US 20260235874 A1

(19) **United States**
(12) **Patent Application Publication**
Chambers et al.

(10) **Pub. No.: US 2026/0235874 A1**
(43) **Pub. Date: Aug. 13, 2026**

(54) **DISPLAY ADJUSTMENT FOR A HEAD-MOUNTABLE DISPLAY DEVICE**

(71) Applicant: **Apple Inc.,** Cupertino, CA (US)

(72) Inventors: **Trevor S. Chambers,** San Diego, CA (US); **Alexander B. von Schulmann,** Sunnyvale, CA (US); **Matin Seadat Beheshti,** Sunnyvale, CA (US)

(21) Appl. No.: **19/301,065**

(22) Filed: **Aug. 15, 2025**

Related U.S. Application Data

(60) Provisional application No. 63/758,214, filed on Feb. 13, 2025.

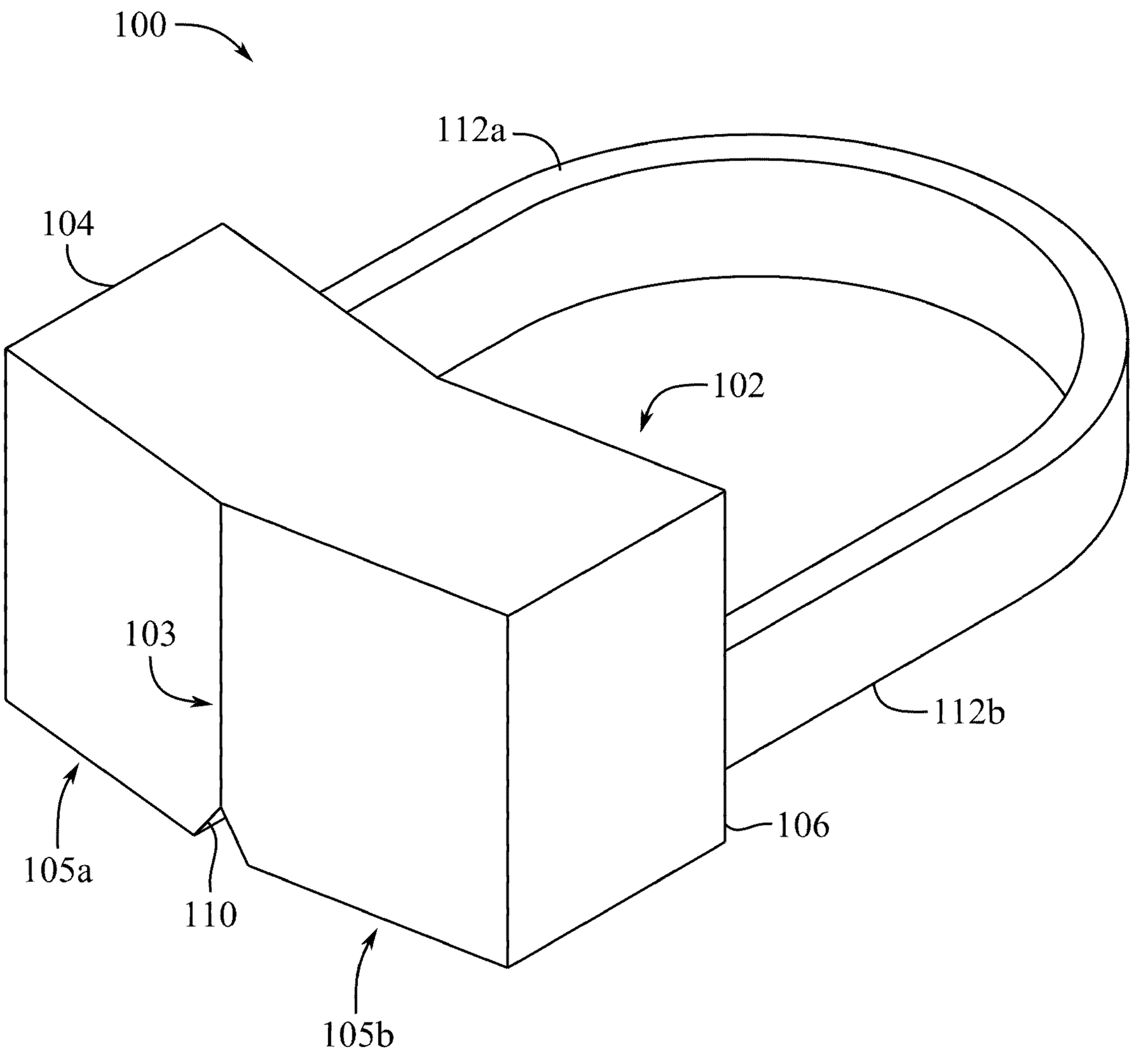
Publication Classification

(51) **Int. Cl.**
G02B 27/01 (2006.01)
G02B 7/12 (2021.01)

(52) **U.S. Cl.**
CPC ***G02B 27/0149*** (2013.01); ***G02B 7/12*** (2013.01); *G02B 2027/0154* (2013.01)

(57) **ABSTRACT**

A head-mountable display device (HMD) can include a frame, a display coupled to the frame, an adjustment mechanism, and a motion transfer member. The display can include a first optical module and a second optical module. The adjustment mechanism can be coupled to the first optical module. The motion transfer member can be coupled to the adjustment mechanism and the second optical module. The motion transfer member can extend between the first optical module and the second optical module. The adjustment mechanism can be configured to simultaneously adjust a position of the first optical module and a position of the second optical module relative to each other.



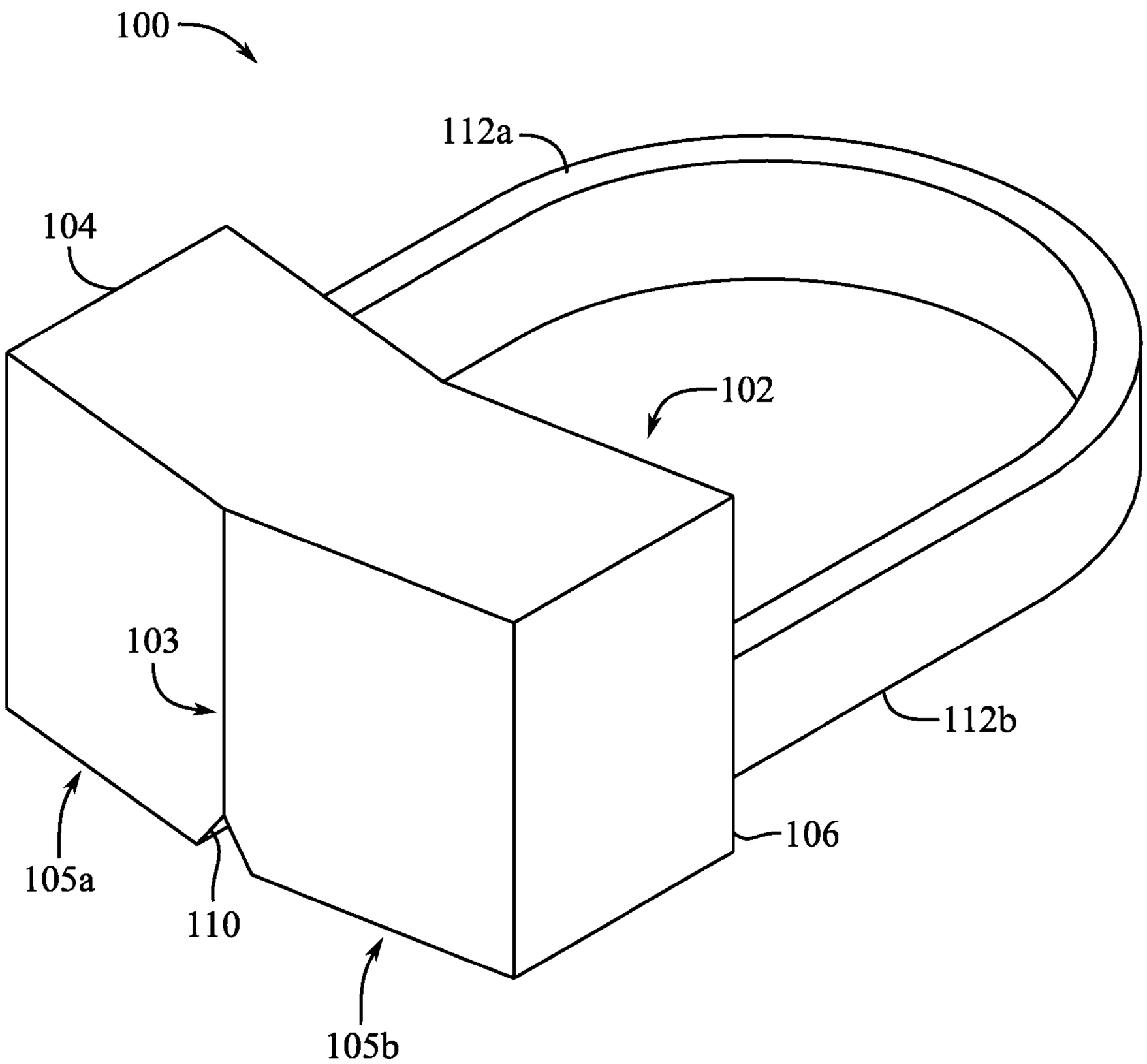


FIG. 1

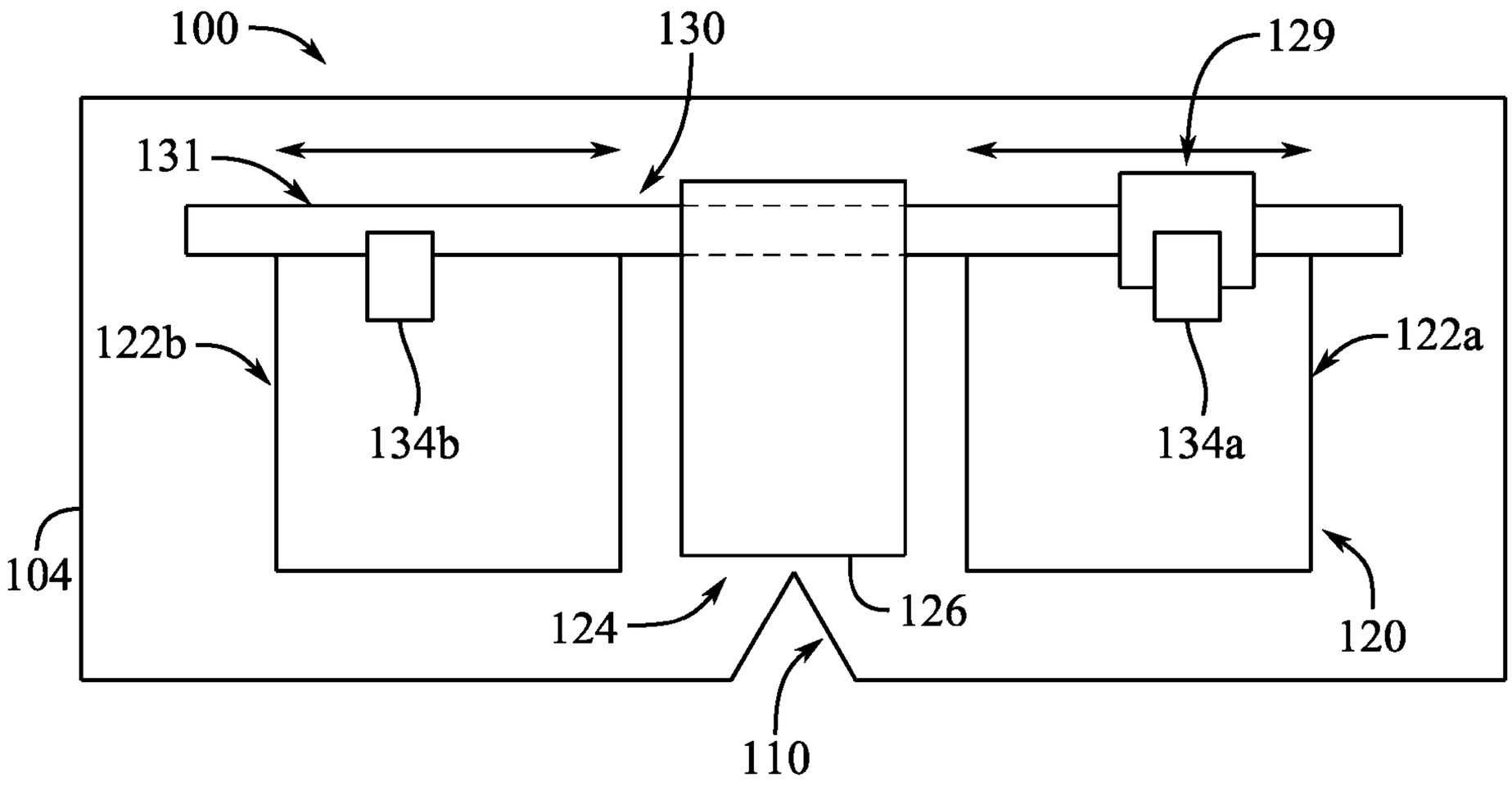

100
130
129
131
122b
134b
134a
122a
104
124
126
120
110

FIG. 2

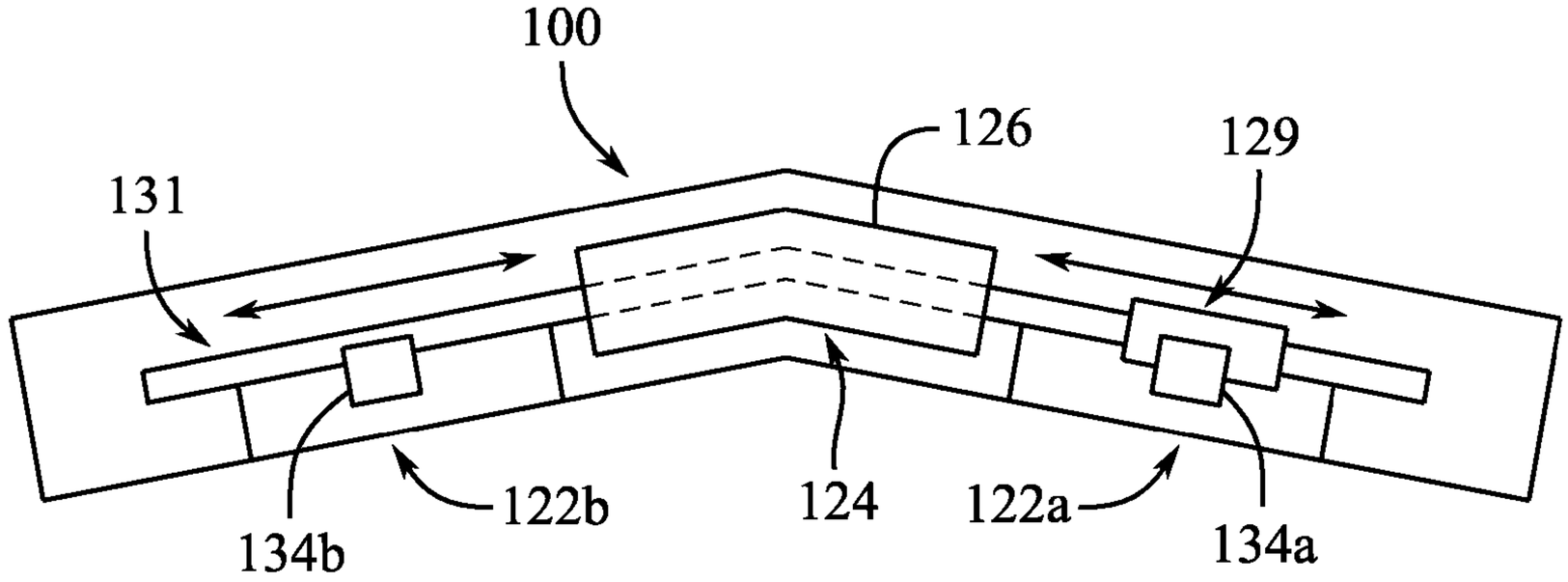

100
126
129
131
134b
122b
124
122a
134a

FIG. 3

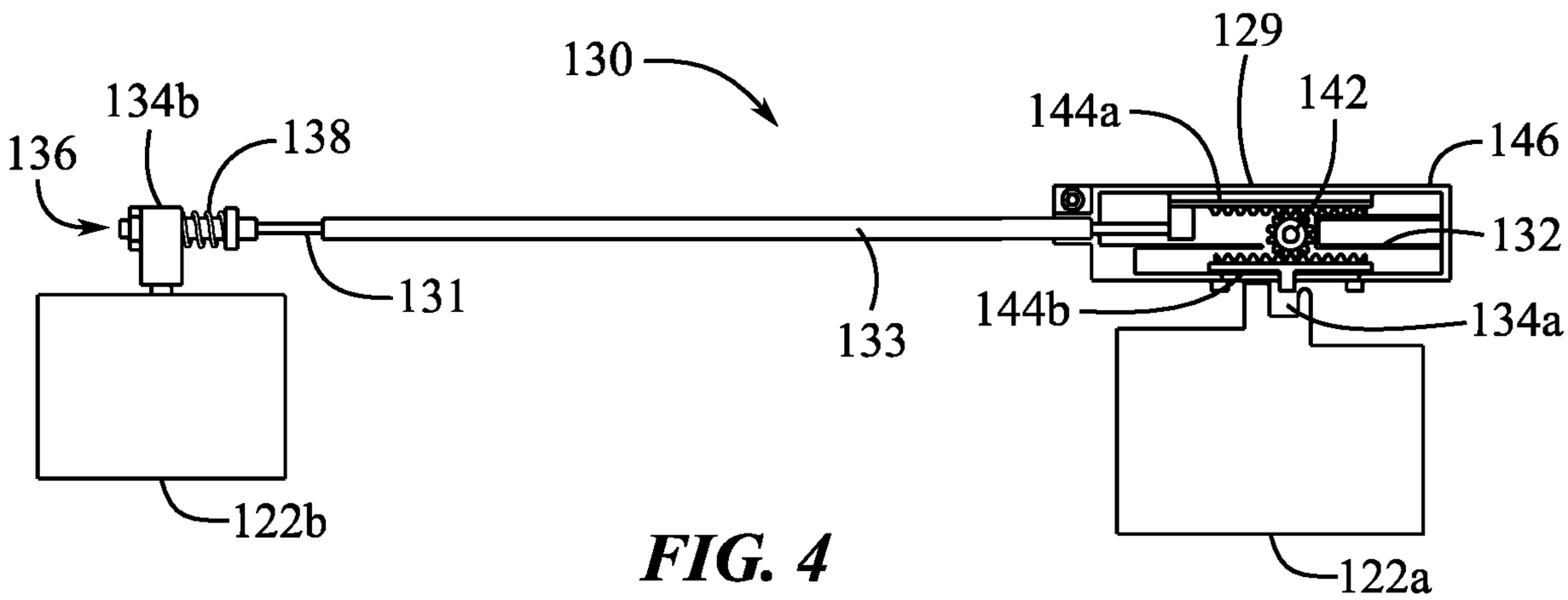


FIG. 4

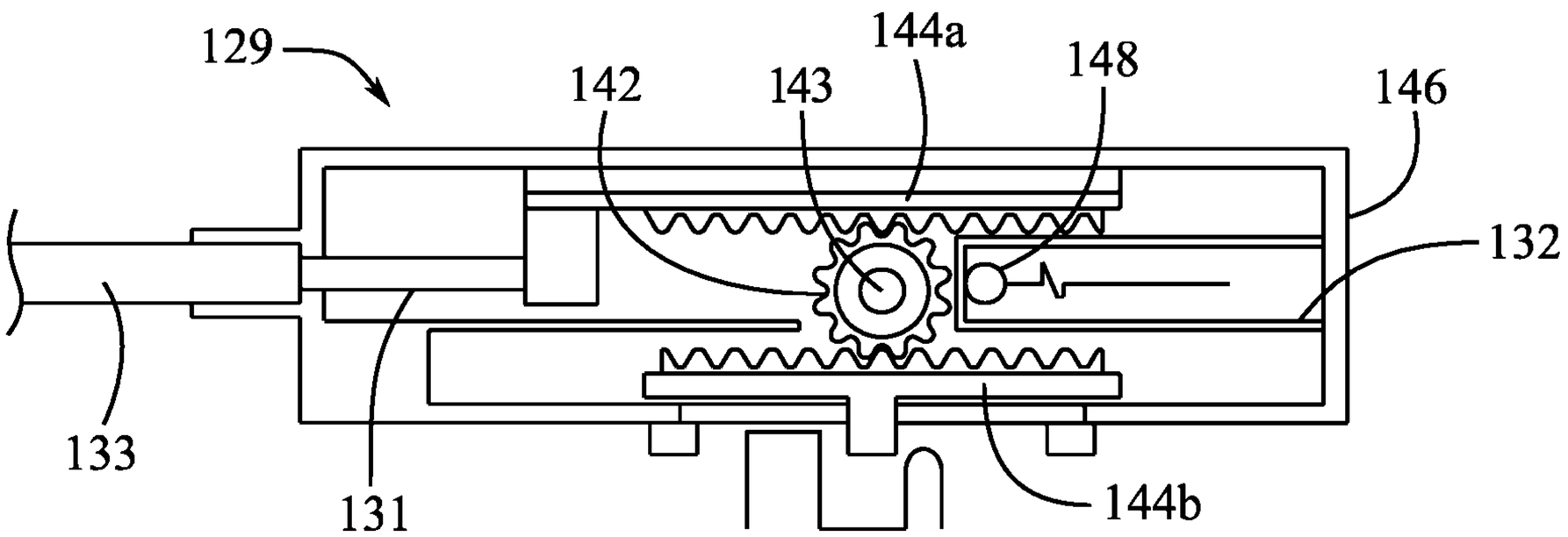


FIG. 5

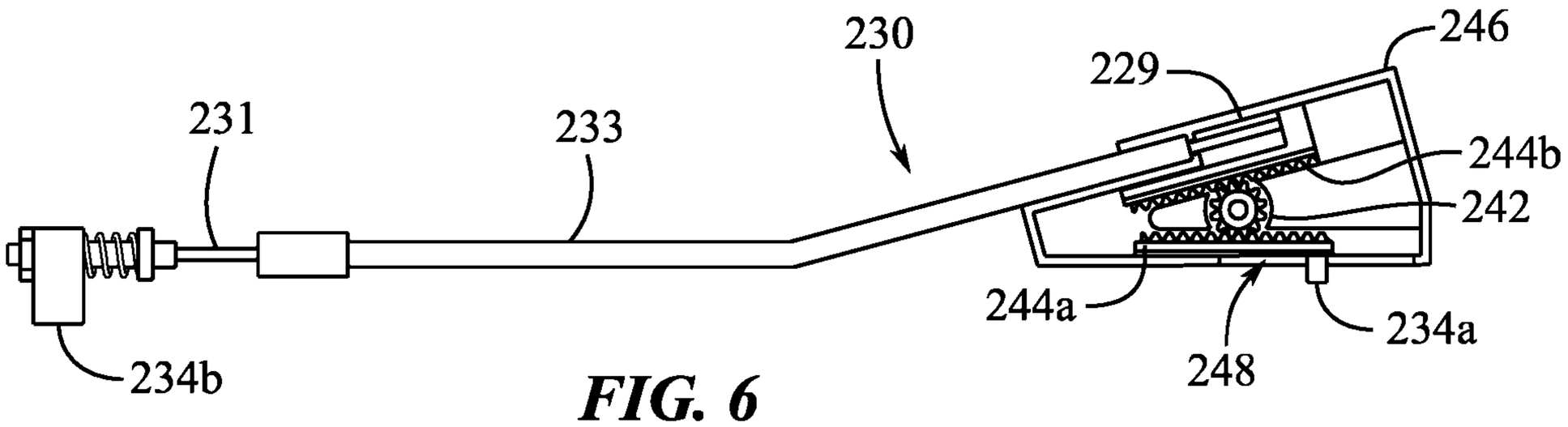


FIG. 6

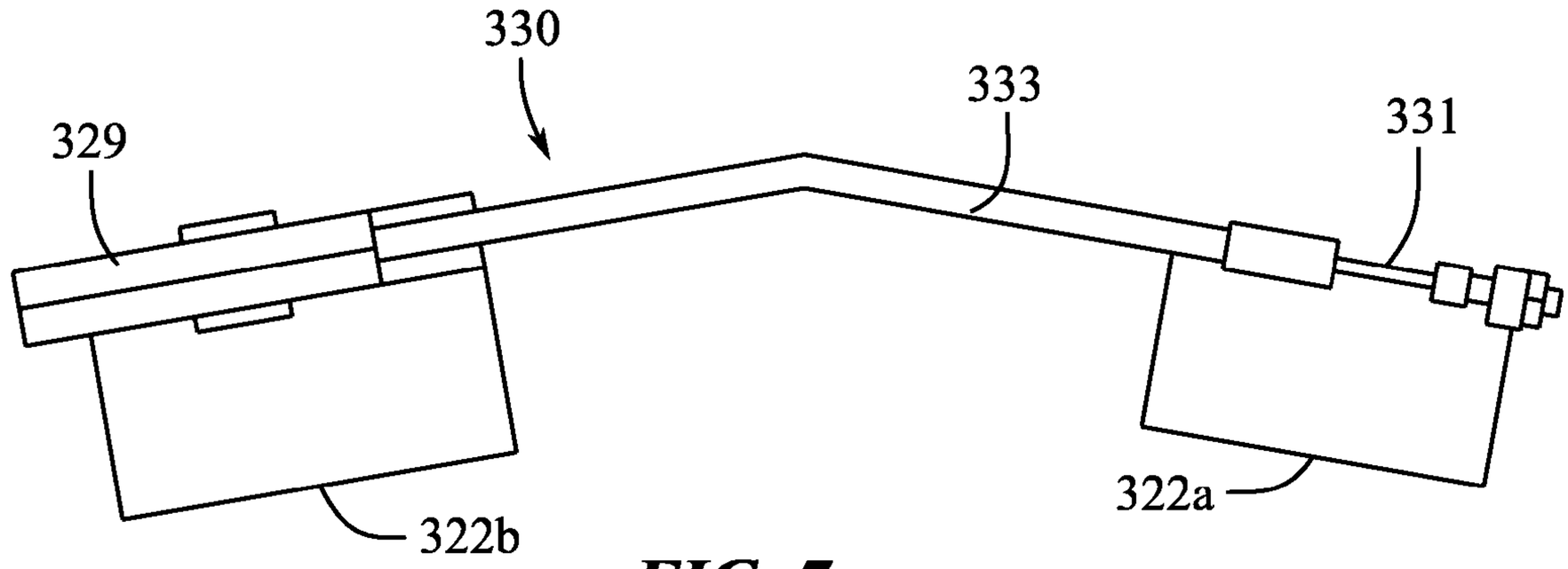


FIG. 7

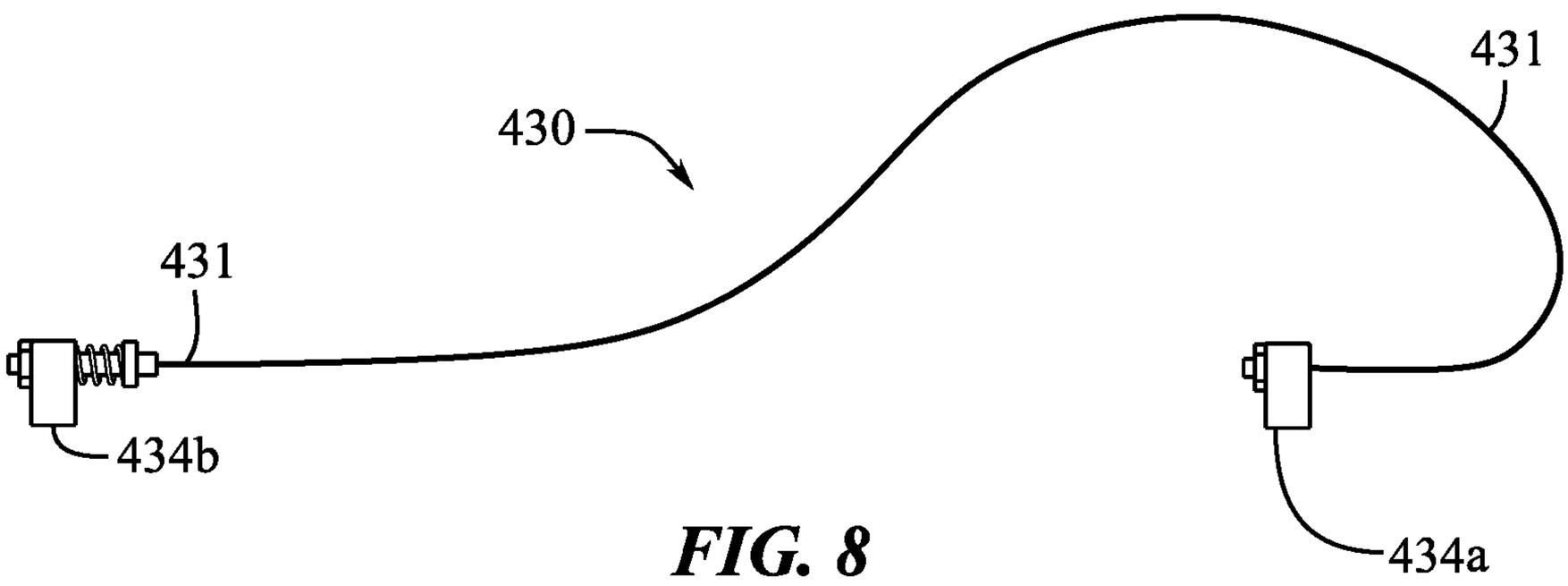


FIG. 8

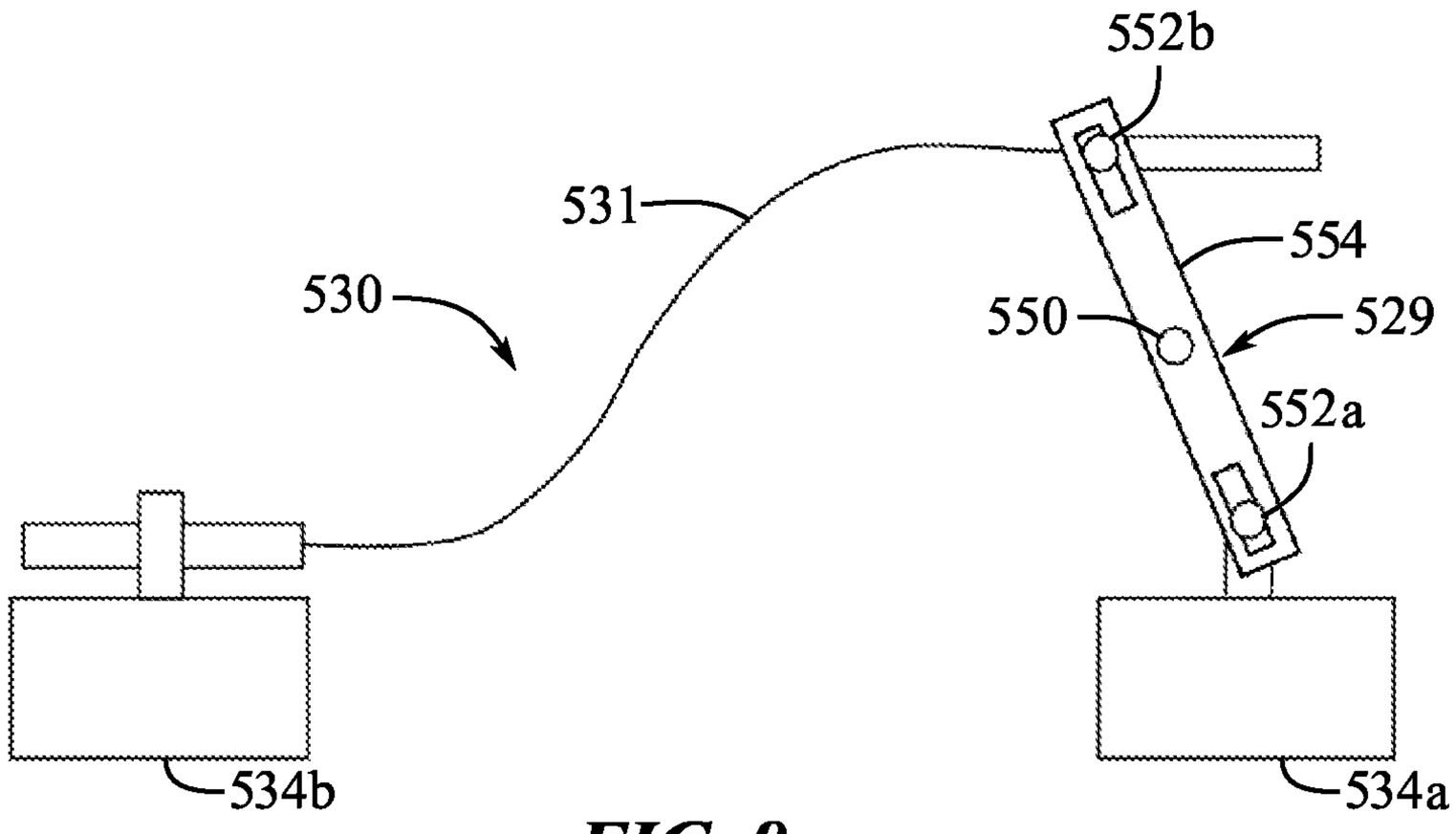


FIG. 9

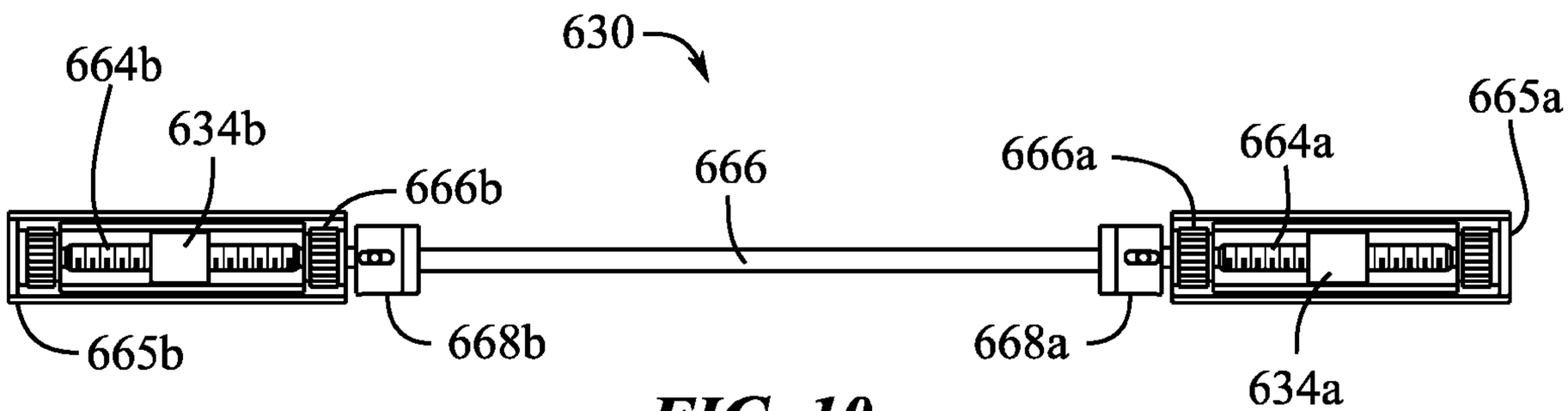

630
664b
634b
666b
666
666a
664a
665a
665b
668b
668a
634a

FIG. 10

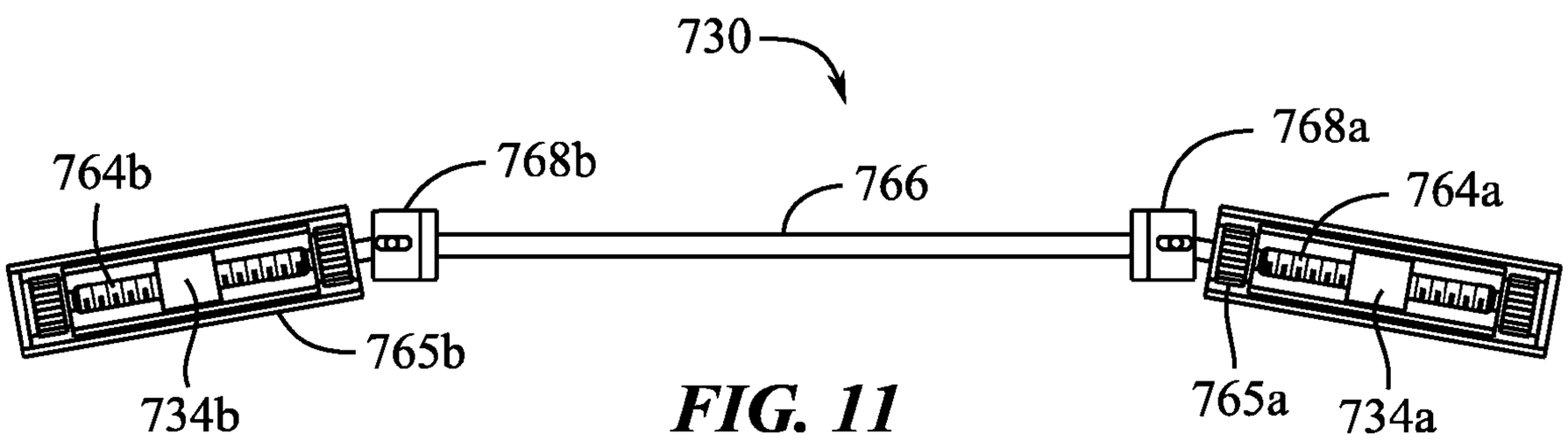

730
764b
768b
766
768a
764a
765b
765a
734b
734a

FIG. 11

DISPLAY ADJUSTMENT FOR A HEAD-MOUNTABLE DISPLAY DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 63/758,214, filed 13 February 2025, entitled "DISPLAY ADJUSTMENT FOR A HEAD-MOUNTABLE DISPLAY DEVICE," the entire disclosure of which is hereby incorporated by reference.

FIELD

[0002] The present disclosure relates generally to head-mountable display devices. More particularly, the present disclosure relates to adjusting an interpupillary distance of optical modules for a head-mountable display device.

BACKGROUND

[0003] Recent advances in portable computing have led to an increase in the use of head-mounted display devices. Displays of the head-mountable display devices (HMDs) can include one or more optical modules that present images to the user's eyes. Users of the head-mounted display devices can have unique interpupillary distances (IPD), or distances between the center of the user's two pupils. For optimal use of the head-mountable display device, a position of the pair of optical modules can be adjusted so that the optical modules are aligned with the user's interpupillary distance. However, systems for IPD adjustments within HMDs can be bulky, hard to manage or operate, and difficult to fit around other components of HMDs, especially when consumers prefer light-weight and small form factors.

SUMMARY

[0004] In at least one example, a head-mountable display device can include a frame, and a display coupled to the frame. The display can include a first optical module and a second optical module. The head-mountable display device can also include an adjustment mechanism coupled to the first optical module and a motion transfer member coupled to both the adjustment mechanism and the second optical module. The motion transfer member can extend between the first optical module and the second optical module. The adjustment mechanism can be configured to simultaneously adjust a position of the first optical module and a position of the second optical module relative to each other.

[0005] In some examples, the adjustment mechanism can include a rack and pinion. The motion transfer member can include a cable. The rack and pinion can be disposed at an angle relative to the cable. The rack and pinion can include a rotating post, and a detent configured to engage with the rotating post. The rack and pinion can include a damping element configured to absorb energy from impacts. The adjustment mechanism can include a lead screw. The motion transfer member can include a flexible shaft. The head-mountable display device can include an impact absorption element disposed at the coupling between the motion transfer member and the second optical module.

[0006] In one aspect, an interpupillary distance adjustment mechanism can include a first guide coupled to a first optical module, a second guide coupled to a second optical module, an adjustment mechanism coupled to the first guide, and a motion transfer member. The motion transfer member can include a first longitudinal end coupled to the adjustment mechanism, a second longitudinal end coupled to the second guide, and an elongate portion extending from the first longitudinal end and the second longitudinal end. The adjustment mechanism can be configured to simultaneously adjust a position of the first guide and a position of the second guide relative to each other.

[0007] In some examples, the motion transfer member can extend through a midpoint of the interpupillary distance adjustment mechanism. The motion transfer member can extend through the midpoint in a non-linear configuration. The interpupillary distance adjustment mechanism can also include an actuator disposed off-center relative to a midpoint of the interpupillary distance adjustment mechanism. The actuator can be disposed adjacent to the first optical module. The actuator can include a first rack coupled to the first guide, a second rack coupled to the motion transfer member, and a circular gear engaging the first rack and the second rack.

[0008] In one aspect, a head-mountable display device can include a frame, and a display coupled to the frame. The display can include a first optical module and a second optical module. The head-mountable display device can also include an interpupillary distance adjustor configured to modify a distance between the first optical module and the second optical module. The interpupillary distance adjustor can include a first leadscrew coupled to the first optical module, a second leadscrew coupled to the second optical module and disposed at an angle relative to the first leadscrew, and a center joint connecting the first leadscrew and the second leadscrew. A rotation of the first leadscrew can cause an adjustment of the interpupillary distance between the first optical module and the second optical module.

[0009] In some examples, the adjustment of the first leadscrew can simultaneously adjust a position of the first optical module and the second optical module. The adjustment of the first leadscrew in a first rotational direction can be configured to translate the first optical module and the second optical module closer to one another. The adjustment of the first leadscrew in a second rotational direction can be configured to translate the first optical module and the second optical module farther from one another. The interpupillary distance adjustor can include an actuator disposed adjacent to the first lead screw.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

[0011] FIG. **1** illustrates a perspective view of one example of a head-mountable display device (HMD);

[0012] FIG. **2** illustrates a rear schematic view of one example of an HMD;
[0013] FIG. **3** illustrates a top schematic view of one example of an HMD;
[0014] FIG. **4** illustrates one example of an interpupillary distance (IPD) adjustment mechanism;
[0015] FIG. **7** illustrates a close-up of an actuator of an IPD adjustment mechanism;
[0016] FIG. **5** illustrates one example of an IPD adjustment mechanism in a non-linear configuration;
[0017] FIG. **6** illustrates one example of an IPD adjustment mechanism in a non-linear configuration;
[0018] FIG. **8** illustrates one example of an IPD adjustment mechanism including a motion transfer member in a non-linear configuration;
[0019] FIG. **9** illustrates one example of an IPD adjustment mechanism;
[0020] FIG. **10** illustrates one example of an IPD adjustment mechanism; and
[0021] FIG. **11** illustrates one example of an IPD adjustment mechanism in a non-linear configuration.

DETAILED DESCRIPTION

[0022] Reference will now be made in detail to representative examples illustrated in the accompanying drawings. It should be understood that the following descriptions are not intended to limit the examples to one preferred example. To the contrary, it is intended to cover alternatives, modifications, and equivalents as can be included within the spirit and scope of the described examples as defined by the appended claims.
[0023] The present disclosure relates generally to head-mountable display devices. Examples of head-mountable devices can include optical devices, for example glasses lenses, goggles with lenses, transparent display windows, display screens or virtual/augmented reality devices that can include optical components. In these examples, the head-mountable device can be donned on the head of a user such that optically transparent widows, for example lenses and transparent optical displays, can be positioned in front of a user's eyes. Displays of the head-mountable display devices (HMDs) can include one or more optical modules that present images to the user's eyes. User's heads can vary in size and shape, and more specifically the distance between a user's eyes, otherwise known as interpupillary distance (IPD), can vary from user to user. For example, an average IPD for adults can be between 50–70 mm, with an average around 63 mm. The average IPD for children can be 43–58 mm. Display screens or display lenses provide the optimal immersive experience when the lenses are positioned directly in front of the user's eyes.
[0024] Current wearable display devices can include an adjustment system that can adjust the position of the lenses or displays for a user. The current wearable display devices can adjust the displays, but the adjustment mechanisms do not allow for a symmetrical and precise adjustment of the displays of the wearable display device. However, the adjustment of the lenses to match a user's IPD can be difficult as small adjustments to the lens of the wearable display devices can affect the immersive experience delivered to the user. Further, the addition of an IPD adjustment mechanism can add more components to the HMD. A persistent challenge when dealing with conventional IPD adjustment mechanism designs can lie in the placement and efficient packaging of an IPD adjustment mechanism within an HMD. For example, conventional HMDs can include a variety of components and structures (e.g., fans, processors, cameras, etc.) within the HMD, in addition to the IPD adjustment mechanism and any corresponding components (e.g., actuators). The numerous components can cause IPD adjustment mechanisms to be bulky, heavy, and positioned at or near the optical modules, to transfer motion or translate each optical module. Thus, the HMDs with an IPD adjustment mechanism can struggle to maintain a lightweight, slim form factor HMD. Further, conventional IPD adjustment mechanisms can be difficult to position and operate amongst the variety of controls and components within a conventional HMD.
[0025] The devices and systems described herein provide a lightweight, slim form factor HMD while providing an IPD adjustment mechanism. In addition, the optical modules can be moved independently and/or simultaneously to improve alignment with the IPD of the user. For example, an HMD can include a frame and a display. The display can include optical modules. The HMD can include an adjustment mechanism extending between the optical modules such that the adjustment mechanism can simultaneously adjust the positions of the optical modules. The IPD adjustment mechanism can appropriately position each optical module such that a user only needs to adjust one optical module to automatically, or simultaneously, adjust the other. Simultaneous adjustment prevents the user from having to independently adjust two optical modules. Independent adjustment can require more time and effort for adjustments and can lead to increased chances of adjustment. In some examples, the IPD adjustment mechanism can include an actuator, a motion transfer member, and guides that couple to the optical modules. In some examples, the IPD adjustment mechanism described herein can include a rack and pinion, a pair of lead screws, cables, rods, pulleys, and/or gears configured to move optical modules simultaneously and accurately.
[0026] A slim, lower profile, motion transfer member of the adjustment mechanism can extend, and transfer motion, from a first longitudinal end of the mechanism to a second longitudinal end. Therefore, the adjustment mechanism can be offset within the HMD. For example, the adjustment mechanism can be positioned off-center, such as at a longitudinal end of the HMD. Further, the lower profile motion transfer member can allow for a slimmer form factor for the HMD and expand the available space for other components of the HMD, particularly around the center or midpoint of the device.
[0027] To contour the shape of a user's face, the optical modules can be offset from each other to match the contour. As such, the optical modules can be non-coplanar. The adjustment mechanism can adjust displays along non-parallel and/or non-colinear paths such that the HMD can be curved to conform to a human face can accommodate

two displays being adjusted along the same curvature.

[0028] These and other examples are discussed below with reference to FIGS. **1–11**. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes only and should not be construed as limiting. Furthermore, as used herein, a system, a method, an article, a component, a feature, or a sub-feature including at least one of a first option, a second option, or a third option should be understood as referring to a system, a method, an article, a component, a feature, or a sub-feature that can include one of each listed option (e.g., only one of the first option, only one of the second option, or only one of the third option), multiple of a single listed option (e.g., two or more of the first option), two options simultaneously (e.g., one of the first option and one of the second option), or combination thereof (e.g., two of the first option and one of the second option).

[0029] FIG. **1** illustrates a perspective view of one example of a head-mountable display device (HMD) **100** including a display portion **102**, a frame **104**, a facial interface **106**, and one or more securement arms **112***a*, **112***b* coupled to the frame **104**. The HMD 100 can be configured to be mounted to a head of a user. The HMD **100** can be configured to display media to the user. The HMD **100** can be configured to provide a comfortable user experience. In some example, components of the HMD can include a variety of polymers, ceramics, metals, or composite materials. The materials used to construct components of the HMD **100** can include silicone, foam, fabric, aluminum, steel, plastics, and/or other materials.

[0030] The display portion **102** can be positioned at least particularly in or on the frame **104**. The display portion **102** can be configured to present augmented reality visualization, a virtual reality visualization, visual media, or another suitable visualization to the user. For example, visual media can include videos, live streams, websites, recordings, virtual reality settings, television, or other forms of visual media. The display portion **102** can include one or more optical lenses, optical modules, or display screens that are configured to be positioned in front of the eyes of a user. The optical modules of the display portion **102** can be a screen. The optical modules can be an organic light-emitting diode (OLED) screen, a light-emitting diode (LED) screen, a liquid crystal display (LCD) screen, or another type of screen. In some examples, the optical modules can include non-corrective lenses, transparent windows, or reflective materials. In some examples, light from the optical modules can travel through a lens before being perceived by a user. The optical modules can facilitate a desirable user experience by producing high-quality, engaging, and clear media for a user to perceive.

[0031] The frame **104** can be a housing of the display portion **102**. The frame **104** can correspond to the contour of the user's face. In some examples, the frame **104** can be angled. The frame **104** can include a first lateral side **105**, a second lateral side **105***b*, and a central region **103**. For example, as illustrated, a first lateral side **105***a* can be angled toward the central region **103**. The second lateral side **105***b* can also be angled toward the central region **103**. The first lateral side **105***a* and the second lateral side **105***b* can be on different planar, or non-coplanar. In some examples, the frame **104** can be curved from the first lateral side **105***a* to the second lateral side **105***b*. The central region **103** can similarly be curved. The frame **104** can have a constant radius. The frame **104** can have a curve defined by a complex curve that has a radius of curvature that varies through the curve.

[0032] The first and second lateral sides **105***a*, **105***b* can be symmetrical around the central region **103**. The first and second lateral sides **105***a*, **105***b* can be mirrored from one another from the central region **103**.

[0033] The central region **103** can define an angle between the first and second lateral sides **105***a*, **105***b*. The central region **103** can define a curvature of the frame **104**. The central region **103** can be rounded. The central region 103 can define a continuously curved surface between the first and second lateral sides **105***a*, **105***b*.

[0034] The frame can include a nose piece **110**. The nose piece **110** can be configured to conform to the shape of the nose of a user. The nose piece **110** can be configured to rest on the nose of the user. The nose piece **110** can be configured to support at least a portion of the weight of the HMD **100**.

[0035] The nose piece **110** can be aligned with the central region **103**. For example, the nose piece **110** and the central region **103** can be vertically aligned. The nose piece **110** can include a padded portion or a contoured portion. In some examples, at least nose piece **110** can be a combination of padded and contoured portions.

[0036] The facial interface **106** can be physically coupled to the frame **104**. In some examples, the facial interface **106** can be integrated with the frame **104**. The facial interface **106** can extend toward the user's head and face from display portion **102** and/or frame **104**. The facial interface **106** can provide an interface between the user's head and the frame **104**. For example, the facial interface 106 can be configured to maintain an appropriate and comfortable distance between the display portion **102** and the user's face, for instance, the user's eyes. The facial interface **106** can include portions configured to conform to, contact, or press against regions of the user's face. The facial interface **106** can include portions configured to engage or shield the user's face.

[0037] The one or more securement arms **112***a*, **112***b* can secure the HMD **100** relate to the user's head. The one or more securement arms **112***a*, **112***b* can be connected to the display portion **102** or frame **104** and extend distally toward the rear of the user's head. The one or more securement arms **112***a*, **112***b* can be configured to secure the display portion **102** or frame **104** in a position relative to the user's head (e.g., such that the display portion **102** is maintained in front of the user's eyes). The one or more securement arms **112***a*, **112***b* can be configured to support at least a portion of the weight of the HMD **100**. The one or more securement arms **112***a*, **112***b* can extend over the user's ears. In some examples, the one or more securement arms **112***a*, **112***b* can rest on the user's ears to secure the HMD **100** via friction between the one or more securement arms **112***a*, **112***b* and the user's head. In some examples, the one

or more securement arms **112***a*, **112***b* can apply opposing pressures to the sides of the user's head to secure the HMD **100** to the user's head.

[0038] In some examples, the HMD **100** can also include various electrical and electronic components. For example, the HMD **100** can include one or more processors, speakers, batteries, screens, projectors, motors, linear actuators, cameras, sensors, wires, and other components. The various electrical and electronic components can be disposed within various parts of the HMD **100**. For example, at least one of the securement arms **112***a*, **112***b* can include a battery and/or a speaker. The display portion **102** can include a processor, camera, and screen. The electronic components disposed in the securement arms **112***a*, **112***b* can be electrically coupled to the electronic components disposed within the display portion **102**. The electrical and electronic components included in the HMD **100** can produce an immersive and desirable user experience.

[0039] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **1** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **1**.

[0040] FIGS. **2** and **3** illustrate a rear and top schematic view of one example of the HMD **100** including the frame **104**, a display **120** and an interpupillary distance (IPD) adjustment mechanism **130**.

[0041] The display **120** can be disposed in the frame **104**. The display **120** can be integrated into the frame **104**. The display **120** can include one or more of optical modules **122***a*, **122***b* that are configured to present images to a user. For example, the display portion **120** can include a right optical module **122***a* and a left optical module **122***b*. The right optical module **122***a* can correspond to a right eye and the left optical module **122***b* can correspond to a left eye of the user. The right optical module **122***a* and left optical module **122***b* can be positioned to accommodate the nose piece **110**. Right optical module **122***a* can define a first viewing plane. Left optical module **122***b* can define a second viewing plane. Right optical module **122***a* and left optical module **122***b* can be angled (e.g., a non-zero angle) with respect to each other to position the optical modules substantially parallel to the surface of the user's face. In some examples, optical modules **122***a*, **122***b* can be non-parallel, offset, and/or not co-planar with respect to one another. The optical module **122***a*, **122***b* can each have a lens barrel with a display and a lens that present an image from the display to a corresponding eye of the user. In some examples, optical modules **122***a*, **122***b* can each be or can include a screen. In some examples, optical modules **122***a*, **122***b* can each be an OLED screen, an LED screen, an LCD screen, or another type of screen. In some examples, the optical modules **122***a*, **122***b* can each be or include a surface onto which an image is projected. In some examples, the optical modules **112***a*, **122***b* can each include transparent windows or lenses, corrective lenses, and so forth. In some examples, light from optical modules 122a, **122***b* can travel through a lens before being perceived by a user. The lens can be configured to change a characteristic of the light from optical modules **122***a*, **122***b*. For example, the lens can be configured to magnify or focus the media produced at optical modules **122***a*, **122***b*. In some examples, the lens can be configured to change some portions of the media produced at optical modules **122***a*, **122***b*. For example, the lens can change the proportions of the media produced at optical modules **122***a*, **122***b*. The lens and the optical modules **122***a*, **122***b* can facilitate a desirable user experience by producing high-quality, engaging, and clear media for a user to perceive. To accommodate users with different interpupillary distances, optical modules **122***a*, **122***b* of display **120** can be adjusted by the IPD adjustor or adjustment mechanism **130**.

[0042] The IPD adjustment mechanism **130** can include an actuator **129**, a motion transfer member **131**, a right guide **134***a* and a left guide **134***b*. The IPD adjustment mechanism **130** can be configured to adjust the IPD distance between the optical modules **122***a*, **122***b*. In some examples, the IPD adjustment mechanism can be configured to simultaneously adjust the optical modules **122***a*, **122***b* to adjust the IPD distance between the optical modules **122***a*, **122***b*.

[0043] The actuator **129** can be positioned outside the internal central region **124**. In some examples, the actuator **129** can be positioned proximal one of the right or left optical modules **122***a*, **122***b*. Accordingly, the actuator **129** can be positioned distal the other of the right or left optical modules **122***a*, **122***b*. The actuator **129** can be configured to cause motion within the IPD adjustment mechanism **130**. The actuator **129** can be configured to cause motion of the motion transfer member **131**. The actuator **129** can be configured to cause motion of the optical modules **122***a*, **122***b*. The actuator **129** can include a motor, a gear set, or other component configured to generate motion. For example, the actuator **129** can include a rack and pinion mechanism, a pair of lead screws, cables, rods, pulleys, and/or gears configured to generate motion.

[0044] The motion transfer member **131** can extend from the actuator **129**. The motion transfer member **131** can extend between the optical modules **122***a*, **122***b*. The motion transfer member **131** can extend between the guides **134***a*, **134***b*. The motion transfer member **131** can extend from the actuator **129** to the left optical guide **134***b*. In some examples, the motion transfer member **131** can extend from the actuator **129** to the right optical guide **134***a*. The motion transfer member **131** can be configured to transfer motion from the actuator **129** to the guides **134***a*, **134***b*. The motion transfer member **131** can be configured to simultaneously transfer motion from the actuator **129** to the guides **134***a*, **134***b*.

[0045] The right guide **134***a* can couple the right optical module **122***a* to the IPD adjustment mechanism **130**. In some examples, the right guide **134***a* can rigidly couple the right optical module **122***a* to the IPD adjustment mechanism **130**. In some examples, the right guide **134***a* can couple the right optical module **122***a* to the actuator **129**. In

some examples, the right guide **134***a* can couple the right optical module **122***a* to the motion transfer member **131**. The left guide **134***b* can couple the left optical module **122***b* to the IPD adjustment mechanism **130**. In some examples, the left guide 134b can rigidly couple the left optical module **122***b* to the IPD adjustment mechanism **130**. In some examples, the left guide **134***b* can couple the left optical module **122***b* to the motion transfer member **131**. The guides **134***a*, **134***b* can be positioned outside the internal central region **124**. The guides **134***a*, **134***b* can be positioned adjacent the optical modules **122***a*, **122***b*. The guides **134***a*, **134***b* can be angled (e.g., a non-zero angle) with respect to each other to position the optical modules **122***a*, **122***b* parallel to the surface of a user's face. In some examples, the guides **134***a*, **134***b* can be non-parallel, offset, and/or non-coplanar with respect to one another. The guides **134***a*, **134***b* can be configured to cause movement of the optical modules **122***a*, **122***b*.

[0046] The frame **104** can include an internal central region **124**. The internal central region **124** can be between the optical modules **122***a*, **122***b*. The internal central region **124** can be above the optical modules **122***a*, **122***b*. The motion transfer member **131** can pass through the internal central region **124**. In some examples, no other components of the IPD adjustment mechanism **130** are positioned in the internal central region **124**. For example, the actuator **129** can be located outside the internal central region **124**. In some examples, components of the adjustment mechanism **130** in the internal central region **124** account for minimal space. The internal central region **124** can include an angle, curve, or other shape based on the configuration of the optical modules **122***a*, **122***b*. The frame **104** can include one or more components **126** of the HMD **100** in the internal central region **124**.

[0047] The components **126** can include fans, motherboards, sensors, or other components of the HMD **100**. The components **126** can be positioned in the internal central region **124** without interfering with the IPD adjustment mechanism **130**. In some examples, the components **126** can be positioned above, below, in front of, or behind, the motion transfer member **131** in the internal central region **124**. In some examples, such as when the internal central region **124** defines an angle, the components **126** can be positioned on either side of the angle or can be positioned in a linear space of the angle. In some examples, such as when the internal central region **124** defines a curve, the components can be positioned within the space defined by the curve, or the components **126** can define a similar curve.

[0048] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIGS. **2** and **3** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIGS. **2** and **3**.

[0049] FIG. **4** illustrates one example of an IPD adjustment mechanism **130** coupled to optical modules **122***a*, **112***b*. FIG. **5** illustrates a close-up of the actuator **129** of the IPD adjustment mechanism **130**. The optical modules **122***a*, **122***b* present images to the user. The optical modules **122***a*, **122***b* can be substantially similar to the optical modules **122***a*, **122***b* of FIGS. **2** and **3**. The IPD adjustment mechanism **130** can include the actuator **129**, the motion transfer member **131**, the guides **134***a*, **134***b*, and a housing **146**. The guides **134***a*, **134***b*can be substantially similar to the guides **134***a*, **134***b* of FIGS. **2** and **3**.

[0050] The actuator **129** can be configured to cause translation of the optical modules **122***a*, **122***b*. In one example, the guides **134***a*, **134***b*can be coupled to and translate optical modules **122***a*, **122***b* towards or away from one another based on motion of the actuator **129**. The actuator **129** can be a rack-and-pinion. The actuator **129** can include a circular gear **142** (e.g., the pinion) and a pair of linear gears **144***a*, **144***b* (e.g., the racks). In some examples, the actuator **129** can be positioned proximal one of the right or left optical modules **122***a*, **122***b*. Accordingly, the actuator **129** can be positioned distal the other of the right or left optical modules **122***a*, **122***b*. In some examples, the actuator **129** can be positioned above or below one of the right or left optical modules **122***a*, **122***b*.

[0051] The circular gear **142** can rotate about or around a center post **143** of the IPD adjustment mechanism **130** or actuator **129**. In some examples, the circular gear **142** can be sized sufficiently such that linear gears **144***a*, **144***b* are free of engagement with each other during actuation. The first linear gear **144***a* can engage with an upper portion of circular gear **142** and the second linear gear **144***b* can engage with a lower portion of circular gear **142** (or vice versa). In other words, one of the linear gears **144***a*, **144***b* engages the circular gear **142** opposite the other.

[0052] The first linear gear **144***a* can be disposed on a first or top side of the IPD adjustment mechanism **130** or actuator **129**. The second linear gear **144***b* can be disposed on a second, opposite, or bottom side of IPD adjustment mechanism **130** or actuator **129**. The linear gears **144***a*, **144***b* can each be coupled to corresponding guides **134***a*, **134***b*. For example, the first linear gear **144***a* can be coupled to the right guide **134***a* and the second linear gear **144***b* can be coupled to the left guide **134***b*. In some examples, the first linear gear **144***a,* can be coupled directly to the right guide **134***a*, while the second linear gear **144***b* is coupled to left guide **134***b* via a motion transfer member **131**. As the IPD adjustment mechanism 130 is actuated, the circular gear **142** can rotate and linear gears **144***a*, **144***b* can translate in alternate directions.

[0053] The housing **146** can enclose components of the IPD adjustment mechanism **130**. The housing **146** can fully or partially enclose the actuator **129**. The housing **146** can fully or partially enclose a portion of the motion transfer member **131**. In some examples, the housing **146** can be positioned proximal one of the right or left optical modules **122***a*, **122***b*. Accordingly, the housing **146** can be positioned distal the other of the right or left optical modules **122***a*, **122***b*. In some examples, the housing **146** can be positioned above or below one of the right or left optical

modules **122***a*, **122***b*. In some examples, a damping element, for example grease or other damping material, can be dispersed in or around the actuator **129** within the housing **146**. The damping element(s) can be configured to dampen an impact event or energy from an impact event (e.g., from dropping the HMD **100**). The damping element(s) can be configured to dampen an impact, or energy from an impact, that could otherwise be received by the optical modules **122***a*, **122***b*.

[0054] In some examples, a portion **132** of housing **146** can include a detent **148**. The detent **148** can be configured to engage with the circular gear **142**. In some examples, the detent **148** can be used to provide a tactile stop, or resistance, at certain intervals or locations when operating the IPD adjustment mechanism **130** (e.g., actuator **129**) and translating the optical modules **122***a*, **122***b*.

[0055] The motion transfer member **131** can be configured to transfer motion from the actuator **129** to the guides **134***a*, **134***b*. Accordingly, the motion transfer member 131 can be configured to transfer motion from the actuator **129** to the optical modules **122***a*, **122***b*. The motion transfer member **131** can be configured to transfer longitudinal motion. The motion transfer member **131** can extend from the actuator **129**. The motion transfer member **131** can extend between the optical modules **122***a*, **122***b*. The motion transfer member **131** can extend between the guides **134***a*, **134***b*. The motion transfer member **131** can extend from the actuator **129** to the left optical guide **134***b*. In some examples, the motion transfer member **131** can extend from the actuator **129** to the right optical guide **134***a*. In some examples, the motion transfer member **131** can be coupled to one of the linear gears **144***a*, **144***b*. In some examples, the motion transfer member **131** can be used to transfer motion of the second linear gear **144***b* to left guide **134***b*. The motion transfer member **131** can be configured to simultaneously transfer motion from the actuator **129** to at least one of the guides **134***a*, **134***b*. In some examples, the motion transfer member **131** can be used to transfer motion of the linear gear **144***b* to left guide **134***b*.

[0056] The motion transfer member **131** can be a longitudinally elongate member. The motion transfer member **131** can have a low profile. The motion transfer member **131** can be flexible. The motion transfer member **131** can be configured to bend or wind around intervening components of the HMD **100**. For example, the motion transfer member **131** can bend or wind around components of the HMD **100** positioned between the optical modules **122***a*, **122***b*. In some examples, the motion transfer member **131** can include a cable. In some examples, the motion transfer member **131** can comprise a stainless steel (SUS) alloy, a titanium alloy, a composite, a polymer, or a combination thereof. The motion transfer member **131** can include a support tube **133**.

[0057] The support tube **133** can receive the motion transfer member **131**. The support tube **133** can surround at least a portion of the motion transfer member **131**. The support tube **133** can extend between the guides **134***a*, **134***b*. The support tube **133** can define a pathway for the motion transfer member **131** around other components of the HMD **100**. The support tube **133** can be flexible. The support tube **133** can be rigid. The support tube **133** can include flexible portions and rigid portions. The support tube **133** can be configured to protect the motion transfer member **131**. In some examples, a damping element(s) can be dispersed in or around the support tube **133**. The damping element(s) within the support tube **133** can help dampen and smoothen motion of the motion transfer member **131**, which can pass through support tube **133**. The damping element(s) can also dampen energy from an impact event (e.g., from dropping the HMD **100**). The damping element(s) can dampen an impact that could otherwise be received by the optical modules **122***a*, **122***b*.

[0058] The IPD adjustment mechanism **130** can include an impact absorption element **136**. The impact absorption element **136** can be disposed at the coupling between motion transfer member **131** and left guide **134***b*. The impact absorption element **136** can be configured to dampen the energy from an impact event (e.g., from dropping the HMD **100**). The impact absorption element **136** can dampen an impact that would otherwise be received by optical modules **122***a*, **122***b*. For example, the impact absorption element **136** can include a spring **138**. The spring **138** can further serve to bias the left guide **134***b* towards a left-most position (e.g., "left" relative to the viewing plane as illustrated by FIG. **4**) and dampen movement via the IPD adjustment mechanism **130**.

[0059] To actuate, function, or move the optical modules **122***a*, **122***b*, the circular gear **142** can be rotated, and the guides **134***a*, **134***b* can be translated towards one another, or away from one another. Such movement can adjust the IPD distance for the user by simultaneously adjusting the positions of the optical modules **122***b*, **122***a* toward or away from one another. The optical modules **122***a*, **122***b* can translate from a first position to a second position. The IPD adjustment mechanism **130** can be manually actuated by a user. For example, the user can rotate a dial to rotate the circular gear **142**. In some examples, the IPD adjustment mechanism can be actuated by a motor. For example, a user can press a button to rotate the circular gear **142**. In some examples, the user can grip the optical modules **122***a*, **122***b* and can translate them towards or away from one another. In some examples, movement of the optical modules **122***a*, **122***b* can be simultaneous, e.g., a user can move optical modules **122***a*, **122***b* an substantially similar distance either toward or away from one another.

[0060] The location of the actuator **129** and/or housing **146** and the motion transfer member **131** can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **130** and additional components and mechanisms of the HMD **100**. This can result in more efficient use of internal space and increased compactness of the HMD **100**. For instance, spatial area circumvented by the offset position of the actuator **129** and/or housing **146** and the motion transfer member **131** extending between the optical modules **122***a*, **122***b* can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD **100**.

[0061] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIGS. **4** and **5** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIGS. **4** and **5**.

[0062] FIGS. **6–11** illustrate examples of an IPD adjustment mechanism that can include features similar to the IPD adjustment mechanism **130** described above. Accordingly, like features are designated with like reference numerals, with the leading digits incremented to "2–6". For example, the example depicted in FIGS. **6–11** include IPD adjustment mechanism **230**, **330**, etc., that may, in some respects, resemble IPD adjustment mechanism **130** of FIGS. **1–4**.

[0063] Relevant disclosure set forth above regarding similarly identified features thus may not be repeated hereafter. Moreover, specific features of IPD adjustment mechanism **130** and related components shown in FIGS. **1–5** may not be shown or identified by a reference numeral in the drawings or specifically discussed in the written description that follows. However, such features may clearly be the same, or substantially the same, as features depicted in other examples and/or described with respect to such examples. Accordingly, the relevant descriptions of such features apply equally to the features of IPD adjustment mechanism **230**, **330**, etc., and related components depicted in FIGS. **6–11**.

[0064] Any suitable combination of the features, and variations of the same, described with respect to IPD adjustment mechanism **130** and related components illustrated in FIGS. **1–5** can be employed with IPD adjustment mechanism **230**, **330**, etc., and related components of FIGS. **6-11**, and vice versa. This pattern of disclosure applies equally to further examples depicted in subsequent figures and described hereafter, wherein the leading digits may be further incremented.

[0065] FIG. **6** illustrates one example of an IPD adjustment mechanism **230**. The IPD adjustment mechanism **230** can include an actuator **229**, a motion transfer member **231**, a right guide **234***a*, a left guide **234***b*, and a housing **246**. The guides **234***a*, **234***b* can be configured to couple to optical modules of an HMD.

[0066] The actuator **229** can be configured to cause translation of the guides **234***a*, **234***b*. In one example, the guides **234***a*, **234***b* can be coupled to and translate optical modules of an HMD. The actuator **229** can be a rack-and-pinion. The actuator **229** can include a circular gear **242** (e.g., the pinion) and a pair of linear gears **244***a*, **244***b* (e.g., the racks). In some examples, the actuator **229** can be positioned proximal one of the right or left guides **234***a*, **234***b*. Accordingly, the actuator **229** can be positioned distal the other of the right or guides **234***a*, **234***b*. In some examples, the actuator **229** can be positioned above or below one of the right or left guides **234***a*, **234***b*.

[0067] The circular gear **242** can rotate about or around a center post of the IPD adjustment mechanism **230** or actuator **229**. In some examples, the circular gear **242** can be sized sufficiently such that linear gears **244***a*, **244***b* are free of engagement with each other during actuation. The first linear gear **244***a*can engage with an upper portion of circular gear **242** and the second linear gear **244***b* can engage with a lower portion of circular gear **242** (or vice versa). In other words, one of the linear gears **244***a*, **244***b* engages the circular gear **242** opposite the other.

[0068] The first linear gear **244***a* can be disposed on a first or top side of the IPD adjustment mechanism **230** or actuator **229**. The second linear gear 244b can be disposed on a second, opposite, or bottom side of IPD adjustment mechanism **230** or actuator **229**. The linear gears **244***a*, **244***b* can each be coupled to corresponding guides **234***a*, **234***b*. For example, the first linear gear **244***a* can be coupled to the right guide **234***a* and the second linear gear **244***b* can be coupled to the left guide **234***b*. In some examples, the first linear gear **244***a* can be coupled directly to the right guide **234***a*, while the second linear gear **244***b* is coupled to left guide **234***b* via the motion transfer member **231**. In the illustrated examples, the second linear gear **244***b* can be positioned at an angle with respect to the first linear gear **244***a*.

[0069] The housing **146** can enclose components of the IPD adjustment mechanism **130**. The housing **246** can fully or partially enclose the actuator **229**. The housing 246 can fully or partially enclose a portion of the motion transfer member **231**. In some examples, the housing **246** can be positioned proximal one of the right or left guides **234***a*, **234***b*. Accordingly, the housing **246** can be positioned distal the other of the right or left guides **234***a*, **234***b*. In some examples, the housing **246** can be positioned above or below one of the right or left optical modules. In some examples, a damping element, for example grease or other damping material, can be dispersed in or around the actuator **229** within the housing **246**. The damping element(s) can be configured to dampen an impact event (e.g., from dropping an HMD). The damping element(s) can be configured to dampen an impact that could otherwise be received by optical modules. In some examples, the housing **146** can include an opening **248**. The opening **248** can receive a portion of the right guide **234***a* (as illustrated), or the left guide **234***b*. In some examples, the opening **248** can enable one of the guides **234***a*, **234***b* to directly couple one of the linear gears **244***a*, **244***b*.

[0070] The motion transfer member **231** can be configured to transfer motion from the actuator **229** to the guides **234***a*, **234***b*. Accordingly, the motion transfer member 231 can be configured to transfer motion from the actuator **229** to at least one of the guides **234***a*, **234***b*. The motion transfer member **231** can be configured to transfer longitudinal motion. The motion transfer member 231 can extend from the actuator **229**. The motion transfer member **231** can extend between the guides **234***a*, **234***b* (e.g., between optical modules of the HMD). The motion transfer member **231** can extend from the actuator **129** to the left optical guide **134***b*. In some examples, the motion transfer member **231** can extend from the actuator **229** to the right optical

guide **234***a*. In some examples, the motion transfer member **231** can be coupled to one of the linear gears **244***a*, **244***b*. In some examples, the motion transfer member **231** can be used to transfer motion of the second linear gear **244***b* to left guide **234***b*. The motion transfer member **131** can be configured to simultaneously transfer motion from the actuator **229** to at least one of the guides **234***a*, **234***b*. The motion transfer member **231** can be a longitudinally elongate member. The motion transfer member **231** can have a low profile. The motion transfer member **231** can be flexible. As seen in the illustrated example, the motion transfer member **231** can be curved, or bent, such that an angle of a longitudinal axis of the housing **246** and/or actuator **229** of the IPD adjustment mechanism **230** is offset with respect to an angle of a longitudinal axis of the motion transfer member **231**. The motion transfer member **231** can be configured to bend or wind around intervening components of the HMD. For example, the motion transfer member **231** can bend or wind around components of the HMD positioned between the guides **234***a*, **234***b* (e.g., between the optical modules). In some examples, the motion transfer member **231** can include a cable. In some examples, the motion transfer member **231** can comprise a stainless steel (SUS) alloy, a titanium alloy, a composite, a polymer, or a combination thereof.

[0071] The motion transfer member **231** can include a support tube **233**. The support tube **233** can receive the motion transfer member **231**. The support tube **233** can surround at least a portion of the motion transfer member **231**. The support tube **233** can extend between the guides **234***a*, **234***b*. The support tube **233** can define a pathway for the motion transfer member **231** around other components of the HMD. In some examples, the support tube **233** can define a pathway with an angle, curve, or other non-linear configuration. The support tube **233** can be flexible. The support tube **233** can be rigid. The support tube **233** can include flexible portions and rigid portions. The support tube **233** can be configured to protect the motion transfer member **231**. In some examples, a damping element(s) can be dispersed in or around the support tube **233**. The damping element(s) within the support tube **233** can help dampen and smoothen motion of the motion transfer member **231**, which can pass through support tube **233**. The damping element(s) can also dampen an impact event (e.g., from dropping the HMD). The damping element(s) can dampen an impact that could otherwise be received by optical modules.

[0072] In some examples, the angle of the actuator **229** and/or the angle of the motion transfer member **231** enables movement of displays at an angle relative to one another. In some cases, this can be advantageous for a curved geometry of an HMD (e.g., see FIG. **1**), to align with a natural curvature of the face and or pupils of a user. Accordingly, the IPD adjustment mechanism **230** can serve to enhance comfort, visual alignment, and the overall user experience. The location and/or angle of the actuator **229** and/or housing 146 and the motion transfer member **231** can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **230** and additional components and mechanisms of the HMD. This can result in more efficient use of internal space and increased compactness of the HMD. For instance, spatial area circumvented by the offset position of the actuator **229** and/or housing **246** and the motion transfer member **231** extending between optical modules can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD.

[0073] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **6** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **5**.

[0074] FIG. **7** illustrates one example of an IPD adjustment mechanism **330**, a right optical module **322***a*, and a left optical module **322***b*. The IPD adjustment mechanism 330 can include an actuator **329**, a motion transfer member **331**, and a support tube **333**. The IPD adjustment mechanism **330** can be substantially similar to the IPD adjustment mechanism **230**. More specifically, the IPD adjustment mechanism **330** can be the IPD adjustment mechanism **230** in a mirrored configuration. The actuator **329**, the motion transfer member **331**, and the support tube **333** can be substantially similar to the actuator **229**, the motion transfer member **231**, and the support tube **233**, respectively.

[0075] In the illustrated example, the actuator **329** can be positioned proximal the left optical module **322***b*. The actuator **329** can be positioned above the left optical module **322***b*. The motion transfer member **331** and the support tube **333** can extend from the actuator **329**, proximal the left optical module **322***b*, to the right optical module **322***a*. The motion transfer member **331**, and the support tube **333** can include an angle, curve, or other non-linear configuration as the motion transfer member **331** and the support tube **333** extend between the left optical module **322***b* and the right optical module **322***a*.

[0076] Like the IPD adjustment mechanism **230**, the positioning of the actuator **329**, motion transfer member **331**, and the support tube **333** can be advantageous to an HMD. In some examples, the angle of the motion transfer member **331** enables movement of the optical modules **322***a*, **322***b* at an angle relative to one another. This can be advantageous for a curved geometry of an HMD (e.g., see FIG. **1**), to align with a natural curvature of the face and or pupils of a user. Accordingly, the IPD adjustment mechanism **330** can serve to enhance comfort, visual alignment, and the overall user experience. The location and/or angle of the actuator **329** and the motion transfer member **331** can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **330** and additional components and mechanisms of the HMD. This can allow for more efficient use of internal space and increase compactness of the HMD. For instance, spatial area circumvented by the offset position of the actuator **329** and the motion transfer member **331** extending between the optical mod-

ules **322***a*, **322***b* can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD. Further, the IPD adjustment mechanism **330** can provide an alternative configuration of components as compared to other IPD adjustment mechanisms described herein.

[0077] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **7** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **6**.

[0078] FIG. **8** illustrates one example of an IPD adjustment mechanism **430**. The IPD adjustment mechanism **430** can include a motion transfer member **431**, a right guide **434***a*, and a left guide **434***b*.

[0079] The IDP adjustment mechanism **430** can be configured to cause translation of the guides **434***a*, **434***b*. The guides **434***a*, **434***b* can be substantially similar to one or more of guides **134***a*, **134***b*, **234***a*, and/or **234***b*. In one example, the guides **434***a*, **434***b* can be coupled to and translate optical modules of an HMD.

[0080] The motion transfer member **431** can be configured to transfer motion between the guides **434***a*, **434***b*. Accordingly, the motion transfer member **431** can be configured to transfer motion from one optical module to the other optical module. The motion transfer member **431** can be configured to transfer longitudinal motion. The motion transfer member **431** can extend between the right guide **434***a* and the left guide **434***b*.

[0081] The motion transfer member **431** can be a longitudinally elongate member. The motion transfer member **431** can have a low profile. The motion transfer member **431** can be flexible or pliable. The motion transfer member **431** can be disposed in a non-linear or curved configuration. The motion transfer member **431** can be configured to bend, curve, or wind around intervening components of an HMD. For example, the motion transfer member **431** can bend, curve, or wind around components of the HMD positioned between the guides **434***a*, **434***b*. The bend, curve, or wind of the motion transfer member **431** can relax spatial constraints and allow for more efficient and effective use of available space within the HMD. In some examples, the motion transfer member **431** can include a cable. In some examples, the motion transfer member **431** can comprise a stainless steel (SUS) alloy, a titanium alloy, a composite, a polymer, or a combination thereof. In some examples, the motion transfer member **431** can include retention clamps to assist with routing the motion transfer member **431**. The retention clamps can be configured to maintain a position of the motion transfer member **431** while allowing the motion transfer member **431** to transfer motion. In some examples, the motion transfer member **431** includes a support tube surrounding the motion transfer member **431**. In some examples, the support tube can be positioned using retention clamps. In some examples, the retention clamps or end fittings to couple the motion transfer member **431** to the right guide **434***a* and the left guide **434***b*.

[0082] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **8** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **8**.

[0083] FIG. **9** illustrates one example of an IPD adjustment mechanism **530**. The IPD adjustment mechanism **530** can include an actuator **529** and a motion transfer member **531**. The actuator **529** can include a body **554**, a first pin/slot connection **552***a*, a second pin/slot connection **552***b*, and a pivot **550**.

[0084] The body **554** can rotate about or around the pivot **550** of the IPD adjustment mechanism **530** or actuator **529**. The first pin/slot connection **552***a* can be disposed on a first or bottom side of the IPD adjustment mechanism **530** or actuator **529**. The second pin/slot connection **552***b* can be disposed on a second, opposite, or top side of IPD adjustment mechanism **530** or actuator **529**. The first pin/slot connection **552***a* can be coupled to the right guide **534***a* of the optical module. The second pin/slot connection **552***b* can be coupled to the left guide **534***b* via the motion transfer member **531**. The second pin/slot connection **552***b* can be coupled to an end of the motion transfer member **531**, such that the end of the motion transfer member **531** can be linearly constrained within the second pin/slot connection **552***b*.

[0085] In operation, rotation of the body **554** can produce a lever effect or cause the second pin/slot connection **552***b* to pivot about the pivot **550**. When the first pin/slot connection **552***a* translates and pivots about the pivot **550**, the first pin/slot connection **552***a* can push, pull, or otherwise translate the opposite longitudinal end of the body **554**, at the second pin/slot connection **552***b*, coupled to motion transfer member **531**, and otherwise exert a pulling force on motion transfer member **531**. For example, the first pin/slot connection **552***a* can pivot around pivot **550** and translate motion to the second pin/slot connection **552***b*. Such translation can provide a pulling or pushing motion to motion transfer member **531**. In some examples, the horizontal motion of the right guide **534***a* can be in an opposite direction to the horizontal motion of the left guide **534***b*.

[0086] In some examples, the actuator **529** can include a housing. The housing can enclose components of the IPD adjustment mechanism **530**. The housing can fully or partially enclose the actuator **529**. In some examples, the housing can be configured such that the first pin/slot connection 552a and/or the second pin/slot connection **552***b* can extend out of the housing. The housing can be configured such that the body **554** can pivot about the pivot **550** within an interior and/or exterior of the housing. The housing can fully or partially enclose a portion of the motion transfer member **531**. In some examples, the housing can be posi-

tioned proximal an edge of an HMD.

[0087] The motion transfer member **531** can be configured to transfer motion from the actuator **529**. For example, the motion transfer member **531** can be configured to transfer motion from the second pin/slot connection **552***b*. The motion transfer member **531** can be configured to transfer longitudinal motion. The motion transfer member **531** can extend from the second pin/slot connection **552***b*. The motion transfer member **531** can be configured to simultaneously transfer motion from the actuator **529** to a different area of the HMD.

[0088] The motion transfer member **531** can be a longitudinally elongate member. The motion transfer member **531** can have a low profile. The motion transfer member **531** can be flexible. The motion transfer member **531** can be configured to bend or wind around intervening components of the HMD. For example, the motion transfer member **531** can bend or wind around components of the HMD. In some examples, the configuration of the actuator **529** and the motion transfer member **531** can be positioned to avoid intervening component of the HMD. In some examples, the motion transfer member **531** can include a cable. In some examples, the motion transfer member **531** can comprise a stainless steel (SUS) alloy, a titanium alloy, a composite, a polymer, or a combination thereof. The motion transfer member **531** can include a support tube.

[0089] The location of the actuator **529** and the motion transfer member **531** can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **530** and additional components and mechanisms of the HMD. This can allow for more efficient use of internal space and increase compactness of the HMD. For instance, spatial area circumvented by the offset position of the actuator **529** and the motion transfer member **531** extending between through the HMD can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD.

[0090] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **9** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **9**.

[0091] FIG. **10** illustrates one example of an IPD adjustment mechanism **630**. The IPD adjustment mechanism **630** can include a right lead screw **664***a*, a left lead screw **664***b*, a shaft **666**, a right guide **634***a*, and a left guide **634***b*. The guides **634***a*, **634***b* can be configured to couple to optical modules.

[0092] The right lead screw **664***a* can be disposed on a first lateral side of the IPD adjustment mechanism **630**. The left lead screw **664***b* can be disposed on a second lateral side of the IPD adjustment mechanism **630**. The right lead screw **664***a* can be coupled to the shaft **666** via coupling member **668***a*. The left lead screw **664***b* can be coupled to the shaft **666** via coupling member **668***b*. The lead screws **634***a*, **634***b* can be rotationally fixed to the shaft **666**. For example, the lead screws **634***a*, **634***b* and the shaft **666** can be rotated as one body or member. The lead screws **634***a*, **634***b* can be a back-drivable, multi-start leadscrews. In some examples, lead screws **664***a*, **664***a*can be co-planar and in parallel and/or offset from each other. In at least one example, each of lead screws **664***a*, **664***b* can be coupled to a corresponding guide of guides **634***a*, **634***a*. For example, the right lead screw **664***a*can be coupled to the right guide **634***a* and the left lead screw **664***b* can be coupled to the left guide **634***b*. In some examples, lead screws **664***a*, **664***b* can be oppositely threaded, such that rotation of flexible shaft **666** and lead screws **664***a*, **664***b* can simultaneously translate guides **634***a*, **634***b* away from or towards one another.

[0093] The right lead screw **664***a* can be partially or fully enclosed in a right lead screw housing **665***a*. The left lead screw **664***b* can be partially or fully enclosed in a left lead screw housing **665***b*. The lead screw housings **665***a*, **665***b* can include a right bearing **666***a* and a left bearing **666***b*, respectively. In some examples, the bearings **666***a*, **666***b* can be ball bearings. The bearings **666***a*, **666***b* can be disposed at a longitudinal end of lead screw housings **665***a*, **665***b*. The bearings **666***a*, **666***b* can be rotated and can allow for simultaneous rotation of the lead screws **664***a*, **664***b*.

[0094] The shaft **666** can extend between the lead screws **664***a*, **664***b*. The shaft **666** can be configured to transfer rotation motion between the lead screws **664***a*, **664***b*. The shaft **666** can be configured to couple the lead screws **664***a*, **664***b* together. The shaft **666** can be flexible. The shaft **666** can be formed from a pliable material. The shaft **666** can be configured to be curved while still maintaining a torsional rigidity—or effectively transfer rotation motion.

[0095] The IPD adjustment mechanism **630** can be manually actuated by a user. In some examples, the user can rotate a dial to manually rotate lead screws **664***a*, **664***b* relative to the bearings **666***a*, **666***b*. The IPD adjustment mechanism 630 can be actuated by a motor. In some examples, a user can press a button to rotate one or both of lead screws **664***a*, **664***b* relative to bearings **666***a*, **666***b*. When actuated, the lead screws **664***a*, **664***b* and the shaft **666** can be rotated relative to bearings **666***a*, **666***b*. When the lead screws **664***a*, **664***b* and the shaft 666 are rotated relative to bearings **666***a*, **666***b* the guides **634***a*, **634***b* can either move toward or move away from one another to adjust the IPD distance for the user. In some examples, the user can grip optical modules attached to guides **634***a*, **634***b* and move the optical modules towards or away from one another. In some examples, movement of guides **634***a*, **634***b* and their corresponding optical modules is simultaneous, such that a user can also move only one of the optical modules or guide rods and the other optical module or guide rod moves an equal amount either toward or away from one another.

[0096] The location of the lead screws **664***a*, **664***b* proximal the guides **634***a*, **634***b* and the shaft **666** extending between the lead screws **664***a*, **664***b* can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **630** and additional components and

mechanisms of the HMD. This can allow for more efficient use of internal space as well as increasing compactness of the HMD. For instance, spatial area circumvented by the offset position of the lead screws **664***a*, **664***b* and the shaft **666** extending between through the HMD can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD.

[0097] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **10** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures. Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **10**.

[0098] FIG. **11** illustrates one example of an IPD adjustment mechanism **730**. The IPD adjustment mechanism **730** can include a right lead screw **764***a*, a left lead screw **764***b*, a shaft **766**, a right guide **734***a*, and a left guide **734***b*. The guides **734***a*, **734***b* can be configured to couple to optical modules.

[0099] The right lead screw **764***a* can be disposed on a first lateral side of the IPD adjustment mechanism **730**. The left lead screw **764***b* can be disposed on a second lateral side of the IPD adjustment mechanism **730**. The right lead screw **764***a*can be coupled to the shaft **766** via coupling member **768***a*. The left lead screw **764***b* can be coupled to the shaft **766** via coupling member **768***b*. The lead screws **764***a*, **764***b* can be rotationally fixed to the shaft **766**. For example, the lead screws **764***a*, **764***b*and the shaft **766** can be rotated as one body or member. The lead screws **764***a*, **764***b* can be a back-drivable, multi-start leadscrews. In some examples, lead screws **764***a*, **764***a*can be arranged in a non-linear or non-planar configuration with respect to one another. For example, the lead screws **764***a*,**764***b* can be offset from the shaft **766**. In some examples, the lead screws **764***a*,**764***b* can be offset from the shaft **766** by at least about 5-degrees or more. The coupling members **768***a*, **768***b* can be configured to allow the transfer of the rotation motion, even when the lead screws **764***a*, **764***b* are positioned at an angle. In some examples, each of lead screws 764a, 764b can be coupled to a corresponding guide of guides **734***a*, **734***a*. For example, the right lead screw **764***a* can be coupled to the right guide **734***a* and the left lead screw **764***b* can be coupled to the left guide **734***b*. The lead screws **764***a*, **764***b* can be linearly coupled to the guides **734***a*, **734***b*. Accordingly, if the lead screws 764a, 764b are positioned at an angle, the guides **734***a*, **734***b* can be positioned at a similar angle. The offset or angle of the lead screws **764***a*, **764***b* and/or the guides **734***a*, **734***b* can be selected to accommodate the general curvature of an HMD and/or a face of a user. In some examples, lead screws **764***a*, **764***b*can be oppositely threaded, such that rotation of flexible shaft **766** and lead screws **764***a*, **64***b* can simultaneously translate guides **734***a*, **734***b* away from or towards one another.

[0100] The right lead screw **764***a* can be partially or fully enclosed in a right lead screw housing **765***a*. The left lead screw **764***b* can be partially or fully enclosed in a left lead screw housing **765***b*. The housings **765***a*, **765***b* can be positioned at an angle substantially similar to the angle of the lead screws **764***a*, **764***b*. The lead screw housings **765***a*,**765***b* can include a right bearing **66***a* and a left bearing **6676***b*, respectively. In some examples, the bearings **766***a*, **766***b* can be ball bearings. The bearings **766***a*, **766***b* can be disposed at a longitudinal end of lead screw housings **765***a*, **765***b*. The bearings **766***a*, **766***b* can be rotated and can allow for simultaneous rotation of the lead screws **764***a*, **764***b*.

[0101] The shaft **766** can extend between the lead screws **764***a*, **764***b*. The shaft **766** can be configured to transfer rotation motion between the lead screws **764***a*, **764***b*. The shaft **766** can be configured to couple the lead screws **764***a*, **764***b* together. The shaft **766** can be flexible. The shaft 766 can be formed from a pliable material. The shaft **766** can be configured to be curved while still maintaining a torsional rigidity—or effectively transfer rotation motion.

[0102] The IPD adjustment mechanism **730** can be manually actuated by a user. In some examples, the user can rotate a dial to manually rotate lead screws **764***a*, **764***b* relative to the bearings **766***a*, **766***b*. The IPD adjustment mechanism **730** can be actuated by a motor. In some examples, a user can press a button to rotate one or both of lead screws **764***a*, **764***b* relative to bearings **766***a*, **766***b*. When actuated, the lead screws **764***a*, **764***b* and the shaft **766** can be rotated relative to bearings **766***a*, **766***b*. When the lead screws **764***a*, **764***b* and the shaft 766 are rotated relative to bearings **766***a*, **766***b* the guides **734***a*, **734***b* can either move toward or move away from one another to adjust the IPD distance for the user. In some examples, the user can grip optical modules attached to guides **734***a*, **734***b* and move the optical modules towards or away from one another. In some examples, movement of guides **734***a*, **734***b* and their corresponding optical modules is simultaneous, such that a user can also move only one of the optical modules or guide rods and the other optical module or guide rod moves an equal amount either toward or away from one another.

[0103] The location of the lead screws **64***a*, **6674***b* proximal the guides **734***a*, **734***b* and the shaft **766** extending between the lead screws **764***a*, **764***b* can circumvent or avoid spatial conflicts that would otherwise be present between the IPD adjustment mechanism **730** and additional components and mechanisms of the HMD. This can allow for more efficient use of internal space and increase compactness of the HMD. For instance, spatial area circumvented by the linearly offset position of the lead screws **764***a*, **764***b* and the shaft **766** extending between through the HMD can provide room for additional hardware such as sensors, processors, or cooling mechanisms, without compromising a slim profile, form-factor, and/or functionality of the HMD.

[0104] Any of the features, components, and/or parts, including the arrangements and configurations thereof shown in FIG. **11** can be included, either alone or in any combination, in any of the other examples of devices, features, components, and parts shown in the other figures.

Likewise, any of the features, components, and/or parts, including the arrangements and configurations thereof shown in the other figures can be included, either alone or in any combination, in the example of the devices, features, components, and parts shown in FIG. **11**.

[0105] To the extent applicable to the present technology, gathering and use of data available from various sources can be used to improve the delivery to users of invitational content or any other content that may be of interest to them. The present disclosure contemplates that in some instances, this gathered data may include personal information data that uniquely identifies or can be used to contact or locate a specific person. Such personal information data can include demographic data, location-based data, telephone numbers, email addresses, X® (formerly TWITTER®) ID's, home addresses, data or records relating to a user's health or level of fitness (e.g., vital signs measurements, medication information, exercise information), date of birth, or any other identifying or personal information.

[0106] The present disclosure recognizes that the use of such personal information data, in the present technology, can be used to the benefit of users. For example, the personal information data can be used to deliver targeted content that is of greater interest to the user. Accordingly, use of such personal information data enables users to calculated control of the delivered content. Further, other uses for personal information data that benefit the user are also contemplated by the present disclosure. For instance, health and fitness data may be used to provide insights into a user's general wellness or may be used as positive feedback to individuals using technology to pursue wellness goals.

[0107] The present disclosure contemplates that the entities responsible for the collection, analysis, disclosure, transfer, storage, or other use of such personal information data will comply with well-established privacy policies and/or privacy practices. In particular, such entities should implement and consistently use privacy policies and practices that are generally recognized as meeting or exceeding industry or governmental requirements for maintaining personal information data private and secure. Such policies should be easily accessible by users and should be updated as the collection and/or use of data changes. Personal information from users should be collected for legitimate and reasonable uses of the entity and not shared or sold outside of those legitimate uses. Further, such collection/sharing should occur after receiving the informed consent of the users. Additionally, such entities should consider taking any needed steps for safeguarding and securing access to such personal information data and ensuring that others with access to the personal information data adhere to their privacy policies and procedures. Further, such entities can subject themselves to evaluation by third parties to certify their adherence to widely accepted privacy policies and practices. In addition, policies and practices should be adapted for the particular types of personal information data being collected and/or accessed and adapted to applicable laws and standards, including jurisdiction-specific considerations. For instance, in the US, collection of or access to certain health data may be governed by federal and/or state laws, such as the Health Insurance Portability and Accountability Act (HIPAA); whereas health data in other countries may be subject to other regulations and policies and should be handled accordingly. Hence different privacy practices should be maintained for different personal data types in each country.

[0108] Despite the foregoing, the present disclosure also contemplates examples in which users selectively block the use of, or access to, personal information data. That is, the present disclosure contemplates that hardware and/or software elements can be provided to prevent or block access to such personal information data. For example, in the case of advertisement delivery services, the present technology can be configured to allow users to select to "opt in" or "opt out" of participation in the collection of personal information data during registration for services or anytime thereafter. In another example, users can select not to provide mood-associated data for targeted content delivery services. In yet another example, users can select to limit the length of time mood-associated data is maintained or entirely prohibit the development of a baseline mood profile. In addition to providing "opt in" and "opt out" options, the present disclosure contemplates providing notifications relating to the access or use of personal information. For instance, a user may be notified upon downloading an app that their personal information data will be accessed and then reminded again just before personal information data is accessed by the app.

[0109] Moreover, it is the intent of the present disclosure that personal information data should be managed and handled in a way to minimize risks of unintentional or unauthorized access or use. Risk can be minimized by limiting the collection of data and deleting data once it is no longer needed. In addition, and when applicable, including in certain health related applications, data de-identification can be used to protect a user's privacy. De-identification may be facilitated, when appropriate, by removing specific identifiers (e.g., date of birth, etc.), controlling the amount or specificity of data stored (e.g., collecting location data a city level rather than at an address level), controlling how data is stored (e.g., aggregating data across users), and/or other methods.

[0110] Therefore, although the present disclosure broadly covers use of personal information data to implement one or more various disclosed examples, the present disclosure also contemplates that the various examples can also be implemented without the need for accessing such personal information data. That is, the various examples of the present technology are not rendered inoperable due to the lack of all or a portion of such personal information data. For example, content can be selected and delivered to users by inferring preferences based on non-personal information data or a bare minimum amount of personal information, such as the content being requested by the device associated with a user, other non-personal information available to the content delivery services, or publicly available information.

[0111] The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the described examples. However, it will be apparent to one skilled in the art that the specific details

are not required in order to practice the described examples. Thus, the foregoing descriptions of the specific examples described herein are presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the examples to the precise forms disclosed. It will be apparent to one of ordinary skill in the art that many modifications and variations are possible in view of the above teachings.

What is claimed is:

1. A head-mountable display device, comprising:
- a frame;
- a display coupled to the frame and comprising a first optical module and a second optical module;
- an adjustment mechanism coupled to the first optical module; and
- a motion transfer member coupled to the adjustment mechanism and the second optical module, the motion transfer member extending between the first optical module and the second optical module;
- wherein the adjustment mechanism is configured to simultaneously adjust a position of the first optical module and a position of the second optical module relative to each other.

2. The head-mountable display device of claim **1**, wherein the adjustment mechanism comprises a rack and pinion.

3. The head-mountable display device of claim **2**, wherein the motion transfer member comprises a cable.

4. The head-mountable display device of claim **3**, wherein the rack and pinion is disposed at an angle relative to the cable.

5. The head-mountable display device of claim **3**, wherein the rack and pinion comprises a rotating post and a detent configured to engage the rotating post.

6. The head-mountable display device of claim **3**, wherein the rack and pinion comprises a damping element configured to absorb energy.

7. The head-mountable display device of claim **1**, wherein the adjustment mechanism comprises a lead screw.

8. The head-mountable display device of claim **1**, wherein the motion transfer member comprises a flexible shaft.

9. The head-mountable display device of claim **1**, further comprising an impact absorption element disposed between the motion transfer member and the second optical module.

10. An interpupillary distance adjustment mechanism, comprising:
- a first guide coupled to a first optical module;
- a second guide coupled to a second optical module;
- an adjustment mechanism coupled to the first guide; and
- a motion transfer member comprising:
  - a first longitudinal end coupled to the adjustment mechanism;
  - a second longitudinal end coupled to the second guide; and
  - an elongate portion extending from the first longitudinal end and the second longitudinal end;
- wherein the adjustment mechanism is configured to adjust a first position of the first guide relative to a second position of the second guide.

11. The interpupillary distance adjustment mechanism of claim **10**, wherein the motion transfer member extends through a midpoint of the interpupillary distance adjustment mechanism.

12. The interpupillary distance adjustment mechanism of claim **11**, wherein the motion transfer member extends through the midpoint in a non-linear configuration.

13. The interpupillary distance adjustment mechanism of claim **10**, further comprising an actuator disposed off-center relative to a midpoint of the interpupillary distance adjustment mechanism.

14. The interpupillary distance adjustment mechanism of claim **13**, wherein the actuator is disposed adjacent to the first optical module.

15. The interpupillary distance adjustment mechanism of claim **13**, wherein the actuator comprises:
- a first rack coupled to the first guide;
- a second rack coupled to the motion transfer member; and
- a circular gear engaging the first rack and the second rack.

16. A head-mountable display device, comprising:
- a frame;
- a display coupled to the frame, the display comprising a first optical module and a second optical module; and
- an interpupillary distance adjustor configured to modify a distance between the first optical module and the second optical module, the interpupillary distance adjustment mechanism comprising:
  - a first leadscrew coupled to the first optical module;
  - a second leadscrew coupled to the second optical module and disposed at an angle relative to the first leadscrew; and
  - a center joint connecting the first leadscrew and the second leadscrew;
- wherein a rotation of the first leadscrew causes an adjustment of a distance between the first optical module and the second optical module.

17. The head-mountable display device of claim **16**, wherein the adjustment of the first leadscrew simultaneously adjusts a position of the first optical module and the second optical module.

18. The head-mountable display device of claim **16**, wherein the adjustment of the first leadscrew in a first rotational direction is configured to translate the first optical module closer relative to the second optical module.

19. The head-mountable display device of claim **18**, wherein the adjustment of the first leadscrew in a second rotational direction is configured to translate the first optical module further relative to the second optical module.

20. The head-mountable display device of claim **16**, wherein the interpupillary distance adjustor further comprises an actuator disposed adjacent to the first leadscrew.

* * * * *