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(54) **ADJUSTABLE HOCKEY HELMET**

(56) **References Cited**

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(*) Notice: This patent is subject to a terminal disclaimer.

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(21) Appl. No.: **15/904,016**

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(22) Filed: **Feb. 23, 2018**

Sport Maska Inc. d.b.a. Reebok-CCM Hockey, *Bauer Hockey Ltd. v. Sport Maska Inc. d.b.da. Reebok-CCM Hockey*, Federal Court of Canada, Court File No. T-123-15, Thrice Amended Statement of Defence and Counterclaim, Feb. 19, 2018, 43 pages.

Related U.S. Patent Documents

Reissue of:

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

U.S. Applications:

(63) 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)

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

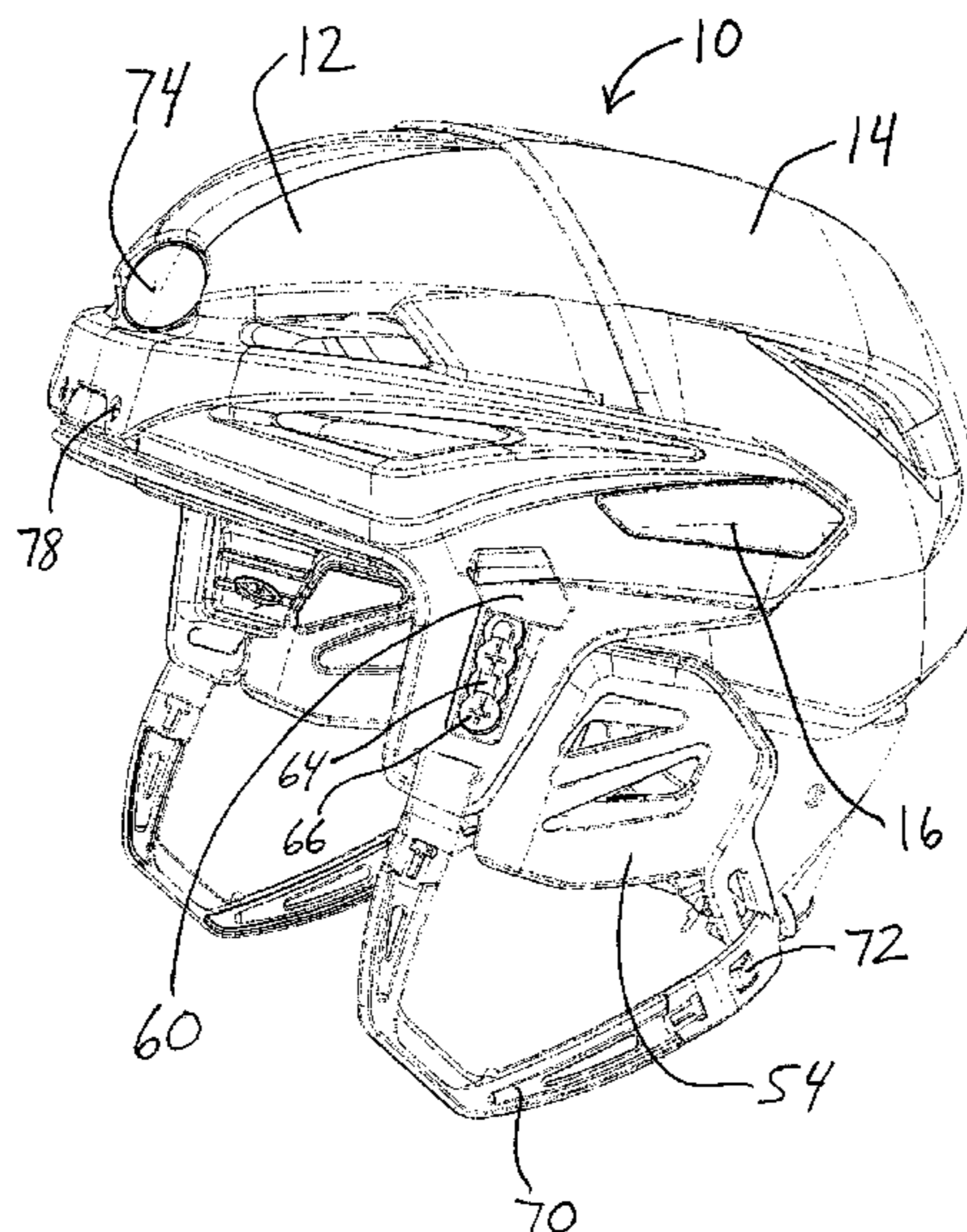
(57) **ABSTRACT**

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

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.

(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.

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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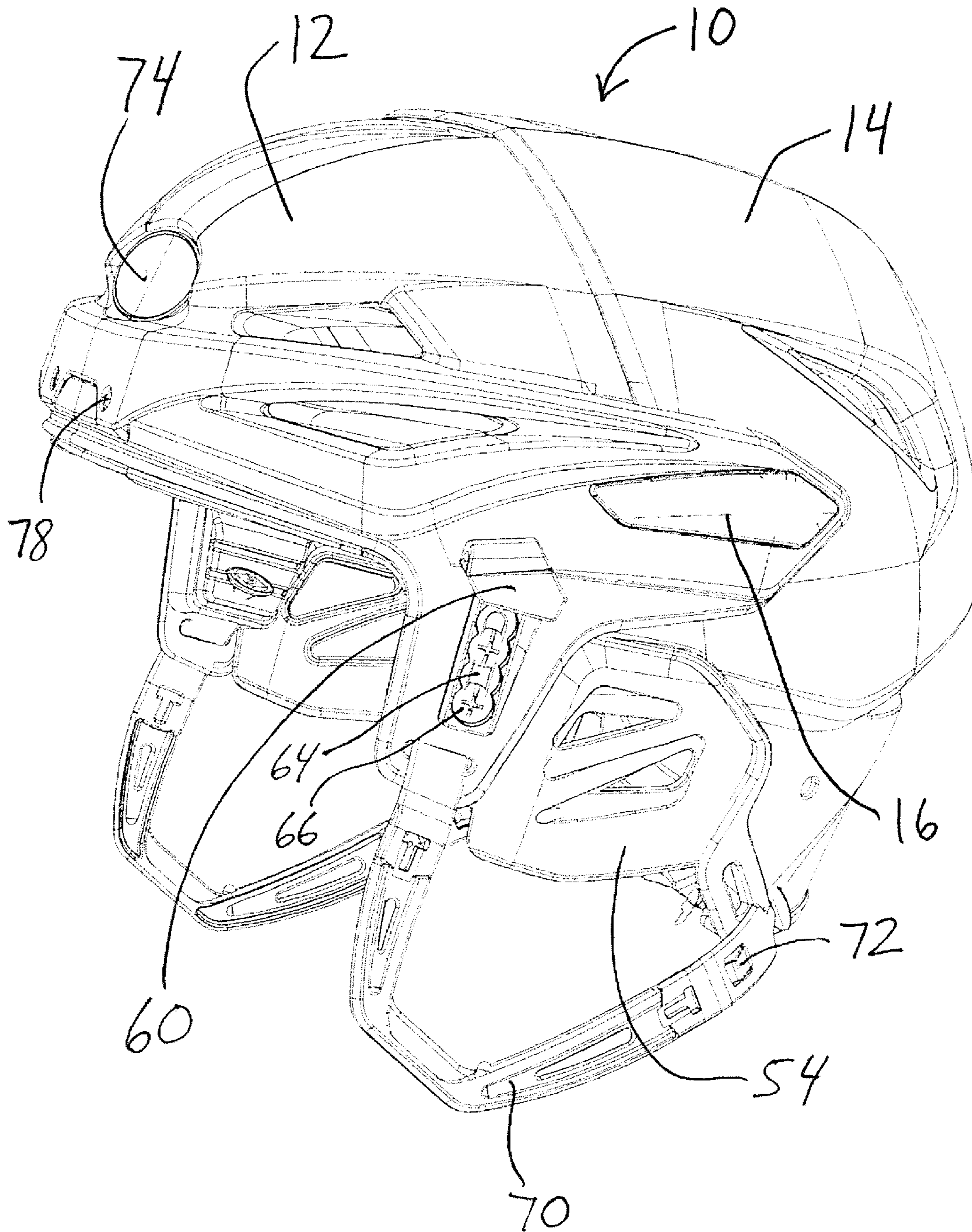


Fig. 1

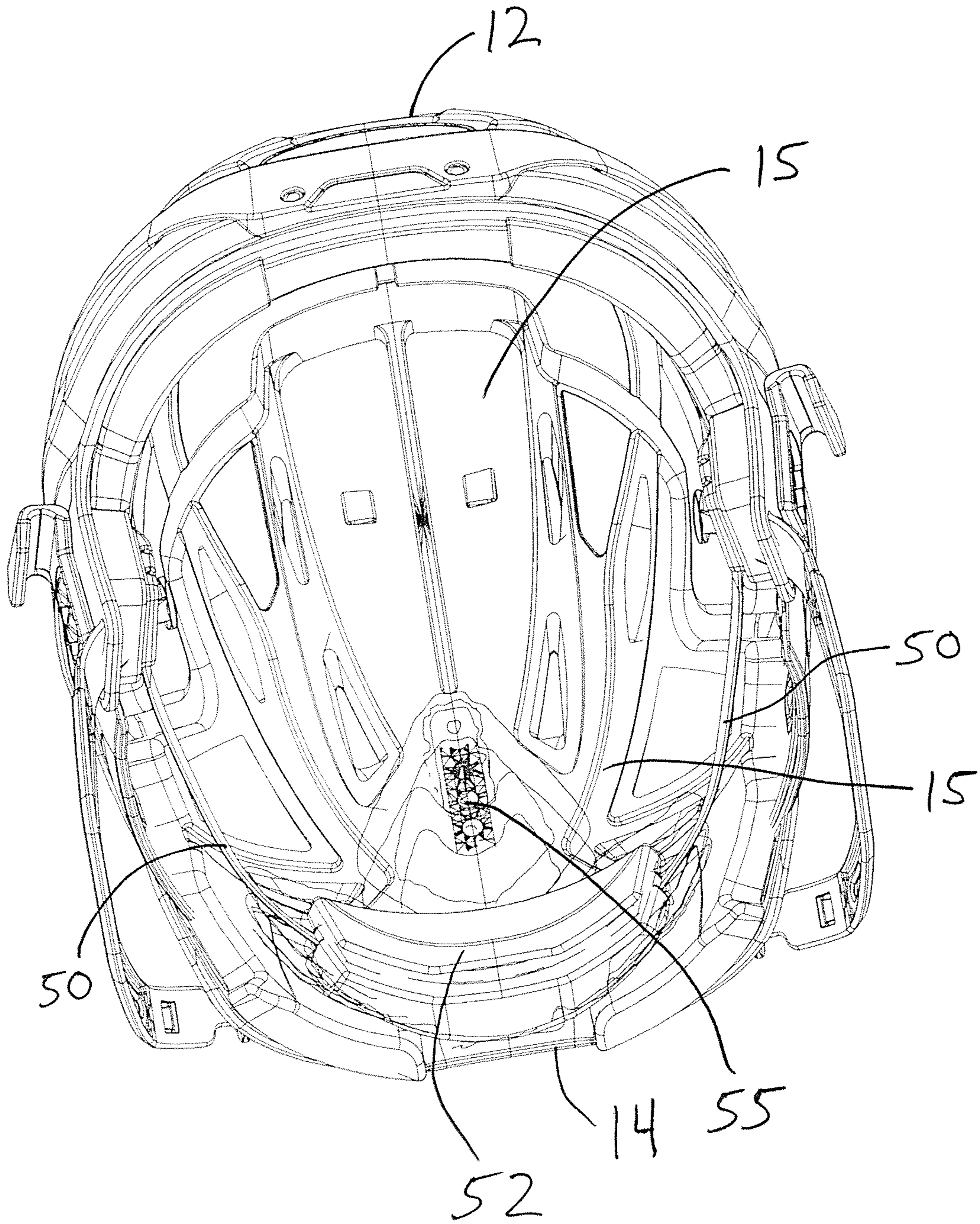


Fig. 2



Fig. 4A

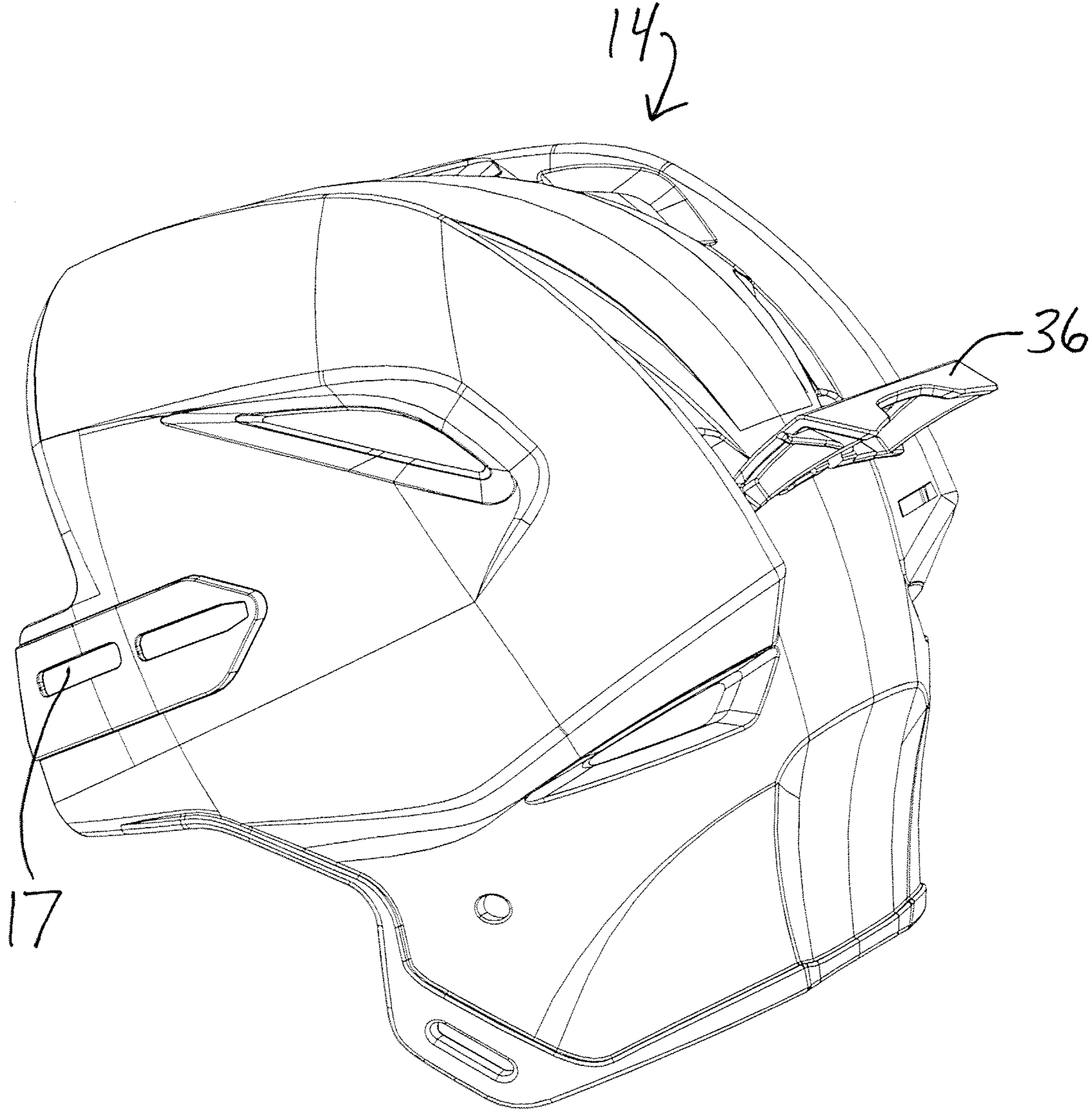


Fig. 4B

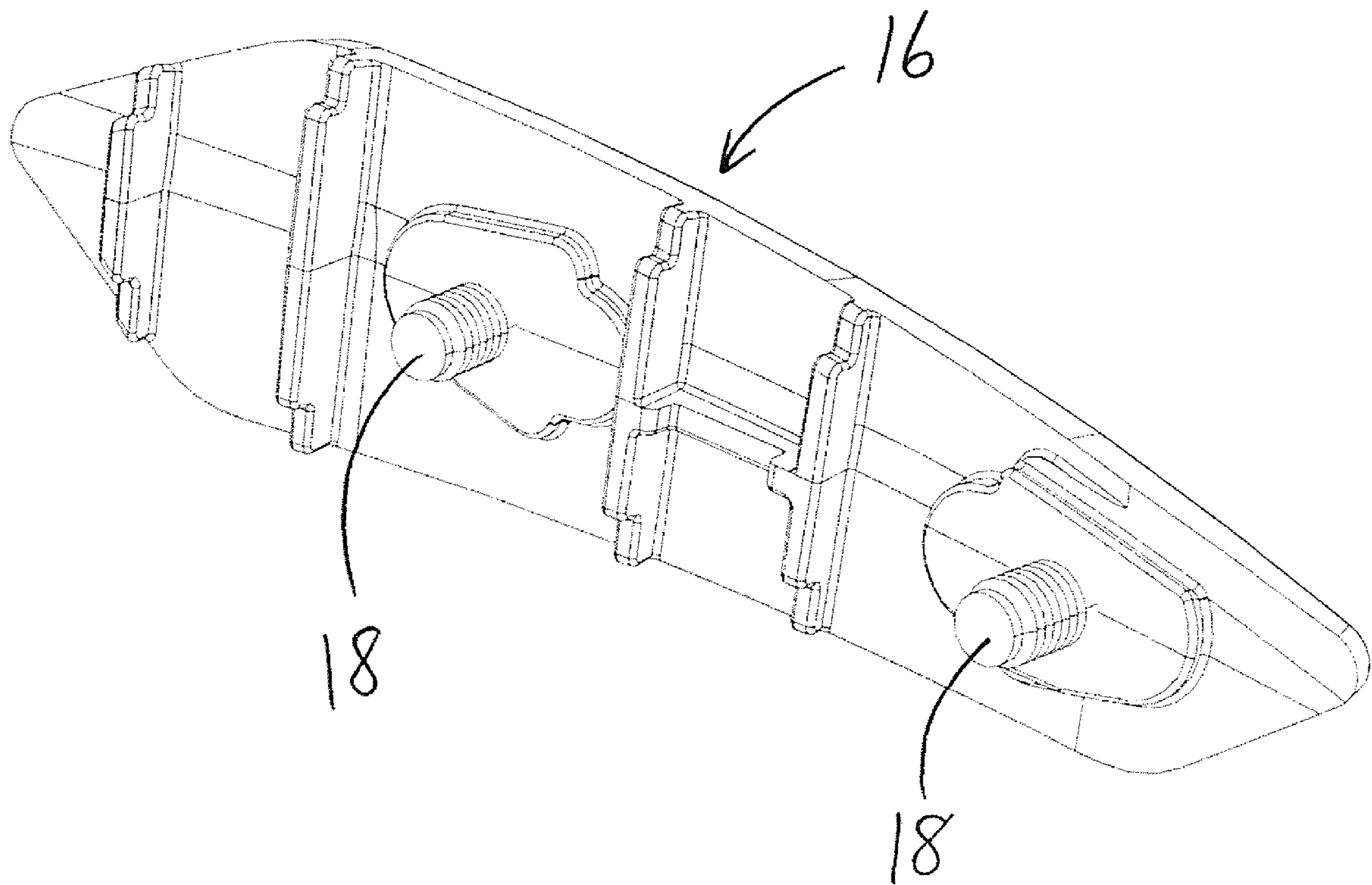


Fig. 5

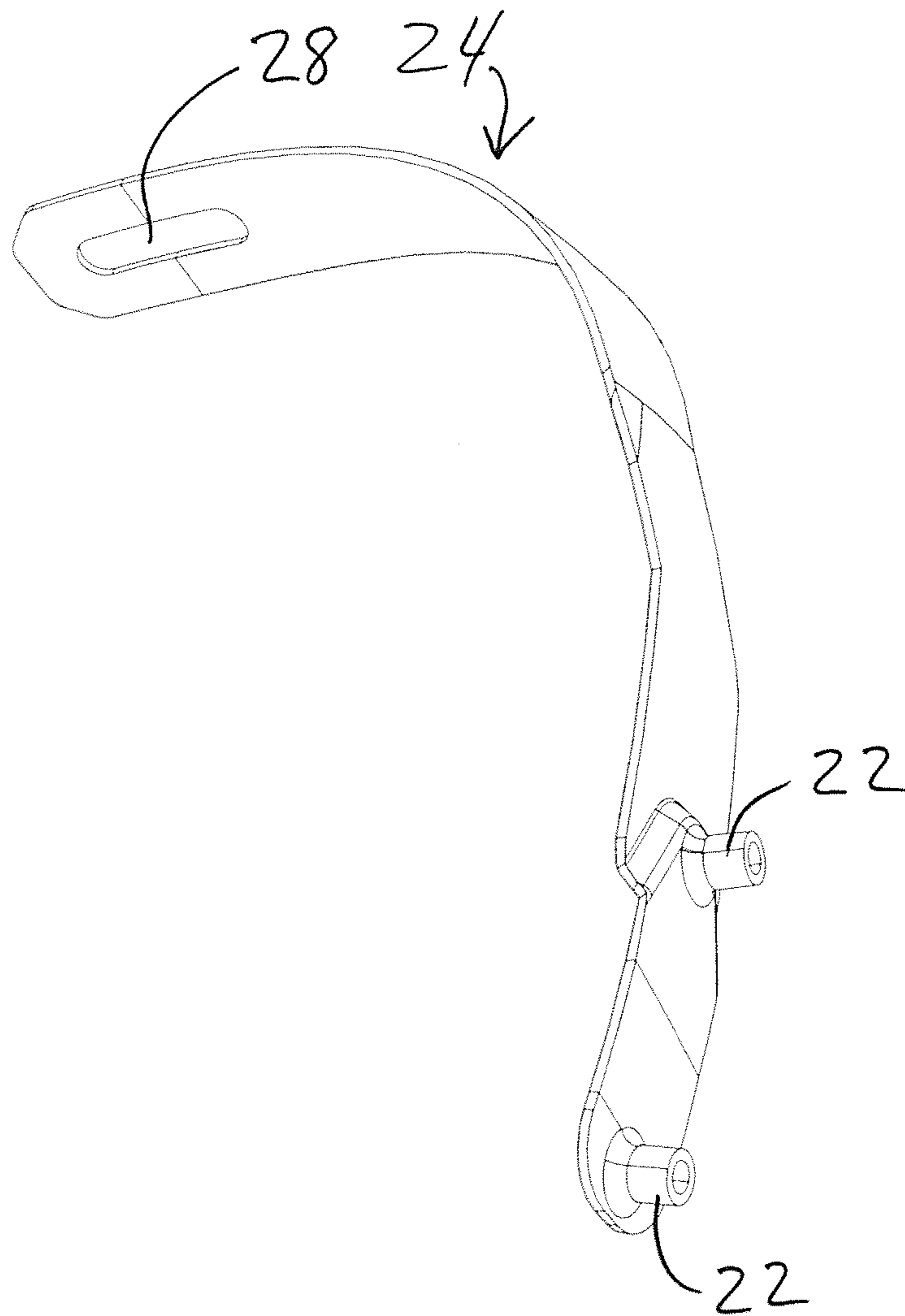


Fig. 6

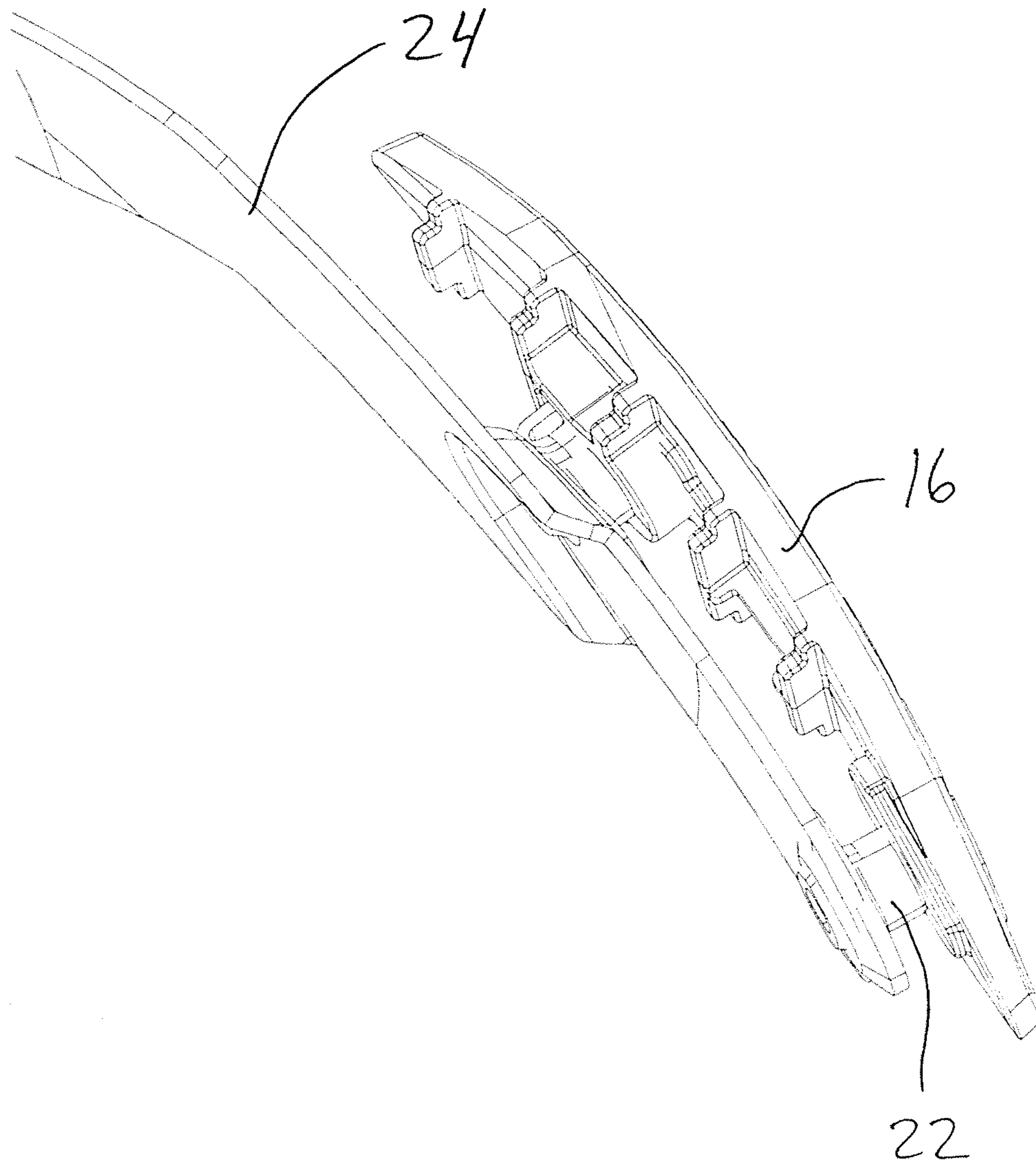


Fig. 7

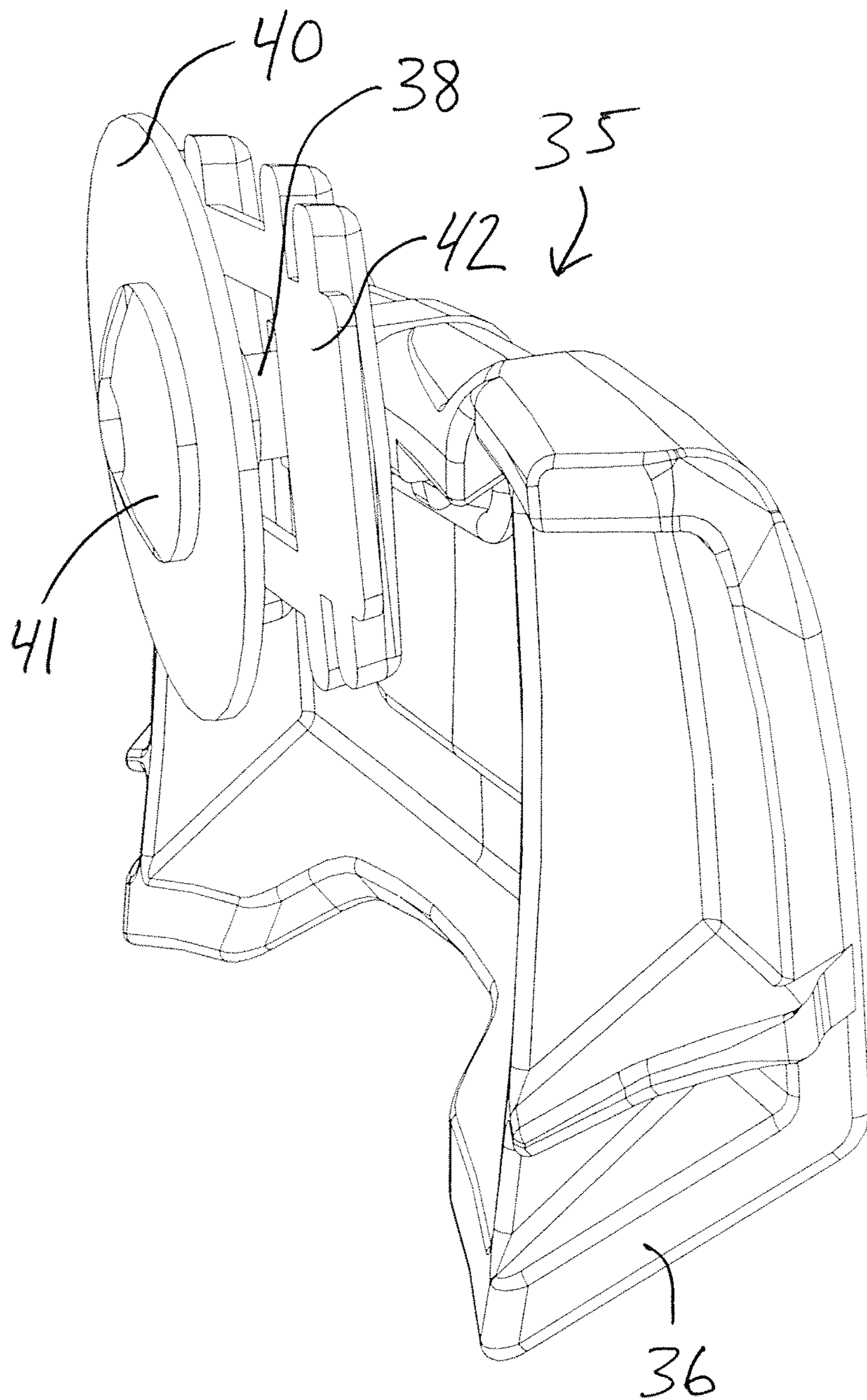


Fig. 8

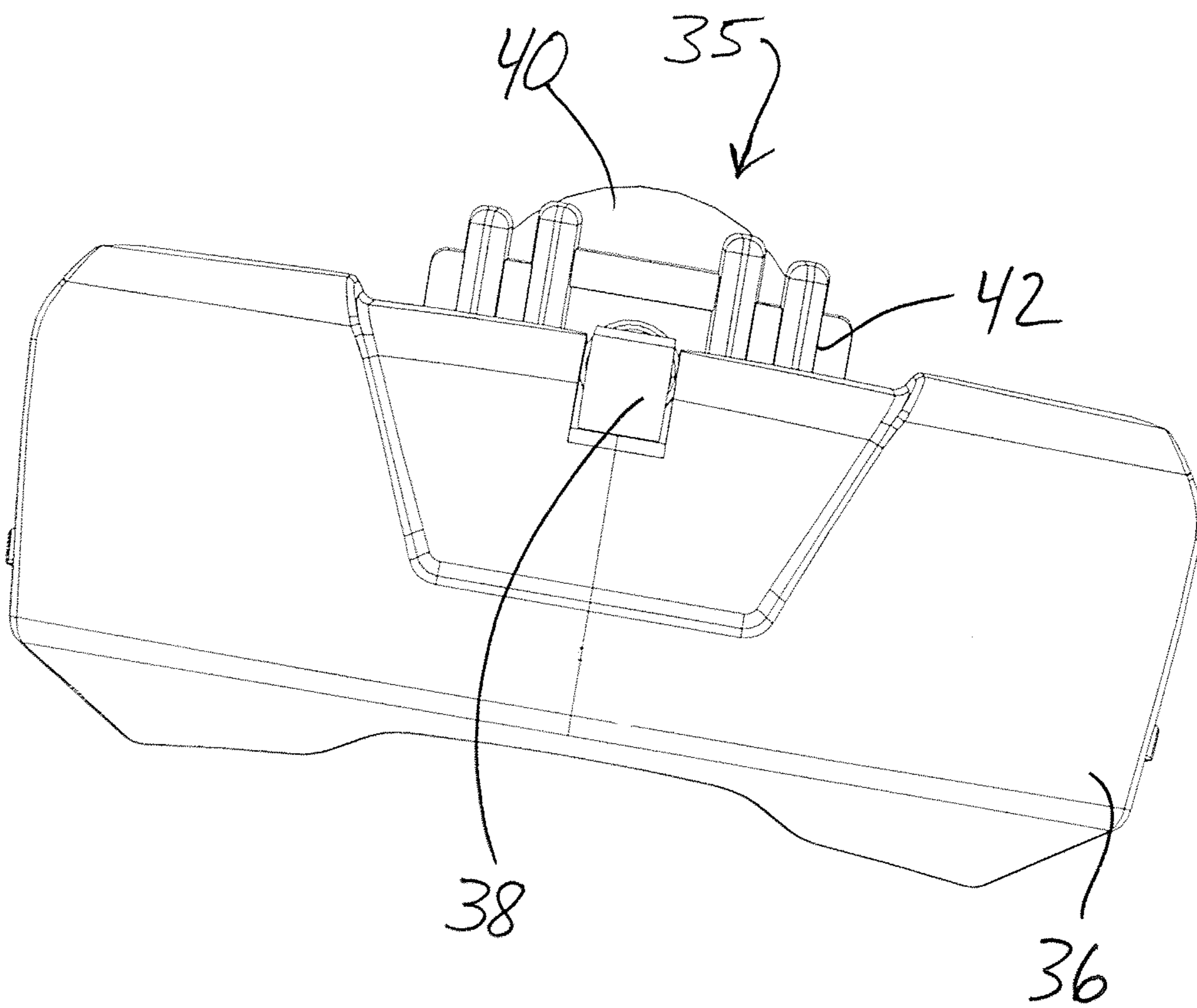


Fig. 9

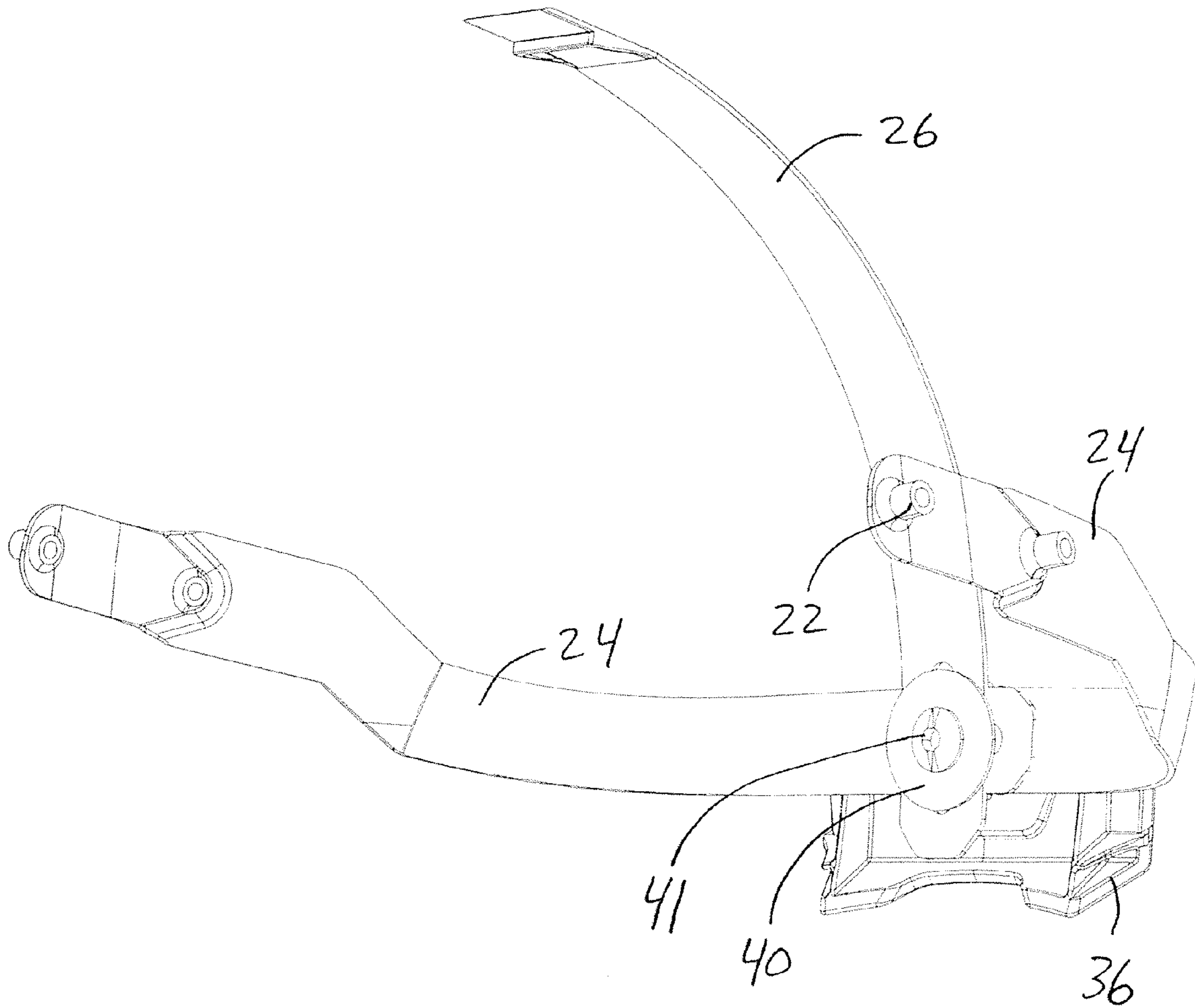


Fig. 10

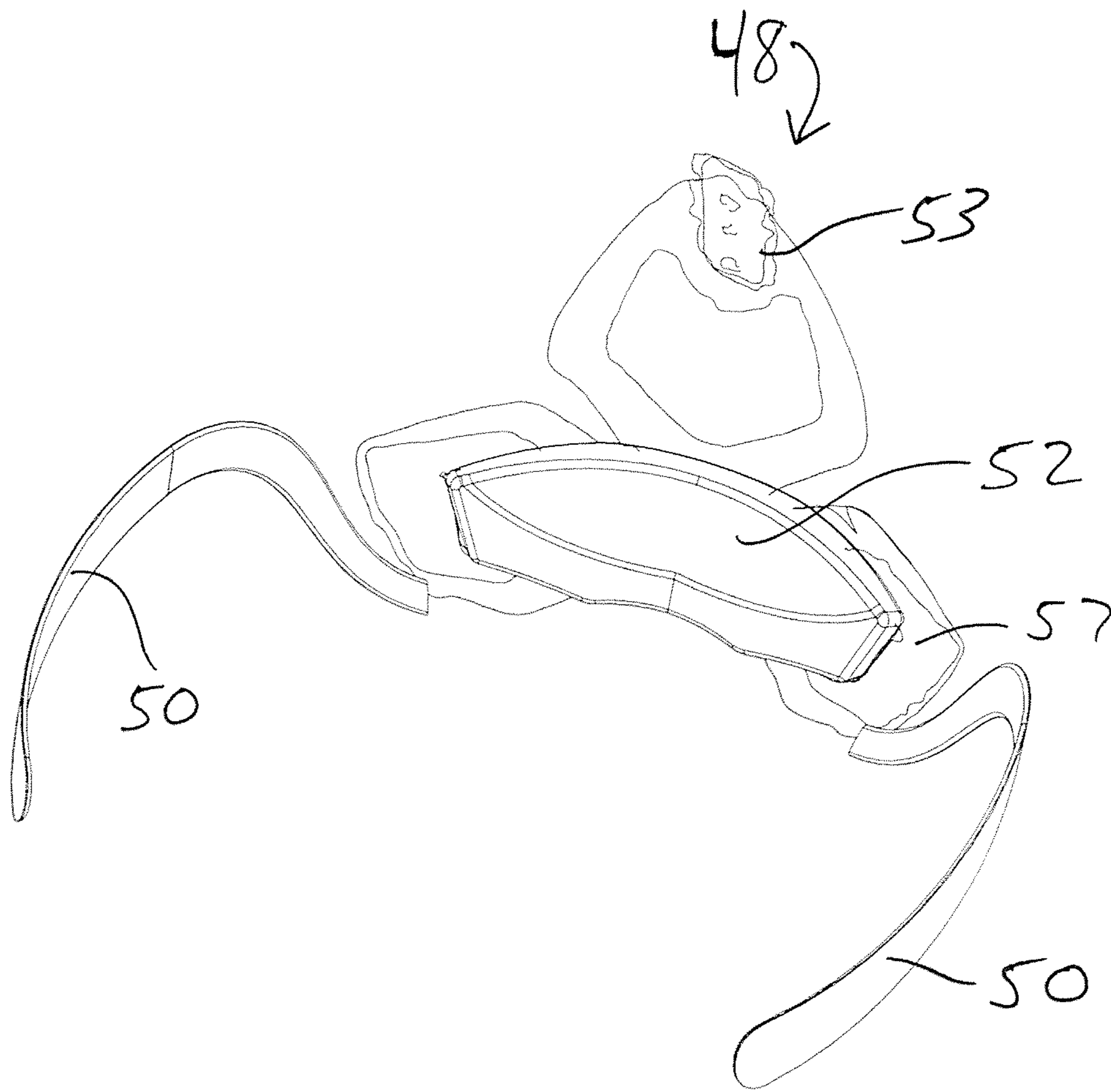


Fig. 11

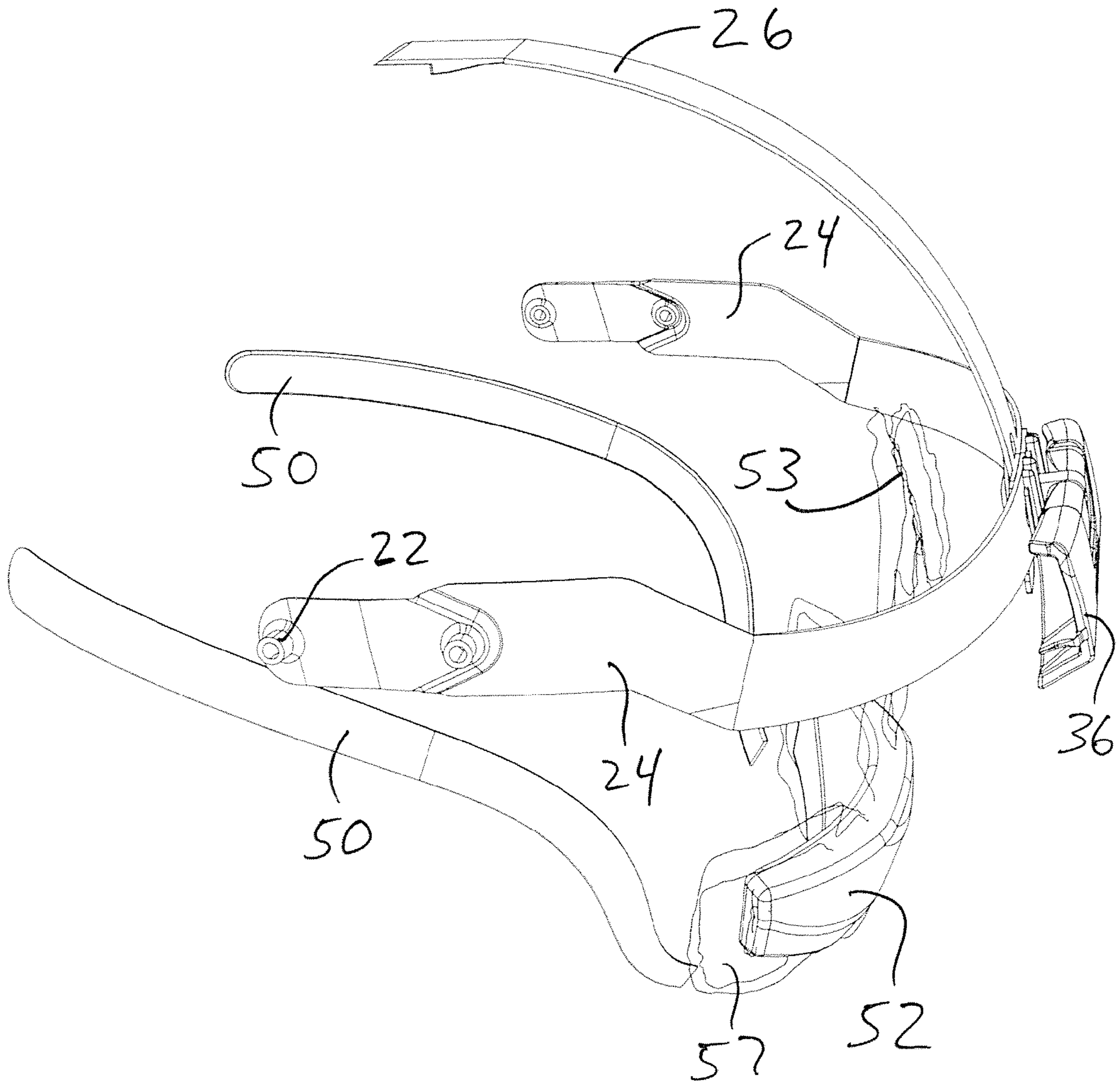


Fig. 12

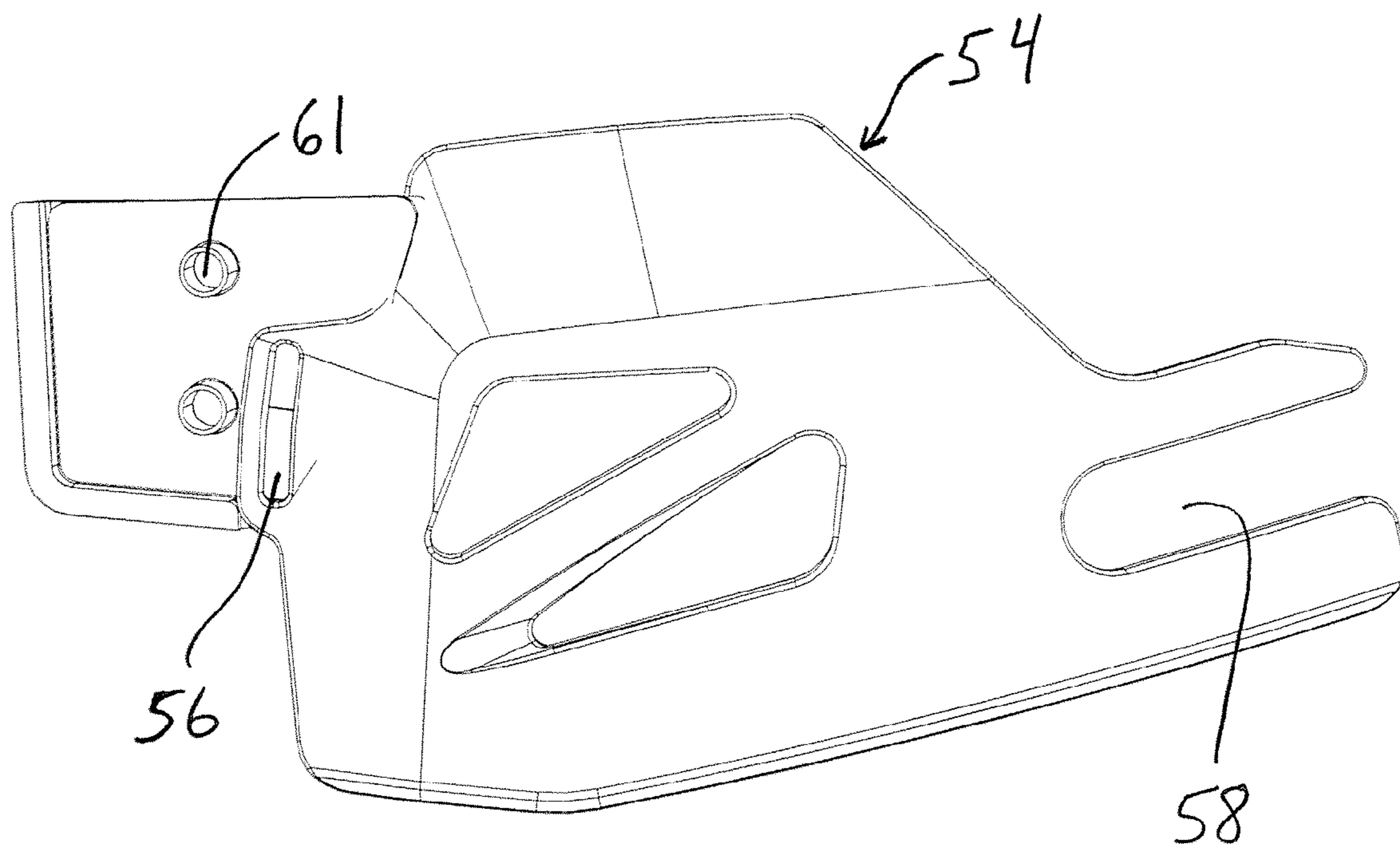


Fig. 13

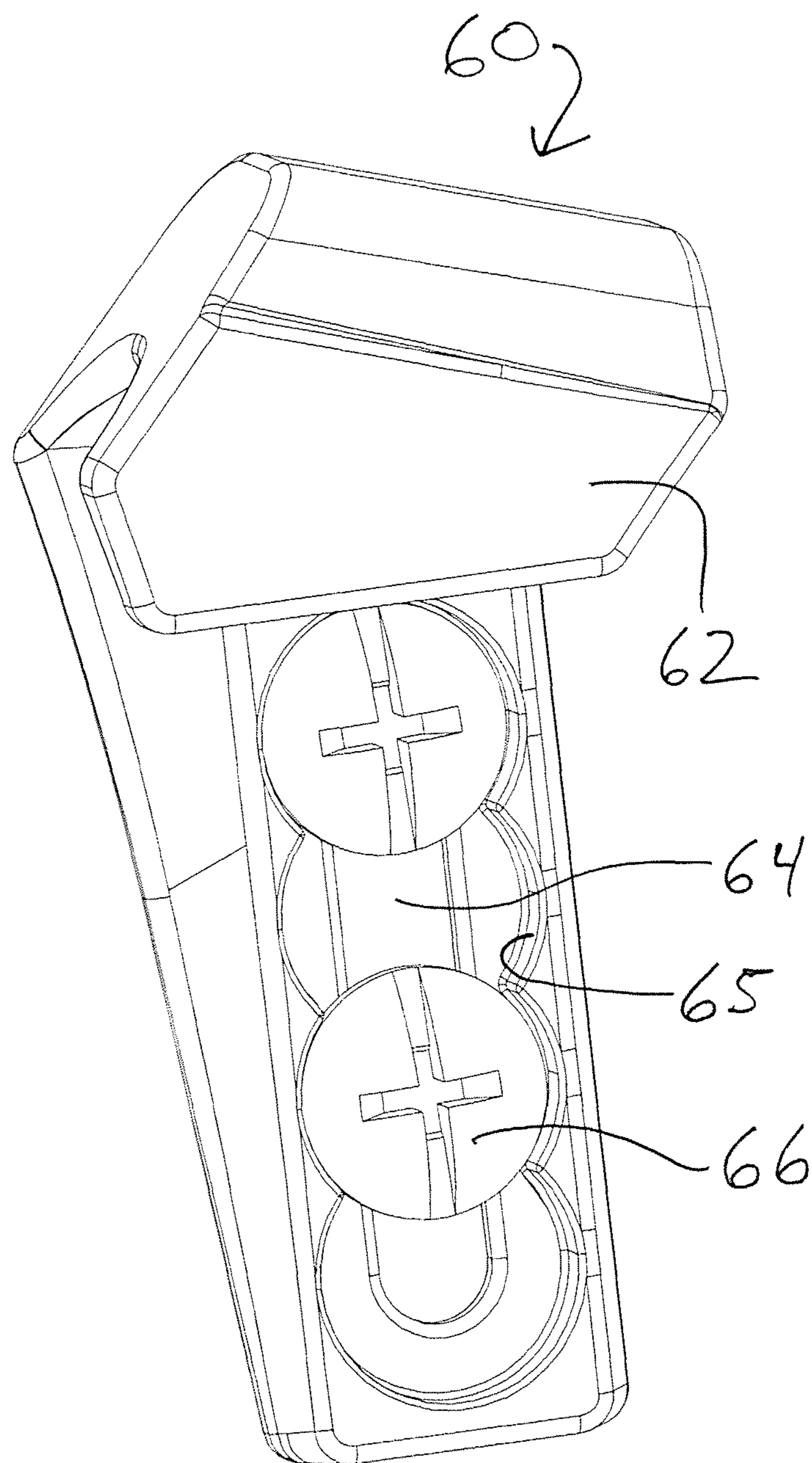


Fig. 14

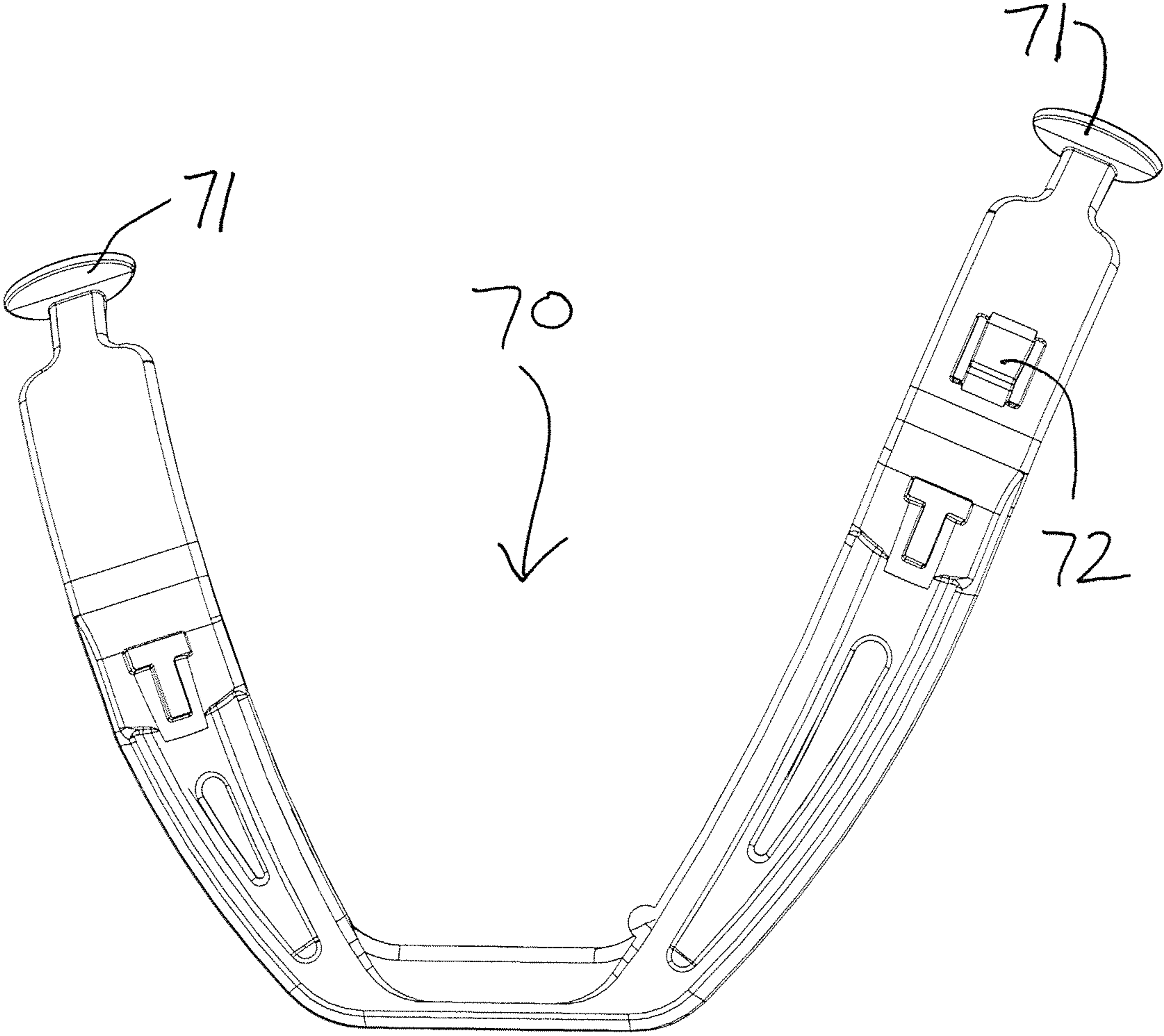


Fig. 15

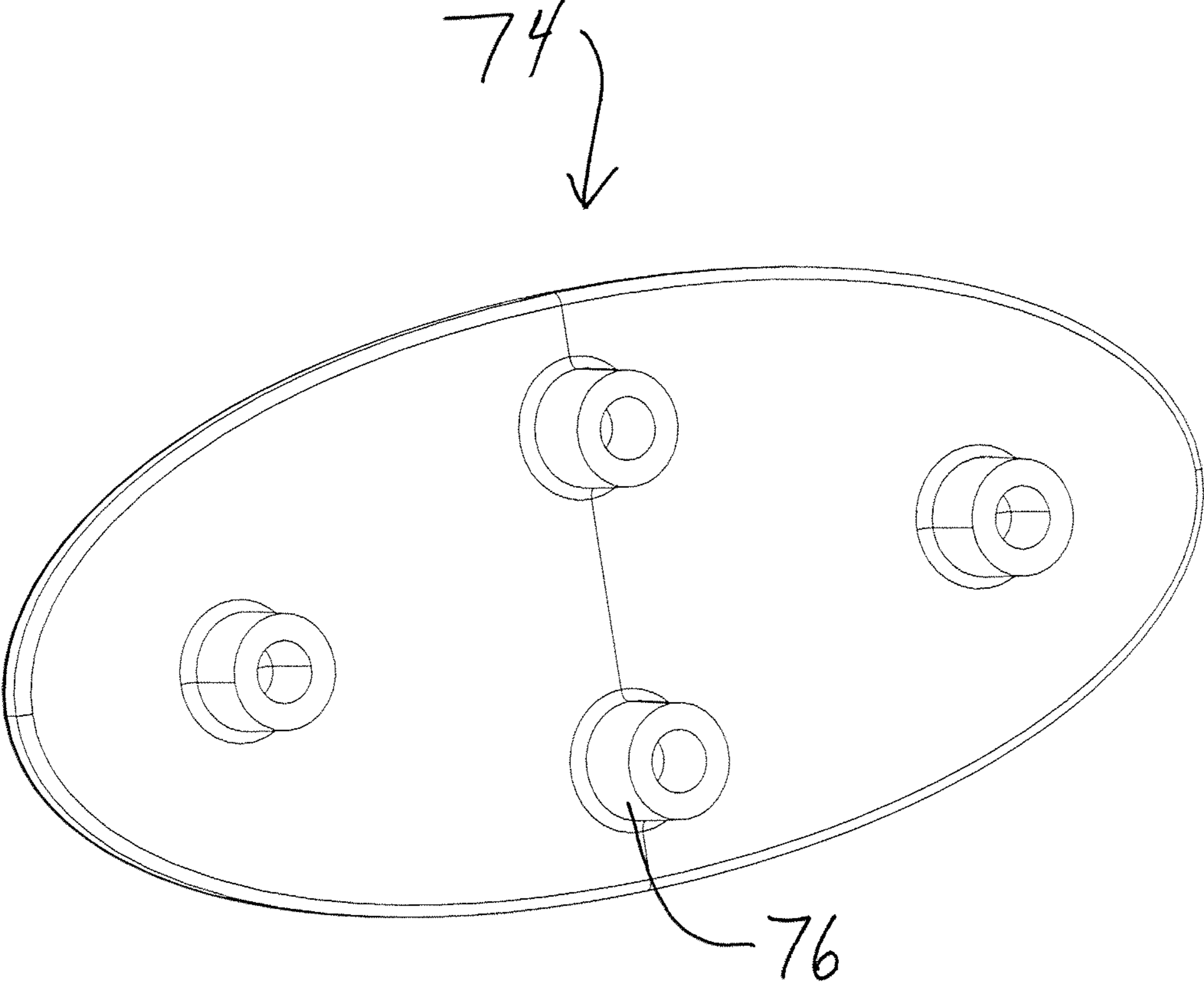


Fig. 16

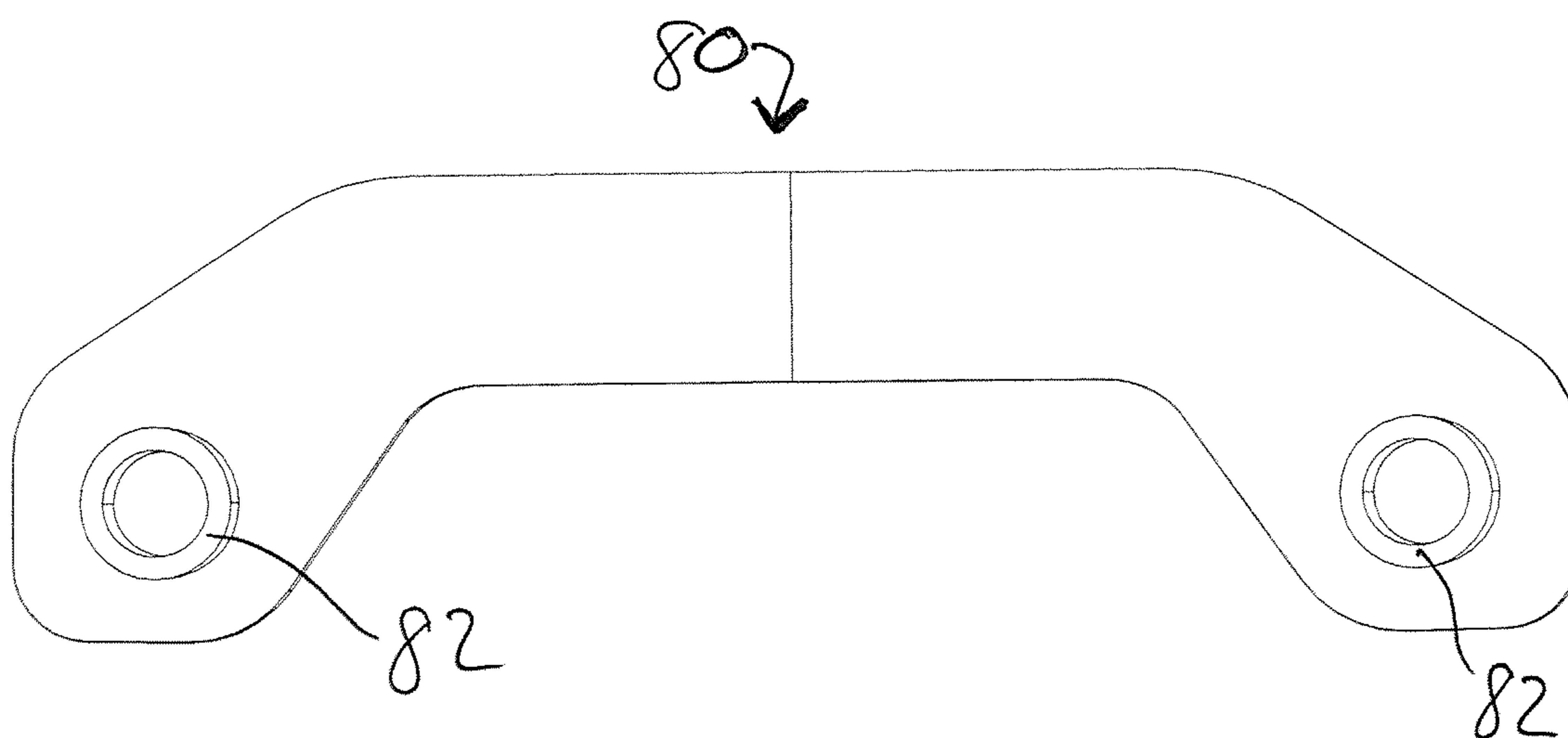


Fig. 17A

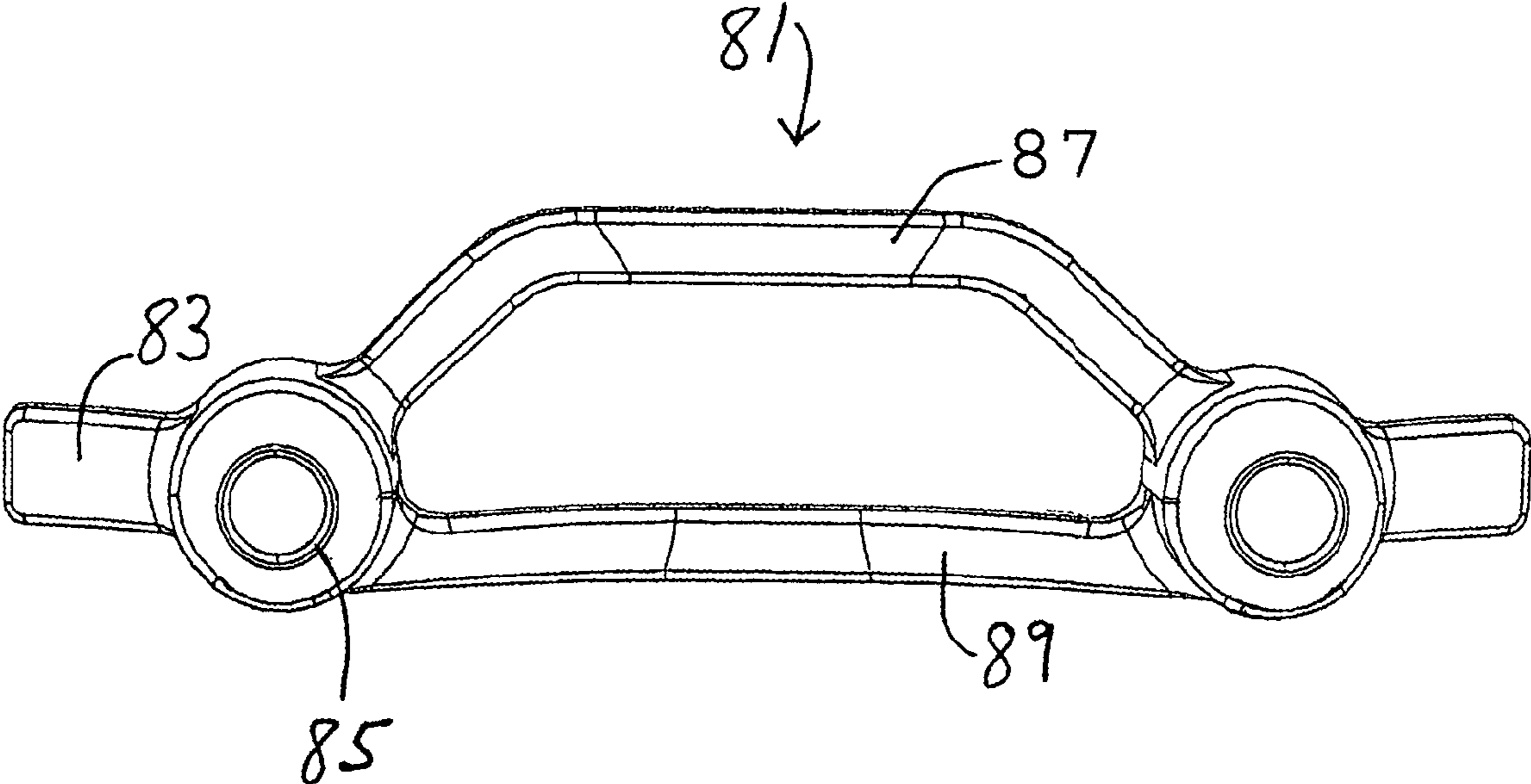
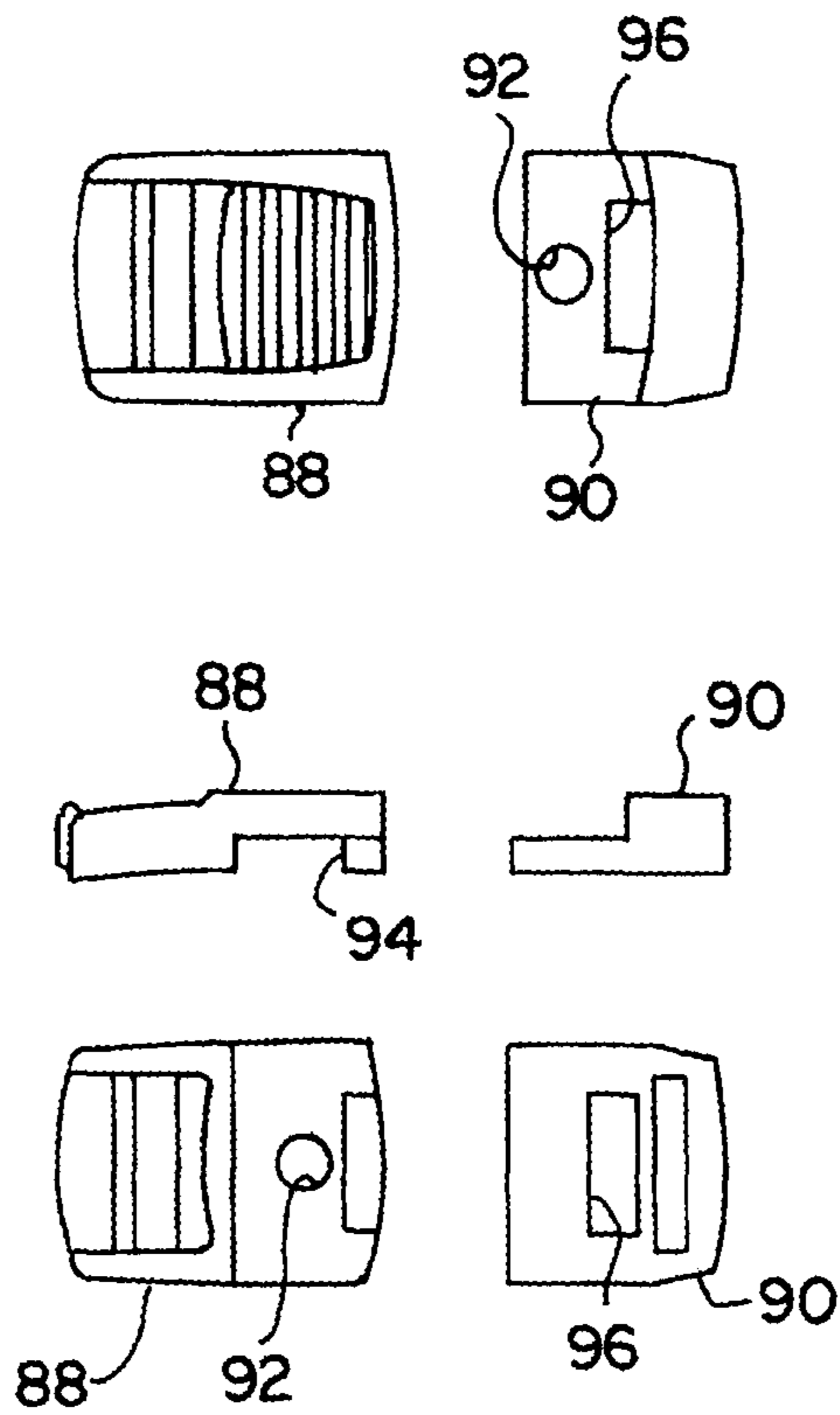
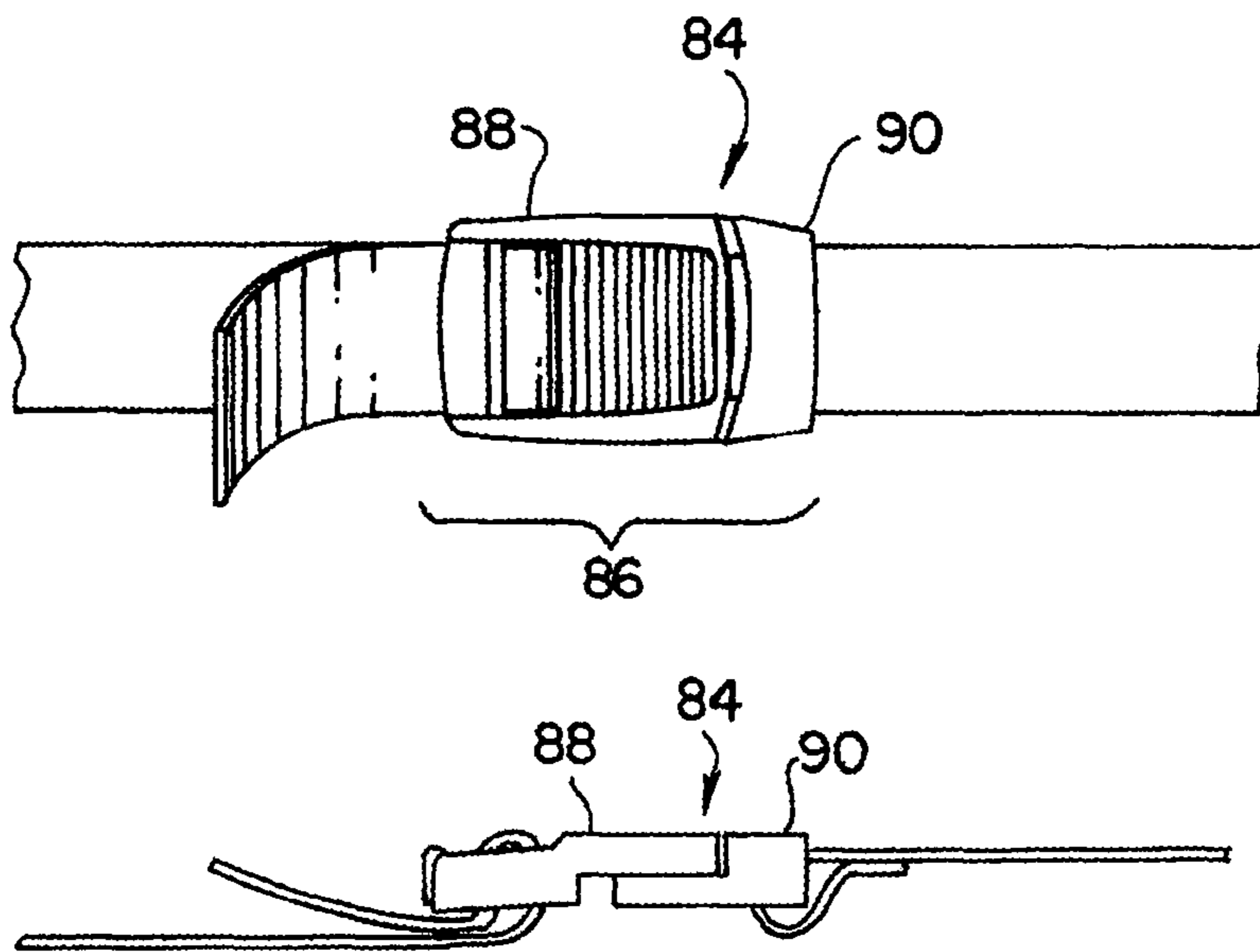
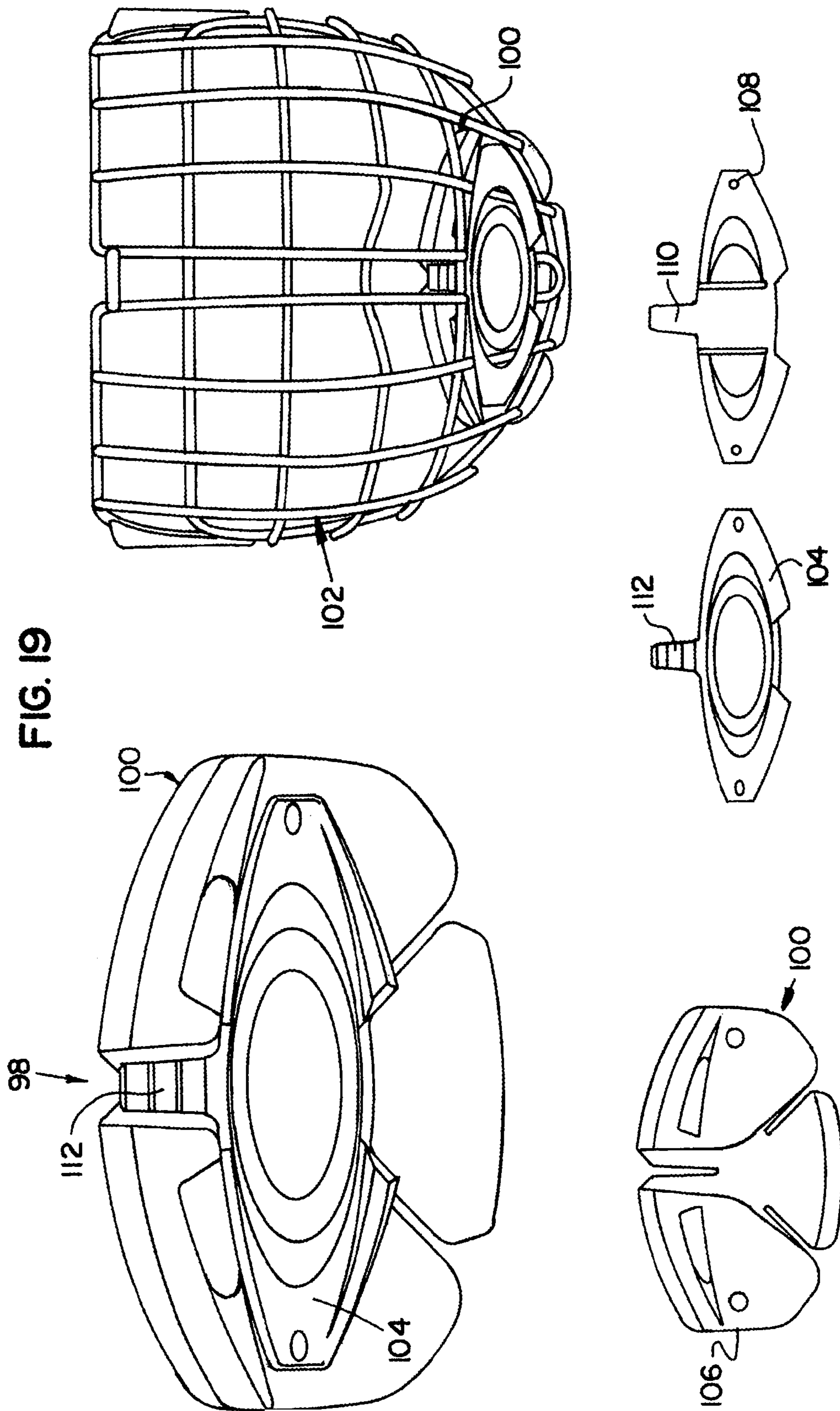


Fig. 17B

FIG. 18





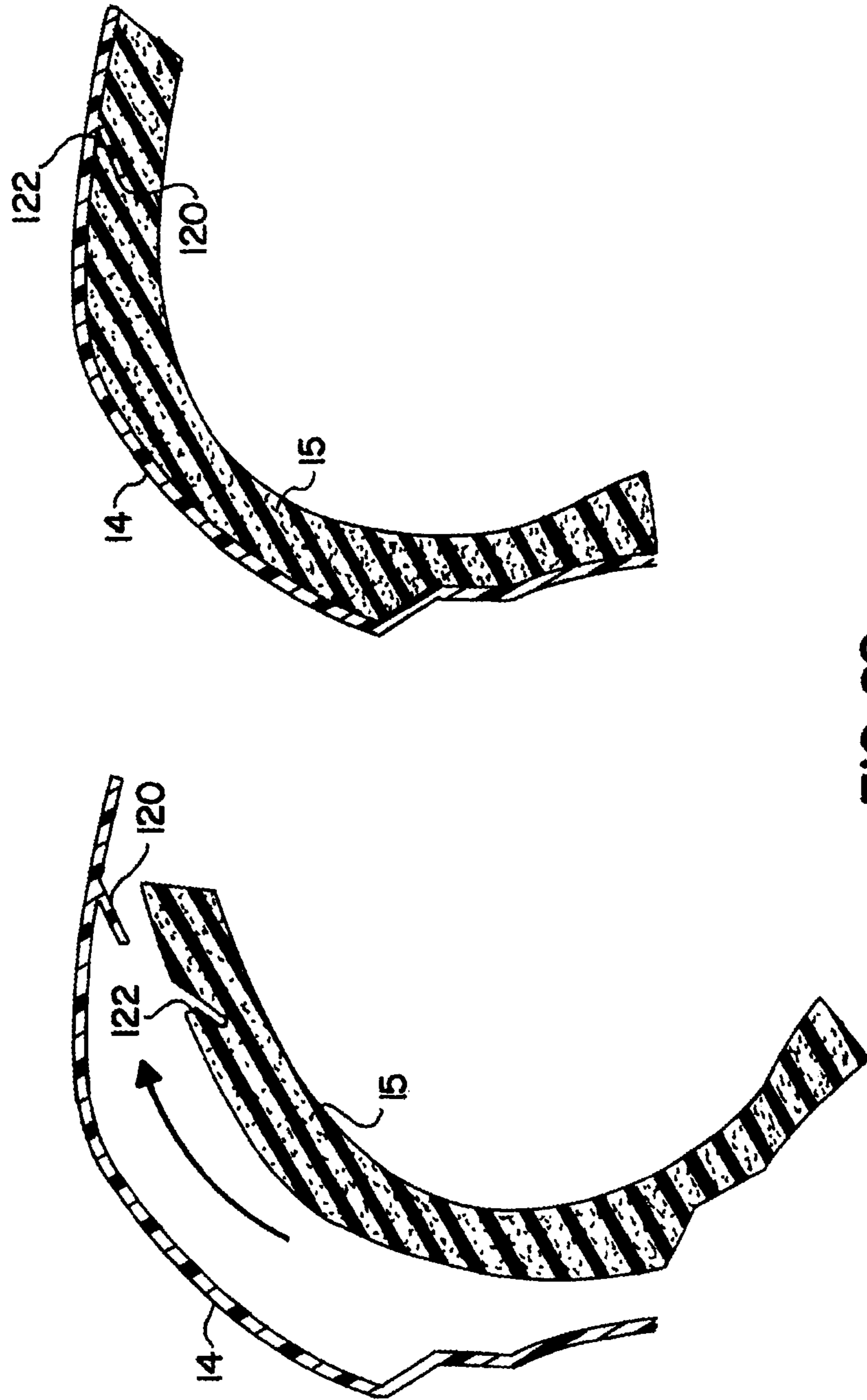


FIG. 20

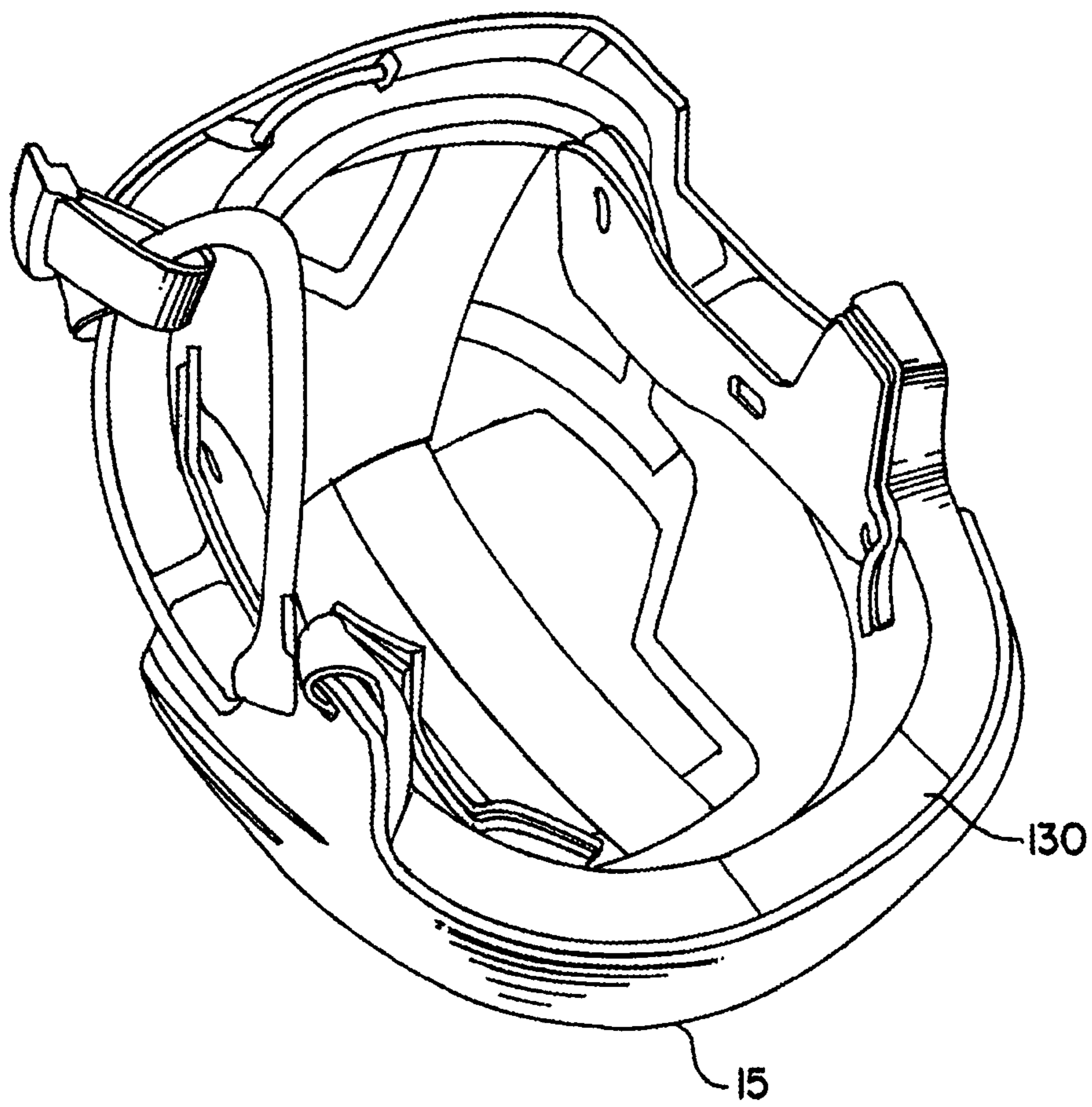


FIG. 21

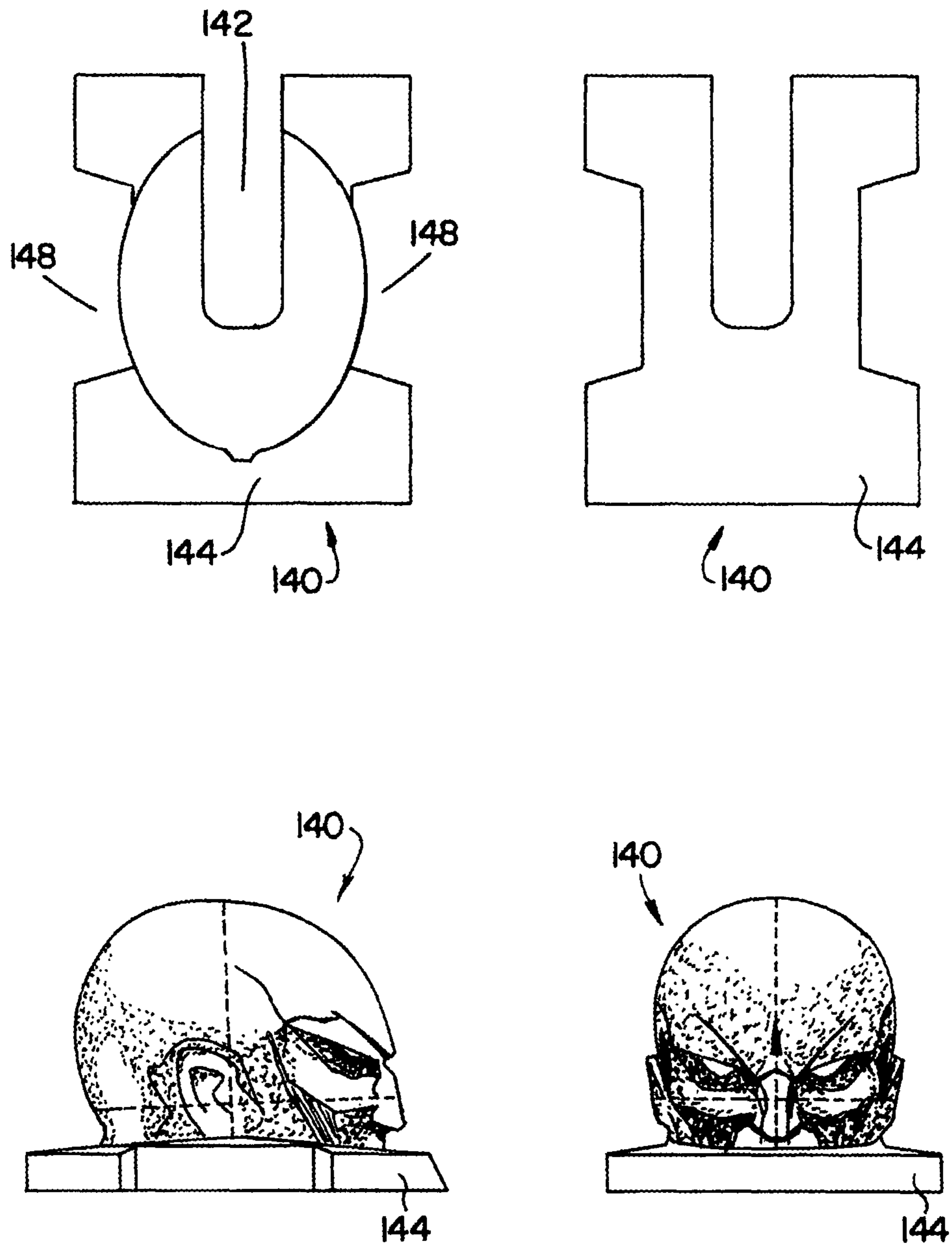


FIG. 22

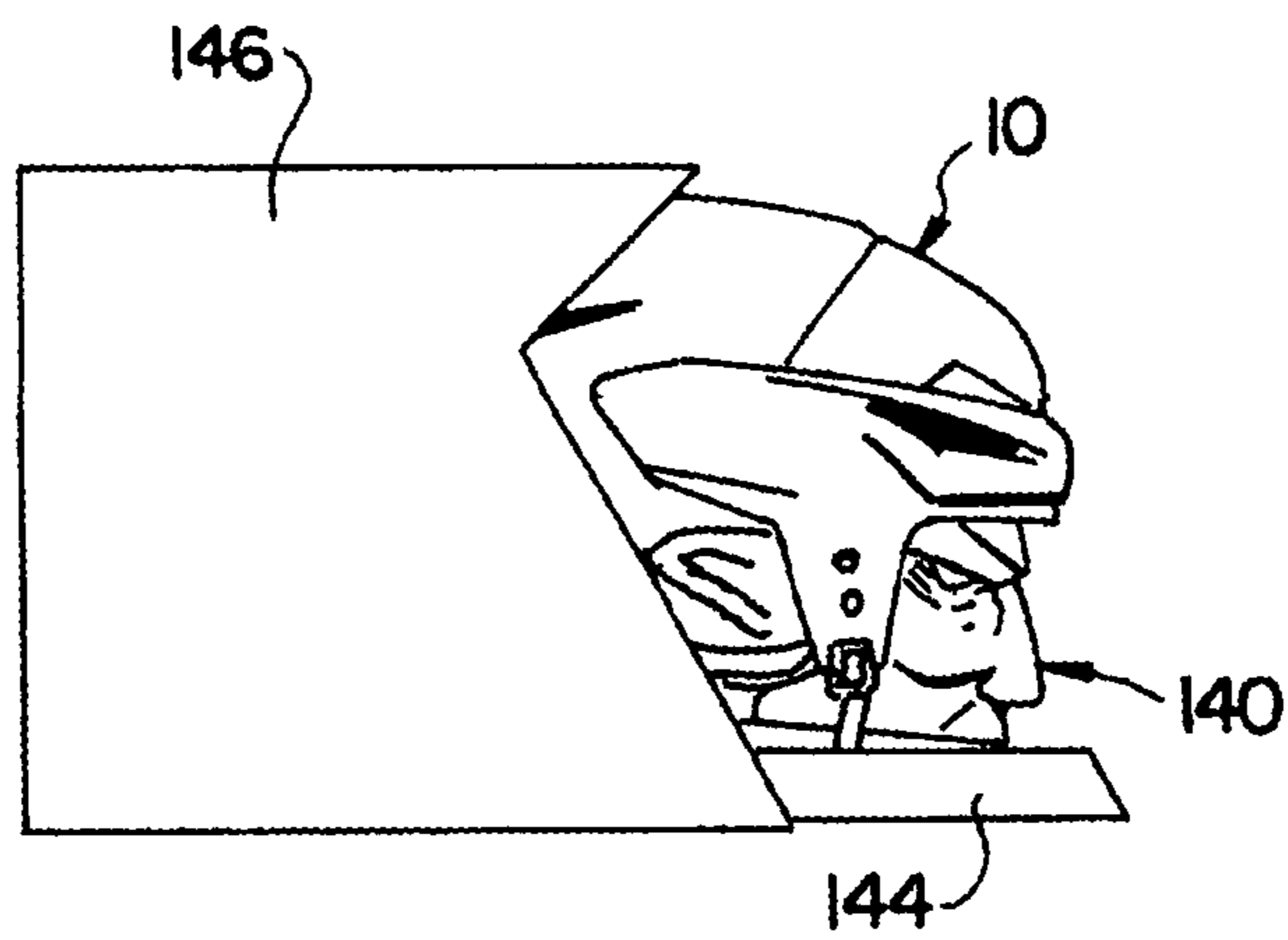


FIG. 23

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. This application is a continuation reissue of application Ser. No. 15/268,127, now U.S. Pat. No. RE47,747, which is an application for reissue of U.S. Pat. No. 8,832,870, which is a continuation of U.S. patent application Ser. No. 12/191,000, 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. 4A is a rear perspective view of the helmet shown in FIGS. 1-3 with the cam mechanism in the closed or locked position.

FIG. 4B 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. 17A 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. 17B 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 facemask 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 descrip-

tion 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. 4B, 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. 4A 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

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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

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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 **17A**, 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. **17B** 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. **17B**. 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 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.]

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[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 longitu-
 dinal 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, having a front region, a rear
 region, and generally opposite side regions, the helmet
 comprising:*

- a) an external protective shell circumscribing an inside
 region for receiving the wearer's head, a size of the
 inside region being variable to adjust a fit of the helmet
 on the wearer's head;*
- b) padding in the inside region, the padding being located
 between the protective shell and the wearer's head
 when the helmet is worn;*
- c) the protective shell including a first shell portion
 engaged with a second shell portion, the first shell
 portion overlapping the second shell portion, whereby
 the first shell portion and the second shell portion
 define a mutual area of overlap, a position of the first
 and the second shell portions relative to each other
 being adjustable to vary an extent of the mutual area of
 overlap, wherein the opposite side regions include a
 first side region and an opposite second side region,
 wherein the mutual area of overlap is located on the
 first side region of the helmet;*
- d) a manually operable adjustment device in the rear
 region of the helmet;*
- e) a substantially rigid strap in the inside region, the
 substantially rigid strap being engaged with the manu-
 ally operable adjustment device and extending toward
 the mutual area of overlap, wherein the substantially*

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- rigid strap extends along the first side region of the
 helmet, at the mutual area of overlap the second shell
 portion residing between the first shell portion and the
 substantially rigid strap, wherein the first shell portion
 includes a recess at the mutual area of overlap, the
 recess configured for receiving a side plate therein;*
- f) the substantially rigid strap being moveable relative to
 the second shell portion in a selected one of a plurality
 of different positions, the plurality of different positions
 corresponding to respective positions of the first and
 the second shell portions relative to each other;*
 - g) the manually operable adjustment device being con-
 figured to secure the substantially rigid strap in the
 selected one of the plurality of different positions;*
 - h) a connector in the mutual area of overlap, the con-
 nector connecting the first shell portion to the substan-
 tially rigid strap and extending through the second
 shell portion;*
 - i) the substantially rigid strap, when secured by the
 manually operable adjustment device in the selected
 one of the plurality of different positions, being con-
 figured to resist displacement of the first shell portion
 relative to the second shell portion.*

*20. The helmet of claim 19, wherein the manually oper-
 able adjustment device constituting the only device of the
 helmet for adjusting the position of the first and second shell
 portions relative to each other.*

*21. The helmet of claim 19, wherein the helmet has a
 longitudinal axis extending along a direction from the front
 region to the rear region and a transverse axis extending in
 a direction from one side region to another side region, the
 substantially rigid strap having a portion extending gener-
 ally along the transverse axis.*

*22. The helmet of claim 21, wherein the first shell portion
 is a front shell portion.*

*23. The helmet of claim 22, wherein the second shell
 portion is a rear shell portion.*

*24. The helmet of claim 19, wherein the recess holds the
 side plate captive therein, the connector connecting the side
 plate with the substantially rigid strap.*

*25. The helmet of claim 19, wherein the connector is a first
 connector, the helmet comprising a second connector spaced
 apart from the first connector, the second connector con-
 necting the side plate to the substantially rigid strap and
 extending through the second shell portion.*

*26. The helmet of claim 25, wherein the first connector
 includes a rivet.*

*27. The helmet of claim 26, wherein the second connector
 includes a rivet.*

*28. The helmet of claim 19, wherein the mutual area of
 overlap is a first mutual area of overlap, the helmet includ-
 ing a second mutual area of overlap between the first shell
 portion and the second shell portion, the substantially rigid
 strap being a first substantially rigid strap, the helmet
 including a second substantially rigid strap extending along
 the second side region of the helmet between the second
 mutual area of overlap and the manually operable adjust-
 ment device, the second shell portion being located between
 the first shell portion and the second substantially rigid
 strap at the second mutual area of overlap, wherein the
 connector is a first connector, the helmet comprising a
 second connector connecting the first shell portion and the
 second substantially rigid strap at the second mutual area of
 overlap, the second connector extending through the second
 shell portion.*

29. The helmet of claim 28, wherein the helmet has a top portion and a rear edge, the first and second substantially rigid straps residing between the top portion and the rear edge.

30. The helmet of claim 19, wherein the second shell portion includes an opening through which the connector extends, the opening being configured to allow the connector to move relative to the second shell portion when the first shell portion moves relative to the second shell portion at the mutual area of overlap.

31. The helmet of claim 30, wherein the opening includes a slot.

32. An adjustable helmet, having a front region, a rear region, and generally opposite side regions, the helmet comprising:

- a) an external protective shell circumscribing an inside region for receiving the wearer's head, a size of the inside region being variable to adjust a fit of the helmet on the wearer's head;
- b) padding in the inside region, the padding being located between the protective shell and the wearer's head when the helmet is worn;
- c) the protective shell including a first shell portion engaged with a second shell portion, the first shell portion overlapping the second shell portion, whereby the first shell portion and the second shell portion define a mutual area of overlap, a position of the first and the second shell portions relative to each other being adjustable to vary an extent of the mutual area of overlap;
- d) a manually operable adjustment device in the rear region of the helmet;
- e) a substantially rigid strap in the inside region, the substantially rigid strap being engaged with the manually operable adjustment device and extending toward the mutual area of overlap, at the mutual area of overlap the second shell portion residing between the first shell portion and the substantially rigid strap;
- f) the substantially rigid strap being moveable relative to the second shell portion in a selected one of a plurality of different positions, the plurality of different positions corresponding to respective positions of the first and the second shell portions relative to each other;
- g) the manually operable adjustment device being configured to secure the substantially rigid strap in the selected one of the plurality of different positions;
- h) a connector in the mutual area of overlap, the connector connecting the first shell portion to the substantially rigid strap and extending through the second shell portion;
- i) the substantially rigid strap, when secured by the manually operable adjustment device in the selected one of the plurality of different positions, being configured to resist displacement of the first shell portion relative to the second shell portion, wherein the protective shell includes a strap guide configured on an inner surface thereof, the strap guide configured to receive the substantially rigid strap, wherein when the position of the first and second shell portions relative to each other is adjusted, the substantially rigid strap is displaced relative to the strap guide.

33. The helmet of claim 32, wherein the strap guide is configured for maintaining the substantially rigid strap adjacent the inner surface of the protective shell as the first and second shell portions of the protective shell are displaced to adjust the helmet.

34. The helmet of claim 33, wherein the substantially rigid strap resides between the protective shell and the padding.

35. The helmet of claim 32, wherein the manually operable adjustment device includes a post projecting from an inner surface of the protective shell.

36. The helmet of claim 35, wherein the manually operable adjustment device includes a generally circular structure mounted on the post, the generally circular structure engaging the substantially rigid strap.

37. An adjustable helmet, having a front region, a rear region, and generally opposite side regions, the helmet comprising:

- a) an external protective shell circumscribing an inside region for receiving the wearer's head, a size of the inside region being variable to adjust a fit of the helmet on the wearer's head;
- b) padding in the inside region, the padding being located between the protective shell and the wearer's head when the helmet is worn;
- c) the protective shell including a first shell portion engaged with a second shell portion, the first shell portion overlapping the second shell portion, whereby the first shell portion and the second shell portion define a mutual area of overlap, a position of the first and the second shell portions relative to each other being adjustable to vary an extent of the mutual area of overlap, wherein the opposite side regions include a first side region and an opposite second side region, wherein the mutual area of overlap is located on the first side region of the helmet;
- d) a manually operable adjustment device in the rear region of the helmet;
- e) a substantially rigid strap in the inside region, the substantially rigid strap being engaged with the manually operable adjustment device and extending toward the mutual area of overlap, wherein the substantially rigid strap extends along the first side region of the helmet, at the mutual area of overlap the second shell portion residing between the first shell portion and the substantially rigid strap, wherein the first shell portion includes a recess at the mutual area of overlap, the recess configured for receiving a side plate therein;
- f) the substantially rigid strap being moveable relative to the second shell portion in a selected one of a plurality of different positions, the plurality of different positions corresponding to respective positions of the first and the second shell portions relative to each other;
- g) a connector in the mutual area of overlap, the connector connecting the first shell portion to the substantially rigid strap and extending through the second shell portion, such that movement of one of the substantially rigid strap and the first shell portion imparts corresponding movement of the other of the substantially rigid strap and first shell portion.

38. The helmet of claim 37, wherein the manually operable adjustment device constitutes the only device of the helmet for adjusting the position of the first and second shell portions relative to each other.

39. The helmet of claim 37, wherein the manually operable adjustment device is joined with the second shell portion and includes a finger operable actuator projecting from the second shell portion.

40. The helmet of claim 39, wherein the finger operable actuator includes a lever.

41. The helmet of claim 39, wherein the manually operable adjustment device includes a cam.

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42. The helmet of claim 37, wherein the helmet has a longitudinal axis extending along a direction from the front region to the rear region and a transverse axis extending in a direction from one side region to another side region, the substantially rigid strap having a portion extending generally along the transverse axis.

43. The helmet of claim 42, wherein the first shell portion is a front shell portion.

44. The helmet of claim 42, wherein the second shell portion is a rear shell portion.

45. The helmet of claim 37, wherein the recess holds the side plate captive therein, the connector connecting the side plate with the substantially rigid strap.

46. The helmet of claim 45, wherein the connector is a first connector, the helmet comprising a second connector spaced apart from the first connector, the second connector connecting the side plate with the substantially rigid strap and extending through the second shell portion.

47. The helmet of claim 46, wherein the first connector includes a rivet.

48. The helmet of claim 46, wherein the second connector includes a rivet.

49. The helmet of claim 37, wherein the mutual area of overlap is a first mutual area of overlap, the helmet including a second mutual area of overlap between the first shell portion and the second shell portion, the substantially rigid strap being a first substantially rigid strap, the helmet including a second substantially rigid strap extending along the second side region of the helmet between the second mutual area of overlap and the manually operable adjustment device, the second shell portion being located between the first shell portion and the second substantially rigid strap at the second mutual area of overlap, wherein the connector is a first connector, the helmet comprising a second connector connecting the first shell portion and the second substantially rigid strap at the second mutual area of overlap, the second connector extending through the second shell portion.

50. The helmet of claim 49, wherein the helmet has a top portion and a rear edge, the first and second substantially rigid straps residing between the top portion and the rear edge.

51. The helmet of claim 37, wherein the second shell portion includes an opening through which the connector extends, the opening being configured to allow the connector to move relative to the second shell portion when the first shell portion moves relative to the second shell portion at the mutual area of overlap.

52. The helmet of claim 51, wherein the opening includes a slot.

53. An adjustable helmet, having a front region, a rear region, and generally opposite side regions, the helmet comprising:

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a) an external protective shell circumscribing an inside region for receiving the wearer's head, a size of the inside region being variable to adjust a fit of the helmet on the wearer's head;

b) padding in the inside region, the padding being located between the protective shell and the wearer's head when the helmet is worn;

c) the protective shell including a first shell portion engaged with a second shell portion, the first shell portion overlapping the second shell portion, whereby the first shell portion and the second shell portion define a mutual area of overlap, a position of the first and the second shell portions relative to each other being adjustable to vary an extent of the mutual area of overlap;

d) a manually operable adjustment device in the rear region of the helmet;

e) a substantially rigid strap in the inside region, the substantially rigid strap being engaged with the manually operable adjustment device and extending toward the mutual area of overlap, at the mutual area of overlap the second shell portion residing between the first shell portion and the substantially rigid strap;

f) the substantially rigid strap being moveable relative to the second shell portion in a selected one of a plurality of different positions, the plurality of different positions corresponding to respective positions of the first and the second shell portions relative to each other;

g) a connector in the mutual area of overlap, the connector connecting the first shell portion to the substantially rigid strap and extending through the second shell portion, such that movement of one of the substantially rigid strap and the first shell portion imparts corresponding movement of the other of the substantially rigid strap and first shell portion, wherein the protective shell includes a strap guide configured on an inner surface thereof, the strap guide configured to receive the substantially rigid strap, wherein when the position of the first and second shell portions relative to each other is adjusted, the substantially rigid strap is displaced relative to the strap guide.

54. The helmet of claim 53, wherein the strap guide is configured for maintaining the substantially rigid strap adjacent the inner surface of the protective shell as the first and second shell portions of the protective shell are displaced relative to each other to adjust the helmet.

55. The helmet of claim 54, wherein the substantially rigid strap resides between the protective shell and the padding.

56. The helmet of claim 53, wherein the manually operable adjustment device includes a post projecting from an inner surface of the second shell portion.

57. The helmet of claim 56, wherein the manually operable adjustment device includes a generally circular structure mounted on the post, the generally circular structure engaging the substantially rigid strap.

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