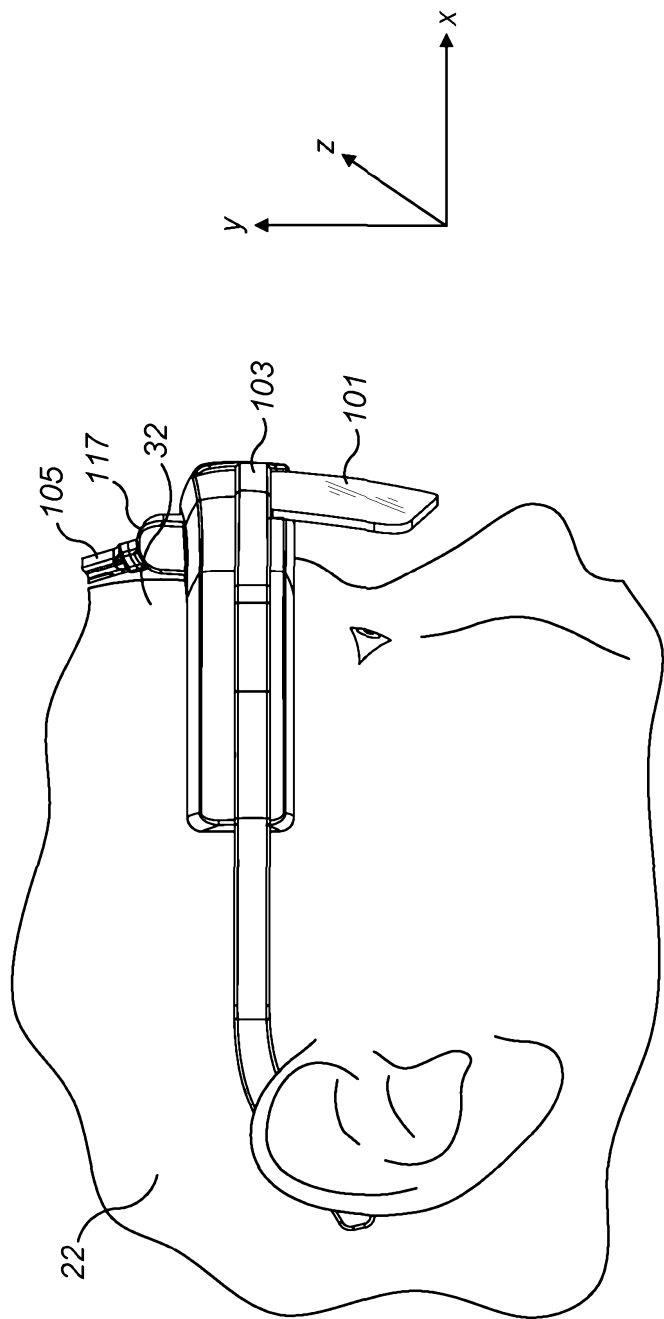


FIG. 5B

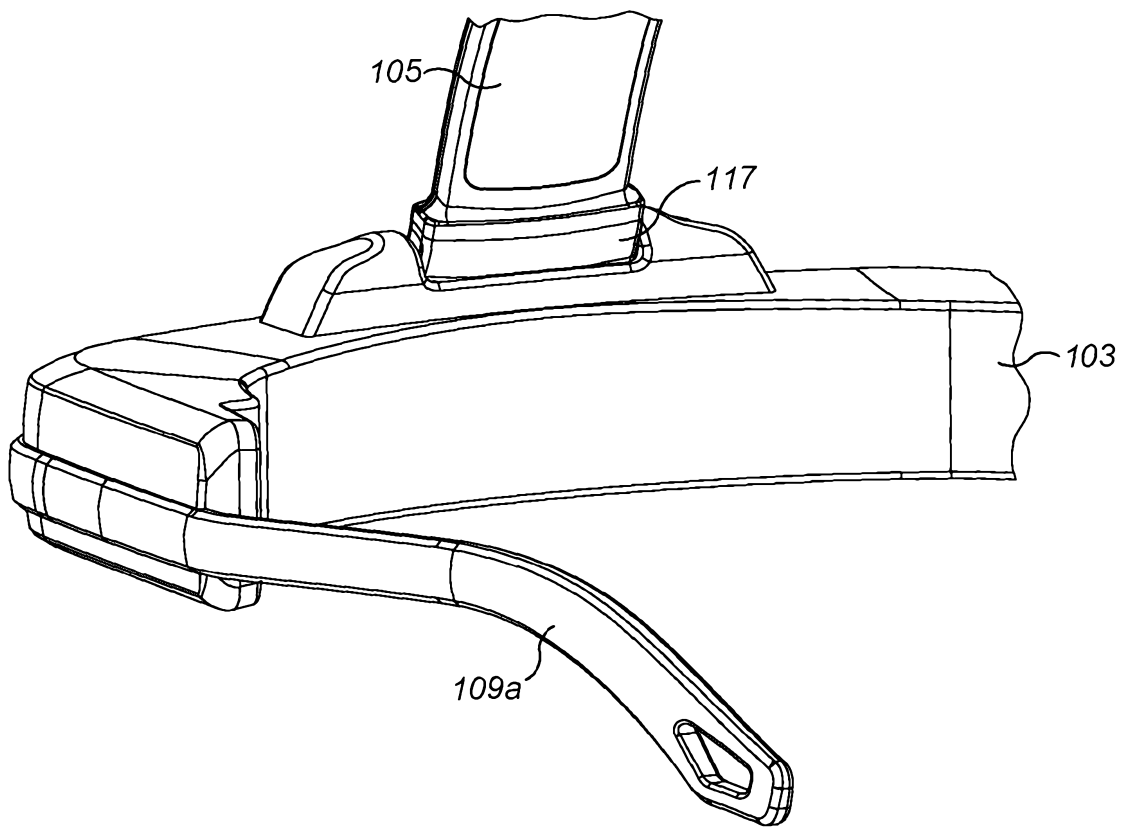


FIG. 6



The following terms are registered trade marks and should be read as such wherever they occur in this document:

Bluetooth

Virtual Reality or Augmented Reality Headset

Technical Field

- 5 The present invention relates to a headset for a virtual reality or augmented reality device.

Background

- 10 In recent years there has been a resurgence in the interest in virtual reality (VR) and augmented reality (AR) technology as improvements in optics and image generation has led to new uses being realised that were not previously possible. VR can now be used to simulate and practice medical procedures, and AR to aid medical professionals when actually performing these procedures on a patient.
- 15 Whilst the use of VR headsets for gaming remains popular and can now provide enhanced immersive gaming experiences.

- Despite the impressive development of the hardware and software used to generate AR and VR images, there has been less development in the wearable
- 20 hardware used in VR and AR headsets.

- Typically VR and AR headsets implement wearable hardware traditionally used in other fields to provide the attachment means for securing the headset to the head of a user. For instance, this may include a series of straps, similar to those
- 25 used in goggles or ski masks, or devices which resemble spectacles or helmets.

Whilst these designs may function to a certain degree, they provide a less than optimised fit to the wearer.

- 30 Due to the weight of these devices, the straps that extend around the user's head need to be tight enough to hold it securely in place. This means that a high pressure is applied to the pressure points on the user's head, on their temples and around their eyes. This is uncomfortable for the user and reduces the amount of time that they may be willing to wear the device.

In addition, most of the weight of convention VR and AR headsets comes from the image generation equipment located within the display region. This means that for spectacle type headsets, which are supported by the user's ears and nose, this can lead to the user experiencing increased neck fatigue when trying to maintain their head in an upright position against the weight of the display pulling the head forwards.

An object of this invention is to provide an improved VR or AR headset that alleviates some of these problems, to provide a consistent display of the generated image, whilst still ensuring that the device is comfortable when worn over extended periods of time.

Summary of invention

15

According to a first aspect of the invention there is provided a virtual reality or augmented reality headset comprising a display for displaying an image to a user, the display configured to be positioned at the front of the head of the user; a counterweight, configured to be positioned at the rear of the head of the user; and a connector connecting the display to the counterweight, such that in use, the connector is adapted to rest on the top of the head of the user to support the weight of the display and the counterweight, and so that the counterweight acts to counter the weight of the display.

Advantageously, the headset provides a comfortable fit for the wearer, as the counterweight at the back of the user's head balances the weight of the display at the front of the user's head. The connector acts as a pivot on the user's head to balance and provide support for the display and counterweight. Therefore, tension is provided through the weight of the display and the counterweight, which is supported by the connector. The headset provides an even weight distribution across the head and away from the nose and temple pressure points. As the weight of the headset is not solely located in the front of the headset the user's head is not drawn forward due to an uneven weight

distribution. This aids in providing a comfortable fit when wearing the headset, reducing fatigue to the user's neck.

5 Preferably, the counterweight comprises a control unit for generating the image, and providing the image to the display. The control unit can therefore provide a balance to counteract the weight of the display at the front of the user's head. In addition, the location of the control unit keeps the weight of the headset to a minimum, so that a secondary counterweight is preferably not required. The control unit may include a battery and/or mobile phone, or other type of
10 electronic device.

In some embodiments, the connector may comprise at least one recess extending between the counterweight and the display, and at least one cable within the at least one recess, the at least one cable for transmitting signals
15 between the control unit and the display. This ensures that the cables running between the control unit and the display are not visible. This can also add to the aesthetically pleasing nature of the headset. In addition, the recess may be located along the side of the connector configured to be closest to the head of the user. This helps to provide a comfortable fit to the user.

20 The cables enable transmission of electrical, optical and/or control signals to the display from the electronics. In some embodiments cables may not be required and other types of connection between the display and control unit that the skilled person would be aware of may be used. For instance, a wireless
25 connection (such as Bluetooth) could be used.

Preferably, the connector is flexible, such that in use, it is configured to contact a plurality of regions of the head of the user, such that the support is distributed across the head of the user. This enables the connector to mould to the user's
30 head when positioning the headset on the user. This provides a comfortable fit for the user, and means that the headset can fit to different users with varying shaped heads to one another. In this way, the connector provides positioning of the headset on the user's head. The tension to hold the headset to the user's

head is provided through the connector balanced by the display and counterweight at the front and back of the user's head.

5 Preferably, the connector is movable from a first shape to a second shape, wherein the second shape is biased towards the first shape, so that the connector can exert a gripping force on the head of the user in the second shape.

10 In this way, the headset can fit to users with a variety of different shaped and sizes of heads, as the connector is configured to expand to fit to the head of the user. In addition, as there is a biasing, the connector provides a continual force on the user's head such that it can securely hold the headset on the user, preventing it from moving on their head.

15 The connector may be arcuate. This ensures that the headset is shaped to accommodate the head of the user. The radius of curvature of the arcuate connector may be different when in the first or the second shape. In some instances, the radius of curvature may be larger when in the second shape. Thus, the arcuate shape of the connector may aid in providing the gripping force.

20

Preferably, the connector comprises cushioning. The cushioning may be one or more cushioning pads. This provides a soft region of the headset against the user's head whilst aiding in the positioning of the headset.

25 In some embodiments, there may be provided a plurality of connectors. For instance, there may be two, three or more connectors. Alternatively, there may be only a single connector.

30 Having more than one connector may help to provide a more secure connection of the headset to the user's head. For instance, two connectors may be provided that are configured to pass over the user's head equally spaced from one another. In other aspects, three or more connectors may be provided.

Preferably, the connector is elongate. This means that the area of the user's head which is covered by the headset is reduced, making the headset easy to wear. For instance, the connector may be comprised of a thin strip of material connecting the display and the counterweight. This may mean the user's head
5 does not get as hot when wearing the headset.

Preferably, there is provided a plurality of balancing members configured to contact the head of the user, such that when in use, the balancing members control the orientation of the display relative to an axis intersecting the centre of
10 both of the eyes of the user.

The plurality of balancing members may include a first balancing member and a second balancing member, the first and second balancing members configured in use to contact respective ears of the user.

15

Advantageously, the balancing members, otherwise known as arms or temples, enable balancing and additional securing and positioning of the headset to the user's head. This may provide a more comfortable fit for the user.

20 The counterweight may comprise at least one pressure pad, such that when in use, the at least one pressure pad cradles the back of the head and extends along at least a portion of the sides of the head of the user.

Advantageously, this provides stability and aids in weight distribution of the headset, whilst helping to ensure easy and correct positioning (i.e. self-centring)
25 of the headset when putting it onto the user. The pressure pad may have a winged shape.

The at least one pressure pad may be padded. This aids in providing a
30 comfortable fit to the user's head. For instance, it may include a soft cushioning material.

According to a second aspect of the invention there is provided a virtual reality or augmented reality headset comprising a display for displaying an image to a

user, the display configured to be positioned at the front of the head of a user; a head mounting attachment, attached to the display, configured to support the display through contact with the top of the head of the user and the forehead of the user; wherein the head mounting attachment comprises a movable joint, such that in use, the display is pivotable relative to the head mounting attachment about an axis that intersects the centre of both of the eyes of the user.

Different users may have various different shapes, and specifically different slopes of foreheads. Having a pivotable display enables its position to be adjusted to take into account the slope of the forehead of the user. In this way the display can be moved and positioned relative to the user's line of sight such that it remains in a vertical orientation (i.e. perpendicular to the axis that intersects the centre of both of the user's eyes). Having a pivotable display can also help ensure that the display is positioned at the correct distance from the user's eyes. This may also help prevent the user from getting eye strain from a poorly positioned display.

In some embodiments the movable joint may comprises a hinge. A hinge mechanism enables the device to be adjusted in a set direction about a fixed axis. This may be a friction hinge. The friction hinge acts against the weight of the display to ensure that once the headset is positioned on the head of the user that the display does not undesirably move about the movable joint.

Alternatively, in other embodiments the movable joint may be a ball and socket joint. Any other type of movable joint that the skilled person would be aware of could be used.

Preferably, the head mounting attachment comprises: a counterweight, configured to be positioned at the rear of the head of the user; and a connector connecting the display to the counterweight, such that in use, the connector is adapted to rest on the top of the head of the user to support the weight of the display and the counterweight, and so that the counterweight acts to counter the weight of the display.

Alternatively, the hinge may be located anywhere along the connector. There may be a plurality of hinges. For instance, a hinge may connect the connector and the counterweight. This would enable further adjustment of the headset to enable a comfortable fit for users with different shaped heads.

The skilled person would understand that features of the first aspect are not limited to the first aspect and may be equally provided in the second aspect, and vice versa.

10

Brief Description of Drawings

Embodiments of the invention are now described, by way of example, with reference to the drawings, in which:

15

Figure 1 is a side perspective view of the headset in an embodiment of the present invention;

20

Figure 2 is a front perspective view of the headset shown in Figure 1 when on a user's head;

Figure 3 is a side view of the headset shown in Figure 1 when on a user's head;

25

Figure 4A is a top view of the headset shown in Figure 1 when on a user's head;

Figure 4B is a top view of the headset shown in Figure 1 when on a user's head showing the points of contact with the user's head;

30

Figure 5A is a close up side view of the headset shown in Figure 1 when on a user's head, where the headset is in a first orientation;

Figure 5B is a close up side view of the headset shown in Figure 1 when on a user's head, where the headset is in a second orientation; and

Figure 6 is a view of the hinge mechanism of the headset shown in Figure 1.

Detailed Description

5 Figure 1 shows a side on perspective view of an AR headset 10 in an embodiment of the present invention. The headset 10 includes a tiltable forehead mount 103. Attached to the forehead mount 103 is a waveguide 101 on which an image can be displayed to the user.

10 The forehead mount 103 is connected through a connector 105 to a rear head support 107. The connector 105 is a single elongate curved strip of material that connects the forehead mount 103 and the rear head support 107. The connector 105 is connected to the forehead mount 103 through a hinge 117.

15 Extending from either side of the forehead mount 103 are a pair of arms 109a and 109b, otherwise known as temples. The arms 109 have curved ends, having a similar shape to the arms of spectacles.

The rear head support 107 has a winged pressure pad 111 configured to contact
20 the head 22 of the user. The connector 105 has three padded regions 113 along its inside surface.

Figures 2, 3 and 4A show the headset 10 of Figure 1 on a user 20, when on the
25 user's head 22, showing a front perspective view, a side view, and a top view, respectively.

As can be seen from Figures 2, 3, and 4A the waveguide 101 is positioned in
front of the user's eyes, such that it is in the field of view of the user 20. The
connector 105 extends over the user's head 22 resting on the top 28 and along
30 the length of the head 22. The rear head support 107 supports the rear of the
head 24 of the user 22. The winged pressure pad 111 ensures that the rear
head support 107 supports the back 24 of the user's head 24 extending around
both of the sides 26a 26b of the user's head 22. Thus, the winged pressure pad

111 provides a cushioning function, this cushioning being comfortable for the wearer through the contact of the head 22 with the winged pressure pad 111.

5 The weight of the rear head support 107 is balanced with the weight of the forehead mount 103 and the waveguide 101 such that the rear head support 107 acts as a counterweight against the weight of the forehead mount 103 and the waveguide 101. The weight of the forehead mount 103, waveguide 101 and rear head support 107, is supported against the head of the user 22 through the connector 105. The padded regions 113 on the connector aid in providing a
10 comfortable support of the connector 105 against the head of the user 22.

Although it cannot be seen from the figures, located within the rear head support 107 is the control unit for generating the image and providing the image to the display 101. The control unit provided within the rear head support provides the
15 predominant weight of the rear head support 107.

In the embodiment shown in the figures, the control unit is connected to the forehead mount 103 through a plurality of cables. Although it cannot be seen in the figures, the cables are located within recesses located on the connector 105.
20 The cables provide the transmission of the control signals and electrical signals from the control unit to the waveguide 101 to generate the image.

The headset 10 is an AR headset 10 with the image displayed to the user 20 through the waveguide 104 using commonly known processes and techniques in
25 AR that the skilled person would be aware of.

It can be further seen from Figures 2, 3 and 4A that the arms 109 are arranged to rest on the respective ears 30a 30b of the user 20. The arms 109 enable balancing additional securing and positioning of the headset 10 to the user's
30 head 22. This may also provide a more comfortable fit for the user 20.

Figure 5A and 5B show a close up side view of the headset 10 shown in Figure 1 when on a user's head 22 in two different orientations. The hinge 117 connecting the forehead mount 103 to the connector 105 enables movement of

the forehead mount 103 and the waveguide 101 such that the headset can fit to users 20 with varying shaped foreheads 32. Figure 6 shows a close up of the hinge 117.

5 Shown in Figure 5A and 5B is a reference axis that will be used herein to describe the movement of the headset 10 about the hinge 117. This reference axis is defined when the user 20 is standing and facing looking forwards. The z-axis is the axis that intersects through the centre of both of the eyes of the user 20. The y-axis is the axis that extends upwards, i.e. between the nose of the
10 user and the forehead 32. The x-axis extends straight ahead of the user 20.

The hinge 117 enables the forehead mount 103 and waveguide 101 to be pivoted about the z-axis relative to the connector 105. The hinge 117 enables a range of movement of approximately 30 degrees, i.e. approximately 15 degrees
15 in either direction relative to a central position. The hinge 117 is a friction hinge, such that once moved by the user 20 into position, the hinge 117 maintains its position unless a user 20 exerts a force large enough such that the friction is overcome and the hinge 117 is activated.

20 Comparing Figure 5A and 5B, the hinge 117 in Figure 5B has been moved about the z-axis such that the waveguide 101 is further and higher with respect to the user's eye, i.e. displaced along the x- and y-axis when compared to the position of the waveguide 101 in Figure 5A.

25 Being able to move the forehead mount 103 enables the waveguide 101 to be positioned relative to the user's line of sight and to be maintained in a vertical orientation. As the hinge 117 is located in proximity to the forehead 32 of the user this enables a customised positioning of the headset 10 for users who may have differently sloped foreheads. This helps ensure that the waveguide 101 is
30 positioned at the correct distance from the user's eyes. This may help prevent the user from getting eye strain from a poorly positioned waveguide 101.

The connector 105 is made from a material that is flexible, such that when the headset 10 is placed on the user's head 22, the tension from the weight of the

components at the front and rear of the user's head causes the connector 105 to flex to conform to the shape of the user's head 22. This can be seen in Figure 4B which shows the regions where the headset 10 is in contact with the user's head 22. As can be seen the connector 105 is in contact with the user's head 22 along the length of the connector 105 extending between the forehead mount 103 and the rear head support 107. As the connector 105 is providing the support for the forehead mount 103 and rear head support 107, this helps distribute the load across the user's head 22. Figure 4B also shows that the headset 10 is in contact with the user's head 22 through the forehead mount 103 at the user's forehead 32 and at the rear of the head 24 in contact with the rear head support 107, as previously discussed.

In addition, the headset 10 is made from a material that ensures when the headset 10 is to be placed on the user's head 22, that the connector 105 can be stretched from a first shape to a second shape such that the head of the user 22 can be accommodated within the curved connector 105. Once the headset 10 is located on the user's head 22, the connector 105 then contracts towards its original shape, such that the connector 105 exerts a gripping force on the head of the user 22.

This enables the headset 10 to fit to users 20 with a variety of different shapes and sizes of heads 22, as the connector 105 is configured to expand to fit to the head of the user 22. In addition, the connector 105 provides a tension with the head such that it can securely hold the headset 10 on the user, preventing it from moving on their head 22. The shape of the winged pressure pad 111 also aids in correct orientation of the headset 10 when it is placed on the wearer's head 22 by supporting the rear 24 and extending down the sides 26 of the back of the user's head.

In addition, the arms 109a 109b aid in the securing and correct positioning of the headset 10 when it is placed on the wearer's head 22. As previously mentioned each of the arms 109 contacts the user's respective ears 30. This aids in balancing of the headset 10 such that the display 101 is maintained at a position

orientated relative to the z-axis. This ensures that the waveguide 104 is at the same position in the x- and y-axis relative to the user's eyes.

5 Many modifications and variations may be made to the above-described embodiments within the scope of the invention.

Although the embodiments show an AR headset, it can be understood that the headset may instead be used for VR technology. Furthermore, the waveguide may be any type of device for displaying images to a user.

10

The arms in the embodiment shown are not movable with respect to the forehead mount 103. However, in other embodiments the arms might be attached to the forehead mount through one or more hinges in a similar way as is known in spectacles. In other embodiments no arms 109 may be provided.

15

In other embodiments the single connector 105 may be supplemented by one or more additional connectors. For instance there may be a connector located either side of the connector 105 which contact the side of the user's head. The additional connectors may or may not also be attached to the rear head support

20

107 and may or may not be hinged.

CLAIMS

1. A virtual reality or augmented reality headset comprising:
a display for displaying an image to a user, the display configured to be
5 positioned at the front of the head of the user;
a counterweight, configured to be positioned at the rear of the head of the
user; and
a connector connecting the display to the counterweight, such that in use,
the connector is adapted to rest on the top of the head of the user to support the
10 weight of the display and the counterweight, and so that the counterweight acts
to counter the weight of the display.
2. The headset of claim 1, wherein the counterweight comprises a control
unit for generating the image, and providing the image to the display.
15
3. The headset of claim 2, wherein the connector comprises at least one
recess extending between the counterweight and the display, and at least one
cable within the at least one recess, the at least one cable for transmitting
signals between the control unit and the display.
20
4. The headset of any preceding claim, wherein the connector is flexible,
such that in use, it is configured to contact a plurality of regions of the head of
the user, such that the support is distributed across the head of the user.
- 25 5. The headset of any preceding claim, wherein the connector is movable
from a first shape to a second shape, wherein the second shape is biased
towards the first shape, so that the connector can exert a gripping force on the
head of the user in the second shape.
- 30 6. The headset of any preceding claim, wherein the connector is arcuate.
7. The headset of any preceding claim, wherein the connector comprises
cushioning.

8. The headset of any preceding claim, comprising a plurality of connectors, or a single connector.

9. The headset of any preceding claim, wherein the connector is elongate.

5

10. The headset of any preceding claim, further comprising a plurality of balancing members configured to contact the head of the user, such that when in use, the balancing members control the orientation of the display relative to an axis intersecting the centre of both of the eyes of the user.

10

11. The headset of claim 10, wherein the plurality of balancing members comprise a first balancing member and a second balancing member, the first and second balancing members configured in use to contact a respective ear of the user.

15

12. The headset of any preceding claim, wherein the counterweight comprises at least one pressure pad, such that when in use, the at least one pressure pad cradles the back of the head and extends along at least a portion of the sides of the head of the user.

20

13. The headset of claim 12, wherein the at least one pressure pad is padded.

14. A virtual reality or augmented reality headset comprising:

25

a display for displaying an image to a user, the display configured to be positioned at the front of the head of a user;

a head mounting attachment, attached to the display, configured to support the display through contact with the top of the head of the user and the forehead of the user;

30

wherein the head mounting attachment comprises a movable joint, such that in use, the display is pivotable relative to the head mounting attachment about an axis that intersects the centre of both of the eyes of the user.

15. The headset of claim 14, wherein the movable joint comprises a hinge.

16. The headset of claim 14 or 15, wherein the movable joint is a friction
5 hinge.

17. The headset of any of claims 14 to 16, wherein the head mounting
attachment comprises:

10 a counterweight, configured to be positioned at the rear of the head of the
user; and

a connector connecting the display to the counterweight, such that in use,
the connector is adapted to rest on the top of the head of the user to support the
weight of the display and the counterweight, and so that the counterweight acts
to counter the weight of the display.

15

18. The headset of claim 17, wherein the connector is elongate.

19. The headset of any of claim 17 or 18, comprising a plurality of
connectors.

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20. The headset of any of claims 17 to 19, wherein the connector is arcuate.

21. The headset of any of claims 17 to 20, wherein the counterweight
comprises a control unit for generating the image, and providing the image to the
25 display.

22. The headset of claim 21, wherein the connector comprises at least one
recess extending between the counterweight and the display, and at least one
cable within the at least one recess, the at least one cable for transmitting
30 signals between the electronics and the display.

23. The headset of any of claims 17 to 22, wherein the connector is movable
from a first shape to a second shape, wherein the second shape is biased

towards the first shape, so that the connector can exert a gripping force on the head of the user in the second shape.

24. The headset of any of claims 17 to 23, wherein the connector comprises
5 cushioning.

25. The headset of any claims 17 to 24, further comprising a plurality of
balancing members configured to contact the head of the user, such that when
in use, the balancing members control the orientation of the display relative to an
10 axis intersecting the centre of both of the eyes of the user.

26. The headset of claim 25, wherein the plurality of balancing members
comprise a first balancing member and a second balancing member, the first
and second balancing members configured in use to contact a respective ear of
15 the user.

27. The headset of any of claims 17 to 26, wherein the counterweight
comprises at least one pressure pad, such that when in use, the at least one
pressure pad cradles the back of the head and extends along at least a portion
20 of the sides of the head of the user.

28. The headset of claim 27, wherein the at least one pressure pad is
padded.



Application No: GB1721347.1

Examiner: Sophie Cartmell

Claims searched: 1-13

Date of search: 14 June 2018

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-13	WO 96/07947 A1 (VIRTUAL I O) See particularly page 5, lines 4-6; page 8, lines 6-27 and page 20, line 30 to page 21, line 4 and figure 17A
X	1-13	WO 97/33270 A1 (VIRTUAL VISION) See particularly page 6, lines 4-21 and figure 1
X	1 and 4-13	CN 106343888 A (GUANGZHOU KEBAND INFORMATION TECH) See whole document
X	1 and 4-13	US 2017/337737 A1 (EDWARDS et al.) See particularly paragraph 50 and figure 1C
X	1 and 4-13	CN 207216151 U (SHENZHEN MENGYUN HOLOGRAPHIC CULTURE) See particularly paragraph 19 and figure 1
X	1 and 4-13	GB 2516242 A (TEN) See particularly page 2, paragraph 6 to page 3, paragraph 2 and figure 1

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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Worldwide search of patent documents classified in the following areas of the IPC

G02B

The following online and other databases have been used in the preparation of this search report

EPODOC, Patent Fulltext, WPI



International Classification:

Subclass	Subgroup	Valid From
G02B	0027/01	01/01/2006



Application No: GB1721347.1

Examiner: Sophie Cartmell

Claims searched: 14-28

Date of search: 18 January 2019

Patents Act 1977

Further Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X:14-16 Y:17-28	US 2002/0118506 A1 SAITO - See whole document especially Fig 1 and 8- 20. Note in Fig 19 and 20 the pivot on the display connected to the headband and the double pivot arrangement of Fig 1 and 8-18.
X,Y	X:14-16; Y: 17-28	CN 206532041 U BEIJING PICO - See Fig 1 and 2. Note the pivot joint between the headband 5 and the display 1 that allows the display to rotate about an axis parallel with the axis through the eyes of the user.
X,Y	X:14-16; Y:17-28	WO 2017/192996 A2 WATSON - See whole document especially Fig 7-22. Note the various embodiments for pivoting the display relative to the headband which contacts the top of the head.
X,Y	X:14-16; Y:17-28	WO 2005/067602 A3 ICUITI - See whole document especially Figs 1-3 and paragraphs 0013 to 0015. Note the display pivoting relative to the headband via friction joint.
Y	17-28	WO 96/33270 A1 VIRTUAL VISION - See Fig and Page 6 Line 4-21. Note reference to a counterweight to a display.
Y	17-28	WO 96/07947 A1 VIRTUAL IO - See Fig 17A and page 5 lines 4-6. Note reference to a counterweight

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC



G02B

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
G02B	0027/01	01/01/2006