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(12) **Reissued Patent**
Belanger et al.

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(54) **ADJUSTABLE HOCKEY HELMET**

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(73) Assignee: **BAUER HOCKEY, LLC**, Exeter, NH (US)

(21) Appl. No.: **16/867,511**

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Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **8,832,870**
Issued: **Sep. 16, 2014**
Appl. No.: **13/654,260**
Filed: **Oct. 17, 2012**

U.S. Applications:

(63) Continuation of application No. 15/904,016, filed on Feb. 23, 2018, now Pat. No. Re. 48,048, which is a continuation of application No. 15/268,127, filed on Sep. 16, 2016, now Pat. No. Re. 47,747, which is an application for the reissue of Pat. No. 8,832,870, which is a continuation of application No. 12/191,000, filed on Aug. 13, 2008, now Pat. No. 8,296,868.

(Continued)

(51) **Int. Cl.**
A42B 3/32 (2006.01)

(52) **U.S. Cl.**
CPC ***A42B 3/324*** (2013.01)

(58) **Field of Classification Search**
CPC A42B 3/324
USPC 2/420, 414, 425, 421, 9, 411, 417, 418, 2/423, 424
See application file for complete search history.

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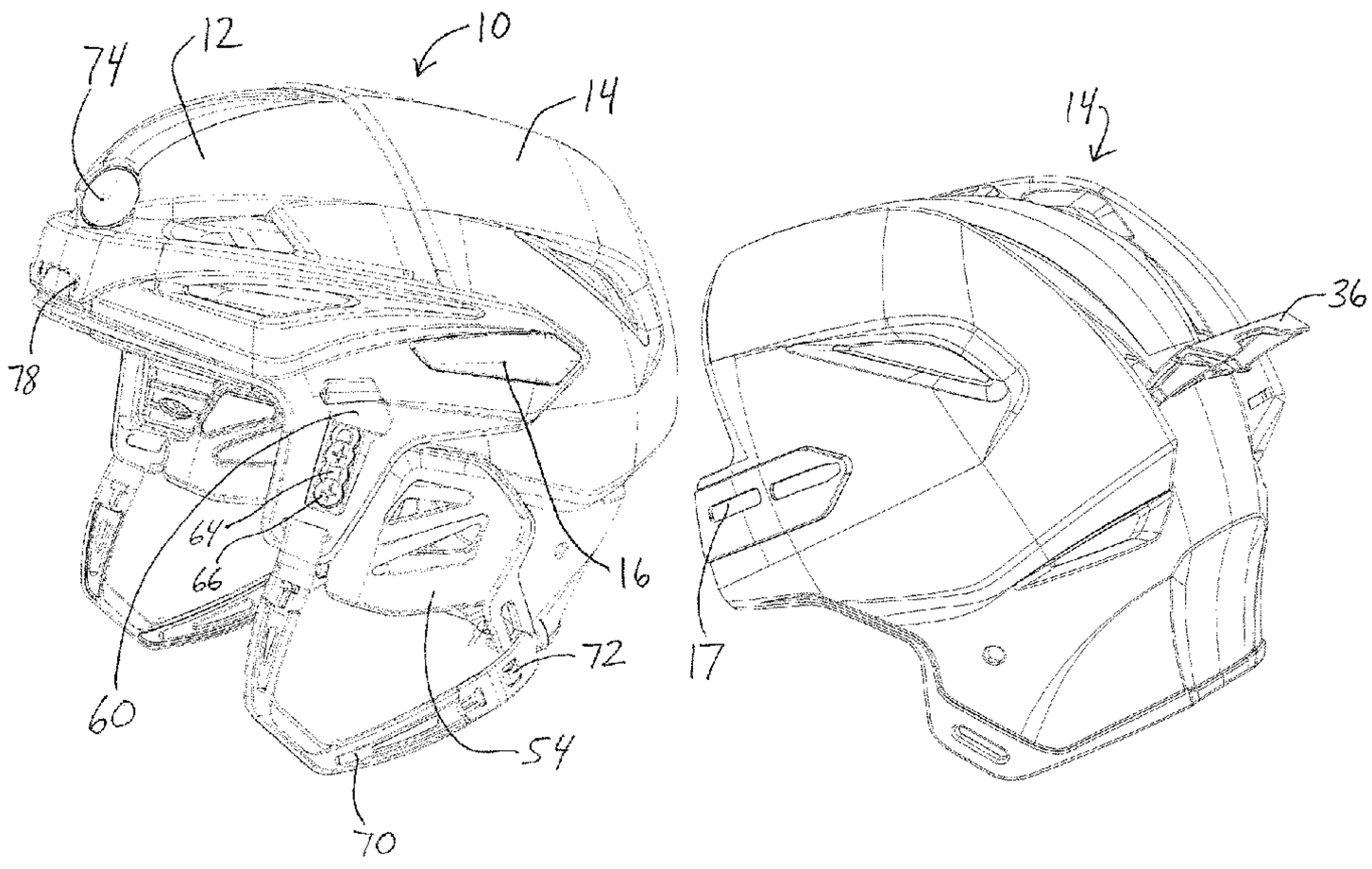
(57) **ABSTRACT**

An adjustable hockey helmet includes a front shell that is longitudinally movable relative to a rear shell to adjust the length of the helmet. One or more substantially rigid straps or similar elements are attached to the front shell and extend to the interior of the rear shell. A cam mechanism or similar device is included on the rear shell for securing the straps directly or indirectly against the interior of the rear shell to prevent longitudinal movement of the front shell relative to the rear shell once the helmet is adjusted to a desired length. Alternatively, the one or more straps may be attached to the rear shell and the cam mechanism may be included on the front shell.

39 Claims, 25 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 60/956,621, filed on Aug. 17, 2007.

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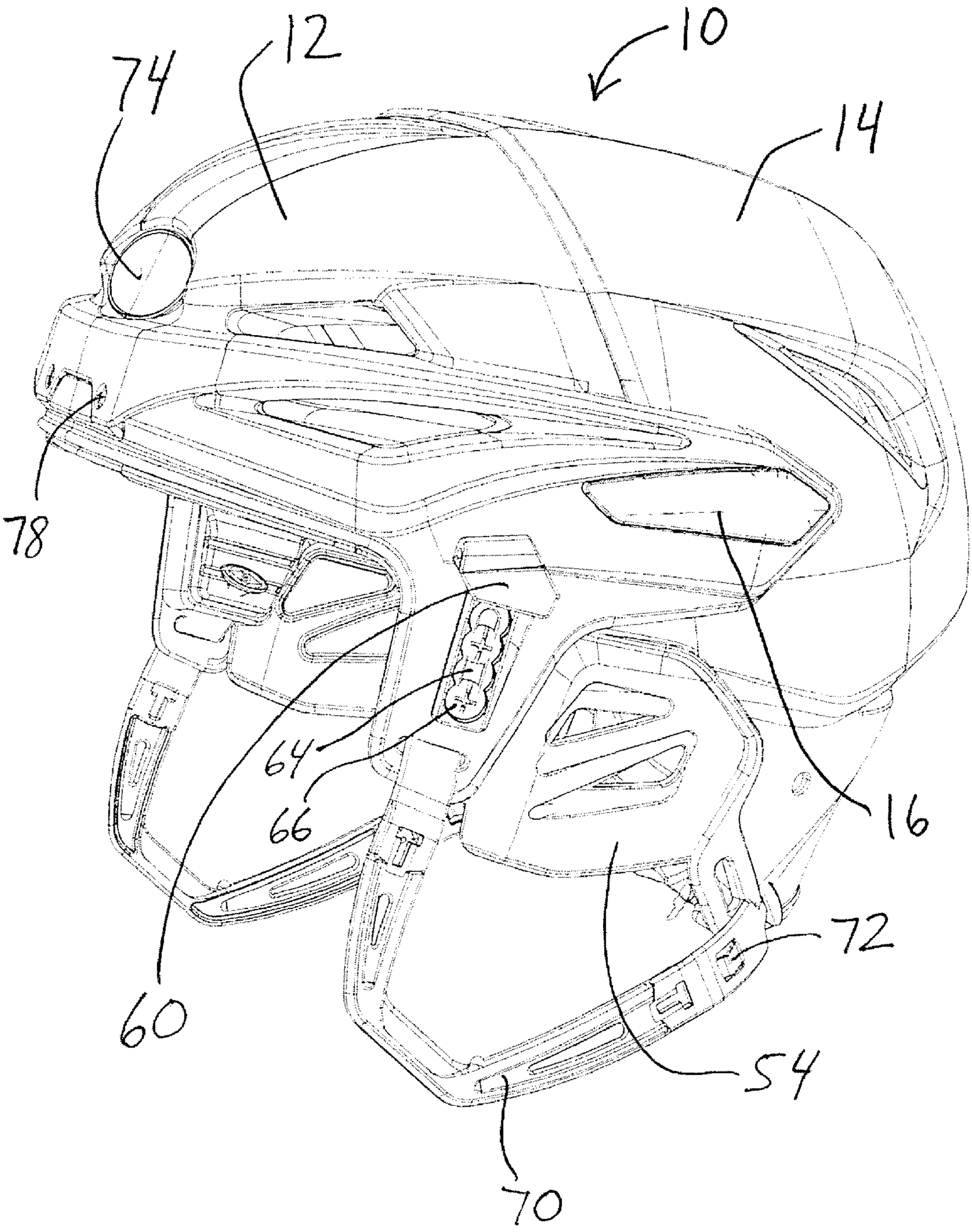

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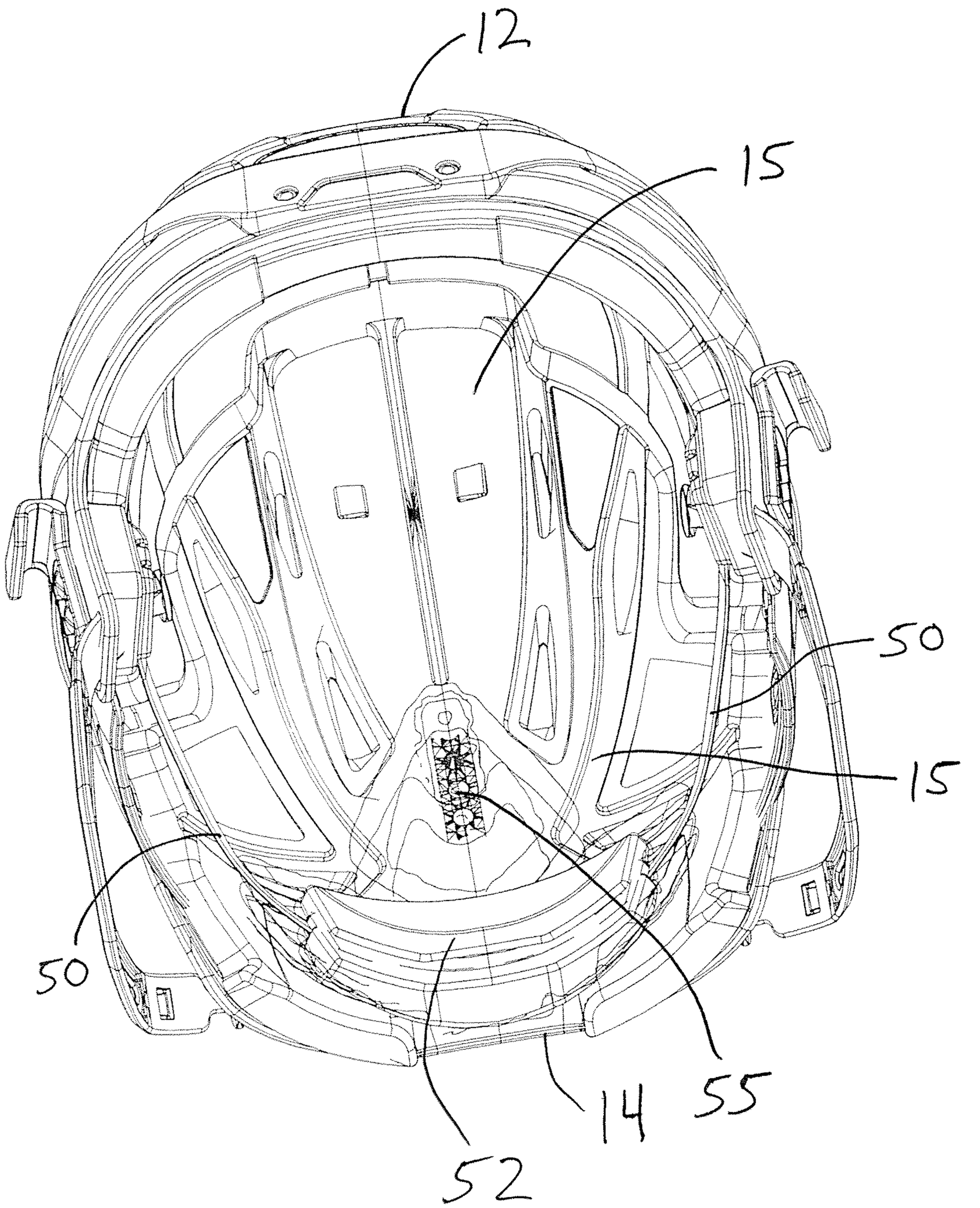


Fig. 2

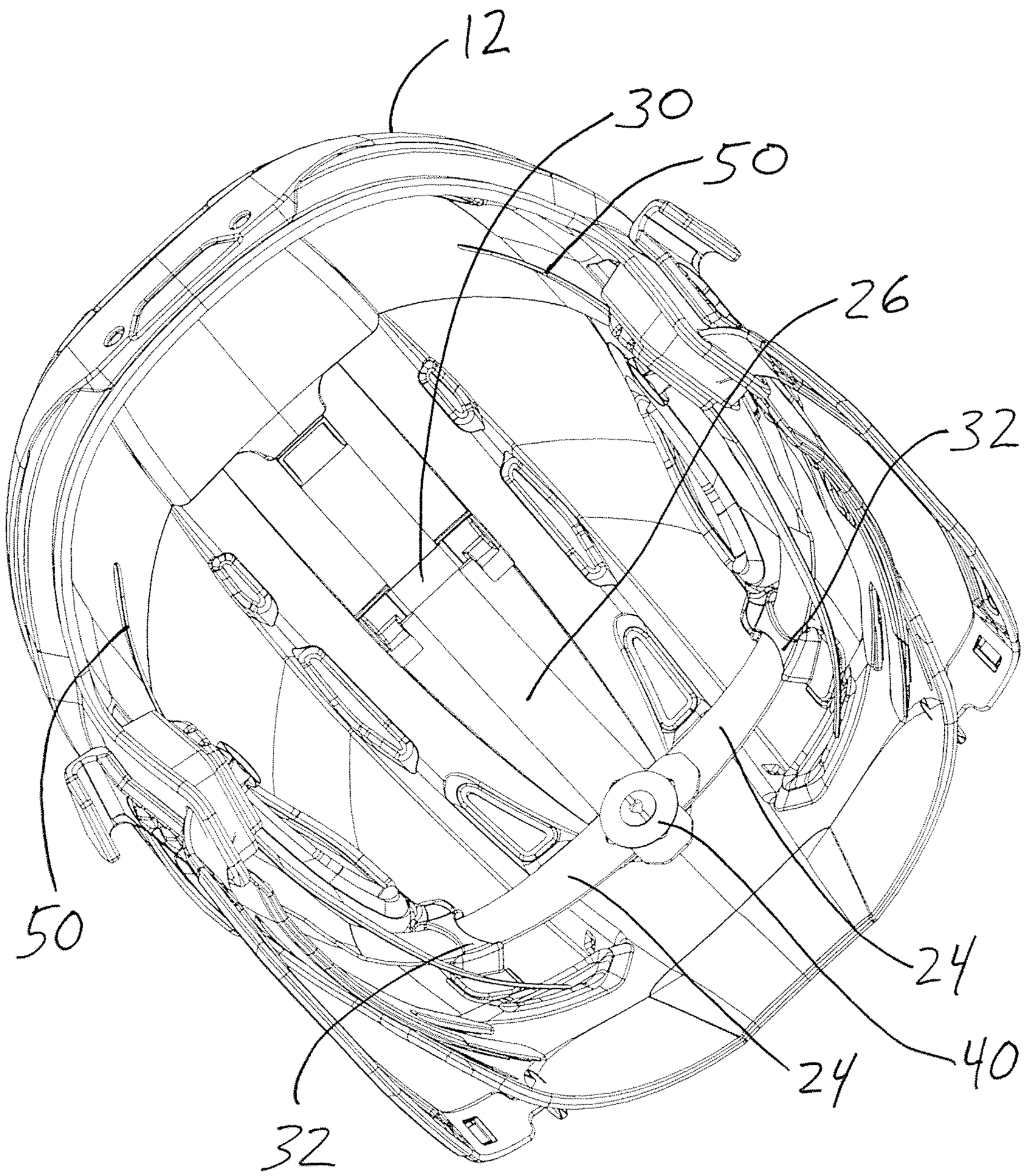


Fig. 3

Fig. 4A

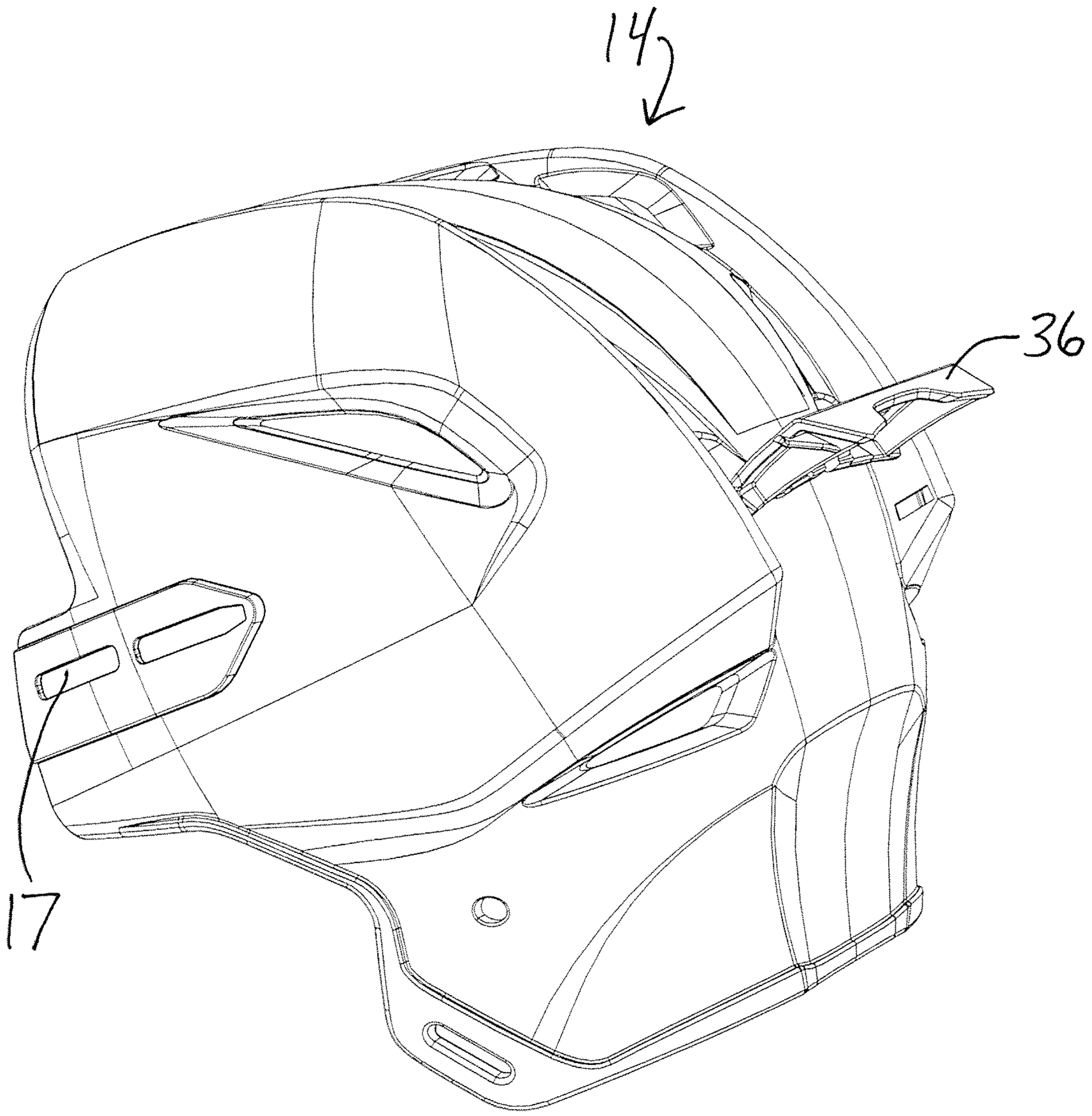


Fig. 4B

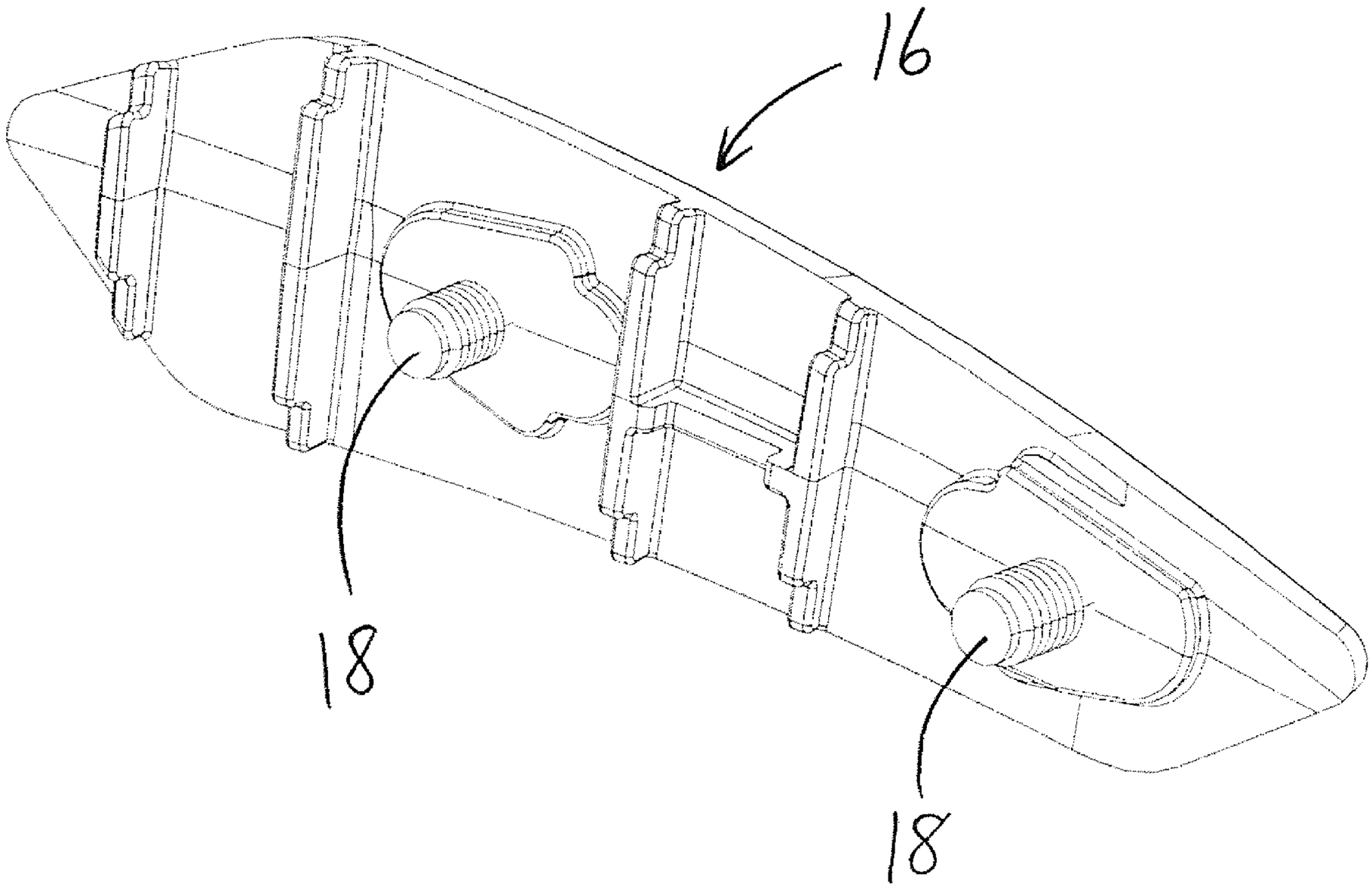
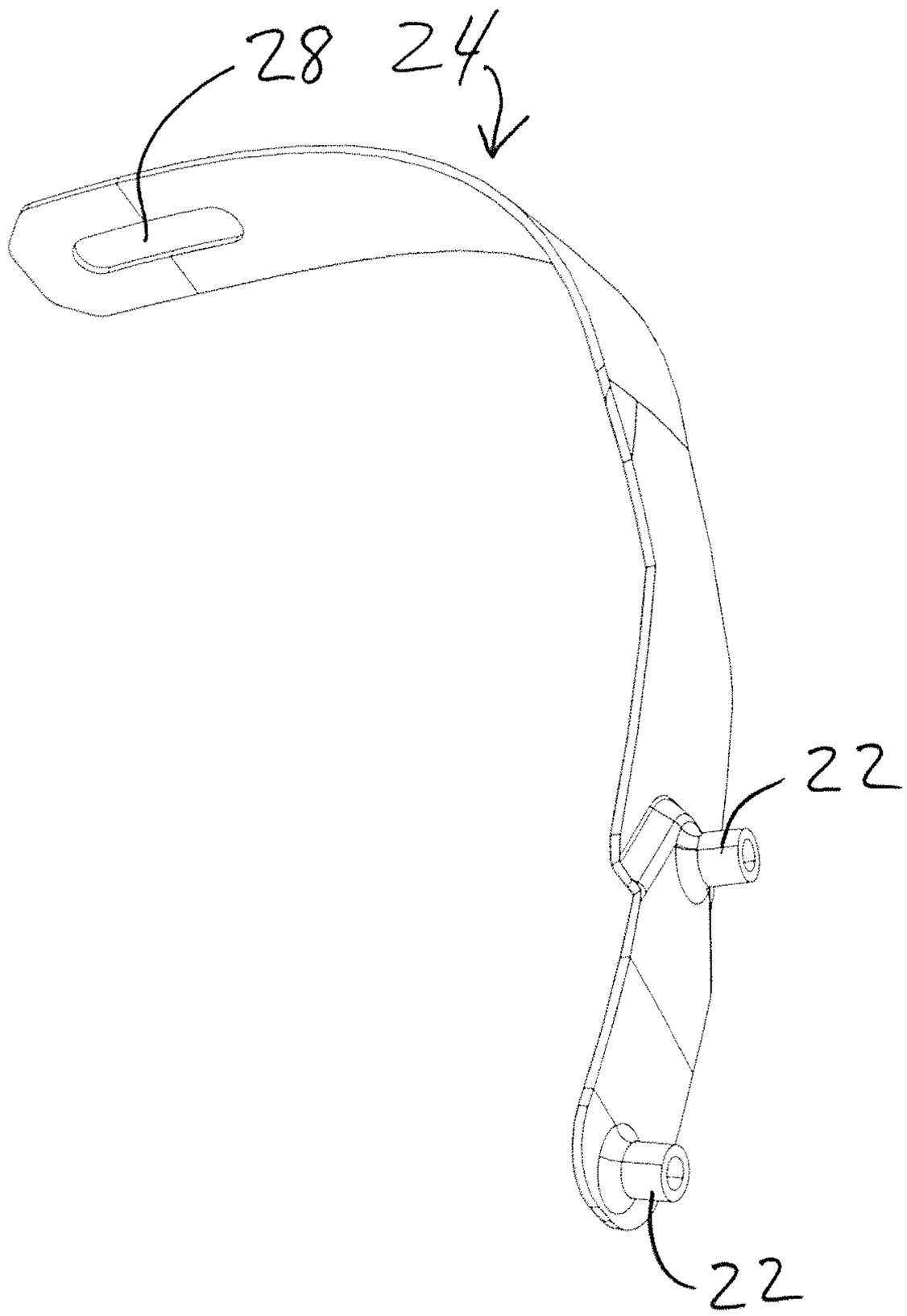


Fig. 5



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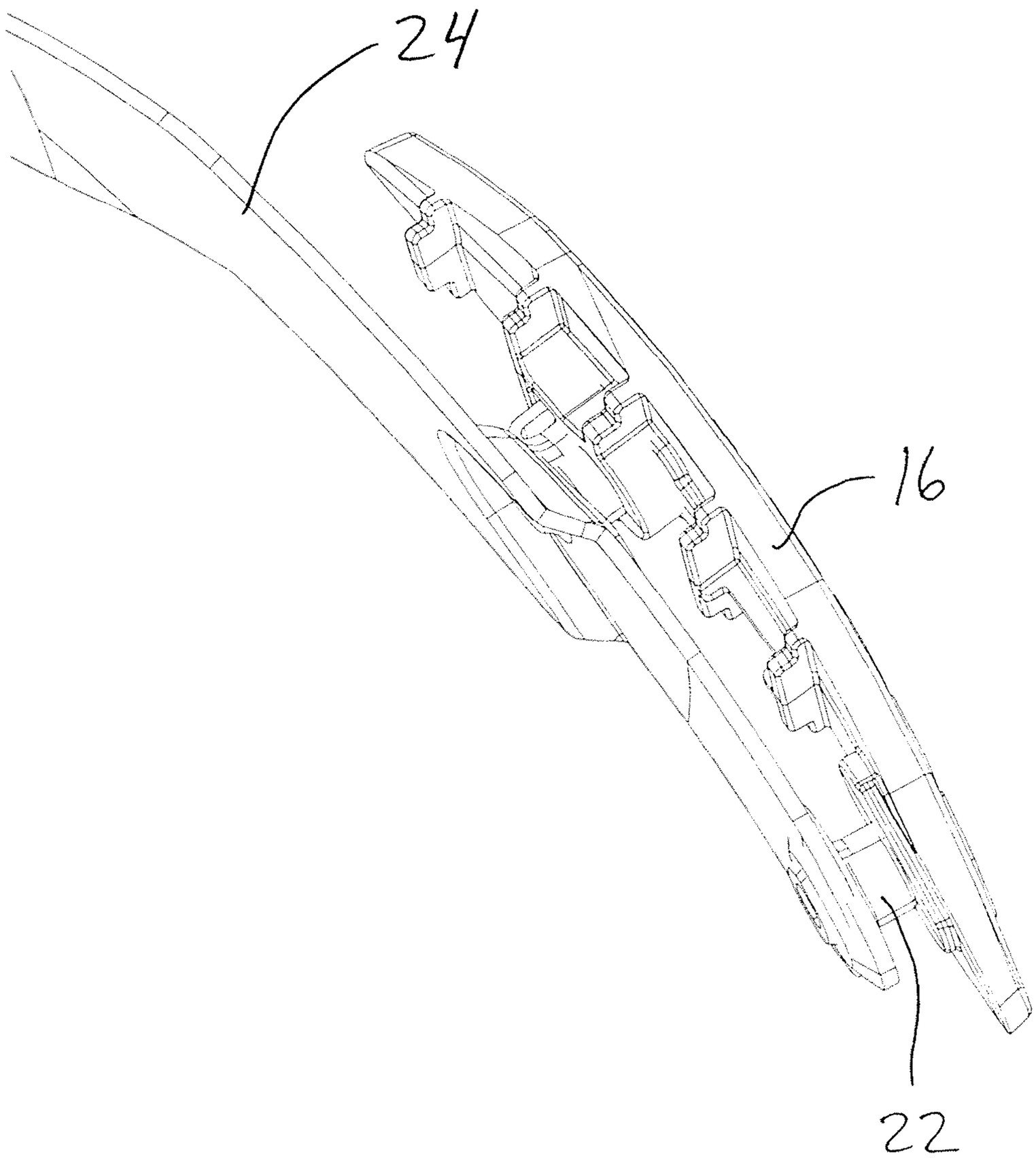

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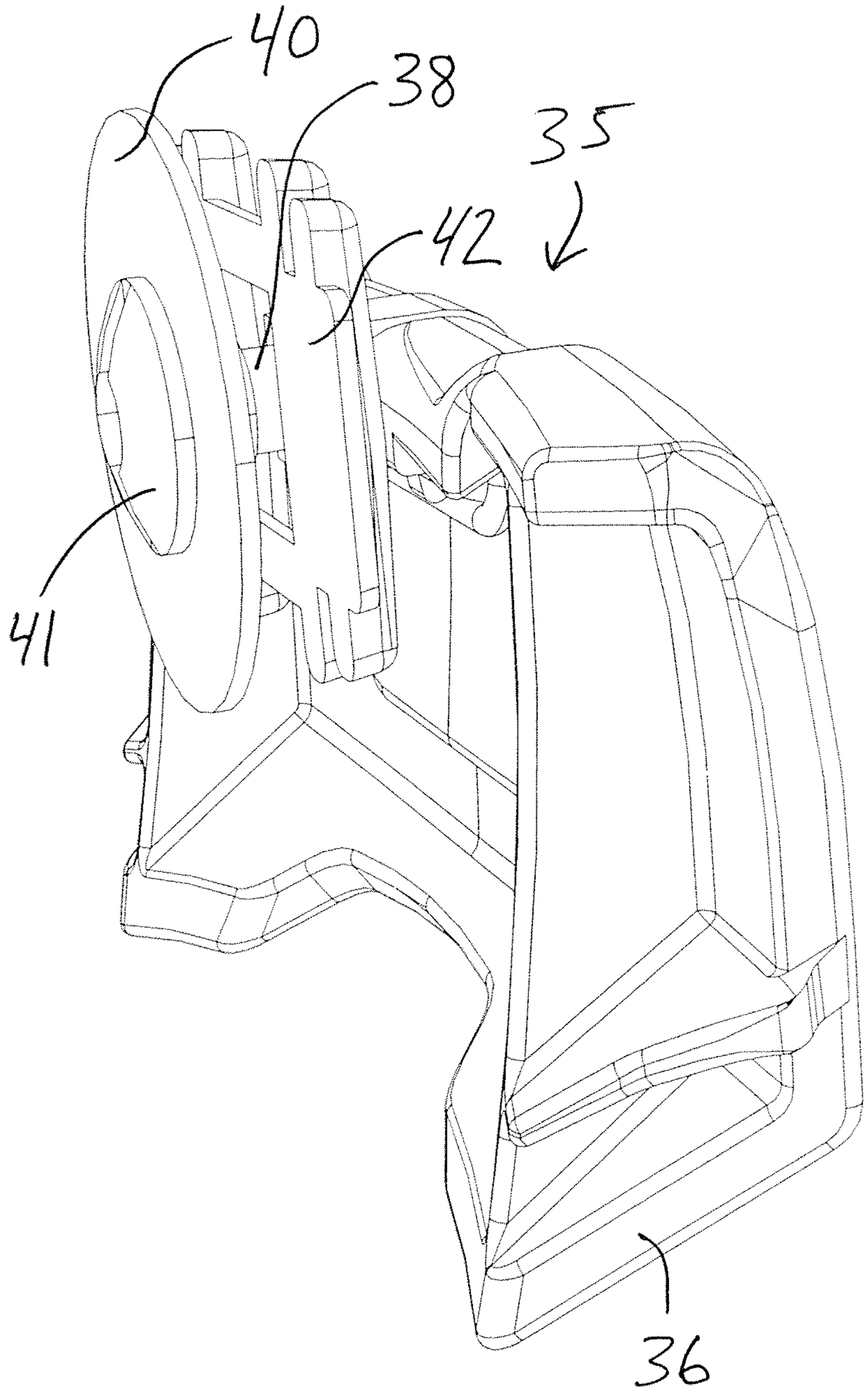


Fig. 8

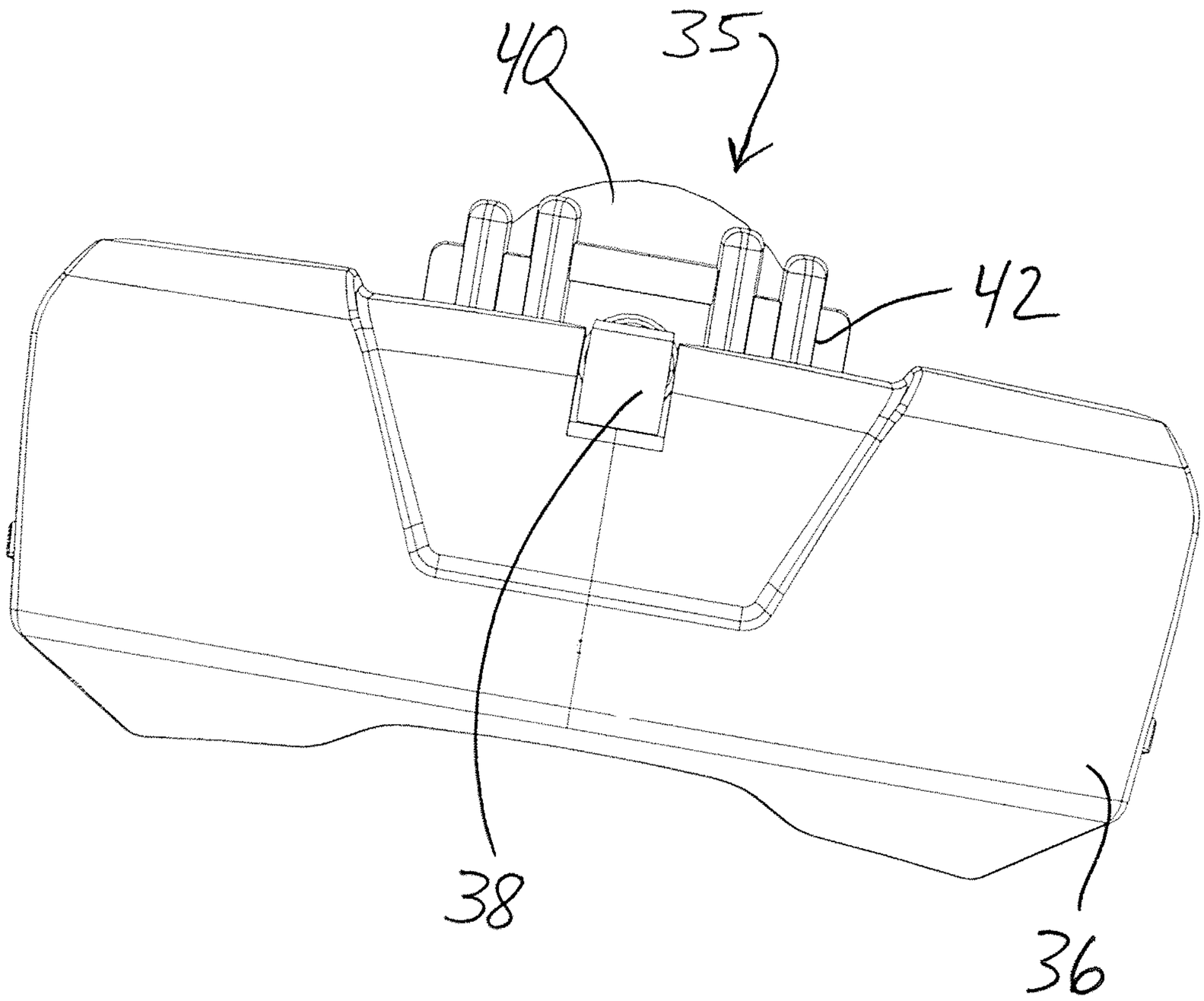


Fig. 9

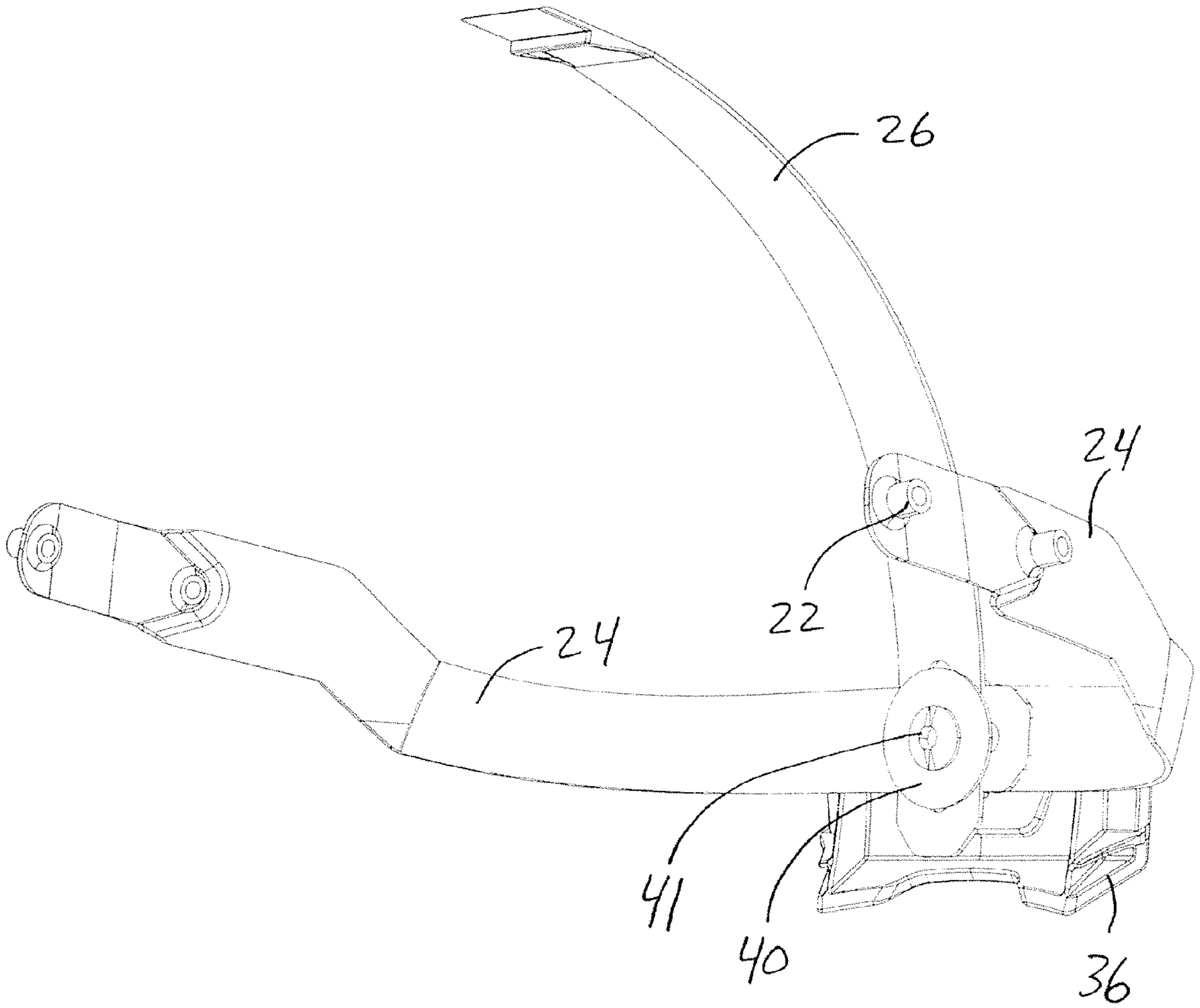
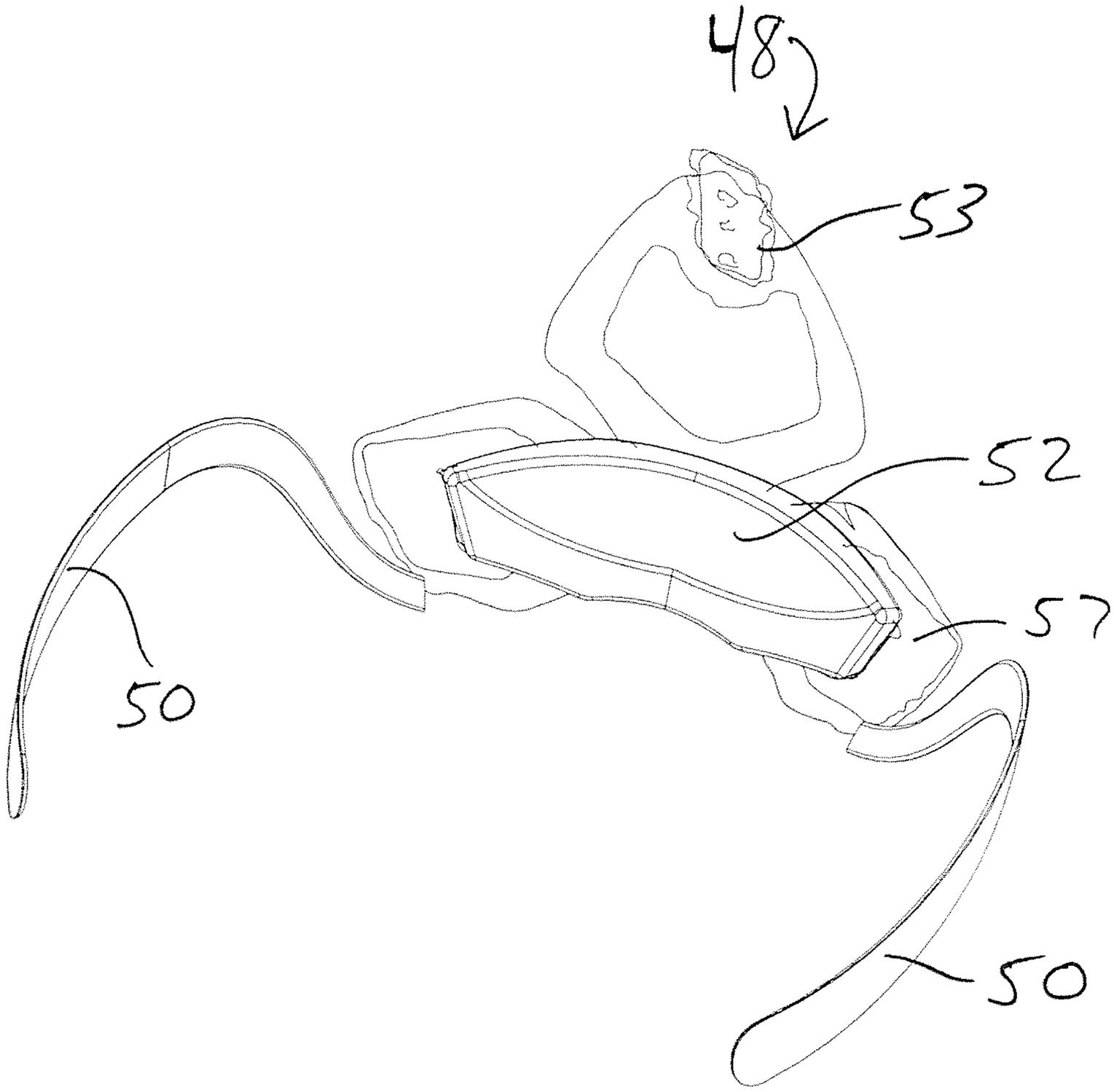


Fig. 10



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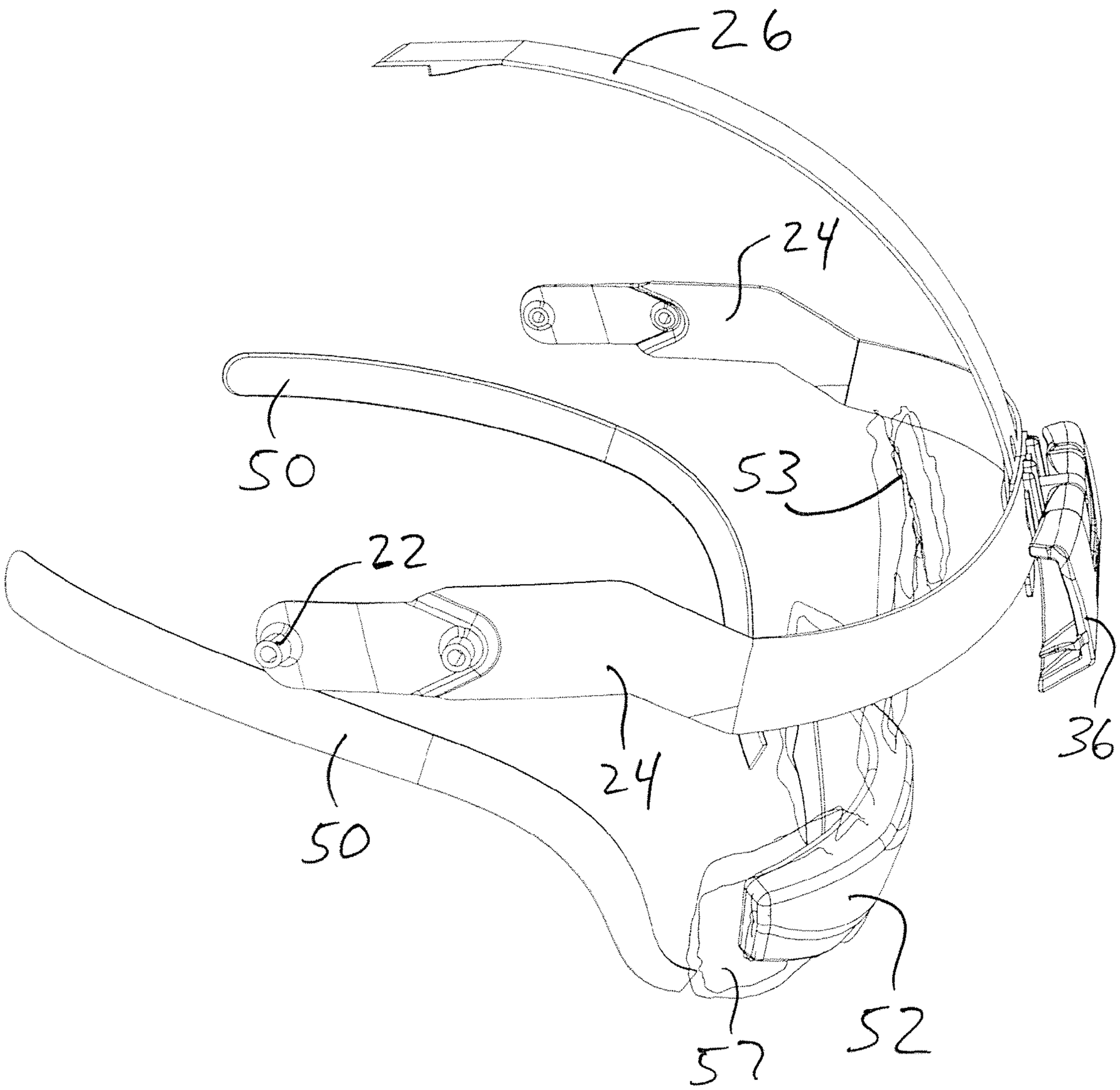

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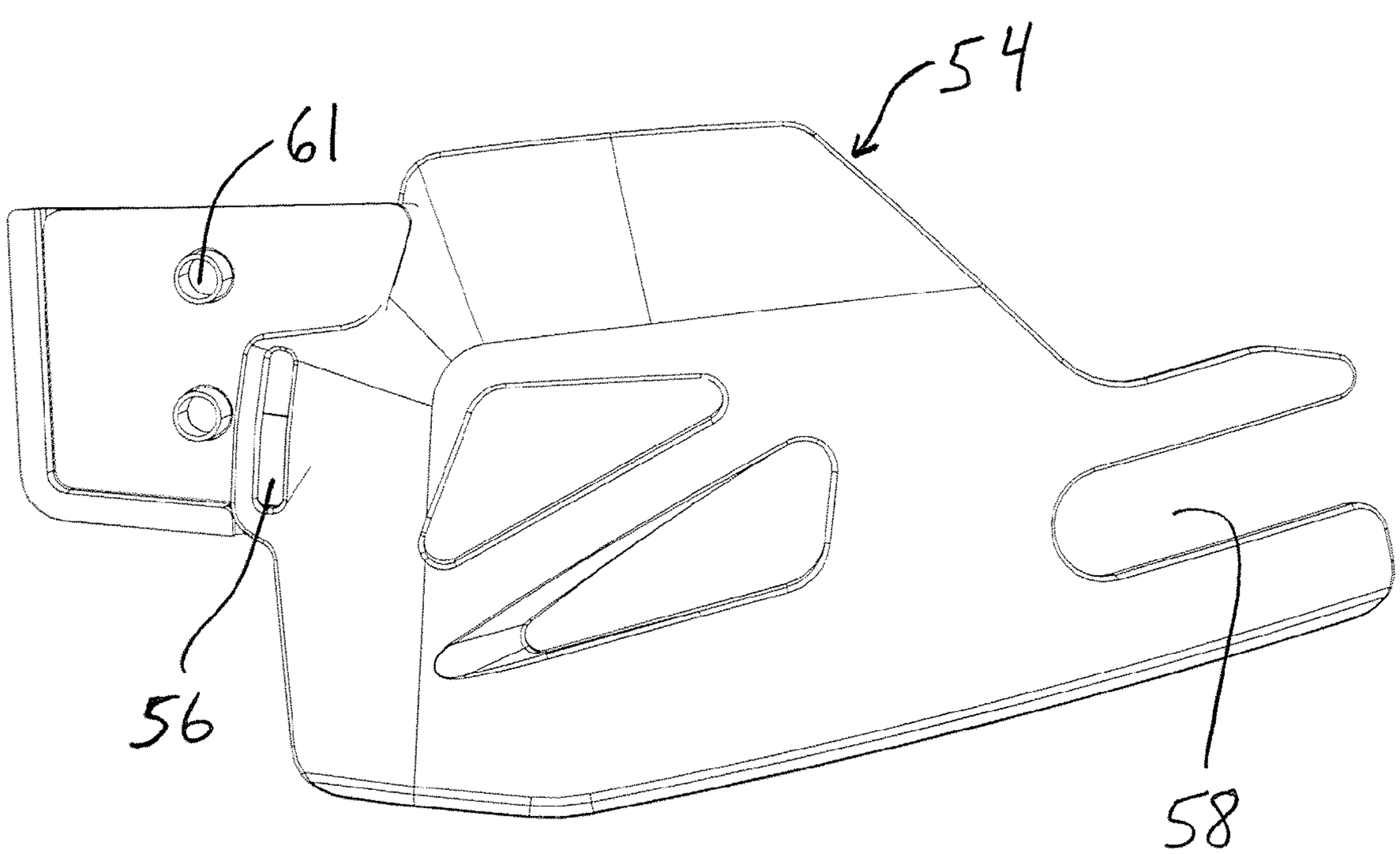

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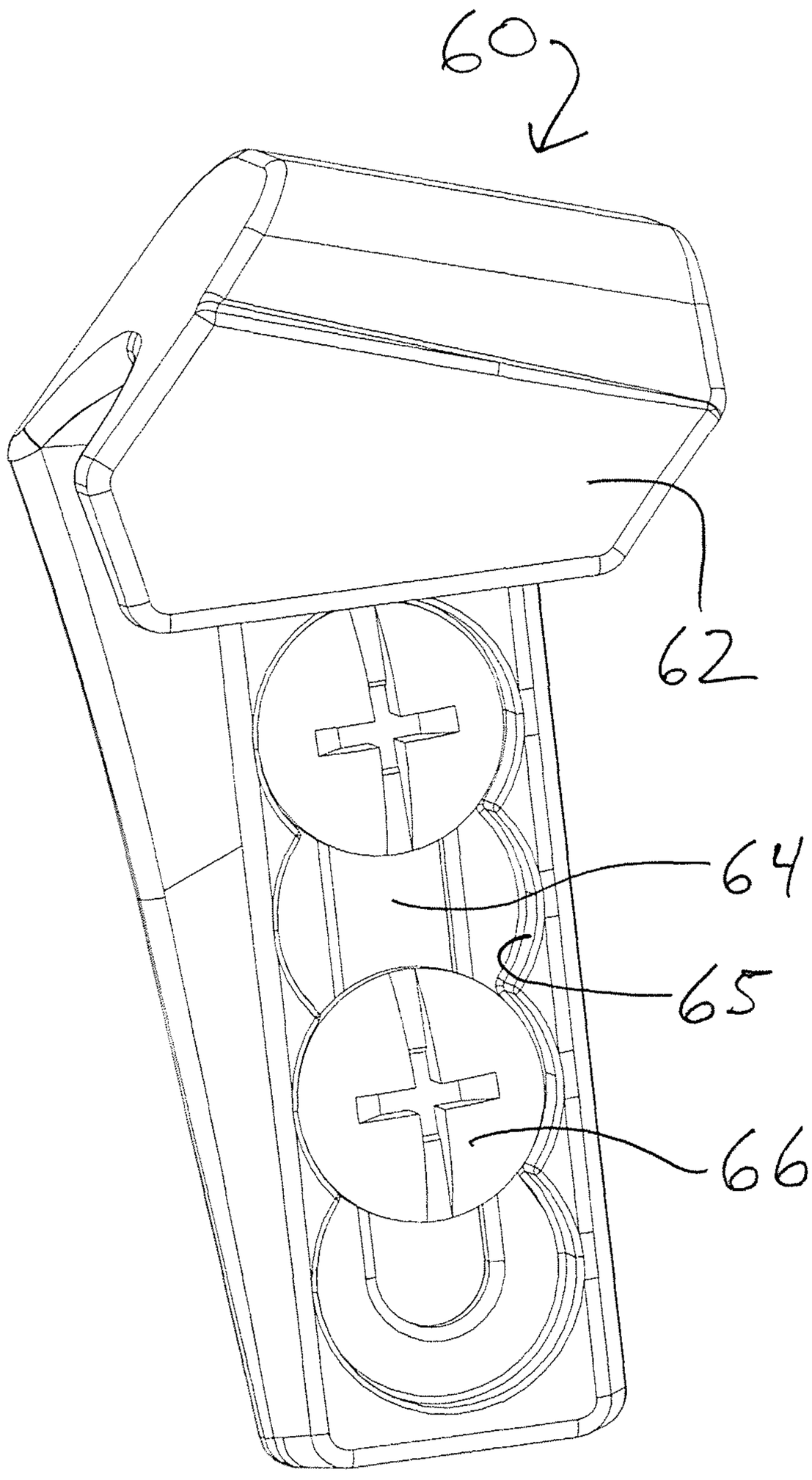
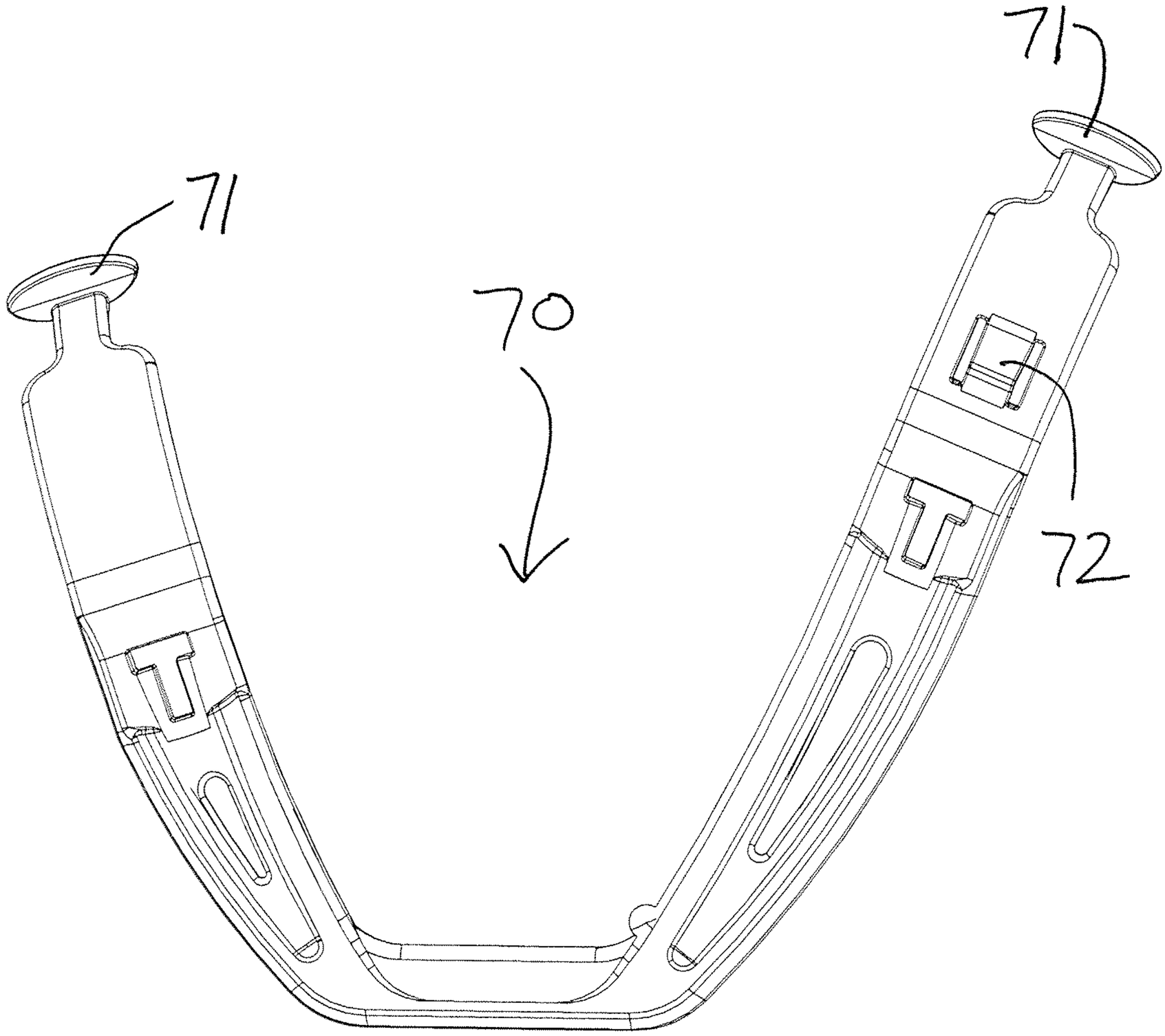


Fig. 14



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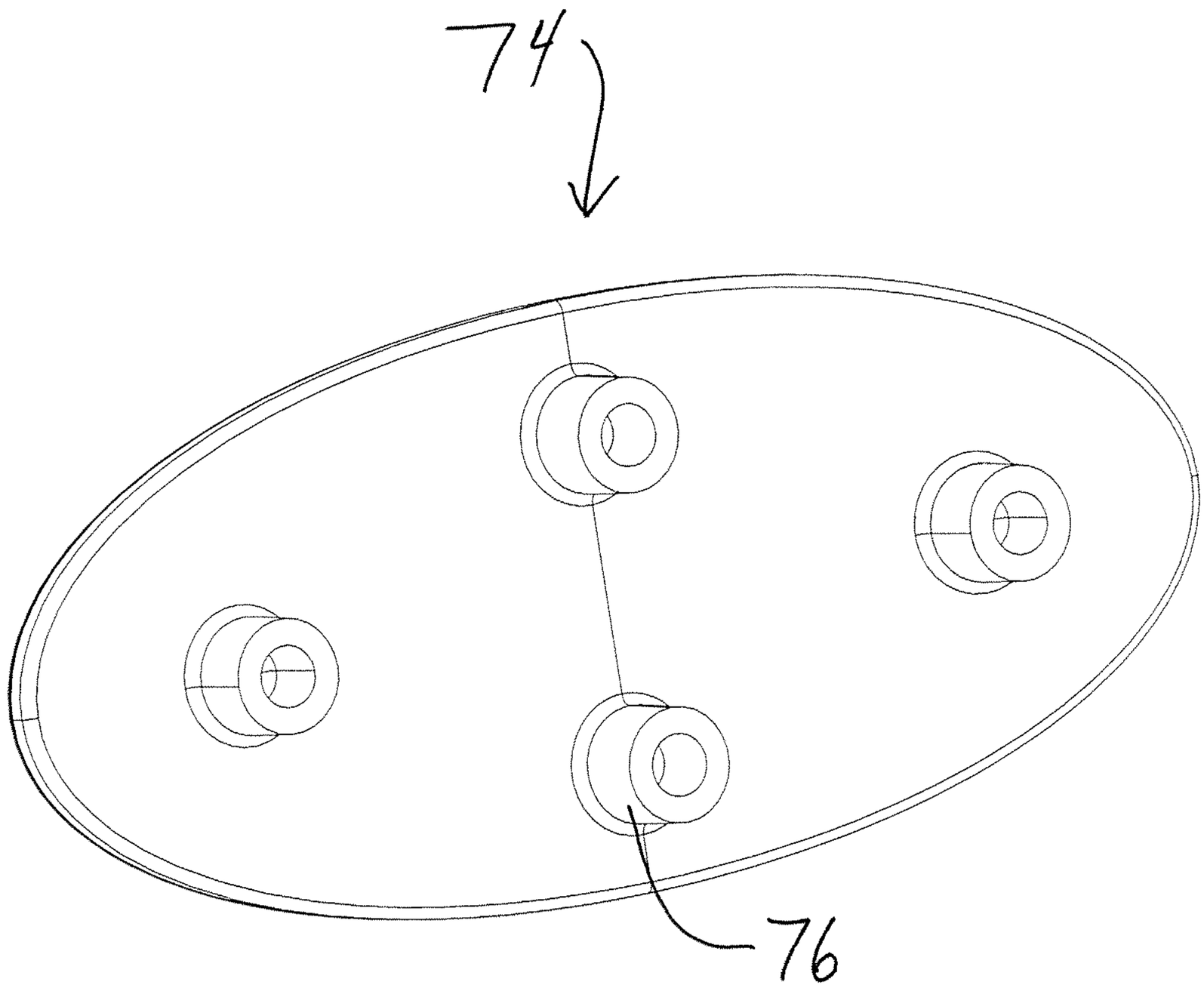


Fig. 16

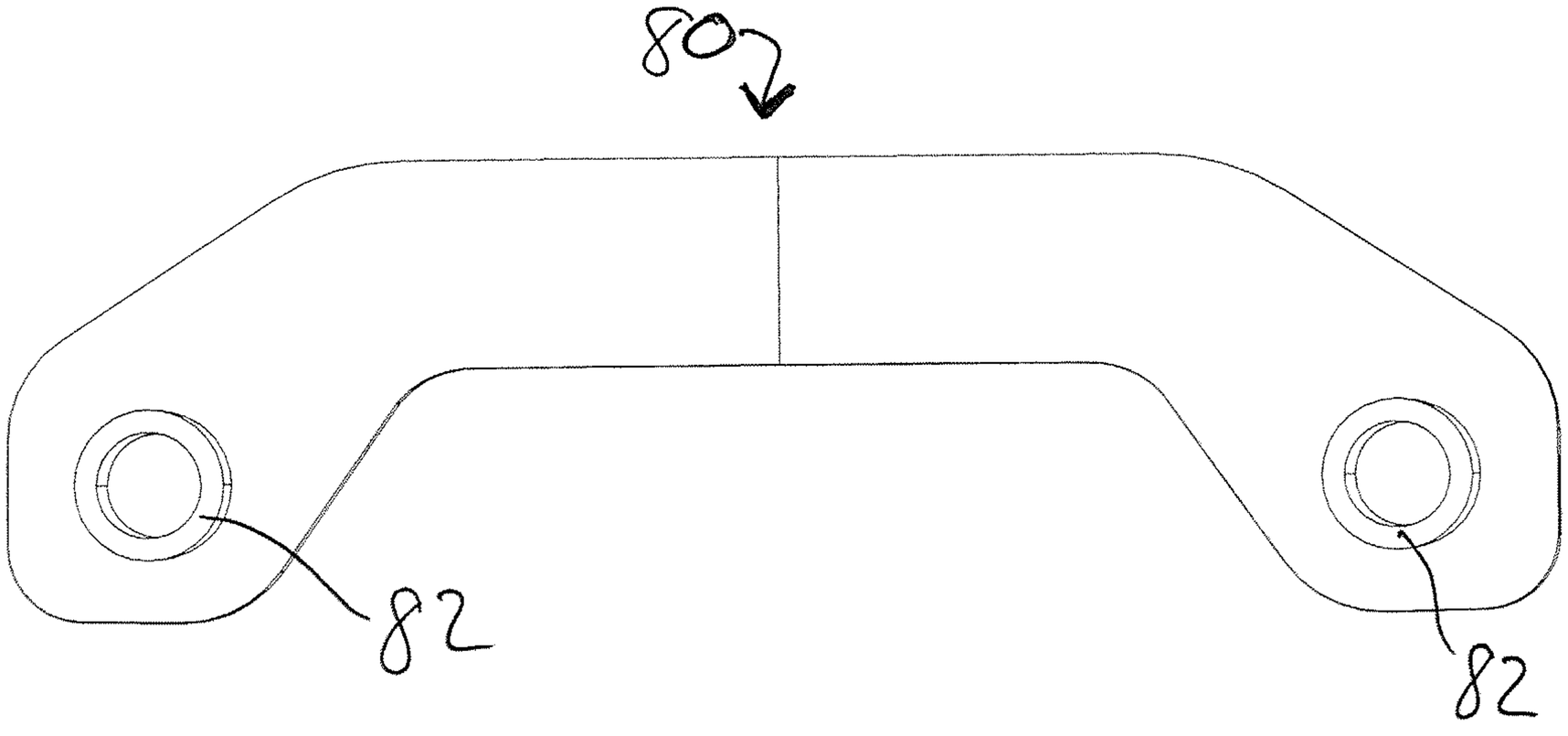


Fig. 17A

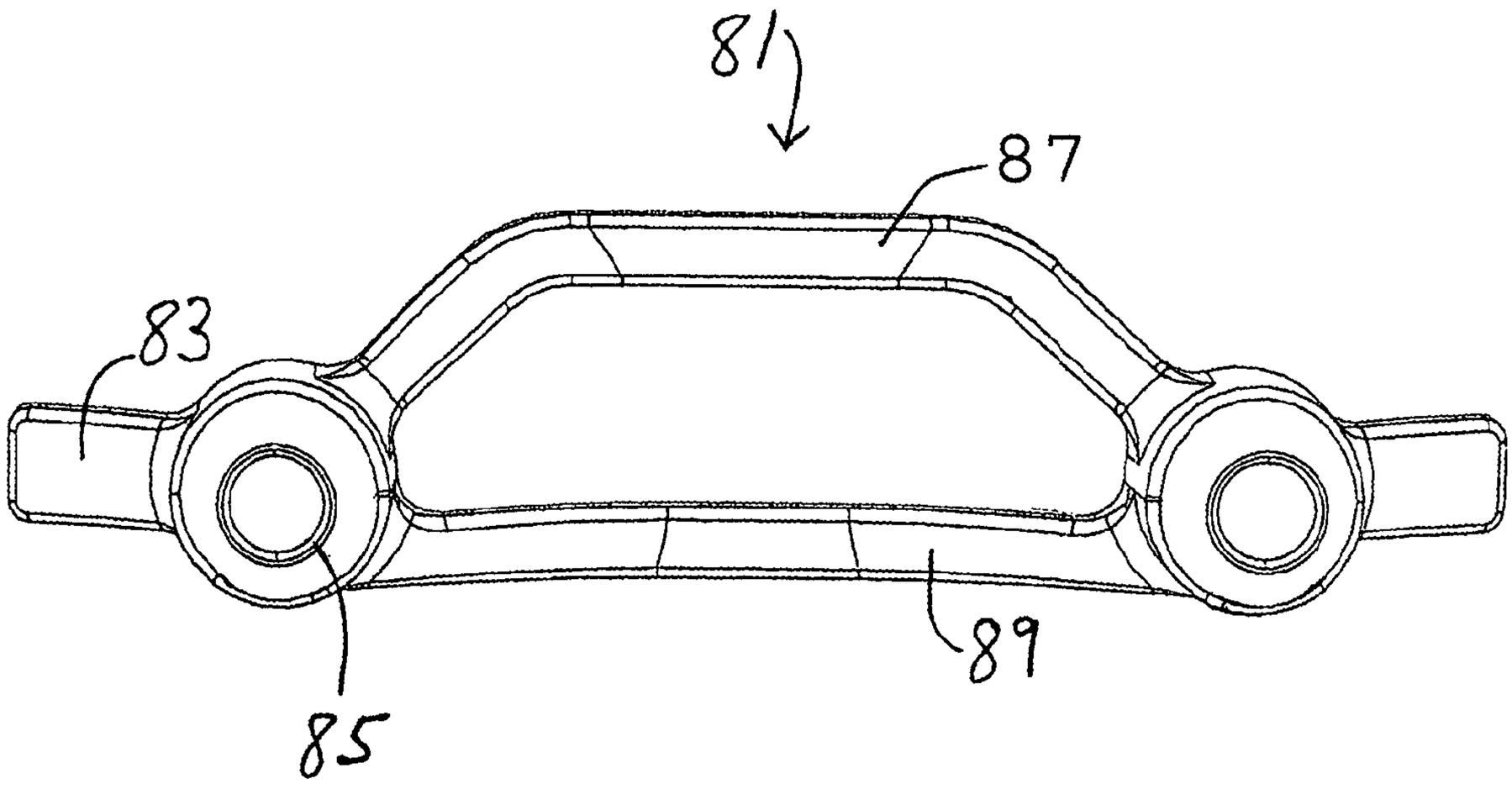
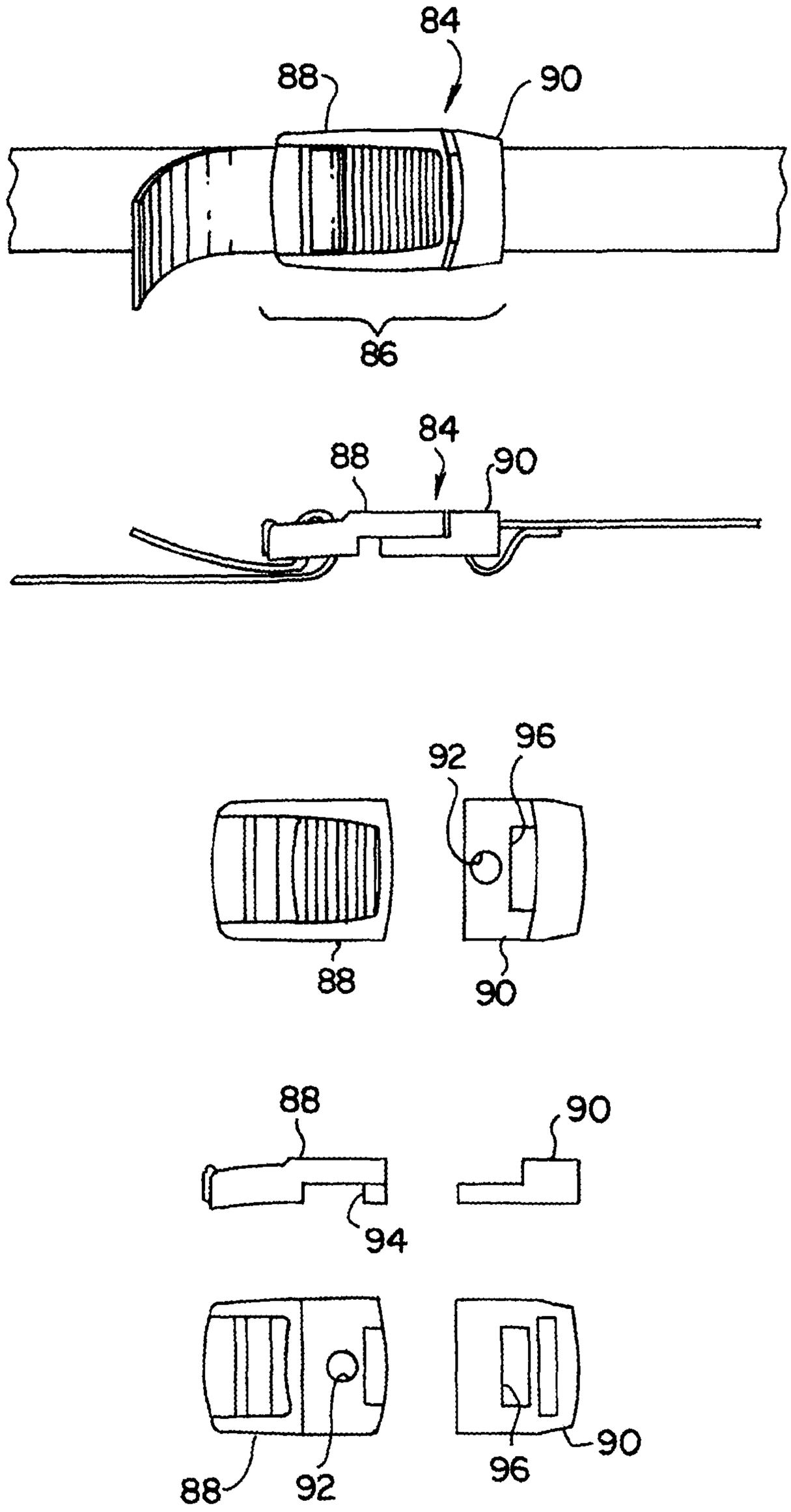


Fig. 17B

FIG. 18



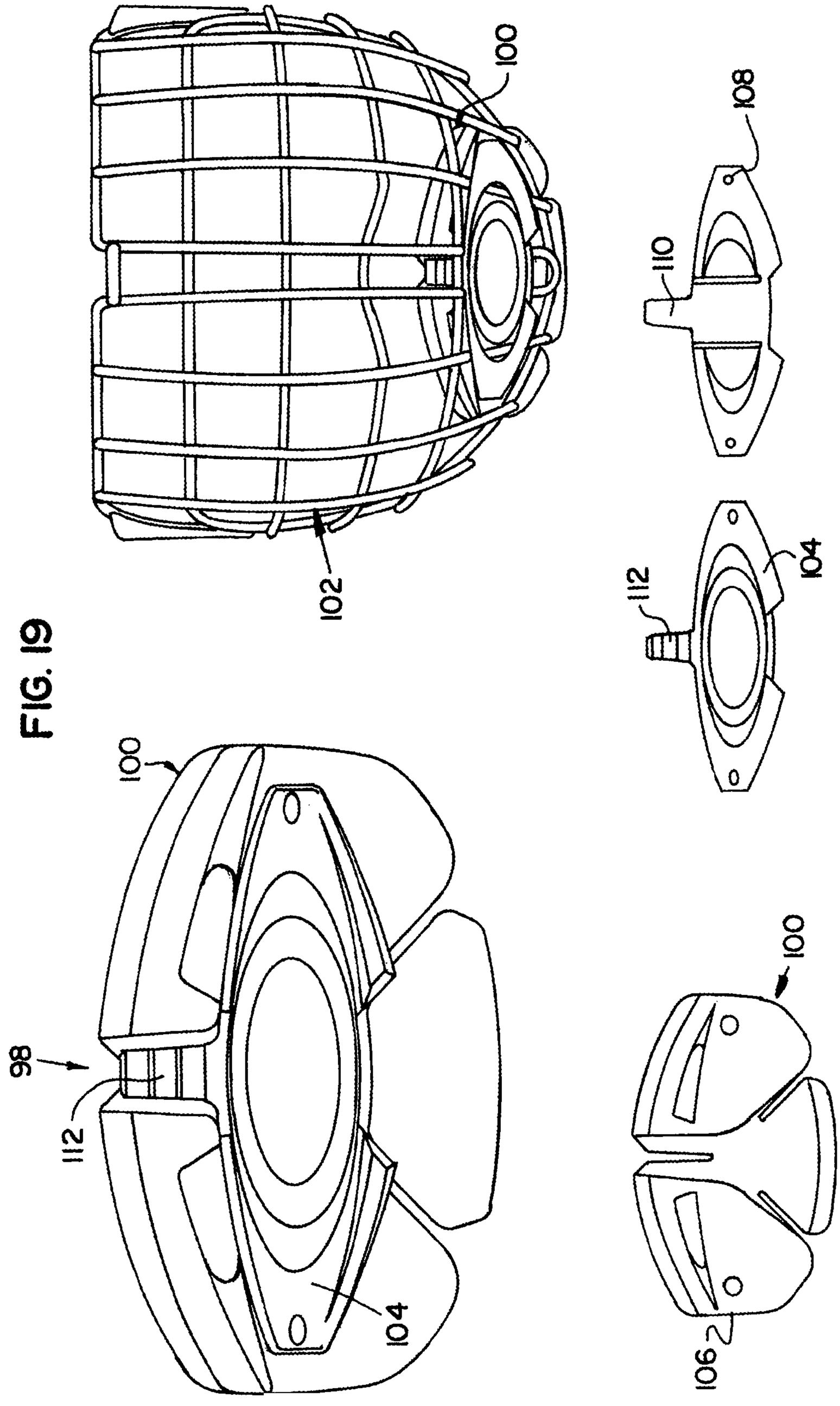


FIG. 19

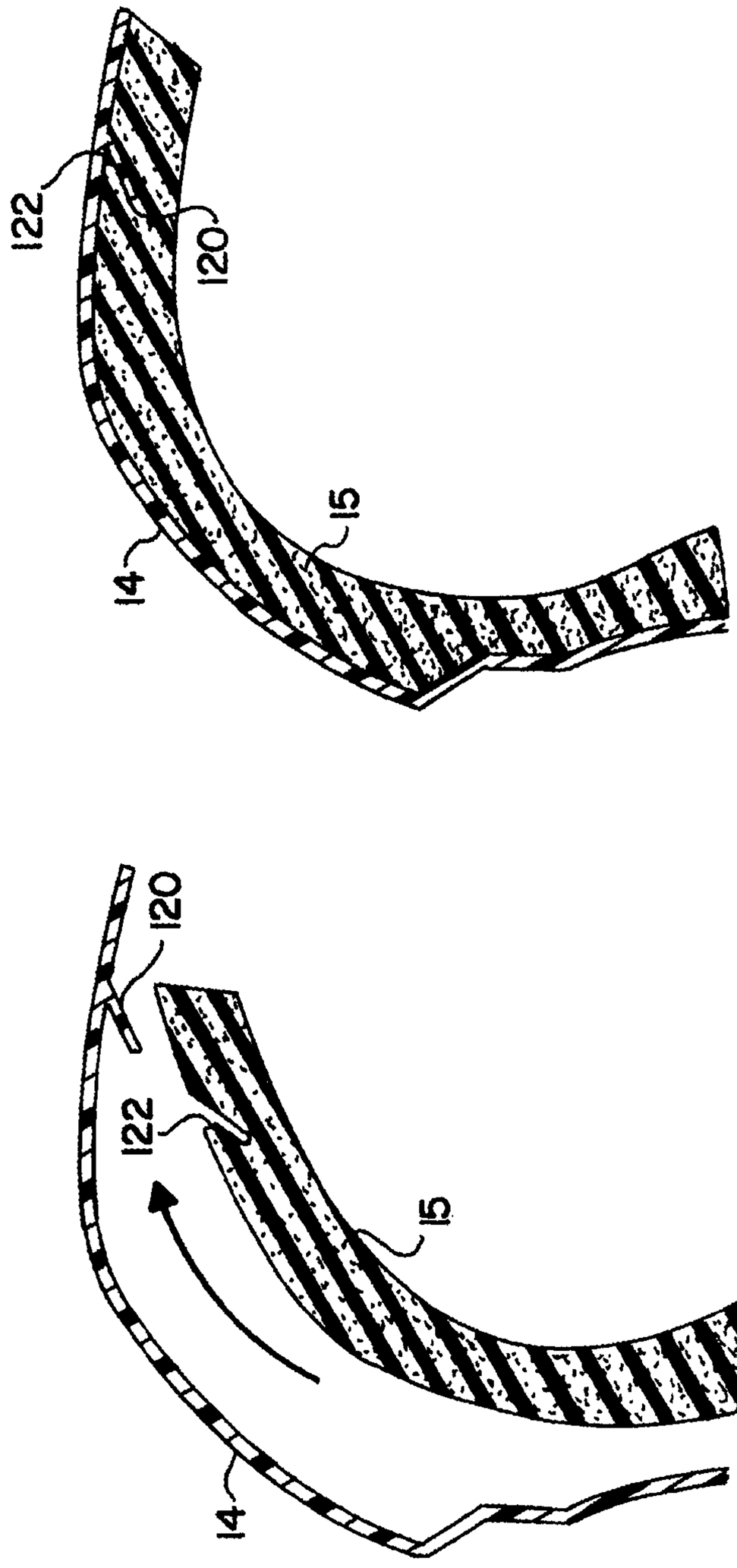


FIG. 20

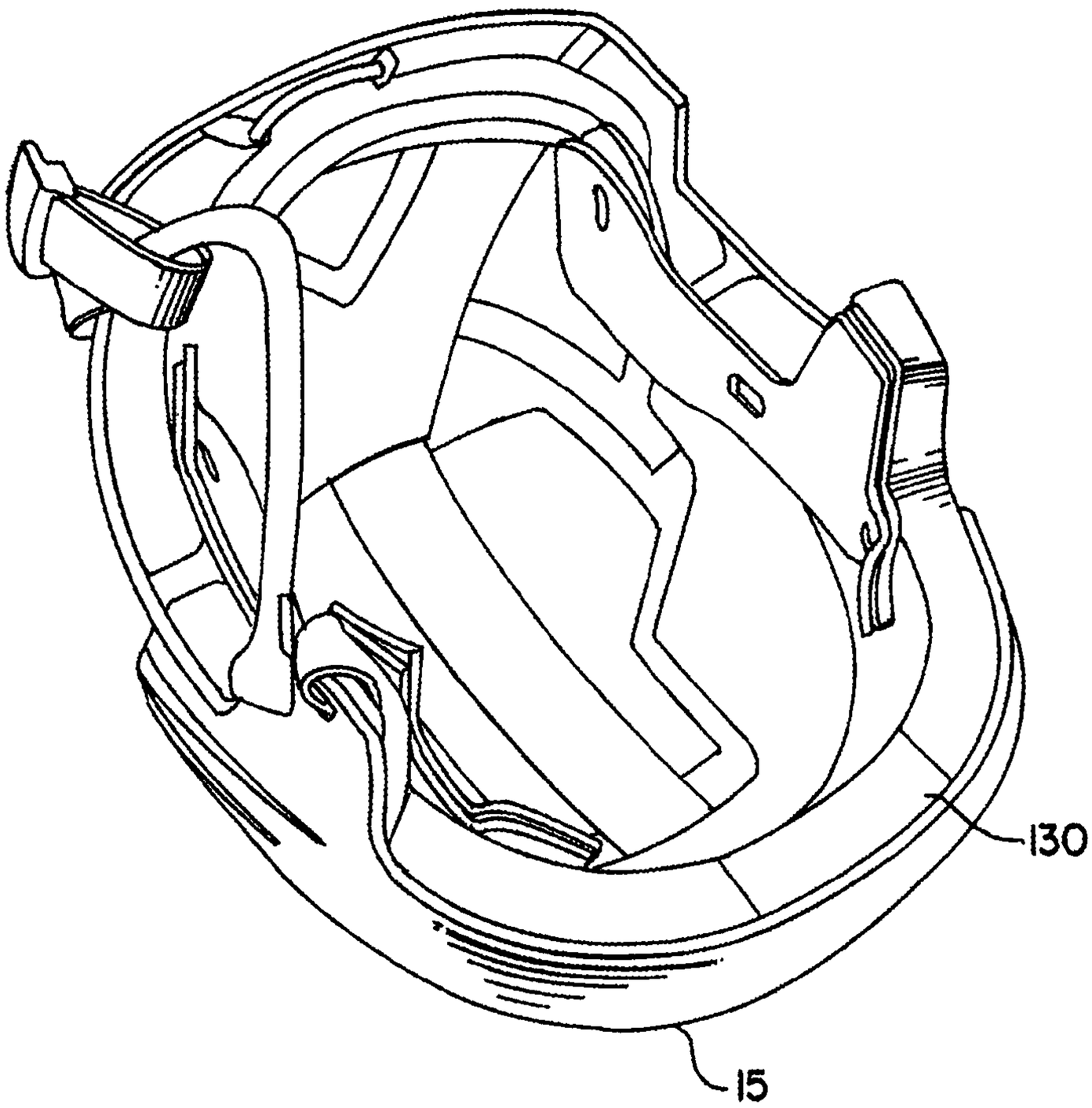


FIG. 21

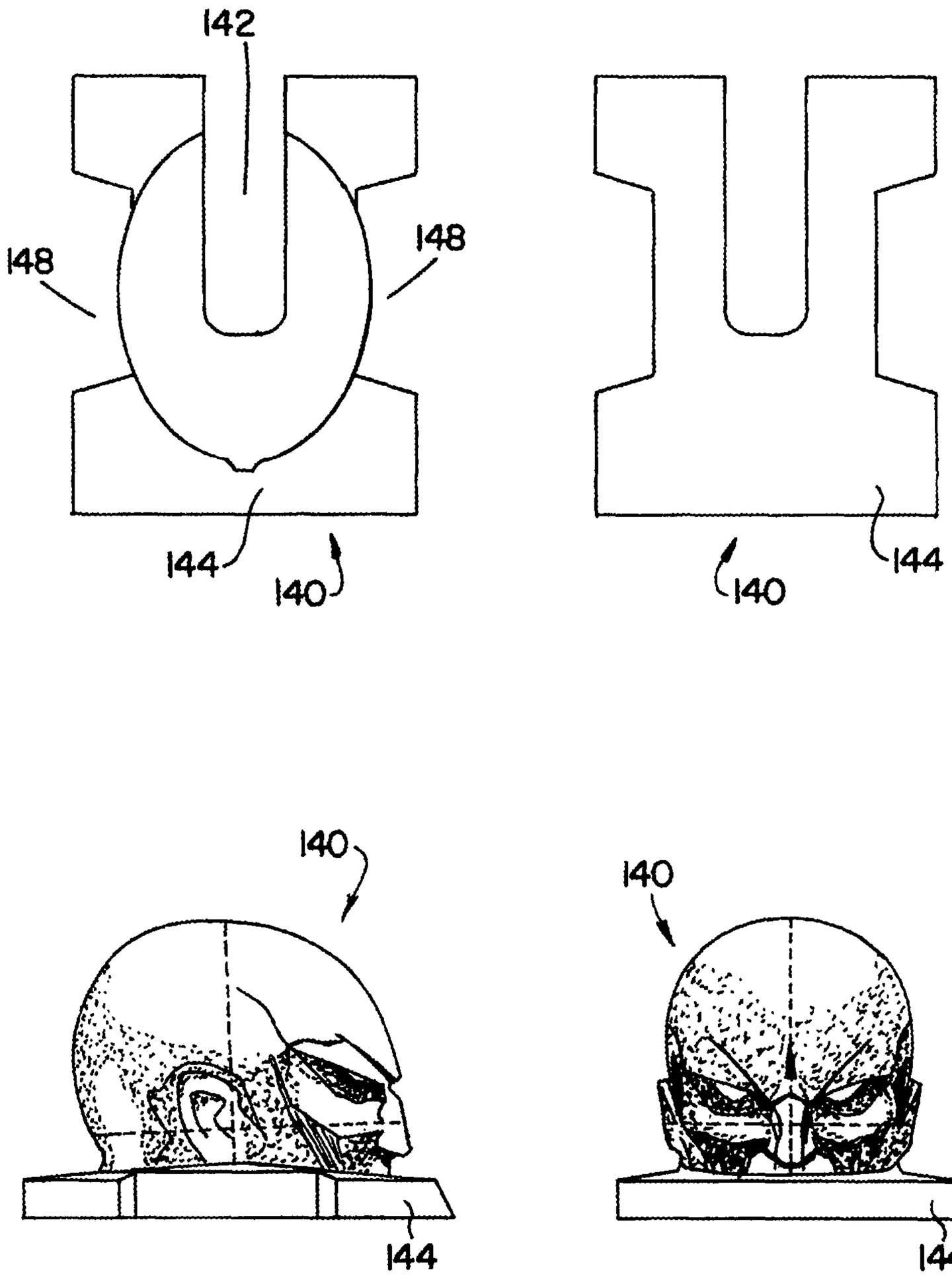


FIG. 22

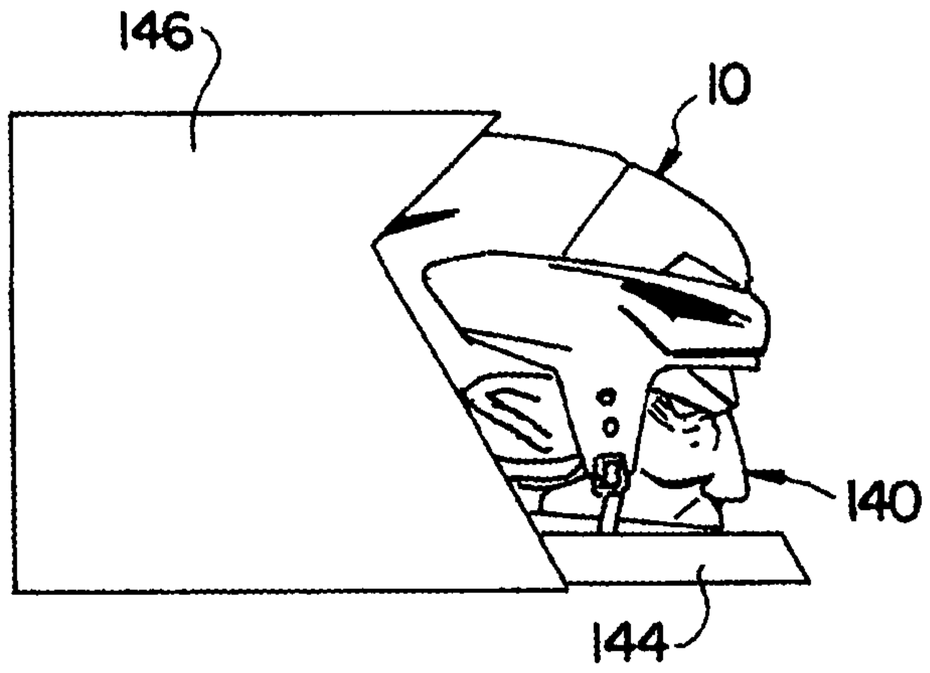


FIG. 23

ADJUSTABLE HOCKEY HELMET

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS REFERENCE TO RELATED APPLICATIONS

Notice: More than one reissue application has been filed for the reissue of U.S. Pat. No. 8,832,870. The reissue applications are application Ser. No. 16/867,511 (the present application), filed May 5, 2020, application Ser. No. 15/904,016, filed Feb. 23, 2018, which issued as U.S. Pat. No. RE48,048, and application Ser. No. 15/268,127, filed Sep. 16, 2016, which issued as U.S. Pat. No. RE47,747. This application *is a continuation reissue of application Ser. No. 15/904,016 (now U.S. Pat. No. RE48,048), which is a continuation reissue of application Ser. No. 15/268,127 (now U.S. Pat. No. RE47,747), which is a reissue of U.S. Pat. No. 8,832,870 (application Ser. No. 13/654,260, filed Oct. 17, 2012), which* is a continuation of U.S. patent application Ser. No. 12/191,000 (*now U.S. Pat. No. 8,296,868*), filed Aug. 13, 2008, which claims priority to U.S. Provisional Patent Application No. 60/956,621, filed Aug. 17, 2007, **[**both**]** *all* of which are hereby incorporated by reference.

BACKGROUND

Adjustable hockey helmets are used to accommodate various head sizes of wearers. A typical adjustable hockey helmet includes a front shell that is movable or slidable relative to a rear shell to adjust the length of the helmet. Cam mechanisms or other locking devices are commonly included on the sides of the helmet to securely engage the front shell against the rear shell to prevent longitudinal movement of the shells relative to each other once the helmet is adjusted to the desired length. While existing adjustable hockey helmets have been relatively effective, it would be advantageous to have a hockey helmet that is more readily adjustable and that can more easily be secured in place.

SUMMARY

An adjustable hockey helmet includes a front shell that is longitudinally movable relative to a rear shell to adjust the length of the helmet. One or more substantially rigid straps or similar elements are attached to the front shell and extend to the interior of the rear shell. A cam mechanism or similar device is included on the rear shell for securing the straps directly or indirectly against the interior of the rear shell to prevent longitudinal movement of the front shell relative to the rear shell once the helmet is adjusted to a desired length. Alternatively, the one or more straps may be attached to the rear shell and the cam mechanism may be included on the front shell.

Other features and advantages will appear hereinafter. The features described above can be used separately or together, or in various combinations of one or more of them.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein the same reference number indicates the same element throughout the several views:

FIG. **1** is an exterior perspective view of an adjustable hockey helmet according to one embodiment.

FIG. **2** is an interior perspective view of the helmet shown in FIG. **1**.

FIG. **3** is an interior perspective view of the helmet shown in FIGS. **1** and **2**, with the interior padding removed to reveal elements positioned between the padding and the interior surface of the helmet.

FIG. **4**A is a rear perspective view of the helmet shown in FIGS. **1-3** with the cam mechanism in the closed or locked position.

FIG. **4**B is a side perspective view of the rear shell of the helmet shown in FIGS. **1-4** with the cam mechanism in the open or unlocked position.

FIG. **5** is a perspective view of a side plate included on the helmet shown in FIGS. **1-4**.

FIG. **6** is a perspective view of a side strap of the longitudinal adjustment mechanism included in the helmet shown in FIGS. **1-4**.

FIG. **7** is a perspective view of the side strap shown in FIG. **6** attached to the side plate shown in FIG. **5** with the other helmet elements removed for clarity.

FIG. **8** is a side-perspective view of a cam mechanism included in the helmet shown in FIGS. **1-4**.

FIG. **9** is a rear perspective view of the cam mechanism shown in FIG. **8**.

FIG. **10** is a perspective view of the longitudinal adjustment mechanism included in the helmet shown in FIGS. **1-4**, including adjustment straps and the cam mechanism shown in FIGS. **8** and **9**.

FIG. **11** is a perspective view of a lateral and occipital adjustment system included in the helmet shown in FIGS. **1-4**.

FIG. **12** is a perspective view of the longitudinal, lateral, and occipital adjustment systems included in the helmet shown in FIGS. **1-4**.

FIG. **13** is a perspective view of a height-adjustable earpiece and a clamping plate included in the helmet shown in FIGS. **1-4**.

FIG. **14** is a perspective view of a height-adjustable J-clip included in the helmet shown in FIGS. **1-4**.

FIG. **15** is a perspective view of an ear-loop included in the helmet shown in FIGS. **1-4**.

FIG. **16** is a perspective view of an interior region of a front plate included in the helmet shown in FIGS. **1-4**.

FIG. **17**A is a perspective view of one embodiment of a front screw-plate that may be included in the helmet shown in FIGS. **1-4**.

FIG. **17**B is a perspective view of an alternative embodiment of a front screw-plate that may be included in the helmet shown in FIGS. **1-4**.

FIG. **18** includes multiple perspective views of a magnetic buckle optionally included on the helmet shown in FIGS. **1-4**.

FIG. **19** includes multiple perspective views of a wire face-mask and height-adjustable chin cup optionally included on the helmet shown in FIGS. **1-4**.

FIG. **20** includes multiple sectional views of a locking tab optionally included in the helmet shown in FIGS. **1-4**.

FIG. **21** is a perspective view of a comfort nose-pad optionally included in the helmet shown in FIGS. **1-4**.

FIG. **22** includes multiple views of a head-form optionally included in helmet packaging.

FIG. **23** includes multiple views of a helmet packaging assembly, including the head-form shown in FIG. **22**.

DETAILED DESCRIPTION OF THE DRAWINGS

Various embodiments of the invention will now be described. The following description provides specific

details for a thorough understanding and enabling description of these embodiments. One skilled in the art will understand, however, that the invention may be practiced without many of these details. Additionally, some well-known structures or functions may not be shown or described in detail so as to avoid unnecessarily obscuring the relevant description of the various embodiments.

The terminology used in the description presented below is intended to be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain specific embodiments of the invention. Certain terms may even be emphasized below; however, any terminology intended to be interpreted in any restricted manner will be overtly and specifically defined as such in this detailed description section.

Where the context permits, singular or plural terms may also include the plural or singular term, respectively. Moreover, unless the word "or" is expressly limited to mean only a single item exclusive from the other items in a list of two or more items, then the use of "or" in such a list is to be interpreted as including (a) any single item in the list, (b) all of the items in the list, or (c) any combination of items in the list.

Turning now in detail to the drawings, as shown in FIGS. **1-4**, one embodiment of an adjustable hockey helmet **10** includes a front shell **12** and a rear shell **14**. As shown in FIG. **2**, the front and rear shells **12**, **14** include liners of protective padding **15** screwed, adhered, or otherwise affixed to interior surfaces of the shells **12**, **14**. The padding **15** may be made of a foam material, such as expanded polypropylene ("EPP"), or of any other material or combination of materials suitable for protecting a wearer's head.

The front shell **12** includes two side plates **16**, which are preferably positioned in recesses in the front shell **12**. As is best shown in FIG. **5**, two rivets **18**, or other suitable connectors, are insert-molded within (or otherwise affixed to) an inner surface of each of the side plates **16**. The rivets **18** are preferably made of a metal material, such as aluminum, but may be made of any other suitable material. Any other suitable number of rivets **18** may alternatively be used.

The rivets **18** extend through aligned slots or openings **17** in the front and rear shells **12**, **14**. The rivets **18** are preferably press-fit into female receiving elements **22**, which are molded onto or otherwise affixed to substantially rigid side straps **24**, shown in FIG. **6**, positioned inside the helmet **10**. This press-fit relationship, shown in FIG. **7**, provides an appropriate tolerance between each side plate **16** and its corresponding side strap **24** to allow the shells **12**, **14** (omitted from FIG. **7** for clarity) to be longitudinally adjusted with respect to each other.

As shown in FIG. **3**, the side straps **24** extend into the rear interior of the helmet **10**. In one embodiment, an upper strap **26**, which is ultrasonically welded or otherwise attached to an upper exterior region of the front shell **12**, also extends into the rear interior of the helmet **10**. The upper strap **26** is optionally attached to the front shell **12** at a location underneath a front region of the rear shell **14**. The side straps **24** and the upper strap **26** may be made of nylon or polyethylene, or of any other material or combination of materials having enough strength or stiffness to prevent longitudinal adjustment of the front and rear shells **12**, **14** when the straps **24**, **26** are held securely in place inside the helmet **10**, as further described below. While two side straps **24** and one upper strap **26** are shown, any other suitable number of straps may be used in the helmet **10**. For example, in one embodiment, the upper strap **26** may be omitted such that only the side straps **24** are included.

As shown in FIG. **3**, in one embodiment, one or more upper strap sleeves or strap guides **30** are attached to an upper interior surface of the rear shell **14** for guiding the upper strap **26** and maintaining it in a position close to the upper interior surface. The upper strap **26** passes through the upper strap guide **30** toward the rear interior of the helmet **10**. Similarly, one or more side strap sleeves or strap guides **32** may be attached to each inner side surface of the rear shell **14** for guiding each of the side straps **24** and maintaining them close to the inner side surfaces. Each side strap **24** passes through its corresponding side strap guide **32** toward the rear interior of the helmet **10**. In an alternative embodiment, a lesser or greater number of strap guides may be included, or strap guides may be omitted altogether.

As shown in FIGS. **4** and **8-10**, a cam assembly **35** is included at a rear region of the rear shell **14**. The cam assembly **35** includes an exterior cam handle **36** attached to a cam post **38**. The cam post **38** extends through an opening in the rear shell **14** into the interior of the helmet **10**. A cam plate **40** is attached to an end of the cam post **38** via a nut **41** or other suitable connector. Alternatively, the cam plate **40** may be molded or otherwise affixed to the nut **41**. A connector with male threads, and a receptor with female threads, may alternatively be used in place of the nut **41** and cam post **38**, respectively.

The upper strap **26** and the side straps **24** optionally each include a slot or opening **28** near their free ends. The openings **28** in each of the straps **24**, **26** are positioned around the cam post **38** such that the ends of the straps **24**, **26** partially overlap one another. A reinforcing plate or shim **42** is optionally positioned around the cam post **38** between the straps **24**, **26** and the interior surface of the rear shell **14** to provide a clamping surface for the straps **24**, **26**, as well as structural support for the cam assembly **35**. In one embodiment, the shim **42** is positioned within a recess in the interior surface of the rear shell **14**. The shim **42** prevents transmission of excessive compressive force against the interior surface of the rear shell **14**, and thus inhibits or prevents permanent compression or "creep" in the rear shell **14**. If creep does occur, the nut **41** may be tightened to compensate for the creep.

The cam handle **36** is preferably rotatable between an open position in which the cam handle **36** is in a substantially horizontal position extending away from an outer surface of the rear shell **14**, as shown in FIG. **4**B, and a closed position in which the cam handle **36** is in a substantially vertical position against or adjacent to the outer surface of the rear shell **14**, as shown in FIGS. **4**A and **8-10**. When in the open position, the cam handle **36** urges the cam post **38** toward the interior of the helmet **10**, pushing the cam plate **40** away from the straps **24**, **26** so that they are free to move or slide about the cam post **38**. When in the closed position, the cam handle **36** urges the cam post **38** toward the rear of the helmet **10**, pulling the cam plate **40** against the straps **24**, **26**. In this closed position, the cam plate **40** presses the straps **24**, **26** against the shim **42** (or against the interior surface of the rear shell **14** if the shim **42** is omitted) so that they are prevented from moving or sliding about the cam post **38**.

When the cam assembly **35** is in the open position, the length of the helmet **10** may be adjusted by pushing the front and rear shells **12**, **14** toward each other or by pulling them away from each other. During this adjustment, the straps **24**, **26** are guided via their respective strap guides **30**, **32**, while their openings **28** slide or move about the cam post **38**. After the helmet **10** is adjusted to a desired length, the cam handle **36** may be rotated into the closed position to secure the side

straps **24** and the upper strap **26** against the shim **42** (or against the interior surface of the rear shell **14** if a shim **42** is omitted). When in the closed position, the rigidity or stiffness of the straps **24**, **26** prevents further longitudinal adjustment of the helmet **10**.

This single-cam system allows for faster length adjustment than the multi-cam or multi-screw systems used in many existing helmets. Furthermore, a snug fit can more readily be achieved when the helmet **10** is positioned on a wearer's head, since the wearer can use one hand to adjust and hold the helmet in place, while using the other hand to close the cam handle **36** to secure the helmet **10** in place.

In an alternative embodiment, single-screw side plates may be used to provide longitudinal helmet adjustment, instead of the strap-based, cam-lock system described above. In this embodiment, each side plate includes one insert-molded rivet on its inner surface, and an opening through which a screw or bolt may be threaded (instead of including a second rivet). In the closed or locked position, the screw or bolt is threaded through the opening in the side plate, through the front shell **12**, and into a threaded receiving element in the rear shell **14**. Alternatively, the side plate may be omitted and the screw or bolt may be threaded directly through the front shell **12** into the threaded receiving element in the rear shell **14**.

To adjust the helmet's length, a user loosens or partially unthreads the single screw in each side plate, which allows the front and rear shells **12**, **14** to be longitudinally adjusted relative to each other. Once a desired length is achieved, the user tightens the single screw in each side plate to secure the front and rear shells **12**, **14** to each other, thus preventing longitudinal movement between them. Many existing adjustable helmets, conversely, typically include two screws in each side plate (or in the helmet shells on each side of the helmet), and therefore require more time and effort to perform length adjustments.

In a related embodiment, the single screw may be replaced with a wing-nut, which may be loosened and tightened by hand. The wing-nut may include a folding or pivoting flap, which, when pivoted to the closed position, abuts or is adjacent to the helmet's surface. When the flap is pivoted to the open position, it provides enough surface area for a user to twist the wing-nut and unthread it from the receiving element in the rear shell **14**. Thus, including a wing-nut instead of a standard screw obviates the need for a screwdriver when adjusting the helmet's length.

In one embodiment, as shown in FIGS. **2**, **3**, **11**, and **12**, the helmet **10** may additionally or alternatively include a lateral and occipital adjustment system **48** configured to engage the sides and back of a wearer's head or the nape of the wearer's neck. The lateral and occipital adjustment system **48** includes one or more bands **50** or straps attached or affixed to the padding **15** (or to the front shell **12**) in the front interior region of the helmet **10**, via screws, snaps, or any other suitable connectors. The bands **50** or straps are preferably made of a relatively flexible plastic, nylon, or other suitable material.

The bands **50** or straps may be tightened or loosened, such that they are displaced laterally toward or away from the central interior of the helmet **10**, via a dial in a dial housing **52**, a knob, or another device located at a rear of the helmet **10**. The lateral and occipital adjustment system **48** also preferably includes an upper attachment portion **53** that may be attached to the liner padding **15**, or to the rear shell **14**, or to a separate attachment element **55** (see FIG. **2**), via screws, snaps, or any other suitable connectors. An occipital pad **57** or similar element is preferably attached to the dial **52**, the straps **50**, or the attachment portion **53** for engaging the rear of a wearer's head or the nape of the wearer's neck. Any other suitable lateral and occipital adjustment system may alternatively be used in the helmet **10**.

The adjustable helmet **10** may include one or more of the longitudinal, lateral, and occipital adjustment systems described above. FIG. **12** shows the general spatial relationship between the longitudinal, lateral, and occipital adjustment systems when all are included in a helmet **10**, according to one embodiment. Variations may of course be made to the relative spacing and orientation of the various adjustment systems.

In an alternative embodiment, the various adjustment systems may be integrated with one another. For example, the longitudinal and lateral adjustment systems may be operable via a single knob and cam system. In such a system, the knob may first be rotated to adjust the longitudinal length of the front and rear shells **12**, **14**. The cam mechanism may then be moved into the locked position, after which the knob may be turned to adjust the lateral bands of the system. The reverse of this system, in which the lateral bands are adjusted when the cam is in the unlocked position, may alternatively be used. These integrated adjustment systems may be accomplished using gears associated with the cam system or using another suitable switching mechanism.

One or more of the following additional features may optionally be included in the adjustable helmet **10**. As shown in FIGS. **1** and **13**, height-adjustable earpieces **54** may be included to allow a wearer to adjust the vertical position of the earpieces **54** on the helmet **10**. An opening **56** in each earpiece is preferably positioned over a raised projection (not visible in the drawings) on an interior surface of the front shell **12**. A clamping plate **59** or similar structure, which may be a molded foam or similar material, includes threaded receiving elements **61** or other receiving elements. The clamping plate **59** is positioned behind (i.e., toward the interior of the helmet **10**) the earpiece **54** to provide a clamping force on the earpiece **54** when one or more screws or other suitable connectors are threaded into the receiving elements **61**.

The rear region of the earpiece **54** is sandwiched between the inner surface of the rear shell **14** and the liner padding **15**. The rear region of the earpiece **54** includes a slot **58** or opening that is positioned around a post-screw assembly (not visible in the drawings) used to attach the liner padding **15** to the rear shell **14**. The post-screw assembly provides a point of rotation for the earpiece **54**. To adjust the height of the earpiece **54**, a user loosens the screws in the receiving elements **61**, causing the clamping plate to release its clamping force on the earpiece **54**. The user then rotates the front region of the earpiece **54** to a desired height, after which the user tightens the screws to secure the earpiece **54** at the desired height. The raised projection positioned in the opening **56** limits the vertical movement of the earpiece **54** in the upward and downward directions by engaging the upper or lower surfaces that define the upper and lower regions of the opening **56**.

As shown in FIGS. **1** and **14**, height-adjustable J-clips **60** may optionally be included at the temple regions of the front shell **12**. Each J-clip **60** includes a hooded arm **62** or similar device for preventing an optional face protector from over-rotating into a wearer's face during impact with a puck or other object. The J-clip includes a slot **64** about which four substantially circular regions, which are defined by ridges **65**, are longitudinally arranged for receiving two screws **66** or similar connectors (or any other suitable number of screws or connectors) that are threaded into openings in the

front shell **12**. A user may adjust the vertical height of the J-clip **60** relative to the front shell **12** by partially loosening the screws **66** until the heads of the screws **66** move beyond the ridges **65**. The user then slides the J-clip **60** into the desired vertical position, after which the user re-tightens the screws **66**.

A conventional J-clip, conversely, includes four round holes into which two screws may be threaded, allowing the J-clip to be moved between the high and low positions. To move a conventional J-clip between these two positions, however, the two screws must be completely removed from the helmet shell, then re-inserted and re-tightened once the J-clip's position has been adjusted. Thus, the slotted configuration shown in FIGS. **1** and **14** allows for more efficient adjustment of the J-clip **60**.

In an alternative embodiment, the recessed slot may include longitudinal ridges instead of ridges **65** that define substantially circular regions. In such an embodiment, the screws **66** must be adequately tightened to prevent vertical movement of the J-clip **60** without the aid of the circular regions. In another alternative embodiment, a horizontal divider, which divides the slot **64** into two separate vertical slotted regions, may be included to provide additional strength to the J-clip **60**.

As shown in FIGS. **1** and **15**, ear-loops **70** are preferably attached to the front and rear shells **12**, **14** on each side of the helmet **10**. The ear-loops **70** include enlarged end portions **71** that are insertable through slots or openings in the front and rear shells **12**, **14** for securing the ear-loops **70** to the helmet **10**. The rear portion (or front portion) of each ear-loop **70** includes a raised ledge **72**, bead, or similar feature that snaps into or squeezes through the slot in the rear shell **14** (or the front shell **12**) when the ear-loop **70** is rotated into an up position, thus maintaining the ear-loop **70** in an up position. Players often like to flip up their ear-loops during warm-ups and in between periods. Conventional ear-loops, however, typically do not remain in the up position because they do not include a mechanism for maintaining the ear-loop in the up position.

As shown in FIGS. **1** and **16**, a front plate **74**, which may be made of a nylon material or other similar material, includes a plurality of posts **76** injection-molded or otherwise integrated onto its rear surface. The front-facing region of the front shell **12** includes a recessed area including corresponding openings into which the posts **76** may be inserted. The posts **76** are optionally heat-staked into the openings to permanently attach them to the front shell **12**. A bubble logo or other decorative element may be adhered or otherwise affixed to the front surface of the front plate **74**. Because the front surface of the front plate **74** is made of a nylon or similar material, as opposed to polyethylene, the logo or decorative element can be securely glued to the front plate **74**.

As shown in FIGS. **1** and **17**A, a front screw-plate **80** may be included for securing the front shell **12** to the liner padding **15**. The screw-plate **80** includes two circular, threaded receiving elements **82** molded on or otherwise integrated thereon. The front shell **12** includes two circular openings in which the receiving elements **82** are positioned.

The screw-plate **80** is directly or indirectly affixed to a portion of the front liner padding **15**. In one embodiment, a stiff fabric material is sandwiched between the screw plate **80** and the interior surface of the front shell **12**. The stiff fabric material has a greater surface area than, and therefore extends beyond the boundaries of, the screw plate **80**. The liner padding **15** may be adhered or otherwise affixed to the stiff fabric material. Screws **78** or bolts are threaded from the exterior of the front shell **12** into the receiving elements **82** to secure the fabric material between the front shell **12** and the screw-plate **80**.

FIG. **17**B illustrates an alternative embodiment of a screw plate **81** including lateral flanges **83** positioned adjacent to two circular, threaded receiving elements **85**. The screw plate **81** may be a unitary piece or may include one or more support arms, such as the upper support arm **87** and the lower support arm **89** shown in FIG. **17**B. The screw plate **81** is preferably embedded within a front region of the liner padding **15**. The receiving elements **85** protrude out of the liner padding **15** and are positioned in the circular openings in the front shell **12** for receiving the screws **78** or bolts.

During threading of the screws **78** or bolts, the receiving elements **82** or **85** are prevented from rotating due to their connection via the screw-plate **80** or **81** in conjunction with their positioning in the shell openings. Many existing helmets, conversely, use individual, non-circular receiving elements that fit into non-circular holes in the helmet shell. The receiving elements are non-circular to prevent them from rotating within the shell openings when screws or bolts are threaded into the non-circular receiving elements. Thus, by incorporating a single, integrated screw-plate **80** or **81**, circular receiving elements **82** or **85** may be used to secure the front shell **12** to the liner padding **15**.

As shown in FIG. **18**, a chin strap **84**, which may be attached at its free ends to the ear-loops **70** or to other suitable helmet regions, includes a magnetic buckle **86**. The buckle **86** includes a first component **88** and a second component **90**, each including a magnet **92** insert-molded thereon or otherwise affixed thereto.

The first and second components **88**, **90** preferably include first and second walls **94**, **96**, respectively, each oriented substantially perpendicularly to the face onto which its respective magnet **92** is molded. The first and second walls **94**, **96** engage each other when the first and second components **88**, **90** are magnetically coupled to each other. This wall arrangement prevents the first and second **88**, **90** components from readily disengaging from each other when the chin-strap is pulled in tension. The first and second walls **94**, **96**, in conjunction with the magnets **92**, are optionally configured in a manner that allows the first and second components **88**, **90** to disengage from each other when a predetermined amount of tensile force is applied to the chin strap **84**. The magnetic buckle **86** is substantially easier to connect and disconnect than are traditional snap-fit arrangements.

As shown in FIG. **19**, a chin-cup assembly **98** for use on an optional wire cage facemask **102** includes a chin cup **100** and a chin cup retainer **104**. The chin cup **100** may be injection-molded, compression-molded, or otherwise formed, and optionally includes female receiving elements **106** molded therein. The retainer **104** optionally includes corresponding insert-molded male snaps **108** or rivets (the male and female elements could of course be reversed). The chin cup **100** and the retainer **104** may be press-fit together or otherwise attached to each other around the wires of the facemask **102**.

An integral, vertically extending indexing arm **110** is optionally included on the retainer **104**. The indexing arm **110** includes horizontal grooves **112** that can snap over the horizontal wires on the facemask **102**. To adjust the height of the chin cup **100**, a user slides the chin cup assembly **98** to a desired height on the facemask **102**, allowing a wire to snap into one of the horizontal grooves **112**. Thus, the chin cup assembly **98** can be secured in a desired location, and

does not have to be removed from the facemask **102** to have its vertical position adjusted on the facemask **102**.

As shown in FIG. **20**, a substantially rear-projecting tab **120** or similar element may be included on the interior surface of the rear shell **14** for engaging a corresponding slot **122** in the liner padding **15**. The tab **120** substantially prevents the padding **15** from rotating in a forward direction, which is often an issue with existing helmets. In an alternative embodiment, the tab **120** may be included on the upper strap guide **30**, which is secured to the upper interior surface of the rear shell **14**.

As shown in FIG. **21**, a comfort pad **130** made of a soft foam or other soft material may be included at the front of the helmet **10** to provide a soft engagement surface, when the helmet is rotated forward, for a wearer's nose. A channel is optionally created in the lower front edge of the liner padding **15** for receiving the comfort pad **130**, which may be adhered or otherwise affixed to the liner padding or to the front shell **12**.

As shown in FIGS. **22** and **23**, a head-form **140** may be included as part of the helmet's packaging. The head-form **140** may be made of expanded polystyrene (EPS) or of another suitable material. The head-form **140** preferably includes a base region **144** configured to fit within a packaging box **146**. The base region **144** preferably includes side openings **148** to accommodate the ear-loops **70** and the chin strap **84** of the helmet **10**.

The head-form **140** substantially fills the interior of the helmet **10** and substantially prevents the liner padding **15** from being dented or damaged during shipping and handling. The liner padding in many existing helmets, conversely, often becomes marked or dented because the padding is exposed during shipping and while the helmet rests on a shelf.

The head-form **140** preferably includes a slot **142** or opening in its rear upper region, or in another suitable location. The slot **142** provides flexibility so that the head-form **140** may accommodate different helmet sizes. For example, when a medium helmet is placed over the head-form **140**, the sides of the head-form **140** are pressed toward each other such that the slot **142** is narrowed. When a small helmet is placed over the head-form **140**, the sides of the head-form **140** are pressed toward each other to a greater degree such that the slot **142** is narrowed even further. Accordingly, the head-form **140** may be snugly secured within helmets of various sizes.

The various helmet components described herein, if not otherwise specified, may be made of any suitable material or combination of materials. While specific elements are often described above, in many cases, other suitable elements may be used in their place (e.g., wing-nuts may be used instead of screws, where applicable).

Any of the above-described embodiments may be used alone or in combination with one another. Furthermore, the adjustable helmet may include additional features not described herein. While several embodiments have been shown and described, various changes and substitutions may of course be made, without departing from the spirit and scope of the invention. The invention, therefore, should not be limited, except by the following claims and their equivalents.

What is claimed is:

[1. An adjustable helmet, comprising:
a first shell;
padding attached to the first shell;
a second shell engaged with the first shell;
a plurality of substantially rigid straps connected to the first shell and extending into the second shell;
a cam assembly on the second shell in engagement with the straps, wherein the straps are movable relative to the cam assembly, and the cam assembly includes a cam handle that is pivotable between:
an open position in which the straps are free to move through the cam assembly, such that the first shell may be longitudinally adjusted relative to the second shell; and
a closed position in which the straps are prevented from moving through the cam assembly, such that the first shell is prevented from being longitudinally adjusted relative to the second shell.**]**

[2. The helmet of claim **1** wherein the first shell is a front shell and the second shell is a rear shell, or the first shell is a rear shell and the second shell is a front shell.**]**

[3. The helmet of claim **1** further comprising a lateral adjustment mechanism including a plurality of bands attached directly or indirectly to the first shell or the second shell, wherein the bands are configured to engage sides of a wearer's head.**]**

[4. The helmet of claim **3** wherein the lateral adjustment mechanism further includes a device for tightening and loosening the bands.**]**

[5. The helmet of claim **3** further comprising a pad attached to the lateral adjustment mechanism for engaging an occipital portion of a wearer's head.**]**

[6. The helmet of claim **1** further comprising a height-adjustable earpiece on the helmet.**]**

[7. The helmet of claim **1** further comprising a height-adjustable J-clip attached to the first shell via at least one threaded connector, with the J-clip including a slot positioned around the threaded connector for allowing the J-clip to be vertically adjusted relative to the first shell when the threaded connector is loosened without requiring removal of the threaded connector from the first shell.**]**

[8. The helmet of claim **1** further comprising an ear loop including a raised ledge configured to pass through a slot in the helmet and to engage an inner surface of the helmet to maintain the ear loop in an upward position.**]**

[9. The helmet of claim **1** further comprising padding in an interior of the second shell, and a rear-projecting tab on an interior surface of the second shell that engages a slot in the padding to prevent rotation of the padding.**]**

[10. An adjustable helmet, comprising:
a first shell;
a second shell engaged with the first shell;
a plurality of substantially rigid straps connected to the first shell and extending into an interior region of the second shell, with each of the straps including an opening;
a cam assembly attached to an exterior region of the second shell, the cam assembly including a cam post extending into the interior region of the second shell and through the openings in the straps, and a cam plate on the cam post;
wherein the cam assembly is movable between:
a closed position in which the cam plate secures the straps against the second shell, such that the first shell is prevented from being longitudinally adjusted relative to the second shell, and
an open position in which the straps are free to move about the cam post such that the first shell may be longitudinally adjusted relative to the second shell.**]**

[**11**. The helmet of claim **10** wherein the first shell is a front shell and the second shell is a rear shell, or the first shell is a rear shell and the second shell is a front shell.]

[**12**. An adjustable helmet, comprising:
a first shell;
padding attached to the first shell;
a second shell engaged with the first shell;
a plurality of substantially rigid straps connected to the first shell and extending into the second shell;
a cam assembly on an exterior region of the second shell in engagement with the plurality of straps, wherein the cam assembly is not engageable with the first shell.]

[**13**. An adjustable helmet, comprising:
a front shell;
padding attached to the front shell;
a rear shell engaged with the front shell;
at least one substantially rigid strap attached to the front shell and extending into the rear shell; and
a cam assembly on an exterior region of the rear shell that is engageable with the strap, wherein the cam assembly includes a cam handle that is pivotable between an open position and a closed position.]

[**14**. The helmet of claim **13** wherein the strap is attached to an upper region of the front shell such that, in use, the strap overlies the top of a wearer's head.]

[**15**. The helmet of claim **13** wherein engagement of the cam assembly with the strap substantially prevents longitudinal adjustment of the front shell relative to the rear shell.]

[**16**. The helmet of claim **13** wherein the cam assembly is located on a rear-exterior region of the rear shell.]

[**17**. The helmet of claim **13** wherein the strap comprises at least one opening engageable by the cam assembly.]

[**18**. An adjustable helmet, comprising:
a first shell;
padding attached to the first shell;
a second shell engaged with the first shell;
at least one substantially rigid strap attached to the first shell and extending into the second shell, wherein the strap is contained within the interior of the helmet; and
means for engaging the strap to substantially prevent longitudinal movement of the first shell relative to the second shell, wherein the means for engaging is located on a rear exterior region of the second shell.]

19. An adjustable helmet, comprising:

a) an external protective shell circumscribing an inside region for receiving a wearer's head, the inside region having a longitudinal dimension;

b) a fit adjustment system configured to vary the longitudinal dimension of the inside region and adjust the fit of the helmet on the wearer's head, the fit adjustment system comprising:

i) a first elongated member extending along a first side region of the adjustable helmet;

ii) a second elongated member, generally opposite the first elongated member extending along a second side region of the adjustable helmet;

iii) a manually operable mechanism configured to secure the adjustable helmet in a selected longitudinal dimension of the inside region;

iv) each of the first and the second elongated members including:

a front connection area at which the elongated member connects to the adjustable helmet;

a rear connection area at which the elongated member connects to the manually operable mechanism, whereby movement of the first and the second elongated members with relation to the manually operable mechanism allows varying the longitudinal dimension of the inside region;

v) a first elongated member guide associated with the first elongated member, the first elongated member guide being connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the first elongated member, the first elongated member guide receiving and supporting the first elongated member and allowing the first elongated member to move relative the first elongated member guide as the longitudinal dimension is varied;

vi) a second elongated member guide associated with the second elongated member, the second elongated member guide being connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the second elongated member, the second elongated member guide receiving and supporting the second elongated member and allowing the second elongated member to move relative the second elongated member guide as the longitudinal dimension is varied.

20. The adjustable helmet as defined in claim 19, wherein the first and the second elongated members are mounted along an internal surface of the helmet.

21. The adjustable helmet as defined in claim 20, wherein the internal surface of the helmet is generally concave, the first and the second elongated members have a curved configuration conforming to the generally concave internal surface.

22. The adjustable helmet as defined in claim 20, wherein the first and the second elongated member guides project from the internal surface.

23. The adjustable helmet as defined in claim 19, wherein the first and the second elongated members are formed, at least in part, from nylon.

24. The adjustable helmet as defined in claim 19, wherein the first and the second elongated members are formed, at least in part, from polyethylene.

25. The adjustable helmet as defined in claim 19, wherein each of the first and the second elongated member guides comprises a member extending in a direction generally transverse to the elongated dimension of its associated elongated member.

26. The adjustable helmet as defined in claim 19, wherein the front connection areas of the first and the second elongated members are located at temple regions on the first and the second side regions of the adjustable helmet.

27. The adjustable helmet as defined in claim 19, wherein the front connection area of each of the first and the second elongated members includes at least one projection for connection of the elongated member to the adjustable helmet.

28. The adjustable helmet as defined in claim 19, further comprising interior padding in an interior of the exterior protective shell, the interior padding comprising:

liner padding attached to the exterior protective shell; and

comfort padding arranged to contact the wearer's head when the helmet is worn.

29. The adjustable helmet as defined in claim 28, wherein each of the first and the second elongated member guides is at least partially covered by a portion of the comfort

padding that is located between the elongated member guide and the wearer's head when the helmet is worn.

30. The adjustable helmet as defined in claim 28, wherein the comfort padding comprises a plurality of comfort pads arranged to contact different portions of the wearer's head when the adjustable helmet is worn.

31. The adjustable helmet as defined in claim 30, wherein the plurality of comfort pads comprises:

a first comfort pad disposed between the first elongated member guide and the wearer's head and when the helmet is worn; and

a second comfort pad disposed between the second elongated member guide and the wearer's head when the helmet is worn.

32. The adjustable helmet as defined in claim 31, wherein the plurality of comfort pads further comprises an occipital pad configured to engage an occipital region of the wearer's head.

33. The adjustable helmet as defined in claim 32, wherein the occipital pad is mounted to an attachment portion that extends upwardly therefrom to connect the occipital pad to a portion of the helmet that is located above the occipital pad.

34. The adjustable helmet as defined in claim 19, wherein the manually operable mechanism is the sole actuator to perform an adjustment of the longitudinal dimension of the inside region to adjust a fit of the adjustable helmet.

35. A fit adjustment system for adjusting the fit of a helmet having an external protective shell circumscribing an inside region for receiving a wearer's head, the fit adjustment system comprising:

i) a first elongated member configured such that, when the fit adjustment system is installed in the helmet, the first elongated member extends along a first side region of the helmet;

ii) a second elongated member configured such that, when the fit adjustment system is installed in the helmet, the second elongated member extends along a second side region of the helmet generally opposite the first elongated member;

iii) a manually operable mechanism configured to secure the helmet in a selected longitudinal dimension of the inside region;

iv) each of the first and the second elongated members including:

a front connection area for connecting the elongated member to the adjustable helmet;

a rear connection area for connecting the elongated member to the manually operable mechanism, whereby movement of the first and the second elongated members with relation to the manually operable mechanism allows varying the longitudinal dimension of the inside region;

v) a first elongated member guide associated with the first elongated member and configured such that, when the fit adjustment system is installed in the helmet, the first elongated member guide is connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the first elongated member, the first elongated member guide receiving and supporting the first elongated member and allowing the first elongated member to move relative the first elongated member guide as the longitudinal dimension is varied;

vi) a second elongated member guide associated with the second elongated member and configured such that, when the fit adjustment system is installed in the helmet, the second elongated member guide is connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the second elongated member, the second elongated member guide receiving and supporting the second elongated member and allowing the second elongated member to move relative the second elongated member guide as the longitudinal dimension is varied.

36. The fit adjustment system as defined in claim 35, wherein, when the fit adjustment system is installed in the helmet, the first and the second elongated members are mounted along an internal surface of the helmet.

37. The fit adjustment system as defined in claim 36, wherein the first and the second elongated member guides project from the internal surface.

38. The fit adjustment system as defined in claim 36, wherein the first and the second elongated members are formed, at least in part, from nylon.

39. The fit adjustment system as defined in claim 35, wherein each of the first and the second elongated member guides comprises a member extending in a direction generally transverse to the elongated dimension of its associated elongated member.

40. The fit adjustment system as defined in claim 35, wherein the first and the second elongated members are configured such that, when the fit adjustment system is installed in the helmet, the front connection areas of the first and the second elongated members are located at temple regions on the first and the second side regions of the helmet.

41. The fit adjustment system as defined in claim 35, wherein the front connection area of each of the first and the second elongated members includes at least one projection for connection of the elongated member to the helmet.

42. The fit adjustment system as defined in claim 35, further comprising comfort padding arranged to contact a wearer's head when the helmet is worn, wherein each of the first and the second elongated member guides is at least partially covered by a portion of the comfort padding that is located between the elongated member guide and the wearer's head when the fit adjustment system is installed in the helmet and the helmet is worn.

43. An adjustable helmet, comprising:

a) an external protective shell circumscribing an inside region for receiving a wearer's head, the inside region having a longitudinal dimension;

b) a fit adjustment system configured to vary the longitudinal dimension of the inside region and adjust the fit of the helmet on the wearer's head, the fit adjustment system comprising:

i) an elongated member extending along an internal surface of the helmet;

ii) a manually operable mechanism configured to secure the adjustable helmet in a selected longitudinal dimension of the inside region;

iii) the elongated member including:

a front connection area at which the elongated member connects to the adjustable helmet;

a rear connection area at which the elongated member connects to the manually operable mechanism, whereby movement of the elongated member with relation to the manually operable mechanism allows varying the longitudinal dimension of the inside region;

iv) an elongated member guide associated with the elongated member, the elongated member guide being connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the elongated member, the elongated member guide receiving and supporting the elongated member and allowing the elongated member to move relative the elongated member guide as the longitudinal dimension is varied;

v) interior padding residing between the protective shell and the head of the wearer when the helmet is being worn, the interior padding including a recess into which a portion of the elongated member guide is received.

44. The adjustable helmet as defined in claim 43 wherein the internal surface of the helmet is generally concave, the elongated member having a curved configuration conforming to the generally concave internal surface.

45. The adjustable helmet as defined in claim 43, wherein the elongated member guide projects from the internal surface.

46. The adjustable helmet as defined in claim 43, wherein the elongated member is formed, at least in part, from nylon.

47. The adjustable helmet as defined in claim 43, wherein the elongated member guide comprises a member extending in a direction generally transverse to the elongated dimension of the elongated member.

48. The adjustable helmet as defined in claim 43, wherein the front connection area of the elongated member includes at least one projection for connection of the elongated member to the adjustable helmet.

49. The adjustable helmet as defined in claim 43, wherein the interior padding comprises:

liner padding attached to the exterior protective shell; and

comfort padding arranged to contact the wearer's head when the helmet is worn.

50. The adjustable helmet as defined in claim 49, wherein the recess into which a portion of the elongated member guide is received is a recess defined in the liner padding.

51. The adjustable helmet as defined in claim 49, wherein the elongated member guide is at least partially covered by a portion of the comfort padding that is located between the elongated member guide and the wearer's head when the helmet is worn.

52. The adjustable helmet as defined in claim 51, wherein the comfort padding comprises a plurality of comfort pads arranged to contact different portions of the wearer's head when the adjustable helmet is worn.

53. The adjustable helmet as defined in claim 52, wherein the comfort padding comprises an occipital pad configured to engage an occipital region of the wearer's head.

54. The adjustable helmet as defined in claim 53, wherein the occipital pad is mounted to an attachment portion that extends upwardly therefrom to connect the occipital pad to a portion of the helmet that is located above the occipital pad.

55. The adjustable helmet as defined in claim 49, wherein the elongated member and the associated elongated member guide are a first elongated member and a first elongated member guide, the fit adjustment system further comprising:

vi) a second elongated member extending along an inner surface of the adjustable helmet;

vii) the second elongated member including:

a front connection area at which the second elongated member connects to the adjustable helmet;

a rear connection area at which the second elongated member connects to the manually operable mechanism, whereby movement of the first and the second elongated members with relation to the manually operable mechanism allows varying the longitudinal dimension of the inside region;

viii) a second elongated member guide associated with the second elongated member, the second elongated member guide being connected to the helmet independently of the manually operable mechanism and located within the inside region of the helmet between the front connection area and the rear connection area of the second elongated member, the second elongated member guide receiving and supporting the second elongated member and allowing the second elongated member to move relative the second elongated member guide as the longitudinal dimension is varied.

56. The adjustable helmet as defined in claim 55, wherein the comfort padding comprises:

a first comfort pad disposed between the first elongated member guide and the wearer's head and when the helmet is worn; and

a second comfort pad disposed between the second elongated member guide and the wearer's head when the helmet is worn.

57. The adjustable helmet as defined in claim 43, wherein the manually operable mechanism is the sole actuator to perform an adjustment of the longitudinal dimension of the inside region to adjust a fit of the adjustable helmet.

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