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Linares

(54) **BREATHABLE HELMET DESIGN WITH INNER SPRING/FLUID BIASING OR CUSHIONING SUPPORT FOR ABSORBING AND REDISTRIBUTING IMPACT FORCES**

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(52) **U.S. Cl.** **2/413**; 2/468

(57) **ABSTRACT**

The present invention discloses a wearable helmet for providing at least one of impact force cushioning and redirection, anti-rotation and breathability. The helmet exhibits a concave shaped body dimensioned for placement over a user's head, with a plurality of individual and inward projecting elements associated with an interior facing surface of the body and contacting locations of the wearer's head. In this fashion, the projections exhibit a biasing component for cushioning and/or redirecting impact forces to the helmet.

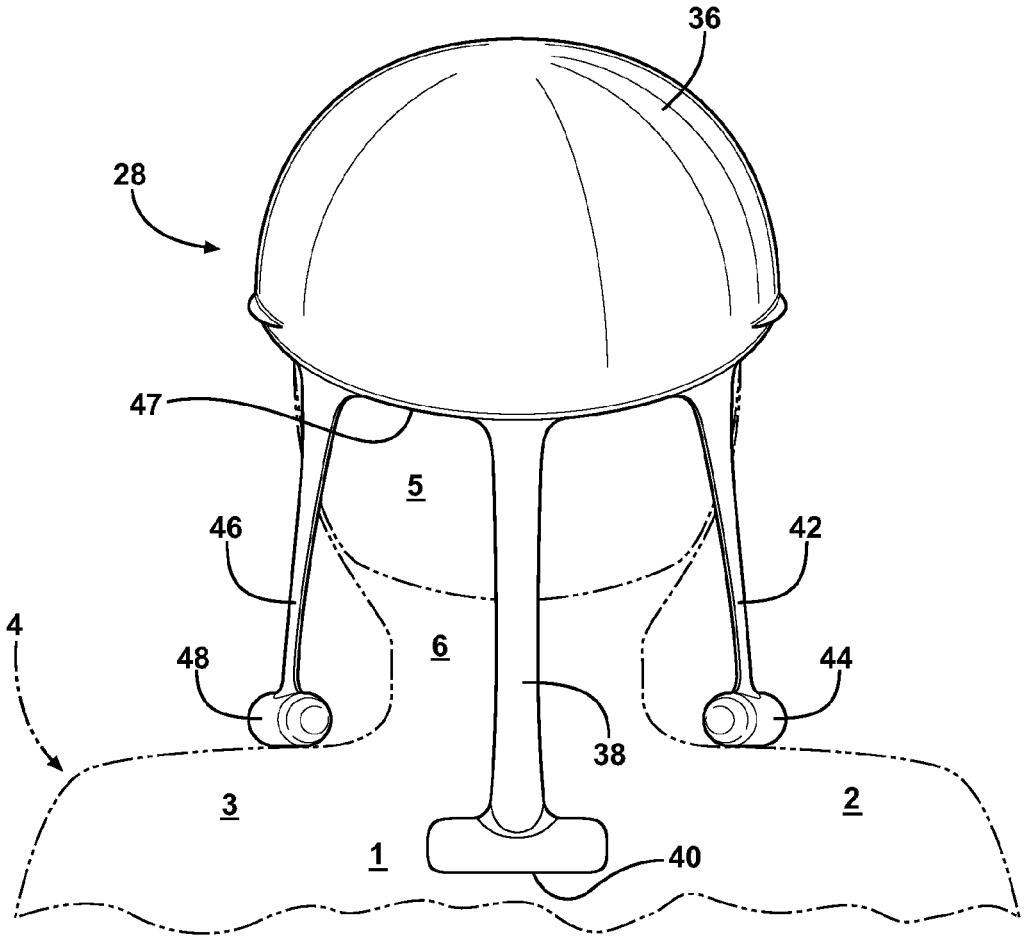


FIG. 1

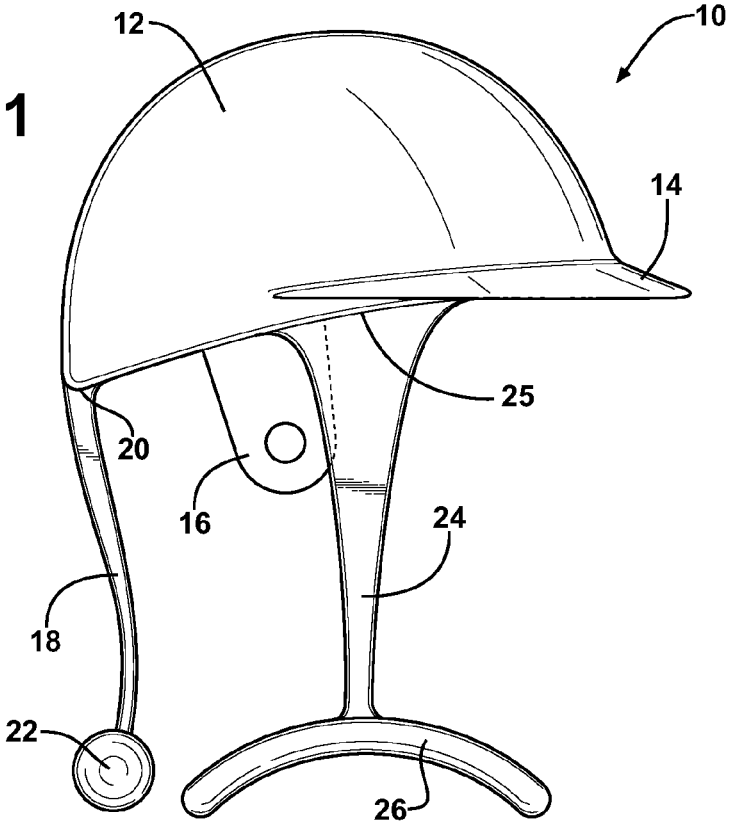


FIG. 1A

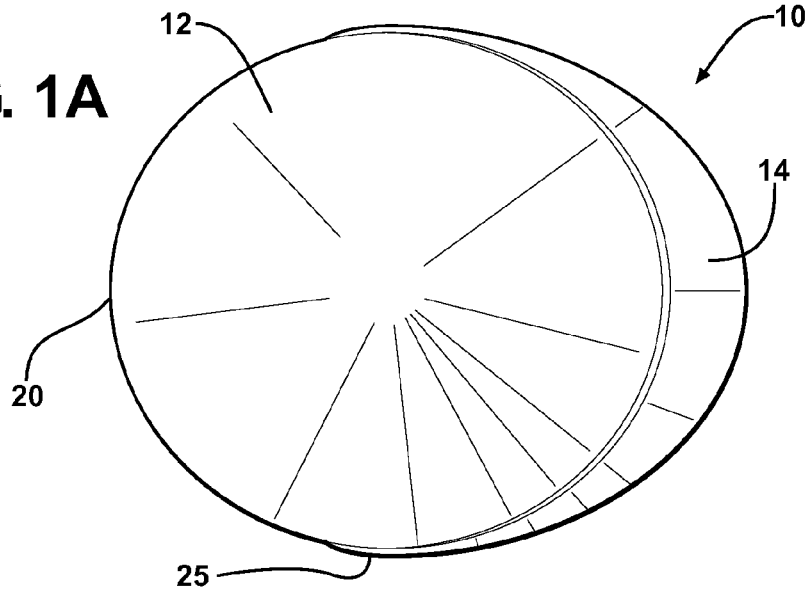


FIG. 2

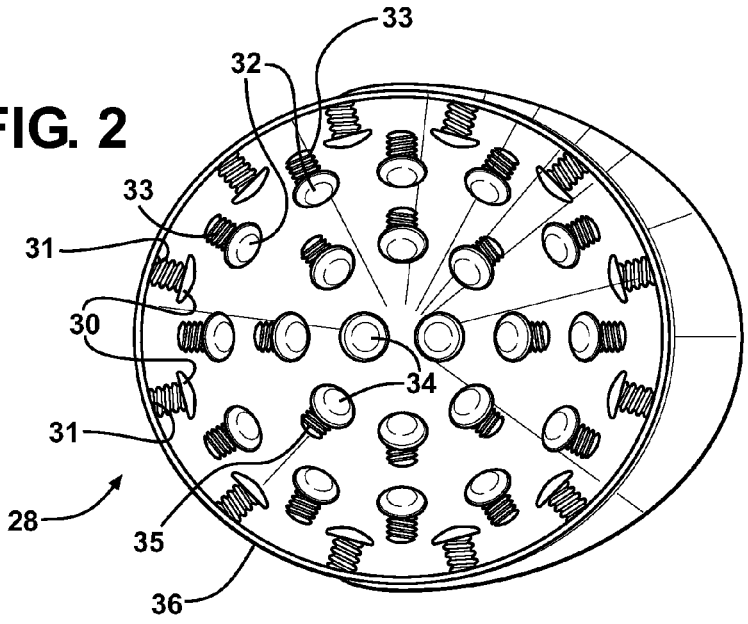


FIG. 2A

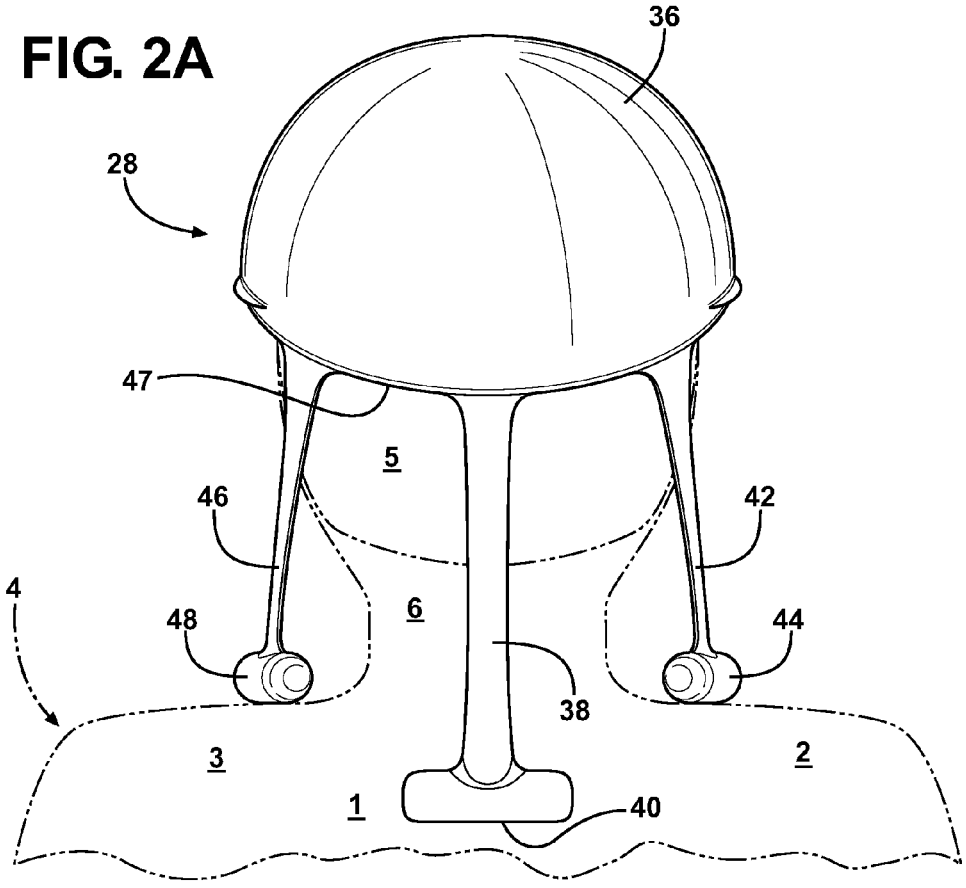


FIG. 2B

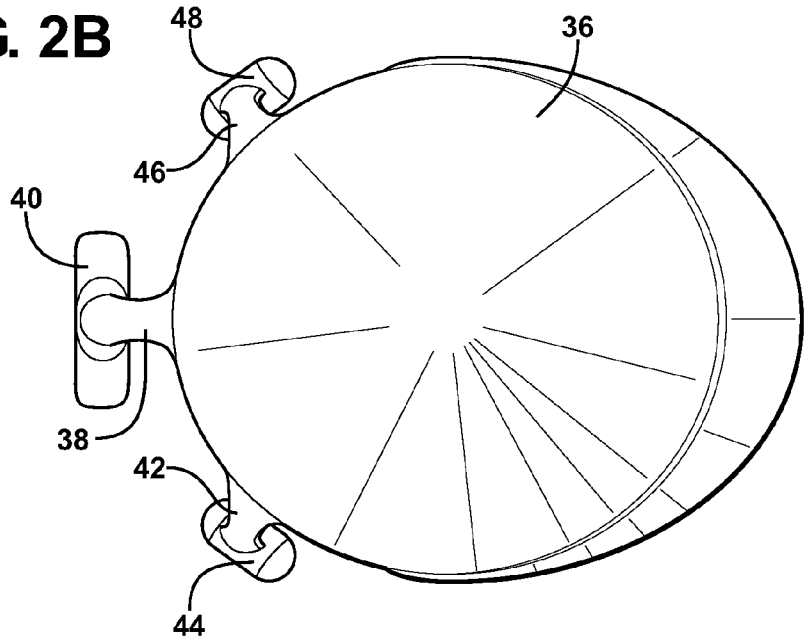


FIG. 3

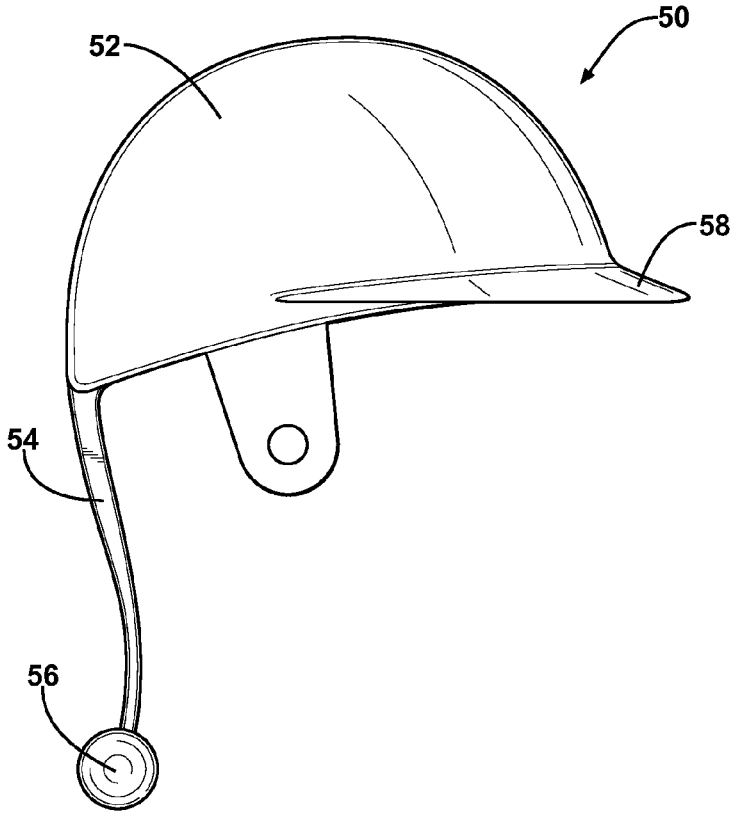


FIG. 3A

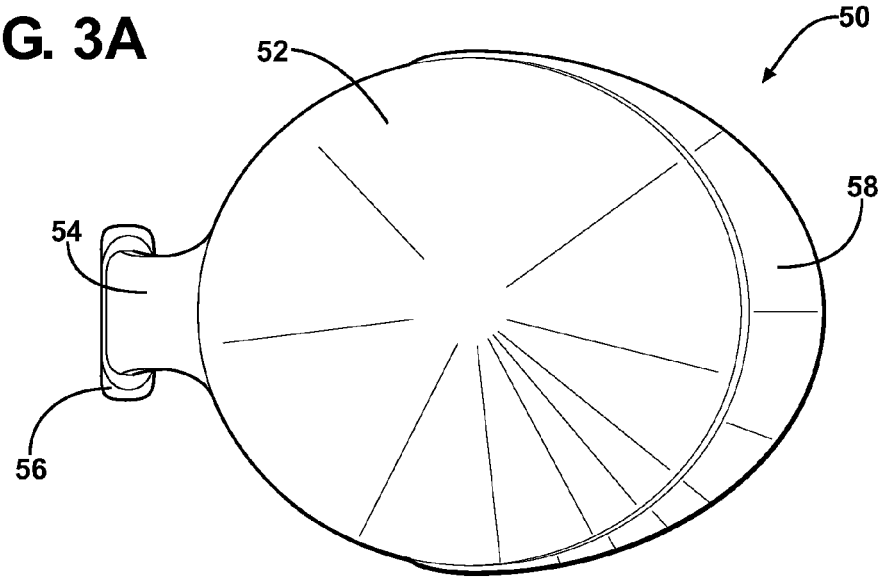


FIG. 4

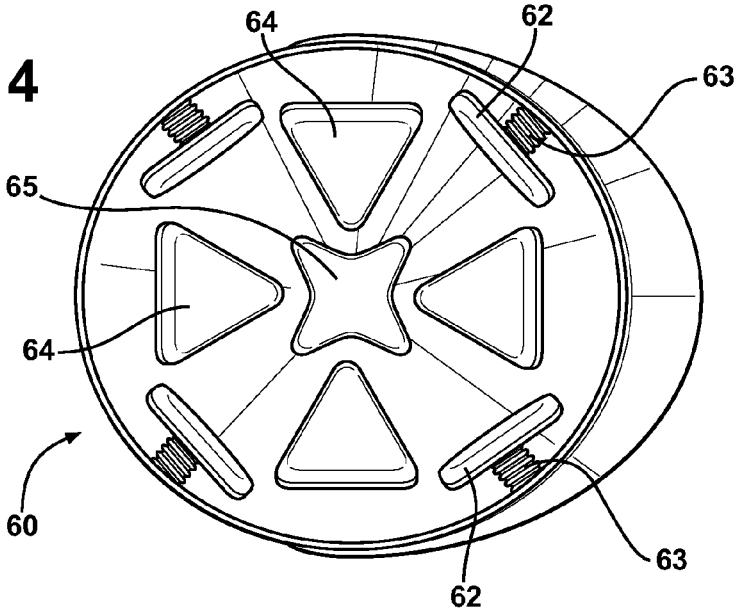
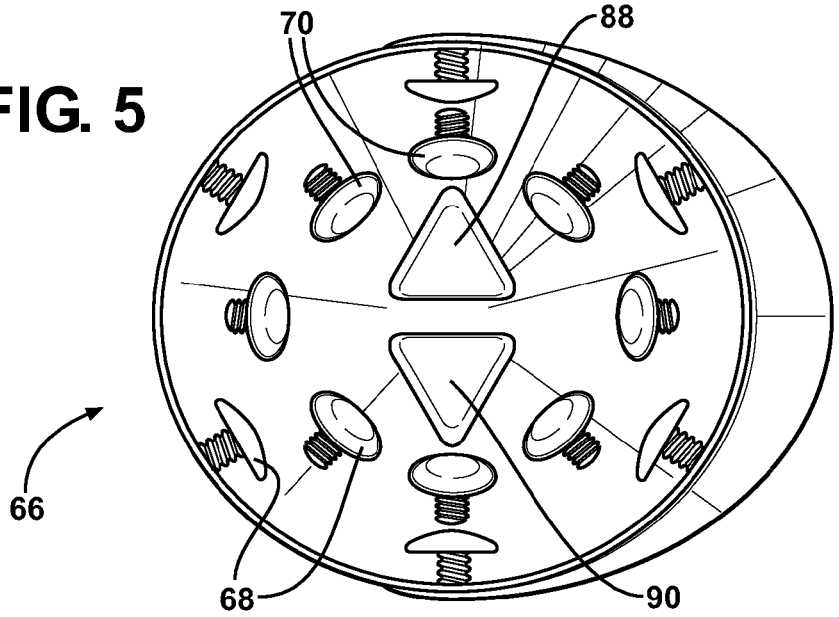


FIG. 5



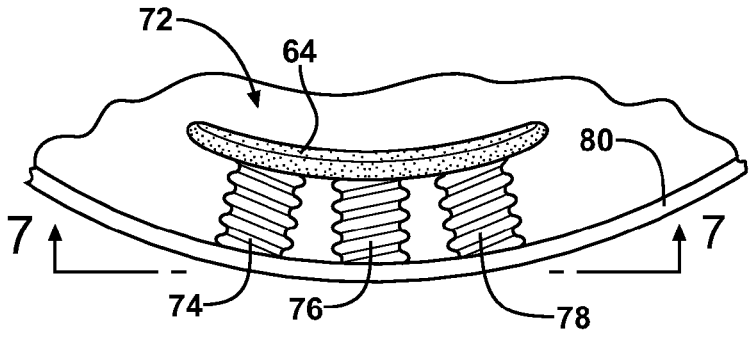


FIG. 6

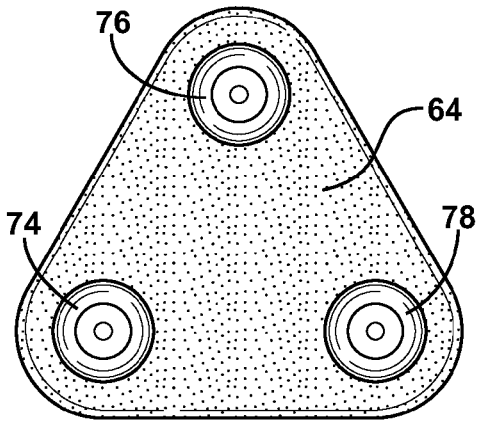


FIG. 7

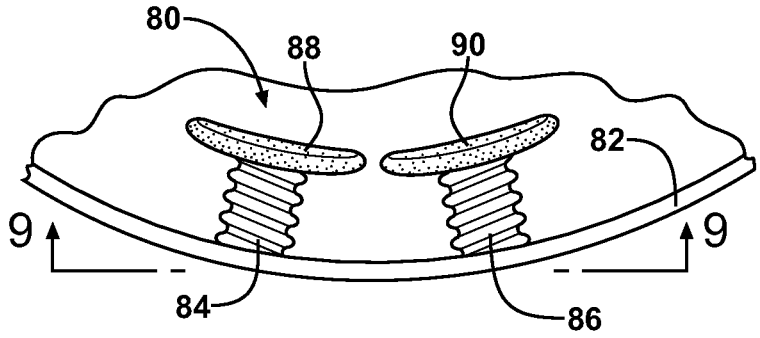


FIG. 8

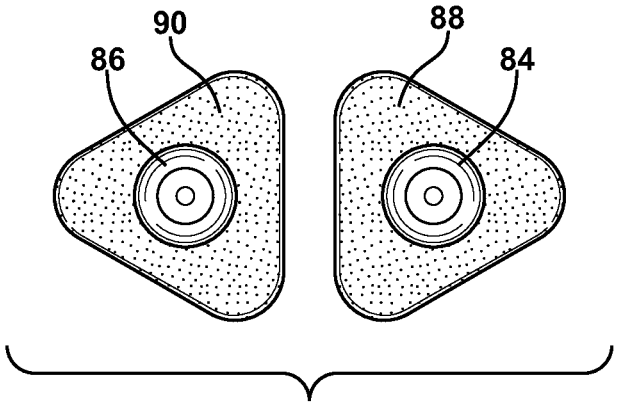


FIG. 9

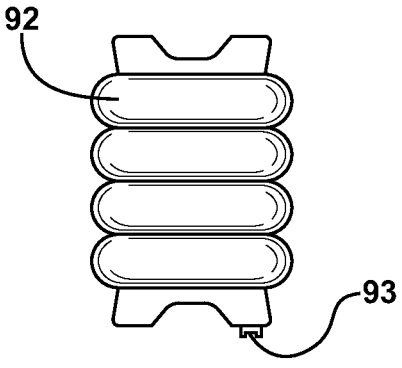


FIG. 10A

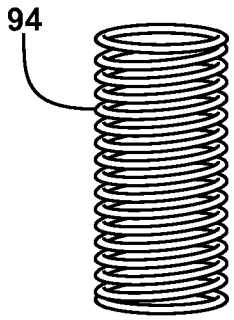


FIG. 10B

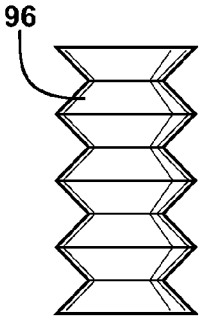


FIG. 10C

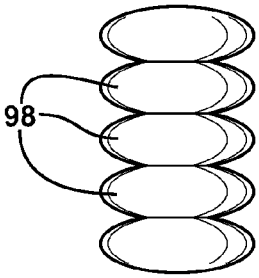


FIG. 10D

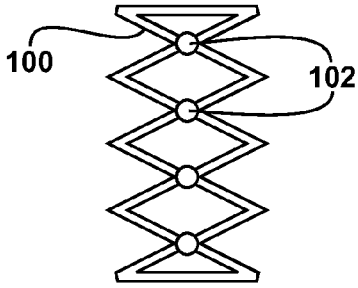


FIG. 10E

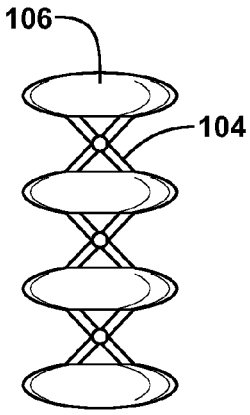


FIG. 10F

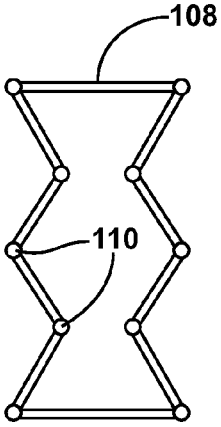


FIG. 10G

BREATHABLE HELMET DESIGN WITH INNER SPRING/FLUID BIASING OR CUSHIONING SUPPORT FOR ABSORBING AND REDISTRIBUTING IMPACT FORCES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/102,504, filed Oct. 3, 2008.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a breathable and cushioning helmet design for use by individuals, such as engaged in contact sporting events, including auto racing, equestrian events and the like. More specifically, the present invention discloses a combination breathable and position restraining/impact resistant helmet, such as which incorporates features drawn from biasing springs or fluid absorption/redirection elements, which are incorporated into interior recess locations of the helmet and which serve to absorb, redirect and dissipate inertial and/or impact forces resulting from such as contact sports or the like.

DESCRIPTION OF THE PRIOR ART

[0003] The prior art is documented with various examples of helmets, the purpose for which being to absorb or cushion impact forces. Such helmets are particularly useful in certain type specific contact sports, and in which impact forces can otherwise cause injury to the wearer in instances where the force of such contact is not capable of being dissipated or lessened.

SUMMARY OF THE PRESENT INVENTION

[0004] The present invention discloses a wearable helmet for providing at least one of impact force cushioning and redirection, anti-rotation and breathability. The helmet exhibits a concave shaped body dimensioned for placement over a user's head, with a plurality of individual and inward projecting elements associated with an interior facing surface of the body and contacting locations of the wearer's head. In this fashion, the projections exhibit a biasing component for cushioning and/or redirecting impact forces to the helmet.

[0005] Additional features include at least one anti-rotation projection extending from THE helmet in order to minimize rotational movement of the wearer's head. The anti-rotation projections can further include a back/shoulder contacting projection extending from a lower rear location of a helmet rim, and which terminates in a lower end portion contacting a midpoint location of the user's back which applies downward pressure during an impact event/collision.

[0006] Other features include first and second side projecting contact portions extending from side midpoint locations of the helmet rim. Each of the side contact portions terminate at a downward extending end in an arcuate shaped and shoulder supporting location to prevent side to side rotation of the helmet.

[0007] An ergonomically contoured and skull surface pad is supported by a plurality of the inward extending projecting elements, at least one of which may further include a pneumatic inflated impact absorbing element constructed of a semi-soft and inflatable plastic. Alternatively, the projecting elements can include one or more of mechanical spring impact absorbing/redirecting element, fluid retaining elements, pluralities of three dimensional oval stacked elements, and combinations of spring and fluid biasing elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Reference will now be made to the attached drawings, when read in combination with the following detailed description, wherein like reference numerals refer to like parts throughout the several views, and in which:

[0009] FIG. **1** is a first side view of the helmet design according to a first preferred embodiment of the present invention and further illustrating anti-rotation back and shoulder contacting projections extending from lowermost side and rear locations of the helmet rim;

[0010] FIG. **1**A is a top view of the helmet design of FIG. **1**;

[0011] FIG. **2** is an underside view of a helmet design according to a further embodiment and showing one desired pattern/array of impact absorbing/redirecting elements built into the helmet interior;

[0012] FIG. **2**A is a rear side operational view of the helmet shown in FIG. **2** and further illustrating multiple anti-rotation and back/shoulder contacting projections extending from lower rear locations of the helmet rim, and contacting both the back and shoulders of the wearer to prevent rearward rotation of the user's head relative to the neck, such as in response to a rearward experienced impact;

[0013] FIG. **2**B is a top view of the helmet shown in FIG. **2**;

[0014] FIG. **3** is a side view of a variation of helmet design similar to that shown in FIG. **1**;

[0015] FIG. **3**A is a top view of the helmet design of FIG. **3**;

[0016] FIG. **4** is an underside view of a helmet design, similar to that previously shown in FIG. **2**, and according to a further embodiment which illustrates a further possible pattern/array of impact absorbing/redirecting elements built into the helmet interior;

[0017] FIG. **5** is an illustration similar to that shown in FIG. **4** of a yet further version of impact absorbing/redirecting elements built into a helmet interior;

[0018] FIG. **6** is a cutaway and enlarged side partial view of a contoured surface of a helmet and further showing a plurality of force absorbing and redirecting elements supporting a skull contacting pad, such as shown FIGS. **4** and **5**;

[0019] FIG. **7** is a cutaway illustration taken along line **7**-**7** of FIG. **6** and showing a planar profile of the skull contacting pad and supporting elements;

[0020] FIG. **8** is an illustration similar to that shown in FIG. **6** of a cutaway and enlarged side partial view of a contoured helmet surface exhibiting a pair of force absorbing/redirecting elements supporting associated contact pad;

[0021] FIG. **9** is a cutaway illustration taken along line **9**-**9** of FIG. **8** and showing a planar profile of the pair of opposing and skull contacting pad and supporting elements;

[0022] FIG. **10***a* is a sectional illustration of a first type of pneumatic inflated impact absorbing element and such as which is incorporated into any of the helmet designs described herein;

[0023] FIG. **10***b* is a succeeding illustration of a mechanical spring impact absorbing/redirecting element;

[0024] FIG. **10***c* is an illustration of a fluid retaining element functionally similar to the items shown in either FIGS. **10***a* and **10***b*;

[0025] FIG. **10***d* is an illustration of a further variant of biasing element incorporating three dimensional oval stacked elements;

[0026] FIG. **10***e* is an illustration of a further modified spring configuration alternative to that shown in FIG. **10***b;*

[0027] FIG. **10***f* is an illustration of a combination spring and fluid biasing element; and

[0028] FIG. **10***g* is an illustration of a further type of spring absorbing element and in which collapsing hinges are defined at specified locations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] As will be described with reference to the several embodiments described herein, the present invention discloses a breathable and cushioning helmet design for use by individuals, such as engaged in various types of contact sporting events, these including auto racing, equestrian events and the like. As will be disclosed with reference to the succeeding embodiments, the present invention discloses a combination breathable and position restraining/impact resistant helmet, such as which incorporates features drawn from biasing springs or fluid absorption/redirection elements, which are incorporated into interior recess locations of the helmet to absorb, redirect and dissipate inertial and/or impact forces resulting from such as contact sports or the like. The ability to restrain the rotating and/or bending motions of the helmet contribute to minimizing or avoiding injury to the wearer engaged in various sport related activities.

[0030] Referring first to FIGS. **1** and **1**A, both side and top views are shown at **10** of the helmet design according to a first and non-limiting embodiment of the present invention. A concave shaped helmet portion **12** exhibits an arcuate, generally bowl shape. Additional features include a forward positioned bill **14**, as well as side ear/strap portions **16**. The helmet and its associated extending appendages is constructed of a durable plastic or other synthetic material exhibiting the properties of controlled rigidity and impact resistance.

[0031] Anti-rotation projections are associated with the helmet and include a back/shoulder contacting projection **18** extending in a generally downwardly and contoured fashion from a lower rear location of a helmet rim **20**. The back contacting portion terminates in a lower end portion **22**, such as configured in an ergonomically supporting ball or other suitable shape for contacting an upper midpoint location of a wearer's back in a comfort inducing fashion. The rear contacting portion **18**, in use, applies downward pressure during an impact event/collision, this in order to minimize rearward rotational movement of the wearer's head.

[0032] First and second side projecting contact portions are further illustrated by selected right side contact portion **24**, this extending from a side midpoint location **25** of the helmet rim. The contact portion **24** terminates at a downward extending end in a generally concave, arcuate shaped and shoulder supporting location, see arcuate shoulder support **26**. The provision of contact locations for both shoulders, in combination with the back contacting portion **22**, further prevents side to side rotation of the helmet, in combination with the anti-rearward rotational support established by the rear projecting portion **18**.

[0033] The sizing, position and dimensioning of the rear **18** and side **24** contact projections are such that they comfortably contact the back and shoulders of the wearer in use, this in order to prevent a rear-side experienced impact force from causing an undesirable rotation of the wearer's head, about the neck, thus causing injury. It is further envisioned and understood that, in one preferred variant, the dimensions of the helmet and associated rear and side contacting portions can be custom sized to correspond to the anatomical specifics of a given wearer, with additional variants also potentially providing a degree of desired adjustability such as associated with length adjustment structure incorporated into the interconnecting stem projecting portions **18** and **24**.

[0034] FIG. **2** is an underside view of a helmet design **28**, such as identical to the previously described variant **10** or alternatively according to a further embodiment. The helmet **28** focuses on the inside force cushioning and absorbing aspects and, in particular, illustrates one non-limiting pattern or array of impact absorbing/redirecting elements, see at **30**, **32**, **34**, et. seq., built into the helmet interior. The elements **30**, **32**, and **34** each exhibit a cushioning and wearer contacting portion (such as a durable foam or soft plastic) as well as an underside extending and inner concave surface contacting stem portion, see respectively shown at **31**, **33** and **35** for elements **30**, **32** and **34**. and which can further include either or both of a dynamic metal or plastic for accomplishing the desired features of force absorption and redirection for forces generated by the reaction forces of the user's head against the array of elements **30**, **32** and **34** (this following and in response to an initial and external impact at a selected location).

[0035] The first indicated plurality of lower/inward facing support elements are referenced at **30**, and which extend about an inner facing periphery of an outer convex/inner concave helmet surface **36**. The additional sub-pluralities of support elements are shown at **32** and **34**, these corresponding respectively to inner crown contacting locations **32** and uppermost locations **34** of the concave shaped helmet underside and which, in combination with the outer most peripheral extending impact portions **30**, provide the combined features of redistribution of any localized impact force located at any edge, crown or upper head location. The spatial arrangement established by the support elements relative to the surface of the wearer's head further promotes a desired degree of ventilation/breathability when being worn by the user.

[0036] Referring to the side view FIG. **2**A, in combination with the overhead view of FIG. **2**B, the helmet **28** further illustrates a variant of the multiple anti-rotation and back/shoulder contacting projections, see back portion **38** terminating in a midpoint and ergonomically contacting location **40**, as well as first (right) side extending portion **42** with like terminating location **44** and second (left) side extending portion **46** with terminating location **48**. For purposes of ease of clarity of illustration, the rear and side extending portions are not shown in the underside facing view of FIG. **2**. Also, and as with the variant disclosed at **10** in FIG. **1**, the rear **38** and left **42**/right **46** extending portions extend from respective lower rear and side locations of a helmet rim (see at **47** in FIG. **2**A), and contact both the back **1** and shoulders **2** and **3** of the wearer **4**, this in order to prevent rearward rotation of the user's head **5** relative to the neck **6** (see as shown in FIG. **2**A), this again such as in response to a rearward experienced impact such as often associated with motor vehicle racing.

[0037] FIGS. **3** and **3**A illustrate both side and top views, at **50**, of a variation of helmet design similar to that shown in FIG. **1**. Helmet **50** is similar to those previously disclosed at **10** in FIG. **1** and at **28** in FIG. **2**, and illustrates an exteriorly convex/internally concave surface **52** with rearward downward projection **54** terminating in a back contacting (anti-rearward head rotating) portion **56** (such as which is ergonomically configured consistent with that previously

described). The contacting portions, such as again shown at **56**, can exhibit a generally cylindrical shape, however it is also envisioned and understood that such can also exhibit a wearer contacting ergonomic taper or profile. As with the earlier variants, a forward bill portion is also shown at **58**.

[0038] Referring now to FIG. **4**, referenced at **60** is an underside view of a helmet design, similar to that previously shown in FIG. **2**, and according to a further embodiment which illustrates a further possible pattern/array of impact absorbing/redirecting (e.g. bumper) elements, see perimeter located and inwardly facing elements at **62**, as well as inner and downwardly facing elements **64**, which is further built into the concave helmet interior. The bumper elements **62** and **64** can each include a first wearer contacting and cushioning head portion (see again as selectively shown at **62**) combined with an underside mounting and spring biasing portion (see as further shown by biasing coils **63** employed in associated with specified portions **62**) which is in turn mounted to selected inner concave surface locations of the helmet interior.

[0039] The surface configuration of the bumper-like elements can also be varied and which is reflected in FIG. **4** by the generally triangular shape evidenced by selected elements **64**, as well as a generally four-pointed star shape **65** evidenced by an inner and central-most located member. FIG. **5** further illustrates, at **66**, a similar illustration to that shown in FIG. **4** of a further version of impact absorbing/redirecting elements, as shown by surface spaced and wearer contacting bumper elements **68** and **70**, built into a helmet interior.

[0040] Referring now to FIG. **6**, a cutaway and enlarged side partial view is illustrated at **72** of a contoured surface of a helmet, such as referenced in FIG. **4** but equally applicable to any of the disclosed embodiments. The illustration **72** shows a selected skull contacting portion, such as which is provided by a durable plastic or other material exhibiting an ergonomically contoured (see generally concave shaped surface) and skull surface contacting location, referenced by example as element **64** in FIG. **4**.

[0041] Further illustrated is a plurality of individual underside extending, biasing and force absorbing/redirecting elements, at **74**, **76** and **78**, these supporting the wearer (skull) contacting pad **64** in a spaced and secured fashion relative to an inner arcuate (e.g. again concave) surface **80** of the helmet. FIG. **7** is a further cutaway illustration, taken along line **7**-**7** of FIG. **6**, and showing a planar profile of the skull contacting pad **64** (such as which can be constructed of a durable foam or sponge-like wearer contacting portion) and the underlying supporting elements **74**, **76** and **78** (which can further include any type of dynamic biasing component including both metal, plastic and admixed composites formed in a spring coil or like fashion and which provide the requisite characteristics of force absorption and redirection).

[0042] Referring now to FIG. **8**, an illustration similar to that shown in FIG. **6** is generally shown at **80** of a cutaway and enlarged side partial view of a contoured helmet surface **82** (see as shown in FIG. **5**) exhibiting a pair of force absorbing/redirecting elements, at **84** and **86**, supporting associated contact pads **88** and **90** (see as also shown in FIG. **5** and which can again include a cushioning and durable foam or suitable soft plastic). FIG. **9** is a cutaway illustration taken along line **9**-**9** of FIG. **8** and, in combination with FIG. **8**, shows a planar/ergonomic supporting profile of the pair of opposing and skull contacting pad and supporting elements **88** and **90** and which is supported atop the absorbing/redirecting element **84** and **86** (again including any type of metal/plastic spring biasing component) in a desired arrayed pattern from the inner concave surface **82** of the helmet. The coil shaped element **84** and **86** are also envisioned to include metal substrate portions coated with a suitable polymeric material.

[0043] Referring now to FIGS. **10**A-**10**G, a series of sectional illustrations are shown of varying types of force absorbing/redirecting elements for mounting to interior (skull or crown contacting) locations of a helmet. As will be described in reference to each succeeding figure illustration, the elements described can include either or both the stem and interconnecting wearer surface contacting portions of a given element. FIG. **10**A is a sectional illustration **92** of a first type of pneumatic inflated impact absorbing element, this exhibiting a hollow interior and which is accessible by a surface located nipple **93**, and such as which is incorporated into any of the helmet designs described herein.

[0044] Although not shown, an air bladder can be built into the body of the element **92**, and which can be accessible through the surface located nipple **93**. A further variant also contemplates mounting a plurality of individual contacting elements **92** to various locations along a common bladder, such as covering the internal surface area of a helmet inner liner and which can access selected, or all, of the plurality of individual contacting elements **92** which are arrayed on the inside of the helmet in contacting and biasing fashion against the surfaces of the user's skull (forehead, crown and the like).

[0045] Referring to FIG. **10**B, a succeeding illustration is shown at **94** of a mechanical spring impact absorbing/redirecting element. FIG. **10**C is an illustration, at **96**, of a fluid retaining element functionally similar to the items shown in either FIGS. **10**A and **10**B, and by which the pneumatic/air pressurization element of FIG. **10**A is substituted by a hydraulic (more viscous) based fluid, such as primarily a water based fluid medium, although it is further understood that oils or other fluid medium can be substituted in order to achieve differing degrees of impact force absorption/redirection.

[0046] FIG. **10**D is an illustration of a further variant of biasing element incorporating three dimensional oval stacked, integrally formed and fluidly interconnecting elements **98**, such as which can be constructed of a semi-soft plastic material exhibiting fluid sealing and biasing properties. FIG. **10**E is an illustration, at **100**, of a further modified spring configuration alternative to that shown at **94** in FIG. **10**B and by which a plurality of individual hinge contacting locations **102** are arranged at vertical spaced intervals along the length of the element **100** to establish controlled force absorption and collapse.

[0047] FIG. **10**F is an illustration of a selected hybrid element exhibiting combined and alternating cross shaped spring **104** and fluid filled and biasing elements **106** arranged in stacked and alternating fashion. Finally, FIG. **10**G is an illustration (such as in lengthwise extending cutaway) of a further type of spring absorbing element, at **108**, and in which collapsing hinges **110** are defined at specified perimeter locations between individual subset segments making up a given cushioning/redirecting element. Depending upon the material content, thickness and configuration of the element **108**, varying collapsing properties are designed into the element **108**. It is also envisioned and understood that a fluid or air pressurizing medium can be incorporated into a sealed interior of the element **108**, such as in order to further vary its performance characteristics.

[0048] As described above, the helmet provides for either immobilization or limited range of motion of the head and neck of the user, such as in given situations where it is desired restrain the range of motion to minimize the risk of injury. In combination, the force absorption and redirection elements protect against excessive injury from an impact force exerted at a specific location, and by absorbing and redirecting the force over a wider area associated with a plurality of such elements.

[0049] Having described my invention, other and additional preferred embodiments will become apparent to those skilled in the art to which it pertains, and without deviating from the scope of the appended claims.

I claim:

1. A helmet providing at least one of force cushioning/redirection, movement restriction and breathability, comprising:

a body having a specified shape and including a concave interior dimensioned for placement over a wearers head;

at least one projection extending from said body and contacting at least one of a back or shoulder location of the wearer; and

a plurality of individual and inward projecting elements extending from locations of said interior, each of said projecting elements including a stem supporting biasing component and an end supported wearer contacting and cushioning component contacting locations of the wearer's head, said elements collectively cushioning and/or redirecting impact forces to said helmet.

2. The invention as described in claim **1**, further comprising at least one of said back and shoulder projections configured to minimize at least one of rotational and bending movement of the wearer's head relative to the neck.

3. The invention as described in claim **2**, said rotation minimizing projections further comprising a back/shoulder contacting projection extending from a lower rear location of said body and terminating in a lower end portion contacting a midpoint location of the user's back, said end portion applying downward pressure during an impact event/collision.

4. The invention as described in claim **3**, further comprising first and second side projecting contact portions extending from side midpoint locations of the helmet rim, each of said side contact portions terminating at a downward extending end in an arcuate shaped and shoulder supporting location preventing side to side rotation of said body.

5. The invention as described in claim **1**, said wearer contacting and cushioning component further comprising an ergonomically contoured and skull surface pad supported by an individual plurality of said stem supporting and biasing components.

6. The invention as described in claim **1**, at least one of said projecting elements further comprising a pneumatic inflated impact absorbing element constructed of a semi-soft and inflatable plastic.

7. The invention as described in claim **1**, at least one of said projecting elements further comprising a mechanical spring impact absorbing/redirecting element.

8. The invention as described in claim **1**, at least one of said projecting elements further comprising a fluid retaining element.

9. The invention as described in claim **1**, at least one of said projecting elements further comprising a plurality of three dimensional oval stacked elements.

10. The invention as described in claim **1**, at least one of said projecting elements further comprising a combination spring and fluid biasing element.

11. A helmet, comprising:

a body exhibiting a concave interior surface dimensioned for placement over a user's head

a portion extending from said body and contacting a location of the wearer remote from the head in order to prevent relative movement or rotation of the body; and

a plurality of projecting elements extending from locations of said interior surface, each of said projecting elements including at least a stem supporting and biasing component contacting locations of the wearer's head such that said elements collectively cushion and redirecting impact forces to said helmet.

12. The invention as described in claim **11**, said plurality of projecting elements each further comprising an end supported wearer contacting and cushioning component secured atop a selected stem biasing component in contact with a location of the wearer's head.

13. The invention as described in claim **11**, said extending portion further comprising at least one of back and shoulder projections configured to minimize at least one of rotational and bending movement of the wearer's head relative to the neck.

14. The invention as described in claim **13**, said projections further comprising a back/shoulder contacting projection extending from a lower rear location of said body and terminating in a lower end portion contacting a midpoint location of the user's back, said end portion applying downward pressure during an impact event/collision.

15. The invention as described in claim **14**, further comprising first and second side projecting contact portions extending from side midpoint locations of the helmet rim, each of said side contact portions terminating at a downward extending end in an arcuate shaped and shoulder supporting location preventing side to side rotation of said body.

16. The invention as described in claim **11**, said wearer contacting and cushioning component further comprising an ergonomically contoured and skull surface pad supported by an individual plurality of said stem supporting and biasing components.

17. The invention as described in claim **11**, at least one of said projecting elements further comprising a pneumatic inflated impact absorbing element constructed of a semi-soft and inflatable plastic.

18. The invention as described in claim **11**, at least one of said projecting elements further comprising a mechanical spring impact absorbing/redirecting element.

19. The invention as described in claim **11**, at least one of said projecting elements further comprising a fluid retaining element.

20. The invention as described in claim **11**, at least one of said projecting elements further comprising a plurality of three dimensional oval stacked elements.

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