In accordance with the teachings of the present invention, a helmet having interior ventilation channels is provided. In a particular embodiment, the helmet includes at least one protective layer configured to cover at least a portion of a user's head and a plurality of pads coupled to the protective layer, the pads defining a network of interconnected ventilation channels between the pads, the ventilation channels substantially covering an interior of the protective layer and allowing air circulation between the protective layer and the user's head when the helmet is worn by the user.
200

START

FORM INNER PROTECTIVE LAYER

FORM OUTER PROTECTIVE SHELL

FORM ONE OR MORE VENTS

INSERT INNER PROTECTIVE LAYER INTO OUTER PROTECTIVE SHELL

FORM PADS

COUPLE LINER TO PADS

INSERT PADS INTO INNER PROTECTIVE LAYER

END

FIG. 3
HELMET HAVING INTERIOR VENTILATION CHANNELS

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates generally to protective headgear and, more particularly, to a helmet having interior ventilation channels.

BACKGROUND

[0002] Protective headgear, such as helmets, are often used in activities, such as bicycling, skateboarding, motorcycling, race car driving, rock climbing, snowboarding, and skiing, that are associated with an increased risk of head injury. Typically, such protective headgear is designed to maintain its structural integrity and stay secured to the head of a wearer, while protecting the wearer from a trauma to the head. In many types of protective headgear, such as motorcycle helmets, it is often desirable to offer substantially full coverage to the top, back, and sides of the wearer’s head to better protect the wearer from head traumas. Unfortunately, this full coverage may also cause heat and perspiration to accumulate within the interior of the helmet leading to user discomfort.

SUMMARY

[0003] In accordance with the teachings of the present invention, a helmet having interior ventilation channels is provided. In a particular embodiment, the helmet includes at least one protective layer configured to cover at least a portion of a user’s head and a plurality of pads coupled to the protective layer, the pads defining a network of interconnected ventilation channels between the pads, the ventilation channels substantially covering an interior of the protective layer and allowing air circulation between the protective layer and the user’s head when the helmet is worn by the user.

[0004] Technical advantages of one or more embodiments of the present invention may include providing for increased circulation of air within a helmet to dissipate heat within the helmet. The dissipation of heat may increase user comfort. Such heat dissipation is provided by ventilation channels surrounding a user’s head that allow air to flow from outside of the helmet, over the user’s head, and out of the helmet. The ventilation channels are formed by pads.

[0005] Another technical advantage of particular embodiments of the present invention includes providing a helmet with a more comfortable fit against a user’s head. The pads in particular embodiments allow for a more personalized fit for each individual. For example, the pads of particular embodiments may more comfortably accommodate different head shapes of different users by yielding to a user’s head more easily.

[0006] It will be understood that the various embodiments of the present invention may include some, all, or none of the enumerated technical advantages. In addition, other technical advantages of the present invention may be readily apparent to one skilled in the art from the figures, description and claims included herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a more complete understanding of the present invention and its features and advantages, reference is now made to the following description, taken in conjunction with the accompanying drawings, in which:

[0008] FIG. 1 is a diagram illustrating a side view (with portions broken away) of a helmet according to one embodiment of the present invention;

[0009] FIG. 2 is a diagram illustrating a bottom view of the helmet of FIG. 1; and

[0010] FIG. 3 is a flowchart of an example method of manufacturing the helmet of FIGS. 1 and 2 according to one embodiment of the present invention.

DETAILED DESCRIPTION

[0011] FIGS. 1 and 2 illustrate an example helmet 10 operable to protect a user’s (a wearer’s) head 20. FIG. 1 is a diagram illustrating a side view (with portions broken away) of a helmet according to one embodiment of the present invention. FIG. 2 is a diagram illustrating a bottom view of the helmet of FIG. 1.

[0012] Example helmet 10 may offer coverage to any one or more parts of the user’s head, including, for example, the top, back, and sides of the user’s head, to protect the user from head traumas. Although helmet 10 is a motorcycle helmet, helmets made according to the present invention may include any type of protective headgear, including, for example and without limitation, a bicycling, skateboarding, motorcycling, race car driving, rock climbing, snowboarding, and skiing helmet. Helmet 10 comprises an inner protective layer 30, an outer protective layer 40, vents 50 and 60, ventilation channels 70, and pads 80.

[0013] Inner protective layer 30 includes any layer of material or combination of materials operable to protect a user’s head from an impact, such as, for example, expanded polystyrene (EPS). Outer protective layer (or shell) 40 includes any layer of material or combination of materials operable to provide an additional layer of protection around inner protective layer 30, such as, for example and without limitation, polycarbonate plastic, carbon fiber/Kevlar/nylon-glass tri-weave, or fiberglass. As illustrated in the example embodiment in FIGS. 1 and 2, inner protective layer 30 of helmet 10 may be disposed substantially within outer protective layer 40. However, inner protective layer 30 may not be covered by protective layer 40 in certain locations. In addition, although two protective layers 30 and 40 are illustrated in the example embodiment, there may only be one protective layer or there may be more than two protective layers in other embodiments.

[0014] As described above, helmets are used in a variety of activities, such as, for example, bicycling, skateboarding, motorcycling, race car driving, rock climbing, snowboarding, and skiing. Helmets offer substantially full coverage to the top, back, and sides of the user’s head to better protect the user from head traumas. As a disadvantageous byproduct, the helmet’s substantially full coverage of the user’s head generates heat within the interior of the helmet, leading to user discomfort.

[0015] To alleviate the discomfort from heat generated within the helmet, users may require some form of ventilation. Helmets may include vents or other air intake or outtake devices to introduce air into the helmet and to allow
air to leave the helmet. Users may also lift the protective face shield (if one is provided) to an open position to admit air.

In the illustrated embodiment, ventilation is provided by air vents 50 and 60. Air vents (or ports) 50 and 60 include any vent or combination of vents operable to allow air to enter or leave the inside of the helmet 10. Although air intake vents 50 are located in the example helmet 10 in a position corresponding to the user’s forehead and mouth, vents 50 may be positioned anywhere on helmet 10, including, for example, on the sides and/or top of helmet 10. Additionally, exhaust vents 60, although located at the back of helmet 10, may also be positioned anywhere on helmet 10, including, for example, on the sides of helmet 10. In addition, though vents 50 and 60 are illustrated in the example embodiment as being separate, they may be combined into one vent that allows air to both enter and leave helmet 10. Ventilation may also be achieved through other means and may not even require any vents 50 or 60 at all. For example, air may enter and/or exit the helmet around the face shield of the helmet or around the user’s neck.

As many users of prior helmet designs have found, however, ventilation by air vents alone often does not alleviate the discomfort due to heat generated within the helmet. The reason that vents alone do not alleviate the discomfort from heat generation is that the ventilated air does not adequately travel within the interior of the helmet to cool the user’s head. Prior helmets have not been designed to provide for adequate circulation of air within the helmet. Prior helmets have sought to cool the user using multiple vents and breathable liners, but these helmets have inadequately allowed air to circulate within the helmet. Although particular prior helmets have comprised limited “channels” between large pads, these “channels” have not been designed to provide circulation of air around much of the user’s head, being too few in number and too narrow and shallow to be effective.

Referring back to FIGS. 1 and 2, example helmet 10 provides a network of interconnecting ventilation channels 70 around the user’s head 20 to allow for increased circulation of air within helmet 10. Ventilation channels 70 are defined by pads 80 located in example helmet 10 between the inner protective layer 30 and the user’s head 20. Pads 80 are positioned around the interior of the helmet to form, in the illustrated embodiment, a network of interconnected ventilation channels 70 that substantially surrounds the user’s head. This allows air coming into the helmet to easily circulate around much of the user’s head and thus to cool the user’s head. Thus, compared to previous helmets having few, if any, spaces between the helmet pads, helmet 10 provides vastly increased air circulation. Furthermore, because less of the helmet 10 is in contact with the user’s head, the fit for the user is more comfortable.

Pads 80 may comprise one or more materials with differing densities, consistencies, or other properties. In particular embodiments, one or more pads 80 may comprise a foam material, such as, for example, closed cell foam or open cell foam. One example of closed cell foam that may be used is CONFOR® CF-45 foam. In particular embodiments, as an example, pads 80 may comprise closed cell foam with a density greater than the open cell foam used in typical helmet pads (which may have, as an example, a density of two to three pounds per cubic feet). In particular embodiments, as an example only, the density of pads 80 may comprise approximately six pounds per cubic feet. The density of the material comprising pads 80 may also differ. For example, the density of the foam comprising pads 80 in some embodiments may vary along a gradient from low to high density foam. The material comprising pads 80 need not be uniform in some embodiments and may include air pockets, other closed or open chambers, and/or holes. In addition, all pads 80 in one helmet 10 need not comprise the same material. For example and without limitation, one or more pads may comprise a first material, another pad or pads may comprise a second material, yet another pad or pads may comprise a third material, and so on.

Pads 80 may also comprise a liner material 82 surrounding part or all of their surface area to reduce friction between the pads and a user’s head and/or to generally provide comfort to the user. For example, as illustrated in helmet 10 of FIGS. 1 and 2, linear material 82 may cover the surface area on the end of the pads 80 that contacts the user’s head 20. In some embodiments, linear material 82 may include Lycra or some other form of spandex. Other suitable materials may alternatively be used. Linear material 82 may provide for increased comfort during use and may allow a user to put the helmet 10 on and take the helmet 10 off with greater ease and reduced stress on the pads 80.

Pads 80 in example helmet 10 are illustrated as being cylindrical with circular cross-sections oriented to face the user’s head 20. However, pads 80 may be any shape or any combination of shapes, and may be oriented in any manner. For example, pads 80 may comprise cylinders having non-circular cross-sections, such as an oval cross-section or a polygonal cross-section. Pads 80 may also include, for example, cones, pyramids, wedges, hemispheres or any other suitable shape or combination of shapes. In particular embodiments, the shape of pads 80 may be chosen to increase airflow through channels 70 and may even be shaped to direct the airflow flowing around a pad 80 in a certain direction (for example, using a “tear drop” cross-section oriented in a particular direction).

In one or more embodiments, pads 80 may all be one size, or pads 80 may be various sizes, such as, for example, in helmet 10 of FIGS. 1 and 2. Pads 80 may be the same or different heights, lengths, or widths, or have the same or different surface areas or volumes. For example, in certain embodiments, pads 80 may have a height of approximately twenty millimeters. In other embodiments, the height of pads 80 may be greater or lesser than this amount. Pads 80 may all be in contact with user’s head 20 when the user is wearing helmet 10, or some may and others may not be in contact with user’s head 20, depending on the size and shape of the head.

The example helmet 10 of FIGS. 1 and 2 includes approximately sixty pads 80. However, helmets according to embodiments of the present invention may comprise any number of pads suitable to create a network of interconnecting ventilation channels 70 around the user’s head 20 to allow for increased circulation of air within helmet 10. Thus, other embodiments may include less or more pads than in example helmet 10 of FIGS. 1 and 2. According to particular embodiments, as an example, forty or more pads 80 may be used for a full face helmet to provide increased ventilation of a user’s head. In addition or alternatively, in particular
embodiments, pads 80 may occupy thirty percent or less of the surface area of the interior of the protective layer. In particular embodiments, as an example, pads 80 may have an area to height ratio (a volume distribution) less than the fifty to one ratio of many typical pads. In certain embodiments, and as an example, the ratio of area to height may be approximately one to one. It should be noted that “pads,” as used herein, may refer to separate pads and/or to padded extensions extending from one pad that provides a common backing for the padded extensions. Thus, references to a “plurality of pads” or to some number of pads may refer to a plurality or some number of separate pads, respectively, and/or to a plurality or some number of padded extensions, respectively, extending from one pad that provides a common backing for the padded extensions.

As in example helmet 10 of FIGS. 1 and 2, the spacing between adjacent pads may be variable. In other embodiments, the spacing between adjacent pads may be constant or be different than that in example helmet 10. The spacing between pads 80 may comprise any variation suitable to create a network of interconnecting ventilation channels 70 around the user’s head 20 to allow for increased circulation of air within helmet 10. In particular embodiments, as an example, adjacent pads may be spaced apart six or more millimeters to provide for increased circulation.

Pads 80 may be attached to inner protective layer 30 using an adhesive. Alternatively, pads 80 may be secured inside the inner protective layer using any other suitable method of coupling the pads 80 to the protective layer 30 (and/or the shell 40).

In operation, according to one embodiment, air 90 from outside of helmet 10 enters helmet 10 through vents 50 (and possibly through other locations). Vents 50 direct the air 90 into the interior of the helmet 10. More specifically, vents 50 direct the air 90 into the ventilation channels 70 between layer 30 and the user’s head 20. The air 90 travels through ventilation channels 70 in any direction, or in multiple directions, around pads 80. The air 90 thereby cools the user’s head 20. The air 90 then exits through vents 60. Again, vents 50 and 60 may, in some embodiments, be the same vent or vents in one or more positions on the helmet 10. By allowing air 90 to flow through ventilation channels 70, helmet 10 allows the air 90 to cool the user’s head 20, decreasing the user’s discomfort from the heat generated by wearing helmet 10.

Modifications, additions, or omissions may be made to the helmet 10 described without departing from the scope of the invention. The components of the helmet 10 described may be integrated or separated according to particular needs. Moreover, the operations of the helmet 10 described may be performed by more, fewer, or other components.

FIG. 3 illustrates a flowchart 200 of an example method of manufacturing the helmet 10 of FIGS. 1 and 2 according to one embodiment of the present invention. Flowchart 200 begins at step 202, where an inner protective layer is formed from a suitable material that can protect a user’s head from an impact. An example of one such material is expanded polystyrene (EPS). Typically, this inner protective layer is formed by injecting a mold in the shape of the inner protective layer with EPS and then heating the mold such that the EPS expands to take the shape of the mold. In particular embodiments, this inner protective layer may also be formed as separate parts which are later joined to form a single inner protective layer.

At step 204, an outer protective shell is formed from a material that can provide an additional layer of protection around the inner protective layer. Examples of such a material include carbon fiber/kevlar/fiberglass tri-weave, fiberglass, and injection-molded polycarbonate plastic. In particular embodiments, this outer protective shell is formed separately from the inner protective shell.

At step 206, one or more vents may be formed through the inner protective layer and/or the outer protective shell at one or more locations. These vents provide a passageway through which airflow may be directed into the interior of the inner protective layer to cool the user’s head. In particular embodiments of the present invention, these vents may be formed at the same time as the inner protective layer and/or the outer protective shell. In such an embodiment, the vents may simply be defined by the mold used to form the inner protective layer and/or the outer protective shell. In other embodiments, the vents may be formed through the inner protective layer and/or the outer protective shell by machining or other suitable means.

At step 208, the inner protective layer is inserted into the outer protective shell. In particular embodiments of the present invention, this may require inserting the inner protective layer into the outer protective shell in separate pieces, as inner protective layer may be too large to fit through the facial opening or neck opening of the outer protective shell in one piece. Once inserted into the outer protective shell, the inner protective layer may be secured inside the outer protective shell using an adhesive or other suitable method of coupling the two.

At step 210, pads are formed from one or more materials with the same or differing densities, consistencies, or other properties. In one or more embodiments, one or more pads may comprise a foam material. For example, one or more of the pads may comprise closed cell foam, such as, for example, CONFOR® CF-45 foam. In another embodiment, one or more of the pads may comprise open cell foam. The density of the foam comprising the pads may also vary along a gradient from low to high density foam. The material comprising the pads need not be uniform and may include air pockets, other closed or open chambers, and/or holes. Pads also need not comprise the same material, so that, for example, some pads may comprise one material and others may comprise another material. The pads may be formed in any shape or combination of shapes, such as cylindrical shapes with circular cross-sections. The pads may be formed to be approximately the same size or various sizes. They may be formed to be the same or different heights, lengths, or widths, or have the same or different surface areas or volumes.

At step 212, a liner may be coupled to part or all of the surface area of the pads to reduce friction between the pads and a user’s head during use and/or to generally provide comfort to the user. The liner may be formed from any suitable liner material such as, for example, Lycra or some other form of spandex. This liner material may allow a user to put the helmet on and take the helmet off with greater ease and reduced stress on the pads. The liner may be secured to the pads using an adhesive, stitching, or any other suitable method of coupling the liner and the pads. It should be noted that the liner may be coupled to the pad material before individual pads are formed (at step 210). In particular embodiments, a liner may not be used.
At step 214, the pads are inserted into the inner protective layer. The pads may be inserted in such a way as to be in contact with a user’s head when the user is wearing the helmet. Alternatively, they may be inserted such that some pads may and others may not be in contact with the user’s head when the user is wearing the helmet. The pads may be placed in any position around the inner protective layer and in any orientation, in a manner that allows suitable circulation of air through a network of interconnected ventilation channels that substantially surround a user’s head during use. The pads may be secured inside the inner protective layer using an adhesive or other suitable method of coupling the pads and the layer and/or the shell.

Although flowchart 200 describes a particular order of steps for assembling a ventilated helmet in accordance with a particular embodiment of the present invention, particular embodiments of the present invention may use all, some, or none of the steps described above. Moreover, particular embodiments may perform those steps in a different order than that described above without departing from the teachings of the present invention.

By directing airflow from the exterior of a helmet into the interior of a helmet and allowing for the air to circulate around a user’s head, particular embodiments of the present invention offer improved ventilation for the user, helping to cool the user’s head and dissipate heat. The dissipation of heat may increase user comfort. Another technical advantage of particular embodiments of the present invention includes providing a helmet with a more comfortable fit against a user’s head.

Although the present invention has been described with several embodiments, various changes and modifications may be suggested to one skilled in the art. It is intended that the present invention encompass such changes and modifications as fall within the scope of the appended claims.

What is claimed is:

1. A helmet, comprising:
   - at least one protective layer configured to cover at least a portion of a user’s head; and
   - a plurality of pads coupled to the protective layer, the pads defining a network of interconnected ventilation channels between the pads, the ventilation channels substantially covering an interior of the protective layer and allowing air circulation between the protective layer and the user’s head when the helmet is worn by the user.

2. The helmet of claim 1, wherein thirty percent or less of the surface area of the interior of the protective layer is covered by pads.

3. The helmet of claim 1, wherein the at least one protective layer comprises:
   - an outer protective shell; and
   - an inner protective layer disposed substantially within the outer protective shell.

4. The helmet of claim 1, further comprising at least one port configured to allow air to flow from an exterior of the helmet into an interior of the helmet.

5. The helmet of claim 1, wherein the plurality of pads comprise at least forty pads.

6. The helmet of claim 1, wherein at least one of the plurality of pads comprises foam.

7. The helmet of claim 6, wherein at least one of the plurality of pads comprises high-density, closed cell foam.

8. The helmet of claim 1, further comprising a liner material covering at least a portion of one or more of the pads.

9. The helmet of claim 1, wherein the minimum distance between any two adjacent pads comprises six millimeters.

10. The helmet of claim 1, wherein at least one of the plurality of pads comprises a cylindrical shape.

11. The helmet of claim 10, wherein at least one of the plurality of pads comprises a cylindrical shape having a circular, oval, or polygonal cross-section.

12. The helmet of claim 1, wherein at least one of the plurality of pads comprises an area to height ratio of less than fifty to one.

13. A method of manufacturing a helmet, comprising:
   - providing at least one protective layer configured to cover at least a portion of a user’s head; and
   - coupling a plurality of pads to the protective layer, the pads defining a network of interconnected ventilation channels between the pads, the ventilation channels substantially covering an interior of the protective layer and allowing air circulation between the protective layer and the user’s head when the helmet is worn by the user.

14. The method of claim 13, wherein thirty percent or less of the surface area of the interior of the protective layer is covered by pads.

15. The method of claim 13, wherein the at least one protective layer comprises:
   - an outer protective shell; and
   - an inner protective layer disposed substantially within the outer protective shell.

16. The method of claim 13, wherein the at least one protective layer comprises at least one port configured to allow air to flow from an exterior of the helmet into an interior of the helmet.

17. The method of claim 13, wherein the plurality of pads comprise at least forty pads.

18. The method of claim 13, wherein at least one of the plurality of pads comprises high-density, closed cell foam.

19. The method of claim 18, wherein at least one of the plurality of pads comprises high-density, closed cell foam.

20. The method of claim 13, further comprising coupling a liner material to one or more of the pads, such that the liner material covers at least a portion of one or more of the pads.

21. The method of claim 13, wherein the minimum distance between any two adjacent pads comprises six millimeters.

22. The method of claim 13, wherein at least one of the plurality of pads comprises a cylindrical shape.

23. The method of claim 22, wherein at least one of the plurality of pads comprises a cylindrical shape having a circular, oval, or polygonal cross-section.

24. The method of claim 13, wherein at least one of the plurality of pads comprises an area to height ratio of less than fifty to one.

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