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(54) **LINER FOR A PROTECTIVE HELMET**

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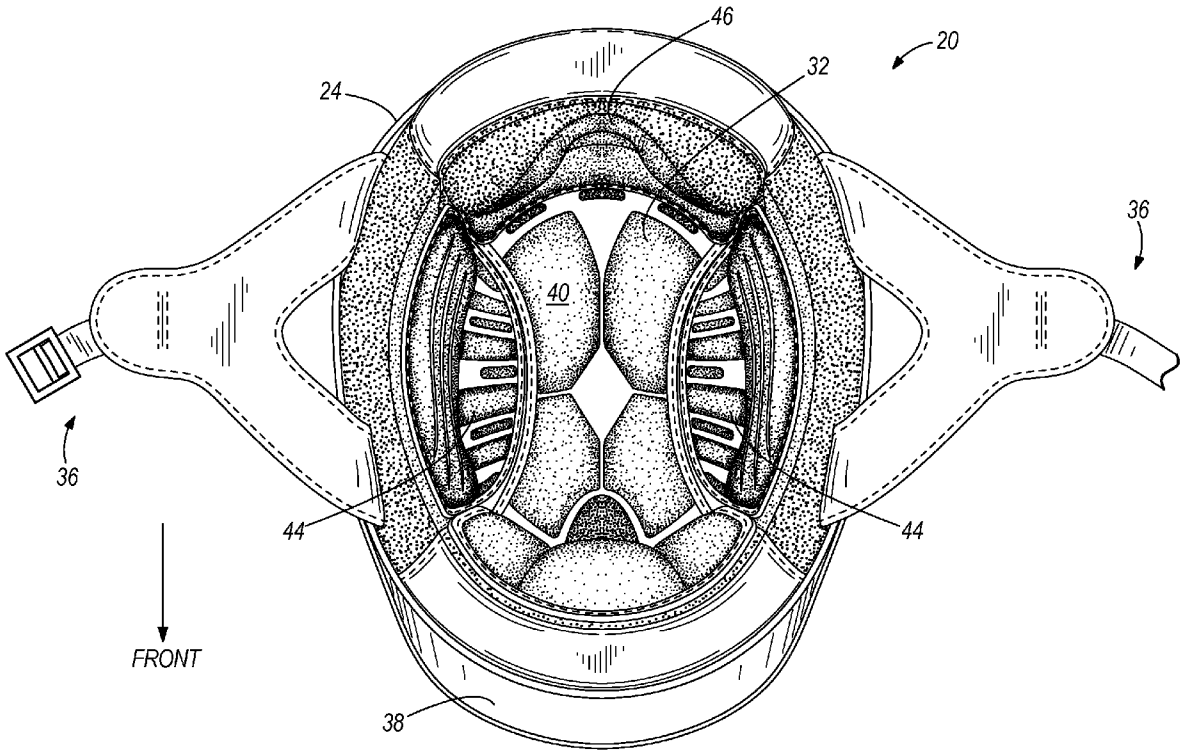
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(57) **ABSTRACT**

A helmet includes an outer shell, an energy-absorbing layer disposed inside the outer shell, and a liner disposed inside of the energy-absorbing layer. The liner includes a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet, a first side portion releasably coupled to the central portion, and a second side portion releasably coupled to the central portion.



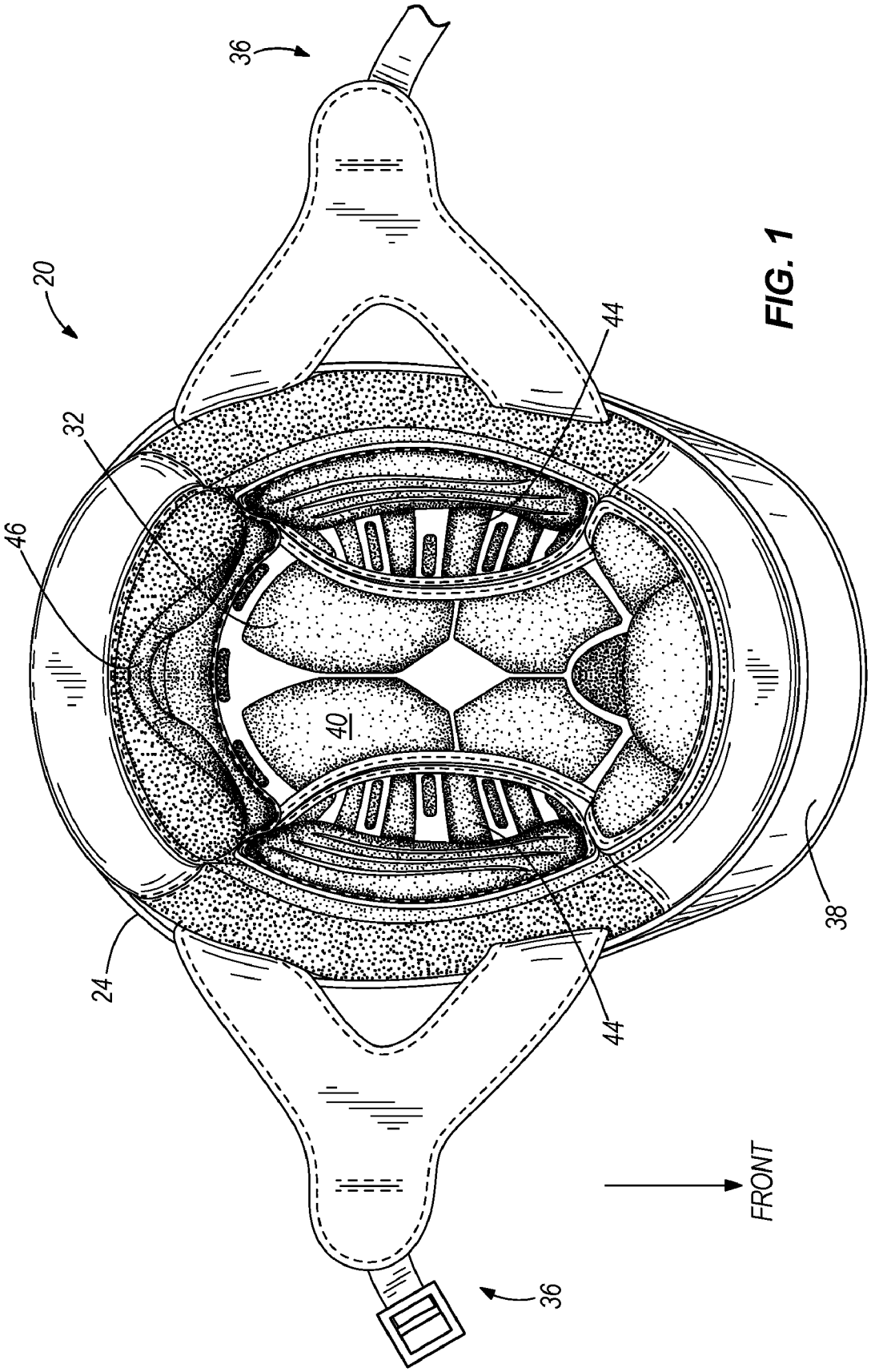


FIG. 1

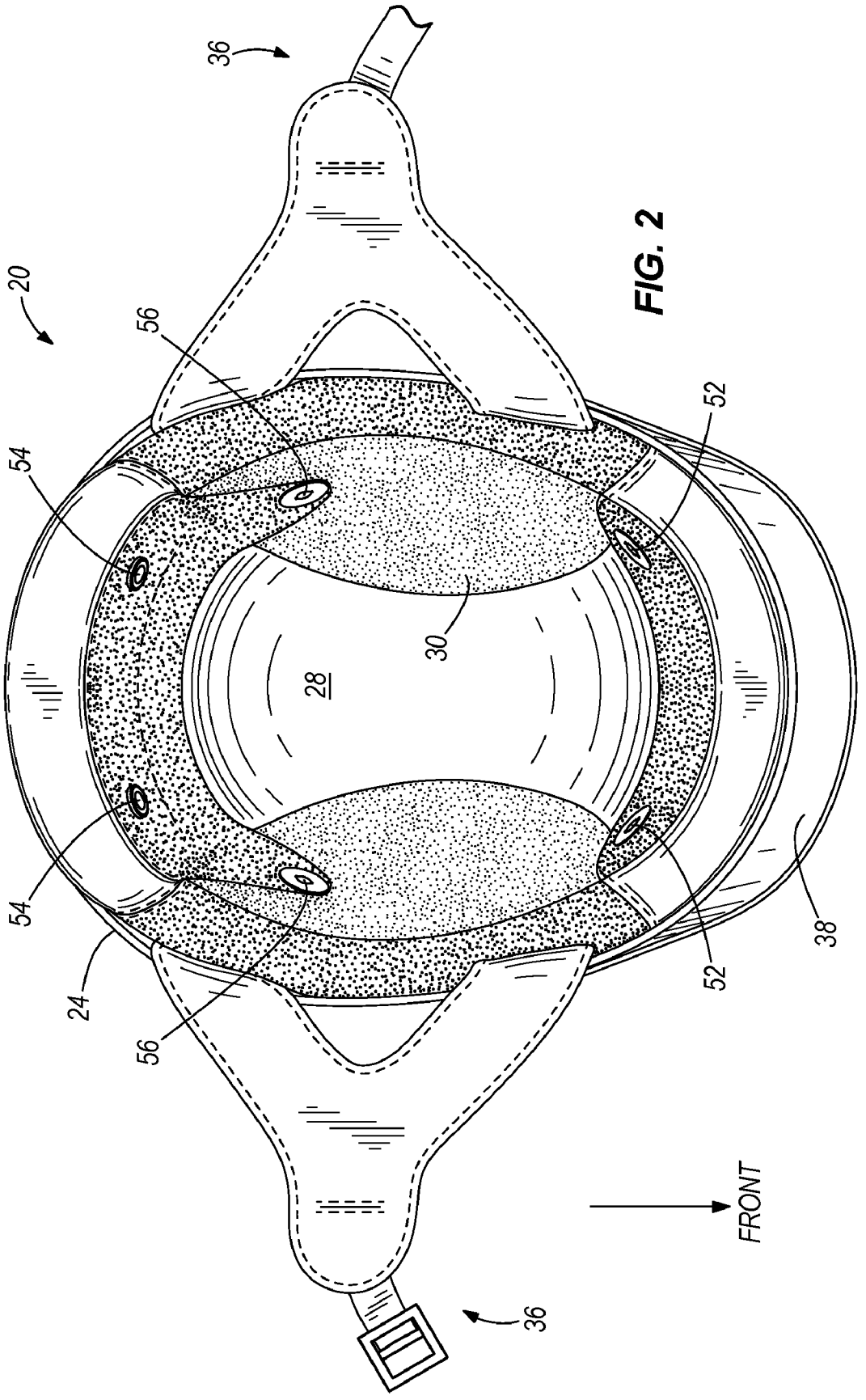


FIG. 2

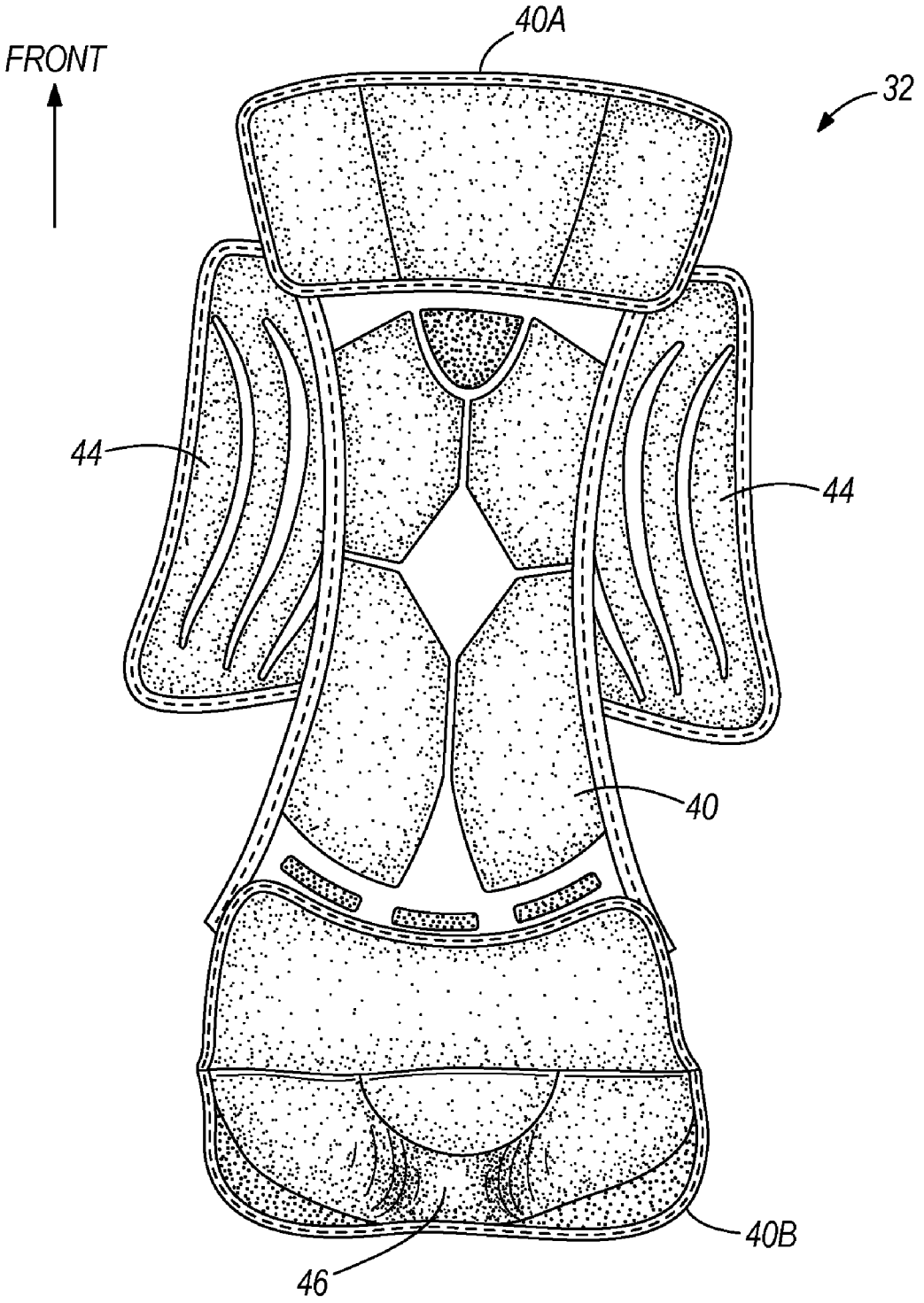


FIG. 3

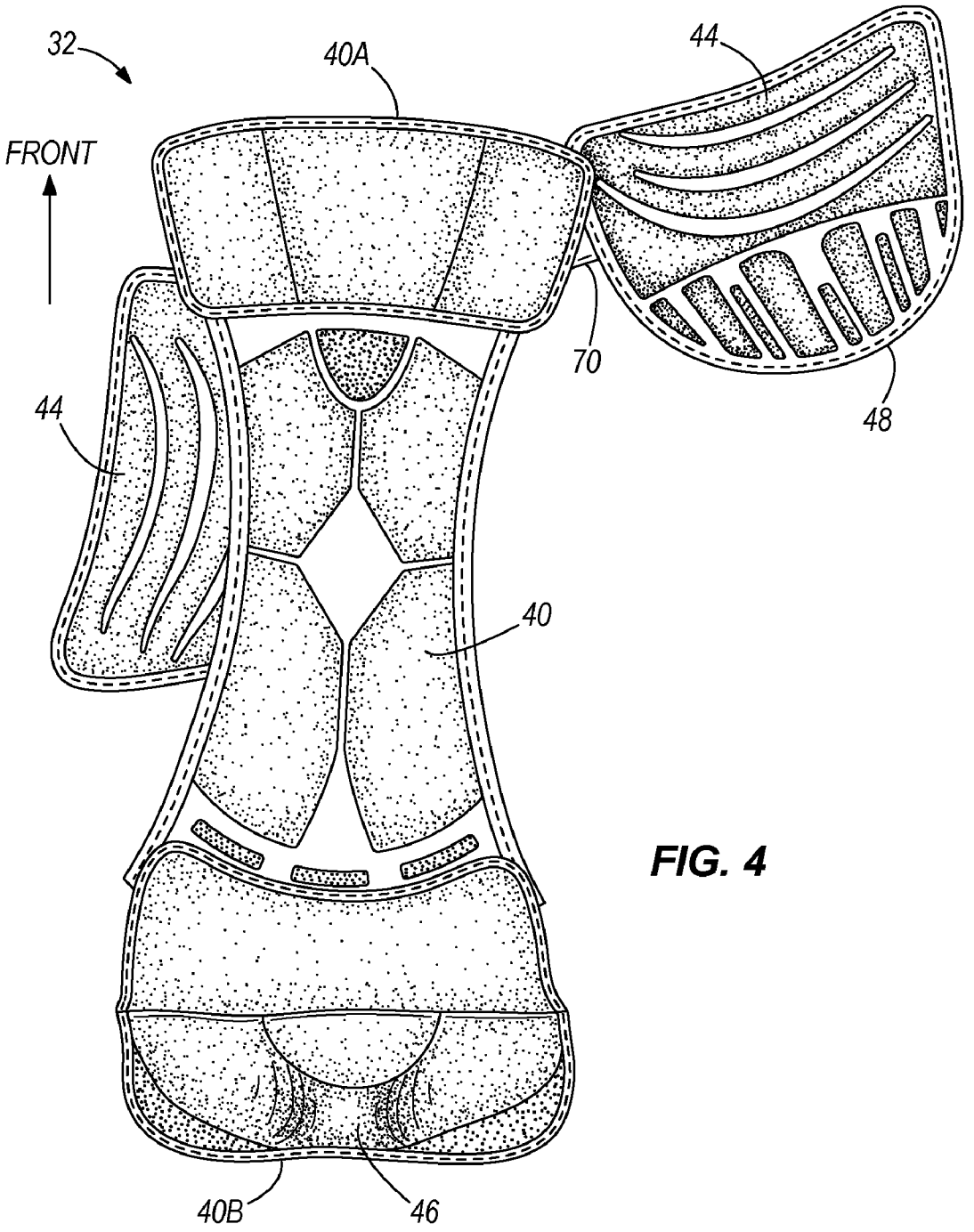


FIG. 4

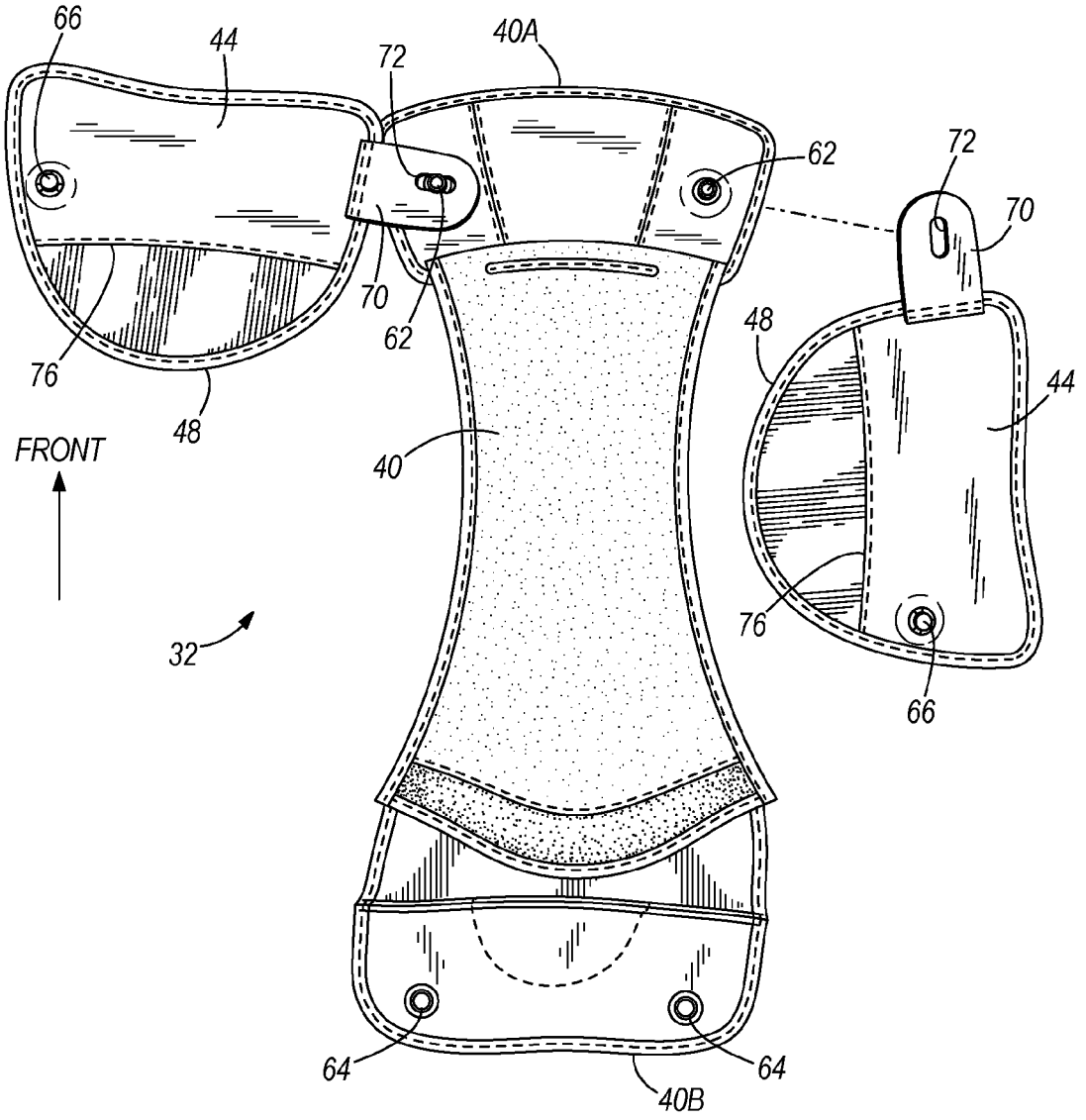


FIG. 5

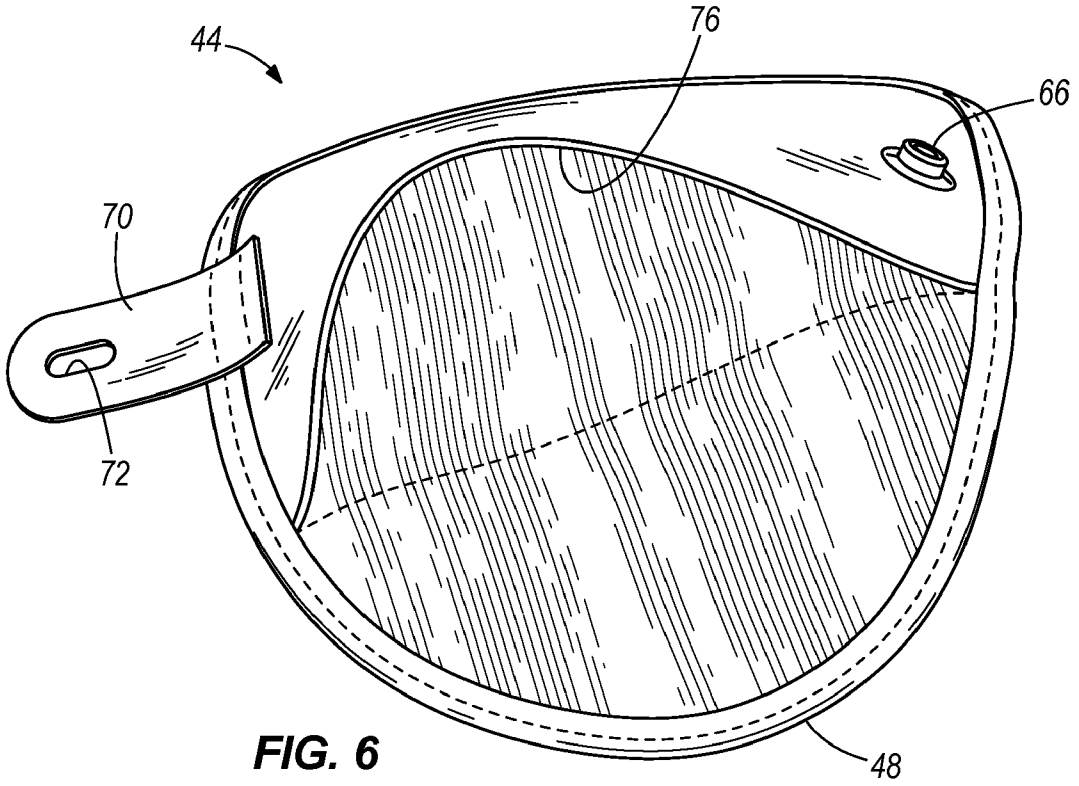


FIG. 6

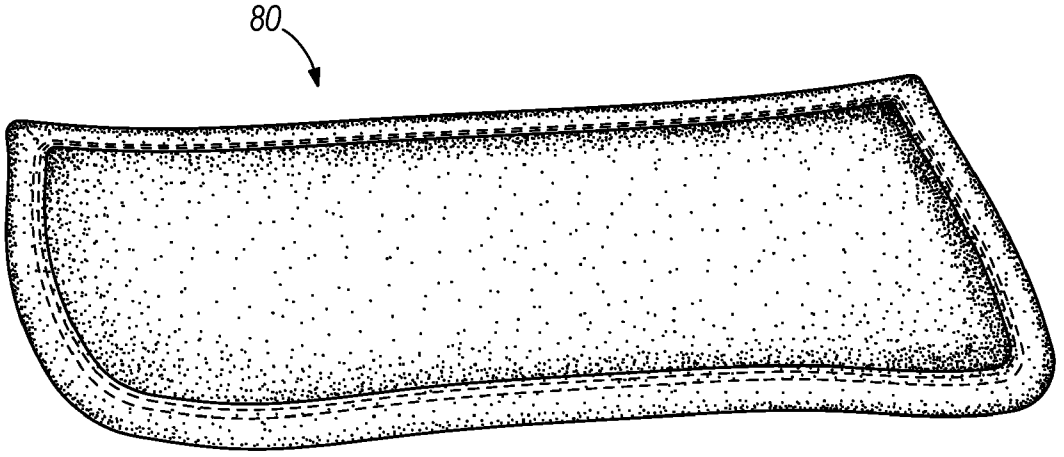


FIG. 7

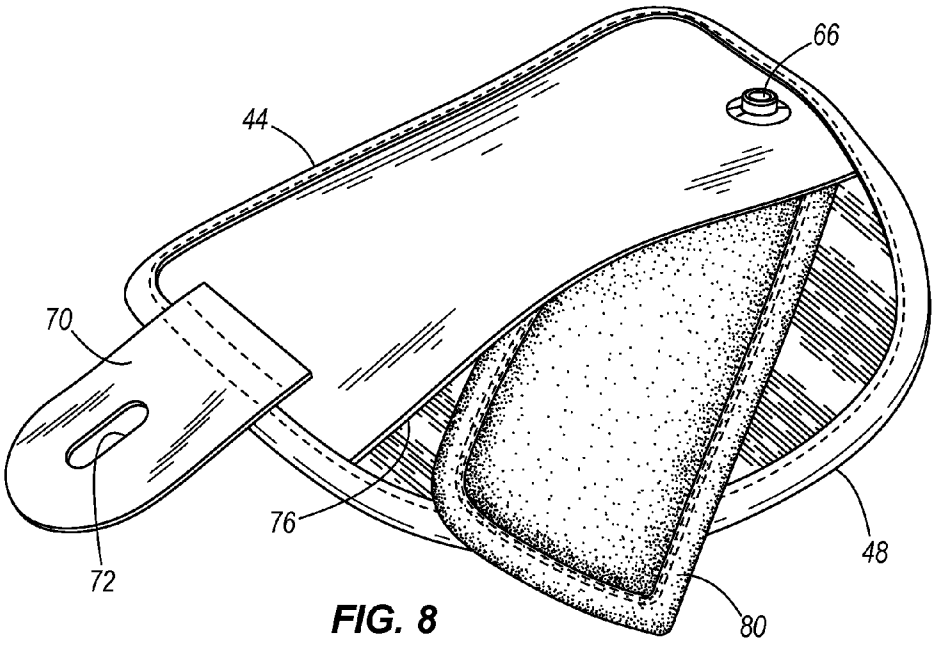


FIG. 8

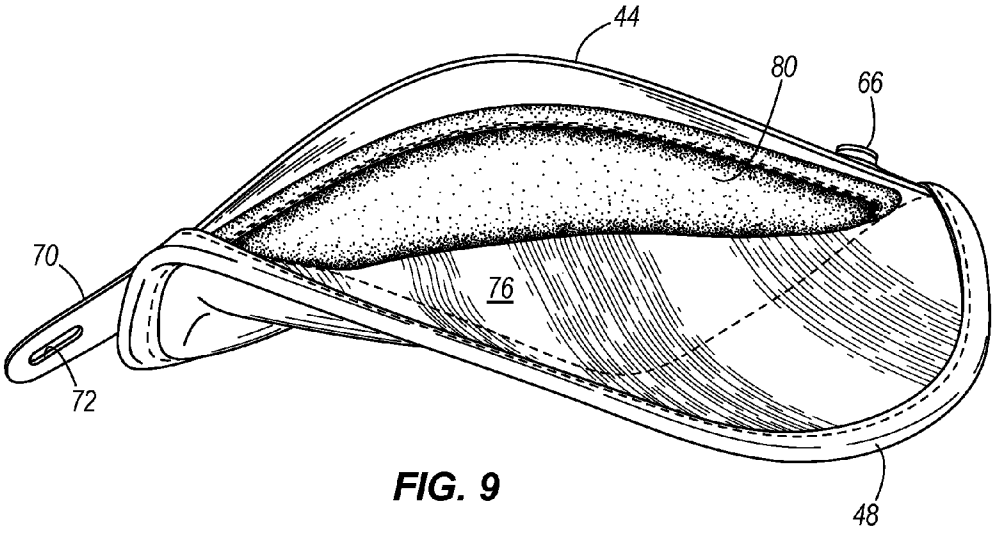


FIG. 9

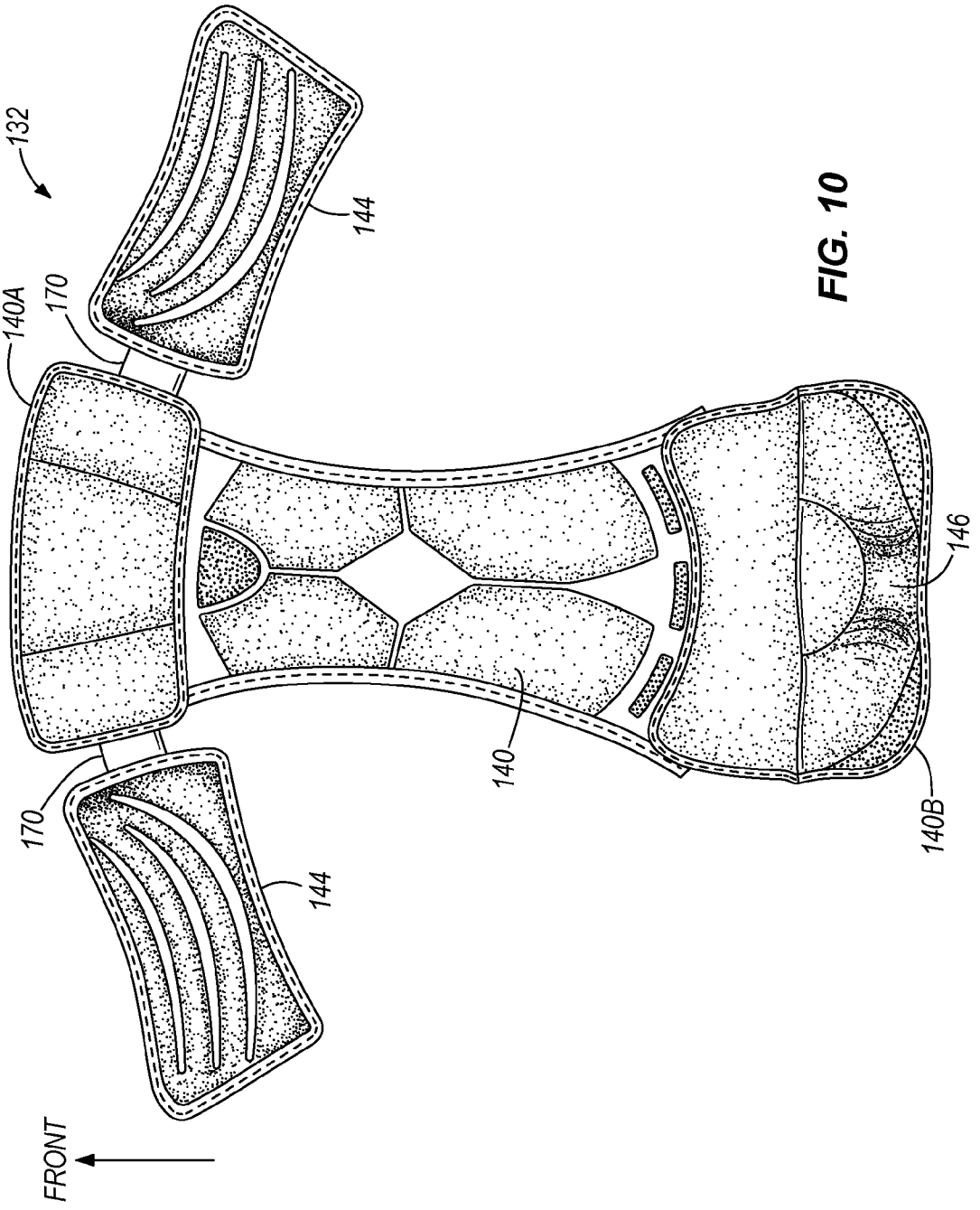


FIG. 10

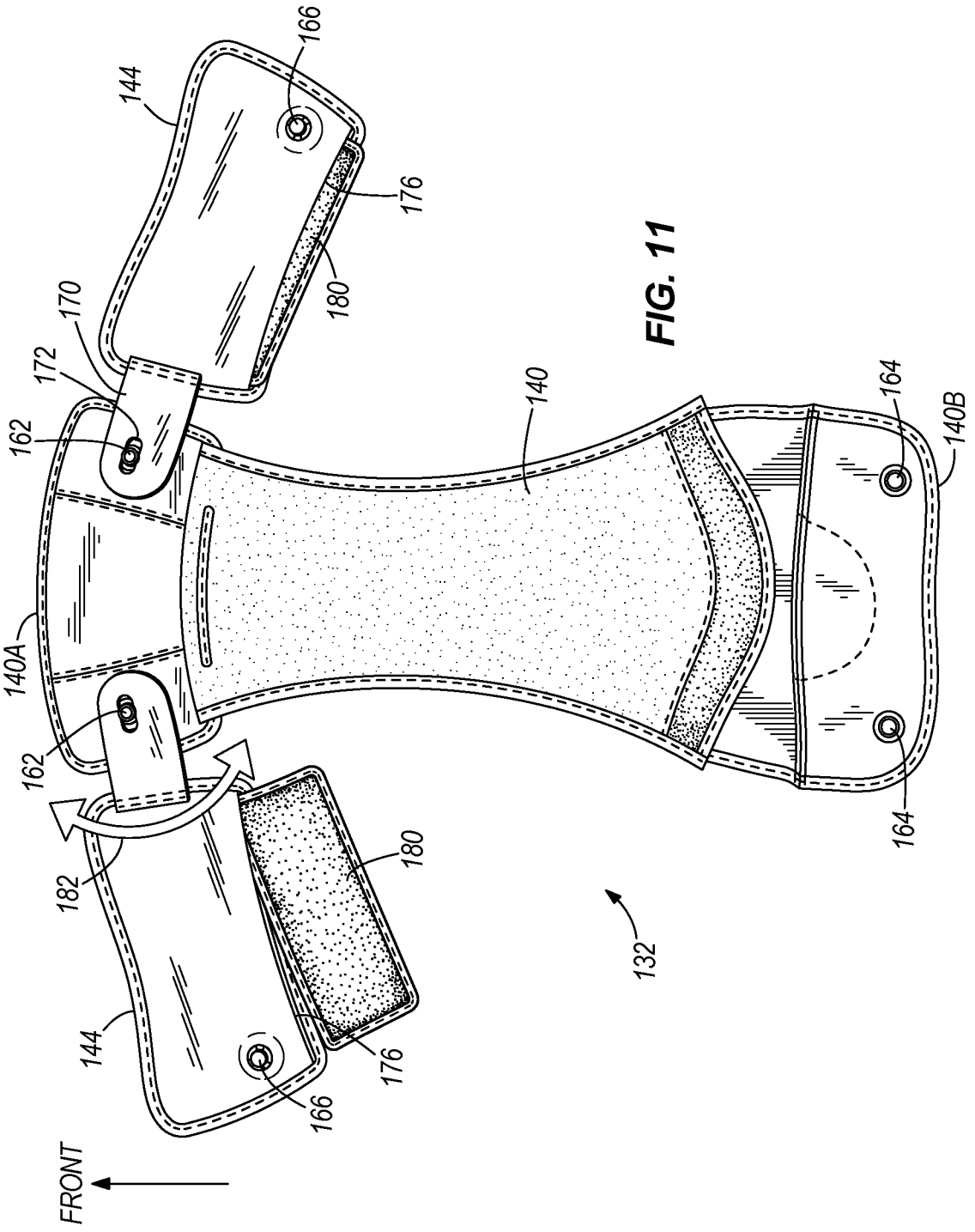

166
144
176
180
170
172
162
140
164
140B
140A
162
180
182
144
176
166
FRONT
132

FIG. 11

LINER FOR A PROTECTIVE HELMET

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 61/008,976, filed Dec. 21, 2007, the entire contents of which are incorporated by reference.

BACKGROUND

[0002] The present invention relates to protective helmets, such as motorcycle helmets. More particularly, the invention relates to a protective helmet with a customizable fit. Although most protective helmets are currently available in a range of standardized sizes to roughly match the size of a wearer's head, the precise fit of a conventional helmet is generally not adjustable for matching the particular shape of a wearer's head. Furthermore, conventional helmets are not able to be precisely sized for persons with head sizes in between two standardized sizes.

SUMMARY

[0003] In one embodiment, the invention provides a helmet including an outer shell, an energy-absorbing layer disposed inside the outer shell, and a liner disposed inside of the energy-absorbing layer. The liner includes a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet, a first side portion releasably coupled to the central portion, and a second side portion releasably coupled to the central portion.

[0004] In another embodiment, the invention provides a helmet including an outer shell, an energy-absorbing layer disposed inside the outer shell, and a liner disposed inside of the energy-absorbing layer and configured to contact the head of a wearer when the helmet is worn by the wearer. The liner includes a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet, a first side portion coupled to the central portion and defining a first pocket, a second side portion coupled to the central portion and defining a second pocket, and a pair of inserts. Each one of the inserts are insertable into one of the first and second pockets to increase the thickness of the corresponding side portion to customize the size of the liner and the fit of the helmet on the head of the wearer.

[0005] In yet another embodiment, the invention provides a method of customizing the fit of a helmet for a wearer. An outer shell is provided with an energy-absorbing layer disposed inside the outer shell. A liner is provided releasably coupled to the energy-absorbing layer. The liner is configured to contact the head of the wearer when the helmet is worn by the wearer. The liner includes a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet. The liner further includes first and second side portions releasably coupled to the central portion. The thickness of at least a portion of the liner is adjusted to adjust the fit of the helmet for the head of the wearer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a bottom view of a protective helmet having a liner embodying the present invention.

[0007] FIG. **2** is a bottom view of the protective helmet of FIG. **1** with the liner removed.

[0008] FIG. **3** is a bottom view of the liner removed from the protective helmet of FIG. **1**, showing two side flaps in a first orientation with respect to a central portion of the liner.

[0009] FIG. **4** is a bottom view of the liner of FIG. **3**, showing one of the side flaps rotated to a second orientation with respect to the central portion of the liner.

[0010] FIG. **5** is a top view of the liner of FIG. **3**, showing one of the side flaps detached from the central portion of the liner.

[0011] FIG. **6** is a perspective view of the detached side flap of FIG. **5**, illustrating a pocket formed therein.

[0012] FIG. **7** is a perspective view of a fit-customizing pad insertable into one of the pockets of the side flaps of the liner.

[0013] FIG. **8** is a perspective view illustrating the fit-customizing pad of FIG. **7** partially inserted into the pocket of a side flap of the liner.

[0014] FIG. **9** is a perspective view illustrating the fit-customizing pad of FIG. **7** fully inserted into the pocket of the side flap of the liner.

[0015] FIG. **10** is a bottom view of a liner according to another construction for use with the protective helmet of FIG. **1**.

[0016] FIG. **11** is a top view of the liner of FIG. **7**, illustrating fit-customizing pads insertable into side flaps of the liner.

[0017] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted," "connected," "supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

DETAILED DESCRIPTION

[0018] FIG. **1** illustrates a protective helmet **20**. In the illustrated construction, the helmet **20** is a motorcycle helmet, particularly a half-shell or "beanie" type motorcycle helmet. However, features of the helmet **20** and portions thereof as described below may be applied to various styles of helmets used for various activities. The helmet **20** includes an outer shell **24**, which is generally a rigid, synthetic material. An energy-absorbing layer **28** (FIG. **2**) is positioned inside the outer shell **24**. The energy-absorbing layer **28** may be constructed of polystyrene foam, for example, and may be partially covered by a skin **30** for enhanced appearance and/or comfort. A comfort liner **32** (FIGS. **1** and **3-5**) is positioned inside the energy-absorbing layer **28**. The liner **32** is adjacent a head of a wearer of the helmet **20** and provides comfort and appropriate fit for the wearer. A retention system **36** provides means for securing the helmet **20** to the wearer's head. The helmet **20** further includes a visor **38** as shown in FIGS. **1** and **2**.

[0019] As described in further detail below, the liner **32** is removable, reconfigurable, and exchangeable, providing a custom fit for a variety of different wearers having different head sizes and/or shapes. Referring to FIG. **3**, the liner **32** includes a central portion **40** extending along a longitudinal direction of the helmet **20** (from front to rear). The central portion **40** generally extends to cover the top of the wearer's head from the forehead to the rear of the skull, but generally does not cover the sides of the wearer's head. Rather, a pair of flaps or side portions **44** are coupled to the central portion **40** and positioned to lie against the sides of the wearer's head. The side portions **44** are releasably coupled to the central portion **40** adjacent a front end **40**A of the central portion **40**, which is also the front end of the liner **32** (FIGS. **3-5**).

[0020] A rear end **40**B of the central portion **40**, which is also the rear end of the liner **32**, defines a longitudinal channel **46** for receiving a gathering of the wearer's hair in a pony tail, braid, etc. The channel **46** is configured to extend along the back of the wearer's neck to receive the gathering of hair, if present, in order to prevent a pressure point or general discomfort to the wearer due to the pinching of the hair within the helmet **20**.

[0021] FIG. **3** illustrates both of the side portions **44** in a first orientation with respect to the central portion **40**. In the first orientation, the side portions **44** extend generally along the central portion **40**. It should be noted that FIG. **3** illustrates the liner **32** in a flattened state, and when positioned within the helmet **20**, the liner **32** assumes an arched shape such that the side portions **44** complement the sides of the central portion **40**. As shown in FIGS. **4-6**, each of the side portions **44** has a curved edge **48** configured to lie adjacent the respective sides of the central portion **40** when the liner **32** is positioned within the helmet **20**.

[0022] As shown in FIG. **2**, the helmet **20** includes a pair of front fasteners **52**, a pair of rear fasteners **54**, and a pair of intermediate fasteners **56** for coupling the liner **32** to the energy-absorbing layer **28** and/or the skin **30**. With further reference to FIG. **5**, the liner **32** includes front, rear, and intermediate fasteners **62**, **64**, **66** corresponding to the respective front, rear, and intermediate fasteners **52**, **54**, **56** on the energy-absorbing layer **28**. The intermediate fasteners **66** of the liner **32** are formed on the side portions **44**, while the front and rear fasteners **62**, **64** of the liner **32** are formed on the central portion **40**. As illustrated, the rear fasteners **64** of the liner **32** are formed adjacent the rear end **40**B of the central portion **40**.

[0023] The front fasteners **62** on the liner **32** are configured to releasably attach the side portions **44** to the central portion **40** in addition to releasably attaching the front portion of the liner **32** to the energy-absorbing layer **28**. As shown in FIGS. **5** and **8**, each side portion **44** includes a flange **70** including an aperture **72**. The apertures **72** receive the front fasteners **62** on the central portion **40** of the liner **32** (e.g., by a press fit, snap fit, etc.) such that the side portions **44** are releasably coupled to the central portion **40**. The flanges **70** of the side portions **44** allow the side portions **44** to rotate relative to the central portion **40** when the liner **32** is removed from the helmet **20** (FIGS. **4** and **5** illustrate one of the side portions **44** rotated to a second orientation relative to the central portion **40**). When attached to the central portion **40**, the flanges **70** do not interfere with the coupling of the front fasteners **62** of the liner **32** to the front fasteners **52** of the energy-absorbing layer **28**. In alternate constructions, the side portions **44** are coupled to the central portion **40** at a separate location on the liner **32** from the front fasteners **62**, which releasably couple the front portion of the liner **32** to the energy-absorbing layer **28**.

[0024] In the illustrated construction, the front, rear, and intermediate fasteners **62**, **64**, **66** of the liner **32** are snaps. The front, rear, and intermediate fasteners **52**, **54**, **56** on the energy-absorbing layer **28** are also snaps in the illustrated construction such that the liner **32** is releasably attachable to the energy-absorbing layer **28** by snapping. In lieu of snaps, alternate means (e.g., screws, buttons, detent arrangements, adhesive strips, hook-and-loop strips, etc.) for releasably mounting the liner **32** in the helmet **20** may be provided.

[0025] FIGS. **5**, **6**, **8**, and **9** illustrate pockets **76**, which are formed in the side portions **44**. The pockets **76** receive one or more fit-customizing inserts or pads **80** (FIGS. **7-9**). Each pad **80** has a given thickness, but alternate pads may be provided with different thicknesses or additional pads **80** may be provided in various quantities in order to change the effective interior size and/or shape of the helmet **20** by altering the thickness of the liner **32** in the area of the side portions **44**. The pockets **76** make it quickly and easily possible to modify the helmet **20** to provide a customized fit.

[0026] Furthermore, the fit of the helmet **20** may be customized for a particular individual by replacing the liner **32** or portions thereof with a similar alternative that has an alternate size, shape, and/or thickness. For example, the side portions **44** can be replaced by thicker or thinner side portions (not shown) that attach to the central portion **40** at the front fasteners **62** of the central portion **40**. An alternate central portion (not shown) having a thickness different from the original central portion **40** may also be provided to replace the original central portion **40**, providing the helmet **20** with an alternate fit.

[0027] FIGS. **10** and **11** illustrate another liner **132** configured for use as part of the helmet **20** of FIGS. **1** and **2**. The liner **132** of FIGS. **10** and **11** is similar in most respects to the liner **32** described above.

[0028] The liner **132** includes a central portion **140** and a pair of side portions **144** that are releasably coupled to the central portion **140** adjacent a front end **140**A thereof. Each side portion **144** includes a flange **170** having an aperture **172** therein for attaching to the front fasteners **162** of the liner **132**. The front fasteners **162** are additionally releasably coupled to the front fasteners **52** on the energy-absorbing layer **28**. The side portions **144** are provided with intermediate fasteners **166** that are releasably coupled to the intermediate fasteners **56** on the energy-absorbing layer **28**. Rear fasteners **164**, provided adjacent a rear end **140**B of the central portion **140**, are releasably coupled to the rear fasteners **54** on the energy-absorbing layer **28**.

[0029] In the illustrated construction, and similar to the liner **32** of FIGS. **3-9**, the side portions **144** of the liner **132** may be releasably attached to the front fasteners **162** (or another location) on the central portion **140** adjacent the front end **140**A. The flanges **170** of the side portions **144** do not interfere with the releasable coupling of the liner **132** to the energy-absorbing layer **28** and furthermore, allow the side portions **144** to rotate relative to the central portion **140** about the front fastener **162** (as shown by the double-arrows **182** in FIG. **11**) when the liner **132** is removed from the helmet **20**.

[0030] As shown in FIGS. **10** and **11**, the side portions **144** are generally rectangular or trapezoidal in shape and do not include arched side edges configured to complement the sides of the central portion **140**. The size and/or shape of the side portions **144** may provide the helmet **20** with an alternate fit,

as compared to the side portions **44** shown in FIGS. **3-6** and **8-9**. Thus, the side portions **44**, **144** may be interchanged with each other on a single liner central portion **40**, **140** to reconfigure the liner **32**, **132** and customize the fit for different wearers having different head sizes and/or shapes.

[0031] The side portions **144** are provided with respective pockets **176**, which allow the helmet **20** having the liner **132** to be further customized for fit. Each pocket **176** is configured to receive one or more fit-customizing inserts or pads **180** of different thicknesses or provided in different quantities in order to change the effective interior size and/or shape of the helmet **20** by altering the thickness of the liner **132** in the area of the side portions **144**. The pockets **176** and interchangeable pads **180** make it quickly and easily possible to modify the helmet **20** to provide a customized fit.

[0032] The liners **32**, **132** described above enable one or more methods of customizing the helmet **20** for fitting the heads of one or more wearers. For example, the liner **32**, **132** may be removed from the helmet **20** and customized by detaching the side portions **44**, **144** from the central portion **40**, **140** and releasably attaching side portions **44**, **144** having an alternate size and/or shape. For example, there may be provided "small", "medium", and "large" side portions **44**, **144**, which can be exchanged to re-configure the liner **32**, **132** and adjust the size of the helmet **20**. Additionally, a given liner **32**, **132** may be interchangeable between helmets **20** having various sized outer shells **24** and energy-absorbing layers **28**.

[0033] Furthermore, the liner **32**, **132** (provided with side portions **44**, **144** and no pads **80**, **180**) may be detached from the energy-absorbing layer **28** so that the side portions **44**, **144** may be altered by inserting one or more of the pads **80**, **180** into the pockets **76**, **176** therein to customize the size of the liner **32**, **132** and the fit of the helmet **20** on the head of a wearer. For a given wearer, additional pads **80**, **180** may be added (or pads of increasing thickness may be exchanged) until the liner **32**, **132** is of an appropriate size so that the helmet **20** is customized to fit the head of the wearer (i.e., providing a snug fit without pressure points).

[0034] Thus, the invention provides, among other things, a customizable helmet having a removable, reconfigurable, and exchangeable liner and removable/interchangeable components thereof.

What is claimed is:

1. A helmet comprising:
an outer shell;
an energy-absorbing layer disposed inside the outer shell; and
a liner disposed inside of the energy-absorbing layer, the liner including a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet, a first side portion releasably coupled to the central portion, and a second side portion releasably coupled to the central portion.

2. The helmet of claim **1**, further comprising a plurality of fasteners on the energy-absorbing layer, the liner having a plurality of fasteners corresponding to the plurality of fasteners on the energy-absorbing layer for releasably attaching the liner to the energy-absorbing layer.

3. The helmet of claim **2**, wherein the plurality of fasteners of the liner includes a pair of front fasteners adjacent a front end of the central portion of the liner, the pair of front fasteners configured to attach to a pair of complementary fasteners on the energy-absorbing layer, wherein the first and second side portions are releasably coupled to the central portion at the pair of front fasteners.

4. The helmet of claim **2**, wherein the liner includes an alternate central portion having a plurality of fasteners corresponding to the plurality of fasteners on the energy-absorbing layer for releasably attaching the alternate central portion to the energy-absorbing layer in place of the original central portion, the alternate central portion having at least one of a different size and a different shape compared to the original central portion to customize the liner and the fit of the helmet on the head of a wearer, the first and second side portions being configured to releasably attach to the alternate central portion.

5. The helmet of claim **1**, wherein the first side portion and the second side portion are pivotally coupled to the central portion.

6. The helmet of claim **1**, wherein each of the first side portion and the second side portion includes a pocket, the helmet further comprising a pair of inserts, each insert of the pair of inserts insertable into a respective pocket of the first and second side portions to increase the thickness of the side portions to customize the size of the liner and the fit of the helmet on the head of a wearer.

7. The helmet of claim **1**, further comprising a third side portion and a fourth side portion, the third and fourth side portions being interchangeable with the first and second side portions and having at least one of a different size and shape to customize the liner and the fit of the helmet on the head of a wearer.

8. A helmet comprising:
an outer shell;
an energy-absorbing layer disposed inside the outer shell; and
a liner disposed inside of the energy-absorbing layer, the liner configured to contact the head of a wearer when the helmet is worn by the wearer, the liner including
a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet,
a first side portion coupled to the central portion and defining a first pocket,
a second side portion coupled to the central portion and defining a second pocket, and
a pair of inserts, each one of the pair of inserts being insertable into one of the first and second pockets to increase the thickness of the corresponding side portion to customize the size of the liner and the fit of the helmet on the head of the wearer.

9. The helmet of claim **8**, further comprising a plurality of fasteners on the energy-absorbing layer, the liner having a plurality of fasteners corresponding to the plurality of fasteners on the energy-absorbing layer for releasably attaching the liner to the energy-absorbing layer.

10. The helmet of claim **9**, wherein the plurality of fasteners of the liner includes a pair of front fasteners adjacent a front end of the central portion of the liner, the pair of front fasteners configured to attach to a pair of complementary fasteners on the energy-absorbing layer, wherein the first and second side portions are releasably coupled to the central portion at the pair of front fasteners.

11. The helmet of claim **9**, wherein the liner includes an alternate central portion having a plurality of fasteners corresponding to the plurality of fasteners on the energy-absorbing

layer for releasably attaching the alternate central portion to the energy-absorbing layer in place of the original central portion, the alternate central portion having at least one of a different size and a different shape compared to the original central portion to customize the liner and the fit of the helmet on the head of a wearer, the first and second side portions being configured to releasably attach to the alternate central portion.

12. The helmet of claim **1**, wherein the first side portion and the second side portion are pivotally coupled to the central portion.

13. The helmet of claim **8**, further comprising a second pair of inserts, wherein each insert of the second pair of inserts has a thickness greater than each insert of the first pair of inserts, the second pair of inserts being insertable into the first and second pockets to replace the first inserts and provide the corresponding side portions with a thicknesses greater than that provided by the first pair of inserts.

14. The helmet of claim **8**, further comprising a third side portion and a fourth side portion, the third and fourth side portions being interchangeable with the first and second side portions and having at least one of a different size and shape to customize the liner and the fit of the helmet on the head of the wearer, each one of the pair of inserts further being insertable into respective pockets of the third and fourth side portions to increase the thickness of the third and fourth side portions to further customize the size of the liner and the fit of the helmet on the head of the wearer.

15. A method of customizing the fit of a helmet for a particular wearer comprising:

providing an outer shell;

providing an energy-absorbing layer disposed inside the outer shell;

providing a liner releasably coupled to the energy-absorbing layer, the liner configured to contact the head of a wearer when the helmet is worn by the wearer, the liner including a central portion configured to extend along a longitudinal axis that runs between a front portion of the helmet and a rear portion of the helmet, the liner further including first and second side portions releasably coupled to the central portion; and

adjusting the thickness of at least a portion of the liner to adjust the fit of the helmet for the head of the wearer.

16. The method of claim **15**, wherein adjusting the thickness of at least a portion of the liner includes detaching the first and second side portions from the central portion, and releasably coupling a third side portion and a fourth side portion to the central portion, the third and fourth side portions having thicknesses different from the first and second side portions.

17. The method of claim **15**, wherein adjusting the thickness of at least a portion of the liner includes placing inserts into respective pockets of each of the first and second side portions to increase the thicknesses of the first and second side portions.

18. The method of claim **15**, wherein the helmet is provided with removable inserts in pockets of the first and second side portions, the step of adjusting the thickness of at least a portion of the liner including removing the inserts from the pockets to reduce the thickness of the first and second side portions.

19. The method of claim **15**, wherein adjusting the thickness of at least a portion of the liner includes detaching the central portion from the energy-absorbing layer, and releasably coupling an alternate central portion to the energy-absorbing layer, the alternate central portion having a thicknesses different from the original central portion.

20. The method of claim **19**, wherein adjusting the thickness of at least a portion of the liner further includes adjusting the thickness of the first and second side portions.

* * * * *